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## Geography and the new social contract for global change research

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## Geography and the new social contract for global change research

### Abstract

Anxious about the failure of decisionmakers to significantly reduce 'the human impact' on Earth, many global change researchers are looking for ways and means to influence public policy, business strategy and civil society more strongly. As part of this, there is a greater emphasis on understanding and altering the 'human dimensions' of global environmental change. A number of physical and society-environment geographers are involved in this endeavour, building on some valuable past achievements. But what lies ahead? I address this question by examining the rich idea of a 'social contract' - one little used in disciplinary debates about Geography's past, present and future, but now relatively common in certain wider discussions of anthropogenic global change. I suggest that there are currents of thinking in contemporary Geography that can offer something both new and much needed in the world of global change research. That 'something' is not ever more integrated, accurate analysis of dynamic, coupled human-environment interactions - as if we live in just one world requiring ever more 'joined-up' and granular description, explanation and prediction. Instead, it is an approach to research that eschews ontological holism, epistemological monism and the fact-value dualism. This approach suggests that taking the human dimensions of environmental change seriously requires a new kind of global change research that is at once overtly political and intellectually plural. Far from being a charter for 'bias' or 'relativism', I show that this approach expresses the rich senses of responsibility, accountability and representation contained in the version of a new social contract I advocate here. A wider implication of my argument is that Geography needs new stories about the nature and merits of 'intra-disciplinarity', ones better attuned to the role of research in fostering democracy in our 'post-normal' times. Thinking afresh about how research should influence society promises to alter many geographers' sense of self while usefully repurposing global change research across several disciplines.

### Keywords

contract, geography, global, social, change, research

### Disciplines

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# Geography and the new social contract for global change research

Noel Castree\*

**Abstract:** Anxious about the failure of decision makers to significantly reduce ‘the human impact’ on Earth, many global change researchers are looking for ways and means to influence public policy, business strategy and civil society more strongly. As part of this, there is a greater emphasis on understanding and altering the ‘human dimensions’ of global environmental change. A number of physical and society-environment geographers are involved in this endeavour, building on some valuable past achievements. But what lies ahead? I address this question by examining the rich idea of a ‘social contract’ – one little used in disciplinary debates about Geography’s past, present and future, but now relatively common in certain wider discussions of anthropogenic global change. I suggest that there are currents of thinking in contemporary Geography that can offer something both new and much needed in the world of global change research. That ‘something’ is not ever more integrated, accurate analysis of dynamic, coupled human-environment interactions – as if we live in just one world requiring ever more ‘joined-up’ and granular description, explanation and prediction. Instead, it is an approach to research that eschews ontological holism, epistemological monism and the fact-value dualism. This approach suggests that taking the human dimensions of environmental change seriously requires a new kind of global change research that is at once overtly political and intellectually plural. Far from being a charter for ‘bias’ or ‘relativism’, I show that this approach expresses the rich senses of responsibility, accountability and representation contained in the version of a new social contract I advocate here. A wider implication of my argument is that Geography needs new stories about the nature and merits of ‘intra-disciplinarity’, ones better attuned to the role of research in fostering democracy in our ‘post-normal’ times. Thinking afresh about how research should influence society promises to alter many geographers’ sense of self while usefully repurposing global change research across several disciplines.

**Keywords:** global change research; geoscience; interdisciplinarity; social contract; democracy; representation; post-normal inquiry

## Introduction

Global change research (hereafter GCR) is a multi-disciplinary endeavour of considerable size and complexity. It includes, but extends well beyond, inquiries into anthropogenic climate change. Though far from unified, its practitioners, networks and organisations share a common determination to understand and alter the escalating ‘human impact’ on Earth – with a particular emphasis on global and regional scale effects. GCR is currently morphing intellectually and institutionally in response to the ‘sustainability gap’. Leading researchers have called on their peers to reformat and repurpose GCR so that it more effectively influences politics, business and civil society. Their concern is that action to arrest and adapt to global environmental change has been, and remains, woefully inadequate. As we will see, they hope that a more ‘decision-

relevant' GCR focussed more on 'human dimensions' can foster timely and appropriate responses to current and predicted planetary changes.<sup>1</sup>

These calls for a different *modus operandi* among global change researchers have found institutional expression in new research programmes and advisory bodies – notably Future Earth (effective from 2015) and the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES, operational since 2013). The former assimilates and redirects research previously conducted under the auspices of three of the four long-standing international GCR programmes (namely, DIVERSITAS, the International Geosphere-Biosphere Programme [IGBP], and the International Human Dimensions Programme [IHDP]).<sup>2</sup> The latter is the new high-level science advisory body that, with respect to terrestrial and aquatic ecosystems, is broadly analogous to the long-established Intergovernmental Panel on Climate Change (IPCC).<sup>3</sup>

This paper critically analyses the changes afoot in some of the networks and organisations that comprise important parts of GCR today. While I agree that business-as-usual is not an option, I believe the sort of alterations imagined to be desirable by leading practitioners fall short of those that are ultimately called for in light of humanity's planetary-scale impacts. I make the case by challenging recent arguments for a 'new social contract' between global change researchers and their various stakeholders. These arguments recall earlier attempts in Anglophone history to codify the relationship between science and society. The notion of a new social contract is a potentially powerful framing device that can speak to all manner of global change researchers across the

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<sup>1</sup>Let me emphasise that because what I am calling GCR is a large, multi-disciplinary and complex enterprise, the calls for change I focus on in this paper emanate only from certain people and places - even though they are intended to have a wide application across this field of fields. This said, these calls echo those being made by those who call themselves 'sustainability scientists' and who together constitute a sizeable part of the GCR community (see note 11 below). Though geographer Robert Kates is a founding figure of sustainability science, surprisingly few global change researchers in the discipline of geography advertise themselves in this way. This is a key reason why the calls for change I choose to review in the first half of this paper do not emanate from sustainability science, despite this science's obvious relevance to geographers working on anthropogenic global change. In sum, when I use the acronym GCR in this paper I am not seeking to homogenise or generalise. GCR is a generic descriptor and here I focus on some recent, prominent contours of the wider landscape.

<sup>2</sup>The World Climate Research Programme, which has direct links to the Intergovernmental Panel on Climate Change, will continue as a separate enterprise. However, it will maintain direct links with Future Earth. In effect, Future Earth replaces the Earth System Science Partnership that has linked the four global environmental change research programmes since the early 2000s. However, its declared mission will focus far more squarely on both 'human dimensions' and 'useable knowledge' than the ESSP did.

<sup>3</sup>The IPBES was inspired not only by the IPCC but also by the Millennium Ecosystem Assessment (2001-5) and before that the Global Biodiversity Assessment (UNEP, 1995). Both of these were conducted under the auspices of the United Nations. The IPBES is a direct response to the failure of signatories to the 1992 UN Convention on Biological Diversity to address the progressive loss of terrestrial and marine diversity since the first Earth Summit.

disciplines and those their investigations are designed to serve. However, I claim that it is mobilised in an overly restricted way by certain thought-leaders in CGR. A *genuinely* new conception of a ‘new social contract’, I will argue, provides a strong intellectual platform that might support ‘styles’ of GCR different to those that currently dominate this multidisciplinary enterprise.

These alternative styles are flourishing in Geography, though are rarely present in the many engagements to-date between geographers and the wider networks and institutions of GCR. They speak to a form of intradisciplinarity very different to that underpinning recurrent arguments – in this journal and elsewhere – for Geography to be less of a house divided. As I will explain, while they are germane to wider calls for more integrated and relevant knowledge in GCR, they also speak to a different social contract than that presumed desirable by certain global change researchers. This contract gives knowledge-in-the-service of deliberation and choice (aka ‘democracy’) parity of esteem with knowledge-in-the-service of action (aka ‘decision’). In my view, it better recognises the true profundity for humans and non-humans of the planetary changes many global change researchers have worked so hard to bring to our collective attention.

In sum, this paper offers a constructive appraisal of important shifts afoot in GCR with reference to some recent research on the society-environment interface within Geography. As such, it explores how GCR might speak to geographers as well as how geographers might speak back to GCR going forward. My argument builds on those I have made in several recent articles (Castree, 2015a; 2015b; Castree *et al.* 2014). The key difference is that the present paper focuses centrally on the concept of a new contract between GCR and society. By unpacking this concept, I hope to provide a robust intellectual case for pushing the boundaries of GCR further than they might otherwise be pushed. Geographers will, I hope, see how my own reading of the concept offers a rationale for alternative forms of engagement with GCR predicated on a new sense of why the dis/unity of our discipline is advantageous.

The paper begins by detailing the intellectual and institutional shifts unfolding in key parts of GCR. It then explores the notion of a new social contract that has been used by some global change researchers to characterise the why and wherefore of these shifts. In the next two sections I turn to Geography,

highlighting some recent instances of research that speak to this wider conception. Finally, I show how these examples, and my vision of a new social contract for GCR, challenge long-standing narratives about the value of a less fragmented discipline (re)centred on the analysis of human-environment relationships. The result, I hope, is an essay that offers a fresh perspective on the relationships between geographers and GCR.

## **The changing composition of global change research**

### ***Background***

Before detailing some of the most recent and ongoing changes occurring in GCR, it is useful to offer some history. This will allow readers to understand why these changes are being proposed and, in some respects, already implemented – making this an especially formative moment in the life of GCR.

Though research into planetary scale biophysical changes goes back many decades, only in the last thirty years has there been a concerted (and growing) focus on Earth-wide alterations caused by human actions. ‘Global change research’ examines anthropogenic impacts on the atmosphere, biosphere, cryosphere, hydrosphere, and lithosphere. It aspires to variously describe, explain, and predict these impacts at the planetary or regional scales, taking account of spatial-temporal variations and focussing on linkages between spheres. Though most emphasis since the early 1990s has been on physical dimensions, GCR also examines actual and possible human responses to global environmental change. Indeed, the need to investigate (and influence) these ‘human dimensions’ has become more important as various geoscientists have revealed the unprecedented scale, scope and magnitude of people’s collective impact on Earth.

GCR is almost entirely located in organisations that are government-funded or perform a public function. It has been led by environmental scientists (and is often called ‘global change science’ for this reason). Aside from various universities, examples of the latter are the National Center for Atmospheric Research (NCAR) and NASA in the USA, several Max Plank Institutes in Germany, the UK’s Met Office and Australia’s CSIRO. Over the decades GCR has benefitted from various forms of national support – evidenced, for example, in the multi-sited, multi-disciplinary research of the UK Tyndall Centre (whose original funding came from the Natural Environment Research Council, the Economic and Social Research Council, and the Engineering and Physical

Sciences Research Council). It has also benefitted from the international cooperation and exchange fostered by the World Climate Research Programme (WCRP, est. 1980), the IGBP (est. 1986), the IHDP (est. 1990, re-launched in 1996), DIVERSITAS (est. 1991) and the Earth System Science Partnership (ESSP) that connected the quartet between 2002 and 2012. Aside from these programmes and the ESSP, there have been complementary regional initiatives such as START (global change SysTEM Analysis, Research & Training, est. in 1992 and focused on Africa and the Asia-Pacific region) and the IAI (Inter-American Institute for Global Change Research, est. 1992). Finally, GCR has benefitted from national and multinational investments in improved and integrated Earth observation technologies. For instance, among others there is the Global Climate Observing System (est. 1992) and, more recently, GEO (the Group on Earth Observations, est. 2005) – with a new European Union Sentinel satellite system unfolding.<sup>4</sup> One result of all this is that GCR has dedicated research outlets, such as the peer review journals *Current Opinion in Environmental Sustainability* (est. 2009), *Global Environmental Change* (est. 1990), *Earth's Future* (est. 2013) and *Anthropocene Review* (est. 2014).<sup>5</sup>

Various feeding into and emerging from these forms of financial and infrastructural support, certain research institutes and centres have become intellectual hotspots of GCR. Some are long-established, some relatively new. For instance, aside from Tyndall (est. 2000), there is the Potsdam Institute for Climate Impact Research (est. 1992), the National Center for Atmospheric Research (est. 1960) and the Stockholm Resilience Centre (est. 2007). However, these physical locations aside, the four international GCR programmes, the ESSP and the IPCC have enabled international research alliances to emerge. These comprise both occasional and more sustained collaborations between far-flung global change researchers. For instance, courtesy of the IGBP the Nobel Prize winning atmospheric chemist Paul Crutzen has worked on several occasions with leading American-Australian climate scientist Will Steffen (e.g. see Steffen *et al.*, 2011). The IPCC, to take another example, inspired the creation of the Integrated Assessment Consortium in 2007 (<http://www.globalchange.umd.edu/iamc/home/>). These hotspots and alliances have not only focused on basic research into

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<sup>4</sup>A full list of global change research programmes and networks, of Earth observation systems and networks and national scale GCR programs can be found on the IGBP website at: <http://www.igbp.net/networks.4.d8b4c3c12bf3be638a80001067.html>

<sup>5</sup>This said, GCR is widely reported in all manner of established disciplinary and interdisciplinary journals, such as *Science*, *Nature*, *BioScience* and *PNAS*.

anthropogenic environmental change. On the contrary, global and national links with public policy have long characterized some parts of GCR – most obviously in the area of anthropogenic climate change. Aside from the IPCC, the short-lived Climate Commission in Australia (2011-13) and the UK Committee on Climate Change (est. 2008) are examples of climatic research findings feeding into expert advisory organizations designed to inform governmental decision-making.

It is against this background – at once intellectual, financial, infrastructural and institutional – that GCR is now undergoing change. The changes do not apply equally and everywhere: GCR is far more complex than indicated in the potted history provided above.<sup>6</sup> However, the changes are cascading through significant nodes and networks within GCR, with institutional backing from the likes of the International Council for Science (ICSU), the United Nations Environment Program (UNEP) and the Belmont Forum of national funding agencies (est. 2009). As we will see in the following sub-sections, these changes reflect a shared concern among many global change researchers: namely, that the content, aims and reporting of their research has not thus far enabled politicians, business leaders and civil society actors to respond with sufficient speed and seriousness to the enormous challenges presented by anthropogenic environmental change. As Nathan Sayre and co-authors put it, “Changing the *role* of [global change] science is necessary but not sufficient to meet the challenges before us – the *practices* of [the] science must also change” (2013: 339, emphasis added). For this reason, recent calls for alterations to the professional habits of global change researchers have focused on three things.

### **Change 1: better communication**

A number of global change researchers, and those with a direct stake in GCR, have focused on the quality of communication with those constituencies the research stands to influence. This has several aspects. First, some have

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<sup>6</sup>A detailed survey of GCR has yet to be written. The recent overview offered by Harold Mooney and others (2013) is usefully wide-ranging, as is that presented by Ignaciuk *et al.* (2012) – but both are all too brief and exclude ‘sustainability science’ (see note 1 above and . Almost all of the more detailed accounts of GCR focus on particular parts of the wider enterprise, whether they be authored by ‘insiders’ (e.g. Liverman & Roman Cuesta, 2008) or by ‘outsiders’ (e.g. Uhrqvist, 2015). One definitional challenge is to determine where GCR now begins and where it shades into other forms of environmental and society-nature inquiry. Mooney *et al.* (2013) include projects conducted within the four global change research programmes, ‘sustainability science’ and that conducted by members of the Resilience Alliance. But one could stretch even this ecumenical definition. For instance, research into biophysical hazards and associated human disasters precedes GCR in Mooney *et al.*’s sense of the latter. However, because anthropogenic environmental change amplifies some ‘natural’ hazards, the vibrant, multi-disciplinary field of study that examines the causes, consequences and responses of/to hazards is now bleeding into the networks and institutions of GCR.

enjoined their peers to resist diluting the hard-hitting implications of scientific findings about anthropogenic environmental change. For instance, in a recent *Nature* article on climate advisors, Oliver Geden (2015) argues that anxiety about being seen as irrelevant by politicians has led too many advisors to relinquish intellectual independence in favour of pragmatism. This echoes the claims of the Tyndall Centre's Kevin Anderson and Alice Bows writing in *Nature Climate Change*. They argue strongly that researchers have a responsibility to communicate their insights “clearly, honestly and without fear” (2012: 640; see also Anderson, 2015). Secondly, others have focussed on communicating GCR to non-academic stakeholders in ways that are very, very clear. Reflecting on the IPCC ‘summaries for policy-makers’, Richard Black laments their length and technicality given they are intended for “time poor generalists who spend virtually all of their working lives outside the climate research ‘bubble’” (2015: 282). Relatedly, David Rose (2014) urges global change researchers to become more literate about the needs of policy makers when deciding how to frame evidence. Meanwhile, Christa Clapp and colleagues (2015) identify important gaps in the climate science-private sector relationship, focussing on green bonds. “The burden is on us researchers”, they argue, “to clearly communicate climate risk and potential implications to investors” (p. 85).

Focussing on science-policy links outside institutions like the IPCC and IPBES, Anthony Barnosky and collaborators have shouldered this burden in the hope of inspiring others. They recently authored a ‘Scientific Consensus Statement on Maintaining Humanity’s Life Support Systems in the 21<sup>st</sup> Century’ (Barnosky *et al.* 2014a). Released in May 2013, it was targeted at policy makers – with former California Governor Jerry Brown a willing intermediary to get the Statement taken seriously elsewhere (for lessons learned see Barnosky *et al.*, 2014b). This example speaks to a third aspect of communication preoccupying some global change researchers: namely, the need to connect directly with non-academic constituencies even in the absence of established institutions like the IPCC. Adam Corner and Chris Groves (2014) suggest that new hybrid organisations should be created to facilitate such connection. Neither science advisory bodies nor politically-partisan think tanks, these organisations would “be explicitly tasked with carving-out a new space between the normative tenets of scientific research and public engagement” (p. 744). In Corner and Groves’ vision, they would allow global change researchers to maintain

academic integrity while connecting their findings to a range of political-ethical visions of preferable social and environmental arrangements (see also Rapley & De Meyer, 2014).

### ***Change 2: a move beyond ‘physical dimensions’***

Because it is now clear that the physical dimensions of environmental change will profoundly shape the human future, a number of urgent calls have been issued to make social science much more central to GCR. A particularly prominent one has come from the ISSC (International Social Science Council) in its third *World Social Science Report*, entitled *Changing Global Environments* (ISSC & UNESCO, 2013). This came on the heels of the ISSC’s manifesto *Transformative cornerstones of social science research for global change* (Hackmann & St. Clair, 2012), which noted that “the focus has fallen sharply on the social sciences, with natural scientists, sponsors and funders alike calling for more social science, better social science and, very importantly, for more attention to global change challenges from mainstream social science disciplines” (p. 9). In a distillation of messages contained in the report and this manifesto, Hackmann *et al.* (2014: 654) recently declared that “The social sciences must help to fundamentally reframe ... environmental change as a social, rather than physical, problem”.

Some in the worlds of environmental science and environmental policy have also made the case for including more environmentally-focused social science in GCR. Writing in *Science*, Phillip Sharp and Alan Leshner of the American Association for the Advancement of Science call on scientists “to operate in fundamentally new ways” (2014: 579) to meet the ‘grand challenges’ of our time. For them ‘convergence science’ is needed that will “integrate ... knowledge from the life, physical, social and economic sciences and engineering” (*ibid.*). Chris Weaver, of the US Environmental Protection Agency, phrases this in terms of ‘knowledge co-production’ in a recent co-authored article in *Nature Climate Change*. Weaver and his colleagues suggest that “Co-framing of both basic and applied research questions from multiple perspectives is not yet the norm in global change research, but it is essential if we are to move forward ...” (Weaver *et al.*, 2014: 658).

Sharp, Leshner and Weaver *et al.* regard improved use of environmental social science as a key way in which GCR can reorient itself towards the ‘context of application’ so as to meet the emerging needs of governments, businesses and

civic actors. In the detail, this can mean a number of things. For some environmental scientists it is about filling knowledge gaps so as to improve the predictive power of Earth system models, thus helping governments plan for the future (e.g. Moss *et al.*, 2010; Palmer and Smith, 2014). For some environmental social scientists it is about gaps elsewhere. For instance, Ben Sovacool and co-authors (2015) argue that ‘adaptation projects’ are too often designed without a close attention to social power, inequality and struggle. Relatedly, Klaus Eisenack *et al.* (2014) argue that the generic concept of ‘adaptation barriers’ needs operationalising through more detailed case study work in different contexts.<sup>7</sup>

These various attempts to show the centrality of social science to GCR reveal contrasting understandings of how to relate to the ‘context of application’. For some – especially environmental scientists and those on the ‘science’ end of the social science spectrum – the relationship resembles something like Roger Pielke’s (2007) ‘honest broker’. Through more seamless integration between STEM subjects and social science, global change researchers can illuminate the varied implications for humanity and its societies of different environmental scenarios (see, for instance, Kraucunas *et al.*, 2015; Liu *et al.*, 2015; Tavoni and Levin, 2014). These scenarios permit consideration of possible ensembles of pre-emptive and adaptive technological, financial and behavioural measures at the global, national and local scales. By contrast, commentators like Heide Hackmann – former executive director of the ISSC and now a senior figure in the ICS – gesture towards a more robust relationship with the context of application. For Hackmann (and various of her recent co-authors), making social science more central to GCR is about helping modern societies

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<sup>7</sup>These and other claims have sometimes been made in the context of promoting the relevance of whole disciplines to global change researchers. Jessica Barnes *et al.* (2013) have made the case for anthropology, focussing on its capacity to disclose interpretive knowledge and cultural diversity – both hugely relevant to understanding the way impacts of and responses to environmental change are registered cognitively, ethically and practically. More recently, Susan Clayton *et al.* (2015) argue that psychology can help GCR become more relevant because it best understands ‘what works’ in terms of (i) communicating environmental change to people, (ii) changing human behaviour, and (iii) helping people adapt to environmental change (see also Carrico *et al.*, 2015). Though both of these advocacy documents promote a rather different sense of ‘human dimensions’, they are underpinned by a shared concern that only select parts of social science have thus far featured in GCR. As David Victor (2015) notes, this is evident in successive IPCC assessment reports, where social science insights have been disproportionately furnished by mainstream economics (see also Carey *et al.*, 2014). Victor argues that such prominence prevents working groups II and III of the Panel from properly addressing important societal questions, such as who should bear the true costs of environmental change and whose values will count the most.

*transform* themselves by challenging policies and practices that sustain our fossil fuel dependent, high-consuming way of life. This implies a more catalytic and political role for GCR, making practitioners at one level ‘issue advocates’ whose normative agenda extends beyond simply ‘speaking truth to power’ (Pielke, 2007).

### **Change 3: a move towards ‘actionable research’**

As the previous paragraph made clear, many global change researchers want its knowledge to be more ‘decision-relevant’, ‘actionable’, ‘user-focused’ and ‘practice-relevant’ than ever before (for additional examples see: Aerts *et al.*, 2014; Chapin *et al.*, 2011; Mace, 2013; Moss *et al.*, 2013; Palmer, 2012; Sivapalan *et al.*, 2014; Stern *et al.*, 2013). Roman Seidl *et al.* (2012) call this science *with* society rather than simply science *for* it (see also Mauser *et al.*, 2013). Depending on who you read, this reflects a concern that (i) too much GCR has been fundamental rather than applied, that (ii) potentially applied research – an example being the design and use of integrated assessment models – has often missed out key data and variables directly relevant to policy discussions, or that (iii) ostensibly ‘policy relevant’ knowledge is too often presented in overly general ways. Looking forward, it is abundantly clear that GCR will be socially and environmentally consequential this century in ways that physics, chemistry, medicine, biology, computer science and engineering were in the 20<sup>th</sup>. Many global change researchers want to anticipate and shape these consequences by routinely reaching-out beyond the academy.

At the highest political level this is already occurring via the United Nations. The likes of Johan Rockström – co-creator of the ‘planetary boundaries’ concept (Rockström, J. *et al.*, 2009) – have shaped the content of the new ‘Sustainable Development Goals’ (agreed by the UN in late 2015). Relatedly, he and other global change researchers engaged directly with international policy makers at the *Our Common Future Under Climate Change* conference held in Paris in July 2015 (<http://www.commonfuture-paris2015.org/>). However, at more local and regional scales, Ruth DeFries, Paul Crutzen and colleagues (2012: 604) envisage research that focuses “... proactively on solutions that are tractable and specific to particular circumstances ...”. After all, the ‘human dimensions’ of global change are ultimately place-based in terms of impacts and responses. One key role that social science can perform here is to help global change researchers learn lessons about how and when ‘relevance’ is achieved (on which see the review by Kirchhoff *et al.*, 2013).

#### ***Change 4: new institutions for a new phase of GCR***

The sentiments being expressed under the three headings listed above are hardly new; similar things have been said in print and at various GCR meetings going back years.<sup>8</sup> However, never have so many global change researchers articulated these common concerns at once, most especially senior researchers with direct links to funding agencies, government departments and other stakeholders. Through the nodes and networks described earlier, these researchers have helped to refashion key parts of the wider institutional landscape that sustains GCR.

Central to this is the earlier mentioned Future Earth initiative (<http://www.futureearth.org/>). It assimilates three of the four global change research programmes. It has high-level support globally.<sup>9</sup> Its transition team was led by Rockström and the geographer Diana Liverman (2013). It hopes to foster “a new type of science that links disciplines, knowledge systems and societal partners to support a more agile global innovation system” (Future Earth, 2014). Two of its three overarching research themes are ‘Global development’ and ‘Transformations towards sustainability’. These indicate a serious desire to make social science’s centrality to GCR more than just rhetoric. Aspirations to co-design projects with stakeholders and offer ‘decision support’ will, it is hoped, make GCR relevant to an unprecedented degree.<sup>10</sup> The ‘Transformations’ theme evidences a particular wish to make at least some global change researchers significant change-agents outside the universities they call home. It is very likely that Future Earth will set the tone for many national level GCR programmes in the immediate future. For instance, in the US the new National Socio-Environmental Synthesis Center (SESYNC) – part-funded by the National Science Foundation – echoes some of the Future Earth agenda.

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<sup>8</sup>For instance, Paul Stern *et al.* edited a manifesto-like book on ‘human dimensions’ of global environmental change back in 1992. A number of claims and suggestions in that collection anticipate those summarised in the previous three sub-sections.

<sup>9</sup>It is sponsored by the Science and Technology Alliance for Global Sustainability, the ICSU, the ISSC, the Belmont Forum of national funding agencies, the new Sustainable Development Solutions Network (SDSN), the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the United Nations Environment Program (UNEP), the United Nations University (UNU), and the World Meteorological Organization (WMO). Future Earth emerged out of a visioning process sponsored by the ICSU and ISSC (ICSU, 2010). It was initiated in 2009 with a ‘task team’ comprised of Johan Rockström, Walter Reid, Heide Hackmann, Khotso Mokhele, Elinor Oström, Kari Raivio, Hans Schellnhuber and Anne Whyte.

<sup>10</sup>Interestingly, the long established CGIAR – the Consortium on Agricultural Research – also underwent a greater shift towards user needs in 2009.

Future Earth aside, the new IBPES also appears to have an appetite for novel practices. For instance, its new conceptual framework aims to accommodate non-Western knowledge systems rather than presuming the universal applicability of the ‘ecosystem services’ concept (see Diaz *et al.* 2015; Borie & Hulme, 2015). What is more, ecological economics will probably have more clout in the Panel than the sort of environmental economics promoted by Nicholas Stern (2015) and others. It is also highly likely that working groups II and III of the IPCC will enjoy greater prominence in future, in part by furnishing more concrete knowledge about the impacts of climate change and possible human responses. Relatedly, some are calling for a new global advisory body covering oceanic ecosystems and fisheries that would, presumably, need to place ‘behaviour change’ at the very heart of its normative agenda (see Maury *et al.*, 2013).

In sum, in terms of both funding and institutional support, GCR now appears to be in a position to make good on some of the declared hopes and wishes of numerous practitioners. It is becoming less dominated by various environmental sciences and less focused on basic research, with a relative increase in social science and ‘user relevant’ inquiry.<sup>11</sup>

## **A new social contract for global change research**

On several occasions in recent years, some of the hoped-for and emerging changes in GCR – detailed above – have been phrased in terms of a ‘new social contract’ (or, now and then, ‘compact’ – see below). The use of this evocative concept is no accident. It recalls a keynote lecture, and subsequent paper in *Science*, by zoologist Jane Lubchenco (1998). Lubchenco was co-author of an earlier *Science* article (Vitousek, *et al.*, 1997) in which she claimed that we now “live on a human-dominated planet” (p. 494). Building on this, her new social contract paper called for a reorientation of STEM subjects<sup>12</sup> towards analysing and helping to solve the most pressing socio-environmental problems of the day. Her watchwords were ‘privilege’ and ‘responsibility’. In her view, publicly funded science (based largely in universities) needed to become more responsive to the needs of the societies sustaining it financially. Scientists should not so much surrender their much valued academic freedom (a

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<sup>11</sup>As I mentioned in note 1 above, the calls for change to GCR summarised in the previous pages find an echo among those who call themselves ‘sustainability scientists’. For recent examples see the special issues of the journal *Sustainability Science* published in 2012 (as Supplement 1 of volume 7) and 2014 (as issue 3 of volume 9, entitled ‘New directions in sustainability science’).

<sup>12</sup>STEM stands for science, technology, engineering and medicine.

privilege) as use it differently (a responsibility) so that their discoveries and inventions dovetailed with political, commercial and civic imperatives. This science-society contract would be 'new' because, at least in the United States, it would reset science's compass away from research that fed into the Cold War ambitions of successive governments after 1945. It would also hew towards the principles of international openness and exchange that, in Robert Merton's (1942) version, helped ensure the 'universality' of science.<sup>13</sup>

Eighteen years after Lubchenco's paper was published, her vision of a new social contract appeals to many global change researchers. Several groups have invoked the term, the implication being that Lubchenco's vision has yet to be realised. It was used in the Stockholm Memorandum, a document that came out of the 3<sup>rd</sup> Nobel Laureate Symposium on Global Sustainability and was presented to the United Nations High-Level Panel on Global Sustainability in 2011; it was cited by Carl Folke and co-authors in a programmatic paper entitled 'Reconnecting the biosphere' (2011), published in *Ambio*; that same year it was in the title of a flagship report by the German Advisory Council on Global Change, chaired by Hans Joachim Schellnhuber (WBGU, 2011); it was also in the title of a multi-authored 2012 manifesto by DeFries and others in the journal *BioScience*; it was a key ingredient of the 2012 *State of the Planet Declaration*, a strategic statement that emerged from the ESSP prior to the Rio+20 Earth Summit (Brito & Stafford-Smith, 2012); it featured in the introduction to a theme issue of *Current Opinion on Environment & Sustainability* focused on changes to the ESSP (Stafford-Smith *et al.*, 2012); it was foregrounded in a recent commentary in the journal *Eos* (Hooke, 2015); and finally it was mentioned in a recent *Nature Geoscience* article by Lubchenco and others about 'science for sustainability' (Lubchenco *et al.*, 2015).

### **A robust and resilient heuristic**

That many senior global change researchers have invoked the idea of a NSC as a way of framing their desire for a different kind of GCR is hardly surprising. It remains "a robust and resilient heuristic" (Guston, 1992: 1) because it has

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<sup>13</sup>Lubchenco's essay appeared the same year as a parallel statement by Paul Hoyningen-Huene *et al.* (1998) which trailed the 1999 World Conference on Science, whose theme was a new social contract for science. Because her argument was normative, and intended as a plenary intervention, Lubchenco did not consider the possibility that more than one 'contract' might be present in university-society relations – on which see Slaughter and Rhoades (2005). Moreover, because her argument was intentionally general it did not unpack the content of her preferred version of the contract. Compare this with Michael Gibbons' (1999) more detailed account in the pages of *Nature*. Gibbons is one of those who promoted the idea of 'mode 2' knowledge as a way of describing a new paradigm for science-society relations (Gibbons *et al.*, 1994).

historical pedigree, is encompassing, is motivational and is founded on several recognized concepts.<sup>14</sup> The pedigree is very much American. The ‘social contract for science’ idea is linked with a post-1945 federal government decision to fund STEM subjects generously: high levels of academic independence were guaranteed so long as a stream of technical innovations ultimately emerged from basic research, benefitting the state, commerce and the public alike. Because America was the world’s scientific powerhouse after World War II, the social contract for science idea became widely known internationally. Electrical engineer Vannevar Bush’s (1945) seminal report *Science: the endless frontier* is usually said to originate it (though, in fact, he did not use the term).<sup>15</sup>

The social contract idea for science is encompassing. It describes a relationship between ‘society’ (i.e. government, business and civil society) and the academic community. Academics who receive reliable funding from society (e.g. in the form of research grants) reciprocate by being professional and productive. Even if they do not know the societal benefits of their research at the outset, at least some research will eventually pay social dividends (e.g. by underpinning new health treatments for citizens or by identifying hitherto unknown physical risks to communities). This description of a two-way relationship is motivational for the parties involved because it is based on established concepts that have a semantic weight to them. The first two are delegation and trust. Governments, acting on behalf of society, delegate the task of producing knowledge (and technology) to experts who are trusted to use their time and resources well driven by a thirst for enlightenment. The third and fourth concepts are accountability and responsibility: researchers can regulate their own behaviour and standards (e.g. through peer review of publications), but at least some of their activities must be responsive to known and emerging societal agendas. These agendas may be political (e.g. national security), commercial (e.g. developing effective and affordable renewable energy technologies) or cultural (e.g. enriching citizens by providing greater knowledge of the history of the universe). Overall, the utility of the social contract for

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<sup>14</sup>My sense is that the historical pedigree of the term is a key reason some GCR researchers have used it, as opposed to equally rich but more historically recent ideas like ‘post-normal science’ or ‘Mode 2’ research.

<sup>15</sup>This said, several elements of Bush’s vision were already present in British science-society relations courtesy of politician Richard Burton Haldane (1854-1928). He was central to the reform of university funding in the First World War period. The so-called ‘Haldane principle’ describes the right of scientists to determine their own questions, topics and methods, with independent research funding bodies acting as buffers against direct governmental interference.

science idea is that it challenges the myth that research can ever occur ‘for its own sake’. Publicly funded science, in the broadest sense, is defined contextually relative to specific institutional and financial relationships that have been constructed in modern nation states.<sup>16</sup>

### ***The need to fill an empty signifier***

There exists a small but rich literature on the history and intellectual basis of the social contract for science (Guston, 1992; Guston, 2000; Hessels *et al.*, 2009; Krishna, 2014; Raman & Mohr, 2014; Stokes, 1997; Sunkel, 2015). There exists a far larger, and extraordinarily stimulating, literature on the changing relations between universities, government, business and civil society. Here terms like ‘mode 2’ knowledge, ‘post-normal’ science, ‘academic capitalism’, ‘science with society’, and ‘responsible innovation’ compete to frame understandings of how 21<sup>st</sup> century societies seek to influence and value university (and wider government-funded) research (and teaching). Yet, despite the pleas for a new social contract by some leading GCR practitioners, only one of the publications cited above says anything of substance about what this might mean (WGBU, 2011). Ironically, what the German Advisory Council does say barely relates to GCR. Instead, it calls for shared responsibility for making a rapid transition to a low carbon between citizens, researchers, and business, with a set of cooperative ‘pro-active’ states at the global helm. In this context, GCR is presented as a means to research and overcome barriers to achieving a ‘Great Transformation’ (see pp. 325-35). But the very general vision of ‘transformational research’ offered is not anchored in any detailed discussion of a new social contract for science. As for the other publications – like the *State of the Planet Declaration* – the reasoning behind the calls for a NSC do not reach beyond the need to identify global and local ‘solutions’ to urgent ‘problems’ like accelerating biodiversity decline.

This was Lubchenco’s approach. Implicitly, the argument is that GCR is compelled to become more socially relevant and interdisciplinary not only because it is publicly funded but because humanity (present and future) is facing unprecedented socio-environmental challenges in areas like food supply, sea

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<sup>16</sup>The concept of a ‘social contract’ emerged as part of the European Enlightenment, when a set of post-monarchical states founded on the principles of democracy began to replace societies dominated by unelected elites. Different versions of the concept were presented at length (for instance, by Jean-Jacques Rousseau). What they had in common was a desire to identify the principles on which peaceable relations could be established between citizens and rulers, individuals and the wider society of which they formed a part. There is neither space nor need to me to expand on the different versions of the social contract idea in this paper.

level rise and so on. Here, then, researchers have new responsibilities to use their expertise in the service of society, meaning accountability must now operate as much outside as within professional academic networks.

While this logic is absolutely fine as far as it goes, there are some vital missing ingredients. As I will now explain, adding-in these ingredients does more than provide substance to the notion of a new social contract for global change research; it also stands to alter the practices of many global change researchers if this notion is taken seriously in the years immediately ahead. In other words, these ingredients may alter some practitioners' sense of why better communicated, more integrated and more 'actionable' GCR is now necessary. They push the idea of a new social contract beyond the 'common sense' reasoning implicit in those recent publications where global change researchers have used it in their calls for change.

### ***GCR in the service of who, and towards which ends?***

As noted above, responsibility and accountability are two pivotal concepts underpinning any argument for a new contract for GCR. But their importance is diminished if they are not understood in direct relation to the concepts (and practices) of *representation* and *democracy*.<sup>17</sup> In simple terms, a new social contract that misses this relation is likely to foster GCR that is good at fostering action in response to pressing risks and threats, as well as manifest opportunities (Jim Proctor [2013: 88] calls this the 'facts-and-action' approach). But in order to know what 'problems' mean for different societies (and communities) and what the full range of responses considered to be feasible and desirable are, GCR will need to both seriously engender and internalise societal deliberation. What does this mean and why does it matter?

If contemporary humans are in a 'no-analogue' situation environmentally-speaking, and if global change researchers must now focus more on 'human dimensions' accordingly, then these researchers will necessarily become 'representatives' in a sense that is as much political as epistemological.

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<sup>17</sup>I will not offer a technical discussion of either concept here. In simple terms, representation is a simultaneous act of delimitation (framing) and substitution (standing-in for). It occurs in diverse walks of life, from the law through to science. It has been the focus of some extremely rich conceptual and historical research across a number of disciplines, from politics to cultural studies. Democracy, meanwhile, is that ensemble of institutions and practices designed to enable members of a political community articulate their views on matters of private and public consequence such that these matters can be debated and actions taken on the basis of mature dialogue among the interlocutors. Democracy operates through a plethora of organisations, stretching from parliaments to a free press. Again, it has been comprehensively researched and debated across numerous disciplines, in both positive and normative terms.

Representation is a vital but highly complex component of modern life. For decades, the majority of GCR has tried to represent Earth surface changes, thereby ‘speaking of’ and ‘speaking for’ actual and predicted biophysical realities. But the more GCR explores how (i) these changes impact on people and (ii) how people ought to respond (in the short, medium- and long-term), the more the embeddedness of GCR in values-based discussions will become apparent. This is because people – as culturally diverse interpretive creatures capable of self-reflection and change – have ‘needs’ and ‘wants’ that are varied and contested. It is also because people exist in power-laden social relationships ordered at different spatio-temporal scales: these relationships are equally contested, and whether they endure, or alter profoundly, affects which ‘needs’ and ‘wants’ GCR will acknowledge and seek to serve.

Fortunately, and despite all its significant shortcomings in practice, democracy is the one apparatus we have to-hand that can open-up these questions about whose needs and wants should condition GCR’s sense of which ‘problems’ and ‘solutions’ seem most relevant globally and at smaller scales. If a new kind of GCR is to be socially ‘accountable’ and ‘responsible’ then it will surely have to work hard to represent socio-cultural variety and foster debate in a world of chronic inequality. Because it cannot represent the ‘realities’ of the fictive entity we call ‘humanity’ it will, instead, have to represent differentiated and disputed patterns of human-environment relations at different scales.

This task speaks to the critical social sciences (and humanities) which have played a fairly limited role in GCR to-date. It challenges the presumption, common in parts of GCR, that there is one world ‘out there’ awaiting more complete analysis such that ‘suitable actions’ can then be recommended to governments, firms and communities at any given scale. On the contrary, which environmental and social ‘facts’ count, and what their normative implications are, depends significantly on how ‘reality’ is framed in any encounter between global change researchers and their various stakeholders. The same applies to practical ‘solutions’. Atmospheric geoengineering is a good example: whether this is a ‘rational’ response or an act of hubris depends on far more than some ‘objective’ measurement of risk that we can all agree on. Meta-physical and emotional questions arise about how science and technology perpetuate or challenge certain worldviews about ‘nature’, life, time, and so on. It turns, these worldviews implicate different human practices, relationships and institutions (i.e. material worlds actual and possible).

The encounter between GCR and society will need to be both broad and sustained to ensure accountable and responsive research, even as the urgency of environmental change creates stresses and anxieties for all involved. As parts of the World Social Science (ISSC & UNESCO, 2013) report rightly argued, if we live in a ‘game changing’ moment in human history, GCR needs to promote the idea that there is more than one game and many legitimate pathways of change (cf. Leach *et al.*, 2010). This will necessarily *politicise* GCR. Yet to pretend neutrality is absurd given the high-stakes character of worldwide environmental change.<sup>18</sup> One consequence is that the long-standing model of creating science-advisory bodies (like the IPCC) will need to be supplemented by organizations that allow GCR to bring vital ‘human dimensions’ into the arena of ‘evidence-based decision-making’. These dimensions pertain to things like faith, hope, charity, justice, rights, entitlements, obligations, conceptions of nature and so on. After all, ‘solutions’ cannot be defined with reference to biophysical actualities or probabilities alone. Indeed, they will be far more legitimate and effective in practice if they emerge from a rich process of dialogue.

### ***Science as a servant of diversity, deliberation and decision in extra-scientific contexts***

This hard-wiring of research to democracy has been advocated by several STS (science and technology studies) scholars in different contexts. Global change researchers seeking to change their *modus operandi* would do well to consult their writings. Here certain writings by Andy Stirling (2012) and Steve Fuller (2000) can serve, all too briefly, as illustrative examples from the literature.

Taking the case of the biosciences, Stirling makes the case for engagement with stakeholders as a means of explicitly opening-up choices about what researchers should focus their energies on, how and with what practical consequences. The biosciences have been heavily politicised by non-scientists in the last 20 years (and have been commercially driven in many cases, as with agro-food firms selling genetically modified seeds). For Stirling, substantive ‘upstream’ engagement with society would explore the varied moral, cultural

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<sup>18</sup>One of the very unfortunate aspects of the recent politics-science linkage in GCR is the way climate change sceptics have framed politics as both negative and a deformation of ‘good science’. This has had a chilling effect on many global change researchers, especially in the US, and further entrenched a science-politics division that has always been illusory anyway. It has impeded an open and constructive discussion of science’s necessary implication in ways of life that are saturated with values-based decisions about right and wrong, good and bad, etc.

and even spiritual consequences of choices about possible (consequential) lines of organized bioscientific inquiry. Decisions about what to investigate toward which ends would have to be justified with reference to more than putatively objective ‘imperatives’ existing in society or environment. This is because too much bioscientific research (and technology) is high-stakes to be framed narrowly in terms of ‘risks’ or ‘breakthrough medical treatments’.

In his brilliant book *The governance of science*, Fuller (2000) places an argument like Stirling’s in a broader political context. Defining science in the widest sense, Fuller notes that it is, in effect, “... a representative body in which the few speak for the many ... Yet there is no parliament of scientists ... [It follows that] science governs and is governed without being formally constituted as a government ...” (p. 8). Given the enormous size and scale of research today (publicly funded, charitably funded and privately funded), Fuller makes the case for a new constitution for science. In his civic republic vision, the institutions and practitioners of science must internalise the values of participation, plurality, and disagreement that ought to characterise a properly functioning democracy. For him science has the capacity to deform these values, a negative instance of what Sheila Jasanoff (2004) calls the ‘co-production’ of knowledge and socio-environmental order. In Fuller’s view, a responsive, accountable and representative science would foster the co-production of diversity, antagonism and change not hegemony and marginalisation.<sup>19</sup> In the present case, the absence of such research threatens to co-produce and sustain a capitalist, neo-liberal order that inflicts considerable socio-environmental harm and is opposed by millions of people worldwide.

## **Geography and the repurposing of global change research**

I earlier identified three elements of incipient change to GCR and, in the previous section, contextualised them in calls for a new social contract. I have suggested that these calls unduly limit the role GCR can and should play in the wider society. My argument is that the accountability and responsibility of researchers – two classic pillars of the social contract for science – should be linked to the practices of representation and democracy, thus fusing the epistemic with the political dimensions of human existence. In light of these

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<sup>19</sup>The political philosophers of science Philip Kitcher and Mark Brown are also insistent that the lifeblood of science emanates from and flows into democracy, an argument likewise made by Bruno Latour in his *Politics of nature* (2004). Within science and technology studies, questions of science and democracy have been explored in rich and ultimately quite pragmatic ways by Silvio Funtowitz and Jerome Ravetz in a string of highly cited publications (see Carrozza, 2015 for an excellent, recent summary).

arguments, let me now turn – at last – to Geography. The question I want to pose is: what resources exist in the discipline to foster the sort of new social contract I have argued for? However, before I answer it is important to do two things: first, acknowledge the contributions that certain geographers have made to GCR and, second, consider their published suggestions for reconfiguring the Geography-GCR relationship.

### ***Global change researchers in Geography***

While I can only highlight one or two contributions here (see below), the following people are among those who have more than occasional involvement in GCR: Eric Lambin, Billie Lee Turner II, Diana Liverman, William Solecki, John Barnett, Susanne Moser, Neil Adger, Katrina Brown, Mark Pelling, Kirstin Dow, Tim Lenton, Frans Berkhout, Richard Aspinall, Bill Adams, John Dearing, Karen Seto, Thomas Downing, Mike Hulme, Robin Leichenko, Martin Parry, Colin Polsky, Tom Wilbanks, Mark Rounsevell, Petra Tschakert and Karen O'Brien. Not all of these self-identify as 'geographers', but they are almost all trained as geographers or else based in academic units where Geography is the main or partial umbrella for research and teaching.<sup>20</sup> Their relationships to GCR vary according to their academic training, interests, networks and the funding they have secured.

Some of their involvements have been formative. For instance, Turner and Lambin have been central to the development of 'land change science' through their role in projects organised by the IGBP and IHDP.<sup>21</sup> Land change science "seeks to understand the array of forcing functions affecting land management, including proximate and distal factors or those immediately and indirectly linked to land-use and land-cover outcomes" (Robbins and Turner II, 2008: 299). It employs mixed methods and variety of data types (quantitative and qualitative), tacking between local and extra-local scales. It is integrative of techniques, evidence and modes of reasoning. Meanwhile Tim Lenton, to take a different example, is an Earth system scientist who has helped to advance the concept of 'planetary boundaries' (see Rockström *et al.*, 2009). Diana Liverman

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<sup>20</sup>For example, Wilbanks – after many years in Geography – is now positioned elsewhere. This leads me to observe that many other geographers are also contributing to global change science in locations outside Geography. These include geoscience, environmental science, ecology, and environmental management departments or centres. It's also important to note that many physical geographers are contributing directly and indirectly through their research, even if they are not formally part of things like the IPCC or projects linked with the IGBP, DIVERSITAS, the WCRP or the IHDP. Many examples can be found in the field of Quaternary science.

<sup>21</sup>Notably the Land Use and Land-Cover Change project which was a 'wide bandwidth' attempt to describe and explain patterns of terrestrial land change.

also lent her name to the concept (*ibid.*), and has been a key person in the GCAFS project of the ESSP. GCAFS stands for Global Environmental Change and Food Systems. Running for a decade (2001-11), its aim was to “to determine strategies to cope with the impacts of global environmental change on food systems and to assess the environmental and socio-economic consequences of adaptive responses aimed at improving food security” (<http://www.gecafs.org/>, accessed June 20<sup>th</sup> 2015). It is also worth noting that (i) Liverman was a co-author of the earlier mentioned DeFries *et al.* paper that promoted the idea of a new social contract for GCR, and (ii) was coordinating co-author of the Future Earth initial research plan (Rockström & Liverman, 2013).

### ***Critical reflections on GCR born of experience***

These involvements aside, some participating geographers have had occasion to stand back and reflect critically on those parts of GCR they know well (for examples see: O’Brien and Barnett, 2013; Liverman & Roman Cuesta, 2008; Manuel-Navarrete, 2014). Such interventions usefully point to areas where ongoing research in Geography could make its presence better felt in GCR. They typically identify gaps in the current conceptual, methodological, evidential or normative toolkit of GCR. For instance, Tschakert (2013) makes the case for more political ecology in climate change research and response, as does the collection edited by Brannstrom and Vadjunec (2013) which focuses on land change science (see also Turner II & Robbins, 2008; Munroe *et al.*, 2013). However, the effect is rather piecemeal. What is generally missing is: (i) a wider sense of what various other areas of Geography might contribute to GCR, and (ii) a persuasive argument for why researchers in these areas might want to alter the intellectual climate prevailing in large parts of GCR. Recent articles by Karen O’Brien – a geographer with IPCC experience and who has so far been important in the Future Earth initiative – are exceptions that prove the proverbial rule.

O’Brien has made a series of stirring calls for global change researchers to radicalise their understanding of how far and to what ends they need to alter their practices (O’Brien, 2011; 2012; 2013a; 2013b; 2013c). These writings are, in part, inspired by her prior involvement in an EU project entitled RESCUE (which stands for Responses to Environmental and Societal Challenges for our Unstable Earth: see O’Brien *et al.* 2013). But they are also informed by her links through the ISSC to the *Transformative cornerstones* report and the agenda

outlined in the 2013 *World Social Science Report*.<sup>22</sup> Her concern is that the changes currently called for in GCR are far too conservative. In one contribution she makes critical reference to arguments for a NSC. “The gap between knowledge and action (to address global environmental change)”, O’Brien argues, “is unlikely to be addressed by a new contract between science and society. Instead, the science of global change may itself need to change [more deeply] i.e. to become more reflective about its own assumptions ..., including those relating to *how* change comes about” (2013a: 588).

O’Brien’s point, building on Kegan & Lahey’s (2009) book *Immunity to change*, is that researchers need to attack *their own* intellectual ‘immune systems’ so as to better foster far-reaching changes in the wider society. Though she says little about accountability, responsibility, representation or democracy, it is clear she sees the role of GCR as helping identifying real choices for responding for the epic challenges global change will throw-up. To have choices you need diversity; to register diversity you need to recognise the partiality of your own framing of reality (cognitively, morally and aesthetically); to decide what to do practically you need to relate and compare alternatives, harnessing research to varied understandings of the actual, the possible, the probable and the desirable.<sup>23</sup> This is all the more important when power asymmetries – including those within the worlds of knowledge production (i.e. universities, think tanks, government research organisations etc.) – would otherwise favour certain frames over others.

### **Geography’s future contributions to GCR**

In a previous article O’Brien makes much of Geography’s potential to inject new thinking into GCR (O’Brien, 2011). However, in her more recent piece on ‘real’ as opposed to ‘superficial’ change, she is more ambivalent. On the one hand, she commends human geographers for exploring ‘human dimensions’ for

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<sup>22</sup>Similar links have likewise informed Susanne Moser’s gradual move towards a call for transformative GCR in recent years. Moser is a member of Future Earth’s science committee and thus a potentially important person for both GCR and for Geography’s relation to it looking ahead.

<sup>23</sup>Many GCR researchers are already adept at creating sophisticated socio-economic scenarios at different spatio-temporal scales. However, these are currently dominated by a scientific-rationalist framing in which assumptions about future states of society are plugged-in to biophysical models, with the aim of representing possible futures accurately. In this paper I am referring to engagements with stakeholders that do more than examine a range of possibilities based on current or projected ‘realities’. A more dialogical, political approach to thinking about the present and the possible future opens-up bigger questions of values, means and ends and positions GCR as a vehicle for representing the factual and practical implications of qualitatively different framings of today and tomorrow.

too long bracketed in much GCR outside the discipline. But on the other hand, she worries that geographers are “complicit in the perpetuation of paradigms that contribute to continued global environmental change ...” (2013: 594). Though she names no names, the implication is that at least some of her own previous research, and that of other geographers already involved in GCR, could do with a shake-up.<sup>24</sup> But the additional implication is that many geographers *not* currently involved in GCR need to step-forward. Her arguments thus make claims on two constituencies in Geography, the second much larger than the first.

It seems to me that examples of alternative styles of research commensurate with O’Brien’s – and my own – sense of a truly different kind of GCR exist in Geography today. That she does not cite any rather limits the force of her otherwise inspirational arguments. Hardly any of these examples arise out of formal engagement with the research plans, programmes, institutional nodes or international networks that make-up GCR. However, they offer demonstration-cases that a different *modus operandi* for global change researchers (be they geographers or not) is possible. They might also inspire belief that geographers not much involved in GCR may have something of real value to offer the enterprise. I will highlight just three examples below (space prevents me from summarising more). They speak to the three elements of change to GCR detailed earlier; together, they also speak to my sense of an NSC driven by a commitment to democracy, responsibility, accountability, diversity and choice in a world full of threats, inequities, cultural plurality, uncertainty, risk and opportunity.

I believe the reason examples like these exist in Geography is simple enough. The discipline’s long-standing intellectual heterodoxy – which is linked to the way it spans environmental science, social science and the humanities – has created the preconditions for novel thinking and practice. As one leading historian sagely notes, real change arises from wider and deeper exchange: “The more exchange, the more change. Inter[-group] ... contacts do not just

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<sup>24</sup>O’Brien’s argument here can be read in one of two ways. The first is that geographers’ academic freedom and university location, while useful, keeps them at a distance from new social movements and other constituencies who serve to remind us (if we pay attention) of the gravity of our global situation. The second is that geographers have been co-opted by the wider currents of neoliberal thinking, resting content to occasionally criticise these currents (as I myself have done in print on several occasions) without going beyond such scholarly acts of protest. Regardless, in one of her recent pieces (2013c) she offers some autobiographical reflections on her own journey towards a deeper questioning of her ‘taken-for-granted’ as a researcher. It makes for an inspiring read.

re-shake the kaleidoscope of the world; they also multiply the crystals it contains” (Fernández-Armesto, in Radcliffe *et al.*, 2010: 111). Contemporary Geography has been productive of such kaleidoscopic multiplication, sometimes framed negatively as a symptom of a ‘divided discipline’ that lacks sufficient intellectual unity. I will challenge this framing in the final section of this paper, but first let’s consider those three cases of positive syncretism. Though two involve consideration of ‘indigenous knowledge’, their wider implications extend beyond these specific instances of cultural specificity.

## **Leading and learning by example: towards a different style of GCR**

### ***Responsibility, accountability and representation in communicating research: ethno-linguistic translations in post-colonial Canada***

Earlier, we saw that many global change researchers urgently want their findings to be communicated in more forthright, clear (audience appropriate) and direct (less intermediated) ways. There are a number of complexities involved in realising these aims (what is communicated, to who, how and in what circumstances?). However, all too often some version of the ‘linear model’ of communication is presumed to apply. According to this model, researchers’ job is to figure-out how their findings can be properly registered and recognised by various constituencies, leading to some of sort cognitive, emotional and ultimately behavioural response.<sup>25</sup> Researchers are thereby responsive and accountable to ‘reality’ and aim to represent certain actualities and probabilities to a range of social actors. Recent research by Emilie Cameron, Rebecca Mearns and Janet Tamalik McGrath (2015) help us think differently about the means and ends of communicating environmental research in our ‘post-normal’ times. It emerges from a fruitful combination of cultural geography, area studies and a concern with climate adaptation.

Cameron *et al.* (2015) analyse a glossary of climate-change related terms used in Nunavut (in arctic Canada) from 2005 (Government of Nunavut and Nunavut Tunngavik Incorporated, 2005). The glossary translated Anglophone concepts such as ‘adaptation’ and ‘resilience’ – now staples in GCR and in climate policy – into Inuktitut (one of five Inuit dialects). Its aim was to enhance public literacy about climate change and how it might impact (is already impacting) indigenous communities in the Canadian north (most Nunavutians

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<sup>25</sup>Indeed, the academic field of environmental communication – which is dedicated to analysing the practice – has for years been dominated by a focus on ‘what works?’ and what does not

do not use English as a first language). From the perspective of global change researchers it appears to be a vehicle for clear and direct communication with ‘stakeholders’. In this light, the principal challenge might appear to be ensuring ‘accurate’ translation into Inuktitut. The fact that the glossary emerged out of dialogue with various elders across Nunavut would appear to have ensured such accuracy.

However, Cameron *et al.* show how deceptive appearances can be. They begin by noting the particularities of Inuktitut. In this language, English-language terms translate in descriptive, flexible, contextual and relational ways – meanings are therefore fluid and only solidify through dialogue and use in indigenous societies over time. They go on to identify two key elements of the wider context in which translated terms from the glossary make sense. One is the long history of dispossession and cultural imperialism that indigenous peoples across Canada have suffered since British and French settlers arrived four centuries ago. The other, far more recent, is an increasing emphasis in Anglophone climate research and policy on adaptation and far less on mitigation. Here anthropogenic climate change is framed as a biophysical problem calling for locally and regionally specific responses to things like sea level rise. These two elements of context are germane to the meaning of the glossary because, Cameron *et al.* show, they key-in to quite different cosmological aspects of indigenous culture in circumpolar Canada.

Consider the term ‘climate change’. In the glossary this is defined as an environmental process, consistent with how many climate scientists define it; the human ‘drivers’ are not incorporated into the definition. In Inuktitut it translates to *silaup asijjiqpallianinga*. *Sila* is a key notion in Inuit society, meaning something like ‘life’: it is an encompassing notion, describing the immanent and transcendent dimensions of existence. In this context, ‘climate change’ is unremarkable if defined as a process of change to *sila* since Inuit culture accepts the idea that the world is in flux. However, if it is defined more expansively to include its causes (e.g. intentional pollution of the global atmosphere) it could tap-into an ethically and politically charged understanding of *sila* in Inuit society. That understanding regards abuse of *sila* as a question of justice and healing. By contrast, understanding climate change as one aspect of ongoing alterations to *sila* calls forth values of patience, resilience and creativity. These values fit well with a research and policy agenda that emphasises people ‘coping’ with climate change rather than addressing its root causes in political

economy and global geopolitics. However, the values called forth by a perceived abuse of *sila* frame that agenda as a profound disrespect for Inuit frameworks of law and as a continuation of colonial power by other means. This has very different normative implications, both morally and practically, than the notion of *silaup asijjiqpallianinga* does.

In sum, using a case of inter-cultural exchange, Cameron *et al.* demonstrate that acts of ostensibly clear and direct environmental communication come freighted with some heavy baggage. ‘Accurate’ definition and translation are shown, in practice, to blur the lines between facts and values, cognition and emotion. In itself, this is not a problem. The authors’ point is that communicating information about society-environment interactions is unavoidably political. This does not mean it is presented dishonestly or in bad faith (though that can happen, of course). But it does mean that research-based communication must be transparent about its own normative commitments and how they articulate with audiences who may not share them.

### ***Forms and goals of more interdisciplinary research: a novel collaboration in the United States***

We saw earlier that many global change researchers are calling for more and better collaboration between STEM subjects and the social sciences so as to bring ‘human dimensions’ more fulsomely into GCR. Many of these calls, I showed, are predicated on the idea of knowledge gaps. The assumption is that social scientists can help environmental scientists better understand how people are impacted by environmental change and how people can (or might wish to) respond. Identifying the ‘missing dimensions’ will, in turn, presumably help global change researchers identify suitable socio-environmental interventions according to the real world context (financial, cultural, political etc.). However, this vision of a more interdisciplinary GCR threatens to leave key intellectual norms unchallenged. One norm is the belief there is one (albeit complex and differentiated) world out there awaiting discovery if the right ensemble of concepts, methods and data is utilised. As Andrew Barry and Georgina Born (2013: 10-11) argue, this supports an ‘additive’ form of interdisciplinary research that has ‘integration-synthesis’ as its goal.<sup>26</sup> By contrast, Hackmann and associates’ call for something more radical gestures towards what Barry and Born call an “ontological logic” (*ibid.* 17). Here GCR

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<sup>26</sup>This is not the place to parse the meanings of ‘interdisciplinarity’ ‘cross-disciplinarity’, multi-disciplinarity’ and ‘transdisciplinarity’.

would aim to change both *that which it analyses* and also *itself*, iteratively, thereby being more than a metaphorical mirror that takes certain socio-environmental realities as ontologically given. But what might this mean in practice? Though not about global environmental change, recent research by a set of American biogeographers led by Elizabeth Barron provides food for thought. This is because it engages field ecology, laboratory analysis, qualitative methods and ‘stakeholder’ consultation in unconventional ways.

Barron *et al.* focus on how morel mushrooms are classified. Wild edibles, morels are highly valued in some indigenous societies and land-based communities but also in mainstream American society (and beyond). Questions arise about how best to manage the ecosystems in which morels grow. For decades, Western scientists have sought to classify morels according to universal criteria, be they morphological or, in recent times, genetic. However, local communities have detailed knowledge of morels based on intergenerational experiences of foraging for and harvesting them. Though not scientific knowledge, it has nonetheless proven useful for scientists trying to characterise morels with appropriate granularity. Moreover, the trend of natural resource management towards community involvement means that this knowledge ought to be considered for practical and ethical reasons too.

A standard social science approach to local knowledge – including the knowledge of morels in the mid-Atlantic region Barron *et al.* work in – would seek to accurately record it using surveys, interviews and ‘walk alongs’ with foragers. This information would then, to the extent possible, be combined with field- and laboratory-based scientific information about morels to create a more complete understanding of mycological variety and ecosystem context. This, in turn, has management implications. However, Barron *et al.* identify two problems with this approach. First, it preserves a traditional division of labour where social scientists get asked to speak for people, while science is left to self-described scientists (as if it has no social dimensions pertinent to the content of scientific knowledge). Second, this approach thereby maintains a power imbalance, where local knowledge does not enjoy parity of esteem with science because science is equated with truth (as opposed to custom and practice) and neutrality (as opposed to interests).

Given this, Barron *et al.* choose to treat scientific inquiry into morels and local understandings of them as equally human, contingent and specific practices.

This means that an interdisciplinary approach involves far more than connecting together pieces of knowledge about the world ‘out there’. It must also involve being interdisciplinary about the process of producing *both* biophysical and social knowledge. Specifically, Barron *et al.* refuse to treat mycological science as immune to the insights of social studies of science and technology (SSK, including research into the historical geographies of science by David Livingstone and others). In itself this is hardly new. But the authors go on to explore knowledge-making practices in a novel way. They ‘perform’ mycological knowledge symmetrically, treating *their own* practices as trained scientists as no more epistemically valid than the local foragers whose knowledge they take to be no more value-based than is scientific knowledge. In the first case the values of universalism and abstraction are key, while in the second case use- and customary-values prevail (linked to a respect for place-specificity). By foregrounding the rival contexts in which certain kinds of knowledge count and come to matter, Barron *et al.* show us that ‘integrated’ inquiry cannot naively hope to ‘join the dots’ from a position outside that which it analyses. If research is a social enterprise through-and-through, then collaborations across the ‘human-physical’ divide cannot fail to question established divisions of academic labour and the ontological distinctions they uphold. Barron *et al.* see their role as recognising – and acting on – the relativity of knowledge to specific contexts, values and goals. Interdisciplinary research here stakes a claim to engendering specific states of affairs, framing the real in ways intended to have effects whose justification is variously moral, political and even aesthetic. In the mid-Atlantic context, that can mean subordinating scientific understanding to knowledge that dovetails with local peoples’ traditions and aspirations. Relatedly, it can mean allowing science to be subject to the claims of critical, reflexive social science (embodied, in our own discipline, in the recent calls for ‘critical physical geography’ by Rebecca Lave and others)

Barron *et al.*’s approach demonstrates a rich sense of what responsiveness, accountability and representation might look like in a more interdisciplinary GCR, governed by a commitment to innovation and participation when identifying issues and responses. Ultimately, the big challenges that global change throws-up must be addressed locally and nationally. However, scaling-up the sort of place-based interdisciplinary research of Barron *et al.* to address global level issues will itself be a challenge.

### **Actionable research for whom? Bringing politics into ‘relevant’ knowledge without compromising academic integrity in New Zealand**

Earlier we saw that many global change researchers are calling for more ‘decision-relevant’ GCR. However, these calls typically leave the meaning of ‘relevance’ unexamined – whether the context is informing government decision-making or assisting a local community in its water resource husbandry. What the two examples above show is that ‘relevant knowledge’ can serve either to encourage reform of that which it depicts or to foster something more catalytic and contested. The latter may strike some global change researchers – especially those in the environmental and earth sciences – as a risky act of ‘playing politics with science’. This is understandable given the perennial problems modern societies have experienced of seeing either (i) science politicised (as happened during the ‘Glacier-’ and ‘Climate-gate’ incidents of 2009-10) or (ii) politics scientised (as with the notorious response of the UK Conservative government to the outbreak of the BSE crisis in 1987). However, what the two examples above show us is that research can be conducted with integrity and rigour while still being alive to the ‘context of implication’. More than context-appropriate ‘application’, knowledge in GCR and other fields supports particular interests and desires that should not be screened-out in any attempt to justify its utility.<sup>27</sup> To pretend that socio-environmental research can separate its practical implications from cognitive acts of description, explanation, prediction or scenario-building is ultimately dishonest. The organic connection ought to openly acknowledge both ‘upstream’ of research and ‘downstream’ of it as well.

A third example shows us why, echoing Barron *et al.*’s point about the contextual character of knowledge in its many forms. Marc Tadaki and Jim Sinner (2014) argue forcefully that *all* research about people and the environments they utilise contains value judgements that warrant scrutiny. This includes scientific and social scientific research equally. Tadaki and Sinner analyse the implementation of the River Values Assessment Systems (RiVAS). This is a fairly recent attempt, by New Zealand water professionals, to make the different ways in which water is valuable *explicit and transparent* by connecting environmental and social data. Tadaki and Sinner reveal that, in

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<sup>27</sup>Of course, there are rich traditions in critical social science of ‘activist’ and ‘engaged’ inquiry that attest to this. I suspect that those global change researchers who happen to be aware of these traditions might not (yet) recognise their relevance to their own endeavours as researchers. In Geography the awareness ought to be higher because of the real and metaphorical proximity of physical geographers to their human counterparts.

their desire to capture stakeholders' plural valuations of freshwater, these professionals use *their own* value-set in determining what societal values are admissible in the System's analytical machinery. This makes them political actors not merely epistemic conduits of socio-hydrological realities.

Since the 1990s New Zealand ecologists and conservation planners have been legally obliged to produce composite measures of the quality of river systems. The systems can then be ranked comparatively. In recent years, regional governments have been tasked with identifying people's valuations of these systems to aid decisions about managing the quality and quantity of freshwater. Again, these valuations referenced nationally. This has necessitated a technique of capturing them in a standardised form in disparate parts of New Zealand. The result was (and is) an ostensibly holistic mapping of both biophysical and social values by mixing physical science and social science methods. The resulting knowledge has direct management implications and 'relevance'.

However, Tadaki and Sinner demonstrate two notable things. First, the RiVAS only captured one kind of 'value'. They call this 'contribution to a goal'. For example, the System asks people how much a river is valued as a place to canoe or dive. The second is that this decision to exclude methods to record *other* ways people might value rivers – Tadaki and Sinner identify three of them (2014: 142) – was *itself* a value judgement. The decision, made by water resource professionals, presumed that rivers matter to people most as possible means to certain instrumental or recreational ends. For this reason, Tadaki and Sinner argue that the RiVAS does not, in fact, 'represent' peoples' values but is a "value *articulating* institution" (p. 148, emphasis added) – this despite its apparent commitment to 'give voice' to otherwise mute stakeholders. This articulating function is shielded from public scrutiny and, Tadaki and Sinner argue, should not be.

The flaw in the System, the two argue, is the pretence to record facts and values objectively as if the recording process is a neutral way-station to fully informed water management cognisant of both physical and social dimensions. Tadaki and Sinner's aim is not about exposing 'bias' in the eventual hope of objectivity. Instead, they show the need to be able to justify value judgements involved 'all the way down', from society through to those who are charged with serving its interests as researchers or analysts. Actionable knowledge cannot separate fact from value and, despite itself, the RiVAS shows why.

## **Towards new narratives about the value of Geography in ‘the age of humans’**

This has been a long, rather (too?) ambitious essay, so let me draw it to a close with a relatively short section that summarises the argument and identifies some of its wider implications. I have shown that GCR is undergoing change but that the alterations imagined to be necessary and desirable by some are less fundamental than they ought, arguably, to be. By outlining a new ‘new social contract’, I have challenged the rather conservative assumptions underpinning some global change researchers’ calls for a shift in science-society relationships. I have noted the long-standing, often formative, involvement of geographers in GCR, but noted too that some involved want both GCR and their geography colleagues to engage in mutual transformation. Finally, I have pointed to three examples in Geography that embody aspects of the new social contract I have argued for; these examples also show that some geographers, even if not formally involved in GCR, are practising the sort of research the likes of Karen O’Brien and Heide Hackmann want to see more of in this field of fields.

The arguments and examples presented in this paper are intended to speak to three constituencies. As I have sought to show, they are relevant to global change researchers outside Geography (environmental and social), global change researchers within the discipline and society-environment geographers not much engaged with GCR so far. Given the scope of the paper I realise there is an inevitable lack of precision in some the claims I have made about GCR and Geography; additionally, my three examples are hardly sufficient to speak to the full range of research conducted in GCR. Both things may therefore limit how far I can sensibly make claims upon the trio of constituencies just mentioned. But supposing there is some validity to the case I have made in the previous pages, I want to end by considering what this means for the stories that Geographers tell themselves about themselves.

All disciplines invent narratives that serve to build identity and purpose among researchers and teachers. In Geography’s case one enduring narrative is that geographers are ‘bridge builders’ and ‘weavers’. Many of us not only seek to understand human-environment interactions at a range of spatio-temporal scales (so the narrative goes); we also do so in a ‘synthetic’ way, paying close attention to how economy, state action, community dynamics and biophysical processes interact. According to this narrative, one of Geography’s unique

contributions to understanding is the refusal either to study society and environment separately or to focus on just one or other thread within the human-nature tapestry. Over the years, the leading society journals in Anglophone Geography have published papers by leading geographers that perpetuate this disciplinary self-understanding. The *TIBG* is one (Stoddart, 1987; Cooke, 1992; Massey, 1999), the *Annals of the Association of American Geographers* another (Kates, 1987; Gober, 2000; Turner II, 2002; Skole, 2004). While there is absolutely nothing wrong with narrating who (we think) we are, once were, and ought in future to be, my sense – as a long-time reader of these sorts of papers – is that they almost never question a key assumption. It is the assumption that the world is a gigantic 3-D jigsaw and that the task of geographers is to identify and connect the relevant pieces by combining concepts, methods and data across our discipline's oft-lamented 'human-physical divide'. This assumption's hold was very evident in a recent call for 'comprehensive research' in *Area* by a group of geographers based in Singapore (Zielger *et al.*, 2013). The watchword then becomes intellectual 'unity'. We should somehow connect the epistemological 'fragments' of our discipline and thereby make visible life's socio-environmental fabric (where other disciplines fixate on the threads). For many commentators, this is presented as the difficult challenge geographers face, one that is ultimately the *raison d'être* for our subject.

Given the scale, scope and magnitude of the human impact on Earth, one can well see the standard narrative being employed to inspire more geographers to address global environmental change; one can also see its utility in persuading those in other disciplines, and also research funding bodies, that Geography is a subject of signal value whose time has come. For instance, there is plenty of the former in Carol Harden's (2012) recent AAAG paper, based on a plenary lecture; and the latter is evident in the US National Research Council agenda-setting report *Understanding the Changing Planet: Strategic Directions for the Geographical Sciences* (2010). To my mind all this is broadly consistent with Lubchenco's version of a NSC, replayed in recent calls to reorient GCR. What is not taken seriously, it seems, is the idea that geographical research is answerable to more than just 'truth' (social or environmental) in a complex and dynamic world that is often difficult to represent epistemologically.

I suggest that our narratives about the history, current condition and wider societal value of Geography need to be rethought in light of key questions

concerning representation, responsiveness and accountability. Revisiting the idea of a social contract is one way to do this, and my own tack in this particular essay (though very rare in Geography: Demeritt [2000] is almost the lone exception). But there are plenty of other ways too. It can be done via the notion of ‘post-normal’ research, the notion of ‘mode 2’ research, the idea of ‘knowledge regimes’ (Pestre, 2003) or the idea of ‘distributed expertise’ (Irwin, 1995).<sup>28</sup> Regardless, the intellectual breadth and diversity of Geography comes to be regarded differently in this context as compared to the familiar unity narrative. The aim is less to connect ‘pieces’ of knowledge so as to mirror ontological connections ‘out there’ and more about what Trevor Barnes and Eric Sheppard (2010) call ‘engaged pluralism’. Engaged pluralism, as these authors would have it, “navigat[es] ... between the Scylla of multiple solitudes and the Charybdis of monism ...” (*ibid.* 194). In the present context, it involves diverse collaborations between physical geographers, human geographers and various real world actors where traditional fact-value, is-ought, object-subject dualism are no longer sacrosanct.

Geographical research so conducted could – to use Sheila Jasanoff’s term once more – help to ‘coproduce’ multiple realities and diversify future possibilities at a very high-stakes moment in global history. Some geographers have made these arguments before (e.g. Demeritt, 2009a; 2009b; Whatmore, 2013), and examples like the three cited in this paper make good on such injunctions practically-speaking. The positive news is that an appetite for new styles of human-environment research alive to the ineluctable politics of knowledge is growing in Geography. Recent calls for ‘ethnogeomorphology’ (Wilcock *et al.*, 2013), for ‘socio-pedology’ (Engel-Di Mauro, 2015) for ‘socio-hydrology’ (Lane, 2014) and, more broadly, for ‘critical physical geography’ (Tadaki *et al.* 2014) are exciting proof of that. What sort of worldly effects would GCR have if its many practitioners followed suit? Is GCR otherwise destined to contribute to what some regard as our ‘post-political’ age becoming part of the proverbial problem not the solution?

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<sup>28</sup>Though this is not the place to explore any of these rich ideas, I would argue to for too long most publications about the ‘dis-unity’ of Geography have not benefitted from examining the discipline in light of them. By focussing on the social contract concept I have in this paper offered one glimpse of these benefits.

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