When climate justice goes wrong: Maladaptation and deep co-production in transformative environmental science and policy

Authors: Tim Forsyth[a] and Constance L. McDermott[b]

[a] Department of International Development, London School of Economics and Political Science, Houghton Street, London WC2A 2AE. t.j.forsyth@lse.ac.uk

[b] Environmental Change Institute, Oxford University Centre for the Environment, South Parks Road, Oxford OX1 3QY, UK. constance.mcdermott@ouce.ox.ac.uk

Abstract

Maladaptation to climate change is often portrayed as arising from the unjust exclusion of vulnerable people. In turn, analysts have proposed knowledge co-production with marginalized groups as a form of transformative climate justice. This paper argues instead that maladaptation arises from a much deeper exclusion based upon the projection of inappropriate understandings of risk and social identity that are treated as unquestioned circumstances of justice. Drawing on social studies of science, the paper argues that the focus on co-production as an intentional act of inclusion needs to be considered alongside "deep" or "reflexive" co-production, which instead refers to the non-cognitive and unavoidable simultaneous generation of knowledge and social order. These processes have linked visions of planetary justice with an understanding of climate risk based on global atmospheric change, and an assumption that community forms an antidote to individualism. The paper uses a discussion of adaptation in western Nepal to illustrate how such deep forms of co-production have significantly reduced understandings of "what" adaptation is for, and "who" is included. Maladaptation, therefore, is not simply unjust implementations of an essentially fair model of adaptation, but also the allocation of exclusionary visions of what and for whom adaptation is for. Debates about transformative climate justice therefore need to understand how their critiques of classical liberal justice generate exclusions of their own, and to engage vulnerable people in reframing, rather than just receiving, circumstances of justice. There is also a need to examine how these circumstances remain unchallenged within environmental science and policy.

KEYWORDS: climate justice, planetary justice, transformation, Nepal, co-production, Science and Technology Studies (STS)

Introduction

In recent years, there has been a growing concern that classical liberal theories of justice, based on Rawlsian ideas of fair allocation, fail to acknowledge social barriers to participation (Agyeman *et al.*, 2016; Byskov *et al.*, 2021; Shi *et al.*, 2016, p. 132). Movements such as Black Lives Matter have highlighted how marginalized groups can be excluded from rules and practices seeking to build social justice. Scholars of climate justice have echoed these concerns by calling for new, transformative forms of justice that seek to redress inequalities within climate change policies, and to allow marginalized people to shape and benefit from interventions. One particular theme of this transformative justice is "tackling the power dynamics inherent in knowledge processes" (Eriksen et al., 2021, p. 10) used in climate science and climate change policies, such as through participatory and inclusive forms of knowledge generation called co-production. This form of co-production has been called "a normative agenda of facilitating the participation of disempowered groups in shaping knowledge production and actual planning processes," (Tubridy et al., 2022, p. 5), and is considered "the gold standard of engaged science" (Lemos et al., 2018, p. 722).

One example of this movement to transformative justice is in the debate about maladaptation to climate change. Defined by Schipper (2020, p. 409) simply as "when adaptation to climate change goes very wrong," it refers to occasions when attempts to build adaptation to climate risks displace or increase people's vulnerability, or undermine long-term sustainable development (Barnett & O'Neill, 2010; Glover & Granberg, 2021; Juhola *et al.*, 2016). Commonly maladaptation is linked to insufficient consultation or understanding of local risk, and various analysts have called for greater knowledge co-production to counter this. Indeed, the Intergovernmental Panel on Climate Change (IPCC) states "Co-productive and participatory decision-making processes and knowledge systems ...often leads to adaptation action that meets societal needs" (New et al., 2022, p. 4).

In this paper, we applaud the movement to a more participatory form of planning for adaptation and climate justice, but we argue that current debates about maladaptation and co-production need to go much further. Instead of defining co-production as a cognitive, intentional process of consultation, we adopt an older approach to co-production from social studies of science, which instead looks at non-cognitive and unavoidable simultaneous generation of knowledge and visions of social order. This deeper, more analytical form of co-production does not only consider "who" participates in shaping adaptation agendas, but also how ideas about "what" risks are considered threatening organizes ideas about who, and vice versa (Bremer & Meisch, 2017; Jasanoff, 2004; Klenk *et al.*, 2017). In effect, this deeper form of co-production examines how current debates about maladaptation and equitable project design are organized around stable ideas of science and justice that could themselves also be opened up to greater scrutiny. Indeed, these objectives reflect a growing interest in co-production and relational knowledge in climate change policy (Chakraborty *et al.*, 2022; Graham *et al.*, 2018; Nightingale *et al.*, 2021, p. 3).

Accordingly, this paper argues that maladaptation is not only the unjust implementation of an essentially fair model of adaptation, but also the allocation of exclusionary circumstances of justice that constitute visions of what and for whom adaptation is for. The paper starts by explaining the growth of criticism of liberal models of justice from so-called transformative climate justice, and how this relates to maladaptation and knowledge co-production. It then discusses so-called "deep" or "reflexive co-production, and its implications transformative and planetary justice. An example from Nepal shows how co-production affects what is considered climate risk and who is impacted. Finally, the paper discusses implications for understanding maladaptation and transformative climate justice.

Maladaptation and theories of justice

Maladaptation is now increasingly discussed within climate change politics (Schipper, 2020). It is commonly understood as occurring when policies aiming to reduce vulnerability to climate change actually have the reverse effect. For many analysts, maladaptation is a matter of social justice because it arises from a lack of inclusion of local people in project design and implementation (D'Alisa & Kallis, 2016; Glover & Granberg, 2021; Juhola *et al.*, 2016).

Discussions about maladaptation have diversified over time. Some initial concerns highlighted technological interventions that were poorly sited or incongruent with other policies. For example, some coastal defenses displaced wave action onto other locations, and using energy-intensive air conditioners to counter heat waves have increased energy use (Barnett & O'Neill, 2010, p. 212; Eriksen *et al.*, 2011; Kovats & Hajat, 2008). Short-term adaptive responses by vulnerable people have also been called maladaptation, such as local attempts to govern climate impacts in zones facing long-term environmental changes (Ayers & Dodman, 2010; Ayers et al., 2014). Such interventions have been claimed to cause "rebounding vulnerability" if they make people more vulnerable to climate change; or "shifting vulnerability" if they displace one set of risks onto other people (Juhola *et al.*, 2016, p. 136; Schipper, 2020, p. 411). They can also be called maladaptive if they undermine long-term sustainable development. The Santa Barbara desalinization plant, for example, has been called maladaptive because it reinforced allegedly unsustainable water use trends (Juhola *et al.*, 2016, p. 138). Some projects have allegedly combined various of these failings: for example, the Wonthaggi desalinization plant in Australia was criticized for allocating water inequitably, and for expropriating indigenous people's land (Sovacool *et al.*, 2015, p. 617).

Over time, however, discussions of maladaptation have focused more up on social justice, and on adaptation interventions that fail to acknowledge local experiences of risk (Nightingale *et al.*, 2021; Tschakert *et al.*, 2017). Initially, some analysts adopted Rawlsian criteria to consider how

to allocate adaptation in ways to protect basic rights, and to maximize benefits to vulnerable people (Byskov *et al.*, 2021; Comberti *et al.*, 2019; Holland, 2017, p. 393; Paavola, 2008; Paavola & Adger, 2006). These approaches were Rawlsian because they approached the problem by imagining an idealized system of fair allocation (Gilardone, 2015; Rawls, 1999).

More recently, however, research has emphasized underlying social structures and processes of marginalization that deny vulnerable people the opportunity to shape adaptation. For example, Eriksen and colleagues (2021, pp. 6-8) argue that maladaptation arises from four key processes of insufficient understanding of contextual vulnerability; inequitable participation in planning and implementing interventions; misguided attempts to retrofit adaptation into development assistance; and allowing adaptation "success" to be defined by dominant development agendas. Indeed, various research has identified causes of maladaptation within project planning and implementation. For example, research in Africa has identified how policies to build resilience and adaptive capacity have failed to acknowledge the dynamic nature of labor markets and instead seek stability, thus reducing opportunities for livelihoods, and hence exacerbating pre-existing social inequalities (Carr, 2019; Mikulewicz, 2021).

Other research, such as in the Marshall Islands and Indonesia, has emphasized colonial or legal structures that discourage local consultation (Bordner *et al.*, 2020; Nurhidayah & McIlgorm, 2019). Neo-Gramscian analysts have also viewed maladaptation as a political struggle around state formation, especially including alliances with parts of civil society (D'Alisa & Kallis, 2016).

Unsurprisingly, therefore, maladaptation is increasingly seen as a topic that can be addressed through transformative climate justice. These new approaches to justice contribute to the general questioning of Rawlsian liberal justice by challenging "universalized assumptions about global justice, individualized rights and responsibilities and the role of (liberal but strong) nation-states protecting and enforcing rights on behalf of citizens" (Newell *et al.*, 2021, p. 7), and

instead emphasizing the influence of authoritarian or weak states, pervasive violence, and lack of democratic space for affected people (Eriksen *et al.*, 2021, p. 11; Schrock *et al.*, 2015; Sovacool, 2021; Thomas *et al.*, 2019). Indeed, Holland (2017, p. 392) has argued that adaptation policies should be evaluated in terms of whether vulnerable populations have the political capabilities to influence adaptation decisions.

Frequently, these ideas of transformative justice are also placed against physical frameworks of atmospheric climate change or planetary boundaries (Meikle *et al.*, 2016). Gupta and her colleagues (2021, p. 3) have argued that planetary targets are "not necessarily just for all humans, and that safe targets may even make things worse for some." The application of planetary boundaries in policy, therefore, should ensure that questions of planetary health do not impede protecting the rights or resilience of vulnerable and marginalized groups.

Similarly, co-production of knowledge about adaptation has also been linked to transformative justice, and as way of avoiding maladaptation. Schipper (2020, p. 413) states that co-production involves "going beyond tried and trusted networks to ensure that the most powerful people are not suppressing any voices." This approach to co-production has been called as "a collaborative process of bringing a plurality of knowledge sources and types together" (Armitage *et al.*, 2011, p. 996; Chakraborty *et al.*, 2022). Engaging with affected people has been linked more equitable forms of adaptation because it can lead to more just project design and implementation (Lemos *et al.*, 2018; Tubridy *et al.*, 2022; Watson, 2014). In this way, this form of co-production can contribute to the "trivalent" view of justice (Bulkeley *et al.*, 2013; Holland, 2017, p. 395; Newell *et al.*, 2021), which seeks to employ distribution, recognition, and participation of marginalized groups as legitimate actors with relevant knowledge. Indeed, Schlosberg (2012, p. 453) argues that misrecognition of such groups "most definitely results in a status injury to a group, identity, or community" (Fraser, 2001; Schlosberg, 2012, p. 453).

Yet, this form of co-production is not the only interpretation of this term (Bremer & Meisch, 2017; Miller & Wyborn, 2018), and there is a need to consider broader implications of knowledge and social representation within maladaptation.

Deep co-production and maladaptation

The preceding discussion has shown that much current analysis presents maladaptation as a malign outcome of unjust development and planning processes. These proposals reflect a more general uneasiness concerning classical liberal theories of justice on the grounds that these theories do not acknowledge how social institutions fail to offer a level playing field for all (Agyeman *et al.*, 2016; Shi *et al.*, 2016, p. 132). Based on these concerns, various analysts have proposed that a more just approach to adaptation should focus upon the experiences of marginalized groups in the face of global atmospheric change (Gupta *et al.*, 2021; Holland, 2017; Newell *et al.*, 2021), as well as seeking ways to adopt forms of knowledge co-production to increase the participation of these groups in adaptation planning and implementation (Chakraborty *et al.*, 2022; Eriksen *et al.*, 2021; Inderberg *et al.*, 2015).

An alternative reading of co-production, however, does not focus only on how to allocate climate policies more successfully to specific groups, but pays more attention to how underlying beliefs and worldviews simultaneously shape both "what" is being allocated and to "whom." According to this interpretation of co-production, the lack of justice in maladaptation does not lie in the insensitive allocation of climate policies to marginal groups, but in the political and scientific processes that reduce diversity in how these policies and groups are represented.

Various analysts have acknowledged that there are alternative understandings of the meaning of the term co-production between different constituencies in the social sciences and in policymaking (Bremer & Meisch, 2017; Miller & Wyborn, 2018). Expert networks such as the

IPCC and Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) have endorsed the vision of co-production discussed above as a means to make scientific findings more useable to diverse groups by actively consulting and co-generating knowledge between different stakeholders and forms of expertise (Dilling & Lemos, 2011; IPBES, 2016; Lemos et al., 2018; Lemos & Morehouse, 2005). This interpretation of co-production, however, differs from pre-existing approaches from within the social sciences, and especially Science and Technology Studies (STS), which is "shorthand for the proposition that the ways in which we know and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it" (Jasanoff, 2004, p. 2). These different interpretations of co-production have also been called "instrumental" and "normative" for the first style, versus "descriptive" or "reflexive" for the deeper alternative (Beck & Forsyth, 2020, p. 221; Miller & Wyborn, 2018; Tubridy *et al.*, 2022, p. 18).

Unlike instrumental co-production, deep co-production is not a deliberate strategy to combine different knowledge sources, but instead considers the unavoidable and often tacit assumptions and worldviews that shape which knowledge is gathered about what themes for which social objectives. A key concern of deep co-production, therefore, is to examine which implicit norms or perspectives are used to identify or attach meaning to other facts and categories. These empirical outcomes of deep co-production cannot be considered value-free because they are where "the co-mingling of *is* and *ought* takes place" (Jasanoff, 2012, p. 19). If the historic social influences on this knowledge is not acknowledged, then there is a risk that environmental policies will be organized around factual claims that are not as universal as believed, or which might enhance one set of interests in tacit ways.

The co-mingling of is and ought is especially felt in debates about justice concerning global systemic change. Turner *et al* (1990) famously divided global environmental problems into two categories: systemic problems driven by changes in one interconnected biophysical system; and

cumulative problems that can be considered global because they occur in most countries, but are not connected to an underlying physical system. Anthropogenic climate change has typically been classified as systemic because it derives from changes to the global atmospheric system (deforestation or biodiversity loss are considered cumulative). Increasingly, however, analysts argue that climate change might be classified as both systemic and cumulative because the experience of climate change as a problem also depends on local context (Ayers, 2011; Dovers, 2009; Nightingale *et al.*, 2021; Smit & Wandel, 2006). In turn, this challenge has led other authors to differentiate so-called "pollutionist" or "outcome" forms of adaptation and vulnerability (which define risk in terms of additional atmospheric greenhouse gas concentrations), versus "development" or "contextual" approaches to adaptation (which also consider local vulnerabilities and development needs) (Burton, 2009; O'Brien *et al.*, 2007, p. 75). Indeed, the IPCC Working Group II has acknowledged this tension, noting "the rational-linear process that identifies potential risks then evaluates management responses" might not be appropriate for diverse contexts of risks, and "overlooks many cultural and behavioral aspects of decision-making" (R. N. Jones *et al.*, 2014, p. 199).

These concerns raise important challenges for visions of climate justice that are based on allocations of resources or policies to counter climate risk that is represented as arising from pollutionist or outcome forms of risk. The growing discourse of planetary justice, for example, seeks to do this by replacing 20th Century visions of justice under the Holocene with a framework that can address the planetary scale needed under the Anthropocene (Biermann *et al.*, 2020; Biermann & Kalfagianni, 2020; San Martín & Wood, 2022). Some of the themes proposed under planetary justice include considering how to detach the pursuit of justice from unending economic growth; expanding justice to consider global, as opposed to state-based objectives; and considering the fate of non-humans and future generations (Dryzek & Pickering, 2018, p. 80).

Proponents of planetary justice, however, make it clear that planetary justice is based on stable assumptions that organize its allocations. These so-called "circumstances of justice" are defined as "a set of background assumptions about the state of the world that makes the pursuit of justice both necessary and possible" (Dryzek & Pickering, 2018, p. 63), and are based on classical ideas about justice after Hume (1975 [1739]) and Rawls (1999, pp. 109-112; Tebble, 2020). By so doing, however, scholars of planetary justice maintain a separation between factual frameworks of sustainability on one hand, and ethical concerns about justice on the other: indeed, Dryzek & Pickering (2018, p. 81) state "justice, while of crucial moral importance, is not the same as sustainability." Stable ideas about physical global change are therefore taken as a fixed basis for allocations. Similarly Gupta *et al.* (2021) discuss planetary boundaries in the same way, as a framework upon which to discuss different questions of capabilities and allocations, rather than seeing current understandings of planetary boundaries as a co-mingling of is and ought.

Simultaneously, many discussions of planetary and transformative climate justice are made hand-in-hand with other circumstances of justice relating to moral arguments about individual versus collective behavior. Early scientific research on ecology was in part driven by these concerns. In the mid-twentieth century, scholars described ecology as a "subversive science" that sought to understand ecology as a "continuing critique of [sic] man's operations within the ecosystem" (Sears, 1964, p. 12), or of a systems approach "beyond that of the individual and the debates about species" (Odum, 1964, p. 15). These themes still ring out today. Dryzek & Pickering (2018, pp. 80-81) argue that planetary justice requires that "individualist approaches yield to the need for collective action." Jacques (2012, p. 15) has equated climate science with a criticism of "the possessive individualistic ontology of the West." Other analysts have also recorded the growth of global environmental values by asking if individuals might reverse individualist interests such as by paying environmental taxes (Dryzek *et al.*, 2013, p. 28; Dunlap & York, 2008; Kahan *et al.*, 2011). These concerns have also influenced debates about climate

justice. For example, Schlosberg (2012, p. 454), criticizes classical liberal theories of justice by saying "unfortunately, climate justice theory is articulated almost exclusively within a liberal individualist conception of justice," and instead argues that "recognition and capabilities are community-level concerns."

The point here is not to denigrate communal or environmental behavior, but to highlight how moral viewpoints are co-produced simultaneously with visions of non-negotiable ecological reality. These co-productions influence debates about environmental justice by establishing circumstances of justice that define "what" should be allocated to "whom" – which in the case of planetary justice frequently means treating global systemic change as the background for local community responses. Historic research in STS has indicated that these kinds of association inevitably generate simplifications and exclusions, especially concerning how projections of risk constitute perceived subjectivities of affected people. For example, analysts have argued that the 1972 Limits To Growth model could only exist as a global environmental problem if we assume that individuals respond to resource scarcity through individualistic competition, an assumption that is not supported by evidence (Mehta, 2010; Taylor & Buttel, 1992). Later work has argued that climate change policies based on Reduced Emissions from Deforestation and Forest Degradation (REDD+) have also projecting tacit stereotypical gender roles (Arora-Jonsson, 2011). Sometimes these connections between risk and subjectivities are made within environmental assessment processes. For example, an anthropologist working in the 2005 Millennium Ecosystem Assessment reported that his role in the project was often reduced to providing local, and culturally grounded examples for global systems thinking that was the unquestioned framework of the report (Filer, 2009). Such a practice has also been described as "taking local/indigenous knowledge, severing it from its socio-historical context, and insert[ing] it within analytical and evaluation methodologies that contradict its cosmological characteristics" (Chakraborty & Sherpa, 2021, p. 10).

The role of community-based adaptation (CBA) in low- and middle-income countries has also received this discussion (Schipper *et al.*, 2014). Some proponents of CBA have argued that it is appropriate because it represents an alternative to individualism (Masud-All-Kamal & Nursey-Bray, 2022; Nurhidayah & McIlgorm, 2019). Other analysts have claimed that community action can still be appropriated by individuals, or that CBA might project romantic collective identities onto more complex, and often exclusionary, realities (Dodman & Mitlin, 2013; Regmi & Star, 2014; Titz *et al.*, 2018).

These debates therefore raise important challenges for debates about transformative climate justice. First, there is a need to match concern about "who" participates with reflection about "what" is being allocated. As discussed above, current debates about transformative justice have criticized classical Rawlsian theories of fair and transparent allocations because of the social barriers experienced by marginalized groups (Rawls, 1999, p. 13). Instead, there is also a need to consider what is actually being allocated – or what Simmet (2020) calls Rawls' "Object-ivity" – and to reflect upon how such items have been identified, and with whose participation (Gilardone, 2015, p. 228; Sen, 2009, p. 134).

Second, there is also a need to consider how far injustice can be resolved through recognition of marginalized groups without also reflecting on how these groups are represented, and how far representations simplify their diversity, or the diversity of other potential voices. Some analysts have argued that epistemic injustices can occur to groups on the ground of their social exclusion (Byskov, 2021; Fricker, 2007). Yet, a deep co-production approach would ask if using specific categories of marginalized people or communities might essentialize their knowledge, or project upon them the political intentions of the people asking them to speak. There is a need to ask why, and with which objectives, such groups are asked to participate (Beck & Forsyth, 2020).

And thirdly, there is a need to look at the context under which different circumstances of justice emerge, with implications for defining what is allocated to whom. Much debate about liberal justice has challenged the Rawlsian idea of seeing "an individual's abilities and talents as a natural endowment" (Gauthier, 1974, p. 25). But more attention needs to be paid to the political arenas and national contexts in which norms of justice become authoritative. These arenas can include expert organizations, environmental assessments, or public debates about social order.

The following discussion provides an illustration of these themes using the example of Nepal as a country that has experienced maladaptation and various attempts at knowledge co-production. In particular, this discussion focuses on how circumstances of justice have emphasized frameworks of risk that organize debates about justice; and how visions of community have reduced the complexity by which local vulnerability and identity are understood.

An illustration: maladaptation in Nepal

Nepal is often considered a success story for adaptation because it has implemented its National Adaptation Plan of Action (NAPA), and Local Adaptation Plans for Action (LAPA) (Chaudhury *et al.*, 2014; MoE, 2010; Penniston, 2013). Despite this, maladaptation is now widely discussed (Clement & Sugden, 2021; Nightingale, 2015, 2018a; Ojha, Ghimire*, et al.*, 2016). In one critical article, Acharya (2021) argued that "climate adaptation programs only add to people's suffering." This article listed five reasons: programs often treat climate change impacts in apolitical technical terms; adaptation often overlooks crucial vulnerabilities such as barriers to land and education; community participation is often only symbolic; financial capital is insufficient within communities; and traditional knowledge is ignored. Other analysts have claimed "the IPCC process fails to address the enduring questions of justice and equity which

are critical in the production of Himalayan climate-society relationships" (Chakraborty & Sherpa, 2021, p. 7).

The following discussion analyzes the injustices within maladaptation according to "what" is being allocated or responded to within adaptation interventions; "who" is included in these processes. This section also considers different approaches to co-production in either resolving or in connecting these definitions of what and who.

"What" is adaptation for?

As noted above, the circumstances of justice are widely understood "a set of background assumptions about the state of the world that makes the pursuit of justice both necessary and possible" (Dryzek & Pickering, 2018, p. 63). In Nepal, however, there is a long history of discussions about environmental change that have often presented contested and uncertain cause-and-effect relationships as unquestioned fact. During the 1970s, the so-called Theory of Himalayan Environmental Degradation developed to propose that population growth and outdated agricultural practices were increasing deforestation and soil erosion in Nepal's Middle Hills, which in turn drove further deforestation, landslides, and downstream flooding. Much of this narrative arose from the writings of a *New York Times* journalist, Eric Eckholm (1976). Later, critical, research acknowledged the ongoing normality of landslides in the Himalayas, plus revealed that actual statistics for deforestation rates between 1965 and 1981 varied by a factor of 67, even after excluding some apparent typing errors (Donovan, 1981), leading analysts to propose that underlying uncertainty was often shaped by different think tanks or political organizations to represent images of crisis or no-crisis depending on different worldviews (Ives & Messerli, 1989; Thompson & Gyawali, 2007; Thompson *et al.*, 1986). The point made by these analysts is that claims of biophysical certainty need to be treated with care.

Moreover, these competing narratives often block out attention to what more vulnerable people actually experience as scarcity (Mishra *et al.*, 2019).

These patterns persist in current debates about climate change. For some years, analysts have noted water springs drying up in Nepal's Middle Hills, which is commonly attributed to climate change (Sharma *et al.*, 2016). Other researchers, however, have argued that declining water tables are also explained by the increasing use of PVC pipes and pumps; transitions from unirrigated maize and millet to water-intensive market vegetables; and a decline in traditional wallowing ponds for buffaloes because livestock is now used less, or because ponds are paved over to prevent malaria or to allow construction (Gyawali & Thompson, 2016, p. 182). In 2021, the *Financial Times* carried a long report about the climate crisis in the Himalayas, describing a landslide allegedly caused by a glacial lake outflow flood (GLOF) in neighboring Uttarakhand in India, and citing Dipak Gyawali, an ex-water minister in Nepal and author of some of the reports discussed above (Parkin, 2021). In a personal communication, Gyawali (2021) claimed he was misquoted and that the landslide was not a GLOF. He stated:

> We have a Nepali saying: you can lock a dog's tail inside a bamboo tube for
> 12 years but it will not have straightened out after the tube is removed. I
> spoke for 2 hours on skype with [the journalist], sent him relevant pdf
> pieces... told him how what happened in Uttarakhand was not a GLOF, that it
> was a slope failure that occurs in the Himalaya all the time with little link to
> climate change... to no avail.

Gyawali clarified that this is "not to say that Climate Change is not happening: it is and temperature rise is very real." Rather, the point is that – like many locations – debates about environmental cause-and-effect in Nepal can easily become overly reductionist narratives. These narratives, however, can also become circumstances of justice if they are used as background assumptions. Like proponents of transformative justice have argued, there is a need

to make more space to understand marginalized voices. But there is also a need to consider how unquestioned scientific explanations can also exclude or organize these voices when they are used as fixed circumstances of justice.

Such concerns have also been expressed in regard to adaptation to climate change, and whether interventions have aimed limited biophysical changes above enhancing local experiences of these changes. Nightingale (2017; Nightingale *et al.*, 2021, p. 8) notes, for example, that an autonomous adaptation project using irrigation in western Nepal failed to address farmer's actual problem of invasive caterpillars, and further bolstered local inequalities in access to commercial crops (especially cardamon). In the same vein, Ensor and his colleagues (2019, p. 227) have asked if adaptation research and policy in Nepal should be reframed to ask about "what are the significant changes taking place in people's lives?" rather than the more standard "what are the impacts of climate change?"

Maladaptation in Nepal, therefore, might therefore refer to a mis-application of frameworks of risk rather than the inadequate implementation of otherwise-appropriate forms of adaptation. Or, as Nightingale (2018b, p. 703) observed: "External observers believe climate change poses the greatest risk to Nepal, whereas I would argue that my analysis points to socionatural entanglements and boundary-making processes as the greatest risks for Nepalis." Various authors have linked this process specifically to the application of the linear model of understanding risk as additional greenhouse gas emissions – also known as "outcome" (O'Brien *et al.*, 2007, p. 75) or "pollutionist" (Burton, 2009) approaches as discussed above (Chakraborty & Sherpa, 2021). These criticisms have especially been made about Nepal's NAPA and LAPA (and indeed, the associated Provincial Adaptation Program of Action, PAPA, and Community Level Adaptation Plan of Action, CAPA) (Darjee *et al.*, 2021, pp. 2, 25), despite their nominal claims to be local. Indeed, according to Nagoda (2015, p. 570), working in Humla, western Nepal, the "NAPA, and LAPA consistently address 'outcome vulnerability' at the expense of

'contextual vulnerability,' and that they offer little new in terms of challenging the structural root causes of vulnerability."

In particular, comments like these challenge the distinction made by the Intergovernmental Panel on Climate Change (IPCC) between "planned" and "autonomous adaptation" (IPCC, 2007, pp. sections 5.5.1-2), in which planned adaptation results from deliberate interventions to anticipate anthropogenic climate change, and autonomous (or spontaneous) adaptation is "adaptation that does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems." Yet, research in similar locations to Nepal such as northern Thailand have shown that some attempts at planned adaptation – such as tree planting to stabilize slopes – can impede local routes to sustainable livelihoods through agriculture (Forsyth & Evans, 2013). The presumed autonomous adaptation from the IPCC definition does not allow for how livelihood transitions contemporaneous with climate change can re-allocate what is considered a risk, or who gets to experience it (Burnham & Ma, 2018).

In the authors' own fieldwork in Jumla – another remote and dry part of western Nepal like Humla – much government policy to implement climate change adaptation has focused on strengthening roads, and enhancing agricultural markets, sometimes in collaboration with the United Nations Food and Agriculture Organization and World Bank (Selvaraju *et al.*, 2014; Thakur, 2017). This work has also built irrigation channels, partly to reduce risks of landslides (The Nation, 2019), as well as investment from the United Nations' Adaptation Fund to build food security through the integrated management of agriculture, water, forest, and biodiversity as part of the LAPA (NCCSP, n.d.). These initiatives both address a biophysical definition of climate risk, and encourage a change in livelihoods towards export-led agriculture. Predictably these plans don't benefit all. One frequently repeated phrase was *roadlay lahdkayo*, roughly

translated as "the road ate my livelihood," meaning that the road brought increasing expenses but not the commensurate opportunities and income to meet those expenses.

Some analysts have blamed this particular type of maladaptation on "one-dimensional technocratic solutions that ignore the drivers of local vulnerability" (Nagoda, 2015, p. 570), or a combination of "techno-managerial" representatives of Nepal's developmental state working alongside the IPCC's continuing "bias" towards "epistemic tools emerging from reductionist, constituent ideologies" that emphasize nation states as the most important spatial units (Chakraborty & Sherpa, 2021, p. 7). These analysts argue "co-production of knowledge creates an alternative to this model by focusing on the politics of framing, advocating a plurality of assessment pathways, and embracing the massive uncertainty within climate-society relationships" (Chakraborty & Sherpa, 2021, p. 10). Yet, this form of co-production can also be challenged by deep, or reflexive co-production to ask not just "what" is allocated through adaptation, but also "who" is assumed to need it.

"Who" is engaged in just adaptation?

Calls to make adaptation more inclusive frequently focus on increasing the consultation with marginalized groups and communities. For example, previous studies have claimed that community-based approaches to adaptation can be "transformational" because its builds "solidarity" (Nurhidayah & McIlgorm, 2019, pp. 17, 11), or because of a desire to listen most to communities that are affected most acutely by climate change (McOmber *et al.*, 2021; Paterson & Charles, 2019, p. 327). Engaging with communities and marginal groups is linked to improving climate justice, especially in avoiding epistemic injustice (Byskov, 2021; Holland, 2017, p. 395).

Much research, however, has shown significant barriers prevent communities either influencing policy, or in including all local voices fairly. Either or both of these can lead to maladaptation. For example, a review of community-based adaptation in Nepal concluded that institutions were quickly captured by elites or powerful individuals, in keeping with older research on the inclusiveness of community forestry institutions (Ojha, Khatri, *et al.*, 2016; Regmi *et al.*, 2016). Research in Humla in western Nepal concluded that marginalized people find committee meetings a waste of time, as they are unable to shape decisions (Nagoda & Nightingale, 2017, p. 91). This lack of inclusion has been attributed – also in Humla – to various cognitive, normative, and institutional barriers, which refer to conscious or subconscious behaviors that exclude groups outside of the Brahmin/ Chhetri elites, such as Dalits (low caste people) or indigenous groups (Janajati) (L. Jones & Boyd, 2011). These kinds of observations support proponents of transformative justice who seek to increase the political space for marginalized groups to participate in adaptation processes (Holland, 2017; Newell *et al.*, 2021).

A focus on deep co-production, however, proposes that these approaches don't go far enough – either in understanding how community actors are identified and afforded agency; or in terms of a focus on "who" participates in adaptation also has to be considered simultaneously with "what" adaptation is for.

First, the notion of "communities" has been widely criticized as a concept on the grounds that it hides social divisions within communities, and can often reflect the romantic projections of outsiders (Titz *et al.*, 2018). It is not clear whether the social barriers in community work mentioned mean that the ideal of community inclusion is flawed in principle, or if this inclusiveness could be achieved after appropriate reforms. Regmi and his colleagues (2015, p. 545), for example, note "vulnerable people do not always conform to popular ideas of vulnerability, such as women or people of low caste."

Despite these concerns, there is a large body of work that attributes significance to "community" because it is considered an antidote to other themes such as individualism (Dryzek & Pickering, 2018, pp. 80-81; Schlosberg, 2012); a counter-balance to global systems thinking (Filer, 2009); or a worldview that emphasizes loss of traditional heritage. For example, the Climate Alliance of Himalayan Communities wrote:

> For thousands of years mountain communities have maintained a close relationship with the environment, depending on ecosystem services for their agrarian livelihood... Drying of natural springs, ponds, rivers ...is adding stress on women and children because they are forced to travel far to collect water. Extreme monsoon rainfall ...is causing flash flood, excessive soil erosion and frequent landslides threatening the livelihood.... women and children now forced to travel far to collect firewood (Sherpa *et al.*, 2015, pp. 6, 108).

This statement reproduces many of the tenets of Theory of Himalayan Environmental Degradation discussed above, and identifies traditional community life as a solution. Yet, this interpretation pays little attention to the livelihood diversification, including migration and commercialization that is happening apace in Nepal, and which changes the meaning of community; the nature of risks faced by different people; and who gets to face them.

Second, the "pollutionist" or "outcome" framework of risk adopted within historic IPCC assessments also pre-shapes adaptation in ways that emphasize direct impacts on land and water rather than ways of managing overall risks faced by vulnerable populations. Indeed, as discussed above, adaptation interventions to manage these direct impacts can sometimes impede co-existing livelihood transitions that transform which risks are threatening to people, and can add to pre-existing inequalities within communities. As Nagoda (2015, pp. 572-4) noted, the vision of vulnerability understood and addressed by Nepal's NAPA is not necessarily the same vulnerability experience by people who receive these interventions. In particular, this

work identified that new irrigation systems facilitated by the World Food Programme benefitted better-off farmers more than poorer households whose land were either unsuitable for irrigation, or too far away. These interventions therefore imagined users who might at some point use irrigation or share the benefits of agriculture with others, rather than seeking to assist in better treatment in labor markets, access to food, and reducing inequality in general. For many of these marginalized people, "autonomous" adaptation might mean engaging in off-farm, or indeed migration-based, work rather than local agriculture, but these are not visible under the pollutionist model of climate risk (Chakraborty & Sherpa, 2021; Nightingale *et al.*, 2019, p. 890).

And thirdly, these various points mean there is a need to acknowledge diversity, intersectionality, and dynamism in understanding political subjects within climate justice (Panta & Resurrección, 2014). Debates within transformative climate justice, or the trivalent view of justice, seek to increase the distribution, recognition, and participation in relation to marginalized groups. But it is important not to confuse these objectives with ascribing uniform experiences of vulnerability or political agency to these groups. Instead, "subjectivities are defined and contested in relation to particular ecological conditions" (Nightingale, 2006, p. 172). Traditional roles of gender and caste are especially transformed in the emergence of new labor markets under commercialization (Cameron, 1995; Nightingale, 2011).

The authors' fieldwork in Jumla, western Nepal, highlighted various contested themes of "who" benefits from interventions. In particular, Nepal's central government has applied various statemaking initiatives following the civil war (1996-2006), and where Jumla was a site of Maoist activity (Hatlebakk, 2010). One theme has been to create public policies emphasizing communal national identity, such as the vision of "Prosperous Nepal, Happy Nepali" adopted by the Government of Nepal, and mentioned as part of the country's climate change policy (Darjee *et al.*, 2021, p. 10; GoN, 2019, p. 5), or the ubitiquous use of "one–one" slogans promising "one"

good or service per each household or village. For example, noticeboards in town centers and local government leaflets announced programs for "one village, one road," "one house, one tap," "one house, one toilet," "one house, one employment," "one house, one orchard" and so on. Such universalist approaches to allocations of course pay little attention to social differences, such as involving both caste and gender. In one location in Jumla, the research encountered one newly allocated toilet that had been converted to a Dalit woman's sleeping quarters for "chhaupadi," a now outlawed practice still observed in western Nepal of isolating women due to their ritual impurity during menstruation. Meanwhile, predictably, the kinds of new economic opportunities promoted through road construction and encouraging export crops in Jumla such as apples and barley take place on top of pre-existing inequalities of land ownership and access to trade between people; yet these interventions have so far not sought to enhance economic participation by everyone (Lewison, 2019).

The point here is that there is a need to consider not just the vulnerability or lack of recognition, of marginalized groups, but also their role as epistemic subjects. What work is their inclusion and participation seeking to achieve? The common idea that participation needs to be done better to reflect marginal groups (Nagoda, 2015, p. 576-7; Newell et al, 2021) needs to be matched by an awareness of the underlying values and political projects that make it useful to define and then introduce these groups (Beck & Forsyth, 2020). The common approach to co-production seeks to avoid epistemic injustices by seeking to include groups that are excluded because of factors such as prejudice, social inequality, or because their knowledge is considered irrelevant (Byskov, 2021, p. 118). Deep co-production, however, analyzes instead what agency are projected onto specific groups following from assumptions about circumstances of justice, such as unquestioned frameworks of environmental risk, or visions of social order. In Nepal, these factors have encouraged a focus upon communal, traditional, or land-based people as recipients of adaptation, rather people engaged in labor markets, migration, and livelihood

diversification, which are frequently the conditions that define their vulnerability more than their status as gender or caste.

There is consequently a need to consider how far the origins of maladaptation do not just lie in inappropriate implementation of adaptation among marginalized communities. There is a need to trace how local-level exclusion begins further up within adaptation planning (Tschakert *et al.*, 2016). This introspection, however, should also refer to underlying models of risk and visions of planetary justice that also organize ideas about "what" adaptation is for, for "whom," and how these factors contribute towards perceived circumstances of justice that feed maladaptation by presenting reduced visions of how climate presents risks, and why different people are vulnerable.

Conclusion

The point of this paper is to argue for a deeper, and more contextual approach to transformative climate justice. In particular, the paper urges caution about current demands to revise classical liberal theories of justice by facilitating the participation of community and marginalized actors as a means of avoiding maladaptation. Rather than being transformative, the paper argues that these approaches to justice carry exclusions of their own because they tend to reify current perceptions of climate risk and social groupings that do not acknowledge the actual contexts under which vulnerable people experience climate risks. Instead, there is a need to understand more about how underlying circumstances of justice become unquestioned within research and policy concerning climate change, and how these then organize discussions of "what" climate adaptation is for, and "who" participates.

A key way of understanding these influences is through the discussion about the meaning of co-production in environmental science and policy. Much current debate proposes co-production

as an intentional act of including marginal groups to bring "a plurality of knowledge sources and types together" (Armitage *et al.*, 2011, p. 996; Chakraborty *et al.*, 2022; Lemos *et al.*, 2018; Lemos & Morehouse, 2005; Schipper, 2020; Tubridy *et al.*, 2022). Yet, the alternative "deep" or "reflexive" co-production, arising from older debates from social studies of science instead views co-production as a non-cognitive process by which factual representations are made simultaneously with visions of social order (Jasanoff, 2004; Miller & Wyborn, 2018). Accordingly, many of the deliberate attempts to correct maladaptation or achieve transformative climate justice use circumstances of justice that paper to be unquestioned and universal, yet have specific histories and values that make them difficult, and sometimes damaging, to apply in different contexts.

In particular, the growing discussion around planetary justice provides an arena in which representations of climate risk and social order lead to fixed, but problematic, circumstances of justice. Under this framework, Dryzek & Pickering (2018, p. 81) differentiate sustainability as a factual framework on one hand and justice as a normative judgment on the other. In an earlier publication Dryzek et al (2013, p. v) also refer to "the science.. which we take as more or less given." This common representation of climate science as fixed, however, confuses debates about greenhouse gas concentrations at the atmospheric level with ongoing, and still uncertain, discussions about how these concentrations present risks for diverse vulnerable societies. Yet, it is now widely acknowledged that "adaptation always has, and arguably should, refer to more than just responses to climate change" (Nightingale *et al.*, 2020; Sabates-Wheeler *et al.*, 2008, p. 53).

Similarly, Gupta *et al.* (2021) organize their discussion of environmental justice around how societies might respond to planetary boundaries, but without considering how questions of justice might reframe the definition of planetary boundaries. The point of this discussion is not to imply that atmospheric greenhouse gas concentrations or planetary boundaries might not

exist or that they do not pose significant challenges. Rather, it is to say that treating current

understandings of these terms as fixed starting points for justice diminishes attention to how

these terms have been influenced by particular histories and framings. The supposed

universalism of these terms breaks down among the diverse values and vulnerabilities of

different contexts.

These concerns also refer to the attention to community as an expected antidote to the

individualistic values prevalent in the causes of the climate crisis, or in those who seek to deny

it (Dryzek & Pickering, 2018, p. 80). This in turn has prompted analysts to link climate justice to

community engagement (Holland, 2017; Schlosberg, 2012). Yet, increasingly, scholars of

adaptation have urged that notions of community hide significant social divisions that are

important for how vulnerability is actually experienced, as well as placing too much attention

on social categories as a means of understanding risk, as opposed to the particular

circumstances under which different people are placed at risk (Nightingale *et al.*, 2021). The

examination of evidence from Nepal in this paper has indicated (similar to other locations) that

so-called community actions frequently contain significant social barriers, but also that

adaptation interventions tend to focus on forms of land-based and infrastructural approaches to

risk management that might only be effective if people conformed to an idealized image of

community (Chakraborty & Sherpa, 2021; Nagoda, 2015; Nagoda & Eriksen, 2015; Nagoda &

Nightingale, 2017).

Instead, there is a need to ask why these associations of risk, community, and planetary justice

remain stable despite growing counter evidence and debate? Or, as Gyawali (2021) joked above,

why a dog's tail remains curled?

The Intergovernmental Panel on Climate Change (IPCC) has certainly acknowledged a need to

diversify its approach to climate risk (R. N. Jones *et al.*, 2014). Yet, various analysts have also

pointed out that the IPCC's approach to public rationality means speaking with one voice, partly to counter the claims of climate change deniers, and to present the IPCC as policy relevant, but not policy prescriptive. These stances, however, have been noted to diminish the diversity and social context in which climate change is experienced or meaningful (Beck, 2011; Beck & Forsyth, 2015; Hulme *et al.*, 2011). Is it possible that the current discussions of maladaptation and climate justice a way to allow political debate about how to use climate science without challenging the IPCC's emphasis on greenhouse gases as the basis of risk?

Regardless, debates about adaptation needs to pay more attention to understanding diverse drivers of vulnerability under conditions of commercialization and migration in locations such as Nepal. Under these conditions, the actual nature of risks experienced by vulnerable people changes according to livelihood transitions simultaneously as challenges to traditional caste and gender roles (Nightingale, 2011). Some people will be able to transcend old social identities and ecological risks, while others cannot. Maladaptation should not be understood simply as the improper implementation of an essentially good thing, but rather as the attempt to base adaptation on visions of risk and community that are not as universal as commonly assumed. Accordingly, then, transformative climate justice is not just allocating solutions for predefined ideas of risk to predefined ideas of marginalized people. It means engaging marginalized people in helping to reframe these circumstances of justice, and considering how visions of "what" risks are faced by "whom" are deeply co-produced within the making of climate science and policy.

REFERENCES

Acharya, S. (2021). Five ways climate adaptation programs only add to people's suffering. Retrieved from https://www.recordnepal.com/five-ways-climate-adaptation-programs-only-add-to-peoples-suffering.

Agyeman, J., Schlosberg, D., Craven, L., & Matthews, C. (2016). Trends and Directions in Environmental Justice: From Inequity to Everyday Life, Community, and Just Sustainabilities. *Annual Review of Environment and Resources, 41*(1), 321-340. doi: 10.1146/annurev-environ-110615-090052

Armitage, D., Berkes, F., Dale, A., Kocho-Schellenberg, E., & Patton, E. (2011). Co-management and the co-production of knowledge: learning to adapt in Canada's Arctic. *Global Environmental Change, 21*(3), 995-1004. doi: http://dx.doi.org/10.1016/j.gloenvcha.2011.04.006

Arora-Jonsson, S. (2011). Virtue and vulnerability: Discourses on women, gender and climate change. *Global Environmental Change, 21*, 744-751.

Ayers, J. (2011). Resolving the adaptation paradox: Exploring the potential for deliberative adaptation policy-making in Bangladesh. *Global Environmental Politics, 11*(1), 62-88.

Barnett, J., & O'Neill, S. (2010). Maladaptation. *Global Environmental Change, 20*(2), 211-213. doi: 10.1016/j.gloenvcha.2009.11.004

Beck, S. (2011). Moving beyond the linear model of expertise? IPCC and the test of adaptation. *Regional Environmental Change, 2*(11), 297-306.

Beck, S., & Forsyth, T. (2015). Co-production and Democratizing Global Environmental Expertise: the IPCC and adaptation to climate change. In R. Hagendijk, S. Hilgartner & C. Miller (Eds.), *Science and Democracy: Making Knowledge and Making Power in the Biosciences and Beyond* (pp. 113-132). Abingdon: Routledge.

Beck, S., & Forsyth, T. (2020). Who gets to imagine transformative change? Participation and representation in biodiversity assessments. *Environmental Conservation*, 1-4. doi: 10.1017/S0376892920000272

Biermann, F., Dirth, E., & Kalfagianni, A. (2020). Planetary justice as a challenge for earth system governance: Editorial. *Earth System Governance, 6*, 100085. doi: 10.1016/j.esg.2020.100085

Biermann, F., & Kalfagianni, A. (2020). Planetary justice: A research framework. *Earth System Governance, 6*, 100049. doi: https://doi.org/10.1016/j.esg.2020.100049

Bordner, A. S., Ferguson, C. E., & Ortolano, L. (2020). Colonial dynamics limit climate adaptation in

    Oceania: Perspectives from the Marshall Islands. *Global Environmental Change, 61*, 102054. doi:

    10.1016/j.gloenvcha.2020.102054

Bremer, S., & Meisch, S. (2017). Co-production in climate change research: reviewing different

    perspectives. *WIREs Climate Change, 8*(6), e482. doi: https://doi.org/10.1002/wcc.482

Bulkeley, H., Carmin, J., Castán Broto, V., Edwards, G. A. S., & Fuller, S. (2013). Climate justice and global

    cities: Mapping the emerging discourses. *Global Environmental Change, 23*(5), 914-925. doi:

    https://doi.org/10.1016/j.gloenvcha.2013.05.010

Burnham, M., & Ma, Z. (2018). Multi-Scalar Pathways to Smallholder Adaptation. *World Development, 108*,

    249-262. doi: https://doi.org/10.1016/j.worlddev.2017.08.005

Burton, I. (2009). Climate change and the adaptation deficit. In E. L. Schipper & I. Burton (Eds.), *The*

    Earthscan Reader on Adaptation to Climate Change (pp. 89-98). London: Earthscan.

Byskov, M. F. (2021). What Makes Epistemic Injustice an "Injustice"? *Journal of Social Philosophy, 52*(1),

    114-131. doi: 10.1111/josp.12348

Byskov, M. F., Hyams, K., Satyal, P., Anguelovski, I., Benjamin, L., Blackburn, S., . . . Venn, A. (2021). An

    agenda for ethics and justice in adaptation to climate change. *Climate and Development, 13*(1), 1-

    9. doi: 10.1080/17565529.2019.1700774

Cameron, M. M. (1995). Transformations of Gender and Caste Divisions of Labor in Rural Nepal: Land,

    Hierarchy, and the Case of Untouchable Women. *Journal of Anthropological Research, 51*(3), 215-

    246. doi: 10.1086/jar.51.3.3630359

Carr, E. R. (2019). Properties and projects: Reconciling resilience and transformation for adaptation and

    development. *World Development, 122*, 70-84. doi: 10.1016/j.worlddev.2019.05.011

Chakraborty, R., Jayathunga, S., Matunga, H. P., Davis, S., Matunga, L., Eggers, J., & Gregorini, P. (2022).

    Pursuing Plurality: Exploring the Synergies and Challenges of Knowledge Co-production in

    Multifunctional Landscape Design. [Original Research]. *Frontiers in Sustainable Food Systems, 5*.

    doi: 10.3389/fsufs.2021.680587

Chakraborty, R., & Sherpa, P. Y. (2021). From climate adaptation to climate justice: Critical reflections on

    the IPCC and Himalayan climate knowledges. *Climatic Change, 167*(3), 49. doi: 10.1007/s10584-

    021-03158-1

Chaudhury, A., Sova, C., Rasheed, T., Thornton, T. F., Baral, P., & Zeb, A. (2014). Deconstructing Local

    Adaptation Plans for Action (LAPAs): Analysis of Nepal and Pakistan LAPA initiatives *Working*

    Paper No. 67. Copenhagen: CCAFS.

Clement, F., & Sugden, F. (2021). Unheard vulnerability discourses from Tarai-Madhesh, Nepal. *Geoforum,*

    126, 68-79. doi: 10.1016/j.geoforum.2021.07.016

Comberti, C., Thornton, T. F., Korodimou, M., Shea, M., & Riamit, K. O. (2019). Adaptation and Resilience at

    the Margins: Addressing Indigenous Peoples' Marginalization at International Climate

    Negotiations. *Environment : Science and Policy for Sustainable Development, 61*(2), 14-30. doi:

    10.1080/00139157.2019.1564213

D'Alisa, G., & Kallis, G. (2016). A political ecology of maladaptation: Insights from a Gramscian theory of

    the State. *Global Environmental Change, 38*, 230-242. doi:

    http://dx.doi.org/10.1016/j.gloenvcha.2016.03.006

Darjee, K., Sunam, R., Köhl, M., & Neupane, P. (2021). Do National Policies Translate into Local Actions?

    Analyzing Coherence between Climate Change Adaptation Policies and Implications for Local

    Adaptation in Nepal. *Sustainability (Basel, Switzerland), 13*(23), 13115. doi:

    10.3390/su132313115

Dilling, L., & Lemos, M. C. (2011). Creating usable science: opportunities and constraints for climate

    knowledge use and their implications for science policy. *Global Environmental Change, 21*(2),

    680-689. doi: 10.1016/j.gloenvcha.2010.11.006

Dodman, D., & Mitlin, D. (2013). Challenges for community-based adaptation: discovering the potential

    for transformation. *Journal of International Development, 25*(5), 640–659. doi: 10.1002/jid.1772

Donovan, D. (1981). Fuelwood: How much do we need? *Newsletter (DGD 14)*.

Dovers, S. (2009). Normalizing adaptation. *Global Environmental Change, 19*(1), 4-6. doi:

    10.1016/j.gloenvcha.2008.06.006

Dryzek, J. S., Norgaard, R. B., & Schlosberg, D. (2013). *Climate-Challenged Society* (1st edition. ed.). Oxford:

    Oxford University Press.

Dryzek, J. S., & Pickering, J. (2018). Planetary Justice. In J. S. Dryzek & J. Pickering (Eds.), *The Politics of the*

    Anthropocene (pp. 58-81). Oxford: Oxford University Press.

Dunlap, R. E., & York, R. (2008). The globalization of environmental concern and the limits of the
postmaterialist values explanation: evidence from four multinational surveys. *Sociological
Quarterly, 49*(3), 529-563.

Eckholm, E. (1976). *Losing Ground: Environmental Stress and World Food Problems*. New York: W.W.
Norton.

Ensor, J. E., Wennström, P., Bhatterai, A., Nightingale, A. J., Eriksen, S., & Sillmann, J. (2019). Asking the
right questions in adaptation research and practice: Seeing beyond climate impacts in rural
Nepal. *Environmental Science & Policy, 94*, 227-236. doi: 10.1016/j.envsci.2019.01.013

Eriksen, S., Aldunce, P., Bahinipati, C. S., Martins, R. D. A., Molefe, J. I., Nhemachena, C., . . . Ulsrud, K. (2011).
When not every response to climate change is a good one: Identifying principles for sustainable
adaptation. *Climate and Development, 3*(1), 7-20. doi: 10.3763/cdev.2010.0060

Eriksen, S., Schipper, E. L. F., Scoville-Simonds, M., Vincent, K., Adam, H. N., Brooks, N., . . . West, J. J. (2021).
Adaptation interventions and their effect on vulnerability in developing countries: Help,
hindrance or irrelevance? *World Development, 141*, 105383. doi:
10.1016/j.worlddev.2020.105383

Filer, C. (2009). A bridge too far: the knowledge problem in the Millennium Ecosystem Assessment. In J. G.
Carrier & P. West (Eds.), *Virtualism, Governance and Practice: Vision and Execution in
Environmental Conservation* (pp. 84-111). New York: Berghahn.

Forsyth, T., & Evans, N. (2013). What is autonomous adaptation? Resource scarcity and smallholder
agency in Thailand. *World Development, 43*, 56-66. doi: 10.1016/j.worlddev.2012.11.010

Fraser, N. (2001). Recognition without ethics? *Theory, Culture and Society, 18*(2), 21-42.

Fricker, M. (2007). *Epistemic Injustice : Power and the Ethics of Knowing*. Oxford: Oxford University Press.

Gauthier, D. (1974). Justice and Natural Endowment: Toward a Critique of Rawlì Ideological Framework.
Social Theory and Practice, 3, 3-26.

Gilardone, M. (2015). Rawls's influence and counter-influence on Sen: Post-welfarism and impartiality.
The European Journal of the History of Economic Thought, 22(2), 198-235. doi:
10.1080/09672567.2013.792365

Glover, L., & Granberg, M. (2021). The Politics of Maladaptation. *Climate, 9*(5), 69.

GoN. (2019). Climate Change Policy. Singhdurbar Kathmandu: Government of Nepal, Ministry of Forest
and Environment (MoFE).

Graham, S., Barnett, J., Mortreux, C., Hurlimann, A., & Fincher, R. (2018). Local values and fairness in climate change adaptation: Insights from marginal rural Australian communities. *World Development, 108*, 332-343. doi: 10.1016/j.worlddev.2017.12.008

Gupta, J., Liverman, D., Bai, X., Gordon, C., Hurlbert, M., Inoue, C. Y. A., . . . Ciobanu, D. (2021). Reconciling safe planetary targets and planetary justice: Why should social scientists engage with planetary targets? *Earth System Governance, 10*, 100122. doi: 10.1016/j.esg.2021.100122

Gyawali, D. (2021). [Personal communication, email 21 March 2021].

Gyawali, D., & Thompson, M. (2016). Restoring Development Dharma with Toad's Eye Science. *IDS Bulletin, 47*(2A), 179-190. doi: doi.org/10.19088/1968-2016.173192

Hatlebakk, M. (2010). Maoist Control and Level of Civil Conflict in Nepal. *South Asia Economic Journal (Institute of Policy Studies), 11*(1), 99-110. doi: 10.1177/139156141001100106

Holland, B. (2017). Procedural justice in local climate adaptation: political capabilities and transformational change. *Environmental Politics, 26*(3), 391-412.

Hulme, M., Mahony, M., Beck, S., Görg, C., Hansjürgens, B., Hauck, J., . . . van der Sluijs, J. P. (2011). Science-policy interface: Beyond assessments. *Science, 333*, 6043.

Hume, D. (1975 [1739]). *A Treatise of Human Nature.* Oxford UK: Clarendon Press.

Inderberg, T. H. A., Eriksen, S., O'Brien, K., & Sygna, L. (Eds.). (2015). *Climate Change Adaptation and Development : Transforming Paradigms and Practices*. Abingdon: Routledge.

IPBES. (2016). The Methodological Assessment Report on Scenarios and Models of Biodiversity and Ecosystem Services. Bonn: IPBES.

IPCC. (2007). Online Glossary, Climate Change 2007: Working Group II: Impacts, Adaptation and Vulnerability. from IPCC https://www.ipcc.ch/publications_and_data/ar4/wg2/en/annexessglossary-a-d.html

Ives, J. D., & Messerli, B. (1989). *The Himalayan Dilemma: Reconciling Conservation and Development*. London: Routledge and UNU.

Jacques, P. J. (2012). A General Theory of Climate Denial. *Global Environmental Politics, 12*(2), 9-17. doi: 10.1162/GLEP_a_00105

Jasanoff, S. (2004). The idiom of coproduction. In S. Jasanoff (Ed.), *States of Knowledge: The Co-Production of Science and the Social Order* (pp. 1-12). London: Routledge.

Jasanoff, S. (2012). *Science and Public Reason*. London ; New York: Routledge.

Jones, L., & Boyd, E. (2011). Exploring social barriers to adaptation: insights from western Nepal. *Global Environmental Change, 21*(4), 1262-1274. doi: 10.1016/j.gloenvcha.2011.06.002

Jones, R. N., Patwardhan, A., Cohen, S. J., Dessai, S., Lammel, A., Lempert, R. J., . . . von Storch, H. (2014). Foundations for decision making. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea & L. L. White (Eds.), *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 195-228). Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

Juhola, S., Glaas, E., Linnér, B.-O., & Neset, T.-S. (2016). Redefining maladaptation. *Environmental Science & Policy, 55*, 135-140. doi: https://doi.org/10.1016/j.envsci.2015.09.014

Kahan, D. M., Jenkins-Smith, H., & Braman, D. (2011). Cultural cognition of scientific consensus. *Journal of Risk Research, 14*(2), 147-174. doi: 10.1080/13669877.2010.511246

Klenk, N., Fiume, A., Meehan, K., & Gibbes, C. (2017). Local knowledge in climate adaptation research: moving knowledge frameworks from extraction to co-production. *Wiley Interdisciplinary Reviews. Climate Change*, 8(5), n/a. doi: 10.1002/wcc.475

Kovats, R. S., & Hajat, S. (2008). Heat Stress and Public Health: A Critical Review. *Annual Review of Public Health, 29*(1), 41-55. doi: 10.1146/annurev.publhealth.29.020907.090843

Lemos, M. C., Arnott, J. C., Ardoin, N. M., Baja, K., Bednarek, A. T., Dewulf, A., . . . Wyborn, C. (2018). To co-produce or not to co-produce. *Nature Sustainability, 1*(12), 722-724. doi: 10.1038/s41893-018-0191-0

Lemos, M. C., & Morehouse, B. J. (2005). The co-production of science and policy in integrated climate assessments. *Global Environmental Change, 15*(1), 57-68. doi: http://dx.doi.org/10.1016/j.gloenvcha.2004.09.004

Lewison, E. (2019). Value Chains and Development Brokers: Engineering Inclusive Agricultural Markets in Jumla, Nepal. *South Asia, 42*(5), 903-919. doi: 10.1080/00856401.2019.1639244

Masud-All-Kamal, M., & Nursey-Bray, M. (2022). Best intentions and local realities: unseating assumptions about implementing planned community-based adaptation in Bangladesh. *Climate and Development*, 1-10. doi: 10.1080/17565529.2021.2003177

McOmber, C., McNamara, K., Ryley, T. d. A., & McKune, S. L. (2021). Investigating the Conceptual Plurality of Empowerment through Community Concept Drawing: Case Studies from Senegal, Kenya, and Nepal. *Sustainability (Basel, Switzerland), 13*(6), 3166. doi: 10.3390/su13063166

Mehta, L. (2010). *The Limits to Scarcity : Contesting the Politics of Allocation*. London ; Washington, DC: Earthscan.

Meikle, M., Wilson, J., & Jafry, T. (2016). Climate justice: between Mammon and Mother Earth. *International Journal of Climate Change Strategies and Management, 8*(4), 488-504. doi: 10.1108/ijccsm-06-2015-0089

Mikulewicz, M. (2021). Disintegrating labour relations and depoliticised adaptation to climate change in rural São Tomé and Príncipe. *Area, 53*(3), 422-430. doi: https://doi.org/10.1111/area.12630

Miller, C. A., & Wyborn, C. (2018). Co-production in global sustainability: Histories and theories. *Environmental Science & Policy*. doi: https://doi.org/10.1016/j.envsci.2018.01.016

Mishra, A., Appadurai, A. N., Choudhury, D., Regmi, B. R., Kelkar, U., Alam, M., . . . Sharma, U. (2019). Adaptation to Climate Change in the Hindu Kush Himalaya: Stronger Action Urgently Needed. In P. Wester, A. Mishra, A. Mukherji & A. B. Shrestha (Eds.), *The Hindu Kush Himalaya Assessment: Mountains, Climate Change, Sustainability and People* (pp. 457-490). Cham: Springer International Publishing.

MoE. (2010). Government of Nepal: National Adaptation Programme of Action (NAPA) to Climate Change. Kathmandu: Nepal Ministry of Environment.

Nagoda, S. (2015). New discourses but same old development approaches? Climate change adaptation policies, chronic food insecurity and development interventions in northwestern Nepal. *Global Environmental Change, 35*, 570-579. doi: https://doi.org/10.1016/j.gloenvcha.2015.08.014

Nagoda, S., & Eriksen, S. (2015). The role of local power relations in household vulnerability to climate change in Humla, Nepal. In T. H. A. Inderberg, S. Eriksen, K. O'Brien & L. Sygna (Eds.), *Climate Change Adaptation and Development : Transforming Paradigms and Practices* (pp. 200-218). Abingdon: Routledge.

Nagoda, S., & Nightingale, A. J. (2017). Participation and Power in Climate Change Adaptation Policies: Vulnerability in Food Security Programs in Nepal. *World Development, 100*, 85.

NCCSP. (n.d.). Helping local communities adapt to the effects of climate change in Nepal. In N. C. C. S. Programme (Ed.). Kathmandu: Ministry of Science, Technology and Environment.

New, M., Reckien, D., Viner, D., Adler, C., Cheong, S.-M., Conde, C., . . . Workman, M. (2022). Decision Making
    Options for Managing Risk (draft). In IPCC (Working Group II) (Ed.), *Sixth Assessment Report:
    Impacts, Adaptation and Vulnerability*. Bonn: Cambridge University Press.

Newell, P., Srivastava, S., Naess, L. O., Torres Contreras, G. A., & Price, R. (2021). Toward transformative
    climate justice: An emerging research agenda. *Wiley interdisciplinary reviews. Climate change,
    12*(6), n/a. doi: 10.1002/wcc.733

Nightingale, A. J. (2006). The nature of gender: work, gender, and environment. *Environment and planning
    D, 24*(2), 165-185. doi: http://dx.doi.org/10.1068/d01k

Nightingale, A. J. (2011). Bounding difference: intersectionality and the material production of gender,
    caste, class and environment in Nepal. *Geoforum, 42*(2), 153-162. doi:
    http://dx.doi.org/10.1016/j.geoforum.2010.03.004

Nightingale, A. J. (2015). A socionature approach to adaptation: political transition, intersectionality, and
    climate change programmes in Nepal. In T. H. A. Inderberg, S. Eriksen, K. O'Brien & L. Sygna
    (Eds.), *Climate Change Adaptation and Development : Transforming Paradigms and Practices* (pp.
    219-234). Abingdon: Routledge.

Nightingale, A. J. (2017). Power and politics in climate change adaptation efforts: Struggles over authority
    and recognition in the context of political instability. *Geoforum, 84*(1), 11-20. doi:
    dx.doi.org/10.1016/j.geoforum.2017.05.011

Nightingale, A. J. (2018a, Apr 2018). Nepal's Towering Climate Adaptation Challenges. *Current History,
    117,* 135-141.

Nightingale, A. J. (2018b). The socioenvironmental state: Political authority, subjects, and transformative
    socionatural change in an uncertain world. *Environment and Planning. E, Nature and Space
    (Print), 1*(4), 688-711. doi: 10.1177/2514848618816467

Nightingale, A. J., Eriksen, S., Taylor, M., Forsyth, T., Pelling, M., Newsham, A., . . . Whitfield, S. (2020).
    Beyond Technical Fixes: climate solutions and the great derangement. *Climate and Development,
    12*(4), 343-352. doi: 10.1080/17565529.2019.1624495

Nightingale, A. J., Gonda, N., & Eriksen, S. H. (2021). Affective adaptation = effective transformation?
    Shifting the politics of climate change adaptation and transformation from the status quo. *WIREs
    Climate Change, n/a*(n/a), e740. doi: https://doi.org/10.1002/wcc.740

Nightingale, A. J., Lenaerts, L., Shrestha, A., Lama 'Tsumpa, P. N., & Ojha, H. R. (2019). The Material Politics of Citizenship: Struggles over Resources, Authority and Belonging in the New Federal Republic of Nepal. *South Asia, 42*(5), 886-902. doi: 10.1080/00856401.2019.1639111

Nurhidayah, L., & McIlgorm, A. (2019). Coastal adaptation laws and the social justice of policies to address sea level rise: An Indonesian insight. *Ocean & Coastal Management, 171*, 11-18. doi: 10.1016/j.ocecoaman.2019.01.011

O'Brien, K., Eriksen, S., Nygaard, L. P., & Schjolden, A. N. E. (2007). Why different interpretations of vulnerability matter in climate change discourses. *Climate Policy, 7*(1), 73-88. doi: 10.1080/14693062.2007.9685639

Odum, E. (1964). The new ecology. *Bioscience, 14*(7), 14-16.

Ojha, H. R., Ghimire, S., Pain, A., Nightingale, A., Khatri, D. B., & Dhungana, H. (2016). Policy without politics: technocratic control of climate change adaptation policy making in Nepal. *Climate Policy, 16*(4), 415-433. doi: 10.1080/14693062.2014.1003775

Ojha, H. R., Khatri, D. B., Shrestha, K. K., Bhattarai, B., Baral, J. C., Basnett, B. S., . . . Paudel, D. (2016). Can Evidence and Voice Influence Policy? A Critical Assessment of Nepal's Forestry Sector Strategy, 2014. *Society & Natural Resources, 29*(3), 357-373. doi: http://dx.doi.org/10.1080/08941920.2015.1122851

Paavola, J. (2008). Science and social justice in the governance of adaptation to climate change. *Environmental Politics, 17*(4), 644-659. doi: 10.1080/09644010802193609

Paavola, J., & Adger, W. N. (2006). Fair adaptation to climate change. *Ecological Economics, 56*(4), 594-609. doi: 10.1016/j.ecolecon.2005.03.015

Panta, S. K., & Resurrección, B. P. (2014). Gender and Caste Relations Amidst a Changing Political Situation in Nepal: Insights from a Farmer-managed Irrigation System. *Gender, Technology and Development, 18*(2), 219-247. doi: 10.1177/0971852414529482

Parkin, B. (2021). Crisis in the Himalayas: climate change and unsustainable development. *Financial Times, 21 March 2021*.

Paterson, B., & Charles, A. (2019). Community-based responses to climate hazards: typology and global analysis. *Climatic Change, 152*(3), 327-343. doi: 10.1007/s10584-018-2345-5

Penniston, B. (2013). A review of Nepal's Local Adaptation Plans of Action High Mountains Adaptation Partnership. Washington DC: USAID.

Rawls, J. (1999). *A Theory of Justice* (Rev. ed. ed.). Oxford: Oxford University Press.

Regmi, B. R., & Star, C. (2014). Identifying operational mechanisms for mainstreaming community-based adaptation in Nepal. *Climate and Development, 6*(4), 306-317. doi: 10.1080/17565529.2014.977760

Regmi, B. R., Star, C., & Leal Filho, W. (2016). An overview of the opportunities and challenges of promoting climate change adaptation at the local level: a case study from a community adaptation planning in Nepal. *Climatic Change, 138*(3-4), 537-550. doi: 10.1007/s10584-016-1765-3

Sabates-Wheeler, R., Mitchell, T., & Ellis, F. (2008). Avoiding repetition: time for CBA to engage with the livelihoods literature? *IDS bulletin, 39*(4), 53-59.

San Martín, W., & Wood, N. (2022). Pluralising planetary justice beyond the North-South divide: Recentring procedural, epistemic, and recognition-based justice in earth-systems governance. *Environmental science & policy, 128*, 256-263. doi: 10.1016/j.envsci.2021.12.002

Schipper, E. L. F. (2020). Maladaptation: When Adaptation to Climate Change Goes Very Wrong. *One Earth, 3*(4), 409-414. doi: https://doi.org/10.1016/j.oneear.2020.09.014

Schipper, E. L. F., Ayers, J., Reid, H., Huq, S., & Rahman, A. (Eds.). (2014). *Community-Based Adaptation to Climate Change: Scaling It Up*. Abingdon: Routledge/Earthscan.

Schlosberg, D. (2012). Climate Justice and Capabilities: A Framework for Adaptation Policy. *Ethics & International Affairs, 26*(4), 445-461. doi: 10.1017/S0892679412000615

Schrock, G., Bassett, E. M., & Green, J. (2015). Pursuing Equity and Justice in a Changing Climate: Assessing Equity in Local Climate and Sustainability Plans in U.S. Cities. *Journal of Planning Education and Research, 35*(3), 282-295. doi: 10.1177/0739456X15580022

Sears, P. B. (1964). Ecology – a subversive subject. *Bioscience, 14*(7), 11-13.

Selvaraju, R., Regmi, K. R., Singh, D. B., Singh, R., Nayava, J. L., Simkhada, U., . . . Rana, N. (2014). Managing climate risks and adapting to climate change in the agriculture sector in Nepal. Rome: Food and Agriculture Organization.

Sen, A. (2009). *The Idea of Justice*. Cambridge, Mass.: Belknap Press of Harvard University Press.

Sharma, B., Nepal, S., Gyawali, D., Pokharel, G. S., Wahid, S. M., Mukherji, A., . . . Shrestha, A. B. (2016). Springs, Storage Towers, and Water Conservation in the Midhills of Nepal *ICIMOD Working Paper*

2016/3. Kathmandu: Nepal Water Conservation Foundation (NWCF), and the International

Centre for Integrated Mountain Development (ICIMOD).

Sherpa, A. R., Ayadi, D. P., & Pradhan, P. (2015). Overview of Climate Change Impact and Adaptation in

Nepal's Himalayas: Climate Alliance of Himalayan Communities.

Shi, L., Chu, E., Anguelovski, I., Aylett, A., Debats, J., Goh, K., . . . VanDeveer, S. D. (2016). Roadmap towards

justice in urban climate adaptation research. *Nature Climate Change, 6*(2), 131-137. doi:

10.1038/nclimate2841

Simmet, H. R. (2020). *In God We Trust: John Rawls and the Objectivity of Liberal Reason*. Paper presented at

the Science and Democracy Network Annual Conference, Cambridge, MA.

Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global Environmental

Change, 16*(3), 282-292. doi: 10.1016/j.gloenvcha.2006.03.008

Sovacool, B. K. (2021). Who are the victims of low-carbon transitions? Towards a political ecology of

climate change mitigation. *Energy Research & Social Science, 73*, 101916. doi:

10.1016/j.erss.2021.101916

Sovacool, B. K., Linnér, B.-O., & Goodsite, M. E. (2015). The political economy of climate adaptation. *Nature

Climate Change, 5*(7), 616-618. doi: 10.1038/nclimate2665

Taylor, P. J., & Buttel, F. H. (1992). How do we know we have global environmental problems? Science and

the globalization of environmental discourse. *Geoforum, 23*(3), 405-416.

Tebble, A. J. (2020). On the circumstances of justice. *European Journal of Political Theory, 19*(1), 3-25. doi:

10.1177/1474885116664191

Thakur, S. B. (2017). Climate change related policy environment in agriculture and food security in Nepal.

Journal of Agriculture and Environment, 18, 120-130.

The Nation. (2019). Climate Literacy In Jumla. *The Nation, 26 December 2019*.

Thomas, K., Hardy, R. D., Lazrus, H., Mendez, M., Orlove, B., Rivera-Collazo, I., . . . Winthrop, R. (2019).

Explaining differential vulnerability to climate change: A social science review. *Wiley

interdisciplinary reviews. Climate change, 10*(2). doi: 10.1002/wcc.565

Thompson, M., & Gyawali, D. (2007). Thirty years of questioning degradation. In M. Thompson, M.

Warburton & T. Hatley (Eds.), *Uncertainty: On a Himalayan Scale* (pp. 1-24). Kathmandu: Himal.

Thompson, M., Warburton, M., & Hatley, T. (1986). *Uncertainty on a Himalayan scale : an institutional theory of environmental perception and a strategic framework for the sustainable development of the Himalaya*: Milton Ash Editions.

Titz, A., Cannon, T., & Krüger, F. (2018). Uncovering 'Community': Challenging an Elusive Concept in Development and Disaster Related Work. *Societies, 8*(3), 71.

Tschakert, P., Barnett, J., Ellis, N., Lawrence, C., Tuana, N., New, M., . . . Pannell, D. (2017). Climate change and loss, as if people mattered: values, places, and experiences. *Wiley interdisciplinary reviews. Climate change, 8*(5), n/a. doi: 10.1002/wcc.476

Tschakert, P., Das, P. J., Shrestha Pradhan, N., Machado, M., Lamadrid, A., Buragohain, M., & Hazarika, M. A. (2016). Micropolitics in collective learning spaces for adaptive decision making. *Global Environmental Change, 40*, 182-194. doi: https://doi.org/10.1016/j.gloenvcha.2016.07.004

Tubridy, F., Lennon, M., & Scott, M. (2022). Managed retreat and coastal climate change adaptation: The environmental justice implications and value of a coproduction approach. *Land Use Policy, 114*, 105960. doi: https://doi.org/10.1016/j.landusepol.2021.105960

Turner, B. L. I., Kasperson, R. E., Meyer, W. B., Dow, K. M., Golding, D., Kasperson, J. X., . . . Ratick, S. J. (1990). Two types of global environmental change: Definitional and spatial scale issues in their human dimensions. *Global Environmental Change, 1*, 14-22. doi: 10.1016/0959-3780(90)90004-S

Watson, V. (2014). Co-production and collaboration in planning - The difference. *Planning Theory & Practice, 15*(1), 62-76. doi: 10.1080/14649357.2013.866266