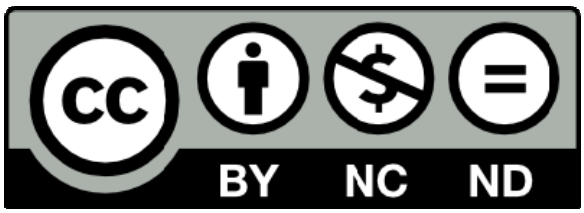

Climate change and deforestation: The evolution of an intersecting policy domain

Marleen Buizer

Centre of Excellence for Climate Change Woodland and Forest Health, Murdoch University, School of Environmental Science, 90 South Street, Murdoch, WA 6150, Australia

David Humphreys

Faculty of Social Sciences, The Open University, UK

Wilde Jong

Center for Integrated Area Studies, Kyoto University, Japan

Abstract

Forests and climate change are increasingly dealt with as interconnected policy issues. Both the potential synergies and policy conflicts between forest conservation and restoration and climate change mitigation now receive sustained and high level attention from academic, policy analysis and practitioner communities across the globe. Arguably the most pronounced contemporary policy manifestation of this is the debate on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (or REDD+) by which governments and private investors from developed countries may compensate actors in tropical forest countries for reducing forest loss beneath an agreed baseline. Problems of climate–forest policies implementation and governance, however, can also be found in countries such as Canada, the USA, the UK and Australia. The future of instruments like REDD+ is uncertain with growing critiques on payment and performance-based mechanisms and unresolved issues of governance, government and accountability. This paper, and the special issue it introduces, illustrates that in the REDD+ debate many contentious issues have resurfaced from past

debates. These issues include the participation and rights of local communities in forest policy and management; the relationship between internationally agreed payment and performance-based programmes and formal democratic decision-making processes and structures; the complexities of rights to carbon versus tenure rights; and the ways in which – in spite of the high expectations of both developing and developed countries to combat carbon emissions from deforestation and forest degradation through the REDD+ mechanism – effective climate-focused forestry policies are seldom found in most tropical forest-rich countries. REDD+ is now very much the dominant discourse at the forest–climate interface, and one with a primary focus on measurability to communicate carbon mitigation results across various levels. However, this serves to disperse and displace, rather than resolve, policy-making on non-carbon values.

Keywords: Climate change; Forest conservation; Forest governance; Mitigation; Adaptation; REDD+

1. Introduction

The problem of anthropogenic climate change, and how human society responds to it, will define the twenty-first century. Central to this challenge is the management of carbon. Carbon is central to our lives: we use it for energy, but in so doing we are changing the atmosphere and reshaping the planetary ecosystem. It is no surprise; therefore, that much of the literature on environmental politics frames climate change as a problem of carbon management. There is an increasing emphasis on the need to decarbonise the global economy (Paterson and Newell, 2010), and to shift from an economy which pumps carbon dioxide into the atmosphere to a ‘new’ economy that removes and sequesters carbon in similar amounts as it produces (Bridge, 2010; Bumpus and Liverman, 2008; Lovell and Liverman, 2010; Mitchell, 2009). Both metaphorically and literally, carbon is the elemental problem of our age.

Forests are integral to any global carbon management and sequestration strategy. They play a major role in global climatic regulation as a sink and reservoir of carbon dioxide, but at the same time climate change will have a direct bearing on global forest cover often resulting in forest species

migrating altitudinally (to higher elevations) and latitudinally (towards the poles). The importance of forests to climate change is reflected by the fact that despite the widespread deforestation of recent decades there is still more carbon in the world's forests than in the atmosphere (IPCC, 2007).

There is, therefore, a growing recognition that forests and climate change need to be treated as interrelated policy domains. However, until recently climate change and deforestation have been dealt with on largely separate international policy tracks (cf. Boyd, 2010). Since 1992 climate change has been handled under the auspices of the UN Framework Convention on Climate Change (UNFCCC). Forests, meanwhile, have been dealt with by a broad range of international public and private institutions. The initial emphasis in the 1980s that deforestation was primarily a tropical problem to be handled by a Tropical Forestry Action Programme driven by United Nations agencies and programmes gave way in the 1990s to an emphasis on national forest programmes, voluntary certification and criteria and indicators for sustainable forest management (Humphreys, 2006). Throughout this period international cooperation on forests has displayed both fragmentation and growing coherence, with actors sometimes cooperating and sometimes competing in what may be seen as a dynamic and evolving international forest regime complex (Rayner et al., 2010).

The Kyoto Protocol of 1997 recognises the importance of forests in climate change mitigation. Under the Kyoto Protocol states agree to the ‘protection and enhancement of sinks and reservoirs of greenhouse gases not controlled by the Montreal Protocol’ and the ‘promotion of sustainable forest management practices, afforestation and reforestation’ (United Nations, 1997, Article 2). The Kyoto Protocol also allows Annex 1 countries to take into account ‘removals by sinks’ when calculating their net carbon dioxide equivalent emissions’ (UNFCCC, 1997, Article 3.7). By recognising a clear political relationship between forests and climate change the Kyoto Protocol redefined international climate and forest politics. Whereas international policy on the two issues had previously been agreed largely in isolation the emphasis increasingly became one of closer policy integration. The clearest manifestation of this is the emergence of REDD+, or Reduction of Emissions from Deforestation and forest Degradation.

This paper summarises recent contributions to the forest–climate debate of which REDD+ is an important part, including 12 papers published as a special issue of *Environmental Science and Policy*. These papers examine how the management of forest carbon to mitigate climate change has repercussions for the futures of communities, land-managers, their practices, the forests and how humans relate to them. Several contributions examine the translations of specific definitions and delineations of forest–climate problems into policies in different parts of the world, including Peru (Evans et al., 2014), Indonesia (Luttrell et al., 2014), Cameroon (Awono et al., 2014; Somorin et al., 2014), Sweden (Kleinschmit and Sjöstedt, 2014), Canada and the United States (Wellstead et al., 2014), and Australia and the United Kingdom (Buizer and Lawrence, 2014). Others are more general and theoretically oriented reflections (Den Besten et al., 2014; Karsenty et al., 2014; McDermott, 2014; Reinecke et al., 2014) or explore a related policy domain to see how it can be instructive to the REDD+ debate (Melo et al., 2014). The theoretical points of departure of the contributions range from environmental economics, multi-level governance, network theory, political ecology, discourse analysis, and media analysis. This paper evaluates the contributions of these papers in relation to the following questions:

(1) What are the defining features of contemporary international forest–climate politics?

(2) How have forest–climate policies been institutionalised across multiple levels of governance?

(3) What key issues of forest–climate politics should be considered a priority in debate and research towards a post-Kyoto Protocol?

It is around these questions that the remainder of this paper is structured.

2. What are the defining features of contemporary international forest–climate politics?

Although the Kyoto Protocol was negotiated in 1997 it was not ratified until 2005. The origins of REDD+ can also be traced to 2005 when the eleventh conference of parties to the UNFCCC agreed a proposal from Costa Rica and Papua New Guinea that developing countries that reduce forest-related

greenhouse gas emissions by reducing their rates of deforestation below a baseline rate should receive financial compensation. REDD+ builds on the idea that conservation of carbon stocks in forests will occur only when the money received for reducing deforestation and forest degradation exceeds the most attractive opportunity cost foregone, for instance income from forest clearance and conversion to agriculture.

In 2007 the Stern Report on the economics of climate change endorsed reducing carbon emissions from deforestation, considering it to be cost-efficient (Stern, 2006: xiii). Initially known as 'avoided deforestation' (AD) the idea then became 'reducing emissions from deforestation' (RED), and was then broadened to include forest degradation (REDD) which was recognised as a significant source of carbon emissions and a precursor to full deforestation (Griffiths, 2007). REDD, which privileged carbon sequestration above other forest goods and services, was further broadened to REDD+ (Pistorius, 2012). This made it possible for slowly deforesting countries to be rewarded for conservation, sustainably managing their forests and enhancement of carbon stocks (Den Besten et al., 2014; McDermott, 2014). REDD+ safeguards added poverty alleviation and an environmental dimension, denoting that forests provide a range of public and private goods in addition to carbon sequestration.

REDD+ represents a fusion of climate politics and forest politics and as such a new form of environmental politics. REDD+ brings together the form of governance that had evolved under the UNFCCC, namely a strong science–politics interface, regular intergovernmental meetings and a market-oriented focus on carbon trading, with generally accepted principles of forest governance, namely the involvement of local communities and indigenous peoples, the voluntary participation of businesses and an emphasis on sustainable forest management.

An awareness of both government (a collection of ministries and state agencies in a political system) and governance (the broader set of processes that shape behaviour and practices to address shared problems involving governmental bodies, intergovernmental organisations, non-governmental and community-based organisations, business corporations and scientific bodies) is necessary to understand the evolution of forest–climate politics. The special issue which this paper introduces, has

contributions focusing on both the government and governance dimensions of forest–climate politics. Governmental capacity to implement and enforce effective forest conservation projects has not been sufficiently addressed, for instance, in the REDD+ debate (Skutsch and McCall, 2010: 396). This is the case not only with developing countries (Awono et al., 2014; Evans et al., 2014; Luttrell et al., 2014; Somorin et al., 2014), but also North American (e.g. Wellstead et al., 2014) and European countries (Kleinschmit and Sjöstedt, 2014). REDD+ and forest–climate policies in developed countries share a strong reliance on the production of scientific data, something that has become important with the Intergovernmental Panel on Climate Change (IPCC) and is also apparent with regard to the newly established IPBES (International Panel on Biodiversity and Ecosystem Services) (Turnhout et al., 2013). This partly explains why broader governance concerns have received less attention, as demonstrated in the US and Canada (Wellstead et al., 2014).

Important questions are, how will governments interact with others actors, how should climate change policy and forest policy intersect, and what will the associated new practices and institutions mean for the governance of forests? Governance, we emphasise, does not imply that consent to governing rules and processes is harmoniously or freely given (Paterson et al., 2003). Several of the papers summarised here reveal considerable contention between different actors over the values and ideologies that shape atmospheric carbon emission reduction policies, in particular whether compensation should come from international public finance or via market mechanisms. These contentions have contributed to a stalemate in the global debate on measures to curb climate change.

REDD+ essentially integrates forest policy into climate policy. At the national level the aim with regard to a future global REDD+ policy is to integrate internationally agreed rules and principles into national programmes while at the local level the intention is to integrate cultural concerns into REDD+ projects. These various integrative processes are inherently value laden and thus contested. From the outset REDD+ has been a controversial form of environmental governance that represents a specific problem definition and a proposed solution, including the desired instruments to achieve this solution (Thompson et al., 2011). The process of integration can be seen as a subjective development in which the assumptions of REDD+ – in particular the primacy of the carbon storage role of forests

and the emphasis, in many cases, on carbon markets – act to steer the national policies of REDD+ host governments in a direction that not all national level policy makers and local communities believe is desirable. In particular, there is significant local resistance to many REDD+ projects (e.g. Awono et al., 2014; Luttrell et al., 2014). Internationally agreed rules never 'arrive' intact in a geographical space. They invariably 'collide' with local cultures and traditions and are mediated through local political institutions and socio-economic systems. This can lead to misunderstandings and conflicts, as the case studies on Peru (Evans et al., 2014), Indonesia (Luttrell et al., 2014) and Cameroon (Awono et al., 2014) make clear.

While the first reactions to the Costa Rica and Papua New Guinea proposal to compensate developing countries for avoiding deforestation or reducing forest degradation were generally positive (Angelsen et al., 2009; see also Skutsch and McCall, 2010) reservations have since been voiced. One criticism emerging from the papers reviewed here is that REDD+ represents a narrowing of how forests are imagined and represented, with calculable and tradable forest values prioritised over those that are more qualitative (Buizer and Lawrence, 2014; Evans et al., 2014; McDermott, 2014; Melo et al., 2014; see also Boyd, 2010). The emphasis on measuring carbon echoes what Agrawal (2005) and Scott (1998) see as the primacy of forest values that are tradable and subject to government or business control. Where this happens, some forest values, such as timber yields, are translated into commensurable units that steer forest management practices towards a specific instrumentality that favours governing elites. The notion of ecosystem services may also be seen in a similar light (Robertson, 2012).

A second criticism centres on 'offsets', when one actor is permitted to emit carbon dioxide equivalent to an emission reduction or carbon sequestration credit from another actor. The idea of offsets predates REDD+. In international forest carbon politics the exchangeability of carbon sequestered in forests for carbon emitted by other sectors may take place as national carbon accounting and as carbon trade between countries. First, under UNFCCC carbon accounting rules, countries can count carbon sequestered by their land use, land use change and forestry (or LULUCF) activities towards emissions reductions in other sectors, such as energy. This has been particularly useful in helping

some large Annex 1 emitters with substantial forest cover to reduce their reported greenhouse gas emissions (Lövbrand and Stripple, 2011). However, such offsets have been criticised for avoiding emissions reductions from the fossil fuel sector, for failing to achieve a permanent reduction of atmospheric carbon dioxide, for being difficult to measure or attribute to human activities and for generating windfall credits (Macintosh, 2012). Second, low polluting countries can sell their own emissions to other high polluting countries. Again, the criticism is that this is merely an accounting procedure that does not incentivise permanent reductions in carbon dioxide emissions.

Under the Kyoto Protocol, developed countries may use reforestation or afforestation activities in other countries to compensate for carbon emissions by means of market-based flexibility mechanisms (Emissions Trading, Joint Implementation and the Clean Development Mechanism). These mechanisms aim to achieve emission reductions in cost-efficient ways, but they have rarely been implemented which is jeopardising the future of these mechanisms. Moreover, they generate similar risks to LULUCF (lack of permanency, windfall credits and difficulties of measurement), offset only the emissions of developed countries, and bring about emissions reductions only from the energy sector without contributing to sustainable development. Also there is an unequal distribution of CDM projects between countries and sectors (see Bakker et al., 2011 for an overview of critiques).

The Kyoto Protocol's flexibility mechanisms have been criticised for promoting a neoliberal logic of market efficiency and endorsing the contestable idea that nature can be saved by selling it (McAfee, 1999), a criticism also made of REDD+ (Melo et al., 2014). The argument in favour of payments for ecosystem services (PES) is that if environmental services are not valued economically (i.e. paid for) they will not be conserved. On this view forests are at risk of clearance for more lucrative alternative land uses unless financially valued, and paying forest owners will thus result in their long-term management and conservation. Therefore, the idea of compensating an actor for reducing forest–related carbon emissions through public REDD+ finance is relatively uncontroversial.

Viewing nature as a limited number of payable services, however, potentially puts pressure on environmental goods and services that cannot easily be quantified or converted into monetary value (Robertson, 2006; Turnhout et al., 2013). This means that although the intention of PES is to value

multiple benefits, a narrowing of appreciation for only those values that are suited for such conversion may occur, with other values marginalised or excluded.

More controversial and debated is the view that carbon emissions avoided through REDD+ should be used as a basis to create carbon credits which can be sold on the international offset market to high polluting countries that may exceed any internationally agreed emissions targets. While, in theory, an international market in offsets may be effective in raising revenue, it would be environmentally ineffective if carbon sequestered in one space is negated by carbon emissions in another space. The notion that forest carbon storage in one place can be exchanged for carbon released elsewhere, however, has often been presented as simply a technical challenge requiring effective institutional design and the accurate measurement of carbon stocks, rather than as an ethical issue. While some argue that the potential for the Kyoto mechanisms and the REDD+ mechanism to achieve climate mitigation is high, especially when they simultaneously promote human development, others question whether this is possible (Boyd and Goodman, 2011). The possible place of REDD+ in any international carbon offsets market is thus likely to see strong disagreements.

Critical voices (e.g. Levin et al., 2008; Phelps et al., 2010, 2012), argue that REDD+ jeopardises the trend towards decentralised forest management and may lead to evictions of local users because of substantial incentives for forest carbon storage, (Phelps et al., 2010). Critics point out the difficulties of converting other forest values such as biodiversity into monetary values and that, in spite of the win-win rhetoric of REDD+, there will be unavoidable trade-offs. The trade-offs and incompatibilities between envisioned co-benefits are often not easily visible. In policy discourses, like the Climate Community and Biodiversity (CCB) certification scheme, participation and poverty-alleviation are endorsed but technocratization and marketisation overshadow social justice and equity (Melo et al., 2014).

The inclusion of so-called environmental and social safeguards into REDD+ is intended to ensure that all forest values are conserved, but the subsequent relegation of these safeguards to an appendix suggests their undervaluation, with carbon remaining the main priority (McDermott, 2014; Visseren-

Hamakers et al., 2012). It is therefore crucial to highlight the associated unresolved issues, which is the topic of Section 4 of this paper.

However, despite the criticisms, REDD+ is seen as a way out of the post-Kyoto Protocol stalemate on forests for two reasons. First, it has been framed as attractive for both developed and developing nations, a win-win-win solution of conserving forests, fighting climate change and alleviating poverty. Second, the provision of financial incentives not only to governments but also to other actors, avoids the national sovereignty concerns of past forest conservation initiatives that were criticised for imposing policy conditions on forested countries (Humphreys, 2006; Karsenty and Ongolo, 2012). In fact, since its first proposal in 2005, REDD+ has increasingly been seen as one of the components for a comprehensive global agreement on addressing climate change. In the climate debate the progress made on REDD+ since 2005, in spite of many unresolved aspects, contrasts starkly with the lack of agreement at many UNFCCC conferences of parties since the agreement of the Kyoto Protocol in 1997 (Bluffstone et al., 2013). The IPCC's (2007) estimate that approximately 17% of greenhouse gas emissions are caused by deforestation and forest degradation – predominantly in tropical forest countries such as Brazil, the Congo Basin and Southeast Asia, in particular Indonesia (Luttrell et al., 2014) – has led to the new international action to reduce carbon dioxide emissions from these countries in order to tackle climate change.

The future of REDD+ will depend not only on the policies that it seeks to promote but also on the institutional arrangements that govern it. It is to this that attention now turns.

3. How have forest–climate policies been institutionalised across multiple levels of governance?

This section will first discuss the institutionalisation of REDD+ and its central position in debates about a post-Kyoto agreement. It then discusses policies with regard to temperate and boreal forests. Importantly, these forests may become significant sources of atmospheric carbon, for example because of an increase of wildfires (Malhi et al., 1999). This will be addressed in the second part of this section. First, however, attention turns to debates on how REDD+ should be institutionalised.

3.1. The institutionalisation of REDD+: progress and pitfalls

The UNFCCC has endorsed the concept of REDD, although outside the UN, REDD+ has since emerged as the preferred designation. The UN-REDD Programme is implemented by the UN Food and Agriculture Organisation (FAO), the United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP) while the World Bank implements its Forest Carbon Partnership Facility (FCPF) which is based on the same principles. REDD+ is thus influenced by the governing principles of these organisations which have shaped the country level capacity building schemes for implementing REDD+, the so called 'REDD Readiness' programmes. While the UNFCCC is now negotiating over REDD, there is currently no international legal framework that endorses it, although that would change should a post-Kyoto Protocol be agreed which encompasses emissions from forests. In short, the long term institutional arrangements for REDD+ governance remain unclear. Formal international rules are likely to be agreed under the UNFCCC process. However, as argued above, REDD+ is a dynamic and emerging form of governance and other rules are almost certain to emerge through negotiations between other actors, such as the donor community, environmental NGOs and indigenous peoples. These rules will vary from country to country. They will not emerge from a political vacuum, but will be shaped in part by previous policy negotiations in relevant policy domains such as forest conservation and energy.

Forest conservation has been a longstanding political issue in international negotiations. Although conventions on biodiversity and desertification were adopted in 1992 and 1994 respectively, despite many years of global attention no legally binding convention has been agreed to regulate the conservation and use of forests, although non-legally binding outputs have been agreed (for example, by the United Nations Forum on Forests) and voluntary certification schemes such as the Forest Stewardship Council (FSC) have been established (Humphreys, 2006). Attempts to solve the problem of global deforestation have failed because deforestation is not "a unitary phenomenon being amenable to easy generalisation, much less global governance" (Boyd, 2010: 866). However, rules generated from other international institutions, such as the UN-REDD Programme and other organisations, help to shape REDD+ at local levels (Awono et al., 2014; Evans et al., 2014; Luttrell et

al., 2014; Somorin et al., 2014). In addition to the rules devised by UNFCCC, the FCPF and the UN-REDD Programme they include the principle of free, prior and informed consent for indigenous peoples, contained within the ILO Convention 169 and the UN Declaration on the Rights of Indigenous Peoples and the principle of benefit-sharing of the Convention on Biological Diversity (CBD). The CBD notion of benefit-sharing implies that indigenous peoples should receive a share of the financial benefits that agricultural and pharmaceutical corporations obtain from patents based on indigenous and traditional forest-related knowledge. The principle is now being invoked to assert that local communities and indigenous peoples should receive a share of the money that governments receive from REDD+ projects on their lands (IUCN, 2009). However there has so far been little consensus on a regulatory framework for safeguards and the sharing of benefits.

The lack of agreement on these issues has not prevented REDD+ projects and policies from emerging, though the emphasis has shifted towards voluntarism (e.g. Reinecke et al., 2014). The REDD+ Partnership (a voluntary and non-legally binding partnership, not to be confused with the UN-REDD Programme) which is subordinate and subsequent to the UNFCCC negotiations, has entered the REDD+ institutional landscape. Its interactive relationship with the UNFCCC can be characterised as a simultaneously cooperative and competitive form of governing in networks (Reinecke et al., 2014). An intergovernmental initiative and a polycentric, participatory partnership have thus shaped each other. The relatively open way the partnership has operated and its setting of “role models” tailored to the specific conditions in specific countries, has enabled it to influence the formal UNFCCC negotiations. Therefore, in the absence of a post-Kyoto Protocol agreement under the UNFCCC, the REDD+ Partnership may possibly survive as a “voluntary refuge fort for REDD+ at the global level” (Reinecke et al., 2014, 9).

An alternative view of the institutionalisation of REDD+ is as a discursive-institutional spiral (Den Besten et al., 2014). In spite of a struggle over definitions and the scope of REDD+ among a growing network of governments, international organisations and NGOs, the institutionalisation of REDD+ has been surprisingly rapid. This has invoked criticism particularly for its focus on carbon and technocratic solutions and its lack of power to tackle the drivers of deforestation. This criticism has,

so to speak, ‘spiralled’ into a new phase of debate and institutionalisation, culminating in the formation of a framework that, in response to raised concerns about its ability to address the causes of deforestation, has included social and environmental safeguards (Den Besten et al., 2014), albeit in an appendix rather than in the core texts of the policy.

The relatively participatory character of the UN-REDD Programme, the interactions of the rather informal REDD+ Partnership with the formal UNFCCC process (Reinecke et al., 2014), and the rapid discursive/institutional evolution of REDD+ (Den Besten et al., 2014) contrasts starkly with the lack of participation of some important relevant stakeholders and the unequivocal national ownership of REDD+ for instance in Indonesia (Luttrell et al., 2014), Cameroon (Awono et al., 2014; Somorin et al., 2014) and Peru (Evans et al., 2014). In Indonesia, in spite of presidential support, and in the absence of an absolute majority of the president's party in parliament, support for reforms required to implement REDD+ is dependent on a coalition of political parties. In fact, there is little that is simple in the political dynamic behind REDD+ in Indonesia (Luttrell et al., 2014). Politicians are often dependent on resource extraction (including timber) to fund their election campaigns; global interventions to set conditions on forests use are perceived and communicated as restrictions on national sovereignty, particularly by a politically engaged business sector; NGOs are divided about the applicability of policies based on performance-based payments in the Indonesian context, in which factors other than performance, such as patron-client relationships, are equally if not more influential. Furthermore, because corruption is a problem in the bureaucracy there is little pressure for reform from public officials, or incentives for debates about whether and how REDD+ would fit in the Indonesian political economy. Finally, because there is a limited awareness of citizens’ rights and responsibilities, this kind of pressure is unlikely to come from members of the public either. REDD+’s focus on rapid results and performance-based payments, Luttrell et al. (2014) argue, risks putting under pressure the slower, more fundamental reforms that are needed for forest conservation (see also Somorin et al., 2014).

From a historical global forest governance perspective, developments since the early 1980s explain why agreement on forest conservation has been difficult to realise (McDermott, 2014). From a broad

focus on sustainable forest management (SFM) in the 1980s and early-1990s, attention narrowed in the late-1990s and early-2000s, when illegal logging became a focus of attention. Critically, negotiations about SFM and attempts to embed its principles in a legally binding agreement foundered because of three key sticking points (McDermott, 2014). First, there was no agreement on how developing countries would be compensated for not being able to use their forests to develop their economies as developed economies had previously done. Second, some countries felt that a legally binding agreement would limit their sovereignty. Third, there were concerns by non-governmental organisations that a legally binding agreement would favour timber production to the detriment of other interests (see also Humphreys, 2006). Meanwhile many non-binding international efforts to address forest loss were frustrated by the variability of driving forces behind deforestation and limited governance capacities at the national and subnational levels (Boyd, 2010). Despite these problems REDD+ appeared to offer the prospect of reducing deforestation in tropical forested countries, mainly because it promised to integrate compensatory payments into policy.

3.2. Linking adaptation to mitigation

REDD+ is not the only instrument that connects forests and climate change. It is receiving the most attention in the relevant policy-oriented academic literature because of its potential role in a post-Kyoto climate policy, but there are increasing problems of adaptation to climate change in forests and landscapes worldwide, although these problems vary and differ in intensity. Drought and related fires, storms and intense weather events, and the migration of invasive species, pests and pathogens are among the changes that may turn forests from a sink into a source of carbon dioxide (Seppälä et al., 2009). The adaptation of forests to climate change is thus critical to preventing more drastic mitigation measures. A changing climate is already altering the geographic boundaries of species distributions (Parmesan, 2006), posing challenges to policies focused on the designation of protected areas. These novel problems require forest–climate policies that can respond flexibly to new realities. However, a study of national forest programmes has demonstrated that mitigation is still a higher priority than adaptation and there are few signs of pro-active adaptation policies (Keskitalo, 2011). Too much focus on REDD+ and mitigation will undervalue the critical relationship with adaptation

(Seppälä et al., 2009). Adaptation by its necessary focus on specific localities and concrete outcomes could benefit from and encourage collaborative governance. However, the opposite seems to happen at present, with more emphasis on mitigation with its focus on centralised data gathering and a strong science policy interface to facilitate steering from a distance.

National forest programmes are a key instrument for providing policies that incorporate sustainable forest management, including adaptation measures. By 2013 130 countries had reported the existence of a national forest programme (FAO, 2013). However national forest programmes are often too general or too reactive (Seppälä et al., 2009), or they focus too much on the technical dimension of adaptation and too little on its governance (Wellstead et al., 2014).

In sum, connecting forests to climate change through REDD+ and its rapid institutionalisation has been considered a promising step from the perspective of climate negotiations which in many respects appear to have stalled. However, in spite of attempts to build safeguards into the REDD+ infrastructure, it is still the question whether REDD+ will solve some of the fundamental issues that have, for many years, stood in the way of effective forest conservation policy, and that have caused deforestation to continue. Moreover, there is a risk that attention is being diverted away from the need to formulate specific adaptation programmes for forests across the world. We identify four fundamental issues that require attention. They are the topic of the next section.

4. What key issues of forest–climate politics should be considered a priority in debate and research towards a post-Kyoto Protocol?

Although the problems associated with forests and climate change are myriad, we have derived four issues from our review and particularly from the papers of this special issue, which should be prioritised for research and debate on a future forest–climate regime. It is beyond the scope of this paper to scrutinise the attention going to fossil fuel emissions as a factor behind global warming vis-à-vis the role of forests, but it is important to note that fossil fuel emissions are still increasing, and efforts to reduce these emissions should constitute the greater part of any action on climate change.

However, in the domain of forest–climate politics we consider four partially overlapping issues as critical for future policy development: (1) The focus on carbon and the associated growing demand for legibility of forest carbon is at odds with the more holistic policy needed to address the myriad of other problems associated both with forests and with climate change. (2) There are still significant implementation problems connected to the different forest–climate policy scenarios – such as non-permanence, leakage, strategic setting of baselines and corruption – which are jeopardising their effectiveness. (3) Land rights and carbon rights issues remain unresolved and the emergence of REDD+ may undermine secure tenure rights, may not benefit forest dependent communities and could divide them further. (4) There are tensions between global policies on deforestation and climate change, and the intensive kinds of local participation required in order to take the context-specific types of action that different communities want.

4.1. The focus on carbon and the related growing demand for legibility

Mechanisms such as the CDM and REDD+, and the UNFCCC require for their reporting requirements a language that universally facilitates the transportation of data on global carbon stocks across different levels of governance, so that performance targets can be set and results measured to enhance global legibility (Buizer and Lawrence, 2014; McDermott, 2014). The orientation towards calculability that comes with this carbon focused view is, of course, not new for the forestry profession, which has a long history of centralised control for the achievement of timber production targets. The newly established link between forest policy and climate change, however, presents a problem of legibility at an unprecedented scale potentially encompassing the entire forest estate of the developing world. At this scale, the universal languages for the transportation of data severely limit the communication of local cultural differences, conflicts and value orientations.

When adopting a broader perspective than pure carbon sequestration, such as is required when searching for ways to adapt to climate change, the language required is to an extent location-specific, personal and mutable (Awono et al., 2014; Evans et al., 2014). It is difficult to translate adaptation into numerical values because future climate change is uncertain, and so therefore is the extent of the adaptation that will be necessary. The language of numbers, however, is relatively static when it is

used to transport data across levels (Buizer and Lawrence, 2014). Therefore the quantifiability of carbon favours mitigation. In other words, because carbon mitigation is easier to quantify than the dynamically changing composition of values involved with adaptation, data about carbon mitigation travel more easily across levels and sectors. This jeopardises the perhaps more elusive, yet broader approach of sustainable and adaptive forest management (Buizer and Lawrence, 2014).

There are significant advances in the measurement and reporting of greenhouse gas data and increasing global control with respect to this element of forest governance. However, this form of legibility has consequences because the focus may become directed towards those elements that are more easily measured and reported (carbon, in this case) and attention for elements that are more difficult to measure and capture into fixed data may decrease. Where there are trade-offs, these may not be readily visible. At the global level, these trade-offs may not become manifest because subjects not incorporated within mainstream data collection, reporting and policy objectives can be displaced to other networks of actors. But at the local level, in the absence of possibilities for such reconciliation, the trade-offs are more likely to be felt. Indeed, and as McDermott (2014, page 2) suggests, "… the narrower and more globally legible the focus of global forest governance the greater the potential for displacement and fragmentation". This risk is at odds with the ideal of win-win-win outcomes that are often promised in the context of REDD+.

2. Implementation problems and the effectiveness of forest–climate policies

In spite of the initially high expectations with regard to CDM, and subsequent hopes that REDD+ would advance future international agreement on tackling climate change, the growing importance of carbon in forest policy has given rise to four reservations that have resurfaced since the inclusion of afforestation and reforestation in the Clean Development Mechanism (Karsenty et al., 2014). First, there is the risk of 'non-permanence', which occurs, for example, when a country receives payments for conserving an area of forests that it later clears or burns. Second, the reduction of carbon emissions in one place may displace deforestation and degradation to other places, a phenomenon known as leakage. There is a possibility that the project-based approach that has so far been most common for the implementation of REDD+ may create situations where achievements are made at the

project level, but deforestation continues across the country as a whole (Karsenty et al., 2014). Third, although forest management guidelines in developing countries are often as strict as those in developed nations (Kanowski et al., 2011), corrupt governance practices may hamper the elimination of unsustainable forest practices (Luttrell et al., 2014), or hamper trustworthy measurements and data collection (cf. Corbera and Schroeder, 2011). Finally, there is the risk that the setting of baselines will largely be a political act rather than one based on verified measurements of deforestation and forest degradation. Countries may set baselines that overestimate their historical rate of deforestation, so that it is later possible to claim more avoided deforestation than has actually taken place. Although this is a fear that is often expressed in the context of REDD implementation in developing countries, Annex 1 countries have also sought to negotiate favourable baselines in order to achieve their carbon dioxide reduction targets. A country might do only very little to conserve its forests and still 'count' them as contributing to their climate policy goals (e.g. Buizer and Lawrence, 2014).

Karsenty et al. (2014) underline the importance of implementing REDD at national levels rather than project levels in order to prevent the problem of leakage of carbon emissions from one REDD-supported location to another. However, they note that project level implementation, notwithstanding the risks of leakage, is now common practice. This renders a situation in which carbon emissions may be reduced in some individual projects while forestry related emissions of the country as a whole increase. However implementing REDD at national level cannot prevent leakage between countries.

There are other risks. Importantly, the carbon price that is set through carbon markets, or the rate agreed in a carbon fund, needs to be high enough to at least cover opportunity and transaction costs. However, opportunity costs may be high particularly when there is significant pressure to convert forested land into agriculture. For example, if the money that forest owners can earn from clearing their forests and planting oil palms exceeds what can be earned from REDD+ then the rational forest owners will forgo REDD+ income and convert their forest to oil palm plantations. In a market-situation, it is not possible to guarantee a carbon price that will exceed the best available opportunity cost foregone. If the market does not provide sufficient income to prevent deforestation then a mechanism is needed to make up the shortfall. The only obvious mechanism is international public

finance, provided that there is sufficient political will to provide the shortfall of financial resources (Karsenty et al., 2014).

Examples like Australia demonstrate how the politics of setting an opportunistic baseline-year may work. At the last minute, the country negotiated the so-called “Australia-clause” (article 3.7) into the Kyoto Protocol which then became applicable for all Annex 1 countries. Article 3.7 allowed these countries to incorporate greenhouse gas emissions from land use change in the 1990 baseline year. For Australia, 1990 followed a period of large-scale forest clearance. Politicians knew at the time that deforestation would continue to be limited compared with pre-1990 years. Setting this baseline meant that the country could achieve its CO2 reduction targets by relying on reduction of forest clearing, and therefore avoids having to significantly reduce emissions in its energy intensive sectors (Buizer and Lawrence, 2014). However, countries that have traditionally conserved their forests and are unlikely to become the object of large-scale agricultural development may not be able to obtain similar rents as those countries that forecast high deforestation rates. The latter countries may strategically estimate their future deforestation rate to be higher than they would have without the financial mechanism (the business as usual scenario).

The adaptation policies in the United States and Canada suggest that there is ample attention to the biophysical dimension of adaptation challenges such as responding to drought, diseases and wildfire, and too little emphasis on matters relating to governance, particularly the relationship between state and society and the address of individual behaviours (Wellstead et al., 2014).

4.3. Land rights, carbon rights and equitable sharing of benefits

Property rights over forests and forestlands have been a contentious issue since forests and forestry became part of the international sustainable development and biodiversity conservation agenda. European colonial powers had claimed forest territories as state property, largely ignoring the rights of customary owners, and the governments of many independent post-colonial states have shown little intention of reversing this (Potter Lesley, 2003). Successful efforts to correct this historical injustice since the 1990s may now be undone because some states may be less interested in initiating or

continuing land titling programmes that legally transfer forestland ownership rights to indigenous groups or other long term residents when tropical forests and their carbon stocks may give states a greater interest to keep these forests as state property (Karsenty et al., 2014; Levin et al., 2008; Phelps et al., 2010, 2012). Property rights have both political and economic importance as they define not only the benefits that can be withdrawn but also how actors engage in political debates (Sikor and Lund, 2009). Complex arrangements on forests that involve local forest dwellers and non-local parties demonstrate that clarification of property rights is essential without which carbon schemes are unlikely to work. In that sense, the emergence of forest carbon as an internationally valued asset and tradable commodity has only increased the need to clarify land and forest property rights (Awono et al., 2014; Evans et al., 2014).

The shifting of forests into the climate change mitigation debate has caused a new claim over carbon rights, especially (but not only) for REDD+ projects. Karsenty et al. (2014) argue that framing the issue in terms of *carbon rights* will provide a rational basis for claiming ownership right over the carbon stocks held in forests. The landlord can hope to become a carbon "rentier". A carbon right assigned to an initial owner can then be traded and transferred, perhaps to a carbon investor. This may increase the competition over forestlands and forests, which is detrimental to the transfer of property rights to resident populations who claim customary rights over territories and the forests they maintain (Karsenty et al., 2014).

However, framing the issue in terms of *carbon credits* means that land ownership becomes secondary: carbon credits do not pre-exist REDD; they come into being only through a number of trials that should be undertaken by REDD+ projects, such as carbon measurement, establishment of a baseline scenario, leakage assessment, MRV provisions, safeguards implementation, third-party evaluation of performance and certification. In the current situation, these trials would come under a private governance system that has filled the gap left by the uncompleted UNFCCC negotiation process over REDD+ (Karsenty et al., 2014). The project promoter, rather than the landowner, is therefore in a position to claim ownership over those credits. A subsequent issue is about the right to benefit from the sale of carbon credits, even if there is no question about the ownership of carbon credits. If there

remain revenues to share after costs have been covered, it becomes then an issue of equitable sharing of benefits, rather than a legal issue over carbon ownership.

Property rights over forests and carbon, therefore, touch directly on the issues of equity and benefit sharing. Different possible property rights arrangements have different implications for who will capture REDD+ payments. The current reality is that in many locations where REDD+ is being considered, multiple parties, including national, regional and local governments, economic entrepreneurs and resident communities, are in competition for prospective REDD+ benefits (Evans et al., 2014). Even at the very local level, different competing groups may claim such benefits based on competing customary claims (Awono et al., 2014).

4.4. Tensions between global policies and participation

The relocation of forests into global climate change mitigation policy has invigorated the forestry debate at international forums (Den Besten et al., 2014; McDermott, 2014). An important issue is who participates in this debate and how. International organisations involved with REDD+ are adapting to the claim for a voice by civil society and entrepreneurial sectors (e.g. Reinecke et al., 2014). However, the UNFCCC does not yet provide the same provisions for participation of stakeholders as, for instance, the CBD. The formal UNFCCC meetings are limited to registered participants only, while the CBD makes conscious efforts to engage civil society and NGOs into its work and implementation. Countries that have an interest in participating in the REDD+ programme usually implement a national strategy similar to a national forestry programme, and it is there where adequate participation of all sectors that have a stake needs to be guaranteed (Evans et al., 2014).

The repositioning of forests into the climate change debate is reproducing the struggle of representation in natural resource political decision making that has marred countries like Indonesia (Luttrell et al., 2014), Peru (Evans et al., 2014) and Cameroon (Awono et al., 2014; Somorin et al., 2014) for decades. The interests at stake and the actors involved have also changed. But whether this revival of old political struggles will move the decision making process towards more democratic processes is a question that still awaits an answer (e.g. AIDESEP, 2011).

5. Conclusion

In Durban in December 2011, UNFCCC parties agreed that a new binding climate protocol should be negotiated by 2015, and REDD+ is expected to be a crucial element of this agreement. Opinions on this result are mixed, ranging from optimism about the possibility that a legally-binding REDD+ mechanism might create a joint responsibility between developing and developed countries for emissions reductions, to serious concerns about the lack of reduction commitments on the part of the developed world, and the prognosis of a low carbon price that will be insufficient to stimulate a market-based REDD+ mechanism. Regardless of this risk, this paper suggests that a fixation on carbon payments and the design of financial mechanisms related solely to performance measurement may actually work against effective action in the long run by deflecting attention from, and therefore keeping unresolved, many of the issues that have caused impasses in earlier negotiations about forest governance, such as customary land rights and benefit sharing. The concept of safeguards has introduced these issues to the REDD+ debate, but placing the issues in an appendix, rather than making them into prerequisites, risks displacing them to the margins of the debate (McDermott, 2014; Karsenty et al., 2014; Visseren-Hamakers et al., 2012). The gradual addition of safeguards has not prevented REDD+ from prioritising one forest service – carbon sequestration – over all others.

A focus on forests as carbon reservoirs and sinks also deflects attention from the scientific uncertainties surrounding forest-related biophysical processes. The absorption of carbon dioxide by forests promotes tree growth and slows atmospheric warming. At the same time, for many species, already having to cope with various stressors, photosynthesis will become more difficult as temperatures increase and enzyme molecules start to break down. While global warming may initially increase the carbon absorption capacity of forests, above a certain temperature threshold, which varies between ecosystems and species, forests will leach carbon dioxide back into the atmosphere (Melillo et al., 2011). An increase in the global temperature will also exacerbate the risk of forest fires, releasing additional atmospheric carbon. The influence of extra warming on forests is receiving much less international attention and, as with the issue of acid rain of the 1970s, arises mostly in national debates. The political problem of deforestation is also contention between different actors over the

various public goods that forests provide. A forest valued solely for its carbon stock, for instance, would be managed very differently to one valued for its biodiversity, its watershed services or its cultural values.

Political conflicts over forests have been and continue to be the product of different, apparently irreconcilable, expectations and claims from different actors over the various public and private goods and benefits that forests provide. Contention is played out at different spatial levels, from the local to global. Ongoing efforts to resolve problems related to forest–climate policies preceded negotiations about REDD+ and other measures to curb greenhouse gasses. However, REDD+ threatens to displace progress by a focus on measurability that is overly focused on carbon stocks. This needs to be balanced by attention to other equally important forest values, which are in danger of being subjugated by the narrow focus on the climate-change mitigation role of forests.

Acknowledgements

We would like to thank Connie McDermott, Jeremy Rayner, Till Pistorius, and Alain Karsenty for their valuable comments on earlier versions of the paper. Some of the preparations of this paper and the special issue of which it is part were supported by the Japan Society for the Promotion of Science (JSPS) Grant-in-aid for Scientific Research: Transnational Natural Resource Governance in Borderlands.

References

Agrawal, A., 2005. Environmentality: Technologies of Government and the Making of Subjects. Duke University Press, Durham and London.

AIDESEP, 2011. Analisis y Propuestas Indigenas Sobre el RPP (3a version) del REDD Peru. (accessed 28.11.12)http://www.reddmonitor.org/wordpress/wp- content/uploads/2011/03/ Analisis-AIDESEP-sobre-RPP3-Per%C3%BA-21.2.2011.pdf.

Angelsen, A., Brockhaus, M., Kanninen, M., Sills, E., Sunderlin, W.D.,Wertz-Kanounnikoff, S. (Eds.), 2009. Realising REDD+; National strategy and policy options. CIFOR, Bogor, Indonesia.

Awono, A., Somorin, O.A., Eba'a Atyi, R., Levang, P., 2014. Tenure and participation in local REDD+ projects: insights from southern Cameroon. Environmental Science and Policy 35, 76–86.

Bakker, S., Haug, C., Van Asselt, H., Gupta, J., Saidi, R., 2011. The future of the CDM: Same same, but differentiated? Climate Policy 11, 752–767.

Bluffstone, R., Robinson, E., Guthiga, P., 2013. REDD+ and community-controlled forests in low-income countries: any hope for a linkage? Ecological Economics 87, 43–52.

Boyd, E., Goodman, M.K., 2011. The Clean Development Mechanism as ethical development? Reconciling emissions trading and local development. Journal of International Development 23, 836–854.

Boyd, W., 2010. Ways of seeing in environmental law: how deforestation became an object of climate governance. Ecology Law Quarterly 37, 843–916.

Bridge, G., 2010. Resource geographies 1: making carbon economies, old and new. Progress in Human Geography 35 (6) 820–834.

Buizer, M., Lawrence, A., 2014. Numbers in forest and climate change policies in Australia and the UK. Environmental Science and Policy 35, 57–66.

Bumpus, A., Liverman, D., 2008. Accumulation by decarbonisation and the governance of carbon offsets. Economic Geography 84, 127–155.

Corbera, E., Schroeder, H., 2011. Governing and implementing REDD+. Environmental Science and Policy 14, 89–99.

Den Besten, J.W., Arts, B., Verkooijen, P., 2014. The evolution of REDD+: an analysis of discursive institutional dynamics. Environmental Science and Policy 35, 40–48.

Evans, K., Murphy, L., de Jong, W., 2014. Global versus local narratives of REDD: a case study from Peru's Amazon. Environmental Science and Policy 35, 98–108.

Food and Agriculture Organization, . National Forest Programme. last updated 16 January 2013 (accessed 9.04.2013)http://www.fao.org/forestry/nfp/en/.

Griffiths, T., 2007. Seeing ''RED''? ''Avoided deforestation'' and the rights of Indigenous Peoples and local communities. Forest Peoples Programme, London, UK.

Humphreys, D., 2006. Logjam: Deforestation and the crisis of global governance. Earthscan, London.

IPCC, 2007. In: Core Writing Team, Pachauri, R.K., Reisinger, A. (Eds.), Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC, Geneva, Switzerland.

IUCN, 2009. REDD-plus and Benefit-sharing: Experiences in Forest Conservation and Other Resource Management Sectors. IUCN, Washington DC.

Kanowski, P.J., McDermott, C.L., Cashore, B.W., 2011. Implementing REDD+: lessons from analysis of forest governance. Environmental Science and Policy 14, 111–117.

Karsenty, A., Ongolo, S., 2012. Can ‘‘fragile states’’ decide to reduce their deforestation? The inappropriate use of the theory of incentives with respect to the REDD mechanism. Forest Policy and Economics 18, 38–45.

Karsenty, A., Vogel, A., Castell, F., 2014. Carbon rights, REDD+ and payments for environmental services. Environmental Science and Policy 35, 20–29.

Keskitalo, E.C.H., 2011. How can forest management adapt to climate change? Possibilities in different forestry systems. Forests 2, 415–430.

Kleinschmit, D., Sjöstedt, 2014. Between science and politics: Swedish newspaper reporting on forests in a changing climate. Environmental Science and Policy 35, 117–127.

Levin, K., McDermott, C., Cashore, B., 2008. The climate regime as global forest governance: can reduced emissions from Deforestation and Forest Degradation (REDD) initiatives pass a ‘dual effectiveness’ test? International Forestry Review 10, 538–549.

Lovell, H., Liverman, D., 2010. Understanding carbon offset technologies. New Political Economy 15 (2) 255–274.

Lövbrand, E., Stripple, J., 2011. Making climate change governable: accounting for carbon as sinks, credits and personal budgets. Critical Policy Studies 5, 187–200.

Luttrell, C., Resosudarmo, I.A.P., Muharrom, E., Brockhaus, M., Seymour, F., 2014. The political context of REDD+ in Indonesia: constituencies for change. Environmental Science and Policy 35, 67–75.

Macintosh, A.K., 2012. LULUCF in the post-2012 regime: fixing the problems of the past? Climate Policy 12, 341–355.

Malhi, Y., Baldocchi, D.D., Jarvis, P.G., 1999. The carbon balance of tropical, temperate and boreal forests. Plant, Cell and Environment 22 (6) 715–740.

McAfee, K., 1999. Selling nature to save it? Biodiversity and the rise of green developmentalism. Environment and Planning D: Society and Space 17, 133–154.

McDermott, C.L., 2014. REDDuced: from sustainability to legality to units of carbon-The search for common interests in international forest governance. Environmental Science and Policy 35, 12–19.

Melillo, J.M., Butler, S., Johnson, J., Mohan, J., Steudler, P., Lux, H., Burrows, E., Bowles, F., Smith, R., Scott, L., Vario, C., Hill, T., Burton, A., Zhou, Y.-M., Tang, J., 2011. Soil warming, carbon-nitrogen interactions, and forest carbon budgets. Proceedings of the National Academy of Sciences 108 (23) 9508–9512.

Melo, I., Turnhout, E., Arts, B., 2014. Integrating multiple benefits in market-based climate mitigation schemes: The case of the Climate, Community and Biodiversity certification scheme. Environmental Science and Policy 35, 49–56

Mitchell, T., 2009. Carbon democracy. Economy and Society 28 (3) 399–432.

Parmesan, C., 2006. Ecological and evolutionary responses to recent climate change. Annual Review of Ecology, Evolution and Systematics 637–669.

Paterson, M., Humphreys, D., Pettiford, L., 2003. Conceptualizing global environmental governance: from interstate regimes to counter-hegemonic struggles. Global Environmental Politics 3 (2) 1–10.

Paterson, M., Newell, P., 2010. Climate Capitalism: Global Warming and the Transformation of the Global Economy. Cambridge University Press, Cambridge.

Phelps, J., Webb, E.L., Agrawal, A., 2010. Does REDD+ threaten to recentralize forest governance? Science 328, 312–313.

Phelps, J., Friess, D.A., Webb, E.L., 2012. Win-win REDD+ approaches belie carbon-biodiversity trade-offs. Biological Conservation 154, 53–60.

Pistorius, T., 2012. From RED to REDD+: the evolution of a forest-based mitigation approach for developing countries. Current Opinion in Environmental Sustainability 4 (6) 638–645.

Potter Lesley, 2003. Forests versus agriculture: colonial forest services, environmental ideas and the regulation of land-use change in Southeast Asia. In: Ley, T., de Jong, W., Abe, K. (Eds.), The Political Ecology of Tropical Forests in Southeast Asia. Historical Perspectives. Kyoto University Press, Kyoto, pp. 29–71.

Rayner, J., Buck, A., Katila, P., 2010. Embracing Complexity: Meeting the Challenges of International Forest Governance – A Global Assessment Report Prepared by the Global Forest Expert Panel on the International Forest Regime, IUFRO World Series 28. International Union of Forest Research Organisations, Vienna.

Reinecke, S., Pistorius, T., Pregernig, M., 2014. UNFCCC and the REDD+ partnership from a networked governance perspective. Environmental Science and Policy 35, 30–39.

Robertson, M.M., 2006. The nature that capital can see: Science, state, and market in the commodification of ecosystem services. Environment and Planning D: Society and Space 24, 367–387.

Robertson, M., 2012. Measurement and alienation: making a world of ecosystem services. Transactions of the Institute of British Geographers 37, 386–401.

Scott, J.C., 1998. Seeing like a state: how certain schemes to improve the human condition have failed. Yale University Press, New Haven.

Seppälä, R., Buck, A., Katila, P. (Eds.), 2009. Adaptation of Forests and People to Climate Change. A Global Assessment Report. IUFRO World Series. p. 224.

Sikor, T., Lund, C., 2009. Access and property: a question of power and authority. Development and Change 40, 1–22.

Skutsch, M.M., McCall, M.K., 2010. Reassessing REDD: Governance, markets and the hype cycle: an editorial comment. Climatic Change 100, 395–402.

Somorin, O.A., Visseren-Hamakers, I.J., Arts, B., Sonwa, D.J., Tiani, A.M., 2014. REDD+ policy strategy in Cameroon: actors, institutions and governance. Environmental Science and Policy 35, 87–97.

Stern, N., 2006. The Stern Review – The Economics of Climate Change. H.M. Treasury, UK.

Thompson, M.C., Baruah, M., Carr, E.R., 2011. Seeing REDD+ as a project of environmental governance. Environmental Science and Policy 14, 100–110.

Turnhout, T., Waterton, C., Neves, K., Buizer, M., 2013. Rethinking biodiversity: from goods and services to ‘‘living with’’. Conservation Letters, http://dx.doi.org/10.1111/j.1755-263X.2012.00307.x.

United Nations,. Kyoto Protocol to the United Nations Framework Convention on Climate Change. (accessed 22.03.2013)http://unfccc.int/resource/docs/convkp/kpeng.pdf.

Visseren-Hamakers, I.J., Gupta, A., Herold, M., Peña-Claros, M., Vijge, M.J., 2012. Will REDD+ work? The need for interdisciplinary research to address key challenges. Current Opinion in Environmental Sustainability 4, 590–596.

Wellstead, A., Howlett, M., Rayner, J., 2014. Beyond the black box: forest sector vulnerability assessments and adaptation to climate change in North America. Environmental Science and Policy 35, 109–116.