Forest Policy and Economics xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Forest Policy and Economics

journal homepage: www.elsevier.com/locate/forpol

Guest editorial

Forest governance in the Anthropocene: Challenges for theory and practice

1. Introduction: forest governance in the Anthropocene

The concept of the Anthropocene signals the unprecedented impact of humankind on the Earth's biosphere that will leave a distinct signature in the Earth's geosphere. As a term, the "Anthropocene" originated in discussions at the 2000 Science Committee of the International Geosphere and Biosphere Programme. It was later made popular by Crutzen and Stoermer (2000) and Crutzen (2002). Although there are debates as to when the Anthropocene started, a general consensus is emerging among scientists that the impact of human activity on the planet's ecosystems is now especially detectable on a global scale since the commencement, around 1800, of the Industrial Revolution in western Europe (Steffen et al., 2007; Ellis et al., 2013). Since then humans have changed the planetary biosphere through increasing emissions of carbon dioxide through forest clearance and fossil fuel burning. The Industrial Revolution has also led to the creation by humans of plastics, chemical pollutants and nuclear material that will leave traces in the geological record. While the view that the Anthropocene should be imagined as an Industrial Revolution phenomenon is now widely recognised, there are some scholars who have proposed the 'Early Anthropocene' hypothesis suggesting that the Earth's biosphere has been severely altered since the beginning of settled, organised forms of agriculture approximately 10,000 years before present (Ruddiman, 2003; Ellis, 2015). Others have suggested that the advent and use of nuclear bombs and their impact on the Earth's biosphere should be seen as marking the beginning of the Anthropocene (Zalasiewicz et al., 2015). Today the concept of the Anthropocene both invites "creative tensions" while also providing opportunities for new conceptual syntheses and integrative approaches (Brondizio et al., 2016).

In this special issue, we provide such a conceptual synthesis for forest governance. In accordance with Giessen and Buttoud (2014: 1) we adopt a broad definition of forest governance as comprising of "a) all formal and informal, public and private regulatory structures, i.e. institutions consisting of rules, norms, principles, decision procedures, concerning forests, their utilisation and their conservation, b) the interactions between public and private actors therein and c) the effects of either on forests." In conceptualising forest governance in the Anthropocene, we consider the Industrial Revolution as the key marker of the Anthropocene for forests, although some important caveats should be noted. Significant human influence on forests pre-dates the Industrial Revolution by several centuries. Michael Williams' comprehensive historical study *Deforesting the Earth* notes widespread deforestation in parts of Europe from 500 CE (Williams, 2003). From about 1500 there was more extensive deforestation in Europe to provide timber for fuelwood, iron making and shipbuilding, with this period also seeing the advent of ecological imperialism as European countries colonised other lands. The Industrial Revolution signals a sharp increase in demand for tree biomass, expanding the ecological footprint of forest loss across the globe (Vitousek et al., 1997; Malhi et al., 2002). Since the Industrial Revolution there has been more extensive deforestation in both temperate and tropical forests. The period since the end of World War 2 has seen the relocation of much deforestation to the global South, amounting to what Williams calls a "Great Onslaught" (Williams, 2003). The science of forestry and the need to actively 'manage' and 'govern' forests only arose after the European colonial powers experienced a pressing need to use more judiciously dwindling forest resources at home and in some colonies (Barton, 2001) and the need for good management of forests has been at the forefront of discussions on forest governance since.

Today, forests occupy just under 4 billion ha, with the world's forest area declining by 129 million ha in the period 1990 to 2015 (FAO, 2016: 32). Forests support high levels of biodiversity harbouring approximately 80% of the world's terrestrial biodiversity (WWF, 2016). They also provide important 'ecosystem services', the benefits that people derive from nature and which may be categorised as supporting, regulating, provisioning and cultural services. Supporting services include soil formation, nutrient cycling and erosion control. Regulating services include water cycling, carbon sequestration and climate regulation. Provisioning services include the timber and non-timber forest products that provide livelihoods. Cultural services include the psychological and health benefits that people derive from forests. Forests also have intangible cultural and spiritual values and many cultures revere forests; they also have a sacred place in many mythologies for their awe-inspiring and enigmatic properties (Bhagwat and Rutte, 2006). The tangible benefits obtained from forests as well as their intangible cultural roots have prompted contemporary cross-cultural concerns about their protection. On the backdrop of these multiple values of forests – which can often come into conflict with each other – this Special Issue examines three challenges that the Anthropocene poses to the contemporary governance of forests: 1. managing forest ecosystems to maintain their multiple values; 2. making forest-dependent communities resilient to the anthropogenic impacts on forests; and 3. responding to the anthropogenic changes through forest-related policy instruments. Collectively, the papers in this Special Issues put forward concepts and resources that are needed for anticipatory and adaptive forest governance in the Anthropocene.

This introduction first reviews some recent literature from the social sciences and humanities on how we should conceptualise and imagine the Anthropocene. It then introduces and examines the three key forest-related challenges of the Anthropocene. The final substantive section introduces the seven papers written for this special issue.

http://dx.doi.org/10.1016/j.forpol.2017.01.010
1389-9341/

2. Conceptualising the Anthropocene

Bonneuil and Fressoz (2016: xi) see the Anthropocene as 'a sign of our power, but also of our impotence'. As a species we are all powerful, having transformed the planetary biosphere (despite warnings from climatologists and Earth scientists) without fully understanding the consequence of our actions. However, our impotence is signalled with the realisation that we cannot now agree on what needs to be done to fend off potentially catastrophic planetary change and a growing realisation that the forces of such change increasingly lie outside our control. In this respect, it is no longer possible to accept the hubristic view that humanity shapes its own history (Clark, 2014).

Who should we blame for our condition? The Anthropocene is a shared condition; no one on the planet can escape it. There are no obvious adversaries and it makes no sense to talk of blame during the Anthropocene: in different ways (albeit, admittedly, to very different degrees) the vast majority of the world's population now inhabit social systems and structures that routinely lead to the environmental degradation of the biosphere through increasing greenhouse gas emissions to the atmosphere. The mere act of turning on a light switch or driving a car contributes to climate change irrespective of our values and beliefs. The problem of the Anthropocene is thus *normalised* into the very way that we lead our lives.

The Anthropocene is more than just an environmental crisis; it is a new geological epoch. Some changes in the Anthropocene are already apparent. Anthropogenic climate change is leading to the migration of forest-dwelling (and other) species, both altitudinally (uphill) and latitudinally (towards the poles). While the term denotes global forces of planetary impact, the changes that will take place during the Anthropocene will involve a diversity of local and regional impacts (Biermann et al., 2016). For example, in North America and Europe there is now evidence that populations of some tree species are slowly moving north (Feurdean et al., 2013). As Verburg et al. (2016) suggest, we need to develop models that support solution-oriented research for the problems of the Anthropocene. Thus, established forestry and forest management models will, at a minimum, need to adapt, and possibly be replaced by a new generation of models that take into account the positive feedbacks that will play out in the Earth system as climate change takes hold. As Bonneuil and Fressoz (2016, p.22) argue, "We are no longer in a reassuring model in which *x* hectares of forests converted into fields leads to the disappearance of *n* per cent of species, causes *y* per cent of species, causes per cent extra greenhouse gas and generates *z* °C increase in global temperature". This calls into question the concept of many established forestry techniques based on mathematical patterns and organised rotations. New forestry models will need to take into account climate-induced ecosystem migration, both anticipating movements of forest species and planning in advance for them. Foresters will need to be prepared not so much for the migration of existing ecosystems per se, but for the differential movements of individual species. In other words, as species populations will migrate at different speeds, some ecosystem change is inevitable (Aitken et al., 2008). This in turn calls into question how ecosystem resilience is imagined: in the Anthropocene resilience must include the flexibility to adapt and to respond to rapidly changing climatic conditions.

While there is a growing recognition of the severity of the problems of environmental change that humanity faces, scholarship has nonetheless been slow to respond by generating the policy tools needed to address problems of environmental degradation, such as deforestation. For example, in the discipline of economics the neoclassical approach remains the dominant paradigm. However, neoclassical economics operates over short, or at best medium, term time horizons and the practice of discounting the future is an unsatisfactory one for intergenerational environmental problems. Much economics research continues to treat environmental degradation as a problem of internalising into the market system the negative externalities that arise from economic activity, such as trading in timber and forest clearance. Proponents of ecological economics argue that successful nature conservation initiatives depend on putting a realistic price on nature (e.g. van den Bergh, 2001). Detractors argue that natural ecosystems and species cannot possibly be valued in monetary terms; they are 'priceless', with markets unable to signal the social and ecological values at stake (e.g. Ackerman and Heinzerling, 2004). Valuing nature in monetary terms is considered ethically offensive by some (e.g. Power, 2001). The response of ecological economics is to insist that economic activity should take only to the extent that it does not lead to the degradation of the natural environment (Common and Stagl, 2005; Daly and Farley, 2011). However, ecological economics theory has yet to gain traction within political and economic elites and the neoclassical approach still remains prevalent in these circles.

Within forestry the main response to deforestation has been the payment of economic services (PES) approach, of which REDD + is a subset. The PES approach has led to some isolated but important conservation successes but it is clear that the approach cannot counter all the trends that generate deforestation (Rosendal and Schei, 2014; Locatelli et al., 2014; Ezzine-de-Blas et al., 2016). While the underlying premise of REDD +, namely providing financial incentives that will weaken forest conversion pressure to other land uses, is commendable, REDD + can only succeed as a conservation tool when the revenues that forest owners will receive from REDD + schemes exceeds what they would receive from deforestation and conversion of the land to other uses. There is no necessary reason why the latter should necessarily exceed the former, especially given how market prices for agricultural commodities fluctuate. Where the income that a forest owner would receive from deforestation and conversion to an alternative land use such as agriculture should exceed the income that can be earned from a REDD + scheme then the rational response of a utility maximising forest owner will be to deforest.

James Gustave Speth argues that powerful political and economic interests gain from market failures such as negative externalities, suggesting that today's business corporations be seen as 'externalizing machines' that systematically keep the social and environmental costs of their activity off the books by dumping them on society at large, while internalising the benefits (Speth, 2008, p.60). It is doubtful whether the correction of market failures can be achieved solely by methodological innovations in economic theory: this probably requires greater social regulation of and intervention in markets so that they contribute to the long term collective good. The problem, in other words, is one of politics rather than economics (Nadeau, 2006; Sagoff, 2008). This suggests the necessary theoretical innovation will need to come from political scientists and scholars of environmental governance. There is what may be termed an "Anthropocene gap" in both governance and technology: the old political systems and carbon intensive technologies are still in place, but they are unresponsive and not suited to dealing with the environmental problems of the twenty-first century. Meanwhile, neither the necessary new governance structures nor environmentally-friendly technologies are emerging (Biermann, 2016; Galaz, 2014).

One reason for the slow pace of social change and theoretical innovation is that the Anthropocene is a no-analogue condition: the future changes that will unfold through positive feedbacks in the Earth's climatic system and the future consequences of this for species and ecosystems lies to a large extent beyond our understanding because we, as a species, have not experienced such conditions before. There is little of which we have knowledge that will prepare us for the Anthropocene. This poses a huge challenge for theory, in both the sciences and social sciences. There are few certainties, beyond the recognition that massive environmental and social change is inevitable during the twenty-first century. While this change will test societies' abilities to deal with it consequences, it will also create opportunities to respond positively to novel futures (Bai et al., 2016). The key question is to what extent foresters and others can exert some control over this, and to what extent we will be at the mercy of forces beyond our control.

Please cite this article as: Bhagwat, S.A., et al., Forest governance in the Anthropocene: Challenges for theory and practice, Forest Policy and Economics (2017), http://dx.doi.org/10.1016/j.forpol.2017.01.010