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10 Governance Failures and the Fragmentation of Tropical Forests

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Abstract

Across the tropics, high rates of forest degradation and deforestation have resulted not only in the loss of large areas of natural forest cover but also in increasing fragmentation of the forests that remain. This chapter examines the underlying governance drivers of forest fragmentation through five key analytical approaches: (i) understanding of historically contested property rights over forests involving states, private-sector actors and communities; (ii) the widespread failure of selective logging timber concessions to achieve sustainability objectives in the tropics; (iii) related problems with weak law enforcement, corruption and patronage politics, and the dominance of commercial forestry by political and military elites; (iv) the conversion of forested areas to other land uses, often in response to market and governance failures; and (v) the globalization of resource commodity networks. Significantly, in considering how extra-sectoral land-use conversion influences forest management, we have found that forest fragmentation is often an intentional, yet typically understated, objective of government spatial planning processes. In some cases, forest fragmentation is even implicit in the approach of certain conservation mechanisms such as the designation of ‘high-conservation-value forests’. Forest fragmentation can also be understood not only in biophysical terms but as a socio-cultural phenomenon with profound implications for displaced indigenous groups and other communities living in and around forests. Continued forest fragmentation poses significant challenges for conservation, for the socio-cultural viability of forest-dependent communities and for market-based global forest governance initiatives such as REDD+ (reducing emissions from deforestation and forest degradation).

Introduction

Across the tropics, high rates of forest degradation and deforestation have resulted not only in the loss of large areas of natural forest cover but also in increasing fragmentation of the forests that remain. Forest fragmentation – broadly defined as ‘any process that results in the conversion of formerly continuous forest

into patches of forest separated by non-forested lands’ (Convention on Biological Diversity, 2014) – can occur at multiple scales, ranging from a single forest stand to a landscape defined by biophysical or administrative boundaries, or even a bioregion stretching across national borders. Fragmentation has long been recognized as a potent threat to the continued functional integrity of tropical forest

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ecosystems and the biodiversity they sustain (Laurance *et al.*, 1998; Bierregaard *et al.*, 2001). For at least three decades, forest ecologists and conservationists have warned that fragmented forests often have limited capacity to support critical species of flora and fauna, and this diminishes not only the biological richness of these forests but also the environmental services they provide and the livelihoods they support (Harris, 1984). In recent years, forest fragmentation has also posed significant technical and institutional challenges for the United Nations (UN)-led initiative of REDD+ (reducing emissions from deforestation and forest degradation) and related efforts to mitigate climate change.

In much of the tropics, processes of forest fragmentation have been catalysed initially by commercial logging and have accelerated as logged-over forests have been converted for smallholder agriculture, commercial tree plantations and agro-industrial crops. Large areas designated as state production forests have been subject to multiple rounds of logging, leaving them depleted of commercial species, biologically degraded with limited capacity for regeneration and vulnerable to a host of continuing threats. In particular, logging roads running through former concession sites provide ready access to informal loggers seeking residual trees, to settlers expanding the agricultural frontier and to corporate actors developing new areas of cropland and pasture. In recent years, growing demand in

global markets for commodities including pulp, oil palm, soybean, beef, sugarcane and para-rubber – as well as a scarcity of arable land in some emerging consumer countries – has created powerful incentives for the conversion of natural forests to industrial plantations and different non-forestry land uses. As tropical forest landscapes have become increasingly fragmented, stands of mature primary forests often remain intact only where extraction of timber and/or conversion to alternate land uses are not yet commercially feasible.

As with the broader processes of deforestation and degradation, forest fragmentation is often driven by weaknesses, contradictions and outright failures of governance institutions. We define ‘forest governance’ as the institutional processes and structures, and modes of political power and authority, that shape ‘how decisions are made about the management and use of forest lands and resources’ (Box 10.1). We note that decisions about forests are significantly influenced by governance institutions and processes situated both within and outside the forestry sector. In this chapter, we will examine the links between forest fragmentation and governance failures, and examine why institutions and processes established to administer forests – including those charged with ensuring sustainable forest management and forest protection – are so frequently undermined by a variety of factors that produce and reinforce weak governance.

Box 10.1. What is forest governance?

The literature on forest governance offers a variety of definitions. For the purposes of this chapter, we use the following definition, formulated by the World Resources Institute:

Forest governance refers to how decisions are made about the management and use of forest lands and resources. These decisions are shaped and influenced by a complicated web of actors, rules, and practices both within and beyond the forest sector. Poor forest governance is often characterized by low levels of transparency, accountability, and public participation in decision making, as well as weak coordination across different sectors and levels of government. It contributes to problems such as unplanned forest conversion, conflict over forest resources, illegal logging, and corruption. These underlying governance challenges remain a persistent obstacle to achieving sustainable and equitable management of forests in many countries.

(From World Resources Institute Governance of Forests Initiative 2013, <http://www.wri.org/project/governance-of-forests-initiative>.)

As we will explore in this chapter, timber concession regulations often allow logging to occur at levels of intensity that lead to rapid commercial and biological depletion, rather than long-term sustainable management across multiple harvesting rotations. Moreover, timber companies have strong economic incentives to exceed harvesting limits and to avoid making investments in sustainable management of their concession areas. In many countries, state leaders have distributed timber concessions to companies associated with powerful government and military officials as a form of patronage, and corruption within agencies administering forest resources is widespread. In such contexts, state forestry agencies often have limited capacity or political will to enforce their own forestry laws, effectively rendering large areas of forest land as an 'open access' resource with few constraints on extra-legal timber harvesting.

We will examine how fragmentation has been linked to the conversion of forestlands to other land uses, and in this way, has been driven by policies, institutional structures and market signals from outside the forestry sector. Government policy and planning decisions aimed at enhancing the profitability of land-extensive commodities often drive forest fragmentation by providing incentives for agricultural expansion in frontier areas. Macroeconomic policies can similarly encourage deforestation when they improve the terms of trade for commodities such as soy, beef or oil palm. As global and regional markets have become increasingly integrated in recent decades, deforestation and fragmentation in many tropical countries have been driven by growing demand for key commodities in China and other major consumer countries. Globalization has, in turn, connected tropical forest landscapes – and the governance of these resources – to new commodity chains, new sources of capital investment and new transnational corporate actors.

Significantly, governance failures driving the fragmentation of tropical forests have also led to the displacement of customary management systems practised by forest-reliant communities. In this way, forest fragmentation

can be understood not only in biophysical terms but also as a socio-cultural phenomenon with profound implications for indigenous groups and other communities living in and around forests. The fragmentation of tropical forests underscores a pressing need for innovative and effective governance mechanisms. We will argue that these are required, on the one hand, to slow or reverse the pace of both biophysical and socio-cultural fragmentation, and on the other hand, to address the specific challenges associated with managing fragmented forest resources.

The 'Political Forest' and Commercial Timber Concessions

Approximately 75% of the world's forests are controlled by governments (Sunderlin *et al.*, 2008). In many tropical countries – including Indonesia, Democratic Republic of Congo, Angola, Venezuela, Zambia, Myanmar, Laos, Cambodia, Central African Republic, Congo, Gabon, Cameroon and Mozambique – virtually all forested lands are administered by state agencies (Sunderlin *et al.*, 2008). In some tropical countries – including Brazil, Peru, Colombia and Bolivia – management control of significant areas has been devolved to indigenous peoples, rural communities and/or private companies (Sunderlin *et al.*, 2008). Across the tropics, however, government forestry departments are charged with maintaining a 'permanent forest estate', portions of which are designated for commercial exploitation, conservation, watershed protection and other environmental services, management by rural communities, or other authorized and zoned uses. In many tropical countries, state forestry agencies and the legal regulatory structures they use to administer forests were initially established during the colonial era, although these have often been adapted and vastly expanded by post-colonial states.

Tracing the origins of what they term the 'political forest', Peluso and Vandergeest (2001) argued that, in South-east Asia, the idea of state territorial sovereignty over a category of land identified as legal 'forests' emerged in the 19th century. During this

period, the region's colonial governments asserted control over forested landscapes and resources, and placed these under the administrative authority of state forestry bureaucracies. The creation of the political forest commonly included: 'territorial zoning and mapping, the enactment of forest laws delimiting legal and illegal forest uses, the constitution of state forestry institutions to implement these laws according to specific procedures, the constitution of forest police, and the creation of legal exemptions that became Customary Rights' (Peluso and Vandergeest, 2001, pp. 764–765). Importantly, the assertion of state control over forests meant that 'Access to forested lands or particular species was made contingent on government-issued permits' (Peluso and Vandergeest, 2001, p. 765). Although the specific institutions and practices used to administer forests varied across political systems and geographical contexts, successive colonial and post-colonial governments carried out similar projects in much of the tropics. These political forests served as a legal mechanism for the delegitimation and exclusion of previously existing forest-land management systems and livelihoods.

In further institutionalizing the political forest, many post-colonial forestry departments – often in partnership with key global organizations such as the UN Food and Agriculture Organization (FAO) – have classified large areas of territory as 'production forests' and made these exclusively available to commercial logging by public and private timber companies. In overseeing the commercial exploitation of forests, government forestry agencies have frequently pursued multiple economic and political objectives. On the one hand, they have sought to promote national economic development by encouraging investment in the sector and by facilitating the production of timber and other commodities for domestic and international markets. On the other hand, they have generated revenue flows for the government itself through licensing fees, timber royalties, export taxes and other forest fiscal payments.

Although timber concession regulations vary among tropical forest countries, they are generally structured to allow licence-holders

to harvest timber selectively from a specified area under approved management plans for a defined period of time. Rooted in the principles of scientific forestry, selective logging concessions were initially designed by colonial forestry services to ensure sustained yields of high-value species, such as teak or mahogany. For several decades, concessionary logging has been promoted by the FAO, the World Bank and other international organizations as the primary institutional structure for achieving sustainable forest management (Vandergeest and Peluso, 2006; Independent Evaluation Group, 2012).

Globally, this conflation of managed selective logging and sustainable forest management has been widely embraced by a diverse range of institutional actors (Zimmerman and Kormos, 2012). Indeed, it is by far the dominant view, shared by professional forestry organizations, bilateral and multilateral donor institutions, forestry research institutes and major conservation organizations.¹ Most recently, the UN REDD+ initiative has promoted the creation of incentives for sustainable forest management through managed selective logging as part of its broader efforts to reduce deforestation and degradation of tropical forests (Zimmerman and Kormos, 2012). As elaborated below, however, this broad acceptance of selective logging timber concessions as the primary institutional mechanism for sustainable forest management is increasingly at odds with the documented long-term performance of such systems in much of the tropics.

Timber Rents and the Breakdown of Sustainable Logging

Paradoxically, the widespread failure of commercial timber concessions to achieve sustainability objectives has been a major catalyst of forest fragmentation processes in much of the tropics. In theory, most timber concession systems are modelled around selective harvesting, and are structured to allow logged-over areas to regenerate before the next rotational felling occurs to facilitate sustained productivity of forests over the long term. In this way, commercial forestry regulations

commonly require timber companies to manage their concessions according to the following principles:

- Rotational harvesting of concession areas.
- Minimum felling diameters.
- Area-based restrictions on harvesting intensity.
- Restrictions on extraction of protected species.
- Retention of minimal seed trees.
- Enrichment replanting of logging sites.

Numerous initiatives have sought to enhance the performance of selective logging concessions systems by introducing policies that promote specialized harvesting practices for reduced-impact logging, more efficient technologies to avoid waste, the use of performance bonds and area fees to guarantee adherence to management plans and long-term tenure security for large-scale forestry concessions (Repetto and Gillis, 1988; World Bank, 1992; Sist *et al.*, 1998; Kaimowitz, 2004; Boscolo and Vincent, 2007).

Over the past three decades, however, a growing literature from Asia, Africa and Latin America has documented a widespread and continuous failure of commercial timber concessions to achieve stated sustainability goals. In a recent review, Zimmerman and Kormos (2012, p. 479) argued that ‘a convincing body of evidence shows that as it is presently codified, sustainable forest management (SFM) logging implemented at an industrial scale guarantees commercial and biological depletion of high-value timber species within three harvests in all three major tropical forest regions.’ Specifically, they concluded that concession regulations in most timber-producing countries allow logging to occur at levels of intensity that result in permanent damage to the forest canopy and to residual trees, and that suppress regeneration of primary forest tree species:

Under prevailing tropical SFM protocols, (a) minimum rotation cycles, typically 25–35 years, are too short by a factor of at least two; (b) minimum felling diameters, most often 50 cm DBH [diameter at breast height], are too small to preserve adequate populations of reproductive adults and to control harvest intensity, assuming that diameter-limit

cutting is the only option; (c) per-unit-area harvest intensities (around eight trees per ha) are too high and leave residual stands most often lacking future tree crop regeneration, overgrown by pioneer vegetation, and fire prone, especially in regions that experience dry seasons; and (d) seed-tree retention rates – that for Brazil is 10% retention of trees greater than 45 cm DBH – are inadequate.
(Zimmerman and Kormos, 2012, p. 483)

Even where reduced-impact logging techniques have been used to decrease collateral damage within residual stands, Zimmerman and Kormos (2012, p. 482) found that ‘high logging intensities and low minimum cutting diameters usually left such a high percentage of the canopy in open gap (20%–50%) that the residual stand became colonized by fast-growing, light-loving vines and pioneer species...suppress[ing] the regeneration of slower-growing, shade-tolerant and shade-intolerant primary forest trees.’

Although challenged by some analysts, the conclusions reached by Zimmerman and Kormos (2012) are both striking and disconcerting: they suggest that, in most contexts, commercial logging companies are unlikely to achieve either biological or commercial sustainability, even if they adhere fully to timber concession regulations. To complicate matters, the institutional breakdown of sustainable forest management through industrial logging is hardly limited to poorly formulated rotation cycles, inadequate harvesting limits, and other technical weaknesses in concession guidelines. Since the mid-1980s, rather, forest economists have shown that logging companies also have strong economic incentives to disregard forest management plans and to refrain from making any significant investments in the long-term sustainability of the forestry concessions they manage.

Repetto and Gillis (1988) documented how governments in Indonesia, Malaysia, the Philippines, Ghana and Brazil have maintained timber royalties, concession fees and other components of forest fiscal systems at levels that allow logging companies to capture economic rents – that is, profits above a normal rate of return. They and others argued that, by undervaluing forest resources in

this way, governments not only fail to collect significant amounts of potential revenues, but, in doing so, they also effectively encourage timber companies to manage their concessions in ways that maximize profits over the short term (Ascher, 1999; Ross, 2001; Barbier, 2005). Concession-holders often recognize that their access to economic rents from state-administered forests – ostensibly a publicly owned resource – may last for only a limited time due to the expiration of concession contracts, potential policy changes and/or physical depletion of high-value timber species. Faced with such uncertainties, they have strong incentives to extract as much value as possible from the forests they manage while it is available. As Barbier *et al.* (2010, p. 103) noted, ‘Such resource-extractive activities tend to be short-term, high-payoff investments that are highly destructive to forests and ecosystems.’

Analysing these trade-offs in lowland mahogany forests of Bolivia, Rice *et al.* (1997, p. 46) discovered that ‘unrestricted logging is from two to five times more profitable than logging in a way that would ensure a continued supply of mahogany.’ They argued that similar dynamics drive unsustainable logging across the tropics, as timber companies often have ‘no economic incentive to invest in sustainable management’:

Logging, as typically practiced in the tropics, rapidly harvests the most highly valued trees. The number of species may be as low as one (where there is a specialty wood, such as mahogany) or as high as 80 or 90 (where there is demand for high variety). Logging companies generally show little concern for the condition of residual stands and make no investment in regeneration. This attitude emerges, in part, as a matter of simple economics. In deciding whether to restrict harvests, companies face a choice between cutting trees immediately and banking the profits or delaying the harvest and allowing the stand to grow in volume and value over time. Economics, it seems, dictates the decision.

(Rice *et al.*, 1997, p. 46)

Interest rates are a significant factor shaping this decision. As Rice *et al.* (1997, p. 46) explained, ‘Because risks are considerable

and capital is scarce, real interest rates in developing countries are often much higher than in industrial countries².... Thus, companies that rapidly harvest their assets can invest their profits immediately and generate continuing rates of return. The benefits of delaying harvest, in contrast, are small.’ Indeed, the slow growth rates of most high-value species, combined with uncertainties concerning future prices and mortality risks, give logging companies little incentive to manage their concessions for optimal profits 40 or 80 years in the future (Karsenty, 2000; Kaimowitz, 2004). Rice and colleagues noted that ‘like most other business people, who are unwilling to make risky investments in developing countries unless offered considerably higher returns, loggers choose to cut their trees as quickly as they can’ (Rice *et al.*, 1997, p. 46).

As high-value species are depleted and formal access to timber rents declines, concession-holders often have an even greater incentive to log outside of approved harvesting sites, to cut trees below the legal minimum diameter and to engage in any number of other violations. Describing the declining profitability of forestry concessions in Indonesia during the late 1990s, Barr (2001a) noted that logging companies have little motivation to play by the rules if doing so provides only marginal or negative returns on their investment. On the contrary, timber companies have a strong incentive to overharvest their concession sites when government forestry departments demonstrate a willingness, as they do in Indonesia, to reclassify areas of production forests for full-scale clearing once they reach a designated threshold of degradation (Meijard and Sheil, 2007; Barr and Sayer, 2012).

In this way, governance failures related to commercial timber extraction frequently represent a critical first step in a multistage process leading to fragmentation of tropical forests on a large scale. Although framed by the discourse of sustainability, empirical studies indicate that industrial logging has led to the degradation of forest ecosystems through overharvesting of concession sites and a failure to support regeneration of residual stands (Karsenty and Gourlet-Fleury, 2006; Cerutti *et al.*, 2008; Clark *et al.*, 2009;

Nasi and Frost, 2009). Many logged-over concession sites also have significant volumes of dead biomass, making them susceptible to fire, and the loss of canopy makes them vulnerable to invasive species, such as *Imperata* and other grasses. With logging roads and other infrastructure developments providing access to previously remote areas, residual forests within logged-over concessions are also susceptible to conversion by smallholder settlers and commercial land users expanding the agricultural frontier.

Weak Law Enforcement, Corruption and Patronage Politics

Weak forest law enforcement is a major factor facilitating uncontrolled logging both within and outside areas designated for commercial timber production. Numerous studies have sought to quantify the scale of illegal logging and illegal trade of wood products at both national and global levels; however, estimates vary widely and are, unavoidably, based on partial evidence and assumptions (Box 10.2). A 2004 study concluded that the global value of illegally produced roundwood, lumber and plywood amounted to US\$22.5 billion on an annual basis (Seneca Creek Associates and Wood Resources International, 2004). Of this, approximately

US\$5.0 billion is traded internationally, amounting to 7–10% of world exports of primary wood products. A more recent analysis estimates that illegal harvesting accounts for 70% of logging in the Brazilian Amazon, 60% in Ghana and Indonesia, 35% in Cameroon and 25% in Malaysia (Lawson and MacFaul, 2010). The World Bank has estimated that governments lose US\$10–15 billion annually due to forgone revenues associated with illegal logging and trade (World Bank, 2002; Gonçalves *et al.*, 2012).

In many tropical countries, the scale of illegal logging and associated trade underscores a fundamental paradox: state forestry agencies have established far-reaching authority to administer forest territories and the resources they contain, yet their performance is frequently constrained by limited budgets, weak law enforcement capacity, competing bureaucratic agendas and, in many cases, powerful political disincentives for sustainable management (Karsenty and Ongolo, 2011). Indeed, many tropical forest countries can be characterized as ‘fragile states’ – defined by the Organisation for Economic Co-operation and Development (OECD) as those countries where there is a ‘lack [of] political will and/or capacity to provide the basic functions needed for poverty reduction, development and to safeguard the security and human rights of their populations’ (OECD/DAC, 2007, p. 2; Irland, 2008).

Box 10.2. Illegal logging

Illegal logging is commonly defined as occurring ‘when timber is harvested, transported, bought or sold in violation of relevant national laws’ (Lawson and MacFaul, 2010). Among the most significant practices associated with illegal timber harvesting and trade are the following:

- Logging in protected forests or other areas not designated for timber harvesting.
- Logging in production forests by unauthorized actors.
- Logging by licensed concession-holders in ways that violate approved management plans, including: (i) harvesting outside of designated felling sites; (ii) harvesting volumes of timber in excess of approved levels; and (iii) harvesting trees below minimum diameter limits.
- Logging or trade of protected species.
- Under-reporting of volumes harvested, transported, or traded to avoid royalty or tax payments.
- Transporting, exporting, or importing timber without required permits.

The specific practices that constitute illegal timber harvesting and trade vary widely across jurisdictions: what is legal in one country can be illegal in another.

(From Lawson and MacFaul, 2010; Seneca Creek Associates and Wood Resources International, 2004.)

Examining the effects of state fragility on forest governance, Harwell (2010, p. 5) further elaborated:

Although not explicit, the definition implies that fragile states lack rule of law (not just monopoly over the use of force), strong institutions, control of private interests and independence of the state from them, and accountability and concern for [the] well-being of [their] population. These weaknesses lead to a context of illegitimate and dysfunctional government and vulnerable citizenry that is not conducive to forest conservation and management.

Corruption, a common characteristic of fragile states, is widespread among tropical forest countries, significantly undermining the ability of governments to enforce their own forestry laws (Irland, 2008; Harwell, 2009; Cerutti *et al.*, 2013). At the highest levels, grand corruption can be a significant driver of forest fragmentation when it involves, for instance, bribery of senior officials by corporate actors seeking to obtain timber concessions or forest conversion licences, influence peddling over land-use policy or planning decisions, or avoidance of prosecution for illegal clearing of forests. At the field level, petty corruption can have similar effects (albeit on a smaller scale) when timber companies make informal payments to local forestry officials to approve harvesting permits, ignore violations at logging sites or allow trucks carrying illegal timber to pass government checkpoints. Where illegally harvested logs are destined for export markets, corruption among customs officials, and a lack of due diligence and interest in consumer countries, frequently facilitates the flow of illicit timber and wood products through global commodity chains.

In analysing the effects of state fragility on forest governance, Harwell (2010) distinguished between fragile states that are relatively strong and those that are relatively weak. In the 'stronger' fragile states (also referred to as 'predatory states'), political leaders commonly use timber concessions as a form of patronage, distributing valuable logging licences to senior government officials and military officers to secure their loyalty and support. In these circumstances, Harwell (2010, p. 6) argues:

Such states are not 'incapable'; rather, the elite choose to focus their capacities not on the pursuit of the public good but on consolidating personal and state power through patronage relationships with the private sector and a wide array of specialized criminal networks. This patronage undermines the rule of law, encourages the expansion of shadow economies, and... further strengthen[s] criminal networks.

Indonesia's Soeharto regime (c.1966–1998), for instance, allocated licences to millions of hectares of timberland to companies affiliated with senior generals, regional military commanders, state ministers, governors and members of the president's own family (Barr, 1998; Brown, 1999). In doing so, the regime's leaders established a high level of personal allegiance, linked to an ongoing flow of economic benefits, among powerful actors at all levels of the state apparatus (Ross, 2001). During the initial decade of the regime, these actors were allowed to extract timber rents from their concessions with relatively minimal oversight of their operations by the Ministry of Forestry. By the mid-1980s, however, as Soeharto had consolidated his power, the state banned the export of raw logs and required concession holders to make downstream investments in plywood production. Access to export markets – and by extension, forest rents – was then tightly controlled by the Indonesian Wood Panel Producers Association (APKINDO), a powerful cartel managed by an associate of Soeharto (Barr, 1998).

Similarly, in Liberia, the government of Charles Taylor used timber concessions as patronage, both to enrich the regime's senior leaders and to finance pro-government forces in that country's civil war. Shortly after coming to power, the Taylor regime 're-align[ed] forest lands into several large concessions [and] That "mega-concession" policy allowed the inner circle of the country's leadership to hand out concession rights to favored political cronies, militia leaders, and arms dealers' (Blundell, 2010, p. 14). Several recipients of concession licences allegedly traded timber for weapons and facilitated the import and distribution of arms to combatants in Liberia's civil war, as well as the conflict in neighbouring Sierra Leone. A 2005 review of

Liberia's forestry concessions found that the volumes of timber harvested were grossly under-reported, allowing companies to evade forestry taxes; and large volumes of logs were smuggled to export markets, especially through Côte d'Ivoire. Significantly, the review also found that by the end of the civil war in 2003, the total area of forestry concessions allocated was 2.5 times greater than the nation's actual forest area (Blundell, 2010).

In stronger fragile states, the pervasive presence of government and military elites in timber production has often meant that forestry bureaucracies have little, if any, political will to enforce regulations concerning sustainable management. On the contrary, the strategic significance of timber rents as political patronage has frequently meant that forestry officials are charged with administering forests in ways that advance the accumulation strategies of state elites and their business associates. Analysing the political economy of timber production in Indonesia, Malaysia and the Philippines, Ross (2001) argued that control over the distribution of forest rents – a process he termed 'rent seizing' – is often the subject of intense political struggles among factions within the state.³ Not surprisingly, where the distribution of timber rents plays a critical role in supporting a regime's political power structure, factions promoting the conservation and sustainable management of forests are often marginalized. This, in turn, shapes what policies are set, who has access to forests, how forest regulations are enforced and, ultimately, how forests are (mis)managed.

By contrast, fragile states are described as being weak when there are significant 'sub-national areas with no state presence and forests are uncontrolled by government authority' (Harwell, 2010, p. 6). The degree of state fragility can vary widely within a particular country's borders and, in regions where fragile states are weakest, there is frequently a negative correlation between levels of state control and density of forest cover. In many forested regions that lie beyond the full reach of state control, forests are managed by local communities under customary tenure regimes. In some such regions, particularly where forests are rich in high-value timber

species, forest resources can be controlled and heavily exploited by private militias, criminal syndicates, armed insurgencies and other armed groups. Logging under these circumstances is rarely constrained by concerns over sustainability and, in many cases, it is linked to violent conflict (Harwell, 2010).

Distinctions between strong and weak fragile states are often complicated further in practice. For example, in Laos (Lao People's Democratic Republic), often described as a relatively weak state, the central Communist Party apparatus nevertheless wields significant political authority and control. Through the Lao state's strategy of 'turning land into capital', large-scale land concession deals have been awarded to private developers in exchange for commitments to finance urban infrastructure projects like shopping malls and an international athlete's village (Kenney-Lazar, 2010; Dwyer, 2013). Provincial governments in Laos have also long used this strategy to finance the construction of roads and government office buildings (Hodgdon, 2008). These barter deals have been completed under less-than transparent arrangements, and some have argued that there is also significant rent seeking associated with them (Global Witness, 2013). Timber harvesting and export quotas have also reportedly been allocated to external logging interests in order to repay loans reportedly extended to Laos by the Soviet Union and Vietnam during the Second Indochina War. In these ways, what appears at first glance to be a rather chaotic forestry policy in Laos becomes a more logical strategy adopted by the Lao state to utilize its natural resource endowments to advance elite-defined development objectives (Dwyer, 2013). Such politically defined land deals and timber quota allocations have major implications for patterns of forest fragmentation in Laos.

Illegal logging and associated trade are widely described as being significant drivers of unsustainable forestry in both tropical and temperate regions. However, the links between illegality, forest degradation and forest fragmentation are not always straightforward. While unlicensed loggers (such as groups of villagers with chainsaws) may operate without government harvesting permits and approved

management plans, there are examples where their practices may be relatively 'sustainable' as based on selective and low-impact logging practices (McElwee, 2004). Nevertheless, high rates of illegal logging often suggest that both the pace of forest degradation and the areas of forest affected will exceed those anticipated by forestry department planners.

Where illegal logging occurs within the boundaries of existing timber concessions, it can mean that commercial and biological depletion – and by extension, degradation and fragmentation – of production forests occur much faster than they would if these sites were exploited according to concession management plans. Where illegal logging occurs outside of concession boundaries, it can mean that degradation and fragmentation occur on a much broader scale across the national forest estate, well beyond areas designated for commercial production. In contexts where the volumes of illegally harvested timber are sufficient to suppress market prices, widespread illegal logging can also serve as a strong disincentive for more responsible forestry companies to invest in sustainable management, and this can operate at an international scale (Seneca Creek Associates and Wood Resources International, 2004).

The large volumes of illegally harvested timber flowing from the tropics suggest that efforts to reduce the fragmentation of tropical forests will need to include effective mechanisms to curb illegal logging and trade. Since the mid-2000s, numerous initiatives have focused on developing systems for verifying the legality of timber and tracking logs through a chain of custody from the stump to destination markets. For instance, through the Forest Law Enforcement, Governance and Trade (FLEGT) programme, the European Union (EU) has negotiated voluntary partnership agreements (VPAs) with several timber-producing countries, through which wood-based imports are limited to legal products verified through an audit-based licensing scheme (Brack, 2012).⁴ Other initiatives aimed at curbing illegal logging and trade have focused on 'following the money' or 'following the investors' (Setiono and Husein, 2005; Global Witness, 2009). Such efforts have sought to apply anti-money laundering laws

and asset confiscation regimes to curtail the flow of profits from illegal forestry activities, especially in cases involving powerful actors with bank accounts and other assets in off-shore jurisdictions (Goncalves *et al.*, 2012).

Governance Drivers of Land-use Conversion, Fragmentation and Deforestation

The discussion thus far has focused on the links between fragmentation and the degradation of forests resulting from licensed and unlicensed timber extraction. We will now examine the relationship between forest fragmentation and deforestation resulting from the conversion of forested areas to other land uses. On a broad scale, such conversion processes are a significant component of forest fragmentation in the tropics, as they make the boundaries between fragments of mature forests and non-forestry land uses both more expansive and more immutable. As with degradation caused by unsustainable logging practices, tropical deforestation – and the resulting fragmentation of forest landscapes – is frequently catalysed by weak regulations, contradictory policy and planning decisions, market distortions and other governance failures.

In recent decades, agricultural expansion has been the largest driver of deforestation in the tropics. During 1980–2000, more than three-quarters of new crop and pastoral land in these regions was developed on areas covered by forests – some 50% involved the conversion of intact forests and another 28% the clearance of disturbed forests (Gibbs *et al.*, 2010). For the period 2000–2010, agricultural expansion was directly responsible for 73% of tropical deforestation, with commercial agriculture accounting for 40% of total forest loss and local/subsistence agriculture accounting for 33% (Hosonuma *et al.*, 2012).

The relative significance of commercial agribusiness actors versus smallholder agriculturalists as drivers of forest change shows considerable geographical variation. Since the early 1990s, agribusinesses producing beef and soybeans for international markets

have been leading drivers of deforestation in the Amazon, and export-oriented production of oil palm (for food, household and cosmetic products) and pulp/paper have been major drivers in South-east Asia (Rudel *et al.*, 2009; Boucher *et al.*, 2011; Obidzinski and Dermawan, 2012).⁵ Increasingly, growing demand for biofuels, spurred on by government policies in the USA, Europe and elsewhere, is shaping forest conversion in both regions (e.g. sugarcane in Brazil and Cambodia; oil palm in Malaysia, Indonesia and Colombia). By contrast, expansion of small-scale subsistence agriculture continues to be the leading driver of forest cover loss in much of Africa (Fisher, 2010). As Hosonuma *et al.* (2012, p. 8) noted, however, corporate actors are rapidly gaining significance as agents of forest change in that region: 'While the four African countries with the largest forest areas (Democratic Republic of Congo, Angola, Zambia, and Mozambique) (FAO 2011) are still in the pre- and early-transition phase, forest loss rates and the influence of commercial globalized agriculture are expected to increase...'

In countries where states exert strong control over forest resources, processes of forest conversion – and the resulting patterns of fragmentation – are shaped heavily by government policy and planning decisions. Indeed, we note that forest fragmentation is often an *intentional*, yet unstated, objective of government spatial planning processes. In some cases, states use fragmentation as a means to exercise internal control over state territory and/or to delineate and regulate national boundaries (Vandergeest and Peluso, 1995; Scott, 1998). State-led spatial planning policies effectively determine which portions of the forest estate will remain under forest cover and which will be converted to other land uses.

In sectoral planning processes, state forestry agencies in many countries have demonstrated limited capacity or political will to rehabilitate, manage or protect forests once they are depleted of high-value timber (Barr and Sayer, 2012). Rather, as they have become administrative stewards of increasingly large areas of logged-over forests, forestry departments have often reclassified 'degraded'

forestlands (or variations such as 'barren' and 'wasteland') for conversion to monoculture timber or pulpwood plantations, agribusiness estates, infrastructure projects and/or smallholder agricultural settlements (Barr and Sayer, 2012). Here, Barney (2008, p. 101) noted, 'Identifying forest-land as degraded forest is useful for the political project of evacuating these zones of substantive social, economic, and ecological significance.'

In multisectoral spatial planning processes, 'degraded' forests can also be the subject of intense inter-agency struggles, as ministries of forestry, agriculture, mining, industry and infrastructure compete for authority over these areas to advance their own sector's development plans and to control the economic rents associated with the land, residual timber and/or subsoil minerals (Ascher, 1999). Powerful industry lobbies frequently use their political influence (both formal and informal) to shape the policy and planning decisions that emerge from such processes (Ascher, 1999; Barbier, 2005).

In countries where states exercise relatively weak control over forests, pressures for forest conversion are shaped much more heavily by the land-use decisions of smallholders and corporate actors operating in loosely regulated frontier regions (Tsing, 2004; Barney, 2008). A growing body of economic analysis suggests that forest transitions are linked to broader processes of land-use change in a particular country or region, and these are frequently shaped by market and policy processes outside the forestry sector per se (Mather, 2007; Barbier *et al.*, 2010). As Barbier *et al.* (2010, p. 99) explained: '[F]orest cover changes over time as the value of one land use relative to the value of its competing use changes over time... [I]f in any time period, the marginal benefits from agricultural production exceed the forest benefits, more land will be allocated to agricultural conversion.'

Although the immediate drivers of deforestation will vary from one context to another, clearance of forests is often encouraged by policy, market and institutional factors that increase the relative profitability of expanding croplands and pasture, versus

maintaining forest cover on the one hand, versus intensifying existing agricultural lands on the other (Angelsen and Kaimowitz, 1999; Chomitz *et al.*, 2007).⁶ While decisions concerning forest conversion are heavily shaped by the economic returns expected from competing land-use options, such decisions are rarely determined by market forces alone and, indeed, are often guided by distorted economic and policy incentives. As Barbier *et al.* (2010, p. 99) argued, '[T]he actual values that are used to allocate land may be far from optimal; [and] the presence of market, policy, and institutional failures... can distort economic and political incentives [and] lead to bias in favour of one type of land use over the other.' Market and governance failures encouraging tropical forest conversion and fragmentation commonly include weak property rights, inappropriate taxes and subsidies, and a general tendency to ignore the range of non-market environmental benefits that primary forests (even after logging) provide.

In recent years, the conversion of tropical forest lands to agriculture has increased dramatically in some regions with the leasing and sale of arable land to foreign companies and governments. These large-scale land acquisitions and commercial transactions, often termed 'land grabs', are undertaken by international corporations, sovereign wealth funds, foreign governments, private equity firms, and domestic corporate and state actors (Borras and Franco, 2012; Seo and Rodriguez, 2012). The objective on the part of governments is to secure food and fuel for growing populations in countries with poor agricultural land, or in those suffering from depleted soils, water shortages and projected energy deficits.⁷ Much of the 'grabbing' of arable land has occurred in Africa – where land is comparatively cheap and considered plentiful and underutilized – as well as in South-east Asia, Latin America and Eastern Europe (McMichael, 2011). In many cases, large land transactions are linked to broader trade and investment agreements between resource-rich and investor country governments. In this way, sustainability concerns are often subordinated to the 'realpolitik' of commercial and diplomatic interests.

Throughout the tropics, roads are a key determinant of land use, and there is often a strong correlation between the development of roads and forest fragmentation (Angelsen and Kaimowitz, 1999; Chomitz *et al.*, 2007). On the one hand, roads make forest landscapes more accessible, facilitating the movement into these areas of agricultural settlers and large-scale commercial actors. On the other hand, roads link forest-agricultural frontiers to markets, thereby raising the profitability of food crops and agro-industrial commodities produced in these regions. Road networks play an integral role in shaping the geographical distribution of particular types of land use, and in this way they significantly influence the spatial geometry of forest fragmentation (Perz *et al.*, 2008a). The specific impacts of roads on forests are shaped by a host of 'road governance' issues, including: who builds and operates the roads and who has access; how decisions are made concerning routing, distance, and function; whether roads are paved or unpaved; how roads link to other infrastructure (e.g. ports, markets and other roads); and how road projects are financed (Perz *et al.*, 2008a,b). Analyses of the effects of roads on forest fragmentation in Amazonia and elsewhere have distinguished between the impacts of 'official roads' built by government agencies and 'unofficial roads' built by non-state actors (Box 10.3).

Globalization and the Governance of Transnational Commodity Networks

Over the past quarter of a century, the transformation of tropical forest landscapes has been driven, to a significant extent, by the combined effects of globalization (Lambin and Meyfroidt, 2011). Global markets for forest products and agricultural commodities have both expanded and become more integrated with the removal of tariff and non-tariff barriers to trade under GATT, the World Trade Organization, and other multilateral trade agreements. At the same time, liberalization of the global financial sector has facilitated transnational flows of capital, technological innovations have enabled the

Box 10.3. Roads and forest fragmentation in the Brazilian Amazon

In Amazonia, the construction of roads has been a major determinant of land-use change and has heavily influenced patterns of forest fragmentation. Official roads include inter-regional highways built or financed by governments and multilateral institutions, and their effects on deforestation and fragmentation are often macro in scope. They often 'form sparse networks, leaving large blocs of forest intact since parallel corridors are often hundreds of kilometres apart' (Perz *et al.*, 2008b, p. 1891). However, by connecting agricultural frontiers with ports and markets, official roads have been instrumental in facilitating the expansion of Brazil's cattle and soy industry into forested regions. One well-documented example is the BR-163 highway, which has functioned as a soy corridor running north to south through Pará and Mato Grosso states (Nepstad *et al.*, 2002; Fearnside, 2007). A significant factor shaping the impacts of roads on forests is whether they are surfaced, as surfacing substantially reduces transport costs, which, in turn, increase the profitability of land-extensive investments in frontier regions. The development of surfaced roads – and in some cases, even the expectation of road paving – causes land values to rise, and often encourages forest clearing by speculators as a way to establish land claims (Fearnside, 2007).

Unofficial roads, by contrast, are built by non-state social actors and are specifically instrumental in converting forests to other land uses. According to Perz *et al.* (2008b, p. 1891), '[U]nofficial roads form much denser networks in landscapes because they are often spaced only a few kilometres apart...[and these] networks fragment forest cover into smaller, more irregularly shaped and often more isolated patches that are more ecologically vulnerable.' In many cases, unofficial road networks extend outwards from much larger official roads, while in other places, they emerge where forests have initially been opened up by logging roads. The specific effects that unofficial roads have on the geometry of forest fragmentation are often shaped by local biophysical conditions as well as the land-use and colonization histories through which they are constructed. Perz *et al.* (2008a, p. 87) described the fragmentation effects of a road network where colonization was planned by INCRA, the national land settlement agency, as having a "fishbone" pattern, characterized by elongated, irregularly shaped fragments organized in more or less parallel rows between deforested areas.' By contrast, in areas where roads have been developed 'spontaneously' by land users, the sizes of forest fragments vary with distance from towns: 'Close to towns, most land has been cleared, leaving isolated fragments, whereas far from towns, there are relatively few, large, rectangular clearings surrounded by large blocks of forests' (Perz *et al.*, 2008b, p. 90).

rapid exchange of information on a global scale, and infrastructure and logistics development has led to increased efficiency in the transport of goods worldwide. The effects of these changes on tropical forest landscapes have been powerfully reinforced by the simultaneous rise of China – and to a lesser extent, India and other emerging economies – as major importers and, in some cases, processors and re-exporters of forest products and agricultural commodities.

Increasingly, large-resource firms are sourcing raw materials from multiple geographical locations and coordinating these into centralized and highly capitalized production facilities (e.g. agro-industrial complexes, biofuel refineries, large pulp and paper mills) for processing and onward export (Bridge, 2008). These global production networks are establishing new divisions of labour, accessing financial markets in new

ways and encouraging modes of governance based upon increasingly rapid turnover of capital – collectively leading to a more intensive commodification of tropical forest landscapes and the resources they contain (Dauvergne and Lister, 2011). Examples of global production networks in the forestry sector include the transnational wood fibre supply chains that supply Japanese and Chinese pulp and paper mills, which in turn generate processed paper products for domestic markets and for export to the USA and Europe, or IKEA's global wood furniture production system, in which plantation timber is sourced from Brazil, processed in Vietnam and then re-exported to consumers in the EU. Where such commodity networks are documented and transparent, there are opportunities for implementing improved sustainability regulations that might serve to limit associated forest fragmentation effects.

However, in cases where such global supply networks are non-transparent and/or illegal, there are significant barriers to the sustainable management of forest lands.

Different forest zones and global forest-based commodity supply chains can be governed through institutions at multiple scales. These include, for instance: traditional state authorities and national legal frameworks; corporate social responsibility programmes, commodity-specific roundtables (e.g. the Roundtable on Sustainable Palm Oil), and other voluntary standards; global financial mechanisms, such as the Equator Principles; consumer/market-based regulation (e.g. eco-certification with third-party auditing); or new legal-verification import requirements such as through the US Lacey Act Amendment or the EU FLEGT programme. In practice, however, the effectiveness of these regulatory systems is often uncertain. The rapid expansion of transnational governance requirements into developing country resource sectors and local contexts raises not only issues over the effectiveness and public accountability of market-based governance systems but also issues of developing country sovereignty (Vandergeest and Unno, 2012). At times, private-sector actors have voiced opposition to so-called 'green tape' and the increasing transaction costs involved in meeting proliferating certification standards.

Alternatively, some transnational corporations manage forest-land assets through large concessions that seemingly operate on the blurred edges of formal, legal regulation (e.g. Global Witness, 2013, in Laos and Cambodia). In such fragile and locally weak state environments, there can be significant challenges for forestry authorities to monitor and regulate effectively powerful transnational actors, who operate with high-level political backing. At the level of central state governance, a number of forest-rich, authoritarian regimes in South-east Asia and elsewhere may be undergoing a process of 'illiberal adaptation' (Felker, 2008), establishing new accommodations with neoliberal economic forces, while also working to consolidate the state's internal power and authority and forestry patronage networks. The prospects for stemming the tide of forest

fragmentation and deforestation in such contexts would appear to be less positive.

Viewed from another perspective, the specific challenges associated with managing fragmented forests have led to the development of new approaches to forest management and conservation. The past decade, for instance, has seen an emerging consensus among corporate actors, conservation organizations and professional forestry institutions on the importance for forestry planning and management decisions to take account of the broader landscapes with which (fragmented) forests are situated (International Tropical Timber Organization, 2005; Sayer and Maginnis, 2007). In particular, the concept of landscape mosaics explicitly recognizes the fact that forest fragments often exist in proximity to lands being managed for a variety of other uses; and even in fragmented form, forest resources can provide essential economic, socio-cultural and environmental functions at the landscape level. This approach further encourages collaborative resource management practices among the often-diverse sets of stakeholders whose management decisions are likely to affect forests within a given landscape.

Among conservation organizations, the fragmentation of tropical forests has significantly influenced the strategies, institutional arrangements and international norms commonly used for biodiversity preservation. Increasingly, conservation efforts are now focusing on the preservation of not only large, intact forests but also forest islands containing vulnerable flora or fauna and/or unique ecosystems within landscapes undergoing transformation. This approach has led many of the world's largest conservation organizations – including the Worldwide Fund for Nature, The Nature Conservancy and Greenpeace, among many others – to collaborate with corporate actors directly involved in large-scale conversion of tropical forests, in an effort to protect fragments of natural forest within areas being converted to other land uses. Where fragmented forests are conserved to protect priority species, the size of the fragments and proximity to other fragments are frequently points of critical concern. These can determine whether the

forested areas being protected are of sufficient size to sustain viable populations of key species. The use of biodiversity corridors to link forest fragments can also facilitate the movement of migratory species and/or those requiring a sizeable range, as well as to maintain a more diverse pool of genetic resources than a single fragment could provide.

In some cases, stakeholders have voiced concerns that corporate actors may be using such collaborations with conservation organizations – and, paradoxically, some of the tools designed to conserve forest fragments within multi-use landscapes – to legitimize continued clearing of natural forests. The use of ‘high conservation value forest’ (HCVF) assessments by Indonesia’s leading pulp and paper producers, for instance, has raised concerns that a tool designed to protect priority conservation areas may in fact be giving the companies a ‘green light’ for large-scale forest conversion (Edwards *et al.*, 2012) (Box 10.4).

Displacement of Customary Management Systems and Socio-cultural Fragmentation

In many tropical countries, the assertion of state control over forests has been accompanied by the displacement of forest management systems utilized by local communities. In particular, national forestry laws have frequently endowed state agencies with far-reaching administrative control over forest resources, while placing constraints on customary tenure institutions (Colchester, 2006; Sunderlin *et al.*, 2008). For indigenous groups and other rural communities, this has often meant that access to land and forest resources – commonly including areas they had owned and managed for generations – has become restricted and many customary management practices deemed illegal. The resulting legal ambiguities and widespread

Box 10.4. Mega-scale pulp mills and forest fragmentation in Indonesia’s Riau province

Since the mid-1990s, Indonesian-based multinationals Asia Pulp & Paper (APP) and Asia Pacific Resources International Ltd (APRIL) have operated two of the world’s largest kraft pulp mills in Riau province on the island of Sumatra. With a combined pulp production capacity of 5.4 million air-dried tonnes per year (in 2013), the two producers’ flagship mills – APP’s Indah Kiat and APRIL’s Riau Andalan Pulp & Paper (Riaupulp) – consume approximately 24 million tonnes of wood fibre annually. For the past two decades, this structural demand for wood fibre has been a significant driver of forest fragmentation in Riau and beyond (Barr, 2001b; Obidzinski and Dermawan, 2012). Forestry companies affiliated with APP and APRIL have converted large areas of degraded natural forest to fast-growing pulpwood plantations under the Ministry of Forestry’s Hutan Tanaman Industri (HTI) industrial plantation policy. Moreover, the pulp mills’ demand for fibre has encouraged the clearing of forested areas for the development of oil palm estates and other land uses. A 2008 study by the Worldwide Fund for Nature found that Sumatra lost 49% of its natural forest cover between 1985 and 2008/2009, and the losses were heaviest in Riau where Indah Kiat and Riaupulp are located (Worldwide Fund for Nature, 2008).

In response to sharp criticisms from civil society organizations and growing concerns from pulp and paper buyers, both APP and APRIL have implemented a range of initiatives aimed at persuading stakeholders that their operations are sustainable. Prominent among these has been a commitment from both companies to refrain from clearing areas designated as HCVF. Under these commitments, APP and APRIL have agreed to conduct HCVF assessments of all forests within their concessions prior to the clearing and conversion of these areas to pulpwood plantations. Proponents of this approach view HCVF assessments as an essential tool for conservation, which can effectively protect fragments of natural forest that have important ecological or social functions. More sceptical stakeholders are concerned, however, that, in Riau’s highly industrialized landscape, APP and APRIL may be using HCVF assessments to create the aura of sustainability and technical legitimacy for the continued clearing of degraded natural forests on a large scale (Edwards *et al.*, 2012). Moreover, significant questions remain about the functional viability of forest fragments designated as having a ‘high conservation value’, as neither company routinely discloses where these areas are located or how they are managed after the HCVF assessment has been conducted.

conflicts represent a major breakdown in forest governance, and, in many regions, these have contributed to forest degradation and fragmentation and to negative impacts on the well-being of forest-reliant communities.

The subordination of customary tenure and management systems to state forestry laws was often initially imposed during the colonial era but has since been reinforced and expanded by post-colonial states across the tropics.⁸ In many countries, state forestry agencies have used their authority not only to promote commercial development within the sector but also to restrict customary forest management and land-use practices. In both insular and mainland South-east Asia, for instance, forestry departments have adopted policies aimed at eradicating swidden agricultural systems in upland areas. As Fox *et al.* (2009, p. 308) explained, 'Post-colonial forest management authorities in these countries oversaw the massive expansion of national production and protection forests, the implementation of fast-growing timber and pulp plantations, development of industrial forestry policies, and in concert with these new land uses, the widespread criminalization of swidden cultivation.'

In some cases, governments have forcibly removed swidden communities from upland forest areas and resettled them in sites designated for sedentary agriculture (Dove, 1983; Baird and Shoemaker, 2007; Padoch *et al.*, 2007). Ironically, state forestry agencies have often justified such policies as being necessary to protect (state-controlled) forests from being fragmented by customary agricultural practices. A substantial body of research has determined, however, that, in the absence of severe population pressures or enclosure due to 'artificial' land use squeezes (such as the zoning of exclusionary protected or conservation forest areas, which confine swiddeners into increasingly smaller areas), long-fallow swidden agricultural systems can be highly appropriate and broadly sustainable strategies for producing food and managing forests sustainably in upland ecosystems (Dove, 1983, 1993; Fox *et al.*, 2000; Padoch *et al.*, 2007). This is not to suggest that community-managed forests are universally sustainable, and many communities have moved into

management practices that are as likely to fragment forests as those promoted by state forestry agencies (cf. Garcia *et al.*, 2010; Feintrenie *et al.*, 2010; Temudo, 2012). The point, rather, is that traditional management systems continue to be marginalized and criminalized today without regard to the extent to which they are sustainable or not.

With the creation of the political forest, the state's view of what constitutes a forest was often superimposed over deeply-rooted social and cultural landscapes. Complex traditional forest management systems were undermined and, in many instances, forcibly circumscribed. Forest fragmentation can therefore be understood as both a biophysical process – i.e. in terms of its impacts on forest spatial structure and ecosystem functioning – and a socio-cultural process. In many cases, policies aimed at curtailing customary agricultural and forest management practices have effectively fragmented socio-cultural landscapes within which forests had been managed sustainably for centuries, with enormous implications for the health, well-being and cultural resilience of these groups (e.g. Dove, 1993; Balee, 1994; Posey, 2000; Fox *et al.*, 2009). Squeezed into increasingly small and marginal lands, and prohibited from accessing forests and resources, upland communities in many areas have been set up for unsustainable livelihoods, and, as discussed below, the pressure on their land and resources continues.

Vested with far-reaching legal authority to administer forests, state forestry agencies have often viewed the territory under their control as being essentially devoid of human occupants and unencumbered by competing tenurial claims. Within these agencies, government planners have routinely drawn land-use maps and demarcated the boundaries of timber concessions and agro-industrial estates with little attention to the locations of villages or local agricultural and forest management systems. Sociologist James Scott (1998) described this process as 'seeing like a state', noting that what state institutions are able to see is generally guided by the policies and plans they are charged with implementing, rather than the physical or socio-cultural realities on the ground.⁹ Across the

tropics, however, a large yet undetermined number of people – minimally, tens of millions and perhaps hundreds of millions¹⁰ – live within and around the boundaries of state-controlled forests (World Bank, 2002; Colchester, 2006). In Indonesia, for example, the Ministry of Forestry has reported that some 40,800 villages are located in and around the national forest estate, and 25% of these are either situated within or immediately adjacent to the boundaries of the forest estate (Departemen Kehutanan, 2009). As these figures suggest, significant areas of state-controlled forestlands are (still) actively managed by local communities under various agroforestry systems (Fay and Sirait, 2004; Contreras-Hermosilla and Fay, 2005).

In many contexts, the state's failure to 'see' forest-reliant communities – much less recognize their rights to forest land and resources – has resulted in tenure disputes and, at times, violent conflicts. This has commonly occurred when state forestry agencies have allocated timber concessions or plantation licences for areas that overlap with territory claimed as customary domain by local communities (Harwell, 2003). Where formal institutions for resolving such disputes are weak or non-existent, resistance strategies by communities have frequently included the blocking of logging roads, the seizure of heavy equipment, the burning of forestry offices and the destruction of timber camps or plantation sites. Operating within such areas, timber and plantation companies have often drawn on government security forces and/or private security contractors to protect their activities from disruption – and in many cases, this has effectively extended the militarization of commercial forestry within such landscapes (Harwell, 2010).

Whether or not disputes over forest tenure ultimately lead to violence, the potential for conflict serves as a strong disincentive for all stakeholders – companies, communities and government agencies – to make significant investments in the sustainable management of forests over the long term. In contrast, competing tenure claims and high levels of uncertainty over how these will be resolved essentially encourage all parties to pursue the maximum benefits they can capture from

forests in the short term. As tenure rights and control over forests become increasingly contested, forests are subject to opportunistic expropriation by many different actors, leading to a 'tragedy of open access' and large areas of 'ambiguous lands' (Hardin, 1968; Sato, 2000). Collectively, these pressures frequently lead to uncontrolled logging and conversion of forests at multiple scales, and over time, this can result in both the loss of forest cover and the degradation and fragmentation of forests that remain standing.¹¹

Such outcomes have become especially prevalent in areas affected by 'land grabbing', as described above. Many land deals have resulted in the displacement of local communities, who often lack formal property titles and use their land under customary tenure arrangements. Deals between foreign investors and local governments are often arranged outside the public sphere, with very little transparency and external accountability, and so communities may not even be part of the negotiations in which their land is sold or leased (Cotula *et al.*, 2009; Seo and Rodriguez, 2012).¹² As Zoomers (2011, p. 18) noted:

The poorer groups are usually the first to lose ground, certainly if they still do not possess formal property rights despite large-scale land titling programmes (people with only customary rights enjoy little protection from the law). At the same time, it is mainly the poorer groups who first decide to sell their land, because of their need for capital (distress sales), and new means of livelihood are not always readily available.

Over the past two decades, efforts have been made to reverse some of the damage resulting from state domination of the forest territories, and the denial of customary rights and practices. Significantly, there has been a trend towards greater recognition of the land, resource, human and cultural rights of indigenous peoples in international and national law (e.g. the UN Declaration on the Rights of Indigenous Peoples, 2007; the Convention on Biological Diversity, 1992 (e.g. Article 8j); the International Labor Organization's Convention No. 169; Posey, 2000). Among corporate actors involved in commercial forestry, agribusiness, and extractive industries, there has also been a

growing adoption of principles of 'free, prior, and informed consent' as best practice in engaging with local communities likely to be affected by the operations of these companies (Colchester and Ferrari, 2007).

At the same time, many countries have moved to decentralize administration of forests within governments and to devolve control over forests from governments to local people (Ribot, 2002; Sunderlin *et al.*, 2008; Moeliono *et al.*, 2009). Decentralization initiatives have had mixed results in terms of impacts on forests and rural communities, and the transfer of authority to local groups has often resulted in management practices that are no more sustainable than those administered by national governments (see Box 10.5). In some tropical countries, moreover, national governments have aggressively sought to recentralize administrative control over forests (Ribot *et al.*, 2006). Several tropical forest countries, mostly in South America, have also

made significant changes in forest tenure in the last ten years.¹³ Brazil, Peru and Bolivia, for instance, have significantly increased land transfers to indigenous and community control. However, the granting of rights has not guaranteed their realization: in these countries, oil, gas and mining exploration has proceeded in violation of indigenous land titles, and in some cases, loggers, ranchers and miners have moved into extractive reserves with limited government response (Sunderlin *et al.*, 2008).

Conclusion

In this chapter, we have examined the links between commercial logging and forest conversion, governance failures and the fragmentation of tropical forests. We have shown how, as with broader processes of deforestation and degradation, forest fragmentation

Box 10.5. Forest fragmentation through conversion of 'degraded' community-managed forests into plantations in Laos

In Laos, regional and transnational companies have sought large-scale land concessions from the Lao state for rubber and eucalyptus plantation projects. While the Lao state claims that there are thousands of hectares of available 'degraded' forest land available in each province for allocation to companies, in reality almost all accessible rural forest lands in Laos are claimed and managed under customary community ownership (Barney, 2008). Degraded forest lands are zoned and demarcated out of complex, community-managed forest landscapes, and allocated to companies through the state Participatory Land Use Planning (PLUP) policy. Typically, these degraded, 'unused' forests are community-managed swidden fallow lands, and are very important for local agricultural and food security systems and socio-cultural identities.

In Laos, some plantation companies ignore the formal land policy framework and, seemingly with high-level political backing, engage in blatant seizures of land from communities. Other firms, whose international commitments and reputations hold them more closely to formal legal procedures, have found the promised plantation concession land impossible to secure in practice. They have been required to undertake detailed and time-consuming negotiations with communities in their allocated project areas in an attempt to secure plantation land. With the enforced limitations on expressions of dissent against state policy in Laos, simmering land conflicts between companies and communities in Laos are now prevalent (e.g. Vientiane Times, 2013).

In mid-2012, the Lao Government announced a freeze on concessions for eucalyptus and rubber until 2016, to allow time to review the effectiveness of state policies in the plantation sector. As with a series of previous plantation concession moratoria between 2007 and 2009, however, there are questions concerning the ability of the central agencies to enforce these policy decisions effectively, due to the extent of discretionary decision making that characterizes the sector. In this way, the politics of land ownership and tenure policies in developing countries, the role of multiple state actors, institutions and bureaucracies, diverging corporate norms and regulatory standards, the high global demand for forest-land commodities, and the contested politics of state–society relations can all be intricately bound up with the spatial patterns of tropical forest fragmentation.

is often driven by weaknesses, contradictions and breakdown of forest governance institutions. The bases for forest governance failures include: (i) poorly formulated policies and regulations, especially related to commercial timber extraction; (ii) corruption and weak law enforcement; (iii) the influence of patronage politics and the dominance of commercial forestry by political and military elites; and (iv) conflicts between national forestry laws and customary tenure regimes.

However significant the effects of forest governance failures may be, forest fragmentation in many parts of the tropics is also driven by extra-sectoral governance processes, which provide strong incentives for forest cover removal. Most visibly, state-led spatial planning processes often promote the conversion of forested areas to a variety of other land uses, including agro-industrial tree crops, ranching, mining, smallholder agriculture, roads, and other infrastructure and development projects. One significant effect of land-use planning processes is that the spatial distribution of forest fragmentation is frequently non-random and is heavily shaped instead by government policies and planning decisions.

Changes in forest land use are also linked to increasingly globalized financial flows and the extension and deepening of global commodity markets, as well as the recent emergence of land grabbing linked to a new model of state capitalism and sovereign wealth funds. In this way, government trade and investment policies, as well as macroeconomic and fiscal policies, also represent important drivers of deforestation and forest fragmentation. Although such policies are generally designed to affect either the economy as a whole or a range of sectors well beyond forestry, they often have profound

impacts in shaping the rate, extent and locus of forest cover loss and fragmentation.

The links between governance and forest fragmentation in the tropics are rarely unilinear, however. As forests become increasingly fragmented at multiple scales, forest fragmentation itself has emerged as a problem that requires innovative governance solutions. As state-controlled forest zones become increasingly fragmented, for instance, there is a growing recognition that effective management and protection of remaining forests will require meaningful forest tenure reform to strengthen rights of rural communities, restrictions on which often have their roots in colonial forest policies (Sunderlin *et al.*, 2008). For government forestry planners and commercial land users, there is also a growing recognition of the need to manage fragmented forests as part of the broader landscapes within which they are situated (Sayer and Maginnis, 2007). These commonly include a mosaic of different land uses managed by a variety of actors.

For conservation organizations, the challenges of protecting fragmented forest ecosystems highlight a need for innovative tools and institutional mechanisms. These are needed on the one hand to ensure that the areas conserved can support viable populations of critical species in spite of being spatially dispersed, and on the other hand to incorporate biodiversity conservation objectives into the management of broader landscapes, including those managed by corporate actors and by local communities. Finally, for proponents of REDD+, forest fragmentation poses significant challenges both for securing adequate scale of forest carbon projects and for managing, measuring, reporting and verification processes across fragmented landscapes without undue transaction costs.

Notes

¹Prominent institutions that have promoted sustainable forest management through selective logging timber concessions include, among others, the Forest Stewardship Council, International Tropical Timber Organization, United States Agency for International Development, International Finance Corporation, Center for International Forestry Research, World Wide Fund for Nature, The Nature Conservancy and Rainforest Alliance.

²Rice *et al.* (1997, p. 46) noted, for instance, that ‘real interest rates on dollar-denominated accounts in Bolivia...averaged 17 per cent [during the mid-1990s], compared with 4 per cent in the US. Similar high rates of interest are common in most Latin American countries.’

³Significantly, governance failures related to rent seizing are not limited to the allocation of timber concessions to state elites. Rather, they can also result from corruption and misuse of forestry revenues after they have been collected by the government. The loss of several billion dollars from Indonesia’s Reforestation Fund, a government-managed fund established in the late 1980s with a mandate to finance reforestation and forest rehabilitation, provides a striking example of this (Barr *et al.*, 2010).

⁴As of March 2013, the EU had either signed or was in the process of negotiating VPAs with the following countries: Ghana, Cameroon, Liberia, Central African Republic, Republic of Congo, Democratic Republic of Congo, Gabon, Côte d’Ivoire, Indonesia, Malaysia, Vietnam, Guyana and Honduras. A review published in 2010 found that the VPA process was motivating participating producer countries to improve the monitoring and tracking of timber produced in their jurisdictions (Lawson and MacFaul, 2010). The challenges they face, however, are reflected in the following characterization of Cameroon’s timber inspection system: ‘The system does not track back to the stump – logs are often first marked many kilometres from the location of harvesting. The system also does not allow for easy reconciliation, and export volumes are rarely checked against licensed production volumes. Although the transport documents include some tamper-proofing measures, they are not sufficient to prevent counterfeiting. More timber transportation permits are often issued to logging companies than are required, and unused permits are not recovered; this has allowed companies to launder illegal logs into the system. The situation is showing signs of improvement, however. A new and more sophisticated timber-tracking system...is currently being developed in the context of the VPA being negotiated with the EU’ (Lawson and MacFaul, 2010, p. 23).

⁵It should be noted that the conversion of natural forest to pulpwood plantations is generally not reflected in official deforestation statistics (including, for instance, those published by the FAO or Indonesia’s Ministry of Forestry). The FAO defines ‘deforestation’ as ‘the conversion of forest to another land use or the long-term reduction of the tree canopy below the minimum 10 per cent threshold’ (Schoene *et al.*, 2007). Under this definition, the replacement of natural forest by monoculture plantations of exotic tree species is not considered to be deforestation, as it is not considered to be a change of land use or a reduction of tree canopy below 10%. Nevertheless, the development of pulpwood plantations in areas previously covered by natural forests can have many of the same fragmentation effects in forest landscapes as would occur under conversion to oil palm or other non-forestry land uses (Lang, 2009).

⁶According to Angelsen and Kaimowitz (1999, p. 81), higher prices for agricultural goods produced in frontier regions will typically stimulate increased forest conversion: ‘As frontier agriculture becomes more profitable, both the existing population and migrants from other areas begin to shift resources into forest clearing. Higher prices also provide capital to put additional land under agricultural production.’ Similarly, the availability of credit can lead to increased deforestation, but it generally does so only when it is allocated ‘to finance activities associated with forest clearing, such as cattle ranching’, as has been the case in Latin America (Angelsen and Kaimowitz, 1999, pp. 83–84). There is also strong evidence to suggest that ‘higher rural wages reduce deforestation by making agricultural and forestry activities more costly’, while ‘at the individual household level, greater off-farm employment opportunities produce a similar effect by competing with such activities for labor’ (Angelsen and Kaimowitz, 1999, p. 84).

⁷Significant momentum for exploitative land-grab processes has arisen from accelerating global commercial pressures on resources, rising commodity prices and the convergence of food, biofuel and wood-fibre markets (Roberts *et al.*, 2008). Extreme weather events, increased costs of petrochemical fertilizers and transportation, and competition from biofuels for agricultural land resulted in volatile food markets in 2007–2008. Spikes in food prices sent both investors and ‘food-insecure’ governments – like those of China (a net importer of food since the early 2000s), South Korea, Japan and the Gulf States – around the world in search of fertile agricultural land (Zoomers, 2011; Seo and Rodriguez, 2012). McMichael (2011, p. 12) described the ongoing land-grabbing processes as a response to a ‘conjunctural crisis’ in capitalist ecology: ‘Rising food prices, peaking oil, emission mandates, and stalled investment funds find material resolution in the land grab, accompanied by an ideology of enclosure in the name of humanity (food) and the environment (green fuel).’ Collectively, these forces have created intense new pressures for the conversion and fragmentation of tropical forests to supply food, biofuels and other commodities for expanding and geographically distant global markets.

⁸As Peluso and Vandergeest (2001) explained, colonial governments in South-east Asia placed restrictions on the unauthorized harvesting of valuable species such as teak, and introduced regulations limiting the activities of local people in the political forest. They granted exemptions for some customary practices

under the legal category Customary Rights, but many forms of customary resource use were taxed and required permits, or were considered 'forest crime'. In some cases, Customary Rights developed in one region were inappropriately applied to another (i.e. length of fallows allowed before land was considered abandoned and reverted to the state), and in other cases, communities were granted rights to undertake activities they did not practise in the first place. The limited recognition of Customary Rights helped governments to implement state forestry laws by striking a balance between consent and coercion, while appearing to be generous.

⁹Michael Dove argued that the inability (or unwillingness) of state actors to 'see' customary management practices has broadly undermined the effectiveness of government policies intended to promote both rural development and sustainable forestry: 'The main reason that policy fails (and will continue to fail) is that government officials have created a set of official myths about villagers' forest management which block their capacity either to see things from forest villagers' viewpoint or to formulate more equitable policies such as bottom-up management, community involvement in decision-making, or co-management strategies' (Dove 1993, cited in Peluso *et al.*, 1995, p. 212).

¹⁰The World Bank (2002) provides the following global estimates; however, these are not specific to the tropics: 'More than 1.6 billion people depend to varying degrees on forests for their livelihoods. About 60 million indigenous people are almost wholly dependent on forests. Some 350 million people who live in or adjacent to dense forests depend on them to a high degree for subsistence and income. In developing countries about 1.2 billion people rely on agroforestry farming systems that help to sustain agricultural productivity and generate income' (World Bank, 2002, cited by Colchester, 2006, p. 3).

¹¹Barbier *et al.* (2010, p. 103) described the effects of tenure insecurity on farmers' land-use decisions in frontier regions from the perspective of resource economics: '[T]he lack of property rights and regulations means that farmers in forested regions face little or no opportunity costs of converting these forests to agriculture.... Since the source of cleared land (i.e. forested areas) is an open access resource, farmers will keep converting land until the additional profits gained from clearing additional land just cover the labour and other costs involved in conversion. Perversely, however, insecure tenure and property rights mean that farmers are often required to make additional expenditures in defending and protecting their cleared land from appropriation by other farmers, squatters and even land speculators. These additional expenditures and effort may be prohibitive, and combined with the problem of declining agricultural yields on poor forest soils, often lead to abandonment of farmland after only a few years of initial cultivation. As a result, in many tropical forested regions, such as the Brazilian Amazon, excessive forest conversion to agriculture and substantial cropland abandonment occur simultaneously'.

¹²Foreign corporate and governmental entities claiming land in order to extract natural resources is, of course, not a new phenomenon, and the roots of current practices can be traced to the political forest created by colonial governments. As McMichael (2011, p. 1) noted: '[L]and grabbing is nothing new, and yet the recent "land rush" has its own distinctive features...land grabbing today continues the aggression of colonialism, but this time with a desperation born of crisis....'

¹³In a potentially significant development, Indonesia's Constitutional Court in May 2013 annulled the state's claims to customary forests. In response to a petition filed by Indonesia's National Indigenous Peoples' Alliance, AMAN (Aliansi Masyarakat Adat Nusantara), the Court eliminated the word 'state' from Article 11 of Indonesia's 1999 Law on Forestry, which previously stated that 'customary forests are state forests located in the areas of custom-based communities' (AMAN, 2013; Pasandaran, 2013).

References

- AMAN (Aliansi Masyarakat Adat Nusantara) (2013) Constitutional Court Agrees on Judicial Review of UUK. May 16, 2013.
- Angelsen, A. and Kaimowitz, D. (1999) Rethinking the causes of deforestation: lessons from economic models. *World Bank Observer* 14, 73–98.
- Ascher, W. (1999) *Why Governments Waste Natural Resources: Policy Failures in Developing Countries*. Johns Hopkins University Press, Baltimore, Maryland.
- Baird, I.G. and Shoemaker, B. (2007) Unsettling experience: internal resettlement and international aid agencies in Laos. *Development and Change* 38, 866–888.
- Balee, W. (1994) *Footprints of the Forest: Ka-apor Ethnobotany – The Historical Ecology of Plant Utilization by an Amazonian People*. Columbia University Press, New York.

- Barbier, E.B. (2005) *Natural Resources and Economic Development*. Cambridge University Press, Cambridge.
- Barbier, E.B., Burgess, J.C. and Grainger, A. (2010) The forest transition: towards a more comprehensive theoretical framework. *Land Use Policy* 27, 98–107.
- Barney, K. (2008) China and the production of forestlands in Laos: a political ecology of transnational enclosure. In: Nevins, J. and Peluso, N.L. (eds) *Taking Southeast Asia to Market: Commodities, Nature, and People in the Neoliberal Age*. Cornell University Press, Ithaca, New York, pp. 91–107.
- Barr, C. (1998) Bob Hasan, the rise of Apkindo, and the shifting dynamics of control in Indonesia's timber sector. *Indonesia* 65, 1–36.
- Barr, C. (2001a) Will HPH reform lead to sustainable forest management? Questioning the assumptions of the "sustainable logging" paradigm in Indonesia. In: Barr, C. (ed.) *Banking on Sustainability: Structural Adjustment and Forest Reform in Post-Soeharto Indonesia*. Center for International Forestry Research and WWF Macroeconomics Program Office, Washington, DC.
- Barr, C. (2001b) Profits on paper: the political economy of fiber, finance, and debt in Indonesia's pulp and paper industry. In: Barr, C. (ed.) *Banking on Sustainability: Structural Adjustment and Forest Reform in Post-Soeharto Indonesia*. Center for International Forestry Research and WWF Macroeconomics Program Office, Washington, DC.
- Barr, C. and Sayer, J. (2012) The political economy of reforestation and forest restoration in Asia-Pacific: critical issues for REDD+. *Biological Conservation* 154, 9–19.
- Barr, C., Dermawan, A., Purnomo, H. and Komarudin, H. (2010) *Financial Governance and Indonesia's Reforestation Fund during the Soeharto and Post-Soeharto Periods, 1989–2009: A Political Economic Analysis of Lessons for REDD+*. Center for International Forestry Research (CIFOR), Bogor, Indonesia.
- Bierregaard, R.O. Jr, Gascon, C., Lovejoy, T. and Mesquita, R. (eds) (2001) *Lessons from Amazonia: The Ecology and Conservation of a Fragmented Forest*. Yale University Press, New Haven, Connecticut.
- Blundell, A.G. (2010) *Forests and Conflict: The Financial Flows that Fuel War*. World Bank, Washington, DC.
- Borras, S. Jr and Franco, J. (2012) Global land grabbing and trajectories of agrarian change: a preliminary analysis. *Journal of Agrarian Change* 12, 34–59.
- Boscolo, M. and Vincent, J.R. (2007) Area fees and logging tropical timber concessions. *Environmental and Development Economics* 12, 505–520.
- Boucher, D.H., Elias, P., Lininger, K., May-Tobin, C., Roquemore, S. and Saxon, E. (2011) *The Root of the Problem: What's Driving Tropical Deforestation Today?* Union of Concerned Scientists, Cambridge, Massachusetts.
- Brack, D. (2012) Excluding illegal timber and improving forest governance: the European Union's Forest Law Enforcement, Governance and Trade Initiative. In: Lujala, P. and Rustad, S. (eds) *High-Value Natural Resources and Peacebuilding*. Earthscan, London, pp. 211–220.
- Bridge, G. (2008) Global production networks and the extractive sector: governing resource-based development. *Journal of Economic Geography* 8, 389–419.
- Brown, D. (1999) *Addicted to Rent: Corporate and Spatial Distribution of Forest Resources in Indonesia: Implications for Forest Sustainability and Government Policy*. Report No. PFM/EC/99/06. Department for International Development, Jakarta.
- Cerutti, P.O., Nasi, R. and Tacconi, L. (2008) Sustainable forest management in Cameroon needs more than approved forest management plans. *Ecology and Society* 13, 36.
- Cerutti, P.O., Tacconi, L., Lescuyer, G. and Nasi, R. (2013) Cameroon's hidden harvest: commercial chainsaw logging, corruption, and livelihoods. *Society and Natural Resources* 26, 539–553.
- Chomitz, K.M., Buys, P., De Luca, G., Thomas, T.S. and Wertz-Kanounnikoff, S. (2007) *At Loggerheads? Agricultural Expansion, Poverty Reduction, and Environment in Tropical Forests*. The World Bank, Washington, DC.
- Clark, C.J., Poulsen, J.R., Malonga, R. and Elkan, P.W. Jr (2009) Logging concessions can extend the conservation estate for Central African tropical forests. *Conservation Biology* 23, 1281–1293.
- Colchester, M. (2006) *Forest Peoples, Customary Use, and State Forests: The Case for Reform*. Paper presented to the 11th Biennial Congress of the International Association for the Study of Common Property (IASCP), Bali, Indonesia, 19–23 June. Forest Peoples Programme <<http://dspace.cigilibrary.org/jspui/bitstream/123456789/12086/1/Forest%20Peoples%20Customary%20Use%20and%20State%20Forests%20the%20case%20for%20reform.pdf?1>> (accessed 29 July 2014).
- Colchester, M. and Ferrari, M.F. (2007) *Making FPIC – Free, Prior, and Informed Consent – Work: Challenges and Prospects for Indigenous Peoples*. FPIC Working Paper (June). Forest Peoples Programme, Moreton-in-Marsh, UK.
- Contreras-Hermosilla, A. and Fay, C. (2005) *Strengthening Forest Management in Indonesia through Land Tenure Reform: Issues and Framework for Action*. Forest Trends, Washington, DC.

- Convention on Biological Diversity (2014) Definitions. <http://www.cbd.int/forest/definitions.shtml> (accessed 9 July 2014).
- Cotula, L., Vermeulen, S., Leonard, R. and Keely, J. (2009) *Land Grab or Development Opportunity? Agricultural Investments and International Land Deals in Africa*. UN Food and Agriculture Organization (FAO), Institute for Food and Agricultural Development (IFAD) and International Institute for Economic Development (IIED), London/Rome.
- Dauvergne, P. and Lister, J. (2011) *Timber*. Polity Press, Cambridge.
- Departemen Kehutanan (2009) Identifikasi Desa di Dalam dan di Sekitar Kawasan Hutan 2009. Ministry of Forestry, Jakarta.
- Dove, M. (1983) Theories of swidden agriculture and the political economy of ignorance. *Agroforestry Systems* 1, 85–99.
- Dove, M. (1993) Smallholder rubber and swidden agriculture in Borneo: a sustainable adaptation to the ecology and economy of the tropical forest. *Economic Botany* 47, 136–147.
- Dwyer, M. (2013) Building the politics machine: tools for ‘resolving’ the global land grab. *Development and Change* 44, 309–333.
- Edwards, D.P., Fisher, B. and Wilcove, D.S. (2012) High conservation value or high confusion value? Sustainable agriculture and biodiversity conservation in the Tropics. *Conservation Letters* 5, 20–27.
- FAO (2011) *State of the World’s Forests Report*. UN Food and Agriculture Organization (FAO), Rome.
- Fay, C. and Sirait, M. (2004) *Indonesia’s Agrarian and Forestry Legal Frameworks: Challenging the National Dual System of Land Administration*. Paper presented at the International Conference on Land Tenure, Jakarta, 11–13 October 2004.
- Fearnside, P. (2007) Brazil’s Cuiabá-Santarém (BR-163) highway: the environmental cost of paving a soy-bean corridor through the Amazon. *Environmental Management* 39, 601–614.
- Feintrenie, L., Schwarze, S. and Levang, P. (2010) Are local people conservationists? Analysis of transition dynamics from agroforests to monoculture plantations in Indonesia. *Ecology and Society* 15, 37.
- Felker, G. (2008) Southeast Asia and globalization: the political economy of illiberal adaptation. In: Kuhonta, E., Slater, D. and Vu, T. (eds) *Southeast Asia in Political Science: Theory, Region and Qualitative Analysis*. Stanford University Press, Stanford, California, pp. 274–301.
- Fisher, B. (2010) African exception to drivers of deforestation. *Nature Geoscience* 3, 375–376.
- Fox, J., Truong, D.M., Rambo, A.T., Tuyen, N.P., Cuc, L.T. and Leisz, S. (2000) Shifting cultivation: a new old paradigm for managing tropical forests. *Bioscience* 50, 521–528.
- Fox, J., Fujita, Y., Ngidang, D., Peluso, P., Potter, L., Sakuntaladewi, N., Sturgeon, J. and Thomas, D. (2009) Policies, political economy and swidden in Southeast Asia. *Human Ecology* 37, 305–322.
- Garcia, C.A., Bhagwat, S.A., Ghazoul, J., Nath, C.D., Konerira, M.N., Cheppudira, K.G., Raghuramulu, Y., Nasi, R. and Vaast, P. (2010) Biodiversity conservation in agricultural landscapes: challenges and opportunities of coffee agroforests in the Western Ghats, India. *Conservation Biology* 24, 479–488.
- Gibbs, H.K., Ruesch, A.S., Achard, F., Clayton, M.K., Holmgren, P., Ramankutty, N. and Foley, J.A. (2010) Tropical forests were the primary sources of new agricultural land in the 1980s and 1990s. *Proceedings of the National Academy of Sciences USA* 107, 16732–16737.
- Global Witness (2009) *Undue Diligence: How Banks do Business with Corrupt Regimes* <<http://www.globalwitness.org>> (accessed 29 July 2014).
- Global Witness (2013) *Rubber Barons: How Vietnamese Companies and International Financiers are Driving a Land Grabbing Crisis in Cambodia and Laos* <<http://www.globalwitness.org/rubberbarons/>> (accessed 29 July 2014).
- Goncalves, P.M., Panjer, M., Greenberg, T.S. and Magrath, W.B. (2012) *Justice for Forests: Improving Criminal Justice Efforts to Combat Illegal Logging*. The World Bank, Washington, DC.
- Hardin, G. (1968) The tragedy of the commons. *Science* 162, 1243–1248.
- Harris, L.D. (1984) *The Fragmented Forest: Island Biogeography and the Preservation of Biotic Diversity*. University of Chicago Press, Chicago, Illinois.
- Harwell, E. (2003) *Without Remedy: Human Rights Abuse and Indonesia’s Pulp and Paper Industry*. Human Rights Watch 15, No. 1 <<http://www.hrw.org/reports/2003/indon0103/Indon0103.pdf>> (accessed 29 July 2014).
- Harwell, E. (2010) *Forests in Fragile and Conflict-Affected States*. Program on Forests (PROFOR), Washington, DC.
- Hodgdon, B. (2008) Frontier country: the political culture of logging and development on the periphery in Laos. *Kyoto Journal* 69, 58–65.
- Hosonuma, N., Herold, M., De Sy, V., De Fries, R., Brockhaus, M., Verchot, L., Angelsen, A. and Romijn, E. (2012) An assessment of deforestation and forest degradation drivers in developing countries. *Environmental Research Letters* 7, 1–12.

- Independent Evaluation Group (2012) *Managing Forest Resources for Sustainable Development: An Evaluation of World Bank Group Experience*. World Bank Group, Washington, DC.
- International Tropical Timber Organization (2005) *Restoring Forest Landscapes: An Introduction to the Art and Science of Forest Landscape Restoration*. ITTO Technical Series No. 23. International Tropical Timber Organization/International Union for Conservation of Nature <http://www.itto.int/news_releases/id=10640000> (accessed 15 July 2014).
- Ireland, L.C. (2008) State failure, corruption, and warfare: challenges for forest policy. *Journal of Sustainable Forestry* 27, 189–223.
- Kaimowitz, D. (2004) Conventional wisdom about sustainable forest management and a pro-poor forest agenda. In: Zarin, D.J., Alavalapati, J.R.R., Putz, F.E. and Schminck, M. (eds) *Working Forests in the Neotropics*. Columbia University Press, New York, pp. 379–387.
- Karsenty, A. (2000) *Economic Instruments for Tropical Forests: The Congo Basin Case*. International Institute for Environment and Development, London.
- Karsenty, A. and Gourlet-Fleury, S. (2006) Assessing sustainability of logging practices in the Congo Basin's managed forests: the issue of commercial species recovery. *Ecology and Society* 11, 26.
- Karsenty, A. and Ongolo, S. (2011) 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.
- Kenney-Lazar, M. (2010) *Land Concessions, Land Tenure, and Livelihood Change: Plantation Development in Attapeu Province, Southern Laos*. Faculty of Forestry, National University of Laos, Vientiane, Laos.
- Lambin, E.F. and Meyfroidt, P. (2011) Global land use change, economic globalization, and the looming land scarcity. *Proceedings of the National Academy of Sciences USA* 108, 3465–3472.
- Lang, C. (2009) Wilful ignorance: FAO and industrial tree plantations. *WRM Bulletin* 141 <<http://wrm.org.uy/articles-from-the-wrm-bulletin/section4/wilful-ignorance-fao-and-industrial-tree-plantations/>> (accessed 29 July 2014).
- Laurance, W.F., Ferreira, L.V., Rankin-de Merona, J.M. and Laurance, S.G. (1998) Rain forest fragmentation and the dynamics of Amazonian tree communities. *Ecology* 79, 2032–2040.
- Lawson, S. and MacFaul, L. (2010) *Illegal Logging and Related Trade: Indicators of the Global Response*. Chatham House, London.
- Mather, A.S. (2007) Recent Asian forest transitions in relation to forest-transition theory. *International Forestry Review* 9, 491–501.
- McElwee, P. (2004) You say illegal, I say legal: the relationship between 'illegal' logging and land tenure, poverty, and forest use rights in Vietnam. *Journal of Sustainable Forestry* 19, 97–135.
- McMichael, P. (2011) The food regime in the land grab: articulating 'global ecology' and political economy. Paper presented at the International Conference on Global Land Grabbing, University of Sussex, 6–8 April.
- Meijard, E. and Sheil, D. (2007) A logged forest in Borneo is better than none at all. *Nature* 446, 974.
- Moeliono, M., Wollenberg, E. and Limberg, G. (eds) (2009) *The Decentralization of Forest Governance: Politics, Economics, and the Fight for Control of Forests in Indonesian Borneo*. London: Earthscan.
- Nasi, R. and Frost, P.G.H. (2009) Sustainable forest management in the tropics: is everything in order but the patient still dying? *Ecology and Society* 14, 40.
- Nepstad, D., McGrath, D., Alencar, A., Barros, A.C., Carvalho, G., Santili, M. and Vera Diaz, M.d.C. (2002) Frontier governance in Amazonia. *Science* 295, 629–631.
- Obidzinski, K. and Dermawan, A. (2012) Pulp industry and environment in Indonesia: is there a sustainable future? *Regional Environmental Change* 12, 961–966.
- OECD/DAC (2007) Principles for good international engagement in fragile states and situations. Organization for Economic Cooperation and Development (OECD), Paris.
- Padoch, C., Coffey, K., Mertz, O., Leisz, S.J., Fox, J. and Wadley, R.J. (2007) The demise of swidden in Southeast Asia? Local realities and regional ambiguities. *Danish Journal of Geography* 107, 29–41.
- Pasandaran, C. (2013) Constitutional court annuls government ownership of customary forests. *Jakarta Globe*, 17 May 2013.
- Peluso, N.L. and Vandergeest, P. (2001) Genealogies of the political forest and customary rights in Indonesia, Malaysia, and Thailand. *Journal of Asian Studies* 60, 761–812.
- Peluso, N.L., Vandergeest, P. and Potter, L. (1995) Social aspects of forestry in Southeast Asia: a review of postwar trends in the scholarly literature. *Journal of Southeast Asian Studies* 26, 176–218.
- Perz, S., Caldas, M., Walker, R., Arima, E. and Souza, C. (2008a) Road networks and forest fragmentation in the Amazon: explanations for local differences with implications for conservation and development. *Journal of Latin American Geography* 7, 85–104.

- Perz, S., Brilhante, S., Brown, F., Caldas, M., Ikeda, S., Mendoza, E., Overdeest, C., Reis, V., Reyes, J.F., Rojas, D., Schmink, M., Souza, C. and Walker, R. (2008b) Road building, land use and climate change: prospects for environmental governance in the Amazon. *Philosophical Transactions of The Royal Society B: Biological Sciences* 363, 1889–1895.
- Posey, D.A. (ed.) (2000) *The Cultural and Spiritual Values of Biodiversity*. United Nations Environment Programme, Nairobi.
- Repetto, R. and Gillis, M. (eds) (1988) *Public Policies and the Misuse of Forest Resources*. Cambridge University Press, New York.
- Ribot, J.C. (2002) Democratic Decentralization of Natural Resources: Institutionalizing Popular Participation. Washington, DC: World Resources Institute.
- Ribot, J.C., Agrawal, A. and Larson, A. (2006) Recentralizing While Decentralizing: How National Governments Reappropriate Forest Resources. *World Development* 34, 1864–1886.
- Rice, R., Gullison, R. and Reid, J. (1997) Can Sustainable Management Save Tropical Forests? *Scientific American* 276, 44–49.
- Roberts, D., White, A. and Nilsson, S. (2008) Convergence of food, fuel and fibre markets: driving change in the world's forests. *ArborVitae* 37, 8.
- Ross, M.L. (2001) *Timber Booms and Institutional Breakdown in South East Asia*. Cambridge University Press, Cambridge, UK.
- Rudel, T.K., DeFries, R., Asner, G.P. and Laurance, W.F. (2009) Changing drivers of deforestation and new opportunities for conservation. *Conservation Biology* 23, 1396–1405.
- Sato, J. (2000) People in between: conversion and conservation of forest lands in Thailand. *Development and Change* 31, 155–177.
- Sayer, J. and Maginnis, S. (2007) *Forests in Landscapes: Ecosystem Approaches to Sustainability*. Earthscan, London.
- Schoene, D., Killman, W., von Lüpke, H. and Mette, M.L. (2007) *Definitional Issues Related to Reducing Emissions from Deforestation in Developing Countries*. Forests and Climate Change Working Paper 5, UN Food and Agriculture Organization, Rome.
- Scott, J. (1998) *Seeing Like a State: How Certain Schemes to Improve the Human Condition have Failed*. Yale University Press, New Haven, Connecticut.
- Seneca Creek Associates and Wood Resources International (2004) *“Illegal” Logging and Global Wood Markets: The Competitive Impacts on the U.S. Wood Products Industry*. American Forest and Paper Association, Washington, DC <http://www.illegal-logging.info/sites/default/files/uploads/1_AF_and_PA_summary.pdf> (accessed 29 July 2014).
- Seo, K. and Rodriguez, N. (2012) Land grab, food security and climate change: a vicious circle in the global South. In: Chhetri, N. (ed.) *Human and Social Dimensions of Climate Change* <<http://dx.doi.org/10.5772/50876>> (accessed 29 July 2014).
- Setiono, B. and Husein, Y. (2005) Fighting forest crime and promoting prudent banking for sustainable forest management: the anti-money laundering approach. CIFOR Occasional Paper No. 44. Center for International Forestry Research (CIFOR), Bogor, Indonesia.
- Sist, P., Dykstra, D. and Fimbel, R. (1998) Reduced-impact logging guidelines for lowland and hill dipterocarp forests in Indonesia. CIFOR Occasional Paper No. 18. Center for International Forestry Research (CIFOR), Bogor, Indonesia.
- Sunderlin, W., Hatcher, J. and Liddle, M. (2008) *From Exclusion to Ownership? Challenges and Opportunities in Advancing Forest Tenure Reform*. Rights and Resources Initiative, Washington, DC.
- Temudo, M.P. (2012) The white men bought the forests: conservation and contestation in Guinea-Bissau, Western Africa. *Conservation and Society* 10, 354–366.
- Tsing, A. (2004) *Friction: An Ethnography of Global Connection*. Princeton University Press, Princeton, New Jersey.
- Vandergeest, P. and Peluso, N.L. (1995) Territorialization and state power in Thailand. *Theory and Society* 24, 385–426.
- Vandergeest, P. and Peluso, N.L. (2006) Empires of forestry: professional forestry and state power in Southeast Asia, Part 2. *Environment and History* 12, 359–393.
- Vandergeest, P. and Unno, A. (2012) A new extraterritoriality? Aquaculture certification, sovereignty and empire. *Political Geography* 31, 358–367.
- Vientiane Times (2013) Land compensation tops parliament debate. *Vientiane Times*, 26 July 2013.
- World Bank (1992) *World Development Report*. Oxford University Press, New York.
- World Bank (2002) *A Revised Forest Strategy for the World Bank Group*. World Bank, Washington, DC.

-
- Worldwide Fund for Nature (2008) Deforestation, forest degradation, biodiversity loss, and CO₂ emissions in Riau, Sumatra, Indonesia. *Worldwide Fund for Nature Indonesia Technical Report*, 27 February 2008.
- Zimmerman, B. and Kormos, C. (2012) Prospects for sustainable logging in the tropical forests. *Bioscience* 62, 479–487.
- Zoomers, A. (2011) Introduction: rushing for land: equitable and sustainable development in Africa, Asia and Latin America. *Development* 54, 12–20.