13 Extra-Sectoral Drivers of Forest Change

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Abstract: This chapter provides a brief summary of the extra-sectoral drivers shaping forests worldwide. Extra-sectoral drivers are driving forces of forest change that originate from beyond the forest sector and that affect forests and their social, economic, and ecological functions. Recent increases in demand for raw materials, especially in emerging economies, increased commodity prices, and the increased scale and pace of extra-sectoral investments in the forest frontier, have contributed to extra-sectoral influences eclipsing sectoral developments as key drivers of forest landscape transformation. This chapter gives a brief overview of extra-sectoral pressures on forests and the effects these have had on forest-dependent communities.

Keywords: extra-sectoral drivers, deforestation, forests and agriculture, infrastructure, communities, urbanisation

13.1 Introduction

Globally, forests cover about 4 billion hectares or 31% of the total land area. From 2000 to 2010, around 13 million ha of forest were converted to other land uses, mostly to agricultural land for commercial agriculture (32%) or subsistence farming (42%) (UNFCCC 2007). These land cover and land use changes are due to both sectoral and extra-sectoral drivers. While many changes in forest cover and condition originate from within the forest sector, the drivers that originate from outside the forest sector (extra-sectoral) can be more powerful than the sectoral drivers in shaping the future of forests and forestry.

Prior analyses of the causes of forest conversion have led to the identification of direct and underlying causes of deforestation (Figure 13.1). Extrasectoral influences, such as agricultural expansion, cattle ranching, mining, and gas and oil extraction, as well as construction of dams and roads, are considered as major direct drivers. Since the forest sector is more embedded in the global economy than ever, major industries have become predominant drivers of deforestation. In countries with high forest cover

(e.g., Brazil, Cameroon, Indonesia), the expansion of markets into areas with large, contiguous forests has significantly contributed to deforestation, especially in old-growth forests (Rudel 2005). Such direct causes are often driven by underlying causes of forest decline, which include market failures, mistaken policy interventions, governance weaknesses, and broader socioeconomic and political causes.

The next section provides an overview of most important extra-sectoral drivers: agricultural expansion (including food crops, livestock, and fuel crops) and infrastructure development (including roads, dams, and mining-related infrastructure). In addition, urbanisation is also analysed as an extra-sectoral driver of both deforestation and forest expansion within and outside of urban areas.

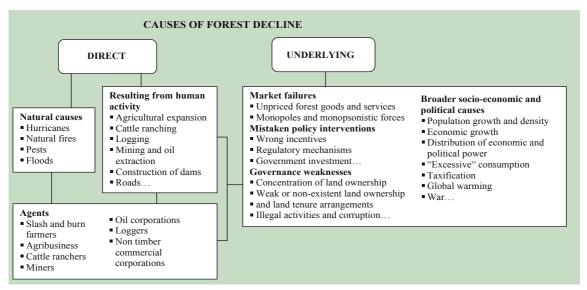


Figure 13.1 Causes of forest decline (Contreras-Hermosilla 2000).

13.2 Extra-Sectoral Drivers and Their Effects on Forests

13.2.1 Agricultural Expansion

Historically, agriculture has expanded and developed at the expense of forest land. While forests have traditionally supported multiple land uses, such as crop production, livestock husbandry, and the provision of habitats for wildlife, today forests and agriculture increasingly compete for land – particularly for large-scale agricultural production serving domestic and international markets. The causes of forest conversion to agricultural land differ in different parts of the world. In Latin America and Asia, the conversion takes place mainly due to the shift towards large-scale agriculture, including pasture, and more recently to biofuel crops (FAO 2007, Martin 2008). In Africa, about 60% of forest land conversion is due to the development of small-scale agriculture on plots that are smaller than 25 ha (FAO 2007). However, large-scale land acquisitions for agricultural production by foreign investors are playing an increasing role, also in Africa.

The world population is expected to exceed 9 billion people by 2050. Population growth will lead to increases in demand for food and fuel. In the absence of adequate productivity growth to match population increase, agricultural expansion will cause further conversion of forest to agricultural land (FAO 2009). Introduction of more efficient and sustainable production systems and new technologies will require expertise and investments that are lacking in many countries around the globe. The question of food supply is not just a matter of availability of land for cultivation; it is a complex socio-economic issue.

The agricultural sector is a major contributor to the national economies of many countries around the world. Government policies tend to promote the expansion of the agricultural sector through special promotional programs, including subsidies. They may also indirectly support agricultural expansion at the expense of forests by making agriculture more economically attractive through such policies as levying excessive taxes on the harvest and transport of forest products. It is fair to assume that if the net returns to agriculture are higher than those to forestry, a landowner would give preference to agricultural land use unless regulatory instruments to prevent it are in place and enforced.

Increasing international market demand for agricultural commodities is an underlying cause of deforestation in areas where the expansion of large-scale agriculture is a major driver of deforestation. The prices and demand for agricultural commodities tend to increase over time. This, and the shortage of agricultural land in some countries, are leading to largescale foreign land acquisitions in the South (Cotula et al. 2009). The growing demand for biofuels, which are often advocated as an environmentally friendly substitute for fossil fuels, has placed additional pressure on scarce land resources through increasing the production of biofuel feedstocks, which, however, often fail to produce net carbon benefits. The growing biofuel market is likely to further increase pressure on forests due to increasing competition for land for producing food, fuel, feed, or forest products. Increased use of existing food crops (such as oil palm, soy, and sugar cane) for biofuels, and the emergence of new biofuel feedstocks, such as jatropha, have also increased pressure on forests, especially in South America and Southeast Asia (Koh and Wilcove 2008, Gao et al. 2009).

13.2.2 Infrastructure Development

The expansion of infrastructure (roads, mines, dams, etc.) has been shown to negatively impact on forest extent and quality (Seymour et al. 2008, Mwitwa et al. in prep.). Among these factors, road construction is by far the one that most contributes to deforestation (Chomitz et al. 2007). In most cases, roads built in forests perform multiple functions and should be viewed as extra-sectoral drivers. Road construction may indirectly contribute to deforestation and forest degradation by reducing the cost of spatial mobility, thus facilitating access to forests for logging, agriculture, and other uses (Geist and Lambin 2002). Roads have been proven to increase access to natural resources by small- and medium-scale operators, and to strengthen the linkage between forests and markets (Vance 1986 and Owen 1987, cited by Perz et al. 2008). Roads constructed by non-state actors (Perz et al. 2008), such as colonists and loggers, to access land and timber resources can lead to dense road networks that fragment forest cover into smaller and often more isolated patches with high ecological vulnerability (Perz et al. 2008). Analysis of such road networks in the centre-western part of the state of Para, Brazil, showed that within about one decade the length of these roads increased four times and comprised about 80% of the total road network in 2001 (Brandão et al. 2006, cited by Perz et al. 2008).

Mining for metals (e.g., gold, copper, nickel), non-metals (e.g., precious and semi-precious stones, asbestos), and fossil fuels (e.g., coal, oil, and natural gas) is another source of forest destruction worldwide (Bryant et al. 1997). While open pit mining is largely considered to be the most damaging on forests, leading to deforestation on large areas, underground mining can also have an important influence on large areas of forest if wood from natural forests is used as underground structural supports (Mwitwa et al. in prep.). Besides the area directly used as mining pits, additional forest area is cleared or degraded when dumping waste material, by acquiring wood fuel for smelters or to purify iron, or wood for construction (Mwitwa et al. in prep.). Other negative impacts on forests may include water stress caused by lowered water table or water contamination, as well as stunting of vegetation due to air and water pollution (Chipundu and Kunda 1994, Mulenga 1999).

Although the direct damage to forest cover is smaller in scale and more localised for mining concessions than for logging concessions, the indirect impacts on forests are similar. Mining and logging both increase access to otherwise remote forest areas and provide an outlet for further deforestation, especially in places where population pressures already exist (Miranda et al. 1998). Furthermore,

studies show that even after mining operations were abandoned, forest recovery on mining sites is slow and qualitatively inferior compared to regeneration following other land uses. A study of forest regeneration following small-scale gold mining in Surinam showed that large parts of previously mined areas remained bare of vegetation and often with standing water (Peterson and Heemskerk 2001). Besides the direct impacts of mining on forest cover, additional indirect impacts may be caused by mining-related infrastructure development or land-use conflicts. Box 13.1 provides an example of land-use conflicts caused by oil and gas exploration in the boreal forests of Alberta, Canada.

Damming rivers for hydroelectric power also floods millions of hectares of forests and disrupts freshwater ecosystems (Bryant et al. 1997). Aside from the direct inundation of forested land, additional direct forest loss is caused by the construction of supporting infrastructure, such as roads, power lines, and power plants. Indirect loss of forests also occurs due to the establishment of settlements to move people out of inundated areas and when replacing inundated agricultural land with clearing forest (World Commission on Dams 2000). Furthermore, changing water levels related to the dam affect forests upstream, downstream, and within adjacent reservoirs. The increasing need for renewable energy combined with climate change mitigation strategies have increased the pace of dam construction for hydropower generation worldwide. Areas of particular interest for dam projects are Africa and Southeast Asia (Imhof and Lanza 2010).

13.2.3 Urbanisation

United Nations Human Settlements Programme (UN Habitat) has named the 21st century the Century of the City (UN Habitat 2008). More than half of the world's inhabitants now live in urban areas, while this share is expected to increase to 60% within the next two decades, an increase from 3 to 5 billion urban dwellers (Kotkin 2005). In Europe, North America, and Latin America, the urban population is greater than 70% of the total population. This scale of urbanisation is a fairly recent phenomenon, as the large majority of the world's inhabitants lived in rural areas until very recently. In 1800, for example, only one out of five people in Britain and Holland lived in cities; today about 90% of residents in these countries live in urban areas (Ponting 1991).

Urbanisation is a complex phenomenon, taking place in different ways across the globe, with large differences in the nature and speed of urbanisation between regions. While cities in large parts of Europe are experiencing population declines, for example

Box 13.1 Forests and infrastructure: Managing cumulative effects in a boreal landscape of Alberta, Canada

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Alberta, a province in western Canada, has experienced rapid population growth – an increase from 3.2 million to 3.6 million between 2003 and 2009. This growth in population is associated with significant activity in the oil and gas industry, which has provided much of the impetus for development and has attracted workers from all over the world. Oil and gas activities, as well as forestry, mining, agriculture, recreation, and housing and infrastructure development have resulted in competition for land, water, and air resources, placing unprecedented pressure on landscapes and generating a wide range of land-use challenges. The intensity of industrial development is illustrated by the severalfold increase in the number of land use permits (dispositions) issued for all development activities, with over 250000 dispositions active across the province by 2009, the majority of which are located in the Boreal bioregion (Figure 13.2).

Alberta is known for its beautiful landscapes, biodiversity, recreational opportunities, agricultural production, and natural areas, but the density of industrial and human activity has unavoidably created instances where landscape-level objectives conflict. Well-developed forest plans are often disrupted by oil and gas exploration, adding to fragmentation of the landscape and creating challenges

to maintain wildlife populations, such as grizzly bears and woodland caribou. An updated approach to the integrated management of land, resources, and the natural environment was needed to ensure Alberta's landscapes and that its values would remain sustainable, productive, and could be enjoyed by present and future generations.

The Alberta Land-Use Framework was developed to address these challenges. The planning framework complements current water and air policies, and directs balanced outcomes for agriculture, housing, energy and industrial development, transportation and utilities, tourism and recreation, natural areas and parks, and habitat for wildlife. Although trade-offs are inevitable, the planning framework sets out an approach to manage public and private lands and natural resources to achieve Alberta's long-term environmental, economic, and social goals. The Framework was developed through comprehensive public consultation and consists of the following strategies to improve landuse decision-making:

- 1. Development of regional land-use plans for seven regions to integrate provincial policies at the regional level and provide the context for land-use decision-making.
- 2. Management of cumulative effects at the regional level to ensure that human activities rec-



Figure 13.2 Intensity of industrial development in Alberta.

- ognise the finite carrying capacity of Alberta's watersheds, airways, and landscapes. This will involve the identification of appropriate thresholds, measurable management objectives with indicators, and targets for air, land, water, and biodiversity.
- Development of conservation and stewardship tools for public and private lands. The assessment and development of market-based instruments, such as Conservation Offsets and Conservation Easements, in addition to traditional regulatorybased mechanisms, will allow the Government
- of Alberta to partner with Albertans, industry, and other levels of government in stewardship of all of Alberta's lands.
- 4. Efficient use of land. Plans are being developed and supported by processes and strategies to reduce cumulative impacts on the landscape.
- 5. Monitoring, evaluation, and reporting systems. Processes are being established to contribute to continuous improvement of land-use planning and decision-making, with the province's Biodiversity Monitoring Program being a key component of this system.



Photo 13.1 Forests and Urbanisation: The 21st century has been deemed the Century of the City by UN Habitat. Megacities such as Ho Chi Minh City, Vietnam, are driving natural resource management throughout the country.

due to suburbanisation and sprawl, cities in the developing world are gaining an average 5 million additional inhabitants every month (UN Habitat 2008). In fact, up to 95% of the future growth of the urban population is expected to take place in developing countries.

The linkages between urbanisation and forests are complex. The most obvious linkage is the increasing land area converted from forests to urban landscapes. Through their physical expansion, urban areas have an increasing impact on local, regional, and global environments, including forests (Photo 13.1). A study in the US found that about one-third of urban expansion took place on forested land (Nowak et al. 2005). Other linkages are less obvious, includ-

ing the impact of urbanisation on the incidence of fire and exotic pest infestations, and on forest fragmentation (Nowak et al. 2005). Urbanisation also leads to changes in culture, values, and norms, and thus changes in the broader relationship between mankind and nature. During the early 1970s, Paris (1972) spoke of the "citification" of the forest: conflict situations between "industrial" and "societal" use of forests have been occurring to an increasing extent, and urban societies have been imposing their ideas, values, perceptions, and lifestyles on the countryside and its forest areas. Thus urbanisation does not only impact on forests through direct transformation of forest land, but also by influencing forests and their management in myriad other ways (see also

Box 13.2 Forests and urbanisation: The Sihlwald in Zurich, Switzerland

Cecil Konijnendijk

The "urbanisation" of forestry is well-illustrated by the case of the 1100 ha Sihlwald near Zurich, Switzerland (Photo 13.2). As early as during the second half of the Middle Ages, more "city oriented" criteria had started to determine forest use and management. Traditionally favoured forest uses, such as masting of pigs and animal grazing, now came secondary to supplying the city with wood. Zurich's city council staked its claim over the forest, drawing up the first regulations and installing forest keepers. The city's influence was steadily expanded, and forest management changed in line with changing demands of the city's inhabitants. During the 1980s, a plan was conceived to develop

this forest area into a "wilderness resort." Timber cutting was banned and natural values were favoured. Presently, the larger part of the Sihlwald is no longer managed, as priority is placed on giving the people of Zurich the opportunity to experience a wilderness area and observe natural processes. The aim is for the Sihlwald to obtain the status of a national "Naturerlebnispark" (Nature Experience Park). According to new legislation for protected areas in Switzerland, these types of parks are "small brothers" of national parks. They are situated near urban centres, are relatively small in size, and offer recreational and educational opportunities. Sources: Irniger (1991), Seeland et al. (2002), Bachmann (2006).



Photo 13.2 The management of Sihwald has changed in line with changing demands of the visitors.

Chapter 4, Section 4.3). Turner et al. (2004) describe, for example, how people's relationships with nature may change fundamentally because of limited exposure to biodiversity in their daily lives.

In spite of an increasing area of forests coming under urban influence, the forest sector has been slow to recognise its urban mandate. It has considered itself a primarily rural activity, as most forest resources are situated in rural areas, with the production process assuming a strong agricultural character (Essmann et al. 2007). Yet, in response to the growing and changing demands of cities towards nearby forests, several new approaches that recognise the urban dimensions of forestry have emerged. Urban forestry was developed in response to the demand

for more integrative, problem-oriented approaches to the management of urban trees and green spaces. It finds its origins in practical concerns, such as the challenge of Dutch Elm Disease, facing North American practitioners, calling for integrated approaches to better deal with the challenges of modern cities (Konijnendijk et al. 2006).

Urban forestry has been defined as an integrated, city-wide approach to the planting, care, and management of trees in urban areas to secure multiple environmental and social benefits for urban dwellers (Helms 1998). The approach focuses on enhancing the multiple economic, environmental, and sociocultural goods and services urban forests can provide. It has been argued that urban forestry has acted

as a driver for forestry development (e.g., Krott 1998, Konijnendijk 2003) as forestry has slowly started to accept its urban mandate (Essmann et al. 2007). As urban communities and their associated developments expand into forests, management and policy decisions concerning the protection, recreational uses, scenic views, wildlife, and other uses become more complex, with more stakeholders and more at stake than before (Nowak et al. 2005). Because of the significant interactions between large parts of the population and urban and community forests, these forests are likely to influence people's attitudes towards forests and their management across the landscape. According to Nowak et al. (2005), this potentially makes these forests some of the most influential forests of the 21st century. Public discussions about forestry issues will often have a "hook" to the local urban forest. Urban forestry's past and present is full of high-profile "social conflict" cases over urban development and forest conservation. Forests in and near cities have also traditionally offered a fruitful testing ground for introducing new concepts and management, focusing, for example, more on social and environmental services, forestry under anthropogenic and other stresses, and on the involvement of stakeholders and on conflict management (Konijnendijk 2008).

Multiple-use forestry is being transformed within modern landscape planning, with the traditional urban-rural divide giving the wrong sense of alternative development options. More regional and landscape concepts are needed to strengthen the links and complementarities between cities and rural areas (Töpfer 2001). Urban forestry is crossing the boundaries between woodlands and other elements of urban (and peri-urban) green spaces. It has developed new types of forested landscapes where woodland is only one part of a multifunctional landscape mosaic (Van Herzele 2005, Konijnendijk 2008). Huge demands for urban forest goods and services have to be met by a small resource base, and conflicts have been a logical consequence (see Chapter 4, Section 4.4). Thus, urban foresters have had to develop their "people skills" as well as conflict management capacities. They are learning how to involve other stakeholders in their decisions and activities. In high-pressure urban environments, partnerships and new institutional set-ups are a necessity. Teamwork with fellow professionals is required, as well as close collaboration with various stakeholders.

13.3 The Effects of Extrasectoral Drivers on Forest Communities

This section provides an overview of the nature of impacts of extra-sectoral drivers on communities, emphasising communities that depend on affected forest areas rather than urban communities. The expansion of agricultural cash crops (soy, sugar cane, tobacco, cotton), energy crops, mining, and infrastructure have all been linked to deforestation, and will therefore be considered in relation to their impacts on local communities.

Extra-sectoral drivers impact on rural communities in a number of ways, many of which are more profound than the impacts of sectoral drivers. This relates to the, in many cases, profound transformation of traditional livelihoods associated with deforestation and globalisation. Some of the extra-sectoral impacts are direct, some are indirect and mediated by extra-sectoral influences on forests. The range and extent of socio-economic impacts associated with industrial activity in forest areas depend on the scale and intensity of exploitation (Johnson and Rosillo-Calle 2007). These impacts may be positive or negative. Positive impacts include job or income generation through increased demand for agricultural or forestry products. Negative impacts may be equally profound, and include impacts on local livelihoods, customary tenure (restrictions in customary rights or complete displacement) and food security, enhanced social conflict, and loss of cultural identity. This section summarises some of the literature on the types and magnitudes of these impacts.

13.3.1 Employment, Infrastructure and Services

Many of the benefits of extra-sectoral drivers to local communities relate to the direct livelihood effects rather than effects on forests, and will, therefore, be treated only briefly. It is important to recognise, however, that many of these direct social effects have spin-offs that in turn shape forests. Smallholder production of oil palm in Sumatra, for example, is leading to significantly higher farmer incomes than other commodities – and causing a massive shift from complex agroforests to monoculture oil palm plantations.

The establishment of large estates can bring significant benefits to employees, such as health care, medical insurance, sanitation, and improved infrastructure (Bury 2005, Tomlinson 2005, Goldemberg et al. 2008 cited in Johnson and Rosillo-Calle 2007). Under progressive corporate or government

policies, companies may also instil profit-sharing mechanisms. More than 84% of Brazilian sugarcane plantations, for example, have such initiatives (Goldemberg et al. 2008). Mining in Peru has led to positive impacts on economic resources and human capital, with significant gains to employment and infrastructure, increased demand for agricultural products, increased provision of credit, increased land values; and improvements in health care, education, sanitation, and training (Bury 2005). Mining in the Copperbelt brought significant gains to infrastructure and social services, particularly when mines were government-owned (Fraser and Lungu 2007, Mwitwa et al. forthcoming). The level of benefits depends on a host of factors, among these are government regulations, corporate policies and practices, and the properties of the commodity itself. Government labour standards and other policies shaping corporate practice can influence such benefits through the setting of minimum standards and the channelling of revenue flows (Kojima and Johnson 2005). Commodities can influence job creation based on how labour-demanding they are and whether or not they lend themselves to mechanisation (Kojima and Johnson 2005).

It is important, however, to use caution when assessing net impacts on employment and extra-sectoral influences. Benefits derived from land conversion to industrial-scale plantations or mines should be compared with the benefits derived from this land using a matrix that can facilitate comparison with alternatives (productive, social, environmental benefits/damages). A recent study from Ghana suggests that the expansion of biofuel feedstocks can result in a net loss of returns to land for local communities (Schoneveld et al. in prep.). Employment benefits and costs must also be looked at over time, both during various phases of industry development and following closure, given the evidence of significant fluctuations between start-up and operations, and the long-term losses that can occur due to the destruction of customary livelihoods (Carrere 2004). There can also be loss of employment from land use changes designed as income-generating measures, as illustrated by the introduction of Eucalypts in India, which caused other land uses to be transferred to labour-saving plantations. Mechanisation has long been a cost-saving measure used for minimising human resource costs. Casual or part-time employment without benefits is a measure utilised by industries in developed and developing countries to keep costs down (Richardson 2001, Fraser and Lungu 2007, Mwitwa et al. forthcoming). The privatisation of the mining industry in Zambia has led to a decline in the quality of employment, with "45% of those working in the mines now unable to access permanent, pensionable contracts. Most mining companies are offering significantly less beneficial terms and conditions, and have increased the use of employment contractors who pay a fraction of the wage offered to permanent workers for the same work in the same mine" (Fraser and Lungu 2007, p. 3). The tendency to contract workers from outside the local area is also a cause of concern for customary residents (Mwitwa et al. forthcoming).

13.3.2 Stimulation of Local Markets

The introduction of a large-scale commercial enterprises into previously remote forest landscapes has a host of economic spin-offs on the local economy and forests. According to a study on the effects of mining in the Copperbelt (Mwita et al. forthcoming), forest residents near mining towns identified a host of economic benefits, from improved markets for agricultural and forest products to improvements in public transport, that strengthen linkages to urban markets. Thus, the effects of extra-sectoral drivers on forests may be mediated through their intermediate effects on local economies. Whether or not enhanced economic activity leads to forest degradation or sustainable forest management depends on a complex set of factors, one of the most important being local institutional capacity to regulate forest resource exploitation.

Economic benefits of extra-sectoral influences are not automatic. Reports on the Zambian mining sector have found that many of the expected benefits for the local economy have not materialised due to the use of hired labour from outside the area for timber sourcing, and to linkages to suppliers, manufacturers, and markets outside Zambia (Fraser and Lungu 2007, Mwitwa et al. forthcoming). In a four-country study of mining, benefits were only found to "trickle down" to communities when both government and corporate policies support local employment (ICCM 2006).

13.3.3 Impacts on Customary Tenure and Livelihoods

Forests, woodlands, and rangelands – often viewed as "unproductive" and "under-utilised" by governments – have become target areas for new investments. Concessions on forest lands are often granted to industry for logging, harvesting non-timber forest products, mining, exploration for and exploitation of oil and gas, and agricultural production (Sunderlin et al. 2008). Research suggests that the recent wave of forest tenure reforms aimed at enhancing local ownership and control over forests may be in jeopardy, as governments derive more immediate benefits from

industrial management models (Eba'a Atyi 1998, Global Forest Watch 2000, Sunderlin et al. 2008). The combined area of industrial concessions in 15 surveyed countries is much larger than the combined area of forest lands designated for use or owned by communities (Sunderlin et al. 2008). In many cases, concessions are awarded on community lands. "In Peru, 45 million ha of land is under contract for oil and gas exploration and exploitation, and almost all titled indigenous lands are affected in some way by these concessions" (Sunderlin et al. 2008). The promotion of soy production in the Brazilian Amazon at the end of the 1990s led many agro-industrial farms to settle in the region. As primary forests were off limits, settler lands were targeted through coercion or forced displacement, leading to two waves of mass displacement (Steward 2007). In some cases, property rights and cultural traditions are brutally suppressed by the authorities through the use of the military and police force (Ite 2004). In other cases, indigenous land rights are undermined by the arrival of recent migrants (Mendoza et al. 2007). Ultimately, the strength, nature, and enforcement of land rights will determine who benefits and who loses when biofuels and other commodities penetrate the forest

In addition to the obvious environmental damages, the shift from customary to private sector tenure has undermined the livelihood and safety net functions of these lands. Local complaints related to industrial-scale concessions have included diversion of valuable water resources used by smallholders for domestic uses and irrigation (Bury 2005, Steward 2007, Cotula et al. 2008), widespread and profound damage to indigenous culture and cultural heritage (Dixon and Dillon 1990, Carrere 2004, O'Faircheallaigh 2008), decreased access to land, diminished water quality (Bury 2005), loss of employment (Raintree 1996), disruption in social organisation and cohesion (Carrere 2004, Steward 2007), loss of community infrastructure (Steward 2007), marginalisation of women (FAO 2008), conversion of marginal lands once providing important safety net functions (FAO 2008), declines in child health, risks of physical injury, and reduced agricultural productivity (Steward 2007, Mishra and Pujari 2008, Mwitwa et al. forthcoming). A four-country report on the socio-economic impacts of mining also found that while society as a whole tends to benefit, there are generally segments of society in mining regions who are gaining little or even losing (ICMM 2006). The cost-benefit ratio of industries such as mining that induce long-term environmental damage increases significantly over time, as mines close up but the economic costs of lost jobs and livelihoods in agriculture, forestry, and fisheries extend far into the future (Carrere 2004).

13.3.4 Impacts on Food Security

The expansion of industrial-scale concessions, infrastructure, and other extra-sectoral influences into forest areas can shape food security through land competition, pricing effects, or demographic changes. The expansion of industrial-scale concessions (agricultural, mining, etc.) into the forest frontier often exhibits a negative effect on food security through the displacement of communities from agricultural land to which they hold only customary (in most cases, informal) rights (Friends of the Earth, Life Mosaic and Sawit Watch 2008). It may also lead to increased competition over forest products and agricultural land, as demographic pressures increase. Yet expansion of infrastructure or economic activity into the forest frontier may also create economic opportunities previously unavailable to communities.

Cotula et al. (2008) predict future consequences of increasing demand for cash crops – which include shifts in land rights (e.g., increasing privatisation or reallocation of entitlements to the private sector, formalisation of tenure), displacement of food with cash crops, and rising incidence of food insecurity, conflict, and reduced access to natural resources. Thus, both staple foods and "safety nets" associated with customary resources (e.g., forests, grazing land) are likely to be at stake. Such negative effects can be ameliorated through government policies, as well as by good planning to mitigate any costs to local livelihoods and food supply (Goldemberg et al. 2008).

13.3.5 Social Conflict

A recent study by DeKoning et al. (2008) explores the causes and consequences of forest conflict. These authors point to increasing demand for arable land for commercial or subsistence purposes, fuelled in part by rapid population growth and economic development in emerging economies, as a key culprit that has intensified human pressure on forests and fuelled competition for resources. "In countries and regions where governments cannot guarantee livelihood and tenure security and equal distribution of benefits... the pressures easily create the kind of grievances that can feed armed conflict" (DeKoning et al. 2008, p. 2). The more common conflicts are low-intensity conflicts, such as disputes between forest communities over village boundaries, or disputes between forest concession holders and local communities over access to forest products, decision-making, and benefit sharing. Interestingly, these authors found that unclear and divergent interpretations of rights or violations of rights and tenure – and high livelihood dependency on forests – are invariably at

the root of those conflicts. Such conflicts normally arise because particular user groups are excluded from participating or sharing in the benefits of forest management (Castro and Nielson 2003). DeKoning et al. (2008) also found that conflicts occur if there are: (i) contradictions between local and introduced management systems; (ii) misunderstandings and lack of information about policy or program objectives; (iii) contradictions or lack of clarity in laws and policies; (iv) inequity in resource distribution; or (v) poor policy or program implementation. Communities whose livelihoods are threatened may respond with low-grade resistance, large-scale protest, or armed conflict (Carrere 2001).

Extra-sectoral drivers can also lead to conflicts within and among local communities due to the significant transformations in livelihoods and social relations. Road building in the Amazon Basin, and seasonal employment in the South African sugarcane industry, for example, have led to conflict between resident communities and migrant workers due to conflicting land claims and competition over limited employment (Goodland and Irwin 1975, Johnson and Rosillo-Calle 2007, Mendoza et al. 2007). Migrants compete for jobs with local residents, and the absence of community cohesion can create a host of social problems such as alcoholism, promiscuous behaviour, and increased HIV infection rates (FAO 1995, Cornland et al. 2001, Mwitwa et al. forthcoming). If migrants become permanent settlers, increased unemployment and pressure over land can intensify conflict with negative effects on community cohesion, ethnic tension, and disintegration of traditional conflict resolution mechanisms and structures of authority (Bury 2005, Johnson and Rosillo-Calle 2007). In some cases in the Brazilian Amazon, development schemes bringing new colonists to remote forest areas have caused land conflicts so serious that federal government intervention became necessary (Schmink and Wood 1992).

13.4 Conclusions and Recommendations

Extra-sectoral pressures on forests and forest communities have increased over time and are increasingly responsible for major forest landscape transformations. Efforts are needed to recognise the scope and scale of such pressures, and to find ways to reconcile the economic activities of other sectors with sustainable use of forests and forest-based livelihoods. The following recommendations may be made to policy-makers with regard to extra-sectoral pressures on forests:

- Move toward more integrated, multi-sectoral approaches to land use planning using a problem-oriented approach and giving attention to landscape-level processes. Sectoral approaches to planning will tend to advance the objectives at some sectors at the expense of others and result in opportunities lost for reconciling the diverse economic, social, and ecological functions of forest landscapes.
- Support the development of land use and economic policies that help to reconcile divergent interests over the use of forest landscapes, and eliminate perverse incentives behind land cover transformation.
- Enable participatory processes for involvement of local communities in decision-making about natural resource allocation and land use. Free, prior, and informed consent helps communities to participate actively and directly in decisionmaking about local ecosystems.
- 4. Find ways to leverage support from higher political authorities who can exhibit some influence over sectors having a profound effect on forest landscapes but who are currently unaccountable to these effects (due, for example, to their status in the broader economy), particularly where opportunities exist for win-win outcomes or for responsible parties to bear the full social and ecological costs of their actions.
- 5. Support research to characterise and quantify the effects of extra-sectoral pressures on forests in order to promote planning processes in support of sustainable forest management. Industrial demand for timber or wood-based fuel or fibre, for example, can be assessed and compared with current supply to identify shortfalls and plan for a sustainable supply.
- 6. Support research to characterise and quantify the effects of extra-sectoral pressures on forest communities in order to identify opportunities for leveraging greater economic benefits, minimising the social and environmental costs, and raising awareness where extra-sectoral developments are irreconcilable with community interests.

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