

# Forests under pressure

**F**orests account for about one-third of the total land area of the world (FAO 2010). Throughout human history, forests have been essential for human well-being and currently contribute to the livelihoods of an estimated 1.6 billion people worldwide (World Bank 2004). Forest resources are especially important for the poor, contributing directly to the livelihoods of 90% of those living with less than USD 1/day. Forests contribute to livelihoods by providing subsistence goods and income from the sale of forest products, inputs to agriculture, and income from employment. In addition to tangible wood and non-wood forests products, forest ecosystems provide a range of services at local, regional, and global levels, including flood control, air filtration, soil stabilisation, and climate regulation. Forests also provide habitat for about two-thirds of the world's known terrestrial species. The world's forests store a large amount of carbon and it has been estimated that they account for a large proportion of the world's land-based carbon uptake (Pan et al. 2011).

While sustainable management, planting, and rehabilitation of forests can sustain or increase forest-based ecosystem services, deforestation, degradation, and poor forest management reduce their provision. In many regions of the world, forests and forestry in general are undergoing far-reaching changes that threaten the sustainable provision of forest-based goods and services. During the past decade about 13 million ha of forest at the global level have been converted annually to other land uses or lost through natural causes (FAO 2010). Deforestation, mainly due to conversion of forests to agricultural land, shows signs of decreasing in several countries but continues at an alarmingly high rate in others. Agricultural expansion, mainly large-scale crop plantations, are the main direct cause leading to forest conversion in the tropics (Chomitz 2007, Rudel et al. 2009, Pacheco et al. 2011), along with forest conversion to cattle ranching in the Amazon (Margulis 2004 and Figure I 2.1). Additional pressures originating in other economic sectors include such activities as biofuel development and mining. Several underlying drivers prompting forest change originate from human activities and include climate change, population growth and urbanisation, associated changes in values and consumption patterns, and globalisation of trade, finance, and investments (Geits and Lambin 2002).

By 2050, the world population is projected to exceed nine billion and the proportion of urban dwellers is likely to be 70%. Nearly all population growth will take place in developing countries. At the same time, incomes will rise (UN 2009). With increasing population and incomes, the global demand for food, feed, fibre, and energy will also increase. Without improved agricultural productivity, rising food demand alone will perpetuate deforestation. Rising incomes in developing countries, especially in emerging economies, will also increase the consumption of some products, such as livestock products and coffee, which require large extensions of land, further increasing pressure on arable lands now under forests (Gerbens-Leerns and Nonhebel 2005).

In coming years, the world's energy consumption is expected to increase dramatically, particularly in Asia, which will place additional pressure on forests. While fossil fuels will account for most of the increased energy supply, renewable sources of energy will gain importance (FAO 2008). There is great variation in the role of wood as a source of energy in different regions of the world. Many developing countries rely heavily on fuelwood and charcoal for energy, and the consumption of fuelwood is expected to grow due to population growth, especially in Africa (FAO 2008). High fossil fuel prices, energy security concerns, and climate mitigation policies in developed countries aimed at replacing fossil fuels with renewable energy have led to rapidly increasing production of biofuels. Policy promoting the use of renewable energy, particularly biofuels, to meet the energy needs of the transport sector has accelerated the demand for some energy crops, with some likely direct and indirect effects on forest conversion in the tropics (Timilsina and Shrestha 2010). Production of biofuels has tripled since 2000 and is projected to double again within the next decade (FAO 2009). Increasing biofuel production can lead to deforestation directly when forests are cleared for biofuel crops or indirectly when other agricultural crops are replaced by biofuels, thus displacing crops or livestock into forest areas (Gao et al. 2011).

The pressures on forestlands in many countries of Africa, Asia, and South America are seen augmenting due to the rapid increase in demand by foreign and domestic investors for land suitable for producing food and energy crops (IFAD 2009). For example, between 2004 and 2009 the land area transferred to



**Figure I 2.1 Forest cleared for agriculture in Mato Grosso, Brazil.** ©Grid-Arendal/Riccardo Pravettoni ([http://www.grida.no/photolib/detail/cleared-land-in-the-amazon-jungle-brazil\\_65e5](http://www.grida.no/photolib/detail/cleared-land-in-the-amazon-jungle-brazil_65e5))

investors amounted to 2.7 million ha in Mozambique, 4 million ha in Sudan, and 1.6 million ha in Liberia (Deininger and Byerlee 2011). It has been estimated that during the past five years, international investors have acquired about 50–80 million ha of land in middle- and low-income countries, through either purchases or lease agreements, mostly for the development of large-scale crop plantations (HLEP 2011). Zagema (2011) has estimated that 227 million ha of land have been sold or leased since 2011, mostly to international investors. While there is not enough information about where these land deals are located, it is assumed that a portion of them are forestlands that could fall prey to agricultural expansion.

Growing urban centres and infrastructure development (roads, mines, dams, etc.) increase pressure on forests in many regions of the world. For example, today the majority of the Amazonian population lives in urban areas. Expanding road networks facilitate access to previously remote forest areas and expand opportunities for commercial utilisation of land and forest resources and/or the conversion of forest to agriculture (de Jong et al. 2010a). In addition, growing urban populations also imply higher consumption demands for supply originated in forestlands converted to agriculture in order to meet such growing demand (DeFries et al. 2010). Furthermore, oil and

gas exploration and exploitation and expanding mining concessions contribute to deforestation and are a source of forest-related conflicts both in developing and developed countries (Figure I 2.2). Increasingly, urban population will also value forests for amenity purposes and recreation, raising pressures to reserve forests for recreation, especially near urban areas (Hägerhäll et al. 2010).

Climate change is already affecting forest ecosystems and the services they provide and these effects will increase in the future. Under most Intergovernmental Panel on Climate Change (IPCC) climate-change scenarios, climate change is projected to alter the distribution of forest types and tree species in all biomes; however, the nature and magnitude as well as their socio-economic and environmental implications vary. In some regions, forest productivity is expected to rise for some decades, however, ultimately, in most areas productivity is expected to decline (Alfaro et al. 2014). Disturbances associated with climate change, such as floods, droughts, wildfires, and pest outbreaks, can lead to further changes in forest ecosystems (Seppälä et al. 2009, Alfaro et al. 2010). Climate change will also indirectly affect forestry by changing the production possibilities and yields of agricultural crops. Although there will be gains in some agricultural crops in some regions of





**Figure I 2.2** The search for minerals and the subsequent road constructions are often the first steps for deforestation as is occurring here in the province of Riau in Sumatra, Indonesia.

©Grid-Arendal/Peter Prokosch ([http://www.grida.no/photolib/detail/rainforest-in-sumatra-indonesia\\_aa2c](http://www.grida.no/photolib/detail/rainforest-in-sumatra-indonesia_aa2c))

the world, the overall impact of climate change on agriculture is expected to be negative (Nelson et al. 2009) and could thus increase land demand for agriculture and shift production to new areas.

Increasing global demand for and trade in forest and agricultural products can have important ramifications at regional and local levels, affecting forest industries, local livelihoods and forests. As already mentioned, global trade may expand the market opportunities for commodity crops that may be produced at the expense of forestlands, either targeting conventional food export markets or expanding biofuel markets. Large-scale agricultural investment often follows market opportunities, in many cases favouring the expansion of mono-crop plantations, mainly soybeans and oil palms (HLPE 2011). In addition, expansion of timber trade tends to prompt timber extraction, often using unsustainable logging practices. Both, global agricultural and timber trade have contributed to deforestation and forest degradation, especially when illegality and poor institutional capacity have resulted in unsustainable practices (Galloway et al. 2010).

It is noteworthy that the sources and intensity of the various pressures on forests differ between regions and countries, but are affecting the sustainability of forests and forest ecosystem services in all parts of the world, with differential effects on people's livelihoods and economic development across

regions. Nonetheless, the impacts of the drivers of change on forests and forest-dependent people are, and will continue to be, most severe in less-developed regions where the pressures on forest are most urgent and where people lack adaptive capacity due to poverty and political and institutional marginalisation. The impacts resulting from those changes tend also to affect the rural poor most severely, including smallholders and communities whose livelihoods depend to a large degree on forest resources. In many cases, a handful of companies and corporations tend to benefit most from forest intervention and conversion due to unequal social distribution of economic benefits. The drivers of change affecting forests and forest-dependent people cut across different scales, from global to local and vice versa. Global processes can directly affect the resilience and sustainability of forests and socio-cultural systems at the local and regional levels. At the same time, land-use decisions at the local and regional levels contribute in a cumulative fashion across time and space to global environmental, social, and economic sustainability, or lack thereof.

Sustainable management and conservation of the world's remaining forests is essential for the continuous provision of forest-based products and ecosystem services. With climate change and the crucial role that forests have in global climate regulation, the need to sustain forests is greater than ever.