

CLIMATE RISK AND VULNERABILITY

A HANDBOOK FOR SOUTHERN AFRICA

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CHAPTER 6: COMMERCIAL FORESTRY

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Forests in southern Africa are critically important for sustainable livelihoods and ecosystems but are vulnerable to changes in climate, most important being accumulated temperature and moisture deficit, as well as to other external stressors, such as deforestation, with which climate may interact.

6.1. Introduction

Forest resources in the SADC¹⁴ region are extensive and diverse. The total forest cover is estimated at 400 million hectares (ha)¹⁵ in area, or more than 40 percent of the total land area of the 15 SADC member states (Figure 6.1) (FAO, 2015b). Forest cover is concentrated in a few countries in the SADC region. The Democratic Republic of Congo, Angola, Zambia and Mozambique have the largest forest areas and account for close to three-quarters of the total forest area in the SADC region. Those four countries are among the five most-forested countries in Africa; together with Sudan, they contain more than 55 percent of the continent's forest estate (FAO, 2012).

6.1.1. Indigenous forests in the SADC region

Natural forest types in the SADC countries range from tropical moist forests in Angola and the Democratic Republic of Congo to scrubland and desert ecosystems in the Kalahari and Namib deserts in western Botswana and southern Namibia (FAO, 2001). Natural forests comprise six main forest types: the miombo woodlands, the mopane woodlands, the baikia woodlands, acacia woodlands, montane and tropical moist forests, and mangrove forests (Mubaiwa, 2004). Miombo woodlands, dry deciduous forests, constitute the most extensive vegetation type in the SADC countries covering a substantial area of Angola, Malawi, Mozambique, Zambia and Zimbabwe, extending north into the United Republic of Tanzania and the Democratic Republic of Congo (FAO, 2001).

14 The SADC region comprises more countries than the southern African region, notably the United Republic of Tanzania (URT) and the Democratic Republic of Congo (DRC). Established in 1980, SADC now has 15 member states: Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, the United Republic of Tanzania, Zambia and Zimbabwe.

15 Total forest cover includes natural and planted forests

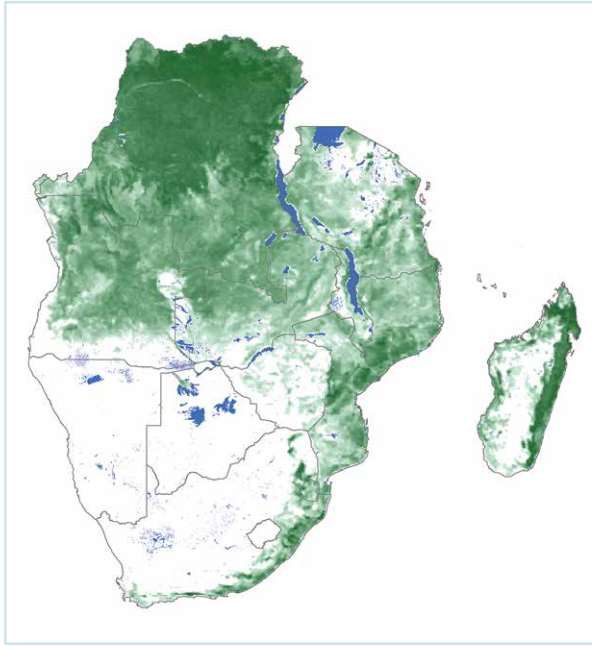
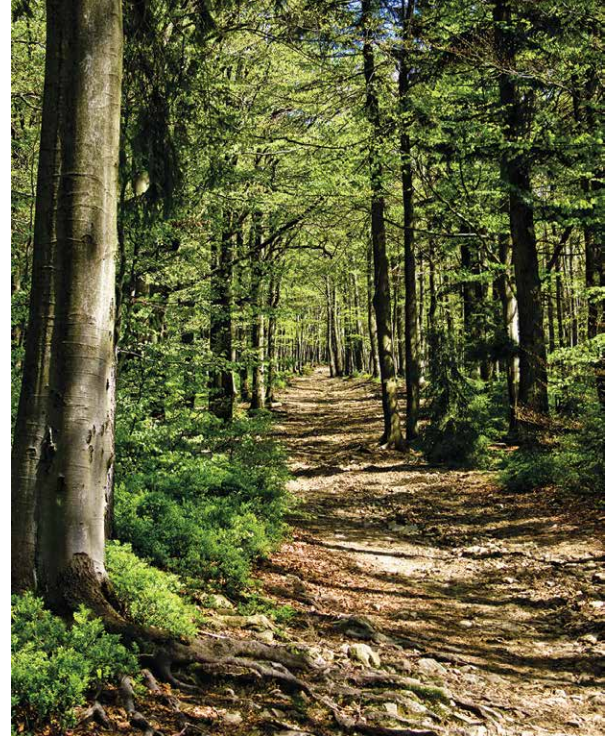


Figure 6.1: Forest cover of southern Africa of 2010 (Source: FAO 2015b).



Mopane woodlands occupy drier areas characterised by low rainfall and high temperatures in Mozambique, northern Namibia, southern Angola and large areas of Zimbabwe and Botswana. The baikia woodlands (Zambezi teak forests) are found in the Kalahari sands of western Zimbabwe, northern Botswana, northeastern Namibia, eastern Angola and Zambia. Acacia woodlands are common in various parts of the Zambezi phytoregion where the rainfall is low and the soil suitable. Montane and tropical moist forests are found in pockets in high-altitude, high-rainfall areas in Malawi, Mozambique, Zimbabwe and Zambia and in most of Angola and the Democratic Republic of Congo. Mangroves occur in coastal areas of the tropical regions of Angola, Mauritius, Mozambique, South Africa and the United Republic of Tanzania (FAO, 2001).

6.1.2. Plantation forests in the SADC region

Plantation forests account for about 3.37 million ha of forest cover in the SADC region, approximately half of which is in South Africa (FAO, 2015a). Angola, Madagascar, Malawi, Mozambique, Swaziland, the United Republic of Tanzania and Zimbabwe have relatively small plantation forest sectors, most of which are for

industrial purposes such as wood pulp and timber and are privately owned. South Africa's plantation forest area of 1.273 million ha accounts for one percent of its national land area (122.3 million ha) (DAFF, 2012). South Africa produces 70 percent of the SADC region's total roundwood and sawn timber production (FAO, 2010). In a list of major producers of industrial roundwood in 2012, consisting of 32 priority countries globally, South Africa is one of only two African countries on the list (the other being Nigeria) and produced 15 906 387 m³ of industrial roundwood in 2012 (Jürgensen et al., 2014). Commercial plantations in South Africa are certified by the Forest Stewardship Council (and the International Organization for Standardization 14001 certification scheme) as sustainably managed (DAFF, 2009). Swaziland has approximately 135 000 ha of plantation forests, Zimbabwe has 87 000 ha of commercial plantations and Mozambique has a plantation forest area of 75 000 ha (FAO, 2015a). Botswana, Lesotho and Namibia do not have commercial plantations, except for some small woodlots that were established for the provision of fuelwood and poles for general farm construction (FAO, 2003).

The expansion of plantation forests in SADC countries is limited by the availability of suitable land. Afforestation in South Africa is also limited by water legislation and permits are required to expand the area under plantations. After the introduction of the National Water Act (NWA, Act No. 36 of 1998) (Republic of South Africa (RSA) 1998), the industry lost approximately 80 000 hectares to comply with both the water and environmental legislation (FAO, 2015b). Climatic conditions in Namibia are not very conducive to tree planting, however limited tree planting aimed at implementing reforestation and afforestation at the national level does take place. Orchard development is part of Namibia's tree planting project with the purpose of increasing fruit production, reducing poverty and creating an opportunity for industrial development through agro-processing (FAO, 2015b). Major investments are currently being made by the private sector into commercial plantations in a number of countries, including Tanzania and Mozambique, as these countries offer larger tracts of suitable land, with Mozambique's proximity to the coast for exporting products to Asia also a positive factor (Jacovelli, 2014).

6.1.3. *Economic, social and environmental functions*

Forests are the 'green lungs' of our planet and multitask as habitats, suppliers of raw materials, a source of livelihoods, places of recreation and a means of climate protection (FAO, 2015b). Forests play a major role in the livelihoods of communities as sources of wood and non-wood products. Most countries in southern Africa have extensive rural areas with high poverty levels and the economic, social and environmental functions of forests vary greatly among countries. In rural areas,

local people rely to a large extent on forests for shelter, food, energy, construction material, employment and other products for domestic consumption as well as trade (Zaikowski, 2008). Fuelwood is probably the most important forest product in many SADC countries, especially among rural communities. The miombo woodlands, for example, are important for livelihoods, with 75 million people inhabiting miombo regions and an additional 25 million urban dwellers relying on miombo wood or charcoal as a source of energy (cited in Dewees et al., 2010).

Planted forests play an important role in global and regional economies to secure industrial roundwood and wood fuel and have, in many developing countries, formed the structural basis for an increasing forest-based manufacturing and export sector (Jürgensen et al., 2014). Plantations are established with a variety of objectives including production of industrial roundwood, afforestation of degraded land, protection of the environment, increasing wood supplies, and often, the purpose may be a combination of more than one of these. The commercial forestry sector is important to South Africa's GDP and employment in the country, and also in terms of the role this sector plays in either contributing to GHG emissions or reducing GHGs. Plantation forestry provides the raw materials for downstream activities such as sawmilling, woodchip exports, timber boards, furniture, mining timber, treated poles, charcoal, pulp and paper manufacture, and non-timber forest products (NTFPs). The plantation forest industry, including support industries, contributes about 1% to South Africa's GDP and employs about 166 000 people (DAFF, 2015).



6.2. Key drivers and processes of change within the sector

Deforestation in the SADC region is a major concern and has been identified as one of the priority areas for regional action through its contribution to increased concentrations of carbon dioxide in the atmosphere and to land degradation, and its negative impact on biodiversity and the balance of associated ecosystems (Lesolle, 2012). The extent of forest-cover change and the drivers of deforestation vary among countries. The main causes of deforestation, often acting in combination, are agricultural expansion, woodfuel use, hardwood timber extraction and conversion to plantations (Geist & Lambin, 2002; Wertz-Kanounnikoff & Wallenoffer, 2011). The rate of deforestation is also affected by the combined effect of factors such as development and conservation policies, reigning ecological conditions and the fragility of ecosystems and social environments (FAO, 2001).

Deforestation in the SADC region is characterised by a combination of forests cleared for agriculture or for commercial purposes, the increasing demand for biomass as an energy source, population growth and poverty, and these pressures are set to increase. Annual net forest loss in the SADC region was approximately 0.46 percent, or 1.8 million ha, in the period 2005–2010 (Figure 6.3); the SADC member states are characterised by very diverse forest cover change rates.

Of the SADC countries, Angola, Madagascar, Mozambique and Zambia have the highest timber production capacities from natural forests (FAO, 2001). The loss of natural forests of high timber potential in countries such as Malawi and Zimbabwe was the result of clearing for agriculture and infrastructure development; fuelwood and pole collection; and overstocking with domestic animals. The ecological conditions in Botswana, Lesotho, Namibia, Swaziland and South Africa do not favour timber-producing natural forests.

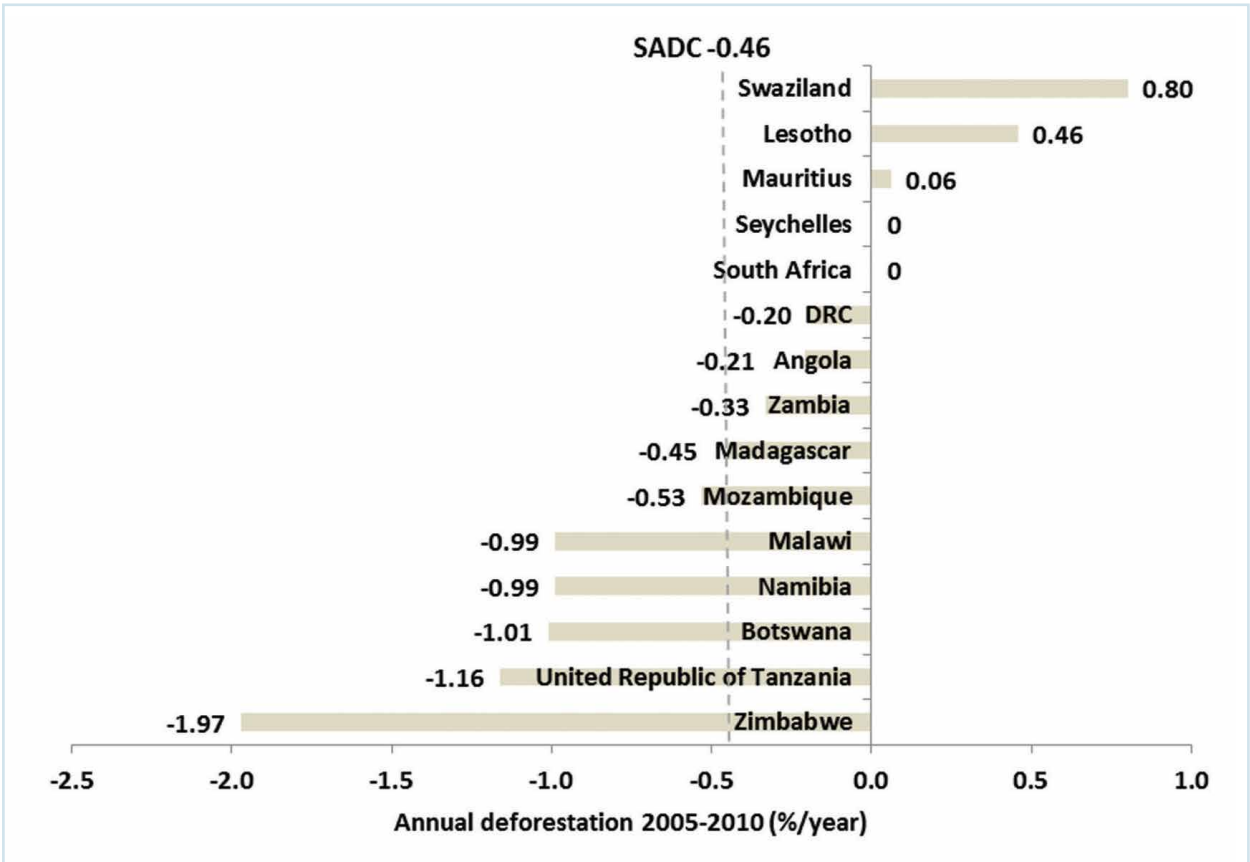


Figure 6.3: Annual rate of deforestation, SADC countries, 2005–2010 (Source: FAO, 2010).

6.3. Vulnerability of sector to climate change

Forest resources in southern Africa are vulnerable to the projected changes in climate in the region, as well as to other external stressors with which climate may interact, which, in turn, will have serious implications for local livelihoods as well as for areas and communities who may be dependent on them. Accumulated temperature and moisture deficit are important factors, but the impact of which is not always straightforward. The impact of climate change will depend on the factor which is most limiting at a site.

Climate change will alter the boundary limits of where current species are able to survive, and, in turn, this will change the consequences for the growth, survival and distribution of species. Increases in temperature in the SADC region are likely to result in changes to tree lines and phenology for certain species (Lesolle, 2012). The implications of increased temperatures on pests and pathogens affecting key species in both natural and plantation forests are also a key area of concern. Relatively minor changes in climate can increase forests' vulnerability to drought, insects and fires. Disease and insect populations and attacks may increase, leading to increased tree mortality. Forests may become increasingly vulnerable to higher background tree mortality rates and die-off in response to future warming and drought, even in environments that are not normally considered water-limited (Allen et al., 2010). Given that the vast majority of the SADC region is already water-limited, the possibility of increased tree mortality is of major concern. Some models may indicate that forest productivity may increase in certain areas, leading to increased supply of certain types of timber, however possible productivity loss through interactions with extreme events and disturbances is likely to outpace these gains (Kowero & Yemshaw, 2011).

Projections show a shift in the conditions suitable for the growth of particular trees and grasses, some of which could be more fire-tolerant than others (Department of Environmental Affairs, 2014a). Climate change has the potential to influence the number of natural and human factors that could significantly affect the fire regimes within the savanna woodlands and forests of the SADC region. The frequency and intensity of wildfires could increase due to a combination of factors such as increased ignition potential as a result of increased

lightning, longer drier periods, hotter, drier and windier weather conditions which would fan the spread of fires and fire disasters, and more biomass produced during wetter rainy seasons (Department of Environmental Affairs, 2014a).

Species choice is crucially important since the current plantation forest species are based on optimum growing areas using site species matching. The different tree species and hybrids planted in commercial forests in South Africa have different climatic constraints and this determines the climatically optimum growth areas where these species can be matched for optimal growth and volume production. Changes in temperature and rainfall regimes are likely to impact the extent and location of land climatically suitable for specific genotypes (Warburton & Schulze, 2008; Department of Environmental Affairs, 2014). The forestry sector is also vulnerable to increased frequency of extreme events such as frost, snow and hail, and increased susceptibility to a wider range of pests and pathogens, as well as to changes in the patterns of disturbance by forest pests (insects, pathogens and other pests).

6.4. Response measures

Given the potential impacts of climate change on forests and commercial plantations in southern Africa, the development and implementation of adaptation policies, measures and strategies in the immediate future is crucial. Adaptation to climate change is a central priority in the Southern African Development Community (SADC)'s regional response framework and countries in the region have recognised the urgency of building resilience and facilitating adaptation to climate change in the forest sector. And while adaptation remains a priority for SADC, voluntary mitigation activities can provide benefits to promote regional integration and socio-economic development in the SADC region (Lesolle, 2012). One of the most important priorities for adaptation in forests is the need for measures to deliver benefits beyond adaptation to climate change (e.g. GIZ, 2010; Midgley et al., 2012; Lesolle, 2012; Clarke et al., 2012). A key priority will be to ensure the achievement of multiple benefits and synergies between climate change adaptation, carbon-smart land use, biodiversity conservation and the reduction of deforestation/degradation; and the improvement of livelihood options in and around forests in the SADC region.

6.4.1. Adaptation

Forests can play an important role in achieving broader climate-change adaptation goals, but may be threatened by impacts from other sectors. Strategies for adapting forests to climate change should be coordinated with those of other sectors and integrated into national and regional development programmes and strategies. Adaptation to climate change can also be construed as an extension of good development policy, like promoting growth and diversification of the economy in order to increase options for investment, employment and incomes of farmers and creating markets for environmental services (Kowero & Yemshaw, 2011). The life cycle of a forest ranges from decades to centuries. Adaptation in the forest sector requires planned responses that are implemented well in advance of the impacts of climate change (Spittlehouse & Stewart, 2003). When developing and implementing forest-related climate change adaptation actions, policies and processes it is essential to have a good understanding of local vulnerabilities to climate change

in their ecological and social contexts (Kleine et al., 2010). Climate change adaptation strategies can be viewed as a risk management component of sustainable forest management plans (Spittlehouse & Stewart, 2003). Forest managers should select adaptive practices that are locally appropriate, and they should work with stakeholders and communities to improve these practices. Examples of climate change adaptation measures are listed in Table 6.1.

Adaptation planning options for plantation forestry could focus on fire and water management in the short term; and in the longer term on pests, and on increasing drought and heat tolerance. Adaptive interventions include developing and utilising more stress-tolerant (e.g. heat- or drought-resistant, or cold-tolerant) species and hybrids; mixing species to provide some assurance against the impacts of climate change; site-species matching; and use of water harvesting methods to relieve water stress during the establishment phase (Makundi, 2014).

Table 6.1: Examples of climate change adaption measures in the forest sector (Source: Spittlehouse & Stewart, 2003; Kalame et al., 2009; Kleine et al., 2010)

Topic	Adaptation measures
Gene management	Reassess the location of conservation areas and seed banks; breed pest-resistant genotypes; determine the adaptability of genotypes and their responses to climate change
Forest protection	Manage forest fire and pests to reduce disturbance; restore destroyed forest; protect trees from disease
Forest regeneration	Use drought-tolerant genotypes; use artificial regeneration; control invasive species
Silvicultural management	Selectively remove poorly adapted trees; adjust rotation periods; manage forest density; adjust species composition and forest structure
Non-wood resources	Minimise habitat fragmentation; conserve wildlife; maintain primary forests and the diversity of functional groups
Park and wilderness area management	Conserve biodiversity; maintain connectivity between protected areas; employ adaptive management

6.4.2. Mitigation

Mitigation actions are aimed at reducing GHG emissions and thereby contributing to reducing the extent of global warming. While most SADC countries have not been major contributors to emissions to date, current patterns of development may be considered, in some areas, to be unsustainable and may add to future ecological degradation (SADC Council of Non-governmental Organisations & FES, 2011). Forests contribute to mitigation through their capacity to remove carbon from the atmosphere and store it. Approximately 20 percent of global GHG emissions are the result of deforestation and forest degradation.

REDD+, reducing emissions from deforestation and forest degradation, is a mechanism to create an incentive for developing countries to undertake forestry and related activities at the national (and in some cases subnational) level that, together, would contribute to climate change mitigation. The incentive is provided through the creation of financial value for the carbon stored in trees. REDD+ can play an important role in reducing emissions and increasing GHG removals from the atmosphere. By incentivising improved forest and land management, REDD+ can also contribute to sustainable socio-economic development and support the transformation to a green economy (refer to case study). However, a key issue for the forest sector is ensuring that there is appropriate community engagement as well as equity in the share of proceeds from forest trade, forest-generated finance, and the benefits generated by REDD+ (Lesolle, 2012).

SADC member states developed a regional REDD+ programme in 2009 aimed at addressing common problems of deforestation and degradation in the region and formulating climate change mitigation measures in the forest sector (SADC, 2013). This REDD+ programme aimed to improve the capacity of member states to manage and benefit from their national REDD+ programmes through regional cooperation and also increase the influence of SADC as a region (SADC, 2013). The priority for SADC was not to just reduce emissions, but for REDD+ to be used as a mechanism for enhancing national development and thus creating the capacity to curb emissions from land-use change and forestry.

The plantation forest sector also plays an important role in terms of mitigation and effective monitoring of the sector's emissions and current activities is needed to understand the potential and progress of this sector with respect to climate change. Introduction of REDD+ in plantations in Africa will require significant expansion of the number and location of the permanent sample plots (PSPs) to obtain estimates of the carbon-relevant plantation attributes such as below- and aboveground carbon density, detritus, products and decomposition profiles (Makundi, 2014). A study on the development of a monitoring, reporting and evaluation (M&E) system for the Agriculture, Forestry and other Land Use sector was conducted by the Department of Environmental Affairs in South Africa (DEA, 2015). The proposed M&E system aimed to ensure, facilitate and streamline data collection across all relevant sectors of Agriculture, Forestry and other Land Use (AFOLU). The study mapped current mandates in relation to the AFOLU sector and linked those mandates to both mitigation and adaptation indicators which should be measured.

6.4.3. Policy

Important policy documents for the SADC region with specific reference to the forestry sector and its functional links with climate change mitigation and adaptation include the SADC Treaty of 2005, enabled the development of the SADC protocol on Forestry 2009, which was followed by the SADC Forestry Strategy of 2010 (Kojwang & Larwanou, 2015). An overview of SADC policies, strategies and programmes related to climate change, forestry and other sectors is given in Dlamini (2014) and Kojwang and Larwanou (2015).

National adaptation priorities, as identified in national adaptation programmes of action (NAPAs) and national communications, include sustainable forest management and the sustainable use of resources; afforestation and reforestation programmes; the promotion of agroforestry, non-timber livelihoods, alternative energy sources and climate-resilient tree varieties; and capacity-building and the strengthening of institutional frameworks. Nationally appropriate mitigation actions (NAMAs) prioritised afforestation, reforestation, and promotion of energy efficiency, efficient crop and livestock production systems, efficient transport systems and waste management (Kojwang & Larwanou, 2015).



Case study: The role of REDD+ in supporting a Green Economy Transformation in Zambia (Adapted from Turpie et al., 2015)

Forests are an important part of Zambia's natural capital and provide important benefits for the rural population, urban areas, the national economy and the global community. However, Zambia has one of the highest per capita deforestation rates in Africa. Zambia's forestry sector is based on both indigenous and plantation forestry, and includes production of industrial roundwood, wood fuel and charcoal, sawn wood and wood-based panels, pulp and paper, wooden furniture, commercial production and processing of non-wood forest products and subsistence use of forest products. The main direct drivers of deforestation are charcoal production, agricultural and human-settlement expansion and illegal exploitation of timber. Mining and forest fires also play a role.

Forest ecosystems play a critical role in sustaining and supporting the stocks and flow of ecosystem services to various economic sectors and human well-being in Zambia. Forests contribute to economic growth, employment, wealth, revenue from exports, a stable supply of clean water, recreation and tourism opportunities, as well as essential building materials and energy for a wide range of economic sectors. Forests support more than 60% of rural Zambian households (which is over one million jobs). The direct and indirect values of forests were estimated to make a direct contribution of US\$ 958 million, equivalent to at least 4.7% of Zambia's GDP. It is important that cost-effective ways for conserving and sustainably managing forests are implemented to support "green economy" growth in the country. Actions to reduce deforestation could be an important catalysing factor for the country's transition to a green economy, and forest ecosystems can offer opportunities to support this transition through the role of REDD+.

Actions to bring about the more sustainable use of forests and to slow the rate of forest loss in Zambia include:

- strengthening and enhancing the management and governance of forests at the local level;
- introducing measures to reduce urban demand for charcoal;
- supporting the development of livelihood and income-generating activities that support or rely upon forest conservation and maintenance; and
- increasing the sustainability and efficiency of agricultural practices.

The success of these strategies depends on the ecological, social, economic and political context in which they are implemented in Zambia. These approaches should be pursued together and can form the pillars of a National REDD+ Strategy in Zambia. The rationale for REDD+ activities and the means by which these activities can and will be undertaken may be different in each province and district of Zambia. The costs and benefits of implementing REDD+ will depend to a large extent on where implementation takes place as well as the strategies employed for reducing deforestation. In areas where forests are largely intact and where the potential for timber extraction is highest, the REDD+ priority should be to develop and enforce sustainable forestry, while ensuring that the increasing population's energy needs are met sustainably (e.g. in the North-West Province). In areas where forest cover has already been significantly reduced and degraded and the demand for charcoal is greatest, REDD+ activities must address the issue of charcoal demand (e.g. in the Central, Southern and Eastern Provinces). Ecotourism, forest conservation and sustainable rural economic development are closely interlinked and interdependent and need to be understood and included when planning to ensure the successful implementation of REDD+.