DATA COLLECTION SURVEY
ON
FOREST CONSERVATION
IN SOUTHERN AFRICA
FOR ADDRESSING CLIMATE CHANGE

Final Report

April 2013

Japan International Cooperation Agency (JICA)

RECS International Inc.
Remote Sensing Technology Center of Japan

MAP OF SOUTHERN AFRICA (provided by SADC)

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Abbreviations

ACP	African, Carribean and Pacific Secretariat,
AMESD	African Monitoring Environment for Sustainable Development
AFD	French Development Agency
AFIS	Advanced Fire Information System
AIFM	Integrated Assessment of Lands and Forests [Mozambique]
AUC	African Union Commission
BMZ	German Federal Ministry for Economic Cooperation and Development
CBFiM	Community based Fire Management
CBFM	Community based Forest Management
CBNRM	Community based Natural Resource Management
CBO	Community-based organization
CENACARTA	National Center of Cartography and Remote Sensing [Mozambique]
CITES	the Convention on International Trade in Endangered Species
CNPZF	National Steering Committee for Forest Zoning [DRC]
CSIR	Council for Scientific and Industrial Research
DANIDA	Danish International Development Agency
DBH	Diameter at Breast Height
DFRR	Department of Forestry and Range Resources [Botswana]
DGF	Directorate for Forest Management [DRC]
DIAF	Directorate for Forest Inventory and Management [DRC]
DNAPF	National Direction of Agriculture, Livestock and Forestry
DNP	Dry Matter Productivity
DNPW	Department of National Parks and Wildlife [Malawi]
DNRI	Sub-department of Natural Resource and Inventory [Mozambique]
DNTF	Department of Lands and Forest [Mozambique]
DoT	Department of Tourism [Botswana]
DRC	Democratic Republic of Congo (DR Congo)
DRH	Directorate for Reforestation and Horticulture [DRC]
DSG	Department of the Surveyor-General [Zimbabwe]
DWNP	Department of Wildlife and National Parks [Botswana]
EMA	Environmental Management Agency [Zimbabwe]
ENPRF	National Strategy of Reforestation [Angola]
ESCOM	Electricity Supply Commission
FC	Forestry Commission [Zimbabwe]
FCPF	Forest Carbon Partnership Facility
FDI	Fire Danger Index
FIP	Forest Investment Program [the World Bank]
FRA	Forest Resources Assessment [FAO]
FRIM	The Forestry Research Institute of Malawi [Malawi]
FWI	Fire Weather Index
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIS	Geographical Information Systems
GIZ	German Development Cooperation
GP	Guiding Principle
IDF	Institute for Forestry Development
IUCN	International Union for Conservation of Nature and Natural Resources
IIA	Institute for Agronomic Investigation [Angola]
ILUA	Integrated Land Use Assessment
INAMET	National Institute for Meteorology and Geology [Angola]
INDC	Institute of Disaster Management [Mozambique]
JAXA	Japan Aerospace eXploration Agency
JOGMEC	Japan Oil, Gas and Metals National Corporation
KAZA TFCA	Kavango Zambezi Transfrontier Conservation Area
LCCS	Land Cover Classification System [Mozambique]

MADRP	Ministry of Agriculture, Rural Development and Fisheries [Angola]
MAWF	Ministry of Agriculture, Water and Forestry [Namibia]
MCA	Millennium Challenge Account
MECCM	Ministry of Environment and Climate Change Management [Malawi]
MECNT	Ministry of Environment, Nature Conservation and Tourism [DRC]
MENRM	Ministry of Environment and Natural Resources Management [Zimbabwe]
MEWT	Ministry of Environment, Wildlife and Tourism [Botswana]
MGDS	Malawi Growth and Development Strategy [Malawi]
MICOA	Ministry of Environment [Mozambique]
MINAG	Ministry of Agriculture [Mozambique]
MLNREP	Ministry of Lands, Natural Resources & Environmental Protection [Zambia]
MLR	Ministry of Lands and Resettlement [Namibia]
MMCT	Mulanje Mountain Conservation Trust [Malawi]
MODIS	Moderate Resolution Imaging Spectroradiometer
MRV	Measurement, Reporting, and Verification
MSG	Meteosat Second Generation
NAMA	Nationally Appropriate Mitigation Actions [Malawi]
NAP	National Adaptation Plan [Malawi]
NAP	National Action Plan [Mauritius]
NAPA	National Adaptation Program of Action
NDP	National Development Plan [Botswana]
NFFP	Namibia-Finland Forestry Program
NFP	National Forest Policy [Mauritius]
NRSC	National Remote Sensing Center
NTFP	Non-timber forest product
OFAC	Observatory of Central Africa's Forest
OSFAC	Satellite Observatory of Central Africa's Forest
PDGSF	The Program for Development of Forestry Sector [Angola]
PEDSA	Strategic Plan for Agriculture Sector [Mozambique]
PFFSAC	National Policy on Forest, Wildlife and Conservation Areas [Angola]
PNEFEB	National Program on Environment, Forest, Water and Biodiversity [DRC]
PWLMA	Parks and Wild Life Management Authority [Zimbabwe]
RECs	Regional Economic Communities
REDD	Reducing Emissions from Deforestation and Forest Degradation
RS	Remote Sensing
SADC	Southern African Development Community
SANSA	South African National Space Agency
SAFNet	Southern Africa Fire Network
SDAE	District Service for Economic Activity [Mozambique]
SIRDC	Scientific and Industrial Research and Development Centre [Zimbabwe]
SLM	Sustainable Land Management
SNPCB	National Fire-fighting Service for Civil Protection
SPFFB	Provincial Services for Forest and Wildlife [Mozambique]
SPGC	Provincial Service for Geography and Cadastre [Mozambique]
SSDS	Seychelles Sustainable Development Strategy [Seychelles]
UEM	University of Eduardo Mondlane
TFCA	Trans Frontier Conservation Area
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VDC	Village Development Committees
WFP	United Nations World Food Programme
WRI	World Resource Institute
WWF	World Wide Fund for Nature
ZAWA	Zambia Wildlife Authority [Zambia]
ZEMA	Zambia Environmental Management Agency [Zambia]
ZFAP	Zambia Forest Action Plan [Zambia]

EXECUTIVE SUMMARY

1. Introduction

Forest area plays important roles for human beings and the environment: the provision of daily commodities (timber, firewood, non-timber forest products, etc.), soil conservation, habitats for flora and fauna, and absorption of carbon dioxide. On the other hand, poverty is a serious problem in Southern Africa where forty percent of the population lives on less than one dollar per day with high population increase, over 2.4 %/year (SADC, 2010[1]; FAO, 2010).

Approximately 62% of natural forests in Southern Africa are dry woodlands called miombo (Dewees, et al., 2011). In addition to the high value of commercial miombo wood products, miombo has also great value for local people, as dry season fodder, fuelwood, and non-timber forest products for subsistence and industry uses.

However, forests in the region are not well managed. The situation of forest fire in Africa is the worst in the world; 8% of forest area is annually damaged by fire in Africa (SADC, 2010[2]). Since major causes of forest fires are human-induced, integrated fire management with local participation that includes the introduction of a fire information system and forest management should be promoted, which directly contributing to the improvement of the livelihood of local people and addressing both mitigation and adaptation to climate change.

The SADC treaty stipulates that SADC commits the Member States to promote common political values, systems, and other shared values through regional integration. The SADC forestry strategy 2010–2020 highlights use of forest resources for food security, enhancing participatory forest management, cooperation on fire management, and needs of forest data for better management.

At the Tokyo International Conference on African Development (TICAD) V, scheduled for June 2013, new aid projects to commit to objectives on poverty and global environmental issues are expected to be identified for Southern Africa.

The objectives of the Data Collection Survey on Forest Conservation in Southern Africa Addressing Climate Change are to examine the current status of the forest sector in Southern Africa with regard to a forest monitoring/information system, fire management, and community participation in forest management, as well as the trends of international cooperation, and to identify the potential area of cooperation by JICA. Fact finding surveys, as well as technical and policy workshops on fire management, community forestry, and forest assessment addressing climate change were held by the survey.

2. Wildfires and Fire Management in Southern Africa

Fire occurrence in Southern Africa

According to the distribution of the hotspots caused by wildfires detected by the MODIS, forty five percent of the affected area is in Africa (Fukuda, 2011), mostly located in miombo woodlands, which mainly extend in Angola, Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe. The forest area annually damaged by fire is estimated to be about 530,000 hectares. During 2000–2007, the worst wildfires occurred in Angola (about 25% burnt annually), followed by Zambia (20–25%),

Mozambique (15–20%), and Tanzania (10–15%).

Use of fire in rural society

Wildfires are mostly human-induced, and the use of fire is customary in the preparation of land for agriculture, chasing animals for hunting, charcoal making, renewal of green grass, removal of insects, weeds, wildlife, etc. It is desirable that the approach to fire management allows for traditional ways of life, enabling the maintenance of rural livelihoods.

Integrated fire management with community involvement

Fire management is an essential part of forest management. Although fire is commonly used in rural societies, uncontrolled fires are largely prohibited in Southern Africa. In order to manage fires efficiently, integrated fire management, including fire information analysis (e.g. satellite images, field surveys), fire prevention (e.g. employing fire breaks, prescribed burning), preparedness (e.g. early warning methods), fire suppression (provided by professional/community volunteers), and restoration of fire affected areas (FAO, 2009), has been implemented and is expanding. Fire lines need to be established, with a proper equipment supply and appropriate guidelines that can be followed by local communities and within local government systems. The ways to combat wildfires are varied among countries.

- In Botswana 6,177 km of firebreaks are established and 10 firefighting teams have been organized, spending 60% of the state forest budget. CBNRM with fire management aiming at maintaining wildlife and tourism resources is implemented.
- In Mozambique the strategic plan for controlling uncontrolled fire 2010–2018 was formulated in 2007, aiming to reduce fire by 10% (MCAA, 2007), but not much has materialized in the way of implementation.
- In South Africa, fire management employs helicopters supplied by the funds of land owners, as well as well trained fire fighters.
- In Tanzania the roles of village chiefs and women and the traditional knowledge and customs surrounding fire management are studied.
- An integrated fire management programme has been implemented in Namibia since 1996 and is being newly implemented in Swaziland during 2012–2014.
- In Zimbabwe integrated fire management strategies 2009–2011 were formulated. A community-based fire management training manual was prepared, and training was provided to 3,000 people in 2011.
- Awareness raising and increased participation of rural populations in wildfire prevention and fire management were promoted through national/regional/local campaign in Mozambique.
- Namibia has a successful fire prevention campaign that uses dramatic plays on radio. Also, fire prevention needs to be promoted within traditional social groups, with the cooperation of local government and traditional leaders.

Use of satellite data for fire management

Fire information based on MODIS images provided by AMESD is obtained at the central level in most countries but not well used for fire detection because they are too extensive to mobilize firefighting in some case. The data on burnt areas is not effectively analyzed to be utilized for policy development on fire management.

Higher resolution satellite images as well as RADAR image (SAR) from Japan (in particular ALOS-2 with a two dimensional, large-formatted infra-red sensor and UNIFORM satellite with an infra-red camera which will be launched in 2013) can be utilized when opportunities arise. In order to ensure effective utilization, satellite data from Japan can be tested with controlled fires (e.g. a large scale prescribed burning at Kruger National Park).

Fire-scar monitoring by satellite image analysis can be used for regional policy formulation, as suggested in the Forest Strategy. Methodologies to utilize fire-scar monitoring for REDD+ can also be studied.

Fire alert by fire dry index

As early warning for the wildfire, FDI (Fire Danger index) /FDR (Fire Danger Rate) is applied. In order to improve FDI/FDR by local climatological parameters and observations, weather data is not sufficient due to low density of weather stations. Weather data can be enhanced by using varieties of satellite data. Soil moisture estimated by microwave radiometers on satellites by Japan, such as AMSR-E and GCOM-W1/AMSR-2 can be integrated into drought index for early warning of forest fire.

Environmental education for supporting climate network

Environmental education at elementary and secondary schools, teaching science involving climate measurement to children, can be promoted along with community-based fire management. JICA can dispatch volunteers for the purpose. By using data from community-based weather station, FDI/FDR can be improved. In Mozambique a school forest was created at a school supported by a JICA-JOCV.

Fire management in SADC Forest Strategy 2010-2020

The key actions required for fire management in the SADC Forest Strategy 2010–2020 include: 1) promotion of a common fire management regime; 2) cooperation agreements between local government, traditional leaders, and community groups; 3) development of a fire-scar monitoring service; 4) establishment of a fire management equipment supply; 5) construction of fire lines; and 6) establishment and enforcement of laws related to fire management.

SADC Regional Fire Management Programme

The programme has five components, namely: 1) establishment of a Regional Fire Management Coordination Centre; 2) reformation and harmonization of policies and procedures for controlling harmful fires and promoting the safe use of beneficial fires; 3) community-based fire management (CBFiM); 4) enhancement of fire information; and 5) capacity building to increase awareness of and knowledge in balanced and integrated fire management and its elements.

3. Community forestry in Southern Africa

Community based forest management and decentralization

There exists increasing shifts from centralized forest management to decentralized or community-based forest management in Southern Africa (Kowero, 2004). Policy or legal commitments to decentralization for communal management of forests are largely found in Southern Africa. However, the stage of decentralization varies from one country to another as follows.

- Tanzania is the most advanced in community forestry (MNRT, 2006), currently having 2.4 million hectares of Community-Based Forest Management (CBFM) for forests in village lands, and 5.5 million hectares of Joint Forest Management (JFM) for state forests.
- In South Africa, CBFM has been abolished in favour of shifting to Joint Forest Management through the decentralization process (DWAF, 2004).
- In Mozambique a strategic plan for CBFM has been prepared but is not generally implemented.
- In Zimbabwe, forests in communal lands are managed by Regional District Councils, having village chiefs as members of sub-committees.
- In Angola and DR Congo, CBFM has been proposed but has not materialized yet.

Agroforestry and NTFP production for livelihood development

The use of trees in the farming system supports food security. The SADC Forest Protocol encourages local people and communities to grow and conserve trees and to integrate them into existing farming systems. Angola plans to introduce community-based resource management by promoting agroforestry, but the actual experience has been limited. Following pilot efforts are found in community forestry for livelihood development.

- Community-Based Natural Resource Management (CBNRM) is also largely implemented in Botswana and Namibia, but is focused more on wildlife resources and NTFPs, owing mainly to the limited forest resources.
- SADC/GIZ Sustainable Forest Management and Conservation Project implemented in 1996-2006 piloting in Botswana, Namibia, Malawi, and Mozambique produced many technical manuals for communal use of natural resources and sustainable management of NTFPs (Kasparek, 2008).
- Community trust in Botswana developed by CBNRM is making land use plan for NTFP production.
- In Mozambique, agroforestry for food security by a voluntary carbon offset investment by a private company was initiated by a government project with a JICA/WFP support.

Community forestry for regional integration

The SADC Forest Protocol speculates upon how best to adopt national policies and mechanisms to enable local people and communities to benefit collectively from the use of forest resources, to share information and expertise related to community-based forest management, and to develop regional guidelines.

Taking advantages of good practices as mentioned above, a regional network like CBNRM forum should be strengthened not only for knowledge base and regional trainings but also for multilaterally facilitating pilot activities in the field. It should be noted that there exist dozens of transboundary tribal areas in Southern Africa. Project implementation to the tribes who separately reside in two states promotes regional integration.

4. Forest assessment and monitoring addressing climate change

Due to inadequate funding and underdevelopment of infra-structure, the forest service of each country cannot perform all production, monitoring, and regulatory roles. Key capacities which need to be enhanced in most of the forest departments in Southern Africa are forest assessment/monitoring and sustainable forest management. The SADC Forest Strategy highlights actions on developing forest assessment guidelines, forest database development, regionally harmonized monitoring systems, preparation of forest status reports, and assessment of national databases.

Following REDD+ readiness preparation by aid projects are in progress.

- In Tanzania the NAFORMA project designed National Forest Inventory with harmonized Forest/land use classification system, and developed forest state maps and REDD+ monitoring tools.
- SADC/GIZ REDD support programme will produce forest maps with harmonized classification at pilot areas in Botswana, Malawi, Mozambique, and Zambia, and design forest assessment and monitoring systems and information databases.
- In Mozambique JICA is developing a forest information database as a REDD+ platform, with MRV basis, RELs/RLs, and dataset of biomass and carbon estimation.
- In DR Congo, a forest resource monitoring system is being developed with supports of the WWF, WB, JICA, and UN-REDD, through the provision of satellite images, forest maps, and capacity development.

Through the preparation for REDD+, technical capacity can be enhanced on personnel training on GIS, database systems, inventory, and remote sensing technologies for sustainable forest monitoring and management. The existing experience in REDD+ advanced states (e.g. Tanzania, Mozambique, participants of FCPF) can be shared with other SADC states.

Setting effective conditions for community involvement in sustainable forest management is a difficult process and is not wholly responsible of the forest sector. The effort for multi-sector integration aiming at mainstreaming forest conservation through hundreds of workshops is an important achievement of REDD+ readiness preparation.

5. Opportunities and shortcomings of regional cooperation through the SADC framework

Regional cooperation through the SADC framework provides following opportunities and shortcomings.

Opportunities

- Training programs effectively organized for all SADC member states
- Information sharing for outcomes by bilateral projects and good practices in SADC member states
- Regional cooperation to tackle trans-boundary issues (e.g. TFCAs, Trans-boundary tribal areas, trans-boundary water conservation/trade)

Shortcomings

- Human and financial capacities of SADC secretariats are very limited. It is important to consider developing a sustainable mechanism to follow the practices conducted by the project after project termination as an exit strategy (e.g. utilization of regional network, follow-up by bilateral projects, collaboration of other IDPs).
- Obtaining agreement with the SADC member states by holding workshops is very costly.
- The high level of heterogeneity exits among the SADC member states. The countries with high human, financial and technical capacities (particularly Southern Africa and Tanzania) should contribute effectively to the project implementation.
- Interaction between the SADC member states should be carefully treated, (competing for better performance avoiding negative interactions to hold back each other).

6. Conclusions

The following conclusions are derived from the survey.

1. Economic values of miombo forests for local people are not well recognized not only by government but also by local people themselves. Transforming the forest of which the value is recognized by and produced for local people through awareness raising, advocating, NTFP production and marketing, and agroforestry in the farms should be promoted based on the existing good practices in the region. Policy reforms through the devolution of resource use rights and benefit sharing as well as existing technical manuals can be reviewed through information sharing workshops. Harmonized policies aiming at developing a regional guideline can be elucidated through the process.

2. Fire management is the essential part of forest management. Since most uncontrolled fires are human-induced, it is important to place local communities at the centre of fire management, being connected with utilization of forest resources for livelihood development. Integrated fire management to combine fire information analysis, fire prevention (e.g. employing fire breaks, prescribed burning), preparedness (e.g. early warning), fire suppression, and restoration of fire affected areas should be promoted through community involvement. Traditional practices on fire management including governance structure of traditional rural societies as well as women's role need to be reviewed and incorporated into fire management strategies.

3. Utilization of satellite data has been introduced by AMESD but not effectively utilized yet. Japan's advanced satellites including radar, soil moisture data, high resolution images can be effectively utilized for the enhancement of data quality and availability.

4. REDD+ emerged as a new financial source for strengthening forest management in Southern Africa. Experiences and technologies developed through REDD+ readiness preparation in advanced states (Tanzania and Mozambique) should be utilized for other SADC member states (e.g. forest monitoring techniques (forest type, inventory method, mapping), project formulation, political process to mainstream forest conservation through multi-sector communication).

5. Regional cooperation is advantageous due to the benefits of multiple countries though contribution to trans-boundary issues for regional integration, while utilizing outcomes of existing bilateral projects and good practices. Collaboration with IDPs as well as strengthening regional networks is important for effective implementation of the opportunities. According to SADC Forest Strategy 2010-2020 and fire management and REDD+ support programs, JICA can effectively implement a regional project.

7. Recommendations

The following recommendations are derived from the survey.

Fire management

- Promote community based integrated fire management (including prevention, preparedness, suppression and restoration) based on traditional local knowledge aiming at livelihood development
- Use advanced satellite images for producing better fire data by improving the spatial and temporal resolution of hot spot detection, burnt scar assessment and FDI/FDR enhancement
- Introduce environmental education in primary/secondary schools with basic science and climate measurement and utilize their observations for FDI/FDR for the early warning of fire

Community forestry

- Develop CBFM schemes with various levels of devolution of resource use rights and benefit sharing suitable to the sites
- Promote agroforestry and NTFP production for livelihood development utilizing investment addressing climate change
- Develop regional guidelines for community forest management and use of trees in sustainable farming system

Forest assessment and REDD+ readiness preparation

- Strengthen forest assessment and monitoring system for REDD+ readiness preparation and sustainable forest management by using experience/technologies of advanced countries
- Elaborate REDD+ potential by reducing wildfires in miombo woodlands by analysing fire-scar satellite images

Regional cooperation strategy

- Contribute to the implementation of fire management and REDD+ support programmes under the SADC framework
- Promote trilateral cooperation among SADC member states through shared-learning process and transfer of advanced knowledge and experiences (e.g., South Africa for remote sensing technologies and Tanzania for Joint Forest Management, Community-Based Forest Management, and REDD+ readiness preparation)
- Strengthen regional networks to conduct research and training specialized in forest assessment and monitoring, fire management, and community forestry for SADC countries

8. Potential areas of cooperation in the JICA regional program on forest conservation and development in Southern Africa

Outline of proposed program

Overall goal: Contribute to region's socio-economic development and the alleviation of poverty through forest conservation and sustainable management of forest resources
Objective:

Strengthen capacity of SADC (member States and the Secretary) to promote forest conservation and sustainable management of forest resources
Potential Areas of Cooperation 1) A forest information system to contribute to organizing a forest monitoring system for REDD+ readiness preparation by raising technical capacity to assess forests (forest inventories and other related data) 2) Integrated fire management to enhance the capacity to manage fires by promoting integration through coordinated actions, with better fire information produced from satellite images and field data gained in part through community involvement 3) Community forestry aimed at reducing poverty in rural societies through ensuring tangible and non-tangible benefits from forests/trees, by promoting community-based natural resource management and agroforestry systems within farming systems
Component 1: Knowledge management and development Existing good practices and available technologies useful for the program are assessed. Regionally adaptable knowledge determined in the assessment will be shared through a series of regional workshops. Piloting regional intervention for specified topics in component 2 will be monitored during workshops. After implementation of training and awareness raising in components 3 and 4, results will be synthesized into a guideline for policy harmonization in the region. Component 2: Pilot activities Pilot activities will test the effectiveness of regional approach and the results will be summarized into a guideline with harmonized policies that facilitate regional intervention practices for forest conservation and sustainable management of forest resources. Component 3: Training Training needs are assessed. A series of technical training courses will be carried out for specified topics. Follow-up activities may be conducted, depending on the results. Component 4: Awareness raising Awareness raising needs are assessed. A series of technical training courses will be carried out for specified topics. Follow-up activities may be conducted, depending on the results.

PART I MAIN REPORT

CHAPTER 1 SURVEY OUTLINE

1.1 Introduction

Forest area, accounting for approximately 31% of the terrestrial part of the earth, plays important roles for human beings and the environment: the provision of daily commodities (timber, firewood, non-timber forest products, etc.), soil conservation, habitats for flora and fauna, and absorption of carbon dioxide. It is estimated that 13 million hectares of forest has been decreasing annually due to agricultural development, logging, forest fires, and other causes in developing countries (FAO, 2010). Greenhouse gas derived from deforestation and forest degradation is estimated to account for 20% of the increased greenhouse gas around world (Gibbs & Herrald, 2007).

On the other hand, poverty is a serious problem in Southern Africa. Forty percent of the population lives on less than one dollar per day (SADC, 2010[1]). Extremely high population increase, over 2.4 %/year in Angola Malawi, Mozambique, Tanzania and Zambia, will clearly worsen the poverty issue in the future (FAO, 2010).

Approximately 62% of natural forests in Southern Africa[1] are dry woodlands called miombo[2] (Dewees, et al., 2011). In addition to the fact that commercial value of miombo wood products is very high because many miombo species can be sold to European furniture producers at high prices, it has also great value for local people, as dry season fodder, fuelwood, and non-timber forest products for subsistence and industry uses. Since up to a third of household consumption of the rural poor comes from forests in the miombo region, better management of miombo woodlands with participation of local people could directly contribute to poverty alleviation.

However, forests in the region are not well managed due to low levels of governance, state budget limitations despite the commercial potential. The situation of forest fire in Africa is the worst in the world; 8% of forest area is annually damaged by fire in Africa (SADC, 2010[2]). The forest area annually burned by fire is about 530,000 hectares in Southern Africa. It is generally agreed that major causes of forest fires are human-induced. Therefore, integrated fire management with local participation that includes the introduction of a fire information system should be promoted. This would directly and appropriately contribute to the improvement of the livelihood of local people. In addition, tackling the forest fire problem in extensive miombo woodlands is an important challenge addressing both mitigation and adaptation to climate change.

The SADC treaty stipulates that SADC commits the member states to evolve common political values, promote sustainable utilization of natural resources, and plays the complementary role between national and regional strategies and programmes. The SADC forestry strategy 2010–2020 highlights use of forest resources for food security, enhancing participatory forest management, cooperation on fire management, and needs of forest data for better management. SADC fire management and REDD support programs were formulated with support by GIZ in 2010 and are currently under implementation.

[1] Southern Africa in this report representes SADC member countries including Angola, Botswana, DR Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe. Madagascar is not included since the membership of SADC is suspended.
[2] In this document “miombo” includes “mopane” and “baikia” and other associated forest types.

Southern Africa has a high economic heterogeneity. The difference between the highest (US$13,000 in Botswana) and the lowest GDP per capita (US$200 in DR Congo and Zimbabwe) is sixty-five times. Significant value of forests needs to be recognized at all levels, the local, the regional, and the national, with an understanding of the gaps among member states.

Japan offers the Tokyo International Conference on African Development (TICAD) with UN, UNDP, the World Bank, and other international organizations so as to promote sustainable development in Africa. At TICAD V, scheduled for June 2013, new aid projects to commit to objectives on poverty and global environmental issues are expected to be identified for Southern Africa.

The potential areas for appropriate cooperation for forest conservation in Southern Africa need to be determined, with a consensus of stakeholders in the region with an understanding of various needs and of differences in the political/socio-economic conditions and the technical levels of each country.

1.2 Objectives and Expected Outputs

The objectives of the Data Collection Survey on Forest Conservation in Southern Africa Addressing Climate Change (hereinafter, the Survey) are to examine the current status of the forest sector in Southern Africa with regard to a forest monitoring/information system, fire management, and community participation in forest management, as well as the trends of international cooperation, and to identify the potential area of cooperation by JICA. The expected outputs are as shown below.

Expected outputs

1. Basic information on forest management and wildfire prevention is collected, and the issues to be solved are identified in Southern Africa.
2. A technical workshop on wildfire prevention and climate change mitigation using satellite images is held for Southern Africa.
3. A policy workshop on fire management, community forestry[3], and forest assessment and monitoring addressing climate change is held for Southern Africa.
4. The potential cooperation by means of Japan's assistance on forest/fire management addressing climate change for Southern Africa is identified.

1.3 Survey Scope

Fact-finding surveys in Southern Africa and Japan

Fact-finding surveys were carried out in the countries that have greater capacity and experience of forest management with miombo woodlands (Angola, Malawi, Mozambique, Tanzania, Zambia, Botswana, and Zimbabwe) and in South Africa in July and August, 2012. Information from six other countries (DR Congo, Lesotho, Mauritius, Namibia, Seychelles, and Swaziland) was collected through internet inquiries.

[3]In Southern Africa several difference terminologies are used for forest activities with local communities. In this document community forestry is used as a general term to indicate forest practices with local communities unless it refers specific policy. Community forestry can be classified into 1) participatory forest management and 2) use of trees in farmlands (agro-forestry). Participatory forest management is further classified into 1) community-based forest management with stronger authority of communities over the resource use (ownership, benefit share, etc.) and 2) joint forest management jointly managed between government and local communities with stronger authority of the government.

Interviews concerning the experience of the REDD+ project in Indonesia and discussions about future cooperation were conducted at Hokkaido and Fukuyama City Universities in Japan in January, 2013.

Technical workshop

A technical workshop was held at the Asian Institute of Technology (AIT) in Thailand on September 10–20, 2012 for the staff of the forest departments so as to improve their capacity to analyze the satellite data to find forest fire spots, estimate forest area, and apply to climate change mitigation. The participants were from Angola, Malawi, Mozambique, Tanzania, Zambia, Botswana, and Zimbabwe. The workshop agenda is attached in Appendix 1.

Policy workshop

A policy workshop co-hosted by SADC, JICA, and GIZ was held in South Africa on February 11–13, 2013, inviting representatives of the forest agencies, NGOs and research organizations of the SADC countries, as well as experts belonging to international and Japanese organizations. Current status of SADC countries, SADC Protocol on Forestry, Forest Strategy 2010-2020, fire management and REDD+ support programmes, wildfire prevention experience in Africa, and JICA's experience on fire management in Asia and forest monitoring projects in Africa were presented. The potential of Japan's aid with was discussed through group discussions regard to fire management, community forestry and forest assessment and monitoring addressing climate change in the workshop. Questionnaire surveys on good practice to share, training needs, and potential pilot activities were also carried out to the participants. The workshop agenda, results of group works, and joint resolution are attached in Appendixes 2, 3, and 4.

Survey Team

The survey was carried out by the following team.

Name	Affiliation	Specialization	Country in charge
Wataru Yamamoto	RECS International	Team leader/Forest & Fire management	Botswana, Mozambique, South Africa, Tanzania
Eiichi Sakata	RESTEC	Data analysis/ Capacity development	Botswana, Mozambique, South Africa, Tanzania
Yusuke Nakayama	Earth and Human Corporation	Forest management	Angola, Malawi, Zambia, Zimbabwe
Masatoshi Kamei	RESTEC	Data analysis/ Capacity development	Angola, Malawi, Zambia, Zimbabwe
Tsugito Nagano	RESTEC	Remote sensing technology Workshop planning	
Mihoko Uramoto	RECS International	Forest information analysis/ Aid planning	DR Congo, Lesotho, Mauritius, Namibia, Seychelles, Swaziland

1.4 Structure of Report

The remainder of this report is structured in the following way.

Chapter 2 presents information of Southern Africa regarding statistics on demography and economies, forest resources and management, and regional cooperation. Chapter 3 demonstrates the potential utilization of remote sensing technologies for forest and fire management. Chapter 4 examines the constraints of the current forest sector and identifies potential approaches by JICA's technical cooperation. Chapter 5 presents a potential program for the forest sector by JICA in Southern Africa. Chapter 6 presents forest sector country reports of SADC member countries prepared based on the fact finding surveys and literature reviews. The reports highlights in forest

policies and programs, forest resources and their changes, fire management, and on-going and planned aid projects.

This report solely presents the result of the survey carried out by the survey team. The contents of the report do not reflect the official position of JICA.

CHAPTER 2 CURRERNT STATUS OF FOREST RESOURCES MANAGEMENT AND INTERNATIONAL COOPERATION IN SOUTHERN AFRICA

2.1 Demography, Economy, and Land Resources

The total area of Southern Africa is about nine million km^2 with a population of about 260 million. DR Congo, Angola, Tanzania, and South Africa account for 63% of the total area (FAO, 2010; UN, 2010; World Bank, 2010, Table 2-1). DR Congo, Angola, Zambia, and Mozambique account for 80% of forested areas. DR Congo has the largest area. Seychelles has the highest GDP per capita, followed by Mauritius, Botswana, and South Africa. Population increases are high (>2.3 %/year) in Angola, DR Congo, Malawi, Mozambique, Tanzania, and Zambia. The population density is particularly high in Mauritius and Malawi (137 persons/km^2). Of the total GDP of Southern Africa (approximately USD 4.3 billion), South Africa accounts for 63%, followed by Angola (13%), and Tanzania (9%). South Africa stands as the super economic power in the region and demonstrates political responsibility for the region.

Table 2-1 Demography, Economy and Land Resources in Southern Africa

	Land area	Population			GDP	
		Population (2011)	Density (2011)	Population increase rate	Per capita GDP	Annual growth rate
	(1000 ha)	(1000)	(person/km2)	(2005-10 %/yr)	(US$)	(2008-11,%/yr)
Angola	124,670	19,618	16	2.92	5,148	3.1
Botswana	56,673	2,031	4	1.35	8,680	6.9
Congo DR	226,705	67,758	30	2.77	231	6.3
Lesotho	3,035	2,194	72	1.00	1,106	10.3
Malawi	9,408	15,381	163	3.00	371	7.2
Mauritius	203	1,307	644	0.66	8,797	4.5
Mozambique	78,638	23,930	30	2.38	535	5.7
Namibia	82,329	2,324	3	1.87	5,293	8.0
Seychelles	46	87	189	0.71	11,711	1.8
South Africa	121,447	50,460	42	0.96	8,070	8.9
Swaziland	1,720	1,203	70	1.42	3,725	7.1
Tanzania	88,580	46,218	52	2.88	528	1.5
Zambia	74,339	13,475	18	2.65	1,425	5.7
Zimbabwe	38,685	12,754	33	0.00	776	11.3
Total or Ave.	906,478	258,740	98	1.76	4,028	6.3

Source：UN, World Population Prospects
World Bank homepage, Financial Sector
FAO, Global Forest Resouces Assessment 2010

2.2 Forest Resources

According to FAO Global Forest Assessment 2010, Africa has approximately 674 million hectares of forest area, of which 382 million hectares (57%) is in Southern Africa (FAO, 2010). Forest area per capita is 1.5 hectares on average, ranging from close to zero in Lesotho and Mauritius, and 0.2 hectares in Malawi and South Africa, to 5.6 hectares in Botswana. The percentage of forest area in

relation to the size of countries is relatively high in Southern Africa. DR Congo has the largest forested area, followed by Angola, Zambia, Mozambique, and Tanzania. Forest areas account for more than a half of the whole country in Seychelles, DR Congo, and Zambia.

Table 2-2 Extent of Forest and Woodland Area in Southern Africa, 2010

	Forest (1000 ha)	% of land area (%)	Other wooded land (1000 ha)	% of land area (%)
Angola	58,480	47	0	0
Botswana	11,351	20	34,791	61
Congo DR	154,135	68	NA	NA
Lesotho	44	1	97	3
Malawi	3,237	34	0	0
Mauritius	35	17	12	6
Mozambique	39,022	50	14,566	19
Namibia	7,290	9	8,290	10
Seychelles	41	88	0	0
South Africa	9,241	8	24,558	20
Swaziland	563	33	427	25
Tanzania	33,428	38	11,619	13
Zambia	49,468	67	6,075	8
Zimbabwe	15,624	40	0	0
Total	381,959		100,435	

Source: FAO. 2010.

Source: Dewees, et al.(2011), adopted from White (1983)

Figure 2-1 Miombo Forest Distribution

Figure 2-2 Miombo Forest in Mozambique after Fire

Sixty-two percent of forest area in Southern Africa is extensive dry woodlands, miombo (Dewees, et al., 2011). The above-ground biomass stock densities of miombo woodlands vary from 20-150m^3/ha. Miombo woodlands are mainly found in areas with more than 700mm annual precipitation distributed in Angola, DR Congo, Malawi, Mozambique, Tanzania, Zambia and Zimbabwe where fires frequently occur (Figures 2-1 and 2-2). Angola has the largest area of miombo woodlands, followed by Zambia and Tanzania. Deforestation in Zambia and Tanzania is severe (Table 2-2).

2.3 Wildfires and Fire Management

According to the distribution of the hot spots caused by wildfires detected by the MODIS, forty five percent of the affected area is in Africa (Fukuda, 2011, Figures 2-3 and 2-4). The most burnt area in Southern Africa is dry sparse miombo woodlands. More than 90 percent of wildfires are caused by human activities, including arson, land preparation for agriculture, logging, misuse of fire for charcoal production, hunting, honey collection, and other traditional or tribal fire-use customs. More than 15% of lands were affected in Angola, Zambia, and Mozambique, followed by DR Congo and Tanzania at 10-15% (SADC 2010[2], Figure 2-5). Frequent wildfires are one of the main causes of deforestation in Africa.

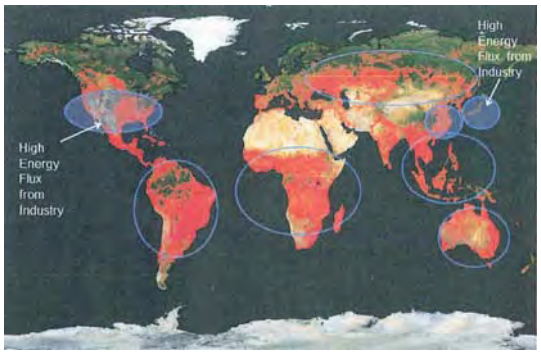


Figure 2-3 Distribution of Hotspots in the World (2005)

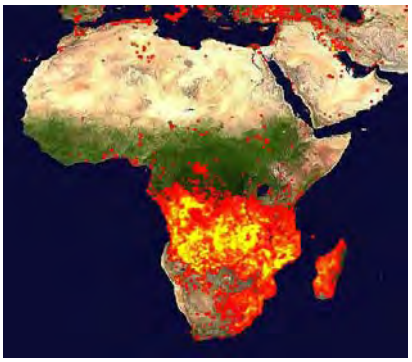
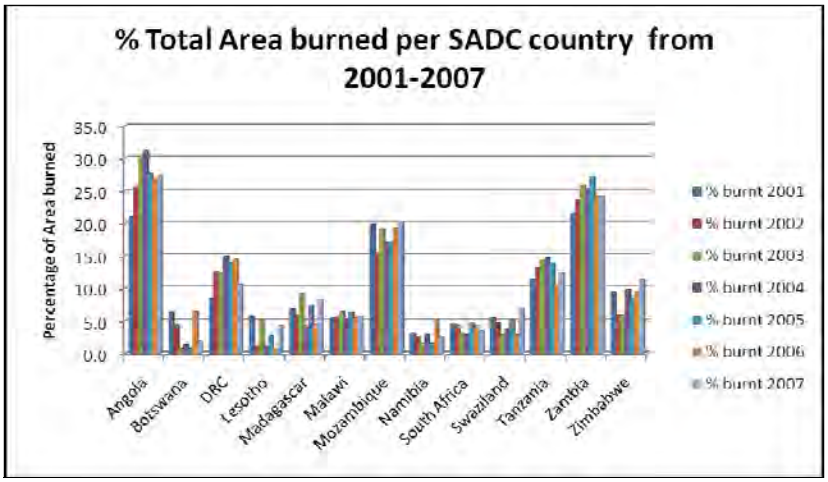


Figure 2-4 Distribution of Hotspots in Africa (Sep. 2011)



Source: SADC, 2010

Figure 2-5 Total Burnt Area in SADC Countries, 2001-2007

Although fire is commonly used in rural societies, uncontrolled fires are largely prohibited in Southern Africa. Policies were formulated and firebreaks are established in several countries but on a limited scale compared with the area burnt, due to limited budgets. The following activities were found in the region.

- In Botswana 6,177 km of firebreaks are established and 10 firefighting teams have been organized, spending 16% of the state forest budget. CBNRM with fire management aiming at maintaining wildlife and tourism resources is implemented.
- In South Africa, fire management employs helicopters supplied by the funds of land owners, as well as well trained fire fighters.
- In Mozambique the strategic plan for controlling uncontrolled fire 2010–2018 was formulated in 2007, aiming to reduce fire by 10% (MCAA, 2007), but not much has materialized in the

way of implementation.

In order to manage fires efficiently, integrated fire management, including fire information analysis (e.g. satellite images, field surveys), fire prevention (e.g. employing fire breaks, prescribed burning), preparedness (e.g. early warning methods), fire suppression (provided by professional/community volunteers), and restoration of fire affected areas (FAO, 2009), has been implemented and is expanding. An integrated fire management programme has been implemented in Namibia since 1996 and is being newly implemented in Swaziland during 2012–2014. In Zimbabwe Integrated fire management strategies 2009–2011 were formulated. A community-based fire management training manual was prepared, and training was provided to 3,000 people in 2011.

Community-based fire management involves awareness raising and the establishment of participatory fire breaks, etc. For developing community-based fire management strategies, the roles of village chiefs and women and the traditional knowledge and customs surrounding fire management are studied, and fire-fighting within forest reserves is carried out by local communities in Tanzania. In Botswana CBNRM with fire management aiming at maintaining tourism resources is implemented. Awareness raising and increased participation of rural populations in wildfire prevention and fire management were promoted through national/regional/local campaign in Mozambique. Namibia has a successful fire prevention campaign that uses dramatic plays on radio. Also, fire prevention needs to be promoted within traditional social groups, with the cooperation of local government and traditional leaders.

Fire information based on MODIS images provided by AMESD is obtained at the central level in most countries but not well used for fire detection. Burnt areas were analyzed in Tanzania and proposed to be analyzed by using original algorisms in Mozambique (DNRI, 2012).

2.4 Community Forestry

There exists increasing shifts from centralized forest management to decentralized or community-based forest management in Southern Africa (Kowero, 2004). Policy or legal commitments to decentralization for communal management of forests are largely found in Southern Africa. The situations vary from one country to another. Tanzania is the most advanced in community forestry (MNRT, 2006), currently having 2.4 million hectares of Community-Based Forest Management (CBFM) for forests in village lands, and 5.5 million hectares of Joint Forest Management (JFM) for state forests. Projects by Finland, DANIDA, and SADC/GIZ helped develop the models.

The devolution of rights to communities to own, manage, and receive benefits is a challenge for many countries (SADC, 2010[1]). The taking back of forests under state control, the reverse of devolution, is found in some countries. In South Africa, CBFM has been abolished in favour of shifting to JFM through the decentralization process (DWAF, 2004).

Many countries in Southern Africa have been tackling community forestry through formulating policy and strategy, developing technical guideline and pilot implementation by aid projects. In Tanzania JFM with greater benefit to the government is proposed. A strategic plan for CBFM has been prepared but is not generally implemented in Mozambique. In Zimbabwe, forests in communal lands are managed by Regional District Councils, having village chiefs just as members of sub-committees. In Angola and DR Congo CBFM has been proposed but has not materialized yet. Community-Based Natural Resource Management (CBNRM) is also largely implemented in Botswana and Namibia, but is focused more on wildlife resources and non-timber forest products (NTFPs, veld resources), owing mainly to the limited forest resources.

SADC/GIZ Sustainable Forest Management and Conservation Project implemented in 1996-2006

piloting in Botswana, Namibia, Malawi, and Mozambique produced many technical manuals for communal use of natural resources (Kasparek, 2008). Sustainable management of NTFPs including domestication and propagation, processing and preserving, marketing, and management and utilization were supported by the project. Community trust in Botswana developed by CBNRM is making land use plan for NTFP production.

The potential of miombo fruit trees as commercial tree crops were suggested in Malawi, Zambia, Zimbabwe and Tanzania by SADC-ICRAF Agroforestry Programme (Akinnifesi, et al., 2006). The potential products are Baobab juice, jam, wine, oil and cereal bar (*A. digitata*), Masuku juice, jam (*U. kirkiana*), Marula wine, oil and jerry (S. birrea), Parinari oil (*P. curatellifolia*), Strychnos jelly (*S. cocculoides*)).

2.5 Forest Assessment and Monitoring for addressing Climate Change

Forest assessment in Southern Africa has been carried out on a limited scale, and situations vary between countries. This is probably due to the low investment in forests. However, the situation has changed since the emergence of REDD+[1]. Foreign aid is becoming more available for forest assessment.

The NAFORMA project in Tanzania and SADC/GIZ REDD support programme are organizing forest assessment addressing REDD+. JICA is also developing a forest information platform in Mozambique for REDD+. Through these projects forest maps will be prepared with harmonized classification (for all of Tanzania by 2012 and for pilot areas in Botswana, Malawi, Mozambique, and Zambia), and forest assessment and monitoring systems, as well as information databases, will be designed. The development of a forest resource monitoring system is largely supported by the WWF, WB, JICA, and UN-REDD in DR Congo, with the provision of satellite images, forest maps, capacity development, etc., although it takes some time to develop actual technical capacity in the related institutions. The summary of the three themes for the SADC member states is shown in Table 2-3.

[1] Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD): Climate change mitigation measures under discussion since COP13, 2007. REDD-plus is to include conservation, sustainable management of forests and the enhancement of forest carbon stocks within its scope while REDD is simply the control of deforestation and forest degradation.
The basic concept behind REDD-plus is for developed countries to provide economic assistance (including financing) to developing countries to reduce greenhouse gas emissions (or to maintain or enhance carbon stocks) through curbing deforestation/forest degradation, or through forest conservation. The main issues currently under discussion are 'Monitoring', 'Reporting', and 'Verification' (MRV) system, social and environmental safeguards, forest reference emission levels (FRELs) and/or forest reference levels(FRLs), and financing. (JICA, 2012).

Table 2-3 Present Status of Fire Management, Community Forestry, and Forest Assessment and Monitoring in Southern African Countries

Fire management	Community forestry	Forest assessment and monitoring
Angola		
• No suppression activities for wildfire in the forest sector.	• Plan to introduce CBNRM with agro-forestry but experience limited.	• The first forest inventory being implemented by FAO.
Botswana		
• Burnt areas dramatically increased after 2008. 27% of country burnt in 2011 • 6,177km firebreak is established. • Ten fire-fighting teams have been organized with technical support of Australia since 2011. • AMESD data is used in the central level.	• Introduced by USAID in 1989. CBNRM programme described in NFP. CBOs cover 150 villages in 10 districts, involving more 135,000 people in 2006. • Community Based Management of Indigenous Forests implemented 1996-2006 through NGO by SNV/GIZ. Production and marketing manuals of NTFPs/livestock production prepared.	• Forest inventory surveys in 2002 in all forest reserves. Forest inventories in Makomoto and Mohembo East by Landsat images in 2007 and 2004. • JICA project 2012-15 produces forest map (1/100,000) for the entire country, forest inventory survey and management plan at the model areas. • SADC REDD support program to develop regional MRV with analyses of forest map in 1990/2000 by Landsat and 2010 by Rapideye at a test area.
DR Congo		
	• CBNRM was proposed. Definition and criteria for CBNRM is under preparation.	• Forest resource monitoring system with capacity development being developed by WWF, by JICA, and UN-REDD.
Lesotho		
• No threat of wildfire	• Management of state owned woodlots was transferred to local councils.	• Forest mapping in 1983.
Malawi		
• Fire in plantation recognized. • Firebreaks, early burning undertaken with limited capacity. • Conservation Trust works for fire management .	• NFP 2001 and CBFM policy 2003 present communal ownership and community empowerment. • Watershed management for food security and soil conservation by agroforestry were supported by WB and JICA. • Community Based Management of Indigenous Forests implemented 1996-2006 by GIZ. Village Committee and Communal woodlots established. Income generation through livestock production/agroforestry implemented. • Potential to produce Baobab juice, jam and wine (A. digitata), Masuku juice, jam (U. kirkiana), Zambia Marula wine (S. birrea) was suggested by SADC/ICRAF Agroforsetry programme.	• Forest resource mapping and biomass assessment in 1993 with support of the WB. Forest inventory with Landsat images of 1972/73 and 1990/91. • Japan supports mapping in seven forest reserves. • SADC REDD support program to develop regional MRV with analyses of forest map in 1990/2000 by Landsat and 2010 by Rapideye at a test area.
Mauritius		
• Firebreaks in fire-prone area established	• No communal forests and no community dependent on forests. • Reforestation program with tree planting campaign	• Forest Land Information System is established in 2010.

	being implemented.	
Mozambique		
• Strategic Plan to increase capacity of rural communities to prevent and control forest fires. • Action Plan for controlling uncontrolled fire, 2007 aiming to reduce fires by 10% by 2018 but not much materialized. • Awareness and tree plantings with incentives for fire prevention implemented by a forest concession owner.	• Strategic Plan to improve capacity of rural communities for sustainable management and reduce human-wildlife conflict. • National program to improve access of local communities to natural resources for sustainable management of forests and wildlife • Agroforestry model (Cashes, Moringa and Corn) with voluntary carbon offset initiated.	• Forest cover maps (1:1,000,000) for entire country and (1: 250,000) for Manica and Maputo provinces by 2004 and 2005 Landsat and ASTER by support of Italy. • Forest maps (1/250,000) at Zambezia and Inhambane provinces by Landsat 2000 and 2001 by Finaland support. • JICA project 2012-2017 develops database as forest resource information platform for REDD+ and produces forest maps in Gaza and Tete with 2010 Alos images. • Satellite images, GIS and image analysis software, and forest survey equipment are provided by Japan. • SADC REDD support program to develop regional MRV with analyses of forest map in 1990/2000 by Landsat and 2010 by Rapideye at a test area.
Namibia		
• National Guidelines on Forest Fire Management formulated in 2001. • Integrated forest fire management implemented with Finland support since 1996. Extensive awareness and training of local communities, annual prescribed burning, 1,000 km firebreaks implemented. • Sizes of burnt areas currently measured. • Forest Act prohibits burning within forest reserves.	• Forest Act 2001 speculates community forests on communal lands with consent of Chief or Traditional Authority. 32 community forests in 4,868,000 ha with 84,500 beneficiaries. Supports by Finland, Denmark, and Germany. • Community Based Management of Indigenous Forests implemented 1996-2006 at Okongo Community forest by GIZ. Forest management plan formulated. Income generation through livestock production/wood processing/agroforestry implemented.	• Forest cover survey in 2000
Seychelles		
• Wildfire seldom occurs.	• No community forestry.	• National vegetation survey in 1992
South Africa		
• Intensive fire control by Forest Protection Associations organized by land owners. Fire fighter groups with NPOs in operation. Fire is liable to land owners.	• Community Forestry was abolished but Joint Forest Management was promoted though the process of decentralization.	• Vegetation map in 2006
Swaziland		
• Poor monitoring with no fire detection system by government. • Only fire prevention for plantation by private companies. • Integrated Fire Management Project is being	• Tree planting by the communities promoted. • Afforestation, reforestation by GIZ project	• Forests increased by 20% in the last two decades due to expanded plantation.

implemented by FAO. • Cross-border fires control agreement signed with South African		
Tanzania		
• 11 million hectares burnt (14%) annually (Rucker and Tiemman, 2012). Fire damage in state plantation. • Awareness raising, regulation making, fire monitoring, and firefighting with local communities through NGOs supported by GIZ/Norway.	• NFP 1998 supports community forest management. • Participatory Forestry implemented since 2004 . • JFM for 5.5 million, CBFM for 2.4 million hectares agreed with support of DANIDA and Finland. • Potential to produce Baobab juice (A. digitata), Syzygium juice (S. guineense), Strychnos juice (S. cocculoides), Vitex jam (V. mombassae) was suggested by SADC/ICRAF Agroforsetry programme.	• National Forestry Resources Monitoring and Assessment (NAFORMA) develops a national forest database and information system, prepares national maps of forests and land uses based on harmonized classification (2009 Global cover 2009), undertakes national forest assessment, designs long term monitoring programme and integrate into REDD+ MRV/NFMA with support of FAO/Finland.
Zambia		
• Forests Wildlife Acts stipulate firebreaks in forest reserves and national parks, and prohibit late burning.	• NFP promotes sustainable, participatory and cross-sectoral management. • CBNRM is promoted by ZAWA with fire management in game management areas. • CBFM in six forest reserves and one customary land developed by support of Finland. • Potential to produce Baobab juice, jam and wine (A. digitata), Masuku juice, jam (U. kirkiana), Zambia Marula wine (S. birrea) was suggested by SADC/ICRAF Agroforsetry programme.	• The first forest inventory in 1965 followed by late 1980s and 1990s by simulation. Inventory and forest map production with support of Netherlands, Finland, and FAO during 2005-2008. • SADC REDD support program to develop regional MRV with analyses of forest map in 1990/2000 by Landsat and 2010 by Rapideye at a test area.
Zimbabwe		
• Integrated Fire Management Strategy 2009-2011 formulated. Community Based Fire Management Training Manual compiled. • Training on fire management to 3,000 participants implemented in 2011, establishing firebreaks in 15 provinces by 1,500 households.	• Promotion of community participation is one of six policy objectives in NEP. • Rural District Councils owns communal lands and is responsible for management. • Potential to produce Parinari oil (P. curatellifolia), Strychnos jelly (S. cocculoides), Masuku jam (U. kirkiana), Marula oil and jelly (S. birrea), Masau leather (Z. mauritiana), Baobab oil and cereal bar (A. digitata) was suggested by SADC/ICRAF Agroforsetry programme.	• Forest inventory in 1992 and 2008 supported by FAO.

2.6 SADC and Regional Policies/Programmes on Forest and Wildfire Management

(1) Southern African Development Community

The Southern African Development Community (SADC) is one of the Regional Economic Communities (RECs) in Southern Africa originally established as a development coordinating conference (SADCC) in 1980 and then transformed into a development community in 1992. Member countries are Angola, Botswana, DR Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe (the membership of Madagascar is suspended due to the political situation of the country). It is an inter-governmental organization whose goal is to promote sustainable and equitable economic growth and socio-economic development through efficient productive systems, deeper co-operation and integration, good governance and durable peace and security among fifteen Southern African member states.

Under deputy executive secretary responsible for regional integration, five divisions are instituted （Trade Industry, Finance and Investment, Infrastructure and Services, Food Agriculture and Natural Resources, Social and Human Development and Special Programmes, Policy Planning and Resource Mobilisation) (Figure 2-6). Food, Agriculture and Natural Resources (FANR) division has seven technical units and one centre (Environment and Sustainable Development, Food Security, Crop Development, Livestock Development, Agricultural Information Management, Agriculture Research and Development, Natural Resources Management, Plant Genetics Resources Centre). Natural Resources Management unit has programme officers in charge of forestry (one permanent officer with annual budget of US$75,000), wildlife, fishery and trans-boundary conservation areas. Environment and Sustainable Development unit is responsible for climate change issues and supervises a cross sector working group.
Under the SADC, the Protocol on Forestry (2002) and SADC Forestry Strategy 2010-2020 were formulated. Of the eight strategic programmes highlighted in the strategy, those on fire management and REDD support are already formulated with the support of GIZ.

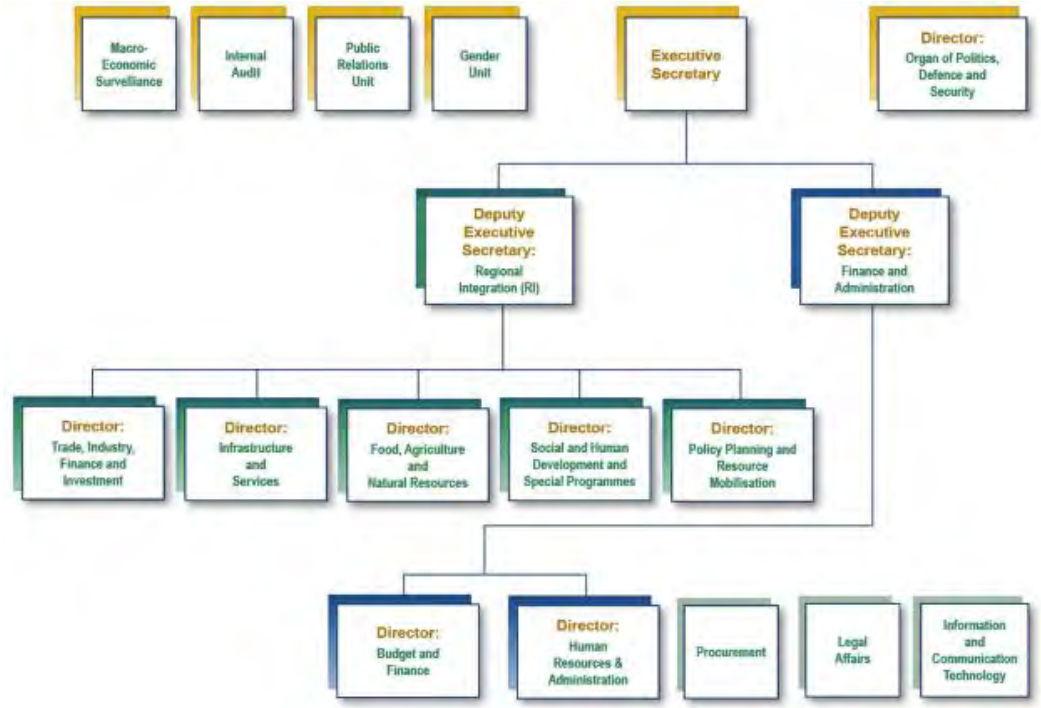


Figure 2-6 Organization Chart of SADC

(2) SADC Forest Protocol

SADC Forest Protocol was formulated in October 2002. The objectives of the protocol are 1) to promote the development, conservation, sustainable management, and utilization of all types of forests and trees, 2) to promote trade in forest products throughout the region in order to alleviate poverty and generate economic opportunities for the people of the region, and 3) to achieve effective protection of the environment and safeguard the interests of both the present and future generations.

The protocol advises adopting national policies/mechanisms and development of regional guidelines for community forestry through encouraging tree growth by local people. It also advises adopting a national policy for prevention and suppression of uncontrolled fires, as well as harmonizing forest assessment among the member states.

(3) SADC Forestry Strategy: 2010-2020

SADC Forestry Strategy 2010-2020 aims to facilitate cooperation among member states to promote the active protection, management, and sustainable use of forest resources, through sound policy guidance and the application of requisite skills and the best available technology, in order that Southern Africa may enjoy the multiple benefits of forests in perpetuity.

The strategy has the following five objectives.
- Regional cooperation and the creation of enabling policy environments
- Increased levels of production and trade in forest products
- Enhanced capacity of forests to provide ecosystem services for climate change mitigation and adaptation, including the protection of key catchments
- The empowerment of rural communities
- The cooperation among countries to assess and monitor key forests of strategic importance to the region

The forestry strategy foresees the following eight strategic programme areas. Logical framework is presented in Appendix 5.
- Climate change mitigation and adaptation
- Protection of key water catchment forests
- Energy supply and rural poverty reduction
- Enhanced participatory forest management
- Enhanced intra-regional trade in forest products
- Cooperation in trans-boundary forest and fire management
- Forest assessments and information management
- Capacity improvement in SADC

It should be noted that community forestry includes community-based forest management as well as tree planting in agricultural lands by local communities (agroforestry). Promotion of agroforestry systems, including nursery establishment, value-added NTFP production, and silvopastoral systems, is found in protection of key water catchment forests and energy supply and rural poverty reduction programmes.

Moreover, according to the SADC Forest Strategy 2010–2020, SADC's role in the operation of the programmes is to evaluate, monitor, and report the performance of the sector, and the responsibility of the SADC secretariat is to "coordinate and promote the implementation" of the forest protocol through the strategy. Thus the actual implementation of the SADC programmes remains the responsibility of member states. The logical framework of the strategy is presented in Appendix 5.

(4) SADC Regional Fire Management Programme

The SADC formulated the Regional Fire Management Programme in 2010. The objective of the programme is to enhance the knowledge and skills of key stakeholders in the region with regard to integrated fire management (prevention, information, preparedness, suppression, and rehabilitation) and, where necessary, to facilitate the adoption of new and/or improved fire management strategies and concepts.

The programme has five components, namely 1) establishment of a Regional Fire Management Coordination Centre, 2) reformation and harmonization of policies and procedures for controlling harmful fires and promoting the safe use of beneficial fires, 3) community-based fire management (CBFiM), 4) enhancement of fire information, and 5) capacity building to increase awareness of and knowledge in balanced and integrated fire management and its elements.

(5) SADC Support Programme on REDD

SADC Support Programme on REDD was formulated in May 2011. The objectives of the programmes are 1) to improve the capacity of SADC Member States to manage and benefit from their national REDD programmes using regional frameworks for REDD, 2) to improve collaboration among SADC Member States to be able to address REDD issues, and 3) to increase the region's influence on the international processes on REDD and climate change.

The key thematic or programmatic areas under the REDD programme include: 1) inter-sectoral coordination mechanisms for the implementation of national REDD programmes, 2) monitoring reporting and verification, 3 funding mechanisms for REDD, and 4) engagement in international negotiations.

(6) SADC Transfrontier Conservation Areas (TFCAs)

In order to promote the conservation of biodiversity and endangered ecosystems and to contribute to improving the living standards of rural communities through the development of tourism and tourism related products, SADC Transfrontier Conservation Areas (TFCAs) have been established. At present, there are 17 identified existing and potential TFCAs within the SADC region (Table 2-4, Figure 2-7). The development of these TFCAs is at different stages: three with treaties, six with memoranda of understanding to facilitate their establishment, and others under negotiation.

The SADC has Transfrontier Conservation Areas (TFCAs) Office established in May 2006 under the Natural Resource Management Unit, FANR. Activities of the TFCAs Office include: 1) to develop frameworks and strategies to define role of all the key stakeholders (e.g. communities, private sector, government institutions, NGOs, IDPs, SADC Secretariat) to actively participate in the establishment and development of TFCAs, 2) to develop and facilitate the implementation of guidelines, standards or best practices for the establishment and development of TFCAs, 3) to establish a resource centre for reference materials on TFCAs, 4) to promote and maintain networking with other TFCA practitioners working in the SADC region, and 5) to facilitate the establishment of permanent support structures for TFCA within the SADC Secretariat.

Table 2-4 Existing and Potential TFCAs within SADC Region

	Name of TFCA	Countries Involved	Status
1	Ai-Ais/Richtersveld Transfrontier Park	Namibia and South Africa	MoU August 2001 Treaty August 2003
2	Kgalagadi Transfrontier Park	Botswana and South Africa	Treaty May 2000
3	Limpopo-Shashe TFCA	Botswana, South Africa and Zimbabwe	MoU June 2006
4	Great Limpopo Transfrontier Park	Mozambique, South Africa and Zimbabwe	MoU November 2000 Treaty December 2002
5	Lubombo Transfrontier Conservation and Resource Area	Mozambique, South Africa and Swaziland	Trilateral Protocol June 2000
6	Maloti-Drakensberg Transfrontier Conservation and Development Area	Lesotho and South Africa	MoU June 2001
7	Iona-Skeleton Coast TFCA	Angola and Namibia	MoU August 2003
8	Liuwa Plain-Kameia TFCA	Angola and Zambia	Conceptual phase
9	Kavango-Zambezi TFCA	Angola, Botswana, Namibia, Zambia and Zimbabwe	MoU developed, to be signed during 2006
10	Lower Zambezi- Mana Pools TFCA	Zambia and Zimbabwe	Conceptual phase
11	Malawi-Zambia TFCA (combination of Nyika and Kasungu/Lukusuzi TFCAs)	Malawi and Zambia	MoU August 2004
12	Niassa – Selous TFCA	Mozambique and Tanzania	Conceptual phase
13	Mnazi Bay – Quirimbas Transfrontier Marine Conservation Area	Mozambique and Tanzania	Conceptual phase
14	Chimanimani TFCA	Mozambique and Zimbabwe	MoU signed
15	Maiombe Forest TFCA	Angola, Congo and DRC	Conceptual phase
16	Kagera TFCA	Rwanda / Tanzania	Conceptual phase
17	Zimoza TFCA	Mozambique, Zambia and Zimbabwe	Conceptual phase

(Source: SADC)

Figure 2-7 Existing and Potential TFCAs within SADC Region

2.7 Regional Networks for Fire Management

(1) Southern African Fire Network (SAFNet)

SAFNet is a regional network that fosters collaborative efforts in fire monitoring and management in Southern Africa. SAFNet's purpose is to enhance the use of information from field observations and remote sensing of fires for natural resource management in Southern Africa. The main activities are 1) to promote the use of validated remote sensing and geospatial information, 2) to facilitate fire-related natural resource management at national, regional and community levels, 3) to provides a forum for informed communication on fire-related issues within the region, 4) to communicate regional fire needs at the international level, 5) to collate and disseminate regional fire information, data and best practices for field observations, and 6) to link with existing fire and other appropriate networks. Current membership of SAFNet is drawn from managers of national parks, government forest fire sectors, regional NGOs, community based organizations, independent consultants, university and research bodies in southern Africa.

(2) The Southern African Regional CBNRM Forum (SACF)

The Southern African Regional CBNRM Forum (SACF) was established as a stakeholder platform for knowledge and information sharing on CBNRM in Southern Africa. The SACF has been supported by the Regional CBNRM Capacity Building Programme in Southern Africa funded NORAD, USAID through WWF Eastern and Southern African Regional Office, as well as Norway and Namibia since 2002. SACF has main office in Zimbabwe CBNRM Forum. The SACF has memberships from Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe and intends to cover the entire SADC region.

2.8 Regional Projects Supported by International Development Partners

Three types of regional/multilateral projects are found in the forest sector in Southern Africa: the SADC framework, multilateral cooperation, and trilateral cooperation through South Africa.

(1) Trans-boundary Use and Protection of Natural Resources

SADC, with support from GIZ, is carrying out the Project for Trans-boundary Use and Protection of Natural Resources. The project period is between 2012 and 2015, with a budget of 5.0 million Euro. The components are 1) implementing the regional Trans-Frontier Conservation Area (TFCA) programme, 2) implementing the regional programmes on REDD and Fire, and 3) integrating climate change and biodiversity conservation into regional and national NRM programmes.

(2) Development of Integrated Monitoring System for REDD+

SADC, with support from GIZ, is carrying out the Project for Development of Integrated Monitoring System for REDD+. The period is 2012-2015, with a budget of 3.4 million Euro. Carbon change in the forests will be monitored in a total area of approximately 26,000km^2 located in the four pilot countries (Mozambique, Botswana, Malawi, and Zambia), and capacity development for MRV will be carried out in all the SADC member states.

(3) African Monitoring Environment in Southern Africa for Sustainable Development (AMESD)

African Monitoring Environment in Southern Africa for Sustainable Development (AMESD) 2007–2012 is an environmental monitoring programme by the EU intended to support all of Africa. AMESD followed PUMA (Preparation for use of MSG in Africa), which was implemented 2001–2005. AMESD provides environmental data on climate and water resources to African countries through technical assistance by EUMETSAT (European Union Organization for

Exploitation of Meteorological Satellites. AMESD provides environmental data based on weather satellite data and weather forecast produced in South Africa.

AMESD develops a partnership between the Regional Economic Communities (RECs), including SADC, the ACP (African, Caribbean, and Pacific) Secretariat, the African Union Commission (AUC), and the EU. The steering committee is composed of voting powers (the AUC, RECs including SADC, and the ACP Secretariat) and observers (European Commission, EUMETSAT, WMO, UNEP, UNECA, and FAO). The activities are coordinated by the Programme Coordination Team based at the AUC in Addis Abeba. AMESD provides long range forecasts, capacity building, user interaction, and data access on agriculture, drought, and wildfire to SADC.

AMESD supports the Advanced Fire Information System (AFIS) through the Centre for Scientific Investigation and Research (CSIR). AFIS is a web based service originally developed to prevent power line from wildfire. Information provided by AFIS includes an active fire alert, a fire danger index, a monthly total of burnt area, an assessment of fire risk by biomass accumulation, the movement of cloud and rain, and flooding areas. A new project (Monitoring Environment for Security of Africa: MESA） is planned to take over AMESD outcomes from 2013 until 2015 or GMES Africa. Botswana Department of Meteorological Service (BDMS) is a regional implementation centre in southern Africa. BDMS has been helping develop technical capability regarding AMESD project to SADC member states.
CSIR has provided field terminals to SADC member states to access AMESD data and AFIS capability. Field terminals are a small set of ground station composed by a small aperture antenna for C-band communication satellite (Atlantic Bird-3), receiving system and PC. Most of SADC countries, except for South Africa, do not have their own ground station to directly receive the data from the satellite. Since the speed of ground network is not sufficient for large data transmission, AMESD infrastructure to retrieve satellite remote sensing data for operational use is needed. AMESD also offers free image processing as well as GIS software to assist remote sensed data analysis.

(4) Trilateral cooperation through South Africa

The NFAP 1997 in South Africa emphasized developing the foundations of a regional approach, including joint studies on research, education, and centres of excellence, the development of an SADC regional forest policy, and a planned SADC timber association. Also, the Forestry 2030 Roadmap (2007) highlighted strengthening international and regional partnerships for sustainable forest management in the strategic objective. Based on the policies, South Africa supports a financial arrangement for trilateral cooperation, a mechanism to implement development programmes in a third country by using the experiences and resources of both a country to give assistance and South Africa. South Africa and Germany implemented the Fire Management Coordination Project in Tanzania under this mechamism.

2.9 Aid Projects by International Development Partners

Many aid projects are being implemented in forest sector by multilateral and bilateral IDPs (e.g. the World Bank, UNDP, FAO, Japan, German, Finland, Norway, Denmark, US). The projects can be roughly categorized into four groups according to the themes: 1) wildfire management, 2) forests inventory and REDD+ preparation with satellite images, 3) forest management, and 4) forest conservation and livelihood development, including community forestry. The list is presented in Appendix 6.

(1) Forest monitoring and preservation projects by Japan

In addition to dispatching forest experts in Mozambique and Malawi, JICA is implementing and planning to implement the following forest assessment and monitoring for REDD+ readiness preparation and watershed management projects.

- Botswana, the Project for Enhancing National Forest Monitoring for the Promotion of Sustainable Natural Resources, 2013-2016
- DR Congo, the Project for Strengthening Natural Forest Resources Monitoring System for Promoting Sustainable Forest Management and REDD+, 2012-2015
- Mozambique, Establishment of Sustainable Forest Resources Information Platform to accelerate the realization of a National REDD Strategy, 2012-2015
- Malawi, the Project for Community Vitalization and Afforestation in Middle Shire, 2007-2012, and Project for Promoting Catchment Management Activities in Middle Shire, 2013-2018

The Ministry of Foreign Affairs in Japan provided grant aids for the forest preservation programme addressing climate change in DR Congo, Mozambique, and Malawi. The total fund provided is about USD40 million. Satellite images, GIS and forest inventory equipment, as well as technical training, were provided by the programme.

(2) Forest Carbon Partnership Facility (FCPF)

The Forest Carbon Partnership Facility (FCPF) is a global partnership operated by the World Bank to support REDD+ readiness preparation. The FCPF aims to: 1) provide financial and technical assistance to pilot an emissions reduction performance-based payment system, 2) test the REDD approach to conserve biodiversity and sustain or enhance livelihoods of local communities, and 3) disseminate the knowledge gained through the development and implementation of the FCPF and related programmes.

The Readiness Fund of currently about USD230 million (USD14 million by Japan) was deposited and USD30 million (USD16.6 million for Sub-Saharan Africa) was approved for readiness projects in Sub-Saharan Africa (DR Congo, Republic of Congo, Cameroon, Mozambique, Kenya, and Ethiopia). In Southern Africa, DR Congo, Tanzania, and Mozambique are participants of the FCPF. Readiness Preparation Proposals (R-PP) of Tanzania and DR Congo were submitted and assessed, and that of Mozambique was endorsed in March 2012.

CHAPTER 3 APPLICATION AND POTENTIAL OF REMOTE SENSING TECHNOLOGIES FOR FOREST RESOURCES AND FIRE MANAGEMENT

Remote sensing is an effective tool for uniformly, broadly, and instantaneously monitoring or investigating vast forest areas, but it is not as accurate as direct observation. However, remote sensing from satellites enables the observation of forests in remote areas where human access is difficult.

3.1 Fire Management by Remote Sensing

(1) Wildfire detection by Terra/Aqua satellite and MSG satellite

The Terra/Aqua satellite and the MSG (Meteosat Second Generation) satellite are commonly used for wildfire detection.

1) Wildfire detection by Terra/Aqua satellite

Terra and Aqua are the EOS series of satellites launched by NASA (National Aero-Space Agency) in the US. These satellites have a MODIS (Moderate Resolution Imaging Spectro-radiometer) sensor that can observe the earth surface by 36 bands of optical wavelength from visible to infra-red. NASA provides two geophysical parameter products for wildfire detection: MOD14 for hotspots and MOD457 for burnt areas.

Hotspot data is provided through NASA's Rapid Response System less than three hours after observation (near real time). The user can retrieve the data from the system free of charge through the internet. However, the geometric accuracy of the location of the hotspot contains errors in orbit prediction, since the rapid response system does not use determined orbit for geometric correction.

2) Wildfire detection by MSG

MSG, a geo-stationary weather satellite belonging to the EU, can observe the earth's surface by infra-red observation, with a 4.8 km spatial resolution at nadir. Although the resolution is larger than MODIS pixel size, being able to make frequent observations, every 15 minutes, is an advantage.

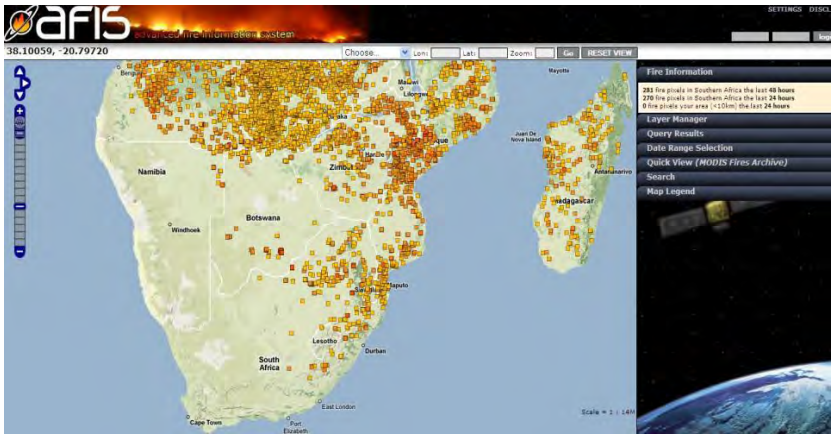
(2) AFIS wildfire information service

AFIS (Advanced Fire Information System) was originally developed by NASA, University of Maryland, and Electricity Supply Commission (ESCOM) for monitoring wildfires in South Africa, specifically to reduce fire damage of power lines.

The AFIS hotspot information is provided to SADC countries through field terminals of AMESD communication, developed by CSIR (Figure 3-1). The algorithm for the extraction of hotspot data was developed by CSIR, based on the MOD14 of MODIS standard processing.

The detectable hotspots are generally large. Those that can be detected by MODIS are 50 m x 50 m in the pixel (1 km x 1 km). The MSG detects hotspots of 500 m x 500 m. The AFIS also provides data for the burnt scar area, based on the algorithm of the MCD45 of MODIS (Figure 3-2).

MODIS and MSG data are received and processed at CSIR Meraka institute and the South African National Space Agency (SANSA) ground station in South Africa. Because these stations cannot cover the northern part of SADC countries (Tanzania and Zambia), CSIR collaborates with ground stations outside of SADC countries (e.g., Marindi ground station in Kenya operated by the University of Rome).



(Yellow or orange spots indicating hotspots)

Figure 3-1 AFIS Hotspot Website Image

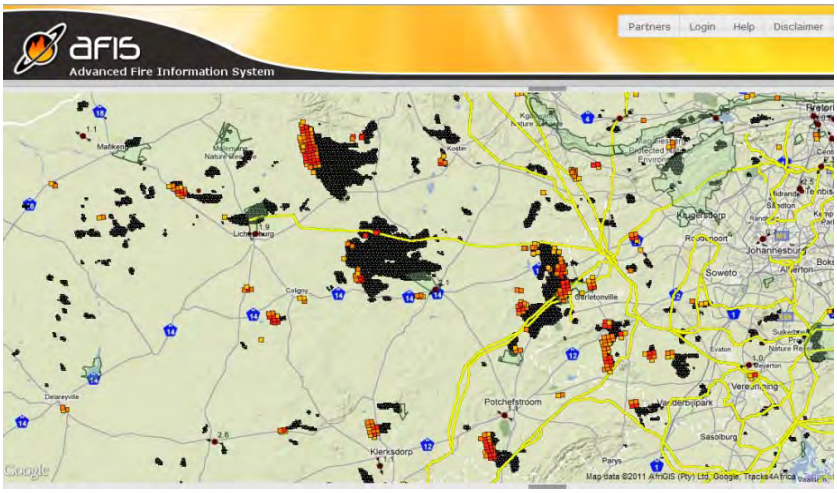


Figure 3-2 AFIS Display of Hotspots and Burnt Scars

(3) Improvement of spatial/temporal resolution for satellite remote sensing

Currently, since hotspot information provided by the AFIS is based on MODIS or MSG observation, the spatial resolution of 1 km or 3 km provides images for only large fires. For detecting small fires at early stages, geometric accuracy is not sufficient to mobilize firefighters. However, an infra-red sensor with a higher spatial resolution is expected to be utilized. Japan is planning to launch the following satellites to enhance the observation system.

1) High resolution infra-red sensor

ALOS-2 (Advanced Land Observation Satellite 2) will be launched by Japan Aerospace eXploration Agency (JAXA） with a two dimensional, large-formatted infra-red sensor (in a Compact Infra-Red Camera: CIRC) as an experimental instrument for observing wildfires. The

spatial resolution is 300 m, smaller than what the MODIS is capable of. Since the satellite can send data through a communication satellite on a geostationary orbit and has a temporal data recorder on board, the observation data in Africa can be received in Japan. However, the use of a CIRC sensor may be constrained by satellite position during operation.

2) Small satellite observation

UNIFORM, a small satellite developed by Wakayama University, has an infra-red camera similar to the CIRC of ALOS-2. UNIFORM is to be launched with ALOS-2 in 2013 as a piggyback satellite. Since a small satellite is not as costly as a large satellite, it is easy to compose constellations and increase observation opportunities. On the other hand, geometrical accuracy must be evaluated since the position and orbit of satellites are confined.

3) Improvement of temporal observation resolution by constellation of satellites

UNIFORM and ALOS-2 will be launched simultaneously and can be set for constellation to improve the temporal resolution. The UNIFORM project plans to launch several satellites in the future; thus constellation with more satellite observations for greater temporal resolution would be possible. The combination of a high resolution sensor and a medium resolution sensor (1 km and 2000 km resolutions) enables assessment of burnt areas, with wider panoramic observation and high resolution.

The AFIS will increase observation frequencies by using NPOESS, a next generation satellite developed by the US, as well as the NPP satellite launched in 2011 as a technology demonstration satellite.

The SGLI (Second Generation Global Imager) sensor of Japan's GCOM-C (Global Change Observation Mission) and the LANDSAT and NPOESS satellites of the US will have infra-red sensors. Combining infra-red observations with CIRC observations, temporal and spatial resolutions will be enhanced. With the resultant dataset provided to the AFIS, multilateral information of wildfire becomes available.

(4) Utilization of Fire Danger Index/Fire Weather Index (FDI/FWI)

Suppressing fire by means of hotspot detection by satellites is generally difficult. Since most wildfires are human-induced, it is important to raise awareness against wildfires. Alerting local communities or firefighters of high risk periods and areas would help raise awareness. FDI/FWI information derived from weather conditions (temperature, humidity, wind speed, etc.) and knowledge of land surfaces and conditions (land cover, soil moisture) is utilized. An alert pertaining to human activities (starting or extinguishing fires) can be produced by incorporating the FDI/FWI into the Fire Danger Rating System (FDRS).

Various FDI/FWI/FDRS are found to be in use in different places, their usage depending upon the condition of the country, the developer involved, and the climate. Among these are the FDI/FWI of the Canadian Forest Fire Danger Rating System (CFFDRS), the McArthur Fire Danger Index developed in Australia, and the Lowveld Fire Danger Index (LFDI) used in South Africa, which has improved the McArthur FDI based on South African conditions.

The AFIS is providing the FDI estimated by LFDI and CFFDRS. South African Weather Service (SAWS) provides AFIS with the original FDI. The FDI is estimated by SAWS based on observation and numerical prediction.

In many cases, the FDI is estimated by the Canadian algorithm; however, it is better to change the model parameters in order to fit better with the conditions of local climate and vegetation.

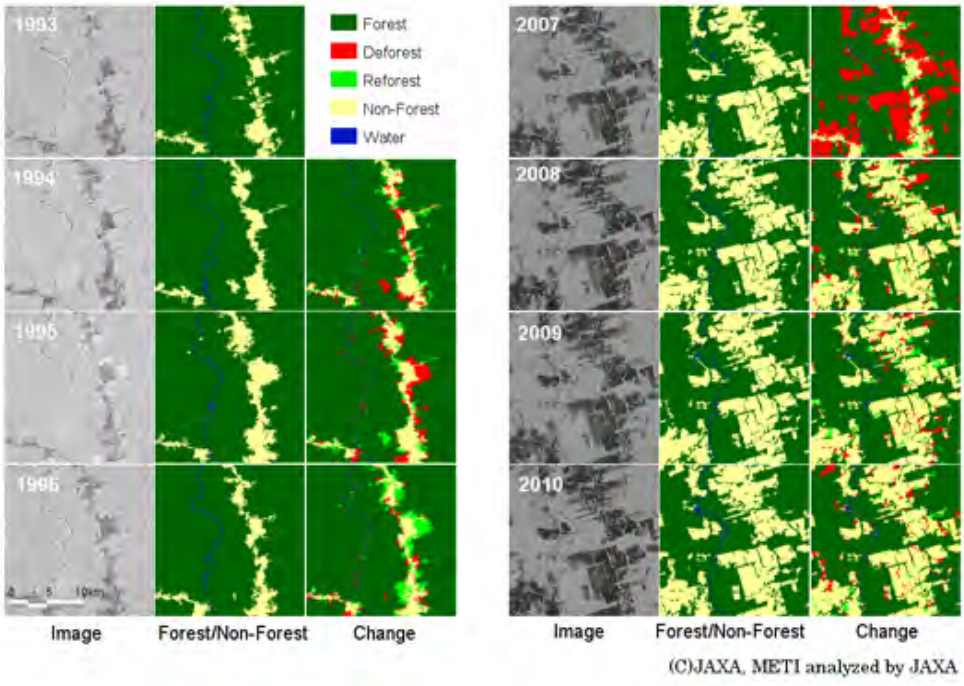
3.2 Forest Resource Monitoring by Remote Sensing

(1) Optical sensor

Although optical sensor observation is affected by cloud coverage, it has several advantages over radar observation. Firstly, a long history of data archives pertaining to optical sensors, including those of LANDSAT and SPOT started in 1970s, enables authorities to monitor and analyze forest areas over a long term. Secondly, having many spectral bands of optical data, especially at infra-red (short/middle wave, near infra-red, long wave), enables spectral classification based on combinations of bands. Thirdly, detail features monitored by means of optical data provide higher accuracy when it comes to estimating burnt areas or change of forest size. Recently developed, a hyperspectral sensor has scores of spectral bands, thus enabling the analysis and classification of vegetation, or land cover, in detail. The data also enables higher accuracy in the assessment of forest resources and burnt areas.

(2) Synthetic Aperture Radar (SAR)

Since Synthetic Aperture Radar (SAR) observation penetrates cloud, rain, and haze, frequent observations become possible with SAR in tropical areas largely covered by cloud. Japan has provided long-term observations generated by SAR, beginning with JERS-1 in 1992, which was succeeded by ALOS and ALOS-2 (Figure 3-3). Forest coverage analysis over decades is very important to providing Reference Emission Levels so as to estimate future carbon trends for REDD+ projects.



Source: JAXA

Figure 3-3 Long-term Monitoring of Forest Cover Change Provided by SAR Data

Utilization of Remote Sensing Technologies in Other Sectors is presented in Appendix7.

CHAPTER 4 CONSTRAINTS AND OPPORTUNITIES CONCERNING FOREST CONSERVATION AND SUSTAINABLE USE OF FOREST RESOURCES IN SOUTHERN AFRICA

The constraints and opportunities concerning better management of the forest sector in Southern Africa make for a complex situation. Despite the high potential of forest resources, particularly for local people, serious forest degradation is causing rural poverty, and misuse of fire makes resource utilization insufficient. Increasing local people's participation in forest management for their own needs and benefits should be promoted. On the other hand, the national level forest governance can be strengthening by enhancing forest information and monitoring system through utilizing funding opportunities for climate change mitigation.

4.1 Deforestation and Forest Degradation

According to the FAO Global Forest Resource Assessment (FAO, 2010), most serious deforestation is found in Tanzania, Zimbabwe, DR Congo, Mozambique, and Zambia. The deforestation rates in Zimbabwe, Botswana, Malawi, and Namibia are larger than one percent per year. The main causes of deforestation and forest degradation are considered to be increased fuelwood consumption by a rapidly increasing population, wildfires, and freely-grazed domestic livestock. Besides DR Congo, most forests in Southern Africa consist of miombo woodlands, and people in rural communities relying for their livelihood on its resources and its lower above-ground biomasses are affected by the high frequency of fires. Therefore enhancement of forest management by better fire management and strengthening community forestry should consider miombo woodlands as the first priority.

4.2 Fire Management

The area subject to the greatest wildfire losses in Southern Africa consists of dry sparse miombo woodlands, which mainly extend in Angola, Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe. The forest area annually destroyed by fire is estimated to be about 530,000 hectares. During 2000–2007, the worst wildfires occurred in Angola (about 25% burnt annually), followed by Zambia (20–25%), Mozambique (15–20%), and Tanzania (10–15%).

Wildfires cause great damage in Southern Africa. In South Africa in 2008 approximately 80,000 ha of plantation land was burnt and 23 people lost their lives. In Botswana burnt areas dramatically increased after 2008, covering 27% of the country in 2011.

Fire management is an essential part of forest management. The key actions required for fire management in the SADC Forest Strategy 2010–2020 include: 1) promotion of a common fire management regime; 2) cooperation agreements between local government, traditional leaders, and community groups; 3) development of a fire-scar monitoring service; 4) establishment of a fire management equipment supply; 5) construction of fire lines; and 6) establishment and enforcement of laws related to fire management.

Wildfires are human-induced, and the use of fire is customary in the preparation of land for agriculture, chasing animals for hunting, charcoal making, renewal of green grass, removal of insects, weeds, wildlife, etc. It is desirable that the approach to fire management allows for traditional ways of life, enabling the maintenance of rural livelihoods. Various activities have been attempted in Southern Africa. For example, a national campaign concerning fire management could be promoted, as occurs in Mozambique. Namibia has a successful fire prevention campaign that uses dramatic plays on radio. Also, fire prevention needs to be promoted within traditional social groups, with the cooperation of local government and traditional leaders.

In order to manage fires efficiently, integrated fire management, including fire information analysis (e.g. satellite images, field surveys), fire prevention (e.g. employing fire breaks, prescribed burning), preparedness (e.g. early warning methods), fire suppression (provided by professional/community volunteers), and restoration of fire affected areas (FAO, 2009), should be disseminated. Fire lines need to be established, with a proper equipment supply and appropriate guidelines that can be followed by local communities and within local government systems. The weaken capacity of the government on fire management by structure adjustment (e.g. Zambia in 1990s) needs to be reconstructed, with clear intention to connect with livelihood development for local people.

Fire hotspot data provided by AMESD is too extensive to mobilize firefighting in some case, and the data on burnt areas is not effectively analyzed to be utilized for policy development on fire management. Higher resolution satellite images as well as RADAR image (SAR) from Japan can be utilized when opportunities arise. RADAR image can observe the object under the coverage of cloud and smoke. In order to ensure effective utilization, satellite data from Japan can be tested with controlled fires (e.g. a large scale prescribed burning at Kruger National Park). Methodologies to utilize fire-scar monitoring for REDD+ can also be studied. Fire-scar monitoring by satellite image analysis can be used for regional policy formulation, as suggested in the Forest Strategy.

Climate data is not sufficient in most countries for developing fire alerts and mobilizing prevention. As early warning for the wildfire, FDI (Fire Danger index) /FDR (Fire Danger Rate) is applied. In order to improve FDI/FDR by local climatological parameters and observations, weather data is not sufficient due to low density of weather stations. Weather data can be enhanced by using varieties of satellite data. Soil moisture estimated by microwave radiometers on satellites by Japan, such as AMSR-E[1] and GCOM-W1/AMSR-2[2] can be integrated into drought index for early warning of forest fire.

Environmental education at elementary and secondary schools, teaching science involving climate measurement to children, can be promoted along with community-based fire management. JICA can dispatch volunteers for the purpose. By using data from community-based weather station, FDI/FDR can be improved. In Mozambique a school forest was created at a school supported by a JICA-JOCV.

4.3 Community Forestry

Rural poverty is a serious problem in Southern Africa. The percentage of the residents living on natural forest lands is relatively high. Use of trees for food security is an important strategy for sustainable development in rural Africa.

Most of the countries in Southern Africa are introducing or has been introduced participatory forestry. The challenge of participatory forestry lies in institutionalization and devolution of rights

1 Advanced Microwave Scanning Radiometer-Earth Observation Station on Aqua satellite which measures cloud properties, sea surface temperature, near-surface wind speed, radiative energy flux, surface water, ice and snow.
[2]Advanced Microwave Scanning Radiometer 2(AMSR2) launched in May 2012 on the Global Change Observation Mission 1st - Water "SHIZUKU" (GCOM-W1), is expected to offer brightness temperature and physical quality from 2013.

to and benefit sharing with communities. Regional experiences must be reviewed in the context of prevailing practice (e.g., Tanzania, Mozambique, Zimbabwe, and Malawi). Examples of Community-based Forest Management (CBFM) and Joint Forest Management (JFM) in Tanzania may be applicable to other countries.

The SADC Forest Protocol speculates upon how best to adopt national policies and mechanisms to enable local people and communities to benefit collectively from the use of forest resources, to develop regional guidelines, and to share information and expertise related to community-based forest management.

The use of trees in the farming system supports food security. The SADC Forest Protocol encourages local people and communities to grow and conserve trees and to integrate them into existing farming systems. It is sensible to share information of advanced cases with the countries with just initiating the action. Angola plans to introduce community-based resource management by promoting agroforestry, but the actual experience has been limited. In Mozambique, agroforestry for food security by a voluntary carbon offset investment by a private company was initiated by a government project with a JICA/WFP support. Also in Botswana, sustainable production and marketing of NTFPs (Veld resources) is incorporated into village land use plan.

Existing regional network like CBNRM forum should be strengthened not only for knowledge base and regional trainings but also for multilaterally facilitating pilot activities in the field.

Regional guidelines for community forestry can be prepared under the SADC framework by reviewing good practices for developing regionally applicable criteria and elaborating needs of training and awareness raising.

It should be noted that there exist dozens of transboundary tribal areas in Southern Africa. Project implementation to the tribes who separately reside in two states promotes regional integration.

4.4 Forest Assessment and Monitoring Addressing Climate Change

A number of demonstration pilot projects for REDD+ have been emerging in potential support for the rural poor through activities to enable them to achieve forest conservation. In order to promote REDD+, basic forest data needs to be systematically produced over time. Effective measures for forest monitoring are needed; measures have not been taken due to the lack of forest information in Southern Africa.

It is advantageous to use the opportunity for REDD+ readiness “preparation” for developing basic forest resource monitoring systems, not only for carbon monitoring but for sustainable forest management. Tanzania and Mozambique are more advanced in forest assessment, because they have received support from bilateral cooperation in addition to assistance from FCPF and/or UN-REDD. Present efforts in Tanzania (e.g., soil carbon monitoring in NAFORMA) as well as a new project to develop forest information platform in Mozambique by JICA may have a potential to be applied in other countries.

Setting effective conditions for community involvement in sustainable forest management is a difficult process and is not wholly responsible of the forest sector. The efforts for multi-sector integration aiming at mainstreaming forest conservation through hundreds of workshops are an important achievement of REDD+ readiness preparation. The experience in REDD+ advanced states (e.g. Tanzania, Mozambique) can be shared with other SADC states.

4.5 Weak Forest Technical Capability

Due to inadequate funding and underdevelopment of infra-structure, the forest service of each country cannot impose regulations, monitor forest resources and sustainably produce forest

products. Key capacities which need to be enhanced in most of the forest departments in Southern Africa are forest assessment/monitoring and sustainable forest management. For forest resource assessment, the SADC Forest Strategy highlights actions on developing forest assessment guidelines, forest database development, regionally harmonized monitoring systems, preparation of forest status reports, and assessment of national databases. Through the preparation for REDD+, technical capacity can be enhanced on personnel training on GIS, database systems, inventory, and remote sensing technologies for sustainable forest monitoring and management. A mechanism for sharing technical capacity of forestry among Southern African countries through regional training programmes is expected to be developed.

4.6 Advantages and Potentials for Regional Cooperation

Regional cooperation through SADC has several advantages and potentials. The following opportunities were recognized.

- Training programs effectively organized for all SADC member states
- Information sharing for outcomes by bilateral projects and good practices in SADC member states
- Regional cooperation to tackle trans-boundary issues (e.g. TFCAs, Trans-boundary tribal areas, trans-boundary water conservation/trade)

Organized training on general topics can be offered to SADC member states. Currently JICA offers training related to forest inventory/REDD+ (remote sensing and GIS analysis) in Japan. These training programs can be shifted to South Africa (e.g. Pretoria University) to trainees from Southern Africa. The technical level can be adjusted among the states. Regional trainings with follow-up projects would give incentives for participants to complete the program successfully. The issues on training regarding satellite image analysis are presented in Table 4.1

Cooperation among IDPs should not stay just on on-going projects. Historical outcomes/good practices produced by other IDP can be expanded by JICA (e.g. IFM in Namibia, Community forestry in Botswana, etc.).

The outcomes of JICA's bilateral cooperation as well as good practices in the region can be shared in regional cooperation. The efforts to share the outcome of bilateral cooperation are already carried out by JICA. However, by implementing regional cooperation by the SADC framework, not only outputs but the process of bilateral cooperation can be monitored and shared by SADC member states. Workshops can also be held to add value to the outcome and shared by member states.

There exist 17 TFCAs as well as dozens of transboundary tribal areas in Southern Africa. Natural resource management by transboundary tribes has not been implemented very much in Southern Africa. Since historical migration in Southern Africa is severe due to the social conflict, there exist great opportunities in this approach. Experience of utilizing traditional fire management of one tribe can be shared with the same tribe who lives in neighbor country. A minority tribe in one country could be a major tribe in other country (e.g. Angola and Namibia); thus it could be politically easier to support minority tribes through neighbor government than the government of the existing political boundary.

Apart from the opportunities, following shortcomings in regional cooperation are also recognized.

- Human and financial capacities of SADC secretariats are very limited (one permanent forest officer in FANR with annual implementation budget of about US$75,000). It is important to consider developing a sustainable mechanism to follow the practices conducted by the project after project termination as an exit strategy (e.g. utilization of regional network, follow-up by bilateral projects, collaboration of other IDPs).
- Obtaining agreement with the SADC member states by holding workshops is very costly.
- The high level of heterogeneity exits among the SADC member states. The countries with

high human, financial and technical capacities (particularly Southern Africa and Tanzania) should contribute effectively to the project implementation.

- Interaction between the SADC member states should be carefully treated, (competing for better performance avoiding negative interactions to hold back each other).

Good practices and available technologies to regionally share as well as training/awareness raising needs and potential of pilot activities are presented in Table 4-2.

4.7 Conclusions

The following conclusions are derived from the survey.

1. Economic values of miombo forests for local people are not well recognized not only by government but also by local people themselves. Recognition of value through awareness raising, advocating, NTFP production and marketing, agroforestry in the farms should be promoted based on the existing good practices in the region. Policy reforms through the devolution of resource use rights and benefit sharing as well as existing technical manuals can be reviewed through information sharing workshops. Harmonized policies aiming at developing a regional guideline can be elucidated through the process.

2. Fire management is the essential part of forest management. Since most uncontrolled fires are human-induced, it is important to place local communities at the centre of fire management, being connected with utilization of forest resources for livelihood development. Integrated fire management to combine fire information analysis, fire prevention (e.g. employing fire breaks, prescribed burning), preparedness (e.g. early warning), fire suppression, and restoration of fire affected areas should be promoted through community involvement. Traditional practices on fire management including governance structure of traditional rural societies as well as women's role need to be reviewed and incorporated into fire management strategies.

3. Utilization of satellite data has been introduced by AMESD but not effectively utilized yet. Japan's advanced satellites including radar, soil moisture data, high resolution images can be effectively utilized for the enhancement of data quality and availability.

4. REDD+ emerged as a new financial source for strengthening forest management in Southern Africa. Experiences and technologies developed through REDD+ readiness preparation in advanced states (Tanzania and Mozambique) should be utilized for other SADC member states (e.g. forest monitoring techniques (forest type, inventory method, mapping), project formulation, political process to mainstream forest conservation through multi-sector communication).

5. Regional cooperation is advantageous due to the benefits of multiple countries though contribution to trans-boundary issues for regional integration, while utilizing outcomes of existing bilateral projects and good practices. Collaboration with IDPs as well as strengthening regional networks is important for effective implementation of the opportunities. According to SADC Forest Strategy 2010-2020 and fire management and REDD+ support programs, JICA can effectively implement a regional project.

4.8 Recommendations

The following recommendations have been derived from the survey for the potential areas of future regional cooperation by JICA on forest conservation.

General principle

In order to encourage investment in forests, economic value needs to be recognized and effectively produced from forests (timber, NTFP, carbon, etc.) with enhanced information with proper and advanced technologies with community involvement.

Fire management

- Promote community based integrated fire management (prevention, preparedness, suppression and restoration) based on traditional local knowledge aiming at livelihood development
- Use advanced satellite images for producing better fire data by improving the spatial and temporal resolution of hot spot detection, burnt scar assessment and FDI/FDR enhancement
- Introduce environmental education in primary/secondary schools with basic science and climate measurement and utilize their observations for FDI/FDR for the early warning of fire
- Enhance AMESD data applicable for fire management practices
- Carry out extensive fire prevention campaign through effective media
- Carry out calibration campaign with satellite observations for fire with local community

Community forestry

- Develop CBFM schemes with various levels of devolution of resource use rights and benefit sharing suitable to the sites
- Promote agroforestry and NTFP production for livelihood development utilizing investment addressing climate change
- Develop regional guidelines for community forest management and use of trees in sustainable farming system

Forest assessment and monitoring addressing climate change

- Strengthen forest assessment and monitoring system for REDD+ readiness preparation and sustainable forest management by using experience/technologies of advanced countries
- Elaborate REDD+ potential by reducing wildfires in miombo woodlands by analysing fire-scar satellite images
- Combine forest assessment with fire data for analyzing the change

Regional cooperation strategy

- Contribute to the implementation of fire management and REDD+ support programmes under the SADC framework
- Incorporate technical capacities of South Africa by using trilateral cooperation for other Southern African countries
- Promote trilateral cooperation among SADC member states through shared-learning process and transfer of advanced knowledge and experiences (e.g., South Africa for remote sensing technologies and Tanzania for Joint Forest Management, Community-Based Forest Management, and REDD+ readiness preparation)
- Strengthen regional networks to conduct research and training specialized in forest assessment and monitoring, fire management, and community forestry for SADC countries
- Collaborate with on-going regional projects and utilized outputs/good practice produced by other IDPs

•Table 4-1 Satellite image analysis and issues on training in Southern Africa

Analysis contents	Objective	Data	Technical issues	Issues on training
Hotspot analysis	Detection of location of fire initiation	MODIS/ (ALOS-2/GCOM-C) （CIRC） Other satellite data with an infra-red sensor	・ Data supply by AMESD ・ Use of MOD 14 algorism developed by NASA ・ Enhanced MOD14 attempted in Indonesia (JICA) ・ Algorism unsuitable to the local conditions ・ Difficulty to download data from NASA due to low cable capacity	・ Relatively easy techniques to obtain by training ・ Application analysis with data interpretation ・ Enhancement of data acquisition ability ・ Use of Japanese satellites
Burned scar analysis	Detection of burned area	MODIS, LANDSAT, SPOT	・ Data supply by AMESD NASA Use of MOD 14 algorism developed by NASA ・ Only Tanzania carried out the analysis ・ Difficulty to download data from NASA due to low cable capacity	・ Possible to obtain techniques by training ・ Application analysis with data interpretation ・ Enhancement of data acquisition ability
Land use analysis	Classification of land use and forest type distribution	LANDSAT, SPOT, ALOS Rapideye, (GCOM-C), others	・ Basic classification methods well established. ・ Survey needed to define classification at reference area ・ Difficulty to download data from NASA due to low cable capacity	・ Possible to obtain techniques by training ・ Application analysis with data interpretation ・ Enhancement of data acquisition ability ・ Use of Japanese satellites
Forest change analysis	Analysis of forest change with all weather without influence of smoke	ALOS/(ALOS2) SAR	・ Image use with optical data is appropriate. ・ Needs to distinguish causes whether fire or not	・ Possible to obtain technology with technical support ・ Enhancement of data acquisition ability
Calculation of fire danger index	Issuing fire alert	MSG/AMSR-E/AMSR-2/TMI/MODIS and others	・ Lack of weather measurement points ・ Needs to improve region specific algorism ・ Enhancement of algorism by Japanese satellite (use of microwave radiometer)	・ Training of new topics ・ Use of Japanese satellite ・ Training for weather measurement by community ・ enhancement of data acquisition ability

Table 4-2 Good Practices/Useful Technologies, Training Needs, Potential Awareness Raising and Pilot Activities in Southern African Countries

	Fire management	Community forestry	Forest assessment and monitoring
Good practices or useful technologies to share in the region			
Botswana	•Organized firefighting •Community based fire fighting (Community Trust) •Weather observation network by local policemen and teachers and Weather Service	•Production and marketing manuals of NTFPs/livestock production (GIZ) •CBFM of Indigenous Forests •Land use planning for NTFP production •Community based wildlife management/tourism development	
Lesotho		•Management of state owned woodlots to local councils.	
Malawi	•Use of traditional structures for fire prevention and control	•CBFM policy •Resource sharing programmes •NTFP production and marketing •Watershed management for soil conservation by agroforestry (JICA/WB) •CBFM (Village Committee, Communal woodlots, income generation through livestock production/agroforestry) (GIZ).	
Mauritius	•Firebreaks in fire-prone area	•Reforestation program with tree planting campaign	•Forest Land Information System
Mozambique	•Action Plan to control uncontrolled fires •Awareness and tree plantings with incentives for fire prevention by a forest concession owner •Wildfire monitoring based on MODIS data.	•Strategic Plan to reduce human-wildlife conflict. •National program for CBFM •Agroforestry model (Cashes, Moringa and Corn) with voluntary carbon offset.	•Forest information platform for assessment and monitoring(JICA) •Remote sensing with radar images (JICA)
Namibia	•Integrated fire management (participatory fire line, awareness program on drama, etc.)		
Seychelles			•Biodiversity conservation on islands
South Africa	•Remote sensing technology for fire management (AFIS, CSIR)) •Firefighting technique (prescribed burning, fire lines etc.) (Working on fire)	•Joint forest management policy	•SPOT mosaic dataset to monitor vegetation change (SANSA)

Swaziland	•Integrated fire management strategy •Firefighting techniques (prescribed burning, fire lines, etc) •Remote sensing and satellite image analysis, GIS (Surveyor Office, University of Swaziland: UNISWA)	•Renewable energy (pilot initiative on solar energy, hydropower, bio-ethanol fuel and wind energy) •Fuel efficient stoves (pilot initiative) •Commercialization of indigenous natural products of fruit trees •Research of indigenous medicinal plants. •Processing and preservation of indigenous food •National Forest Policy (2002), National Decentralization Policy .	•Surveying and Mapping data of invasive alien plant species (IAPS) 2010
Tanzania	•Trilateral cooperation on fire management by SA/GIZ •Traditional fire management (NAFORMA) •Firewise techniques for communities •Fire suppression techniques for communities •Active Fire Information System •Burnt area analysis	•CBFM/JFM schemes •Participatory forest management guidelines •Landscape restoration techniques by Ngitiri system (natural regeneration of indigenous tree species) •Legal framework for CBFM •Group formation in beekeeping; •Linking beekeepers with village community banks/ landing services •Establishment of bee reserves •Guidelines for cost-benefit sharing •Existence of village land natural resource committees •Ngitiri system for fodder bank •Rotational woodlot, •Tree growers associations	•Harmonized forest type and mapping (NAFORMA) •Sampling methodology •Participatory Forest Resources Assessment guideline •Field manuals •Soil carbon monitoring •Forest type classification; •National REDD+ Framework •National REDD+ Strategy •Carbon Monitoring Centre and research •REDD+ Pilot projects •Forest resources database •Forest management plans (plantation and natural forests) •Nature reserves conservation strategy •Forest monitoring with community by Permanent sample plots •REDD pilot projects formulation •Forest and land use management plan
Zambia	•CBNRM with fire management in game management areas.	•CBFM in forest reserves and customary land •Agroforsetry programme	

Zimbabwe	•Integrated Fire Management Strategy •CBFM Training Manual •Community Training on fire management	•CBNRM forum as regional network •CBFM by Rural District Councils which owns communal lands	•Forest inventory in 2008 supported by FAO
Training/awareness raising needs and pilot activities			
Angola	•Firefighting techniques (prescribed burning, fire lines, etc.) •Community based integrated fire management •National programme/ strategy /comission for forest fire management	•Basic training on CBFM and agro-forestry •NTFP utilization, processing and marketing •Biomass utilization for sustainable livelihoods •Alternative energy utilization •Iona-Skeleton Coast TFCA •Liuwa Plain-Kameia TFCA •Kavango-Zambezi TFCA •Maiombe Forest TFCA	•Forest inventory technique •Remote sensing technology & GIS for forest resources assessment •Designing, planning and development of methodologies for REDD+
Botswana	•Community based integrated fire management •Calibration of satellite remote sensing with local observation	•Integrated land use planning for community forestry •Agroforestry model and livelihood development •NTFP utilization, processing and marketing •Kgalagadi Transfrontier Park •Limpopo-Shashe TFCA •Kavango-Zambezi TFCA	• Capacity building on radar remote sensing for forest assessment •REDD+ baseline assessment, emission level calculation
DRC		•Policy and practice to introduce CBFM •Maiombe Forest TFCA	•Forest resource monitoring system.
Lesotho		•Maloti-Drakensberg Transfrontier Conservation and Development Area	
Malawi	•Firefighting techniques (prescribed burning, fire lines, etc) •Community based integrated fire management •Use and management of AMESD system	•Policy reforms for CBFM •Integrated land use planning for CBFM •Agroforestry model and livelihood development •NTFP utilization, processing and marketing	•Advanced forestry inventory and mapping by RS and GIS •Designing, planning and development of methodologies for REDD+ •MRVs for carbon stock •REDD+ baseline assessment, emission

	•National consultation framework with NGOs on fire management	•Biomass utilization for sustainable livelihoods •Alternative energy utilization •Malawi-Zambia TFCA	level calculation •Preparation of forest management plan
Mozambique	•Firefighting techniques (prescribed burning, fire lines, etc) •Community based integrated fire management •Weather monitoring for FDI by weather stations and satellite remote sensing.	•Integrated land use planning for CBFM •NTFP utilization, processing and marketing •Agroforestry model and livelihood development •Biomass utilization for sustainable livelihoods •Alternative energy utilization •Great Limpopo Transfrontier Park •Lubombo Transfrontier Conservation and Resource Area •Niassa – Selous TFCA •Mnazi Bay – Quirimbas TFCA •Chimanimani TFCA •Zimoza TFCA	•Advanced forestry inventory and mapping by RS and GIS •MRVs for carbon stock •REDD+ baseline assessment, emission level calculation •Preparation of forest management plan
Namibia	•RS and GIS analysis for fire data (hotspot & burnt scar)	•Integrated land use planning for community forestry •Biomass utilization for sustainable livelihoods •Alternative energy utilization •Ai-Ais/Richtersveld Transfrontier Park •Iona-Skeleton Coast TFCA •Kavango-Zambezi TFCA	•Advanced forestry inventory and mapping by RS and GIS
South Africa	•Enhancing AMESD data with Japanese satellite data (Hotspot, draught, burnt scar) (SANSA, CSIR) •Field verification of fire detection by Satellites (Kruger NP, CSIR) •FDI improvement by Japanese microwave remote sensing (CSIR, SAWS) •Calibration of hotspot observation	•Ai-Ais/Richtersveld Transfrontier Park •Kgalagadi Transfrontier Park •Limpopo-Shashe TFCA •Great Limpopo Transfrontier Park •Lubombo Transfrontier Conservation and Resource Area •Lubombo Transfrontier Conservation and Resource Area •Maloti-Drakensberg Transfrontier	•Radar satellite remote sensing for forest change assessment •Use of TRMM dataset and Japanese microwave RS data for water resource management and forest monitoring (Water Research Commission)

	SANSA, CSIR and local community)	Conservation and Development Area	
Swaziland	•Fire information system •Linking fire suppression and fighting to carbon credit markets •Community based integrated fire management •RS and GIS analysis for fire data (hotspot & burnt scar) •Early warning and fire index rating system for fire detection •Use and application of weather data to determine fire occurrence	•Integrated land use planning for community forestry •CBFM Development and implementation (CBO Development, benefit sharing) •Community based tree nurseries •NTFP production, processing and marketing •Production and utilization for indigenous forest resources •Soil conservation and water-shed management •Reclamation of degraded land •Agroforestry model and livelihood development •Control and management of IAPS	•Advanced forestry inventory and mapping by RS and GIS •Forest inventory method and forest type classification •Designing, planning and development of methodologies for REDD+ •MRVs for carbon stock •REDD+ baseline assessment, emission level calculation Carbon stock measurement •Formulation of forest management plans •Development of forest models for SFM •Land use planning for delineation of forests •Benefit sharing related to utilization forest biodiversity
Tanzania	•Institutionalization of integrated fire management •Firefighting techniques (prescribed burning, fire lines, etc) •Community based integrated fire management •RS and GIS analysis for fire data (hotspot & burnt scar) •Linking fire suppression and fighting to carbon credit markets •Active fire detection, monitoring and verification •Social-economic impact of forest fires •Procurement and installation of Land sat receiver to monitor and collect data in Northern part of Tanzania and other SADC countries •Tree improvement of resilience species to fire	•Integrated land use planning for community forestry •Construction of Forest Resource and Information Centre at HQ •Advanced training on community forest management •Agroforestry model and livelihood development •Bee resource management and processing of honey products •Niassa – Selous TFCA •Mnazi Bay – Quirimbas TFCA	•GIS and RS in relation to Forest monitoring, change detection, data analysis and interpretation •Vegetation change detection

	•Status of nutrient, soil structure, risks of fungal and insect attack in burnt forest		
Zambia	•RS and GIS analysis for fire data (hotspot & burnt scar) •Community based integrated fire management	•Integrated land use planning for community forestry •CBFM Development and implementation (CBO Development, benefit sharing) •NTFP utilization, processing and marketing •Agroforestry model and livelihood development •Liuwa Plain-Kameia TFCA •Kavango-Zambezi TFCA •Lower Zambezi- Mana Pools TFCA •Malawi-Zambia TFCA •Zimoza TFCA	•Advanced forestry inventory and mapping by RS and GIS
Zimbabwe	•RS and GIS analysis for fire data (hotspot & burnt scar) •Community based integrated fire management	•Integrated land use planning for community forestry •CBFM Development and implementation (CBO Development, benefit sharing) •NTFP production and marketing •Agroforestry model and livelihood development •Limpopo-Shashe TFCA •Great Limpopo Transfrontier Park •Kavango-Zambezi TFCA •Lower Zambezi- Mana Pools TFCA •Chimanimani TFCA •Zimoza TFCA	•Advanced forestry inventory and mapping by RS and GIS •Designing, planning and development of methodologies for REDD+ •MRVs for carbon stock •REDD+ baseline assessment, emission level calculation

Remark: Potential partners and IDPs are shown in parentheses. TFCA is shown in Community forestry columns.

CHAPTER 5 POTENTIAL AREAS OF COOPERATION IN THE JICA REGIONAL PROGRAM ON FOREST CONSERVATION AND SUSTAINABLE USE OF RESOURCES

It is proposed that a new programme by JICA aims at strengthening capacity of SADC member states and secretariats in promoting forest conservation and sustainable management of forest resources. The project activities will be in line with the SADC Forest Strategy 2010–2020 according to the SADC Protocol on Forestry.

The programme has the following three areas of cooperation.

1) A forest information system to contribute to organizing a forest monitoring system for REDD+ readiness preparation by raising technical capacity to assess forests (forest inventories and other related data)

2) Integrated fire management to enhance the capacity to manage fires by promoting integration through coordinated actions, with better fire information produced from satellite images and field data gained in part through community involvement

3) Community forestry aimed at reducing poverty in rural societies through ensuring tangible and non-tangible benefits from forests/trees, by promoting community-based natural resource management and agroforestry systems within farming systems

Outline of proposed program

Overall goal: Contribute to region's socio-economic development and the alleviation of poverty through forest conservation and sustainable management of forest resources
Objective: Strengthen capacity of SADC (member States and the Secretary) to promote forest conservation and sustainable management of forest resources
Potential Areas of Cooperation: • Integrated Fire Management • Community Forestry • Forest Information System (for REDD+)

The programme has the following four components to be carried out in three phases for a period of five years. The program diagram is presented in Figure 5–1. Good/advanced practices and useful technologies that can be shared in the region, potential training needs, awareness raising and pilot activities are presented in Table 5–1.

Program themes by phase

Phase and period	Themes	Period
1. Preparation phase	National level needs assessment and analysis of potential for regional intervention	1 year
2. Implementation phase	Knowledge sharing, training, and testing at regional level	3 year
3.Regional integration phase	Synthesization for regional knowledge base	1 year

Programme outline by component

Component 1: Knowledge management and development Existing good practices and available technologies useful for the program are assessed. Regionally adaptable knowledge determined in the assessment will be shared through a series of regional workshops. Piloting regional intervention for specified topics in component 2 will be monitored during workshops. After implementation of training and awareness raising in components 3 and 4, results will be synthesized into a guideline for policy harmonization in the region.
Component 2: Pilot activities Pilot activities will test the effectiveness of regional approach and the results will be summarized into a guideline with harmonized policies that facilitate regional intervention practices for forest conservation and sustainable management of forest resources.
Component 3: Training Training needs are assessed. A series of technical training courses will be carried out for specified topics. In order to make training more effective, follow-up activities may be conducted, depending on the results.
Component 4: Awareness raising Awareness raising needs are assessed. A series of technical training courses will be carried out for specified topics. Follow-up activities may be conducted, depending on the results.

Institutional arrangement for implementation

In order to secure the smooth implementation of the programme, practical and efficient institutional arrangements need to be considered, such as establishing a programme coordination office under the SADC office in Botswana, a steering committee, and working groups composed of representatives of each area of specialization within SADC member states.

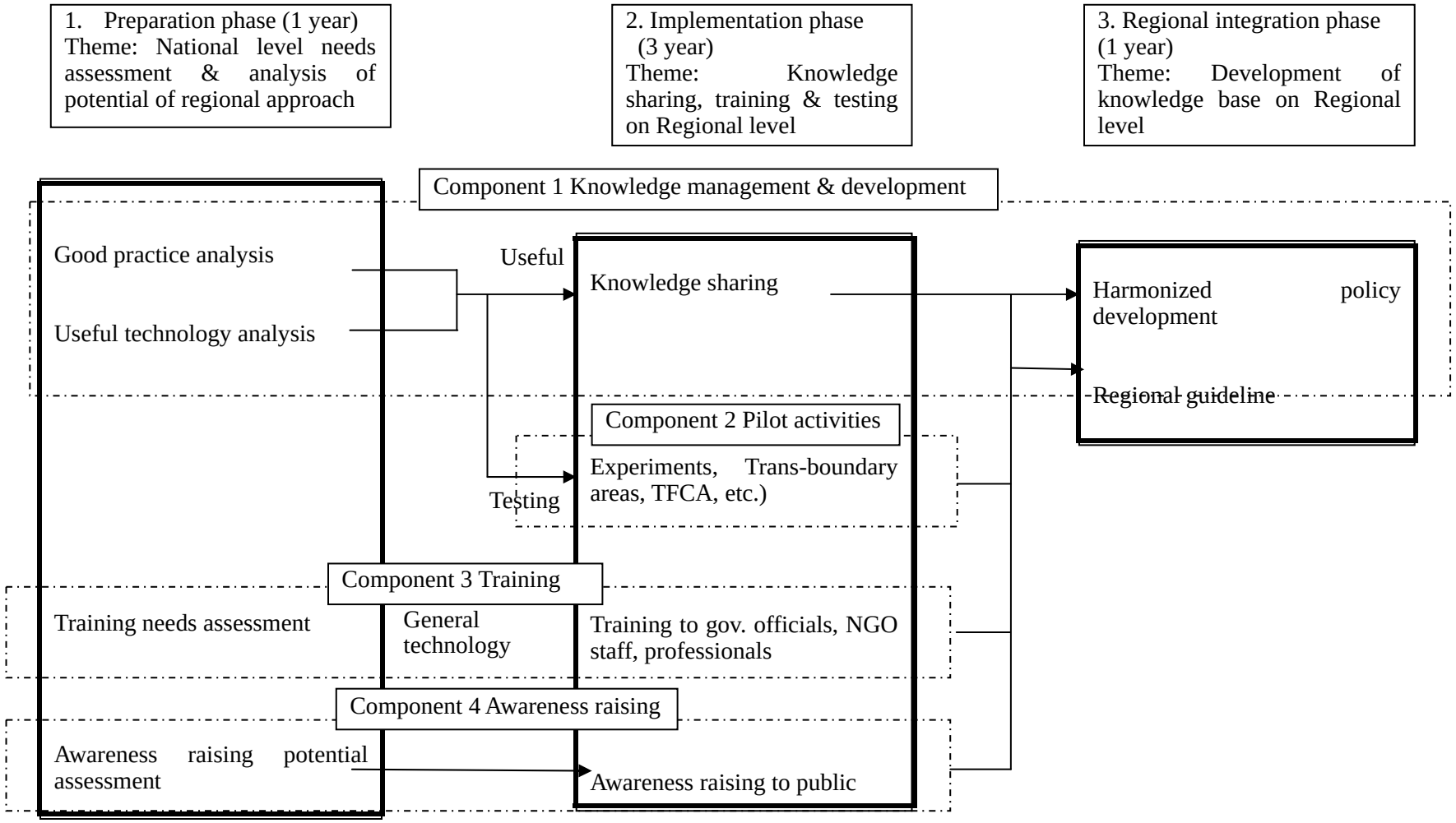


Figure 5-1 Proposed JICA's Cooperation by Phase

Table 5-1 Existing Advanced Practices/useful Technologies and Training Needs in Southern African Countries

	Good practices, Useful technologies	Training needs
Fire management		
•Fire management policy/plan	Mozambique, Namibia, Tanzania	Angola, Malawi
•Community based integrated fire management	Botswana, Namibia, Swaziland	Angola, Botswana, Malawi, Mozambique, Swaziland, Tanzania, Zambia
•Traditional fire management	Namibia, Tanzania, Zimbabwe	Angola, Malawi, Mozambique, Tanzania Zambia
•Fire-fighting techniques (prescribed burning, fire lines, etc.)	Botswana, Namibia, South Africa, Swaziland, Tanzania	Angola, Botswana, Malawi, Mozambique, Swaziland
•RS and GIS for fire management	South Africa (CSIR), Mozambique, Tanzania, Japan	Botswana, Malawi, Mozambique, Namibia, Swaziland, Tanzania, Zambia, Zimbabwe
•Linking fire management to carbon credit		South Africa, Swaziland, Mozambique, Tanzania, Zambia
•Use of RS technologies for enhanced fire danger index	South Africa (CSIR, SAW)	Botswana, Namibia, South Africa (CSIR, SAW), Swaziland, Japan (JAXA, Hokkaido Univ.)
•Field verification of MODIS data, enhancement of fire information with utilization of Japanese satellite images		South Africa (CSIR, Kruger NP), Japan (JAXA, Hokkaido Univ.)
•Weather observation network by local people	Botswana	Botswana, Malawi, Mozambique, Namibia, Swaziland, Tanzania, Zambia, Zimbabwe
Community forestry		
•Decentralization policy for CBFM	Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe	Angola, DRC, Malawi
•Renewable energy initiatives	Swaziland	Angola, Botswana, Malawi,

		Mozambique, Namibia, Zambia, Zimbabwe
•Fuel efficient stoves	Mozambique, Swaziland	Angola, Botswana, Malawi, Mozambique, Namibia, Zambia, Zimbabwe
•NTFP production and marketing	Botswana, Malawi, Namibia, Swaziland, Tanzania, Zimbabwe	Angola, Botswana, Malawi, Mozambique, Swaziland, Tanzania, Zambia, Zimbabwe
•Development of community based organizations and benefit sharing	Botswana, Malawi, Namibia, Tanzania, Zambia, Zimbabwe	Angola, Botswana, DRC, Malawi, Mozambique, Swaziland, Zambia, Zimbabwe
•Soil conservation and watershed management	Malawi, Tanzania	Malawi, Mozambique, Swaziland, Zimbabwe
•Agroforestry model and livelihood development	Malawi, Mozambique, Tanzania (Ngitiri), Zambia	Angola, Botswana, Malawi, Mozambique, Swaziland, Tanzania, Zambia, Zimbabwe
Forest assessment, monitoring and management		
•Forest inventory method and forest type classification for REDD+	Tanzania, Mozambique	Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia, Zimbabwe
•Advanced forest inventory and mapping by RS and GIS	South Africa, Tanzania	Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia, Zimbabwe
•Utilization of radar images for forest change assessment	Japan	Mozambique, South Africa, Tanzania
•Designing, planning and development of methodologies for REDD+	Tanzania, Mozambique	Lesotho, Malawi, Zimbabwe
•Formulation of forest management plan	Tanzania	Angola, Botswana, DRC, Malawi, Mozambique, Swaziland, Tanzania, Zambia, Zimbabwe.

PART II FOREST SECTOR COUNTRY REPORTS

CHAPTER 6 CURRENT STATUS OF THE FOREST SECTOR IN SOUTHERN AFRICAN COUNTRIES

6.1 Angola

Angola is the second largest country in the southern Africa after the DR Congo covering 1,246,700 km² with the population of 19 million speaking approximately 100 different ethnic languages. The upstream oil industry is the country's major source of foreign exchange. Oil and fishing are the main sectors that have attracted foreign investment in recent years.

6.1.1 Forest Policy

The National Policy on Forest, Wildlife and Conservation Areas (Política Nacional de Florestas, Fauna Selvagem e Áreas de Conservação: PFFSAC) was formulated in 2009 but was yet to be approved and promulgated by the government as of July 2012. The policy enables the national government to own forests, allows it to transfer logging rights to the private sector, and stipulates that the Ministry of Environment (Ministério do Ambiente) manages conservation areas (national parks) and that the Ministry of Agriculture, Rural Development and Fisheries (Ministério da Agricultura, do Desenvolvimento Rural e das Pescas: MADRP) controls exploitation of forest resources outside of conservation areas.

The overall goal of the PFFSAC is to promote the sector's contribution to the sustainable development of the country through preservation, conservation, rational use and development of forests, wildlife, and conservation areas for the benefit of present and future generations. It has strategic policies from the economic, environmental, social, and institutional perspectives, as well as nine specific objectives (SO), as outlined below. The policy promotes the protection of forest resources from uncontrolled burning as an impact of slash-and-burn agriculture.

Strategic policy 1: Economic perspective	
SO 1.1	Promotion of utilization and economic profitability of forest, wildlife, and land conservation areas
SO 1.2	Promotion of role and involvement of private user, local community, and cooperative for rational management and use of forest resources, wildlife, and conservation areas
Strategic policy 2: Environmental perspective	
SO 2.1	Improvement of protection systems, conservation and management of forests and wildlife in open areas, including integrated natural resources management with emphasis on ecologically sensitive zones and in arid regions, semi-arid regions, wetlands, and mangroves
SO 2.2	Reclassification and rehabilitation of existing conservation areas, proposing the creation of others, to include biologically and culturally valuable and important ecosystems, habitats, and species that are not already adequately protected
Strategic policy 3: Social perspective	
SO 3.1	Promotion of involvement and full participation of local communities, civil society, and citizens, as direct actors in the protection, conservation, and rational use of forest resources, wildlife, and conservation areas
SO 3.2	Promotion of gender equality and attention to the issues of HIV and AIDS plans and programmes for the protection, conservation, management, and use of forests, wildlife, and conservation areas
Strategic policy 4: Institutional perspective	
SO 4.1	Improvement and harmonization of the central structures of forestry, wildlife, and conservation areas, to ensure integrated and sustainable management of resources

SO 4.2	Enhancement of the organization and training surrounding provincial management structures of municipal and communal forest, wildlife, and conservation areas, in accordance with the requirements of decentralization and participatory management of resources
SO 4.3	Training and capacity development of human resources at all levels

The National Strategy of Reforestation (Estratégia Nacional de Povoamento e Repovoamento Florestal: ENPRF) was formulated in June 2011 as the basic strategic document of the forest sector to realize the policy. ENPRF aims to contribute to the improvement of forest production, ease the impact of climate change by reducing CO_2 emissions, and improve people's living conditions in rural areas.

ENPRF has the goal of plantation of indigenous and exotic species, including 1) production of timber and non-timber, 2) recovery of deforested and degraded areas/lands, 3) environmental protection, carbon sequestration and recreation, and 4) research and development. It also has a long-term goal of 50,000 hectares of tree plantation in 10 years. Conservation of the plantation and biodiversity is raised in ENPRF as a REDD strategy. ENPRF has the following policy to promote governance and sustainable development in the forest sector.

1. To use sustainable forest resources based on ethical, environmental, economic, social and cultural standards.
2. To protect social traditions and endemic forest species and conserve them for future generations.
3. The Government of Angola shall be involved in the following with other organizations:
   - To provide high-quality forests and services for society.
   - To promote protection and conservation and development of both natural and artificial forests.
   - To promote protection and conservation and spread endemic plant and animal species.
   - To conserve water resources and watersheds.
   - To promote forestry development.
   - To enhance incentives for promoting investment in forestry.
   - To manage forest resources, including wooden products, non-timber products, and ecotourism for the interest and education of the entire society.
   - To encourage planting of orchard trees and other multipurpose endemic trees.
   - To formulate policies and forest laws that contribute to poverty alleviation and employment creation and promote direct and sustainable use of forest resources to increase the income of the poor. Provide technical support for in all activities of management and sustainable development of forest.
   - To observe treaties and regional and international agreements on sustainable forest management and environmental conservation, and promote their implementation.

The National Biodiversity Strategy and Action Plan (NBSAP) 2007–12 was formulated as an upper programme in the environment sector.

The overall objective of the NBSAP is to incorporate measures for the conservation and sustainable use of biological diversity and the fair and equitable distribution of biological resources in favour of all Angolans into development policies and programmes. The intervention Strategic Areas for the attainment of the Overall Objective are 1) Research and information dissemination, 2) Education for Sustainable Development, 3) Biodiversity Management in Protected Areas, 4) Sustainable Use of Biodiversity Components, 5) The Role of Communities in Biodiversity Management, 6) Institutional Strengthening, 7) Legislation and Implementation, and 8) Management, Coordination, and Monitoring. The NBSAP is currently being updated.

6.1.2 Forest Programmes

The Programme for Development of Forestry Sector (Programa de Desenvolvimento e Gestão para Sector Florestal: PDGSF) was formulated in 2008. PDGSF has the following six objectives:

- Promotion of forest and wildlife resources management through inventory preparation, protection, and sustainable use
- Contribution to rural area development through participation of local communities in conservation and management of forest and wildlife for the production of firewood, charcoal, building materials and use of non-timber forest products
- Promotion of new competitive forestry businesses and creation of employment
- Promotion of wood production and processing to supply domestic market
- Institutional capacity building of the Institute for Forestry Development (Instituto de Desenvolvimento Florestal: IDF) at central and regional levels through education and training, and recovery of infrastructure
- Improvement of intervention capacity of supervisory agencies for monitoring and instructing rational use of forest and wildlife resources and handling illegal acts

The PDGSF suggests the following three components to achieve these objectives:

1) Forest and wildlife management: promotion of inventory implementation and database construction, development and establishment of game reserves for ecotourism, and community based resources management and conservation, including forestation and measures against desertification
2) Forestry product development: forestry and processing, apiculture, and non-timber products
3) Institutional capacity building: infrastructure development, training centre construction and forestry skills development, enhancement of monitoring of forest and wildlife resources, and realization of a forest development centre network

The National Adaptation Programme of Action (NAPA) was formulated in 2011 for reducing the nation's vulnerability to the impacts of climate change and creating adaptation conditions in accordance with the emergency measures and the sector's priority issues. The NAPA specifies the 15 priority adaptation actions to:

- promote alternative renewable energies to avoid deforestation;
- promote Sustainable Land Management (SLM) for increased agricultural yields;
- ensure basis access to health services and health monitoring;
- study the vulnerability of fishing activities in relation to modifications of climate and currents;
- extend the electricity grid to rural areas;
- revise sectoral laws for proactive adaptation;
- create an early warning system for flooding and storms;
- develop a national institutional mechanism for adaptation planning and mainstreaming;
- control soil erosion through organic methods;
- diversify crops in favour of less climate-sensitive varieties;
- assess technology requirements;
- use varieties adapted to local conditions;
- employ a climate monitoring and data management system;
- study implications of changes in animal disease patterns and water availability for livestock; and
- increase water availability at wells and boreholes in rural villages.

6.1.3 Legislative Framework for Forest Management

(1) Forest and wildlife management

The current law on forest and wildlife management is the law on hunting regulation (Regulamento de caça) enacted in 1957 during the colonial period. The law prohibits burning in forests for hunting, etc.,

with some exceptions. Developing lands for cultivation by burning requires fire control. However, the law is outdated. For example, the fine imposed on killing wild animals is only 1,000 Kz (approx. 12USD).

A bill on forest, wildlife, and conservation areas (Lei de Florestas, Fauna Selvagem e Áreas de Conservação Terrestres) was formulated as a new law on forest management in 2011, but is yet to be approved.

Land ownership in Angola is defined in the Land Law (Lei de Terras de Angola) that was enacted in 2004. Land was nationalized under Article 11 of the law, and the government became the owner of forest under the forestry policy, but these changes await approval. Before, as stipulated by the law lands legally belonged to the Portuguese. Based on the law, the logging and afforestation rights are transferred from the government to the private sector.

(2) Environmental management

The Basic Environmental Law (Lei de bases do Ambiente) enacted in 1998 contains policies related to environmental protection, environmental quality preservation, pollution prevention, and enhancement of conservation areas and natural heritages, and aims to promote rational use of renewable natural resources. The law has no statement concerning regulations on wildfire or bush burning.

6.1.4 Institutional Framework for Forest Management

(1) National Direction of Agriculture, Livestock, and Forestry (DNAPF)

The National Direction of Agriculture, Livestock, and Forestry (Direcção Nacional de Agricultura, Pecuária e Florestas: DNAPF) under the MADRP is responsible for formulation of policies and strategies in the agriculture and forestry sectors, as well as monitoring of their implementation. The DNAPF has a small number of staff, who work only at central office.

(2) Institute of Forestry Development (IDF)

The Institute of Forestry Development (Instituto de Desenvolvimento Florestal: IDF) is responsible for permission and control of exploitation of forest resources in forest areas outside of protected areas (national parks). IDF is responsible for forest management in all 18 provinces (províncias) and conducts research and development, monitoring and management, and technical assistance.

The IDF consists of the Department of Forestry, Department of Wildlife, Department of Administration and Budget Management, and Department of Human Resources. IDF has regional offices in local governments in all of 18 provinces. IDF has 908 staff: 41 high officers (10 are forestry engineers), 193 technicians (61 are forestry officers), 674 administrative officers (522 are forestry police officers). There is no GIS engineer in IDF.

The IDF divides the country into five zones, each consisting of two to five provinces, excluding exclave Cabinda Province,[1] and brigades are located in each zone.

The IDF is attempting to establish inter-organizational mechanism with other organizations concerning wildfire and REDD+. The National Commission of Fire Control and Management and the National Commission for REDD+ are to be established under the Ministry of Interior (Ministério do Interior) and the National Institute for Meteorology and Geography (Instituto Nacional de Meteorologia e geofisica: INAMET), respectively.

(3) National Directorate of Biodiversity (DNB)

The National Direction of Biodiversity (Direcção Nacional da Biodiversidade: DNB) under the Ministry of Environment is responsible for the formulation and implementation of policies and strategies related to nature conservation and sustainable use of natural resources, including conservation and monitoring of protected areas. This is because the DNB has only about 20 staff and it

[1] Cabinda Province is surrounded by the Republic of the Congo and the Democratic Republic of the Congo.

is difficult for them to manage entire protected areas that cover 14 % of national lands

(4) National Fire-fighting Service for Civil Protection (SNPCB)

The National Fire-fighting Service for Civil Protection (Serviço Nacional de Protecção Civil e Bombeiros: SNPCB), under the Ministry of Interior, is responsible for protecting citizens from disasters. The fire brigade under SNPCB handles forest fire.

All fire information is supposed to be sent to the headquarters of the fire brigades of Luanda, and information on forest fires is sent to the Ministry of Environment and the MADPR.

6.1.5 Forest Area and Wood Volume

According to FAO's Forest Resources Assessment 2010 (FAO, 2010), the forest of Angola covers an area of 58.48 million hectares (47 % of national land, Table 6-1, Figure 6-1). It is the third biggest forest area in Africa, following the Democratic Republic of the Congo and Sudan. Of the forest area, a total of 128,000 hectares (2.2% of the forest area) is considered to be plantation. The growing stock in forests is estimated 2,266 million cubic meters (Table 6-1). Since 1990, deforestation has been occurring at an annual rate of 125,000 hectares due to natural and human-related causes, including uncontrolled exploitation, drought, wildfire, charcoal production, and mining.

Table 6-1 Forest Area and Wood Volume in Angola

FRA 2010 categories	Area (1,000 ha)			
	1990	2000	2005	2010
Forest	60,976	59,728	59,104	58,480
Other wooded land	0	0	0	0
Other land	63,694	64,942	65,566	66,190
Inland water bodies	0	0	0	0
TOTAL	124,670	124,670	124,670	124,670
Total growing stock (mil. m^3)	2364	2315	2291	2266
Growing stock of commercial species (mil. m^3)	272	267	264	261

Source: FAO. 2010.

Vegetation types in Angola are classified as closed forest (mainly in the northern area) and open forest (miombo forest), accounting for 2 % and 80 % of the forest area, respectively. Others are subtropical forest, shrub forest, mangrove (approx. 1,250 km^2), and desert.

Angola has 18 forest reserves (2.67 million hectares, 6.6 % of national land) that had been designated before its independence. The plantations of *Eucalyptus* spp. and *Pinus* spp. are found in the central area, covering 148,000 hectares, with estimated wood volume of 17.45 million m^3. Conservation areas cover 16.225 million hectares accounting for 14 % of national land (Table 6-2).

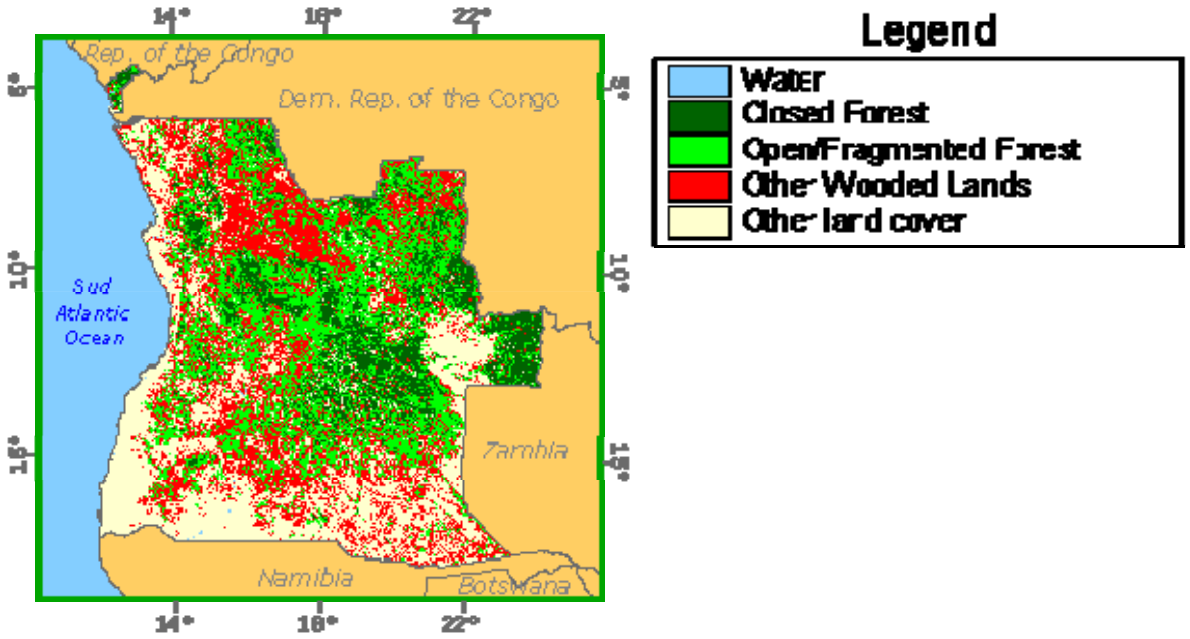
The conservation policy aims to expand the area to 17 % by 2015. No forest inventory has been carried out in the past. The first forest inventory project was carried out from 2010 until the end of 2012, with FAO technical cooperation.

Table 6-2 Conservation Area in Angola

Categories	Number	Area (ha)	% National land cover
National Parks*	6	5,469,000	4.0%
Regional Parks	1	15,000	0.4%
Reserves	6	2,748,000	2.2%
Game Reserves	6	7,992,500	7.5%
Total		16,224,500	14.1%

Source: National Biodiversity Strategy and Action Plan

*Note: the classification of conservation areas was changed in 2011 with nine national parks.



Source: FAO. 2000.

Figure 6-1 Forest Cover Map in Angola

6.1.6 Utilization of GIS/Remote Sensing and Preparation of Forest Maps

MADRP has no division in charge of GIS/RS, although the satellite data is being used. DNAPF does not have an exact record for the satellite data they have used. However, the importance of remote sensing is recognized for monitoring of shifting cultivation, hunting, and desertification, as well as detection of forest fires and burnt area estimation.

IDF has been training on GIS/RS through the forest inventory project supported by FAO, but well-trained experts have not been trained so far. Thus paper maps are the main source of forest operations for the local offices. The data on time and location of wildfires is provided by AMESD, but not managed on GIS.

DNB has not installed GIS software and does not use any satellite data.

6.1.7 Research on Management for Forest and Wildfire

Research institutions in the forest sector in Angola are the Institute for Agronomic Investigation (IIA) and the IDF. Since most of experimental forests of IIA were damaged during the civil war, consistent research is not carried out. No research is currently carried out in IDF.

Strengthening of the research and development of forestry is raised as one of the national strategies. It emphasizes development of fruit varieties, multi-purpose trees, medicinal plants, alternative energy development, agro-forestry, utilization of non-wood products, and charcoal production.

6.1.8 Management of Forest and Wildfire

Angola was decolonized in 1975, but the civil war continued until 2002. No attention was paid to the forest sector during the civil war. Data and information on the forest resources had been lost during the long civil war. Development of the basic database is needed, as the forest inventory is currently being carried out by means of FAO support. The basic skills of forestry, including tree planting were lost during the war. Plantation products such as eucalypt and pine were cut down for railway construction and operation, and for the paper industry; thus, the planted stock was significantly

reduced.

Domestic consumption of firewood, including charcoal, is 56.8% of the total energy consumption. Sixty percent of the whole population lives in the rural area and depend considerably on forest resources. According to ENPRF, residents of Angola (1.5 million people) consume 0.05 m^3 of wood per person (a total of 750,000 m^3/year), which is a much higher amount than the regrowth of natural forest, estimated to be 100,000 m^3.

Wildfires are one of the main causes of forest degradation. It is estimated that Angola loses 68,600 hectares of forest per year (FAO, 2010) to fire, mostly in the north of Angola near the border Wildfire prevention has not been raised as a priority measure for forest conservation because the slash-and-burn method of land clearance is a conventional method for agricultural development. Clearing forest for hunting and misusing fire for the purpose of charcoal production are also main causes of wildfire, and raising awareness of local communities is needed. However, the human, technical, and financial capacities of the related organizations are not enough, because the national territory is too vast.

There are no laws and regulations that restrict field burning or charcoal production, but permission is required to conduct activities on wooded land. All permissions related to forest management is issued by the IDF. IDF forest officers control activities in the forest, such as field burning or charcoal making, to prevent wildfires. However, the IDF has no capacity to extinguish massive wildfires. The IDF collects data on the date and place of fires, but not about the total burnt area. The government budget is not prepared for the planned activities, because the PFFSAC has not been approved yet, which delays the execution of the projects.

SNPCB compiles information of all reported forest fires nationally, but the data are not organized as wildfire statistics. The IDF receives the fire information, but is concerned only with the date and place of the fire. The National Institute for Meteorology and Geology (INAMET) is in charge of managing wildfires to monitor the environment. However, the demarcation of responsibility for forest fire data and control between SNPCB and INAMET is not clearly defined.

Considerable numbers of civil-war landmines are still left in the forest and protected areas, hindering forest operations. The protection purpose and the boundary demarcation of conservation areas need to be reconfirmed, because those areas have been abandoned for a long time. However, administration capacity is not sufficient to supervise the conservation areas. DNB is responsible for the conservation of the protected areas, and it entrusts part of the management work to the NGOs in some national parks as the number of DNB staff is insufficient.

Angola plans to change the policy towards community-based resource management through with promotion of forestry and agro-forestry, as described in energy, climate change, and natural resource conservation strategies, though progress has been limited so far. More interest is shown in GHG emission reduction through forest reduction and degradation.

6.1.9 Aid projects by International Development Partners

(1) Japan

The priority areas of Japan's ODA policy in Angola are human development, management of basic infrastructure, food security, social rehabilitation of veterans, internal displacement of persons and of foreign refugees, land mine management, and governance improvement. The issues of environment or climate change management are not included.

(2) FAO

The FAO prepared the recommendation on sustainable resource management and forest inventory. The FAO supported to prepare the PFFSAC, the basic policy in the forest sector, in 2009, with the funding by the Netherlands.

The project on forest inventory implemented by IDF from 2010 to 2012 is ongoing, and is scheduled to be extended for six more months. Training of research staff was carried out.

(3) UNDP
UNDP Angola plans to implement the Sustainable Charcoal Programme in Uanbo province, a four-year programme of 2013–2017 by the Ministry of Environment. The components of this project are promotion of charcoal marketing, popularization of furnace usage, capacity development, and training for the local people to raise environmental awareness. The outcome is expected to lead to proper legislation on forest management.

6.2 Botswana

Botswana is a completely landlocked country in the center of Southern Africa covering relatively flat 567,000 km² at about 900 metres above sea level. One of Southern Africa's longest rivers, the Okavango, flows into the north-western part of the country, forming the World Heritage Site Okavango Delta. The total population size is 2,031,000 with density 3.6 persons/km^2 concentrated in the eastern parts of the country. The mining sector, and in particular diamond mining, is the major contributor to the export base. The livestock industry contributes about 80 % of agriculture's share of GDP.

6.2.1 Forest Policy

(1) Vision 2016
The development goal of Botswana by 2016 is stipulated in Vision 2016. The Vision 2016 targets the triple growth of real GDP per capita during from 1996 to 2016, which requires 8 % GDP growth per year on average during the period under the expected population growth of 2 % per year.

In the vision, Botswana's reliance on natural resource base as well as the threat by climate change and degradation of natural resources was recognized. During the NDP 9 (2004-2009), the decline of natural resource has been observed due to inadequate management, coordination, and enforcement. Improper management of natural resources has resulted in increasing desertification, habitat loss of wildlife causing declines of some wildlife species and increased human/wildlife conflicts, and the loss of forests due to excessive harvesting for firewood, fencing poles and veldt products.

(2) National Development Plan 10 (NDP10)
The integrated development plan for Botswana from 2009 to 2016, tenth National Development Plan (NDP10) stipulates the development goal by 2016 and development projects during the period.

For forestry and range management, the NDP 10 aims to conduct nation-wide forest inventories, promotion of indigenous tree planting and education, awareness of the communities, and implementation of the community based natural resource management (CBNRM) programme.

For wildlife management, the plan aims to increase wildlife and fish populations for tourism, by carrying out aerial and ground wildlife inventories, promotion of non-consumptive use of wildlife resources (e.g., photographic activities), and provision of water to wildlife within protected areas. The formulation of new wildlife policies and legislation is also planned in the period.

(3) Forest Policy
The forest policy of Botswana was adopted by parliament in July 2011. The 10 principles of the policy include: 1) people centric, 2) sustainable development, 3) polluter/users pays, 4) the custodianship, 5) best practice, 6) environmental governance, 7) equitable access, 8) indigenous and ordinary knowledge, 9) community wellbeing and empowerment, and 10) precautionary approach.

There is no policy related to REDD+.

6.2.2 Forest Programmes

Natural Resources Management Programme of the NDP 10 highlights 1) public awareness in sustainable management of natural resources and prevention of environmental degradation (including monitor and evaluation), 2) analysis of the progress of CBNRM on identification of key areas to be addressed, 3) decentralised participatory management of designated protected areas, and 4) protection of trans-boundary ecosystems and protected areas.

6.2.3 Legislative Framework for Forest Management

(1) Forest Act
The Forest Act of Botswana enacted in 1968 and revised in 1980 and 2005 stipulates delegation by forest officers, declaration of protected areas, protection of forest resources, and control of forest products. Forest reserves were established and setting fires in forest reserves are prohibited according to the act,

(2) Herbage and Preservation Act
The Herbage and Preservation Act enacted in 1977 stipulates the establishment of Herbage Preservation Committees, prohibiting burning vegetation, duty to extinguish fires, and establishment of firebreaks by land owners. According to the act Herbage Preservation Committees may order compulsory firebreaks to land owners, and holds the right to establish firebreaks in private lands with the cost for establishment payable by the land owners.

(3) Community-based Natural Resource Management (CBNRM) Policy
In order to create a foundation for conservation-based development while improving rural livelihoods and reduced poverty, Community-based Natural Resource Management Policy was formulated in 2007. The policy stipulates 15-year Community Natural Resource Management Lease for the commercial use of natural resources, natural resources user rights of the community, establishment of Community Based Organizations, requirements to develop plans and strategies for sustainable use of land and natural resources, and community participation in monitoring natural resources, wildlife habitats and related ecosystems, and socio-economic data collection. Opportunities for protected area management and tourism enterprises, development of education programmes and awareness campaigns by the community are also given to the communities.

Department of Wildlife and National Parks (DWNP), the Department of Tourism (DoT) and the Department of Forestry and Range Resources (DFRR) are responsible for CBNRM at national level, and the Technical Advisory Committee (TAC) is established at district level.

(4)Tourism policy
Tourism is recognized as one of the key sectors in Botswana to help diversify the economy beyond mining sector in the National Development Plan. Botswana Tourism Master Plan (2000) and the Botswana National Ecotourism Strategy (2002) were formulated by the government. The main strategic policy guidelines proposed in the Botswana Tourism Master Plan include: product diversification, community/citizen participation, private/public sector partnership, and ecological/economic sustainability.

(5) Wildlife Conservation and National Parks Act
Wildlife **C**onservation and National Parks Act enacted in 1992 stipulates the regulation of wildlife conservation and protected areas including establishment of national parks, game reserves, sanctuaries and private game reserves, wildlife management areas and controlled hunting areas, and protection of game animals, hunting licenses, game farms/ranches, and export and import control of animals.

6.2.4 Institutional Framework for Forest Management

Ministry of Environment, Wildlife and Tourism (MEWT) is responsible for the forest sector in Botswana.

Department of Forest Range Resources (DFRR) under the MEWT has four divisions (Figure 6-2). Conservation and management division formulates and implements strategies for the management of forest fires, veld products and soils. Extension services division promotes the development of forest and range resources through various extension strategies such as raising-awareness, technical knowledge and educational skills. Research and monitoring division carries out national research, programmes and strategies which are based on the scientific principles and standards to address forest and range resources problems. Departmental management division coordinates and manages all departmental resources and support services. DFRR has about 600 staff in total with 150 technical staff and 450 industrial class staff.

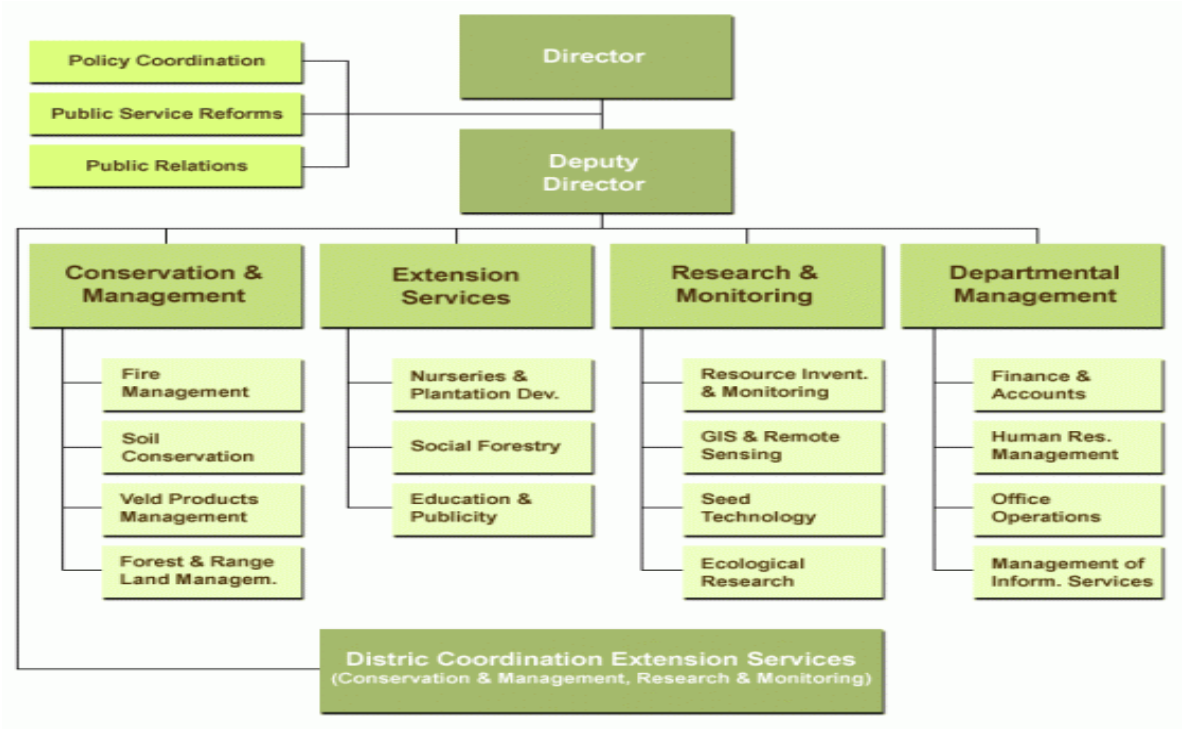


Figure 6-2 Organization Chart of Department of Forest Range Resources

Botswana has ten districts and DFRR has a district office in each district. District offices are further divided into sub-district offices. The number of DFRR staff in local level is about 100. Main tasks of district offices are operation and control of forest-related laws, harvest permit for veld products, restoration of degraded forests in forest reserves, countermeasures against wildfires, evaluation of grassland resources, holding conservation committee meeting, etc.

6.2.5 Forest Area and Wood Volume

In Botswana Kalahari sands/sand veld covers 77%, (449,000km^2) of the total land area and the remaining 23% (133,000km^2) in the south-east, eastern and north eastern parts of the country comprise the hard veld with sandy loam and loamy sand soils that support the arable agriculture industry (Table 6-3). Dry deciduous forest area is found in the north east where more precipitation (up to 800mm/year) is available, while aquatic savanna is found in the Okavango Delta and the Orapa region (Figure 6-3). The mophane tree dominates the north-east and the hinterland of the Okavango.

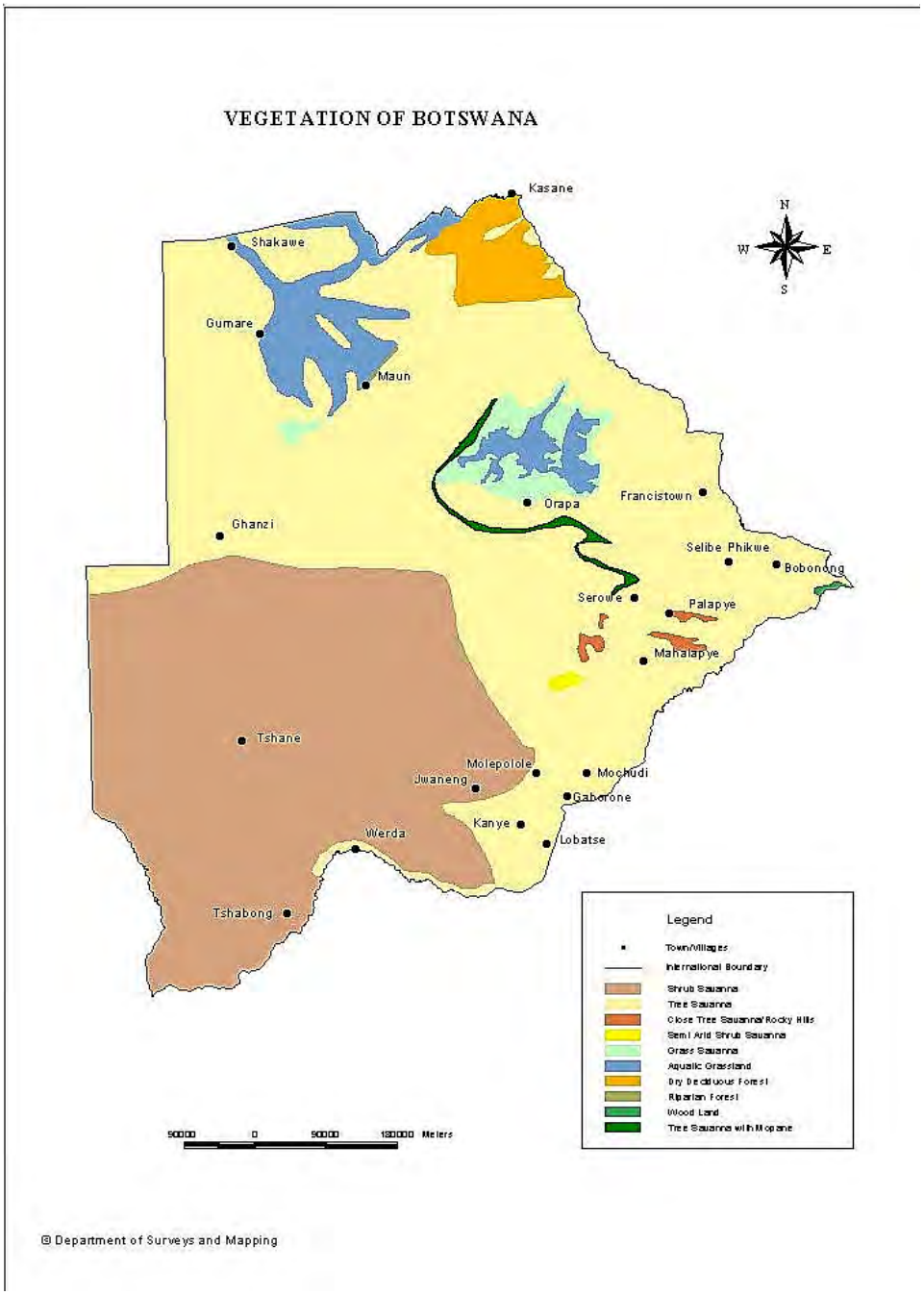
Nation-wide forest data is not produced in Botswana since national scale forest inventory survey has never been carried out. According to the FAO Forest Resource Assessment 2010 (FAO, 2010), in Botswana approximately 20% of land is covered with forest (113,510 km2), and 60% other wooded lands. Forest has been reduced by 10% in the last ten years. Growing wood stock in the forest and

other woodlands is estimated as 760 million m^3.

Table 6-3 Forest Area and Wood Volume in Botswana

FRA2010 Category	Area (1,000ha)							
	1990	%	2000	%	2005	%	2010	%
Forests	13 718	24	12 535	22	11 943	21	11 351	20
Other woodlands	34791	60	34791	60	34791	60	34791	60
Other land	8164	14	9347	16	9939	17	10531	18
Inland water bodies	1500	3	1500	3	1500	3	1500	3
Total	13 718		12 535		11 943		11 351	

Note: Forest: more than 10% of the land (0.5 ha minimum) is covered by trees with 5m height.
Wooded lands: 5-10% of the land (0.5 ha minimum) is covered by trees with 5m height (10% with trees, shrub and bushes).
Source: FAO. 2010.



Source: Department of Surveys and Mapping

Figure 6-3 Vegetation Map of Botswana

6.2.6 Utilization of GIS/Remote Sensing and Preparation of Forest Maps

Resource inventory and monitoring division in DFRR carries out forest inventory. Forest inventory surveys were carried out in 2002 in all forest reserves, but no forest inventory data is available in national parks and game reserves (Table 6-4). Forest inventories in Makomoto and Mohembo East were studied by using Landsat images in 2007 and 2004, respectively. GIS software used in DFRR is Arc GIS and ILWIS.

Table 6-4 Forest Inventory Survey in Botswana

Area	All forest reserves	Khwee village	Makomoto	Mohembo East
Survey year	2002/2004	unknown	2007	2004
Report issuance	2009	Dec. 2010	2008	2009
Area (ha)		7,570	145,912	7,000
Satellite images	Landsat TM	NA	Landsat TM	Landsat TM
Sampling method	Systematic sampling	Systematic sampling (0.5km, 0.8km, 0,86km and 2.5km)	Systematic sampling (3.15km)	Systematic sampling (5.34km)
Sampling plot	Circle 30 and 8m Kasane (56 plots) Chobe (95) Mailaelelo (30) Sibuyu (42) Kazuma (19)	Circle 30m 23plots	Square 50mx20m	Circle 30 and 8m
Others	1 team 1month	Inventory survey for *Spirostachys Africana* (Morukuru)	1 team 1month	10 forest types 4 teams five months

Source: JICA Study, 2012

6.2.7 Research on Management for Forest and Wildfire

Department of Environmental Science in University of Botswana has a receiving facilities of AMSED teaches remote sensing technology.

6.2.8 Management of Forest and Wildfire

(1) Land tenure system

Land tenure system in Botswana is classified by three types: Tribal/communal lands (55% of the total area), State land (42%, Game reserves, National Park, Forest Reserves) and Free hold lands (3%).

(2) Forest reserves and protected areas

There are six forest reserves in Botswana accounting for 0.8% of the national land (409,540 hectares Table 6-5). All forest reserves are located in Chobe district.

Table 6-5 Forest Reserves in Botswana

Name	Area (ha)	Year of establishment
Kasane	75,040	1968
Kasane Extension		1981
Chobe	148,500	1981
Maikaelelo	54,300	1981
Sibuyu	116,100	1981
Kazuma	15,600	1981
Total	409,540	

In Botswana there are three national parks **(**Chobe National Park, Makgadikgadi/Nxai Pans National Park, and Kgalagadi Transfrontier Park), three game reserves (Central Kalahari Game Reserve ,

Khutse Game Reserve, and Moremi Game Reserve) and three educational game reserves (Gaborone Game Reserve, Manyelanong Game Reserve , Maun Game Reserve (Maun Educational Park), and Francistown Game Reserve).

(3) Forest resource monitoring

The expansion of agricultural activities, overexploitation of forest and range resources due to commercialization, urbanization and wildfires aggravated the forest resources. The forestry sector has put a policy to improve legal framework and to monitor use of vegetation resources in order to comply with international obligations. The regulations to monitor harvesting of veldt products were passed. The baseline data on national vegetation resources is needed in order to clarify the policy direction.

(4) Wildfire management

Wildfires are very serious problem in Botswana. Burnt areas were dramatically increased after 2008. In 2011 27% of the land is burnt as a whole (Table 6-6). The figure is particularly worse in Ghanzi, Chobe Kgalagadi and Ngamiland districts. Wildfires usually occur between May and November with the peak in September.

One of the main works of DFRR is the wildfire prevention. Firebreaks are established at all the forest reserves (6177km in length, Figure 6-4). The firebreaks around the forest reserves are sub-contracted to the private sector and those in the reserves (338km) are made by DFRR. Approximately 16% of annual budget of DFRR (approximately 80 million Pulas/year, 1 pula is 0.126 USD) is used for setting firebreaks (6177 km in total). Ten fire fighter teams are stationed during the dry season. Normally one team is composed of 11 crews (one leader, eight fighters and two assistants) and two vehicles. Equipment and techniques of fire-fighting is supported by New South Wales Province of Australia.

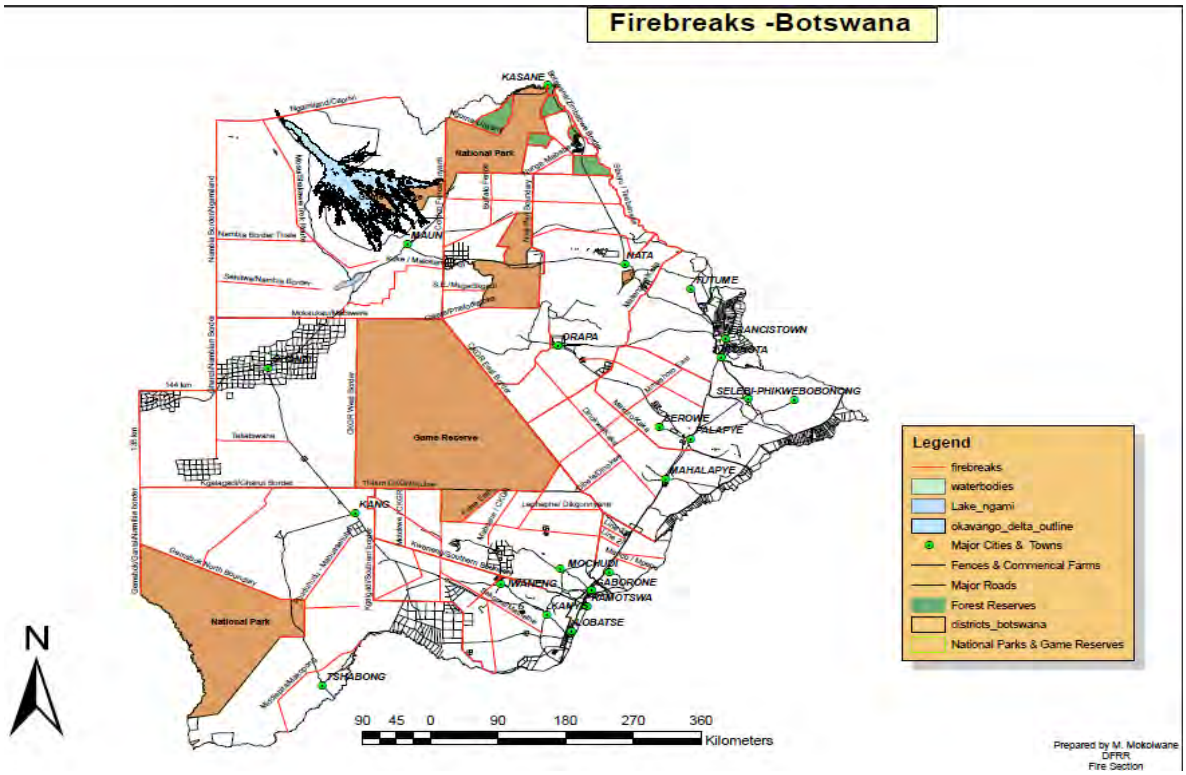
Table 6-6 Burnt Area in Botswana by District

(Unit: ha)

District	2,006	2,007	2,008	2,009	2,010	2,011	District size	% in 2011
Central	803,070	56,820	1,460,431	179,136	2,757,523	1,150,172	14,637,419	7.9
Chobe	771,400	309,390	683,599	446,677	534,789	812,350	2,101,920	38.6
Ghanzi	1,428,153	1,109,580	5,241,479	238,065	5,291,407	5,228,384	11,472,587	45.6
Kgalagadi	665,520	738,995	397,478	357,151	901,540	3,466,251	10,491,604	33.0
Kgatleng	3,280	0	111,452	2,571	122,939	159,396	761,943	20.9
Kweneng	74,427	167,010	1,287,104	9,336	683,658	514,127	3,696,345	13.9
Ngamiland	1,929,956	854,680	2,565,514	842,762	2,408,697	3,712,408	11,134,421	33.3
North East	32,955	1,070	1,910	3,301	494	14,846	514,619	2.9
South East	5,350	0	9,888	0	1,503	2,804	85,800	3.3
Southern	2,090	58,620	87,933	45,953	884,225	378,296	2,723,320	13.9
Grand Total	**5,716,201**	**3,296,165**	**11,846,790**	**2,124,952**	**13,586,774**	**15,439,035**	**57,619,978**	26.8

Source: MODIS Burnt area

There are Community Based Fire Management (CBFiM) projects in Khama Rhino Sanctuary (2010-), Mababe (2011-) and Khwai (2012-), respectively. The objective of these projects is to promote community involvement in managing fires in and around their property or rangelands to reduce the damage that fire can cause.



Source: DFRR.

Figure 6-4 Firebreaks in Botswana

(5) Fuelwood consumption

Fuelwood is used for energy sources by most of the population in the rural areas. It was estimated that 57 percent of primary schools as well as other government institutions utilizes fuelwood.

(6) Wildlife conflict and management

The overall wildlife population in Botswana has increased substantially over the past 10 years, the doubling of the elephant population between 1994 and 2006. As a result, human-elephant conflict is on the rise outside the protected areas. The 14th Conference of Parties to the Convention on International Trade in Endangered Species (CITES) in June 2007 approved Botswana's proposal to trade in elephant by products, such as hides, leather products, hair and ivory. On the other hand, the decline in populations of springbok, hartebeest, reedbuck, tsessebe and wildebeest are observed caused by increased human activities in the southwestern ecosystem.

(7) Community-based Natural Resource Management

In order to promote conservation-based development through diversifying livelihood and sustainable resource utilization, community based natural resource management (CBNRM) was introduced by USAID in 1989. CBNRM was supported by other projects of IUCN and SNV. In CBNRM, communities manage wild lands, maintain wildlife resources and obtain benefits from conservation and tourism development.

According to Community based natural resource management policy enacted in 2007, communities are entitled to receive land lease of 15 years from land authority by preparing land use management plan. Communities pay royalty to the government: land royalty to land authority and resource utilization royalty to MEWT. Community-based organization (CBO) is organized by several villages represented by Village Development Committees (VDC). CBO forms Trust.

These CBOs cover 150 villages in 10 districts of Botswana, involving more than 135,000 people. The various CBNRM activities created 8080 jobs and generated P16.3 million in revenue by 2006. Most of the

revenue was generated by wildlife-based CBOs, particularly trophy hunting and photographic tourism. The revenues rose to P22.8 million in 2007 for wildlife-based community-based trusts alone. Cultural tourism, including veldt products marketing, craft production and others, accounted for the rest.

The number of CBOs is increasing and about 10% of the population in Botswana belongs to CBOs. However, it is pointed out that the active CBOS are limited.

6.2.9 Aid Projects by International Development Partners

(1)Germany

Sustainable Forests Management and Conservation Project

Sustainable Forests management and Conservation Project was implemented in Botswana, Malawi, Mozambique and Namibia between 1996-2006. In Botswana, five villages in Kweneng West Sub-district were targeted with the beneficiary of 3,400 villagers. The project was implemented through SNV with support of Botswana NGO, Veld Products Research and Development (VPR&D). Several toolkits were developed mainly for use of veld products for livelihood development. Tool kits developed include: technical handbook on experience with guinea fowl rearing, harvesting grpple plants, setting up harvester groups, working with village-based officer, marketing of NTFP, beekeeping, how to grow indigenous and exotic fruits [Mmilo (Wild Medlar, Vangueria infausta), Morojwa (African chewing gum, Azanza garcheana), Mororogorwane (wild orange: Strychnos cocculoides), and Morula (Sclerocarya birrea)]. The marketing of NTFPs are carried out by Veld Fruit. The company provides training on sustainable harvest, fruit selection, preservation and purchases materials, and processes. Malura was sent to an exhibition on food development 2010 in Japan.

Development of integrated monitoring system for REDD+

Under SADC FANR, the project aims at building capacity to develop regional MRV system. Botswana is one of the pilot countries (others are Mozambique, Malawi and Zambia).

(2) USA

Southern Africa Regional Environmental Programme (SAREP)

In order to protect watershed, sustainable economic development with environmental protection, fair access to water, SAREP is implemented by USAID in Angola, Namibia, and Botswana between 2010 and 2013. The Programme has three component 1) biodiversity, 2) water supply and sanitation and 3) livelihood. The biodiversity component of the Programme conducted satellite image analysis on land use.

Forest Conservation of Botswana (FCB)

Forest Conservation of Botswana was established by Debt for Nature Swap which was developed based on the Tropical Forest Conservation Act (TFCA) in USA. Botswana is the first country to make a treaty for TFCA. The fund is utilized for activities and research of forest protection, restoration, and maintenance by CBO, VDO, University and Botswana College of Agriculture. Eighteen projects including community nursery, tree planting, restoration, permaculture, palm planting, and community forest reserve were already implemented.

(3) Japan

Botswana Remote Sensing Centre

Japan Oil, Gas and Metals National Corporation (JOGMEC) opened Botswana Remote Sensing Centre located at 70km south of Gaborone in 2008. Botswana Remote Sensing Centre carries out training on remote sensing technology for geological studies. JOGMEC SADC Remote sensing workshop was carried out for four days in 2011 to the trainees of Botswana, Mozambique, Malawi, Tanzania, Lesotho Namibia, South Africa Swaziland, and Zimbabwe.

Forest Resource Management based on sharing with Community and Wildlife

JICA plans to launch a project tentatively titled, Forest Resource Management based on sharing with Community and Wildlife. The project aims at developing capacity of forest department to carry out

inventory survey using satellite images. The project period is from 2012 to 2015 with budget of 300 million yen. The activities of the project include preparation of forest map (1/100,000) for the entire country, forest inventory survey at the model area, and development of forest management plan in the model area.

(4) UNDP

Bio Chobe Project

Bio Chobe Project is about to be implemented between 2012-2014 by GEF fund in the Chobe river watershed, Chobe-Kwando-Linyanti (CKL) area. Department of Environmental Affairs (DEA) is an implementation agency of the project. Prior to the project, UNDP implemented Building Local Capacity for Conservation and Sustainable Use for Biodiversity in Okavango Delta (BIOKAVANGO).

6.3 Democratic Republic of Congo (DRC)

The Democratic Republic of Congo (DR Congo), formerly known as the Republic of Zaire, is situated at the centre of Africa, is the largest state in the Southern Africa on the Equator, covering an area of 2,267,050 km². The DR Congo has 37 kilometres of coastline and a vast central basin low-lying plateau rising to volcanoes and mountains in the east. The DRC's economy is primarily based on the mining sector. The oil industry, mainly from offshore fields, is another important contributor to the economy. DR Congo became independent in 1960. DR Congo had been suffered from political chaos with many social conflicts that affected des-function of the government. It was not until 2002 that the preparation and execution of the national policies was resumed.

6.3.1 Forest Policy

DR Congo had been suffered from political chaos with many conflicts. It was not until 2002, that the preparation and execution of the national policies was resumed.

The National Programme on Environment, Forest, Water and Biodiversity (Program National Environnement, Forêts, Eau et Biodiversité: PNEFEB) was prepared in June 2011, supported by the World Bank and GIZ. The programme is expected to be executed through the funding of IDPs, and NGOs. The priority items of the PNEFEB are:

- to resolve the chaotic conditions on forest development right;
- to make sound logging business;
- to promote multi-purpose forest management; and
- to strengthen the related organizations on forest management.

6.3.2 Forest Programmes

No information has been obtained.

6.3.3 Legislative Framework for Forest Management

The Forest Code (Law No.011/2002) was promulgated in August 2002. It stipulates that the nation owns forests (Article 7).

The Forest Code envisions the zoning of DRC's forest estate into three categories:

- Permanent production forests (commercial concessions, community forest, etc.)
- Classified forests
  - For nature conservation (integral nature reserves, national parks, wildlife reserves, botanical gardens, etc.)
  - For other purposes (erosion control, watershed protection, etc.)
- Protected forests

Non-zoned forests remain protected forests. Permanent production forests include current timber concessions as well as tracts of forest for future allocation as timber concessions. In effect, forests

designated as permanent production could remain in reserve for commercial timber operations carried out by private companies or local villages.

The Forest Code (Article 22) hints at the possibility of another macro-zone, the "community forests", often called CBNRM (Community Based Natural Resource Management) where local communities essentially manage forests. Vast areas of DRC have been proposed as CBNRM although no ministerial declarations have formally established any CBNRM. The DRC Government is currently developing definitions and other criteria for CBNRM.

6.3.4 Institutional Framework for Forest Management

The ministry responsible for the production forests and protected forests is the Ministry of Environment, Nature Conservation and Tourism (MECNT). Three Directorates are directly related to forest: Directorate for Forest Inventory and Management (DIAF), Directorate for Forest Management (DGF), and Directorate for Reforestation and Horticulture (DRH). MECNT has local offices in respective provinces.

In 2009, a National Steering Committee for Forest Zoning (Comite national de Pilotage du Zonage forestier - CNPZF) was established to oversee the zoning of forests in DRC. Recommendations about macro-zoning including new permanent production forests, classified forests, and CBNRM will be made by the CNPZF after consultation with a forest planning/zoning team, and local forest zoning committees at the territorial level.

6.3.5 Forest Area and Wood Volume

The forest areas for each land cover class are shown in Table 6-7. The dense forest occupies 114,525ha (49.3% of the national territory), and in addition, 23,700ha (10.2%) of miombo, 21,400ha of complex and young secondary forest (9.2%), 37,000ha of woodland (15.9%). The growing stock data is not available. The protected areas and logging concessions are shown in Figure 6-5.

Table 6-7 Land Cover in DRC

Land cover class	Area (1,000 ha)	Percentage
Lowland dense moist forest	101,822	43.8%
Sub-montane forest	3,273	1.4%
Montane forest	931	0.4%
Edaphic forest	8499	3.7%
Mangrove	0	0.0%
Total dense forest	**114,525**	**49.3%**
Forest-savanna mosaic	6,960	3.0%
Rural complex and young secondary forest	21,425	9.2%
Tropical dry forest-miombo	23,749	10.2%
Woodland	36,995	15.9%
Shrub land	6,705	2.9%
Others	22,089	9.5%
Total country land area	**232,448**	**100.0%**

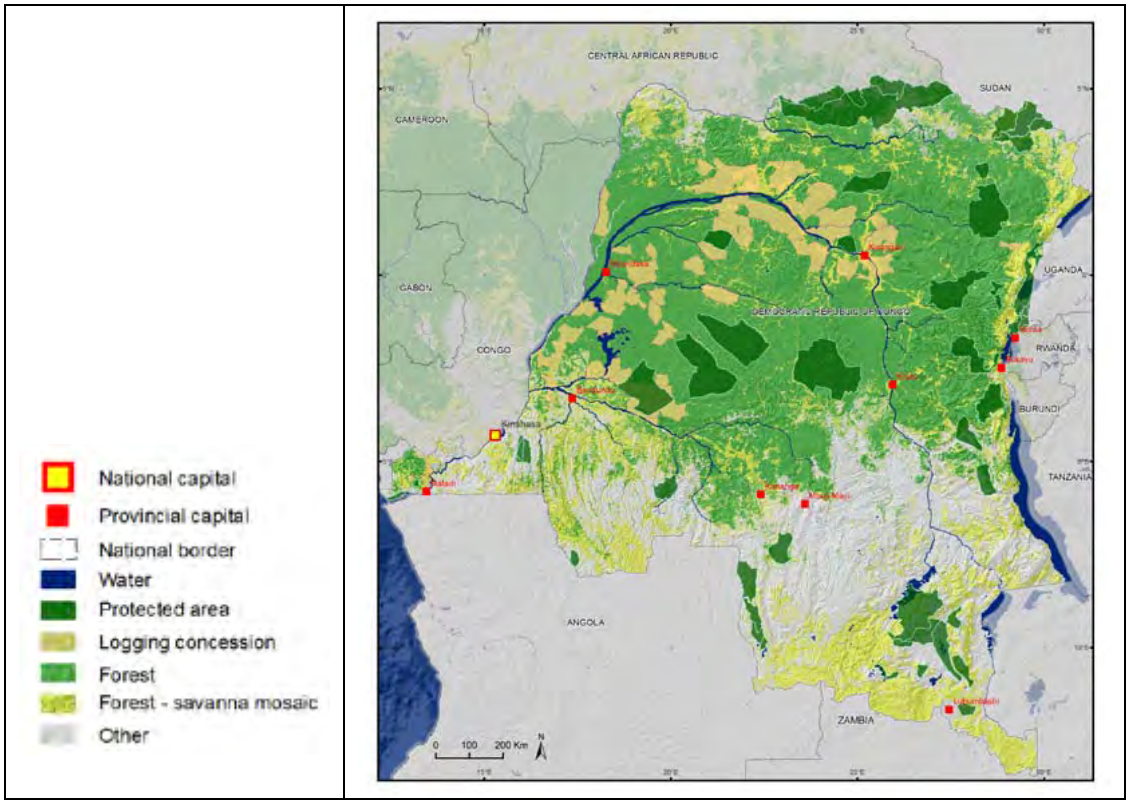
Source: Observatoire des Forêts d'Afrique Centrale (OFAC), State of the Forest 2010

Table 6-8 shows the data obtained using the satellite images. The total forest cover in year 2000 was estimated to be 159 million hectares, and the loss was estimated. Based on the data, the total forest cover in 2010 is calculated to be 155 million hectares, and 1.9 million hectares of forests are lost between 2005 and 2010.

Table 6-8 Forest Cover and Forest Loss in DRC

Forest type	2000 Forest cover (1,000 ha)	2000 - 2005 Forest loss (1,000 ha)	2005 - 2010 Forest loss (1,000 ha)
Primary forest	104,455	367	701
Secondary forest	18,293	1,168	947
Woodland	36,781	201	328
Total	159,529	1,736	1,976

Source: OSFAC, 2010.



Sources: OFAC, 2010.

Figure 6-5 Distribution of Protected Areas and Logging Concessions Delineated in DRC

6.3.6 Utilization of GIS/Remote Sensing and Preparation of Forest Maps

DIAF, with 61 staff members, has three divisions. One of them is geographic information division with 30 staff members, which consists of sections of remote sensing, technical drawing, and GIS. All the staff members can use GIS software through the training by the World Wide Fund for Nature (WWF), the World Resource Institute (WRI) and others. However, no one has been trained to analyze the satellite images, as no software has not been installed.

6.3.7 Research on Management for Forest and Wildfire

No information has been obtained.

6.3.8 Management of Forest and Wildfire

Use of fuelwood is growing in cities due to the rapid population growth, the lack of alternative energy sources, and the weak implementation of forest legislation, and becomes increasingly causing deforestation and forest degradation . In Kinshasa, the country's capital city with around 8 million inhabitants, it is estimated that the total charcoal consumption in 2010 was around 500 thousand tons. Fuelwood represents 87 % of households' cooking energy in the capital city. Various businesses, like bakeries, aluminum forgers, breweries, restaurants and brick makers also depend on fuelwood.

For DRC, unsustainable land use practices and deforestation are mainly observed in the peri-urban areas. For the charcoal supply for Kinshasa comes from within 200 km from the city, 135 km on average. Biodiversity-rich areas, such as Virunga National Park, suffer greatly from illegal wood exploitation for charcoal production.

There are customary laws on the forest resource uses in the indigenous societies. The conflicts occur between the indigenous people who follow customary laws and the companies that conduct logging based on the Forest Code.

The Forest Code stipulates the framework for the forest resources inventory. The inventory is defined as to state the quantities, qualities, and characteristics of the timber and forest environment (Article 1), with concrete description (Article 65-70). Preparation of the inventory is required for all the logging activities prior to the logging.

Guidelines on forest resource inventory for the concessions including classification of the land/forest, sample lots establishment, methods of field work, etc. was prepared in July 2007.

As shown in the Forest Code and the above guidelines, the policy of forest resource monitoring for sustainable timber production was prepared, paying more attention to REDD.

The decree[2] on the promotion of REDD+ was promulgated in 2009, which stipulates establishing the following organizations.

- National Committee (to make decisions on policies for REDD+)
- Inter-ministerial Committee (to make plans based on the decision)
- National Coordination (to work as secretariat for the above committees and to monitor the progress of the plans)

The national REDD+ strategy is under preparation, and the establishment of National REDD+ Fund is under discussion as of March 2012.

6.3.9 Aid Projects by International Development Partners

(1) Japan

1) Forest Preservation Programme

The Forest Preservation Programme, an environmental grant programme of Japan, FY 2010, is going to provide with equipment and technologies for forest preservation under MECNT. The total amount is 1,000 million yen. The main provided equipment is software for satellite image analysis, personal computers, optical satellite images of the target three provinces (Bandundun, Equator, and Oriental), and equipment for ground survey on forest resources. Training for installation and handling of the equipment is also provided.

2) The Project for Strengthening National Forest Resources Monitoring System for Promoting Sustainable Forest Management and REDD+ in the DR Congo (36 months from April 2012)

This project aims for establishment and preparation of the operation plan on national forest resources inventory system, and capacity development of the government staff related to this issue. The activities are 1) preparation of forest base map in Bandundun province using satellite images, 2) development of ground survey method and procedure for inventory preparation, 3) establishment of forest resources database, and 4) establishment and operation plan preparation on national forest resources inventory system.

[2] Decree No.09/40 of 26/11/2009, Providing for the creation, compositions and organization of the implementation structure of the process of reducing emissions from deforestation and forest degradation, 'REDD'

(2) French Development Agency (AFD)

AFD started a capacity development support project for sustainable forest management. The main objectives are 1) capacity development of the logging companies, who prepare forest management plan for the concession, 2) capacity development of the DIAF staff, who monitor and evaluate the prepared forest management plan, and 3) support to policy framework on forest management.

AFD provides images by the Satellite for globe observation (Satellite Pour l'Observation de la Terre: SPOT), that covers 20,000 km2 of tropical rainforest in the basin, to the people related to the forest conservation project in Congo basin.

(3) FAO/UN-REDD

In the COP 15 in 2009, FAO and National Institute for Space Pequisas（Instituto Nacional de Pequisas Espaciais: INPE）in Brazil agreed that Terra Amazon, a forest decrease analysis programme developed by INPE, would be used for capacity development in the developing countries. Terra Congo is the programme that is newly developed for the Congo basin based on Terra Amazon.

FAO is supporting to prepare the national forest resource inventory in DRC.

(4) GIZ

GIZ is supporting in legal system consolidation, regulation on illegal logging, promotion of forest certification, etc.. In addition, GIA is planning to prepare a database of maps, land data, and satellite images in a certain area.

(5) Observatory of Central Africa's Forest（Observatoire des Forêts d'Afrique Centrale: OFAC）

OFA biannually publishes "State of the Forest", a comprehensive report on forest related information in the six countries in central Africa.

(6) Satellite Observatory of Central Africa's Forest (Observatoire Satellital des Forêts d'Afrique Centrale: OSFAC)

OSFAC conducts trainings related to remote sensing and GIS.

(7) World Bank

The World Bank is funding various fields including establishment of national REDD+ execution system, ground survey on forest project, sustainable management or forest reserves, and others, through Forest Carbon Partnership Facility (FCPF), Forest Investment Programme (FIP), and Global Environment Facility (GEF).

(8) World Wide Fund for Nature（WWF）

WWF is planning to establish a system to grasp and monitor carbon stock change in Bandundun province, through satellite image analysis and ground survey, aiming for creating REDD+ executing system. The implementation of the project needs to be collaborated with the Project for Strengthening National Forest Resources Monitoring System for Promoting Sustainable Forest Management and REDD+ in the DR Congo by JICA, since some activities are overlapping.

6.4 Lesotho

The Kingdom of Lesotho covers an area of 30,355 km² and is entirely surrounded by South Africa. Lesotho's geographical formation is characterised by high mountains and deep valleys, and it is the only country in the world to have all its entire territory located at more than 1,000 metres above sea level. The population of Lesotho is 2,194,000 (2011). In 1966, Lesotho gained independence from UK.

The manufacturing subsector, mainly driven by textile and clothing industries, has dominated Lesotho's exports since 2001.

6.4.1 Forest Policy

National Forestry Policy was endorsed in 2008.

6.4.2 Forest Programmes

Preparation of Lesotho National Forestry Program 2008-2018 started and the documentation finished in November 2008, however, the official approval is pending, as of 2010.

6.4.3 Legislative Framework for Forest Management

The revised Forestry Act 1998 provides the basis for the sustainable management of Lesotho's forestry resources. The act protects the rights of individuals, groups of individuals, communities' organizations/cooperatives, or their assigns and successors, who plant and grow trees on land lawfully held by such people to own and use such trees as private, cooperative or communal forests. Other forested areas such as Government-owned forest reserves, protected areas, nature reserves and trees in public places belong to the Government.

The enactment of the Forestry Act 1998 together with the new Forest Policy 2008 and the Environment Act 2001 and their subsequent legislation under the respective ministries provides the legal framework to the appropriate institutions for supporting sustainable forest management. The Environment Act falls under the Ministry of Environment, Tourism and Culture.

6.4.4 Institutional Framework for Forest Management

The main government body responsible for the forestry affairs is the Forestry Department, under the Ministry of Forestry and Land Reclamation. The head is the Director of Forestry. The mandate of the forest administration is:

- Forest protection, management and regulation,
- Communal woodlots establishment, and
- Transfer of the management of state owned woodlots to the local councils.

With the establishment of 'proper' local authorities in 2005 most of the forestry staff been transferred to the local government. The number of staff within public forest institutions including sub-national level in 2008 is 115, of which the number of staff with university degree or equivalent is14.

6.4.5 Forest Area and Wood Volume

Table 6-9 is the original forest data in Lesotho (1983). Table 6-10 was prepared through re-classification of this original data, considering the estimated positive trend for the 'Forest' area of 220 ha/year and the decreasing trend of 2,250ha/year for the 'Other wooded land'.

Table 6-9 Original Forest Data (1983)

National Classes	Area (ha)
Escarpment and riparian woodland	137,100
Escarpment Grassland with Scrub woodland	550,400
Plantations	3,500
Escarpment Grassland with Scrub woodland (on small farms)	298,700
Highveld and Riparian Grassland	5,99,500
Alpine/Sub-alpine Grassland and Heathland	1,446,300
Total	3,035,500

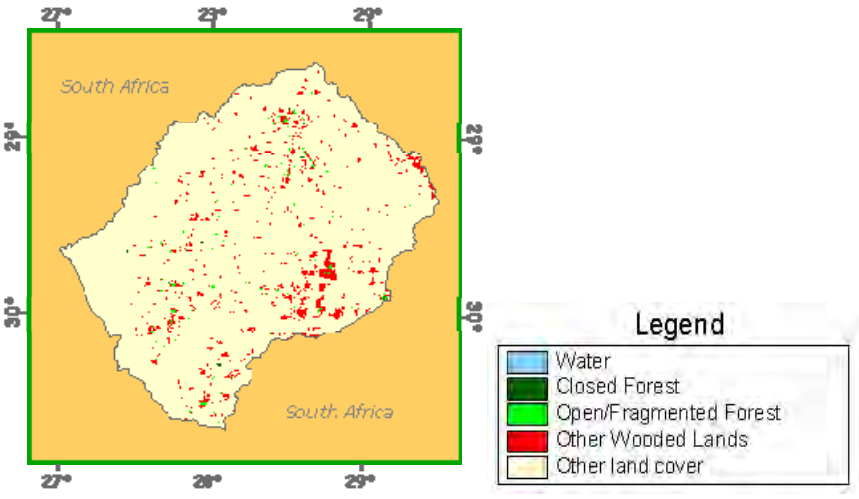
Table 6-10 Forest Area and Wood Volume

FRA 2010 categories	Area (1,000 ha)			
	1990	2000	2005	2010
Forest	40	42	43	44
Other wooded land	142	120	108	97
Other land	2,853	2,873	2,884	2,894
Inland water bodies	0	0	0	0
Total	3,035	3,035	3,035	3,035
Total growing stock of forest (mil. m^3)	2.60	2.73	2.80	2.86
Growing stock of commercial species (mil. m^3)	n/a	n/a	n/a	n/a

Source: FAO, 2010.

The 'Other wooded land(area will decrease further, as long as the over-utilization on communal land, mainly due to pressure from high grazing and use of woody biomass, continues. To be in line with the national polies, e.g National Forest Policy 2008 or Vision 2020, the national long-term vision prepared in 2000, new forest area have to be 1000 ha per year to meet the target.

Figure 6-6 shows indicative locations of the forests.



Source: FAO. 2000.

Figure 6-6 Forest Cover Map in Lesotho

6.4.6 Utilization of GIS/Remote Sensing and Preparation of Forest Maps

There is no plan for remote sensing survey or mapping.

6.4.7 Research on Management for Forest and Wildfire

The research staff is three technical staff and one MSc holder. The main research areas are tree seed testing and vegetative propagation for gene pool multiplication purposes, and diagnosis on trees pests and diseases (entomology and pathology), both at nursery and field levels.

6.4.8 Management of Forest and Wildfire

The greatest threat to the forest resources is the browsing of the re-growth of harvested woody plants by its huge population of freely-grazed domestic livestock. The second threat is wood harvesting for household fuel at a level considerably in excess of the regenerative capacity of the forest resources.

The Advanced Fire Information System has just been introduced to the country through AMESD, but accurate data on wildfires is not available. As countermeasures, 73 km of fire belt is annually prepared. Nationwide hands-on and theoretical training sessions on fire management for local communities, and regional workshops/exchange sessions on wildlife and fire management were held. Cross-border collaboration with South Africa on cross-border fire management and control is on-going. A joint fire management plan exists between Ukhahlamba Drakensburg Park (UDP) and Sehlabathebe National Park (SNP).

Empowerment of communities to own and manage forests sustainably, and training of farmers on seedling production and nursery management, and others are on-going as CBFM activities.

Activities and approaches for REDD+ have been provided for in the National Forestry Policy, though there is no stand-alone REDD+ policy. Intensive afforestation is being carried out in Integrated Watershed Management Programme of the Ministry of Forestry and Land Reclamation.

6.4.9 Aid Projects by International Development Partners

No information has been obtained.

6.5 Malawi

Malawi is a landlocked country located in southern central Africa, covering a total area of 118,484 km². Lake Malawi is the third largest lake in Africa. Malawi has an estimated population of 15,381,000. The country gained independence in 1964, and became a Republic within the British Commonwealth. In 1994, Agriculture is the largest sector of the economy, contributing more than a third of GDP, generating more than 90 % of total export earnings.

6.5.1 Forest Policy

The Malawi Growth and Development Strategy 2011-2016 (MGDS II) formulated in 2011 overarches the medium term strategy, aiming to continue reducing poverty through sustainable economic growth and infrastructure development. MGDS II identifies six broad thematic areas, namely: 1) sustainable economic growth, 2) social development, 3) social support and disaster risk management, 4) infrastructure development, 5) governance, and 6) gender and capacity development.

The MDGS II has nine key priority areas: 1) agriculture and food security, 2) energy, industrial development, mining and tourism, 3) transport infrastructure and Nsanje World Inland Port, 4) education, science and technology, 5) public health, sanitation, malaria and HIV and AIDS management, 6) integrated rural development, 7) green belt irrigation and water development, 8) child development, youth development and empowerment, and 9) climate change, natural resources and environmental management. As the forestry sector strategy, MGDS II aims to increase the forest coverage from 35.2 % to 50 % by 2016. Forest fire prevention is regarded as a focal activity in the thematic matrix in the Attachment.

In Malawi, the National Forestry Action Plan was formulated in 1994, and the National Forest Policy was established in 1996. The goal of the National Forest Policy is "to sustain the contribution of the national forest resources to the quality of life in the country by conserving the resources for the benefit of the nation". The general objectives (GO) of the policy are as below.

GO 1 Allowing all citizens to have regulated and monitored access to some forest products

Strategy

- Enact a law that removes restrictions to access to the use of forests and forest products, and promote equity and participation by local communities

GO 2 Contributing towards improving the quality of life in the rural communities and providing a stable local economy, in order to reduce the degenerative impact on the environment that often accompanies poverty

Strategy

- Promoting graded skilled proven methods for utilizing forest products and introduce value-adding processes to popularize their commercial values
- Encouraging the establishment of investment incentives to promote the development of small-and medium-scale industries in the rural areas and offer employment opportunities to the rural communities
- Enhancing and supporting sustainable and profitable networks of rural marketing services and the transportation of forest products
- Promoting increased forestry production, and controlled utilization of over-mature trees, licensed grazing and access for the collection of non-timber forest products; and
- Encouraging agro-forestry

GO 3 Appropriate incentives that will promote community-based conservation and a sustainable utilization of the forest resources as a means of alleviating poverty, including on-farm trees, and fostering the growing of trees by all sections of the communities in order to achieve sustainable self-sufficiency of wood and forest-derived products

Strategy

- Promoting communal individual ownership
- Promoting the establishment of nurseries by communities and individuals
- Encouraging and enhancing community and individual marketing of seeds, seedlings and other forest products
- Strengthening and maintaining regular reward system for tree planting and improve the public information system

The policy also presents the following 18 specific objectives.

- providing an enabling framework for promoting the participation of local communities and the private sector in forest conservation and management, and promoting planned harvesting and regeneration of the forest resources
- empowering rural communities to manage the forest resources
- providing an enabling environment for access to all government controlled plantation resources by small-scale enterprises, and instituting transparent and competitive bidding procedures for the disposal of government-owned timber
- formulating, applying and evaluating environmental policies, plans and legislation, in partnership with other organizations and institutions
- providing appropriate incentives for both community and private sector participation in the identification and protection of key sites of unique biodiversity
- ensuring that harvesting and exporting of timber and other forest products are not in violation of national and international laws and regulations, and of the customary rights of indigenous people
- undertaking endogenously well designed and relevant research programmes, whenever necessary, in order to improve and achieve sustainable management and utilization of both planted and natural forest and tree resources

- developing and disseminating to target to groups improved technologies for the development and management of trees and forests, so as to ensure sustainable production of a wide range of wood and non-wood products
- developing a full and comprehensive forestry extension service to support community programmes
- initiating and promoting environmental education, extension and awareness programmes to promote and support the conservation and protection of forest ecosystems;
- reducing dependence on fuelwood as a source of energy
- accelerating and intensifying efforts to manage forest plantations
- providing information of the status of the constituted and proposed forest reserves
- development requisite high quality human resources through education and training in order to strengthen the institutional capacity required to effectively manage the forest resources
- creating and maintaining an environment where every employee is able to reach his or her maximum potential in a climate favouring innovation and excellence in the development, dissemination and use of technologies for the management and enhancement of forest and tree resources
- prompting the management of cross-border forest and forest resources
- comply with the agreed national obligations arising from bilateral, regional and international environmental and other related conventions
- forming a Multi-disciplinary and Multi-sectoral Board, entrusted with the responsibility of monitoring the development, conservation and sustainable use of forest and tree resources in the country for the benefit of Malawians

The National Forest Policy also has separate objectives in specific areas in connection with the specific objectives and strategies. The specific areas are: tackling of cross-sectoral issues, clarification of women's role in forest and forest resources management, securing funds for such non-profit-making forest protection activities as conservation of biodiversity, ecotourism development for conservation of ecology and biodiversity in the country, development of legal framework for sustainable use of forest resources, which includes formation and functioning of rural natural resources committee.

In 2003, Malawi has speculated Community-based forest management (CBFM) policy as the supplemental document to the National Forest Policy. According to the policy, the goal for CBFM is to empower rural communities to conserve and develop Malawi's forest resources for the economic and environmental benefits of the present and future generations. The policy describes Community management of customary forest, Management of customary forest by Government, Co-management of forest reserves, and implementation policies for CBFM.

There is no policy on forest fire speculated in the NFP. The government has begun reviewing the forest policy in view of revisions.

The Government of Malawi formulated the Wildlife Policy in 2000. The overall goal of the policy is "to ensure proper conservation and management of the wildlife resources in order to provide for sustainable utilization and equitable access to the resources and fair sharing of the benefits from the resources for both present and future generations of Malawians." This policy seeks to meet the following objectives.

Objective 1	Ensuring the adequate protection of representative ecosystems and their biodiversity through promotion and adoption of appropriate land management practices, that adhere to the principle of sustainable use
Objective 2	Enhancing public awareness and understanding of the importance of wildlife conservation and management and its close relationships with other forms of land use
Objective 3	Taking the necessary legislative steps as well as pertinent enforcement measures to curtail the illegal use of wildlife
Objective 4	Creating an enabling environment for wildlife based enterprises
Objective 5	Developing a cost-effective legal, administrative and institutional framework for

	managing wildlife resources without compromising the special ecological attributes of the resources

The policy has eight specific actions for achieving the goals. Each action has its purpose, policy and strategy. No specific action on forest fire is presented in the policy.

The National Environmental Policy (NEP) was formulated in 1996 and revised in 2004. The overall goal of the NEP is the "promotion of sustainable social and economic development through the sound management of the environment and natural resources". The NEP has the following 12 specific goals.

Specific goal 1	Securing for all persons, now and in the future, an environment suitable for their health and well-being.
Specific goal 2	Promoting sustainable utilization and management of the country's natural resources and encourage, where appropriate, long term self-sufficiency in food, fuel wood and other energy requirements.
Specific goal 3	Facilitating the restoration, maintenance and enhancement of the ecosystems and ecological processes essential for the functioning of the biosphere and prudent use of renewable resources.
Specific goal 4	Promoting the ecosystems management approach so as to ensure that sectoral mandates and responsibilities are fully and effectively channeled towards sustainable environment and natural resources management.
Specific goal 5	Enhancing public education and awareness of various environmental issues and public participation in addressing them.
Specific goal 6	Integrating sustainable environment and natural resources management into the decentralized governance systems and ensure that the institutional framework for the management of the environment and natural resources supports environmental governance in local government authorities.
Specific goal 7	Promoting local community, Non-Governmental Organizations (NGO) and private sector participation in environment and natural resources management.
Specific goal 8	Promoting the use and application of local knowledge and norms that facilitate sustainable environment and natural resources management.
Specific goal 9	Promoting co-operation with other Governments and relevant regional and international organizations in the management and conservation of the environment.
Specific goal 10	Developing and regularly update environmental information systems to facilitate planning and decision-making at local, national and international levels. 5
Specific goal 11	Facilitating development and regular review of policies and legislation to promote sustainable management of the environment and natural resources.
Specific goal 12	Facilitating development of mechanisms for management of conflicts in the environment and natural resources sector.

The NEP clearly presents a policy on wildfire. According to the cross-sectoral policies (Chapter 4) wildfires must be controlled to reduce air pollution and environmental hazards and the government need to conduct awareness campaigns on the dangers of uncontrolled bush fires and its management in accordance with the Climate Change Convention. In the policy on forest sector (Chapter 5), since wild fire is detrimental to sustainable forest management they need to be prevented and controlled.

6.5.2 Forest Programs

Malawi has high population density and most farmers are smallholders. The problem is rural livelihoods of smallholders who depend upon decreasing forest resources which creates diversified forest goods and services. The Government summarized the following problems in rural society: 1) degradation of natural resources exacerbates the poverty, 2) fuelwood problems hit women and children, 3) national demands for forest products is much greater than supply, 4) potential benefits from plantation forests are not utilized, 5) broader threats to sustainable development are forest

degradation, 6) policy innovation needs to be accompanied with capacity development, and 7) existing institutions needs to change their roles in order to control the pressure from stakeholder and to adjust new policy demands. The National Forestry Programme (NFPR) in 2001 was formulated in line with the forestry policy.

The goal for the NFPR is "sustainable management of forest goods and services for improved and equitable livelihoods". The NFPR has the following principles: 1) communication and transparency, 2) building capability and motivation, 3) making use of 'good-enough' information, 4) learning from success and failure – continuous improvement, 5) inter-sectoral and intra-sectoral consistency, 6) strategic and tactical action (not comprehensive project wish-lists), 7) negotiation and prioritization for objectives and actions, 8) devolution to effective levels, 9) collaboration and partnerships to realize roles, and 10) energetic process and practical outcomes. The NFPR presents the following strategies.

Strategy 1.	Manage the process of institutional change
Strategy 2.	Optimize policy influences on forests and livelihoods
Strategy 3.	Build local forest governance through decentralization
Strategy 4.	Support community-based forest management
Strategy 5.	Improve individual smallholder livelihoods
Strategy 6.	Strengthen forest extension
Strategy 7.	Sharpen research and information systems
Strategy 8.	Influence wood energy supply and demand
Strategy 9.	Manage forest reserves
Strategy 10.	Foster improved industrial forestry
Strategy 11.	Increase wood production in the estate sector
Strategy 12.	Develop forest sector financing

The NFPR places importance on the roles of the local governments and civil communities as measures against wildfires for forest protection and identifies the following as one priority actions of Strategy 10 as an action with importance and urgency: Strengthen fire-management systems involving government, communities and private sector (prior to full devolving of responsibility to private sector - see below) by improving skills and infrastructure. It emphasizes the transfer of responsibilities to the Department of Forestry and, particularly, to the private sector.

The Government of Malawi also formulated the National Adaptation Program of Action (NAPA) on climate change in 2006, ranked the program as high priority, and suggested to make a plan (goals, rough activities, investment and output, and financial sources and budget plan) for the selected actions. The following projects under the programme were proposed.

- Improving community resilience to climate change through the development of sustainable rural livelihoods
- Restoring forests in the Upper and Lower Shire Valleys catchments to reduce siltation and associated water flow problems
- Improving agricultural production under erratic rains and changing climatic conditions,
- Improving Malawi's preparedness to cope with droughts and floods
- Improving climate monitoring to enhance Malawi's early warning capability and decision making and sustainable utilization of Lake Malawi and lakeshore areas resources

The NAPA treats "managing forest fires in collaboration with communities" as one of main adaptation needs under the low urgency rank.

6.5.3 Legislative Framework for Forest Management

(1) Forestry Act

The Forestry Act 1997, was a revision of the former forestry act that was established in 1968 before the independence of the country. The purposes of the Act specified in the article 3 are: 1) to identify and manage areas with permanent forest cover as protection or production forests in order to maintain

environmental stability; to prevent resource degradation and to increase social and economic benefits,2) to augment number of trees and protect/manage forests on customary lands in order to meet basic fuelwood and forest produce needs of local communities and for soil and water conservation , 3) to promote community involvement in the conservation of trees and forests in forest reserves and protected forest areas in accordance with the provisions of this Act, 4) to empower village natural resources management committees to source financial and technical assistance of the private sector, NGOs and other organizations, 5) to promote sustainable utilization of timber, fuelwood and other forest produce, 6) to promote optimal and land use through agroforestry in smallholder farming systems, 7) to upgrade the capability of forestry institutions in their resource management, 8) to control trafficking in wood and other forestry produce including exportation and importation, 9) to protect fragile areas such as steep slopes, river banks, water catchment and to conserve and enhance biodiversity, 10) to provide guidelines in planning and implementation of forestry research and education, 11) to establish a forestry administration, and 12) to promote bilateral, regional and international co-operation in forest development and conservation.

The Article 7 of the act, stipulates protection of forests, timber and forest products from fire and pests and diseases. The Article 39 prohibits burning in forest reserves, forest protected areas, or rural forests without permission, and allows control fires in and outside the areas with full responsibility for damage. The act allow the director of the DOF to designate fire-protected areas and control intentional burn (Article 40) and forest officers to request persons to assist fire extinguishment (Article 41). The Article 65 mentions that up to 10,000Kw (1Kw = approx. USD 0.0033) of fines and five year imprisonment are imposed to violators of the Article 39 and that up to 2,000 Kw of fines and one year imprisonment are imposed to the person who refuses to participate in fire-fighting without reason .

(2) National Parks and Wildlife Act

The National Parks and Wildlife Act of 2004 is the revision of the former act that was enacted in 1992. The act classified the protected areas from the viewpoint of wildlife protection into five national parks, four wildlife reserves, and three nature sanctuaries.

The act prohibits intentional burn in the protected areas (Chapter 5, Article 38), and use of fire for hunting (Chapter 8, Article 64). Four to ten thousands Kw of fines and two year imprisonment for the first violation, Four to eight thousands Kw of fines and four year imprisonment will be imposed for the first and the second violation or multiple violations, respectively (Chapter 13, Article 108).

(3) Environmental Management Act

The Environment Management Act was promulgated in 1996. The act defines that conservation is to preserve natural resources and protect them from non-proper use, fire and waste. However, there is no article on intentional burn or fire extinguishment. A bill on the revision is submitted to national parliament and a new act is expected to be passed by the end of 2012.

(4) Guidelines concerning Community Participation

Through the formulation of the National Forestry Policy in 1996 and the revision of the Forestry Act in 1997, the approach of forestry management shifted from the top-down to the one with strong focus on community participation. The National Forestry Programme in 2001 and the Community based Forest Management (supplement to the National Forest Policy) in 2003 clearly present the basic concept of the CBFM and aim to achieve sustainable forest resources management. The DOF in 2005 formulated the Standards and Guidelines for Participatory Forestry in Malawi, subtitled Improvement of Forest Governance and Rural Livelihoods, as practical guidelines for promoting the CBFM. It was produced as a tool for local foresters to understand and practice the basic concept for managing forest resources on customary lands and forest reserves through collaborative governance with citizens.

In 2008, the DOF formulated the Guideline for Co-management of Forest Reserves in Malawi as the supplement to the Standards and Guidelines of the CBFM. It reflects lessons learned from the pilot activities that were implemented at some forest reserves based on the 2005 guidelines. It is more practical than previous one clarifying the view on benefit distribution.

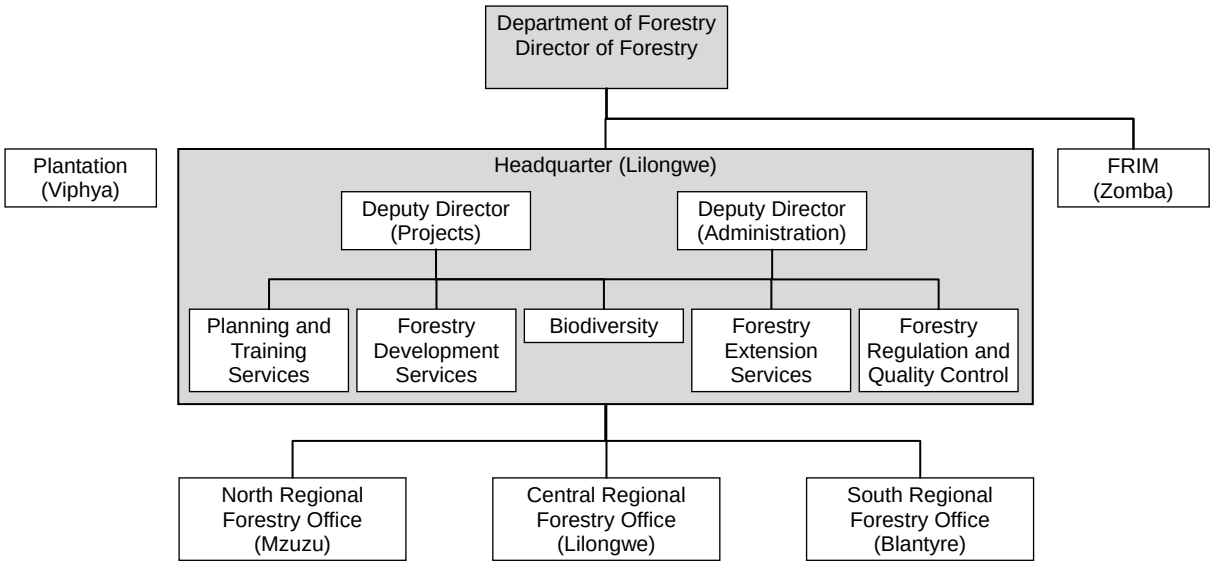


Figure 6-7 Organization Chart of Department of Forestry

6.5.4 Institutional Framework for Forest Management

(1) Department of Forestry

The Department of Forestry (DOF) is an administrative organ responsible for forest resources management under the Ministry of Environment and Climate Change Management (MECCM). The DOF is responsible for establishing forest reserves and protected areas, forest protection, and use of forestry products as well as conducting projects for promoting participatory forest management.

The organization chart is shown in Figure 6-7. The DOF has approximately 5,000 staff and 70 % of them are manual laborers. Under the Director there are two Deputy Directors and Assistants Directors are assigned to the five divisions: Planning and Training Services, Forestry Development Services, Biodiversity, Forestry Extension Services, and Forestry Regulation and Quality Control.

The DOF has Northern, Central and Southern Regional Forestry Offices and also a district office in each of 28 districts. In each district there is Extension Planning Areas (EPA) or Area Control Unit (ACU) as the smallest unit. Although there are about 180 EPAs across the nation, there are less than 100 forestry offices in the field and this is not sufficient.

(2) Environmental Affairs Department

The Environmental Affairs Department, the environmental policy-decision-making organ, is under the MECCM similar to the DOF. The department is responsible for overall climate change issues and the contact point of the UNFCCC. The office of the Designated National Authority (DNA) for CDM is also in the department.

(3) Department of Climate Change and Meteorological Services

The Department of Climate Change and Meteorological Services is under the MECCM. The service is composed of monitoring and prediction system, engineering and communication, and weather, climate, and climate change research divisions. It is the counterpart of the drought component of the AMESD.

(4) Forestry Research Institute of Malawi (FRIM)

The Forestry Research Institute of Malawi (FRIM) is a research institute of the forestry sector attached to the DOF. FRIM does not have experimental forests and conducts research on the forest reserves of the DOF. The FRIM has around 120 staff including 10 researchers. The FRIM conducts research on the following four areas.

- Indigenous Woodland Management Strategy: sustainable management of indigenous woodland
- Trees on Farm Strategy: agroforestry
- Seed and Tree Improvement: tree seeds and breeding
- Plantations Strategy: plantation productivity

It also conducts research in collaboration with South Africa and Zimbabwe on such fields as climate change adaptation, REDD+ and emissions trading.

The FRIM has not introduced the GIS system. Some staff members have received training overseas, but equipment is not sufficiently. The FRIM does not have sufficient information device, transportation or research equipment, thus it is difficult to be an independent research institute. After the FRIM's Strategic Plan 2002-2007, no revised plan is made. In the plan, research on fire is a low-priority issue.

(5) Department of National Parks and Wildlife (DNPW)

The Department of National Parks and Wildlife (DNPW) is under the Ministry of Tourism, Wildlife and Culture. It is responsible for conservation and management of wildlife in protected areas that account for 11 % of total national land. DNPW consists of the following three divisions. Only nine staff members work at the Lilongwe headquarters.

- Conservation Services: execution of laws related to the protected areas
- Education and Extension: PR, education and eco-tour, etc.
- Research and Planning: various technical survey, information gathering, animal monitoring, and environmental impact assessment, etc.

DNPW has four regional branch offices. The number of the DNPW staff exceeds 600. It has not introduced GIS or database equipment but some offices are equipped with GPS.

6.5.5 Forest Area and Wood Volume

According to FAO Forest Resources Assessment 2010 (FAO, 2010), the total area of forest in Malawi was 3,237,000 hectares (27 % of national land cover) in 2010 (Table 6-11). Natural forests and plantations were estimated to be 934,000 hectares and 365,000 hectares, respectively. The total growing stock in forest and other wooded land in the same year were estimated to be 354 million cubic meters. The area of forest in 2010 is 83 % of the estimated figure of 1990, which indicates an annual decrease of 33,000 hectares.

Table 6-11 Forest Area and Wood Volume in Malawi

FRA 2010 categories	Area (1,000 ha)			
	1990	2000	2005	2010
Forest	3,896	3,567	3,402	3,237
Other wooded land	0	0	0	0
Other land	5,512	5,841	6,006	6,171
Inland water bodies	2,440	2,440	2,440	2,440
TOTAL	11,848	11,848	11,848	11,848
Total growing stock of forest (mil. m^3)	427	391	373	354
Growing stock of commercial species (mil. m^3)	n/a	n/a	n/a	n/a

Source: FAO, 2010.

Malawi carried out forest resources mapping and biomass assessment to compile a land classification chart in 1993 with assistance of the World Bank. The forest inventory analyzes Landsat images of 1972/73 and 1990/91 and estimates the volume and fluctuation of the volume of growing stock in forest and other wooded land. As a result, the forest area in 1990/91 was 2,643,000 hectares (27.6 % of land area), more than 40 % of which is situated in the Northern Region (Table 6-12). The forest area accounted for 45 % of land area in 1972/73, whereas it declined to 25.3 % in 1990/91. Sixty-two

percent the deforestation on flat land during the period is due to the rapid farmland expansion.

Table 6-12 Land Cover Areas 1990/91

(1,000 ha)

	Northern Region		Central Region		Southern Region		Whole of Malawi	
Forest (less than 20% open land)	1,123.1	41.3%	737.4	20.7%	782.3	23.7%	2,642.8	27.6%
Open natural vegetation	374.3	13.8%	331.5	9.3%	59.0	1.8%	764.8	8.0%
Extensive agriculture (20-70% cultivated land)	1,122.4	41.3%	792.0	22.2%	753.8	22.9%	2,668.2	27.9%
Intensive agriculture (more than 70% cultivated land)	90.6	3.3%	1,664.4	46.7%	1,350.5	41.0%	3,105.5	32.4%
Marshy area or swamp	3.4	0.1%	20.5	0.6%	153.2	4.6%	177.1	1.8%
Non-vegetated land	1.8	0.1%	3.4	0.1%	10.9	0.3%	16.1	0.2%
Built-up area	1.7	0.1%	10.4	0.3%	10.3	0.3%	22.5	0.2%
Water surface	0.0	0.0%	3.0	0.1%	175.6	5.3%	178.5	1.9%
Unclassified	2.2	0.1%	0.0	0.0%	0.0	0.0%	2.2	0.0%
Total*	2,719.5	100.0%	3,562.6	100.0%	3,295.6	100.0%	9,577.7	100.0%

Source: Forest Resources Mapping and Biomass Assessment for Malawi, 1993
* Land area excluding Lake Malawi (22,443km²)

Table 6-13 Biomass statistics by region and land cover class 1990/91, total volume

(1,000 m³)

	Northern Region	Central Region	Southern Region	Whole of Malawi	
Evergreen Forest	12,833	1,518	6,258	20,609	4.5%
Brachystegia in hilly areas	97,544	53,180	37,428	188,152	40.8%
Brachystegia in flat areas	19,152	29,792	16,816	65,760	14.3%
Extensive agriculture in forest areas	86,651	27,799	31,731	146,181	31.7%
Intensive agriculture	1,351	29,461	9,558	40,370	8.8%
Total	217,531	141,750	101,791	461,072	100.0%

Source: Forest Resources Mapping and Biomass Assessment for Malawi, 1993

According to the Malawi State of Environment and Outlook Report 2010, the total area of 88 forest reserves across the country was 918,000 hectares (9.8 % of land area excluding Lake Chilwa). The total of five national parks and four wildlife reserves was 1.1 million hectares (11.7 % of land area excluding Lake Chilwa). Plantations and customary forest owned by the government totaled 90,000 hectares (1.0 % of land area excluding Lake Chilwa) and 1.1 million hectares (11.7 % of land area excluding Lake Chilwa), respectively. Although there is no accurate statistical data, the total of private forest areas when tea and tobacco plantations are regarded as private forest is estimated to be 275,000 hectares (2.9 % of land area excluding Lake Chilwa).

Five national parks, four wildlife reserves and three nature sanctuaries are designated as protected areas under the National Park and Wildlife Act. The total area is 10,655 km². The list of the protected area is shown in Table 6-14.

Table 6-14 Protected Area in Malawi (except forest reserves)

Category	Name	Area
National parks	Nyika	3,134 km²
	Kasungu	2,360 km²
	Liwonde	548 km²
	Lake Malawi	94 km²
	Lengwe	887 km²
Wildlife reserves	Nkhotakota	1802 km²
	Majete	689 km²
	Vwaza	986 km²
	Mwabvi	135 km²
Nature Sanctuary	Mzuzu	30 ha
	Lilongwe	166 ha
	Michiru	1,800 ha

Source: DNPW

6.5.6 Utilization of GIS/Remote Sensing and Preparation of Forest Maps

In order to collect basic data of forest resources over Malawi, The DOF has been installing GIS equipment, acquiring forest inventory data, evaluating land use, developing forest map and training personnel through the Forest Preservation Programme, Japan's Environmental Program Grant Aid. However, it is likely that the GIS/RS training is concentrated on only two officers in the DOF.

The DOF is in charge of the forest fire component of AMESD and installed an antenna to receive AMESD products but they are not operational yet. Also the DOF participated in SAFNet and obtained Ilwis software and MODIS dataset but they are not used yet.
The DOF conducted National Forest Resource Assessment funded by the World Bank in 1991 and developed a land classification map over Malawi. This map was developed by Swedish company Satellitebid.

The FRIM and the DNPW have not used GIS/RS technology. The DOF developed the land use map over Malawi in 2000 where land uses are categorized into six classes: Forest land, Cropland, Grassland, Settlements, Wetland and Other land (Figure 6-8).

As a NGO, the Mulanje Mountain Conservation Trust (MMCT), an environment preservation trust has installed new technologies to prevent forest fires. After contracted with the World Bank and GEF in 2002, they started to use MODIS data by their own in around 2003 and provided the information on forest fire for the DOF. They are also a member of SAFNet. MMCT have built their capacity in the collaboration with the Forest Services in USA through training courses with lectures from USA.

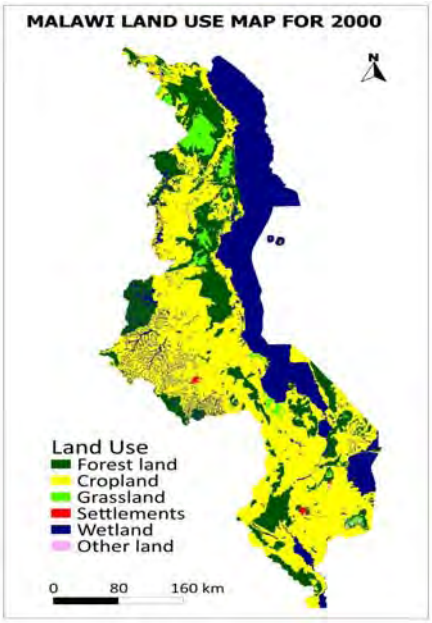


Figure 6-8 Land Use Map over Malawi by the Forestry Department

6.5.7 Research on Management for Forest and Wildfire

The research on forest fire is limited, though more attention is paid to this issue recently. A research on forest fire in Chikawawa in 1983-84 by the FRIM failed due to the difficulty to distinguish intentional and accidental fires.

The FRIM considers that early burning is effective to prevent forest fire. The knowledge about the effect of fire on forest ecosystem (e.g. fire-residence of each plant, effects by fire on plant growth, vegetation change after the fire) is not well studied. An appropriate fire intensity need to be studied in order to optimize seed dispersal of *Brachystegia* with hull break by fire with the least damage of young trees.

The field of forestry was established recently in the Bunda College cooperating with FRIM. Forestry technicians are brought up in Malawi College of Forestry. The forestry department has been established recently in Mzuzu University, and there is the master course for forestry in Chancellor College, University of Malawi in Zomba.

6.5.8 Management of Forest and Wildfire

The population density in Malawi is 137persons/km^2, much higher than any neighboring countries. Eighty percent of the whole population depends on agriculture, and ninety-five percent of farmers have only less than one ha of farm land. In this condition, a half of farmers cannot have enough food, and some farmers are forced to live on illegally cutting trees in the forest reserves. More than 90% of the consumers' heat energy is from wood, and the residents need to cut down trees for fuelwood in the customary lands. This trend is more noticeable in the south. The deforestation rate is 1.0 to 2.8%/year.

Wildfires also occur in plantation because the government decreased the number of staff in 1995. For example, 10,000 ha of plantation was burnt in the Viphya plantation of 53,000 ha. Sixty percent of the plantation has lost the best time for harvest. DNPW entrusts the forest management to the private partners, and they are involved indirectly in the natural parks and Wildlife reserves. The government agencies do not have sufficient capacity to control unregulated logging in the forest reserves.

The charcoal consumption in the major four cities is estimated to be 6,080, 000 sacks according to the Malawi Environment White Paper, 2010. The charcoal yield by traditional method is approximately 20%, which is inefficient, and the 60% of the charcoal is produced illegally in forest reserves or

natural parks.

The National Parks and Wildlife Act allows hunting in the national parks and Wildlife reserves, but prohibited in the wildlife reserves. A lisence is required for hunting in the customary lands, but not for hunting small animals. Fire used for hunting small animals is one of the causes of forest fire.

Fire in the plantation is considered as a risk to damage financial benefit, but not in the customary land, forest reserves and national parks. Setting of firebreaks or early control burning and members extinguish fire by the DOF staff is conducted in the plantation. On the other hand, no firefighting activities are conducted in natural forest including forest reserves.

The measures such as setting of firebreaks or early burning is undertaken, but the equipment and human and technical resources are not sufficient. Even boundaries for protected areas have not been settled. Pilot activities are conducted in Nyika、Kasungu、Lengwe、Nkhotakota, part of protected areas for a long time, but they are not systematic due to the lack of budget.

According to the DOF fire records that occurred in 90,000 ha of state plantations in 26 areas between 2000 and 2011, 97 fires occurred and 3,600 ha burnt, comprising four percent of the all plantation.

The country has a CBFM supplementary policy as well as the guidelines for community management of forests both in customary and public forests. However, implementation is a challenge due to lack of resources. Improved Forest Management for Sustainable Livelihoods Programme (IFMSLP), and Community Vitalization and Afforestation in the Middle Shire, Malawi (COVAMS) are examples of CBFM in Malawi.

A REDD strategy is in the process of development, and the governance structure for REDD+ with the steering committee, technical committee, working groups, etc. is in place. Forest inventory at national-level is on-going under Forest Preservation Programme by JICA.

6.5.9 Aid Projects by International Development Partners

(1) Japan

Japan's ODA policy for Malawi is to support to alleviate severe poverty, and the emphases are put on 1) preparation of infrastructure to grow industries such as agriculture and mining, and 2) improvement of basic social services. Natural resource management is raised as one of the minor goals. The followings are on-going or recently completed projects. An advisor of forest conservation has been dispatched in DOF.

Project for Community Vitalization and Afforestation in Middle Shire (Phase-I) (Nov. 2007-Nov. 2012)

JICA implemented the Project for Community Vitalization and Afforestation in Middle Shire. In order to increase farm productivity at the middle reach of the rive Shire caused by soil erosion on the river bed, capacity development of the resident on growing forest, soil erosion management, and knowledge acquirement of livelihood improvement were carried out by the project. The second phase with larger focus on increasing agricultural productivity will be starting as Project for Promoting Catchment Management Activities in Middle Shire, 2013-2018.

Environment program grant 'Forest Preservation Programme' (Jan. 2012- Jan.2014)

The grant provided by Japanese government (1,700 million Yen in total) to contribute to the climate change mitigation. The anticipated outcomes are: 1) Evaluation of the land use change in Malawi, 2) development of the forest resources baselines, and map production for land use/land use change and forest (LULUCF), and forest resources monitoring baseline, 3) map preparation of seventeen forest reserves, and 4) forest monitoring by the DOF and revision of forest resources maps based on 2012 satellite images. GIS section has been established in DOF with the introduction of the GIS equipment, and capacity development is conducted.

(2) Norway

Lake Chilwa Basin Climate Change Program (Apr.2010-Mar.2015) is supported by Norway. The World Fish Centre is executing the project with cooperation of the Leadership for Environmental and Development Southern and Eastern Africa and FRIM. The Chiwa Lake had been dried up nine times in the 20th century, and it is predicted that the trend will be accelerated, and the temperature of the basin will be raised by 5℃ in 2075. The increased burden on the natural resources brought by environment degradation, food shortage and famine may be raised as serious issues. This program is conducted as the activities towards securing the sustainable living environment and natural resources conservation.

(3) UNDP

UNDP is actively supporting the forest conservation sector for climate change mitigation. In Sustainable Land Management (SLM, Apr.2010-May 2014) Environmental Affairs Department works as the coordinating organization, with the GEF fund USD2.7 million in cooperation with the Department of Meteorology, Energy, Fishery, Livestock, Water Use, Land Resource Conservation. The target areas are 4 districts, Blantyre, Balaka, Neno, and Mwanza. SLM project aims to prepare policies and institutions for sustainable land management in the whole basin, establishing government and private partnership, increasing cereal production, and utilization of meteorological data, so as to prevent land degradation.

National Climate Change Program (Apr.2010-Dec.2012) is promoted through a basket fund from UNDP, Norway, DFID, and Japan to mitigate climate change. This program contains two projects, 'National Programme for Managing Climate Change in Malawi' and 'Building Capacity for Integrated and Comprehensive Approaches to Climate Change Adaptation in Malawi'. Support to the central and local governments is going to be provided so that a comprehensive program to mitigate climate change will be executed in environment, economic development, and food security sectors. The Ministry of Economic Planning and Development is the coordinating organization.

A website of Malawi Climate Change and Environment Programmes (http://www.nccpmw.org/) has been developed aiming information disclosure on climate change mitigation measures and CDM in Malawi as one component of this program.

Preparation of policy documents such as National Climate Change Policy, National Climate Change Investment Plan, and Climate Change Communication Strategy under the program by the Environmental Affairs Department. In addition, Nationally Appropriate Mitigation Actions (NAMA), and National Adaptation Plan (NAP) are going to be prepared.

The DOF is going to complete 1) establishment of Carbon Unit, 2) Preparation of Carbon finance portfolio, and 3) Strategic watershed investment plans by the end of 2012.

(4) World Bank

Shire River Basin Management Program is going to be initiated by the fund USD 125 million from IDA, and USD 6.6 million from GEF. The program has three components: 1) Shire basin planning, 2) catchment management, 3) water-related Infrastructure. Forest management plans are supposed to be prepared as part of the second component.

(5) EU

Improved Forestry Management for Sustainable Livelihoods, phase 2 is being implemented to support the DOF. It is an eight-year project by EU that begun December 2009 with Euro 9.8 million. The objective is to improve the community livelihood that depends on forest, through participatory management of the forest reserves and the customary lands by executing the NFP. The target areas are 12 forest reserves and the surrounding areas in thirteen districts. The project aims 1) optimization of the effects on institutional change, forest, and livelihood by the policies, 2) strengthening local

forest governance and CBFM, 3) improvement of small-scale famers' livelihood, and 4) improvement of fund raising conditions for the forest sector.

(6) Mulanje Mountain Conservation Trust

Mulanje Mountain Conservation Trust (MMCT) is an environmental conservation trust, which begun the activities in 1991, for biodiversity conservation and forest management in the forest reserve in Mulanje Mountain. Mulanje Mountain is the highest mountain (3,002m in elevation) in Southern Africa where many endemic and rare species are found, but land degradation is occurring due to farm land development, fuelwood collection, wildfires, invasion by foreign species, illegal logging, etc.

MMCT is eager to combat wildfire, and began to use the MODIS data by themselves. MMCT organized a volunteer fire management group 'mountain workers' with 30-50 members, and conduct activities such as promotion of early burning, setting of firebreaks and preparation of fire management plan, in collaboration with the DOF.

MMCT get fund from the WB or GEF, and got USD 2.5 million from USAID and Norway recently. MMCT has five to six staff and several project staff. MMCT board consists of around 15 members who are the chiefs of the DOF, Water Department, and Environment Affairs Department, national botanical garden, the FRIM, NGOs, private sector, etc.

6.6 Mauritius

The Republic of Mauritius is volcanic islands situated approximately 2,400 km to southeast off the coast of Africa, covering a total land area of 2,040 km² with the total population 1,307,000. Mauritius is heading towards a service-oriented economy. The financial services sector is emerging, representing 13% of GDP.

6.6.1 Forest Policy

The National Development Strategy (2003) shows the long term vision of the nation to 2020. The forestry-related goals are the conservation of biodiversity, increasing water supply, promotion of land and property development practices that enhances the environment, restoration of natural forests and wetland, safeguarding valued elements of natural and man-made environment, promoting ecotourism in the coastal and country side, and protection of the country's best-quality agricultural land and its environmentally sensitive areas and landscape.

The overall objective of the National Forest Policy (NFP) 2006 is to protect and enhance the country's natural environment, biodiversity and national heritage, while at the same time promoting recreation and tourism. It lays more emphasis on the environmental and protective functions of forests rather than timber production. It recommends that timber exploitation be gradually phased out and restricted to salvaging operations following natural disasters such as cyclones.

6.6.2 Forest Programs

NFP is being implemented through Forest Programs. The activities through the programs are geared towards conservation of soil, water and biodiversity as well as leisure and recreation.

One of the main issues of the NFP is to increase tree cover to enhance the environment and the carbon sink capacity of the forests. The on-going reforestation program and the National Tree Planting Campaign contribute significantly in increasing tree cover, thus mitigating climate change. Creation of nature walks within forested areas is included in the program for recreation and awareness.

A draft National Action Plan (NAP) has already been prepared under the project "Capacity Building for Sustainable Land Management in Mauritius and Rodrigues" funded by UNDP/GEF/FAO/GoM. One of the strategic goals of the NAP is Sustainable Forest Management, and a number of forestry

projects will be implemented after approval of the plan.

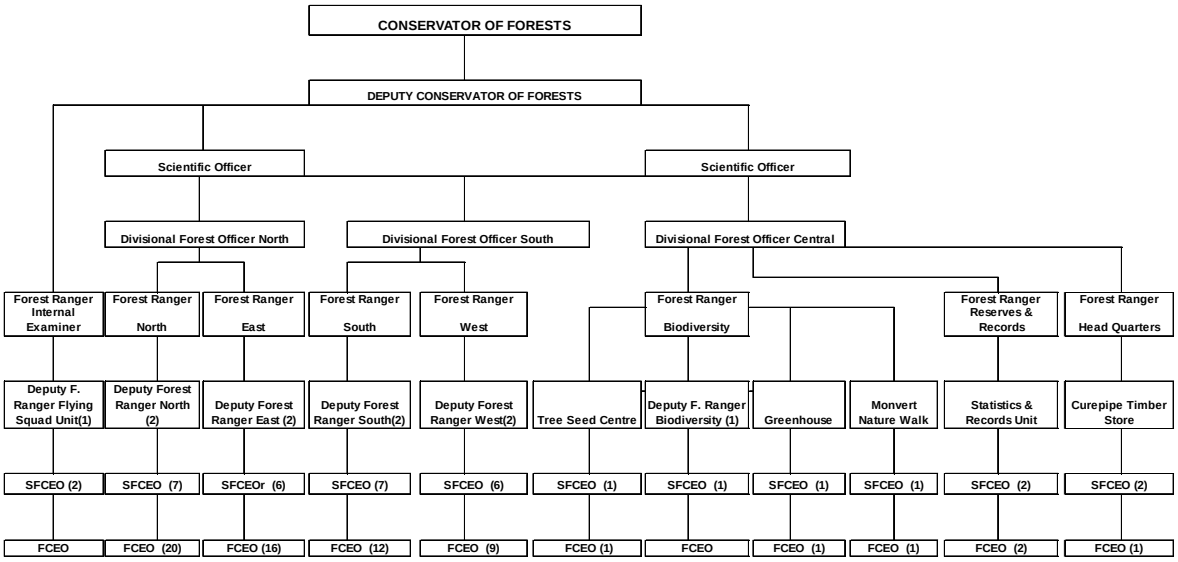
6.6.3 Legislative Framework for Forest Management

The basic law on forest is the Forests and Reserves (Amendment) Act 2003, established in 1983 and amended in 2003, which was proclaimed so as to amend and consolidate the law relating to forests, reserves and related matters. Other than that, there are two other important related laws: the Wildlife and National Parks Act 1993 and the Environment Protection Act 2002.

6.6.4 Institutional Framework for Forest Management

Two government institutions are responsible for the management of forestry resources. The Forestry Service, under the Ministry of Agro-industry and Food Security, is responsible for the management of state forest plantations and nature reserves as well as mountains, rivers and road reserves. The Forestry Service is also in charge of wildfire prevention.

The number of staff of Forest service is 695. It has four central offices including one head office, and 24 local offices. The organization chart of the Forestry Service is shown in Figure 6-9.



SFCEO:Senior Forest Conservation and Enforcement Officer
FCEO : Forest Conservation and Enforcement Officer

Figure 6-9 Organization Chart of Forestry Service

The National Parks and Conservation Service, also under the Ministry of Agro-industry and Food Security, is responsible for the management of forests and wildlife in National Parks and islets. It has 81 staff, one central office and five local offices. The organization chart of the National Parks and Conservation Service is shown in Figure 6-10.

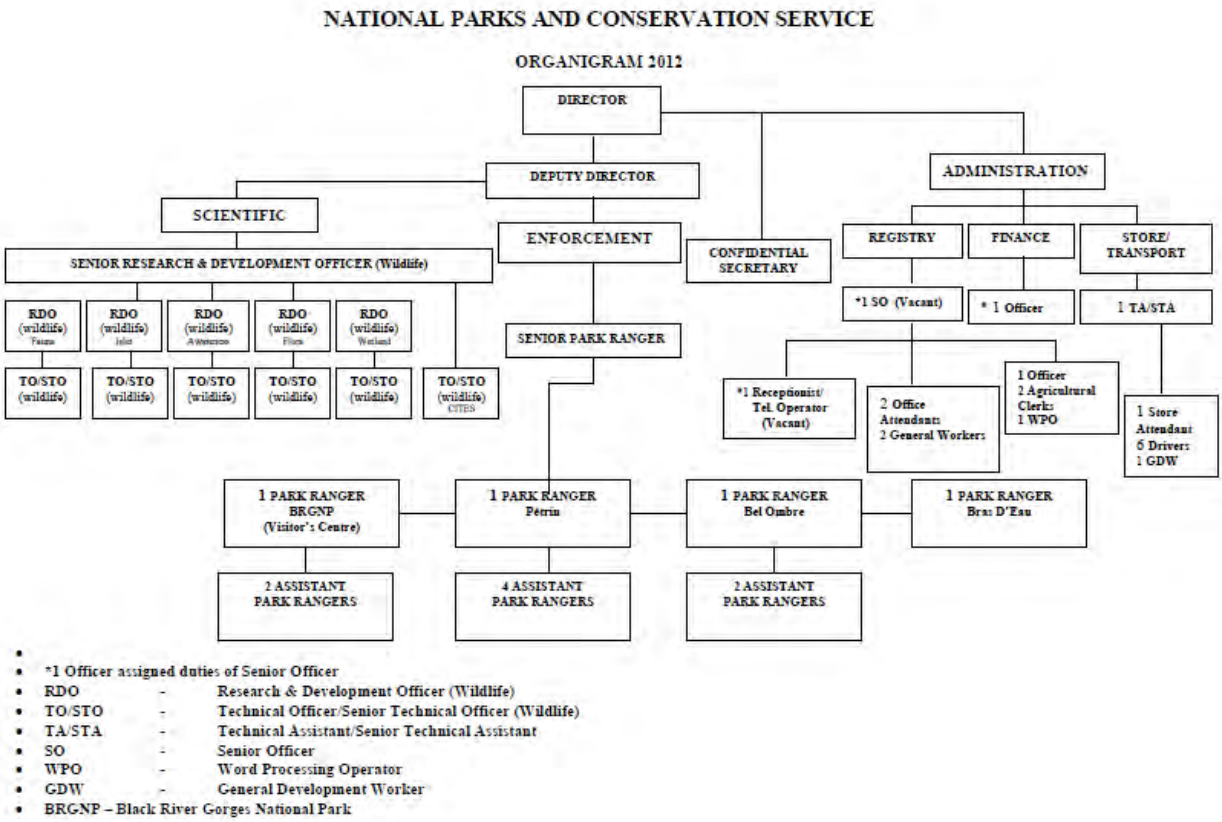


Figure 6-10 Organization Chart of National Parks and Conservation Service

6.6.5 Forest Area and Wood Volume

The extent of forest cover in Mauritius is around 47,000 hectares representing about 25% of the total national land area (Table 6-15). Two types of forest ownership are found: public and private. No communal forest and no communities living within or dependent on the forests are existent in Mauritius. The following table shows the types and categories of forest lands in Mauritius.

Table 6-15 Forest Area in Mauritius

Category	Area (Ha)
(I) State Forest Lands	
Plantations	12,349
National parks	7,205
Nature reserves	799
Endemic garden	275
Other forest lands	1,512
Sub-Total	22,140
(II) Privately-Owned Forest Lands	
Mountain reserves	3,800
River reserves	2,740
Private reserves	13
Plantations	2,600
Other forest lands including scrub and grazing lands	15,847
Sub-Total	25,000
Total	**47,140**
RODRIGUES	
Native forests	50
Plantations	3313
Total	**3,363**

Source: Ministry of Foreign Affairs, Regional Integration and International Trade.

According to FAO's Forest Resources Assessment 2010 (FRA 2010), the forest of Mauritius covers an area of 35,000 hectares, accounting for 17.2 % of national land. The growing stock in forest is 340,000 cubic meters (Table 6-16).

Due to rapid economic development and increasing population, the forest cover in Mauritius has declined from some 60,000 hectares in the 1980s to about 47,000 hectares presently to make way for settlement, grazing areas, dam, roads and other infrastructural developments. Most of the forest loss occurred on private forest lands. Private forests are not regulated by law, therefore, there is no reliable data on private forest land conversion to other land uses for development. State forest lands are better protected and managed and have a good growing stock as compared to private forest lands where timber stock is generally poor.

Table 6-16 Forest Area and Wood Volume in Mauritius

FRA 2010 categories	Area (1,000 ha)			
	1990	2000	2005	2010
Forest	38,769	38,729	34,909	35,009
Other wooded land	17,954	17,900	12,276	12,156
Other land	146,277	146,071	155,515	155,535
Inland water bodies	1,000	1,300	1,300	1,300
Total	204,000	204,000	204,000	204,000
Total growing stock of forest (mil. m^3)	3.19	3.20	2.98	2.99
Growing stock of commercial species (mil. m^3)	1.86	1.86	1.85	1.85

Source: FAO. 2010.

6.6.6 Utilization of GIS/Remote Sensing and Preparation of Forest Maps

The Forest Land Information System (FLIS) was set up in 2010 for better monitoring and management of the forestry resources. The FLIS is under the responsibility of the Forestry Service. Two Officers have received basic training on GIS/LIS/LMIS/Remote Sensing under the project "Capacity Building for Sustainable Land Management in Mauritius & Rodrigues". There are no engineers/scientists or GIS specialist working for the FLIS, and no budget is specifically earmarked for the FLIS.

FLIS has two computers for data processing, but no antenna/receiving station. Mauritius has the satellite data of Spot (2006) with 5 m resolution, Quick Bird (2006) with 60 cm resolution, and high resolution aerial orthophotos with 15 cm resolution from LAVIMS.

As for the map data, 1:25,000 maps with the format of mxd/jpg files are available that cover Mauritius and Rodrigues. Only Arc GIS 9.2 and ENVI are used as the software to process data.

6.6.7 Research on Management for Forest and Wildfire

No information has been obtained.

6.6.8 Management of Forest and Wildfire

Most of the state native forests have been declared as nature reserves, national parks and endemic garden and are legally protected. More emphasis is currently laid on the environmental functions of forests such as conservation of water, soil and biodiversity, and CO2 sequestration as well as the recreational functions.

In Mauritius, timber exploitation is carried out only in forest plantations. The two main timber species, Pine and Eucalyptus, comprise more than 90 % of timber production. Pine is managed under the clear-felling system whilst Eucalyptus is managed under the coppice system. However, timber harvest on state forest lands has been gradually reduced over the years and is very limited. Only 4,000 m^3 of timber, 1,000 m^3 of poles and 5,000 m^3 of fuelwood are annually harvested.

The data on wildfire is as shown in Table 6-17. Firebreaks are created and maintained in the fire-prone forest areas in dry zones. Firebreaks were established for 17 ha of forest in 2011, and for 21ha in 2012. AFIS is not used for fire management.

Table 6-17 Wildfire Occurrences in Mauritius

	2007	2008	2009	2010	2011	2012
Number of incidents	25	26	14	46	31	n.a.
Area affected (ha)	154	136	123	188	96	80
of which						
Protected areas (ha)	4	1	0	53	10	n.a.
Unprotected areas (ha)	150	135	123	135	86	n.a.

Community based forest management is not carried out since there are no communal forests and no communities living within or dependent on the forests. Activities on Preparation for REDD+ are not applicable for Mauritius.

6.6.9 Aid Projects by International Development Partners

Capacity Building for Sustainable Land Management in Mauritius and Rodrigues was funded by UNDP/FAO/GEF/Government of Mauritius (GoM), which begun in 2006 and will be completed by the end of 2012.

Expanding Coverage and Strengthening Management Effectiveness of the Terrestrial Protected Area Network on the Island of Mauritius was funded by UNDP/GEF/GoM/private sector.

6.7 Mozambique

Mozambique lies on the east coast of Southern Africa, accounting for a total of 799,380 km² in area. The Zambezi and Limpopo rivers, two of Africa's major rivers, flow through Mozambique to the Indian Ocean. The total population is approximately 23,049,000. The official language is Portuguese. Agriculture is the backbone of the economy providing employment for over 75 % of the workforce and contributing an estimated 26.2 % to GDP in 2005.

6.7.1 Forest Policy

The PEDSA (Strategic Plan for Agriculture Sector) 2011-2020 is the basic long-term policy of agriculture and forest sectors in Mozambique. In the forest pillar of the PEDSA, the following seven outcomes are stipulated.

Outcome 3.1: Improved technical and practical use of natural resources - land, water, forests and wildlife
Outcome 3.2: Improved capacity to formulate policies and programs related to land, water, forests and climate change
Outcome 3.3: Improved land administration:
Outcome 3.4: Sustainable use of Forest resources
Outcome 3.5: Increased capacity of rural communities to prevent and control forest fires
Outcome 3.6: Improved capacity of rural communities and officials wildlife sector for sustainable management and reduction of conflict human wildlife
Outcome 3.7: Improved responsiveness to the effects of climate change

The strategies for sustainable use of forest resources in PEDSA include, 1) to increase government capacity to monitor and enforce the laws and regulations relating to the use and enjoyment of use of forest resources; 2) to promote the establishment of community forests, mainly in areas at risk of erosion, 3) to promote commercial forestry plantations and processing plants forest products; 4) to

develop and disseminate models of partnership between investors and communities for sustainable management of forest resources; 5) to promote the production and marketing of non-timber forest products.
The strategies to increase capacity of rural communities to prevent and control forest fires are: 1) to conduct information campaigns on the impact of forest fires to increase the capacity and willingness of communities to monitor and report its occurrence; 2) to increase public sector capacity to monitor and respond to needs control of forest fires through awareness training and the availability of resources, including transportation; 3) to create an early warning system and a database of the occurrence of fires uncontrolled.

National REDD+ policy is under disscussion among stakeholders, to contribute to reducing deforestation and forest degradation and solving poverty problems by the climate change mitigation mechanism which should also be compatible with adaptation purposes

6.7.2 Forest Programs

(1) National Forest and Wildlife Program

National Forest and Wildlife Program stipulates the plan for between 2007 and 2012. The objectives of the program are 1) to establish a regulatory and institutional framework for the effective and efficient sector of forestry and wildlife; 2) to establish a diverse and competitive business sector, based on the sustainable use and management of forest and wildlife resources; 3) to protect and conserve forest and wildlife resources effectively, to produce goods and services; 4) to improve the access of local communities to natural resources and the sustainable management of forests and wildlife National Forest and Wildlife Program for the next five years including actions for climate change was started preparation by the cooperation of Finland.

(2) Action Plan for Controlling Uncontrolled Fire

Action Plan for Controlling Uncontrolled Fire was formulated by MICOA in 2006. The objective of the action plan is to reduce uncontrolled forest fires by 10% by 2018 from those occurred in 2006. The action plan presents countermeasures to be taken by the government and other related organizations and the role of NGOs and research organizations with investment/budget required.

6.7.3 Legislative Framework for Forest Management

Legislative system for forest management in Mozambique is based on the forest and wildlife law 1999 and its regulations 2002. According to the law, the controls over the wildfires are responsible for the provincial government. Article 106 stipulates the control and penalty of wildfires. At the frontline, SDAE, District Service for Economic Activity, is responsible for managing and controlling wildfires. The actions by SDAE include establishment of fire breaks, specification of tree species which needs fires for germination, and the formation of firefighter teams by communities.

All intentional uncontrolled wildfires are considered a crime in the law with punishment up to one year sentence and/or a corresponding fine (Article 40). Local people are allowed to make use of fire for management purposes and subsistence practices. Agricultural staff at a local district office is responsible for issuing a permit for prescribed burning (Article 106). All prescribed burnings are required to meet the following conditions: 1) delimitation of the area with fire breaks, 2) establishment of a firefighter team with local communities to prevent fire spreading, 3) an assessment of existing wildlife resources, and 4) tax payment based on damage by fires.

For participatory forest management, a council for forest management can be established at local communities by the forest law (Article 33). The council is to utilize forest resources with the government in order to enhance the quality of life of local community members, and to solve conflicts between different stakeholders. The forest resources are utilized based on a management plan. Legal and Institutional Framework for REDD+ is under formulation since 2012.

6.7.4 Institutional Framework for Forest Management

Central level

(1) National Directorate of Lands and Forest (DNTF)

National Directorate of Lands and Forest (DNTF) under Ministry of Agriculture (MINAG) was established by merging departments of forest and wildlife and lands in 2006 is responsible for forest and wildfire management. DNTF has Departments of Land surveying, Cadastre, Forestry, Wildlife, Natural Resource Inventory (DNRI), of Law and Law enforcement, and of Planning and Administration (Figure 6-11). Annual budget of DNTF is approximately 60-70 million metical except for project budget (25 million metical from internal funding). Approximately 100 staff members work for DNTF. DNTF also has Community Management Section under Forestry Department.

DNTF is a leading agency on REDD+ policy and implementation in Mozambique. Deputy Director of DNTF is assigned as a National Co-Coordinator of Technical Unit of REDD+ for readiness preparation started from 2012.

DNRI carries out Forest resource monitoring, mapping of land cover change, inventory, MRV, RL/REL and Information Platform which is including a function as registry for REDD+ and database on forestry and fire, and also responsible for REDD+ policy in cooperation with Forest Department. Forest Department is responsible for managing concession and Wildlife Department issues hunting license and conflict between community and wildlife. An application for a forest concession to provincial level is made after having a permit from local communities at district level. A permit for a forest concession up to 1,000 ha can be issued by a governor, up to 10,000 ha by MINAG and the council of ministry more than 10,000 ha.

(2) Ministry of Coordination of Environmental Affairs (MICOA)

MICOA coordinates the environmental affairs related to more than two different ministries. Deputy Director of National Directorate of Environmental Management (DNGA), MICOA is in responsible for REDD+ readiness preparation coordination as a Co-Coordinator of REDD+ Technical Unit.

(3) Ministry of Tourism

Ministry of Tourism is in responsible of management of national parks and protected areas and development of Tourism in the country. (However, matters related to forests are under DNTF's jurisdiction.)

(4) Institute of Disaster Management (INGC)

Institute of Disaster Management (INGC) is responsible for disaster prevention and actions against disasters including wildfires. INGC carries out emergency preparedness program on disaster management including wildfires and organizes community organizations at each few communities to make volunteer activities against disasters.

(5) National Centre of Cartography and Remote Sensing

National Centre of Cartography and Remote Sensing (Centro Nacional de Cartografia e Teledetecção CENACARTA) is responsible for: 1) production of thematic maps, 2) development of land measurement network, and 3) production and management of cartographic maps. CENACARTA including technical sections (remote sensing, land and photo measurement and surveys) has about 120 staff. CENACARTA has 1/250,000 topographic maps to cover most of the country and 1/1,000,000 maps to cover entire country. The new version of 1/50,000 maps is currently under production by updating old one.

Provincial and district level

Unlike the central level, Forest and wildlife management in the provincial level are divided into land

management by Provincial Service for Geography and Cadastre (SPGC) and Provincial Services for Forest and Wildlife (SPFFB) under Provincial Department of Agriculture (DPA).

SPGC typically has about 10 staff and SPFFB has about 15 technical staff with 80 wards (Fiscais).

(1) Provincial Forest and Wildlife Service (SPFFB)

SPFFB is responsible for wildlife, natural resources, law enforcement and plantation divisions. SPFFB monthly reports to the central level and produces an annual report.

(2) Provincial Service for Geography and Cadastre (SPGC)

SPGC has survey and mapping, cadastre, and district land registration divisions. SPGC produces land use maps, and updates land data for licensing land use with GIS software and GPSs for land measurement. SPGC has typically about 10 technical staff and a few technical staff at district level.

(3) District Service for Economic Activity (SDAE)

At District level District Service for Economic Activity (SDAE) is in charge of managing and supporting various economic activities. SDAE has sections of agriculture, livestock production forestry, commercial and industry, fire control, and tourism and fishery. SDAE has typically 15-20 technical staff. Forestry section arrests people engaged in illegal logging at control points with police, and checks license of logging, species and number of seedlings of plantation. Technical staff of SDAE trains teachers for the assigned technologies at local schools.

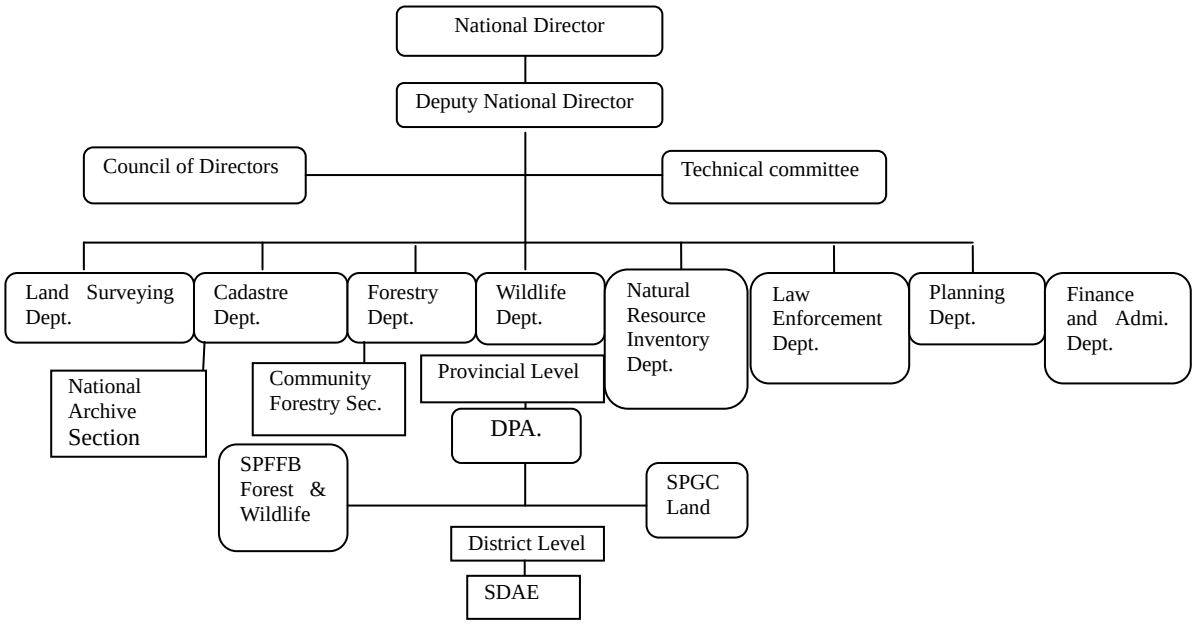


Figure 6-11 Organization Chart of DNTF

6.7.5 Forest Area and Wood Volume

Forest area in Mozambique is about 51% of entire country (about 40 million ha, 2008), mostly found in Niassa, Zambezia,Cabo Delgado, Sofala provinces (Figure 6-12). Forest types are composed of 60% miombo, 15% dry deciduous, and 11% mopane forests (Table 6-18). Main species are *Brachystegia spp.* in miombo and *Colophospermum mopane* in mopane forests. Mopane forests are mostly found in Tete Gaza, and northern part of Manica and Sofala provinces.

Deforestation rate in Mozambique is estimated approximately 220,000 ha/year (0.58%/year). According to FRA (FAO, 2010), 2.7% of forest is lost in the last ten years (Table 6-19). The causes of deforestation generally considered are: 1) conversion of forest to agricultural lands by shifting

cultivation, 2) fuel wood consumption, 3) logging, and 4) mining. The provinces with high deforestation rate are: Maputo, Nampula, Tete, Zambezia, Manica and Cabo Delgado. Zambezia and Nampula provinces have high population densities and high dependency on forests by local people.

One third of forest areas (13 million ha) is designated as protected areas; however the deforestation in the conservation area are also high, probably due to the weak forest governance for conservation.

According to National Forest Inventory produced by DNTF under AIFM Project, timber stock is estimated 36.431.9m3/ha on average: 40.2m3/ha in closed canopy forests, and 32.2m3/ha in open forest, suggesting that the low difference between closed-canopy and open forests.

Table 6-18 Forest Area of Mozambique by Ecological Zone and Province

（Unit: 1000ha）

Ecological zone	Total	%	Cabo Delgado	Gaza	Inhambane	Manica	Maputo	Nampula	Niassa	Sofala	Tete	Zambezia
Highland humid forests/humid miombo	1,312	3.3				531		18		36	234	494
Semi coastal humid forest	791	2.0								685		106
Miombo forest	11,808	29.5	1,185		22	1,034		1,544	4,593	238	462	2,731
Dry miombo forests	12,216	30.5	2,803		247	506		928	4,415	411	1,572	1,335
Mopane forest	4,308	10.8		2,507	290	282				58	1,171	
Dry deciduous forest 乾燥落葉樹林	6,081	15.2	644	364	1,711	956	356	146	411	985	335	173
Semi dry grasslands	2,404	6.0		847	98	74	426			590	368	
Coastal mozaic vegetation	476	1.2	109	2	40		5	85		101		135
Humid area	672	1.7	63	59	11	74	33	52	11	202	80	89
Total	40,068	100.0	4,803	3,779	2,419	3,456	820	2,771	9,429	3,305	4,221	5,064
%			12.0	9.4	6.0	8.6	2.0	6.9	23.5	8.2	10.5	12.6
Deforestation rate 1990-2002 （%）	0.58		0.54	0.33	0.52	0.75	1.67	1.18	0.22	0.63	0.64	0.71

Source：Inventario Forestal Nacional, 2007

Table 6-19 Forset Area Change between 1990 and 2010

Category	1990	2000	2005	2010
Forest	43,378	41,188	40,079	39,022
(%)	54.3	51.5	50.1	48.8
Other wooded land	15,146	14,856	14,711	14,566
Other land	20,114	22,594	23,848	25,050
Inland water bodies	1,300	1,300	1,300	1,300
TOTAL	79,938	79,938	79,938	79,938

Source: FAO. 2010.

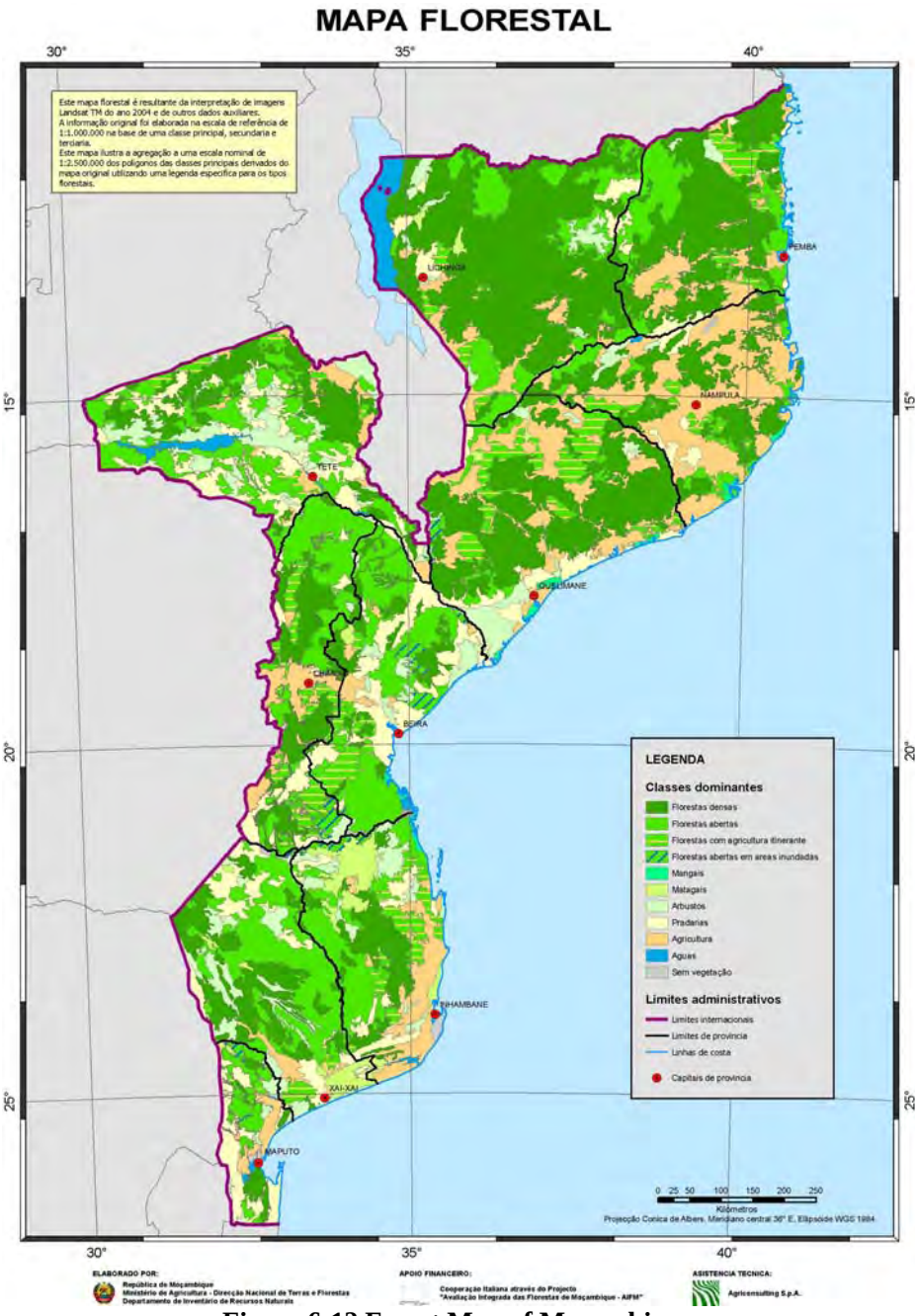


Figure 6-12 Forest Map of Mozambique

6.7.6 Utilization of GIS/Remote Sensing and Preparation of Forest Maps

Department of Natural Resource and Inventory (DNRI) of DNTF is responsible for forest inventory and map production. DNRI has RS/GIS and forest inventory sections. DNRI has eight staff. Most of DNRI staff is trained to use GIS software but the technical level is various depending upon the individuals.

On the other hand, the license of software to analyze satellite images license was not updated; therefore continuous operation is not maintained. No experience to analyze radar images in the department. However, Japan Grant Aid on Forest Preservation Programme (USD 7million) provided more licenses and updated software.

Forest inventory of Mozambique is based on Integrated Assessment of Forests in Mozambique (AIFM) which was implemented between 2005-2007 with a support from Italy and Sustainable Resources Management Project (PMSR) was implemented between 2000and 2005 with a support of

Finland.

The forest cover map covers (1:1,000,000) entire country and 1: 250,000 forest cover map for Manica and Maputo provinces by mainly using 2004 and 2005 Landsat 5 with ASTER Landsat 7, MODIS and Mr. Sid and Land Cover Classification System (LCCS) were produced by AIFM. In AIFM 85,000 tree data were collected from 840 clusters (1cluster 4 plots) with four 20m x100m samples along the square of 400m.

Before the AIFM, 1/250,000 forest maps for Zambezia and Inhambane provinces were produced based on Landsat 2000 and 2001 by PMSR. Forest data (commercial tree height, DBH, species, tree form, damage by fire, influence of wildlife, and use of NTFP) were collected at 900 clusters at Zambezia province and 600 clusters at Inhambane province by PMSR.

6.7.7 Research on Management for Forest and Wildfire

(1) University of Eduardo Mondlane (UEM)

Forest department of University of Eduardo Mondlane (UEM) has natural forest group (subgroups: silviculture, GIS and forest fire) and plantation group (subgroup: restoration, plantation and agroforesty). Each subgroup has one professor and two assistants. Forest department has approximately 100-120 undergraduate students and 20 master students per year.

Forest department of UEM is currently involved with the following carbon monitoring.

- A study on carbon measurement from the sea level to the elevation 1000m at Manica and Sofala provinces (two year project by National Research Fund). The sampling plots of 0.8ha consist of 4 sub plots of 20m x 100m are measured mostly in open dry forests with some closed canopy forests above 800 meter high.
- Ground samplings at protected area in miombo forests for using radar images (budget of USD 20,000 with period of 1 - 1.5 years, supported by EU funded global project).
- Development of allometric equations (including Biomass Conversion Expansion Factor) for forest carbon measurement by subcontracted under IIED under the south-south cooperation with Brazil FAS by Norwegian support.

(2) DNRI

Apart from forest inventory and mapping of land cover changes, DNRI obtains MODIS data every day and analyzes forest fire occurrence. With a support of Italian consultant, DNRI is preparing for producing periodical Forest Fire Situation Report “Sistema de Alerta e Monitoria das Queimadas (SAMOQUE)” by MODIS data analysis.

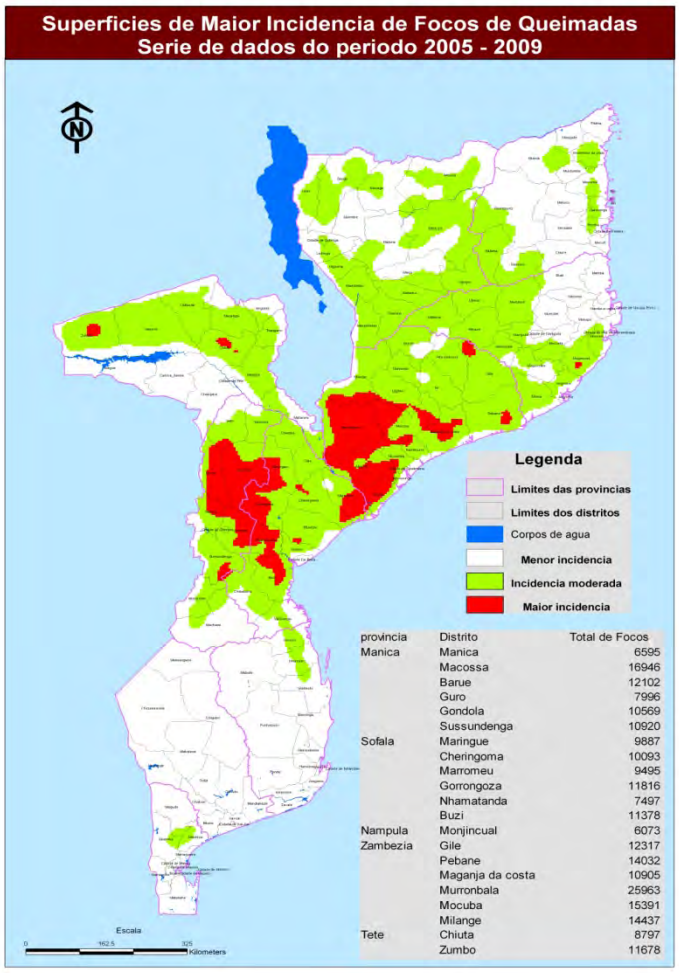
6.7.8 Management of Forest and Wildfire

In Mozambique forest areas are categorized by: 1) Protected areas (mostly under state management with some parts under management contracts with private sector or international conservation organizations), 2) Productive forests (allocated to private companies under long concessions and annual licenses), and 3) Multiple-use forests (generally subjected to competitive uses and users).

In Mozambique all the land belongs to the government. Those who want to use the land for forest plantation need to apply the land use right of 50 years (DUAT). Forest concession license is applied for 50 years and possible extention of another 50 years. 20 percent of stumpage fees from forest concession collected by the government is utilized for community development through Agriculture Development Fund (FDA: Fondo Desenvolvimento Agrário).

In the rural society of Mozambique, a fire is a customary practice in the preparation of land for agriculture, chasing animals for hunting, charcoal making, renewal of green grass, removal of insects/weeds/wildlife, etc. In rural areas more than 100 people are annually killed and crop fields are damaged by wild animals (e.g. killed by lions, buffalos, crocodiles).

Wildfires are concentrated in the central part of Mozambique (Figure 6-13) and the frequencies are stable in the last decade (Table 6-20). Only in September there were about 50,000 wildfires in 2009 and 2011 and 70,000 fires in 2010. Zambezia, Niasa and Tete provinces have high fire occurrences due to large forest area and population (Table6-21).Wildfires occur in almost all types of vegetation. Some tree species in miombo and mopane forests germinate only at high temperature; thus ecosystem in miombo and mopane are fire dependence.



provincia	Distrito	Total de Focos
Manica	Manica	6595
	Macossa	16946
	Barue	12102
	Guro	7996
	Gondola	10569
	Sussundenga	10920
Sofala	Maringue	9887
	Cheringoma	10093
	Marromeu	9495
	Gorrongoza	11816
	Nhamatanda	7497
	Buzi	11378
Nampula	Monjincual	6073
Zambezia	Gile	12317
	Pebane	14032
	Maganja da costa	10905
	Murronbala	25963
	Mocuba	15391
	Milange	14437
Tete	Chiuta	8797
	Zumbo	11678

Figure 6-13 Main Fire Occurrences in Mozambique

Table 6-20 Wildfire Occurrences between 2003 and 2011

year	frequency
2003	143,153
2004	109,783
2005	158,070
2006	133,033
2007	150,239
2008	177,078
2009	132,303
2010	157,926
2011	144,940
Average	145,170

Source: DNRI (based on MODIS data)

Table 6-21 Wildfire Occurrences in 2010 by Province

Province	Frequency
Cabo Delgado	12,221
Gaza	4,387
Inhambane	3,677
Manica	16,229
Maputo	3,507
Nampula	13,023
Niassa	23,334
Sofala	17,198
Tete	21,204
Zambezia	22,349

Source: DNRI (based on MODIS data)

Deforestation is one of the major issues in Mozambique. Deforestation has been increased since 1990（0.21% annually between 1972 and 1990, 0.58% between 1990 and 2002）.

Illegal logging and wildlife hunting are also a major issue in Mozambique. Currently law enforcement is strengthened for licensing, penalty, taxation, and plantation. Heavier penalty for illegal logging and wildlife hunting as well as heavier taxation on forest development is imposed by new laws aiming at restoring forests and reducing illegal activities and wildlife protection. Logging license is annually issued up to 500m3 but will be changed to be issued by five years with the requirement to have a management plan.

Despite the clear policy on wildfires, there has been lack of systematic efforts to control them. However there is a substancially increase in public awareness and a reduction of wildfire in areas by annual campaigns to control uncontrolled fire initiated by the government. Operational wildfire monitoring system to specify location, quantify area and burnt biomass were not developed yet. The management plans of forest and wildlife in conservations areas should include the use of fire in order to maintain the various kinds of vegetation, secure adequate pasture for the wildlife population, and control shrub invasion. In order to properly control wildfires, working with local communities to reduce uncontrolled fires caused by human activities is essential.

Two regional REDD+ projects are being implemented under national approach: one is REDD+ MRV Project by SADC/GIZ, which focuses on mopane ecosystem in northern area of Sofala Province, mapping, and forest stand measurement. The other is REDD+ MRV Project by the USDA, which focuses on mangrove ecosystem in Zambezia delta, mapping, biomass assessment, and others.

Community Management of Natural Resources has its legal bases of benefits sharing with communities in the followings:

- Law no. 10/99 of 07 July (n.5 Article 35)
- Regulation of the Law of forests and wildlife n.10/99 07 July (Article 102)
- Ministerial Diploma 93/2005

The Government policy to protect forest, and to encourage and support reforestation programs in degraded areas is promoted under the Presidential Initiative “One Child One Tree One Community One New Forest”.

The possible measures to work with communities include: 1) a proper zoning to identify areas for agricultural practices and other land uses; 2) dissemination of alternative technologies to avoid misuse of fire (e.g. hunting, honey production), 3) provide incentives to discourage communities to use fire by establishing community-based forest management schemes (e.g. charcoal production); and 4) support communities to adopt more sustainable agricultural practices and shifting cultivation.

6.7.9 Aid Projects by International Development Partners

(1) Japan

Forest Preservation Programme under Grant Aid for Environment is provided by Japan in 2010. The objective of the programme is to provide equipment and satellite images to improve forest conservation capacity in Mozambique. The project budget is approximately 8.8 million USD. Provided equipment includes GPS, vehicles, GIS and image analysis software for forest survey and remote sensing which are issued for DNTF (DNRI in particular), SPFFB (a vehicle and a computer with GIS) and SDAE (GPS).

JICA dispatches a forest management advisor to DNRI. The advisor provides policy advice on sustainable forest management and climate change countermeasures including REDD+ policies, and coordination for developing framework of international cooperation with multiple donors and CBFM project formulations including a DNTF-WFP-JICA-CFG cooperation project.

JICA plans to implement technical assistance Project for the Establishment of Sustainable Forest Resource Information Platform for Monitoring REDD+ with DNTF. The project period is for five years from 2013 to 2018. The objective of the project is to develop regular and appropriate forest resource monitoring based on the Forest Resource Information Platform for promotion REDD+ implementation. The expected outputs are: 1) established database system functioning as the forest resource information platform, 2) development of basis of MRV for the forest resource information platform, 3) production of RELs/RLs for the Forest Resource Information Platform, and 4) preparation of dataset of biomass and carbon estimation.

(2) Norway

South-South REDD, A Brazil-Mozambique Initiative was implemented in contract with IIED; a UK research institution. The project started : 1) facilitating steps towards the design of a National REDD Strategy for Mozambique, 2) supporting the preparation of the Readiness Preparation Plan (RPP) for Forest Carbon Partnership Facility (FCPF) to the World Bank, 3) strengthening technical, institutional and legal capacity within the scope of REDD, and 4) conducting viability studies to identify potential areas to implement REDD projects in Phase I but some were not completed.

A Pilot project in Manica Province is planned for the phase II. IIED is subcontracted to UEM (University of Eduardo Mondlane), CTV (Centro Tera Viva), etc. for implementation.

(2) Finland

Support to National Forest Program (SUNAFOP (APRONAF in Portugese)) was implemented in order 1) to improve the capacity of DNTF to carry out policy making, establishing a necessary regulatory framework for policy implementation, 2) to enhance forest utilization, industrial development and business environment in forest sector, and 3) to introduce Community Based Natural Resource Management (CBNRM) at four provinces in northern region（Nampula, Cabo Delgado, Zambezia, and Niassa). The project period was planned for five years since 2009 and interrupted in the end of 2012.

The project supports forest inventory at production forests and to develop fee collection system from concessionaires. The project forms community-based concession and carries out inventory of forest and wildlife. By introducing community-based waden pressure, illegal logging and hunting is expected to be reduced and legal fee will be collected from logging and hunting operations. Due to the lack of the monitoring of forest concession, financial return to local community (20% of sales from logged timber) is not paid.

Finland supported on forest inventory and remote sensing to produce forest cover maps at Zambezia Inhambane provinces between 2000-2005, which contributed to raising technical level of forest inventory in Mozambique in general.

(3) France

Gile National reserve project in Zambezia province is implemented with the support of French Development Agency (AFD) (French Global Environmental Funds). MITUR（inside the national reserve）and MINAG (in buffer zone) are the counterparts of the project. The project was implemented between 2009 and 2012. The components of the project are: improvement of the reserve management, Wildlife restoration and ecological monitoring, Community development and governance structure, valorization of the buffer zone, and project monitoring & evaluation. The project defined the buffer zone, reintroduces endangered species monitored key species and carried out the feasibility study for setting-up of a community-based hunting zone.

The Phase 2 of the project will aim at the preparation of REDD+ implementation. Estimation of REDD+ potential, estimation of reduction of GHG emission, community organizing, pilotting small-scale livelihood activities with low carbon emission (conservation farming, sport hunting and eco-tourism) are planned in the project. Forest fires, vegetation change and biodiversity (elephant as keystone species) will be monitored in the phase2. The project period is from 2012-2014 with budget of 5 million Euros.

(5) Denmark

DANIDA supports MICOA for capacity building on climate change through their climate change experts.

(6) UK

Edinburgh University conducted deforestation studies using ALOS PALSAR at Sofala and Manica provinces. The study was partly supported by EU.

(7) European Union

Forest carbon monitoring project is planned with UEM by using radar technology. EU also finances Blue REDD+ program by WWF.

(8) USA

Land Tenure Project is implemented with the support of USAID as a part of Millennium Challenge Account (MCA). The objectives of the project are 1) coordination of the access to lands by local communities, 2) review and monitoring of land policies, and 3) enhancement and capacity building of land management. The project implements land use inventories and maps and support planning processes. The project budget is USD68 million.

In Land Tenure Project, geographical information database at the community level is produced in four provinces in the northern region (12 Districts 8 Municipalities in Nampula, Cabo Delgado, Niassa and Zambezia provinces).

USDA Forest Services support UEM to implement biomass assessment of mangrove forest for REDD+ MRV in Zambezi Delta.

(9) World Bank

A draft of RPP for readiness fund of FCPF submitted by the government of Mozambique was approved in March 2012. With a fund of USD3.8million, formulation of necessary guidelines, clarification of institutional arrangements etc are going to be made for REDD+ readiness preparation.

(10) UNDP

Coastal protection project is planned to be implemented for adaptation of Climate Change by GEF grant (LDC fund) between 2012 and 2016 with total fund of USD 14 million[3]. African Adaptation

3 http://www.adaptationlearning.net/project/ldcf_mozambique

Programme (AAP) of Japan funds for a coordinator who is advising MICOA on climate change issues.

(11) WFP

To enhance adaptation capacity of vulnerable communities against climate change, in cooperation with JICA, WFP started One Forest One Community for Food Security Pilot Project with an investment of voluntary carbon offset by a Japanese private company; Carbon Free Consulting (CFG). The Project supports DNTF and INAS to implement Food For Work agroforestry in order to promote the initiative of the president "One Child One Tree, One Leader One New Forest".

6.8 Namibia

Namibia is situated on Africa's south-western seaboard. The country covers 823,290 km², and the population is 2,324,000. The population density is 2.8 persons/km^2, the lowest in the southern Africa countries. In terms of foreign revenue earned, tourism offers tremendous potential for growth, following the mining sector. Different players are involved in tourism.

6.8.1 Forest Policy

Development Forest Policy for Namibia was endorsed in 2001. The main objectives of the policy are:

- To reconcile rural development with biodiversity conservation by empowering farmers and local communities to manage forest resources on a sustainable basis;
- To increase the yield of benefits of the national woodlands through research and development, application of silvicultural practices, protection and promotion of requisite economic support projects;
- To create favorable conditions to attract investment in small and medium industry based on wood and non-wood forest raw materials; and
- To implement innovative land-use strategies including multiple uses of conservation areas, protected areas, agro-forestry and a variety of other approaches designed to yield forestry global benefits.

Namibia launched its National Policy on Climate Change to guide efforts to mitigate the impact of climate change on the country's development. REDD+ issues are dealt with by the policy. Currently, Namibia is in the REDD+ readiness phase, working towards mapping out the forest area and identify the drivers for deforestation and forest degradation.

6.8.2 Forest Programs

No information has been obtained.

6.8.3 Legislative Framework for Forest Management

The Forest Act (No. 12 of 2001), amended by the Forest Amendment Act (No. 13 of 2005), is the law through which the Forest Policy is implemented. The Act stipulates the use of forest resources and the responsibilities of the users.

6.8.4 Institutional Framework for Forest Management

The Directorate of Forestry (DOF), under the Ministry of Agriculture, Water and Forestry (MAWF) is responsible for protecting Namibia's forests and people's right to use forest resources. It is their duty to ensure the followings.

- Property rights for people who benefit from forests
- Regulations to enforce the Forest Act effectively
- Provision of technical support and advice (extension services) to the public
- Research, education, training and national programs on forest conservation/protection
- Forest management

- Sustainable management and utilization of forest resources/products, which help to reduce rural poverty and lead people to recognize the importance and value of forest resources

The number of staff of public forest institution as of September 2012 is 532, of which 25 are university degree holder or equivalent.

The Forest Act stipulates to establish a Forestry Council which is responsible for making recommendations on law, policy and any other matters related to forests. The MAWF, the Ministry of Lands and Resettlement, two farmers' unions and the Council of Traditional Leaders represent the Council.

6.8.5 Forest Area and Wood Volume

The original data on land cover is shown in Table 6-22. Forest and woodland account for approximately 17% of the country (Figure 6-14, Table 6-23).

Table 6-22 Land Cover in Namibia (2000)

Land cover description	Area (ha)	%
Shrubland	43,460,321	52.8
Forest	99,496	0.1
Grassland	7,220,148	8.8
Riverine woodland	346,870	0.4
Salt pans	538,262	0.7
Shrubland-woodland mosaic	14,211,507	17.3
Sparse grassland and shrubland	3,576,921	4.3
Woodland	12,875,475	15.6
Total	**82,329,000**	**100.0**

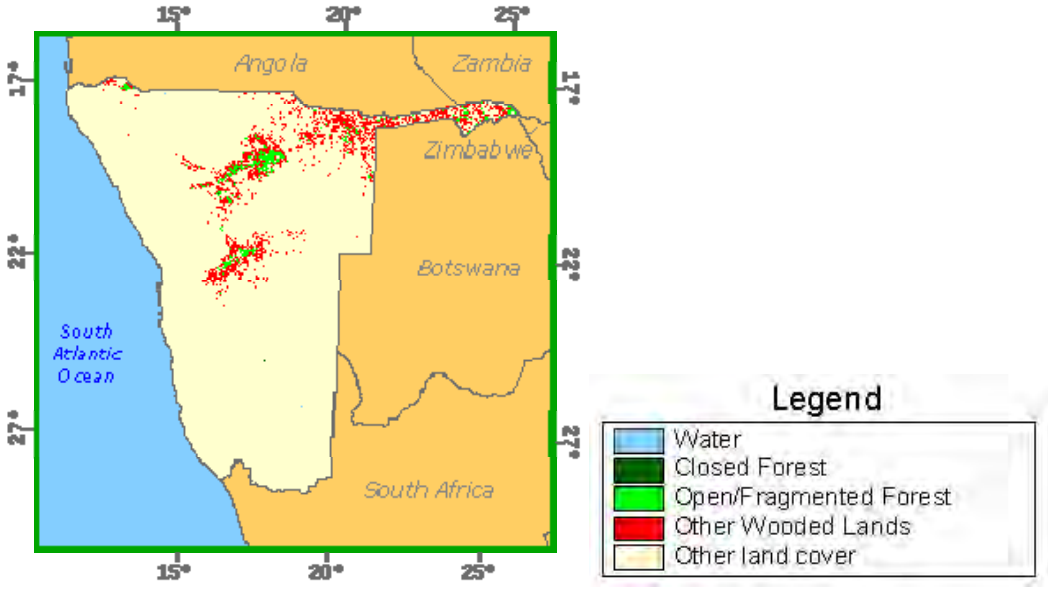
Source: FAO. 2010.

Only the data in 2000 is available, thus the data for 1990, 2005 and 2010, estimation and forecasting are based on linear extrapolation.

Table 6-23 Forest Area and Wood Volume in Namibia

FRA 2010 categories	Area (1,000 ha)			
	1990	2000	2005	2010
Forest	8,762	8,032	7,661	7,290
Other wooded land	9,023	8,656	8,473	8,289
Other land	64,544	65,641	66,195	66,749
Inland water bodies	100	100	100	100
Total	82,429	82,429	82,429	82,429
Total growing stock of forest (mil. m^3)	211	193	184	175
Growing stock of commercial species (mil. m^3)	n/a	n/a	n/a	n/a

Source: FAO. 2010.



Source: FAO. 2000.

Figure 6-14 Forest Cover Map in Namibia

6.8.6 Utilization of GIS/Remote Sensing and Preparation of Forest Maps

The National Remote Sensing Centre (NRSC) is responsible for remote sensing survey and mapping. Remote sensing data such as TM images of Landsat and MODIS data by Aqua and Terra are obtained on line.

As for software, ERDAS, Imagine and ENVI (for image processing) and Arc GIS, ArcView (for GIS) are used for data processing and mapping by the NRSC staff. The freeware such as ILWISS (for Image processing) and Quantum GIS and GRASS (for GIS) is used by the DOF staff.

AMESD data and developed algorithm are used for burnt area mapping.

6.8.7 Research on Management for Forest and Wildfire

The main research organization is Research Division in the DOF. The number of research staff is seventeen, seven technical staff, eight staff with BSc, and two staff with MSc. The main research areas are indigenous fruit tree propagation, shrub land management, fire, nursery experiments, agroforestry, and species trials.

6.8.8 Management of Forest and Wildfire

(1) Forest Management

State forest reserves can be established by the MAWF on state lands or communal lands for managing forest resources of national importance or to preserve biological diversity with the agreement of Ministry of Lands and Resettlement (MLR). State forest reserves can also be established on communal land where a community forest would not function with agreement of the chief or traditional authority or the MLR.

Regional forest reserves are similar to state forest reserves, but they are established at the request of the Regional Council. The Regional Council negotiates with the Chief or Traditional Authority and other stakeholders, and makes recommendations to the Minister.

(2) Forest Fire

The number of fires that occurred is not known. The National Sensing Centre only measures the sizes of burnt areas. The burnt area is shown in Table 6-24.

Table 6-24 Annual Burnt Area in Namibia (2000-2011)

Year	Burnt area (ha)	Year	Burnt area (ha)
2000	4 813 543	2006	5 174 318
2001	4 847 662	2007	6 091 985
2002	3 629 772	2008	3 721 174
2003	4 206 982	2009	7 247 731
2004	4 027 162	2010	6 154 779
2005	4 018 162	2011	6 616 421

The DOF regulates fire management through the Forest Act, which is mainly concerned with prohibiting fires within forest reserves, declaring fire hazard areas and specifying landowner liability for fire damage. The lighting of fire on communal land is illegal without authorization from the DOF.

It is illegal to set a fire in any classified forest, forest management area or protected area, though there are exceptions determined by a fire management committee or another relevant authority. If a person set a fire and it spreads, the person will be responsible for the damage. To help protect classified forests, nearby areas can be declared fire management areas. Each of these areas must have a fire management plan that states what precautions must be in place, and what action must be taken if a fire does break out. In an emergency, people may be legally required to help with fighting the fire.

The length of the firebreaks established were 3,261km in 2011/12, and 5,642km in 2012/13. A fire bulletin, which is produced based on the real-time fire information data through AMESD, is distributed on a daily basis to alert farmers and other communities about the fire incidences.

The formalization of national policy to strengthen the coordination of fire prevention and suppression among government, private and community stakeholders occurred only recently, through the Draft National Forest and Veld Fire Management Policy (DOF, 2005). Implementation consists of discouraging burning through education and awareness campaigns, firebreak networks and community training in wildfire suppression.

The Caprivi Integrated Fire Management program begun in 2006, and developed the Caprivi Integrated Fire management Strategy (2007–11).

(3) Community Forestry

The community forests can be created based on the Forest Act 2001. Community forests can be declared on communal land, with the consent of the chief or traditional authority. An organization representing the people who traditionally use the community forest will be appointed as the forest management authority which enters into a written agreement with the Minister responsible for forestry. The authority will have legal rights to use the forest resources and graze animals in the community forests, or to rent out these rights to others. The management authority is obliged to do the following.

- To look after the forest according to a management plan
- To ensure that all community members have equal access to the resources in their forest
- To reinvest adequate fund made from the forest to keep protecting the forest, and share left over between the community members.

The overall objective of the Community Forestry program in Namibia is to improve forest resource management and the livelihoods of local people, by empowering communities to acquire the rights, capacity and resource information for managing their forests and pasture in a sustainable manner and in collaboration with relevant authorities and stakeholders. Presently, 32 community forests have been recognized with an approximate total surface area of 4,868,000 ha supporting a total of 84,500 beneficiaries.

Community forestry started with the financial and technical support of the Namibia-Finland Forestry

Program (NFFP), The Community Forestry and Extension Development Project funded by the Danish and the Okongo Community Forestry Project funded by GTZ. This support is still going on as the Community Forestry in Namibia (CFN) Project funded by BMZ through KfW with technical support of GIZ.

6.8.9 Aid Projects by International Development Partners

No information has been obtained.

6.9 Seychelles

Seychelles is a country of diverse races that stem from Europe, Africa and Asia. The official languages of Seychelles are English, French and Creole and the population is about 87,000.

6.9.1 Forest Policy

Seychelles Sustainable Development Strategy (SSDS 2012) is the policy framework for environment protection and forest management. The main national forest policies are:

- To conserve and manage terrestrial and aquatic biodiversity to ensure sustainable use and equitable benefit to the people;
- To improve the understanding of biodiversity and the functioning in a changing environment, and
- To achieve sustainable forest management using ecosystem approach which further strengthens ecosystem services.

6.9.2 Forest Programmes

No forest program is formulated.

6.9.3 Legislative Framework for Forest Management

The Forest Reserve Act was enacted in 1955 and amended in 1976. Other related laws are Environment Protection Act 1994 and National Parks and Nature Conservancy Act 1982.

6.9.4 Institutional Framework for Forest Management

The Ministry for Environment and Energy is responsible for the policy and enforcement of forest-related matters, with a small unit of five staff personnel.

Seychelles National Parks Authority with 99 staff is responsible for the forest management including forest firefighting (Figure 6-15).

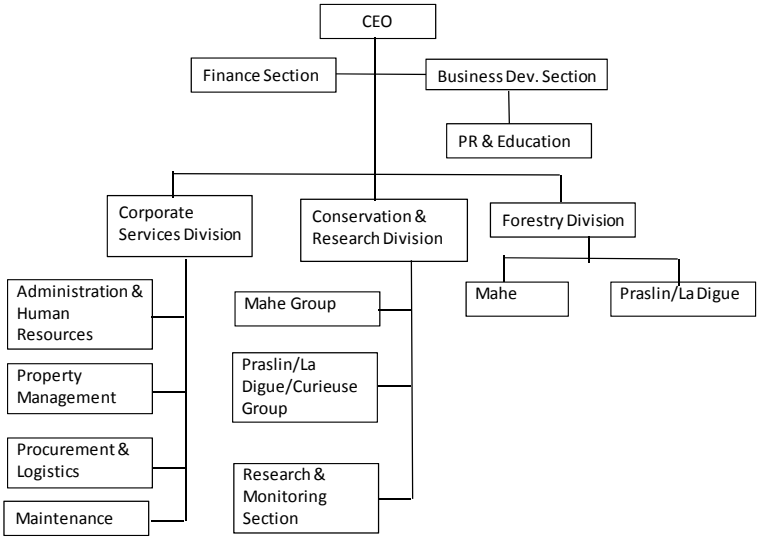


Figure 6-15 Organization Chart of National Parks Authority

6.9.5 Forest Area and Wood Volume

According to FRA 2010, forest area in Seychelles is around 40,700 ha, occupying 88% of the national territory (Table 6-25). The forest stock is estimated to be 3.1mill. m^3.

Table 6-25 Forest Area and Wood Volume in Seychelles

FRA 2010 categories	Area (1,000 ha)			
	1990	2000	2005	2010
Forest	40.7	40.7	40.7	40.7
Other wooded land	0	0	0	0
Other land	5.3	5.3	5.3	5.3
Inland water bodies	0	0	0	0
Total	46	46	46	46
Total growing stock of forest (mil. m^3)	3	3	3	3
Growing stock of commercial species (mil. m^3)	n/a	n/a	n/a	n/a

Source: FAO. 2010.

Considerable changes have been found in forest management in Seychelles in the last two decades. Seychelles put much emphasis on protection of the environment, and the protected area increased considerably. At least 10,000 new trees were annually planted on a basis.

Timber import largely increased for the construction industry, and domestic timber harvesting was reduced by at least 20%. Neither harvested nor planted amount of timber is significant in the last two decades. The national data of the area by vegetation types in 1992 is shown in Table 6-26. It is likely that a large change has not been found since then.

Table 6-26 National Data of the Area by Vegetation Types in 1992

Category	Area (ha)
Albizia	1,424
Mixed	24,525
Plantation	4,929
Coconut	2,929
Bush	6,859
Deforested	343
Other	4,990
Total	46,000

Source: FAO. 2010.

6.9.6 Utilization of GIS/Remote Sensing and Preparation of Forest Maps

Aerial photos from 1999(1.0 m resolution) and those from 2011 (0.5m resolution) were used for national level mapping and images by the QuickBird (2.4 m resolution) is used for mapping of a few islands.

As for software, ERDAS and Imagine (for image processing) and Arc GIS, ArcView (for GIS) are used for general mapping and image processing. The freeware such as WinBilko (for Image processing) and Quantum GIS, GRASS and Post GIS (for GIS) are used as well. Three staff members are assigned for GIS related works, one principal GIS officer with M.Sc of GIS, and two technicians. No work has been done for fire detection using RS.

6.9.7 Research on Management for Forest and Wildfire

There is no institution that conducts research on forestry.

6.9.8 Management of Forest and Wildfire

The forest areas affected by fire was 345 ha in 2011, and 93 ha in 2012. Fire seldom occurs in Seychelles therefore, firebreak is not established.

The forest fire policy stipulates that fire in an open air, plantations, field or forested areas shall not be lighted without an authorized burning permit issued by Ministry of Environment. Forest Fire Contingency Plan was developed in 2010, under which the database for forest fire was in place in 2010, and yearly training programme on forest fire-fighting, as well as public education and awareness programme is carried out throughout the year. Notification of fire incident is reported through established Communication and reporting channels such as the Department of Risk and Disaster, Rescue and Fire Service Agency, police stations, and district administration.

Seychelles do not have a policy on REDD+ but have conservation programme under the SSDS 2011-2020 which relate to REDD activities. Campaign for 20,000 tree-planting in 2012, and restoration of degraded area on the inner and outer islands are promoted. No systematic forest inventory has been prepared in the Seychelles and available data are limited.

6.9.9 Aid Projects by International Development Partners

No information has been obtained.

6.10. South Africa

The Republic of South Africa is located at the southernmost part of the African continent. Of an estimated population of 50,586,000, around 77 % are of African origin, 10 % of European descent, 9 % mixed origins and 3 %. Asians There are 11 official languages, and each of them is the first language for many of South Africa's people. The South African economy is the most advanced on the African continent accounting for approximately 60% of GDP in SADC countries. South Africa has a sophisticated financial system that includes one of the top 10 stock exchanges in the world, and well developed physical, telecommunications, and energy infrastructures.

6.10.1 Forest Policy

(1) The National Forestry Action Programme (1997)

The National Forestry Action Programme (NFAP) was enacted in 1997 as a strategic program for the period between 1997 and 2000. In the NFAP forestry is recognized as a tool for poverty alleviation in rural development. The NFAP placed a greater emphasis on the development potential of community forestry, preparing the legislative tools for controlling seed pollution and the spread of invasive trees and addressing sustainable forestry needs for the promotion of economic and social development.

The NFAP 1997 recognized that South Africa's forest sector is a part of that of the Southern African Development Community (SADC) and emphasized to develop the foundations of a regional approach including joint studies on research, education and centres of excellence, the development of SADC regional forest policy, and a planned SADC timber association.

(2) Forestry 2030 Roadmap

Forestry 2030 Roadmap was formulated in 2007 in order to specify the long-term strategic position of the sector. The roadmap has the following six principles and strategic objectives. Strengthening international and regional partnerships for sustainable forest management was emphasized as the eighth strategic objective.

Forestry 2030 Roadmap: principles and strategic objectives

- Forests and forests resources to be treated as a national assets
- Forests are protected from negative effects of fire, and diseases and alien invader plants
- People driven development and gender equity
- Recognition of the scarcity of water resources
- A competitive and value adding forest sector
- Forests developed and managed so that persons or categories of persons previously disadvantaged by unfair discrimination are advanced

SO1 – Facilitate improved timber availability and secure supply of timber to ensure sustainability of entire timber value chain.
SO 2 – Increase the contribution of all types of forests and related goods and services to the quality of life of South Africans with particular focus on rural and disadvantaged communities.
SO 3 – Promote conservation of forest biological diversity, ecosystems and habitats, while ensure the fair and equitable distribution of their economic, social, health and environmental benefits.
SO 4 – Facilitate skills development, to support sustainable forest sector development.
SO 5 – Implement innovative ways to enhance and streamline the regulatory environment to assist the sector to be compliant while reaching its potential in terms of sustainable development.
SO 6 – Create enabling institutional and financial arrangements for sustainable forest management.
SO7 – Maintain the forest sector as a knowledge-based enterprise, adept to addressing constraints to growth in the sector and managing the risks to growth.
SO 8 – Strengthen international and regional partnership in order to enhance sustainable forest management.

Good progress has been made towards the formulation of the policy on REDD+. A concept document has been developed and a consultation workshop is scheduled to take place before the end of the year.

6.10.2 Forest Programme

DAFF Strategic plan 2012/13-2016/17

Forestry and Natural Resource Management Programme in the DAFF Strategic plan, aiming at ensuring the sustainable management and efficient use of natural resources has the following three subprograms.

- Forestry Operations: Ensure sustainable management of forestry operations through managing state forests and woodlands, other state assets in the nine provinces.
- Forestry Development and Regulation: Ensures effective development of policies for forestry development and regulation by promoting the optimum development of commercial and greening and the development of small-scale forestry.
- Natural Resources Management: Facilitate the development of infrastructure and the sustainable use of natural resources through an enabling framework for the sustainable management of woodlands and indigenous forests, the efficient development and revitalisation of irrigation schemes and water use.

The program has a plan for rehabilitation of 50 000 ha indigenous forests, woodlands and agricultural land and developing Climate Change Adaptation Plans by 2013.

6.10.3 Legislative Framework for Forest Management

(1) The National Forests Act

The national forest act (NFA) was enacted in 1998. The act stipulates general principles of sustainable forest management, special measures to protect forests and trees, use of forests, institutions, general administration, offences and penalties, enforcement, and general and transitional provisions. The prohibits harvest of natural forests without licenses and stipulates forest development, conservation targets with ratings or priorities, national forest types or sub-types differ, determination of the jurisdiction areas for trusteeship of the natural forests, promotion of rehabilitation of degraded forests, types of access and use of natural forests, landscape approach for protecting various veld types, community forestry, etc.

(2) The National Veld and Forest Fire Act

The National Veld and Forest Fire Act also enacted in 1998 stipulates the establishment of fire protection associations, fire danger rating, veldfire prevention through firebreaks, fire-fighting, offence and penalty against fires and research on fires, etc.

6.10.4 Institutional Framework for Forest Management

The Department of Agriculture, Forestry and Fishery (DAFF) is primarily responsible for the formulation and implementation of policies governing the Agriculture, Forestry and Fisheries Sector.
The DAFF has six branches. Forestry branch has the following seven programs.
Forestry Oversight program develops policies to support sustainable forest management, oversees the sector and ensures that policies at all levels of government.

Forests, Fire Regulation and Governance program ensures the administration based on the forestry related laws and supports rural socio-economic development through access and use of State forests and developing systems and strategies for preventing, managing and monitoring veld and forest fires. It provides technical advice to, and support for, the organization and operation of local institutions to prevent veld and forest fires and to achieve fire management goals in general.

Forestry Development program develops strategies that support Forestry Broad Based Black Economic Empowerment Charter and that enable communities to make use of tree and forest resources to improve their livelihoods, including international liaison, which promotes forestry development in South Africa, as well as in the SADC region. It further develops forest enterprise development and Livelihoods that enable communities to participate in the benefits of forestry to generate economic growth and sustain livelihoods.

Forest Technical and Information Services programme ensures sustainable use of the natural resource base through the management of the overall system for forestry data, information, and knowledge, including spatial and non-spatial forestry information. State Forest Transfer, Regulation, Administration and Oversight programme deals with the transfer, and post-transfer administration and regulation, of state forests and relations with stakeholders.

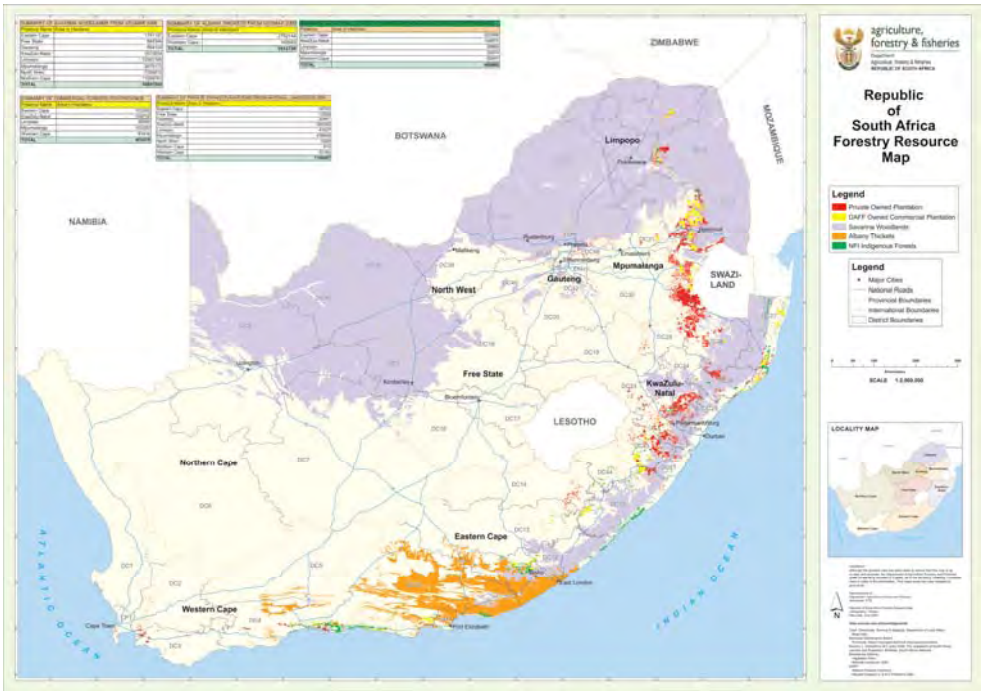
6.10.5 Forest Area and Wood Volume

According to the vegetation map in 2006, in South Africa approximately 90% of the national land is savanna woodland and indigenous forests comprise only 1.1% of the territory (Figure 6-16). Plantations accounting for 3.5% owned by private sector (2.6%, 1.1 million hectares) and the government (0.9%, 410,454 hectares) are concentrated in the eastern parts of the country (Table 6-27). Dense woodland containing Succulent plant and *Euphorbia* spp. called “Albany thicket” is found in the southern edge of the country.

Table 6-27 Vegetation Area by Province in South Africa

(Unit: ha)

Province	Indigenous Forest	Savanna Woodland	Albany Thicket	Private Plantations	Commercial State Plantations	Total
Eastern Cape	222,368	1,791,187	2,752,144	38,730	103,260	4,907,689
Free State		884,348		12,269		896,617
Gauteng		564,104		20,941		585,045
KwaZulu-Natal	149,075	3,570,654		505,335	108,732	4,333,796
Limpopo	28,688	12,083,166		43,527	35,080	12,190,461
Mpumalanga	32,574	2,675,175		476,606	163,382	3,347,737
North West		7,288,812		5,029		7,293,841
Northern Cape		11,099,763		810		11,100,573
Western Cape	62,961		160,583	53,180	41,416	318,140
Total	**495,666**	**39,957,209**	**2,912,727**	**1,156,427**	**410,454**	**44,932,483**
%	1.1	88.9	6.5	2.6	0.9	100.0



Source: DAFF, based on vegetation map 2006

Figure 6-16 Forest Resource Map of South Africa

6.10.6 Utilization of GIS/remote Sensing and Preparation of Forest Maps

Remote sensing and GIS is widely used in South Africa forestry. DAFF has forest vegetation maps 1/2 million (country wide), 1/70-90,000(local level) and 1/30,000 for protected areas.

6.10.7 Research on Management for Forest and Wildfire

(1) Department of Agriculture, Forestry and Fishery (DAFF)

The DAFF has a Forest Research Coordinator to support the current research base in South Africa. The short term goals of the new research and development capacity include: 1) reinvigorate Research and Development Strategy, 2) establish national forest research forum, and management of intellectual property.

(2) Centre for Science and Industrial Research (CSIR)
Meraka Institute in CSIR has been supporting to develop Advanced Fire Information System (AFIS) using MODIS and MSG (Meteosat Second Generation) data. The institute carries out developing wildfire detection algorism and offers wildfire products (HotSpot, fire dry index alerts, etc.) through AMESD supported by EU. The institute also established field terminals with receiving facilities in South Africa and other SADC countries. Ground stations of CSIR receive data from earth monitoring satellites. CSIR established a fire coordination centre and a coordinates fire-fighting activities in the region.

(3) Agricultural Research Council (ARC)
ARC has eight research institutes and six programs: Earth Observation, Soil and Water, Soil Health and Remediation, Pedometrics, Agroclimatology, and GeoInformatics. By the fund from DFRR ARC developed WebGIS system AGIS that offers various thematic maps including fire, climate, soil, demography, political jurisdiction and roads. Earth Observation programs monitors fire, draught, and invasive plant, and national crop estimation, sustainable land management, soil erosion are studied. Agroclimatology program uses data from 100 manned and 450 automated climate monitoring stations.

(4) Pretoria University
Geography Department of Pretoria University has Remote Sensing and GIS centre. A graduate student is verifying MODIS active fire alert with fire scar data. The university carries out a research of forest area change with plant science. It belongs to miombo network, a framework for a Terrestrial Transect Study of Land-Use and Land-Cover Change in the miombo ecosystems of Central Africa, developed by International Geosphere-Biosphere Program (IGBP) by International Council of Scientific Union and collaborated a research with Bunda College of Agriculture in University of Malawi.

6.10.8 Management for Forest and Wildfires

(1) Wildfires
Wildfires are one of the most serious issues in forest management in South Africa. A large wildfire in 2008, burned about 80,000 hectares (mostly plantations) and lost 23 lives. Land owners are liable for fire occurrence in their lands. Forest Protection Association (FPA) are formed by land owners. FPA has an office in each province. Joining FPA makes insurance cost lower for land owners.

Since 2003 Working on Fire (non-profit fire fighter group) has been organized under Ministry of Environment. Working on Fire organized one troop (25 fighters each) in each 50,000 hectares. 5000 people are employed in the entire country, has a initial training in Nespruit for 21 days. The troops are trained to be mobilized for 24 hours 7days a week. Troops are stationed in the eastern region in winter and in the western region in summer due to the different dry season. Working on Fire has a coordinator at each province.

The total number of FPA is 261. The burned area in 2011 was 3,299,570 ha and the total area extinguished by Working on Fire was 697 175 ha in 2011.

Centre for Scientific Investigation and Research (CSIR) is implementing the fire monitoring support component of AMESD with EU support. AMESD supports to develop Advanced Fire Information System (AFIS). AMESD terminated in the end of 2012 and followed by Monitoring Environment for Security of Africa（MESA）with the period between 2013 and 2015. In AFIS fire alert is issued twice a day to south African countries based on the MODIS data by a method developed by NASA (MOD14) (resolution 1kmfor fire hotspot). Data provided in AFIS include active fire alert, fire danger index (3 day forecast based on methodologies developed in Canada and Australia), monthly burnt are, fire risk by biomass accumulation, movement of cloud and rain and flooding areas. Although training is offered the data is not well utilized at each country for the action against fires. In MESA is planning to be supported the issue.

Kruger National park (covering over 2 million hectares) has been conducting a large scale control fires. More intensive control fires are planned in the year with higher precipitation due to higher biomass growth. They are usually planned once in 5-6 years in each location in order to remove accumulated biomass.

(2) Participatory forestry

According to the review of NFAP in 2004 by DWFA (Department of Water Affairs and Forestry), due to the difficulty to identify the role of the Department in the National, Provincial, and Local framework for service delivery, Community Forestry was abolished and the need for decentralization of forest administration was suggested. Participatory Forest Management (PFM) in preference to Joint Forest Management (JFM) has been adopted instead of the term Community Forestry. PFM Programme includes a service to support the sustainable use of forests and forest resources to serve the livelihoods of poor, rural and marginalized communities.

6.10.9 Aid Projects by International Development Partners

(1) European Union

Meraka Institute in CSIR is implementing AMESD with EU support（African Monitoring of the Environment for Sustainable Development） as described above.

(2) GIZ

Tanzania – South Africa Fire Management Coordination Project is implemented in the period of 2010-2011 by the Trilateral Cooperation Fund, a mechanism to implement development programmes in the third country by using the experiences and resources of both South Africa and Germany. The project aims to improve natural resource management through enhanced skills and knowledge of fire management techniques in selected Tanzanian communities and officials. The project partners are Department of Water Affairs, DAFF, Working on Fire (WoF), FireWise and the Meraka Institute in CSIR.

6.11. Swaziland

The Kingdom of Swaziland is a small, landlocked country covering a total area of 17,364 km² located between Mozambique and South Africa. Swaziland has four climatic areas ranging from 400 to 1800 metres above sea level. The population is 1,203,000, and about 70% lives in rural areas. The agricultural sector is the main source of income for more than 70 % of Swazis, particularly in the rural areas.

6.11.1 Forest Policy

National Forest Policy was approved in 2002. The policy has the following objectives.

- Improve the access to land for the utilization and development of forest resources, and secure the tenure of forest and trees
- Promote the rational and sustainable use of land, and achieve a sustainable balance between forestry and other uses of the land/water resources;
- Improve the forest productivity, and ensure sustainable supply of multiple forest products and services by maintaining the forest areas
- Improve income and living conditions, and alleviate poverty
- Conserve the biodiversity of the forest resources, encourage its sustainable use and ensure that benefits accrued are shared equitably
- Promote the integration of forestry into urban development
- Enhance the national capacity to manage and develop the forestry sector in collaboration with other stakeholders

Swaziland does not have a policy for REDD+.

6.11.2 Forest Programmes

Draft National Forest Program was developed in 2002, which was reviewed and updated. However, it has not been approved.

6.11.3 Legislative Framework for Forest Management

Draft Forest Bill was developed in 2002 and further worked upon in 2010. It needs to be finalized and submitted to the Attorney General's Office, Cabinet and Parliament for promulgation into law.

The bill has the following objectives.

- Establish a framework for efficient, profitable and sustainable management and utilization of all forests of Swaziland for the benefit of the entire society
- Increase the role of forestry in environmental protection, conservation of plant and animal genetic resources and rehabilitation of degraded land
- Control and manage forest fires
- Establish the Forestry Advisory Committee
- Establish the Swaziland Forest Fund
- Provide for the domestication and implementation of the basic principles and rules of international law relating to the sustainable use and management of forests based on the SADC Protocol on Forests and the treaties, conventions and agreements

Other existing laws related to forest management are: Tree Planting Control Act (1972), Flora Protection Act (2001), and Forest Preservation Act (1910), Wattle Bark Act (1960), and Private Forest Act (1951).

6.11.4 Institutional Framework for Forest Management

The Department of Forestry (DOF), under the Ministry of Tourism and Environmental Affairs is responsible for forestry with 60 staff members. Local offices are located at the regional, sub-regional and area levels.
The Swaziland National Trust Commission (SNTC), under the Ministry of Tourism and Environmental Affairs is responsible for protected area management with 91 staff members. The SNTC has local offices at various locations.
The Swaziland Fire and Emergency Services, under the Ministry of Housing and Urban Development is the main organization to deal with national fire issues. It has five sections of training, fire prevention, operation (west), operations (east), and transport, with 380 staff members. It has a headquarters and four local offices. Forest fires prevention is handled by several agencies including the DOF.

6.11.5 Forest Area and Wood Volume

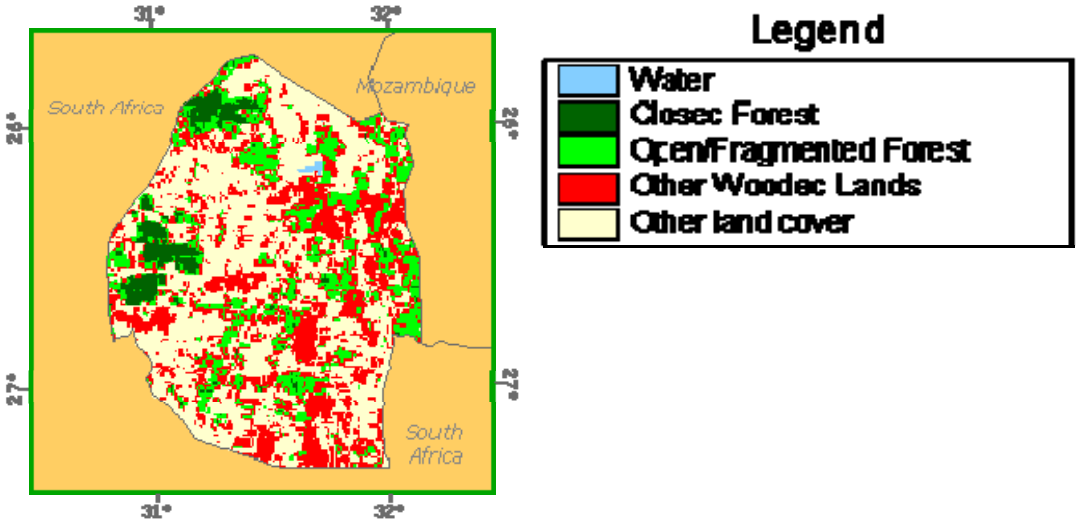
According to the FRA 2010, approximately 32% of the national territory is forest in Swaziland. Closed forests are found in the northeastern part of the country (Figure 6-17). Forest area in Swaziland has increased in the last two decades due to the expansion of plantation. However, the actual growing stock might be decreasing due to the fires which destroyed large portion of plantation forest (Table 6-28). In 2008, 20,000 hectare of forest was damaged by fire.

Table 6-28 Forest Area and Wood Volume in Swaziland

FRA 2010 categories	Area (1,000 ha)			
	1990	2000	2005	2010
Forest	472	518	541	563
Other wooded land	152	289	358	427
Other land	1,096	913	821	730
Inland water bodies	16	16	16	16
Total	1,736	1,736	1,736	1,736
Total growing stock of forest (mil. m^3)	19.7	19.4	19.2	19.1
Growing stock of commercial species (mil. m^3)	13.5	12.1	11.4	10.7

Source: FAO. 2010.

The official data in Swaziland shows that the total forest area is 785,000 ha in 2000, and deforestation and forest degradation is ongoing.



Source: FAO 2000.

Figure 6-17 Forest Area in Swaziland

6.11.6 Utilization of GIS/Remote Sensing and Preparation of Forest Maps

Surveyor General's office of the Ministry of Natural Resources and Energy (50 staff members) is responsible for mapping. It consists of three sections: general survey, general mapping, and general information and services. The general survey section has land surveyors and survey technicians. The general mapping section has cartographers in charges of photogrammetry, drawing, and GIS/computer.

6.11.7 Research on Management for Forest and Wildfire

There is no national forest research institution. The public forestry service has only a very limited research programme, due to a lack of resources.

6.11.8 Management of Forest and Wildfire

No formal forest management plan by the government is prepared; management plans are developed only by the private forest industry for managing their forest areas. The draft Forest Bill (2010) calls for forest management plans to be prepared and submitted to government.

Slash burning after clear-felling even-aged stands is a common practice in plantation forests. In communal lands, grasslands typically are burnt annually in the dry season to create a flush of green grass when the food supply for livestock is low. Fire is also used in honey collection, the fire of which

is often left unattended and lead to disastrous consequences, especially in areas surrounding plantation forests.

Protected areas or national parks implement early dry season burning in the form of fire belts and block burns to encounter uncontrolled fires and to reduce fuel load, whilst at the same time facilitating the removal of moribund vegetation. To minimize losses, plantation forest companies have been designed with networks of fire breaks. Even with these precautions, such protected areas are not spared from uncontrolled fires, most of which are results of arson from poachers and neighboring communities.

No fire detection system is in use for wildfire. The government relies on reports when a fire or visible smoke is observed. Devastating fires occurred due to extreme dry weather in 2007, 2008, and 2012. No fire data is available due to poor monitoring system. Private companies are not willing to disclose the fire data due to insurance issues.

The Swaziland Government has signed a Memorandum of Understanding (MoU) between the South African Government on cooperation on cross-border fires and other forest development matters in September 2011. It has not been operationalized yet.

Community forestry through planting of trees of multiple-use tree species in woodlot and plantations by the communities is being promoted by the DOF. These trees are planted in schools, public institutions and communally-owned lands. Tree species including eucalyptus, pines, wattle and other species are planted and used to provide socio-economic and environmental benefits to sustain livelihoods of the communities. There exist institutional structures through the traditional leadership, though proper structures for community-based forest management are defined in the proposed draft Forest Bill, 2010. Community-based eco-tourism involves two communities at Shewula and Ngwemphisi and there are various other community projects around protected areas through community outreach programmes.

6.11.9 Aid Projects by International Development Partners

(1) FAO
Integrated Fire Management Project (June 2012 - May 2014) funded by FAO is under implementation to undertake preparation of Fire Management Policy, Fire Management Strategy, and Fire Management Act, Pilot community-based fire management in eight focal areas, and awareness raising and public education on fires.

(2) Global Environmental Facility (GEF)
An integrated Land Management project under the Lower Usutu Small Holder Irrigation Project is being implemented funded by GEF (2011-2014). The DOF is implementing a component of afforestation, reforestation, conservation of natural forests and woodlands, and control of invasive alien plant species.

6.12 Tanzania

Tanzania is located on the east coast of Africa between the great lakes of the African Rift Valley system in the central part of the continent and the Indian Ocean, covering total area of 885,800 km^2. Tanzania has total population estimated as 46,218,000 with over 120 ethnic groups. Swahili and English are the official languages. The economy is heavily dependent on agriculture, which accounts for 46 % of GDP, provides 75 % of exports and employs 80 % of the total workforce.

6.12.1 Forest Policy

National Forest Policy (NFP)
National Forest Policy of Tanzania was enacted in 1998. The NFP objectives on the basis of the overall

goal are to:

- Ensure sustainable supply of forest products and services by maintaining sufficient forest area under effective management
- Increase employment and foreign exchange earnings through sustainable forest-based industrial development and trade
- Ensure ecosystem stability through conservation of forest biodiversity, water catchments and soil fertility
- Enhance national capacity to manage and develop the forest sector in collaboration with other stakeholders.

Policy statements stipulated in the NFP include: 1) management of village forest reserves based on management plans, 2) support of private and community forest management, 3) support of private woodlots and plantation by research and financial incentives, 4) development of artisanal wood-based products, 5) use of lesser known species, 6) developing beekeeper component in forest management plans, 7) forest-based ecotourism by private sector and community, 8) investment in non-wood forest product industry, 9) wildlife conservation in forest reserve management, 10) establishment of catchment forest reserves for watershed management and soil conservation, and 11) developing national criteria and indicators for sustainable forest management.

The NFP (1998) recognizes fire as an agent of deforestation and forest degradation.

6.12.2 Forest Programmes

National Forest and Beekeeping Programme (NFBP) was implemented between 2001 and 2010. The NFBP has five Development programs and sub-programs.

The objective of Forest Resources Conservation and Management is sustainable supply of forest products and services ensured to meet the needs at the local and national levels. The key issues of the subprogram Participatory Forest Resources Management and Gender Aspects is to: 1) establish CBFM and JFM by using innovative ways to share the costs and benefits and by assessing the economic, financial and social viability of participatory initiatives with paying attention to gender balance, 2) collaborate with local governments in the management of forests in the general lands and local government forest reserves, 3) involve specialized executive agencies, private sector and local governments by commercialization or privatization of the management of existing industrial plantations through concessions and leases and 4) expand existing plantations and promote tree planting in private farmlands.

The critical issues of Forest Resources Conservation and Management programmes pointed out in the review of NFBP in 2007 are: 1) Lack of systematic data collection and absence or outdated Forest Management Plans, 2) Limited coverage of PFM interventions, and 3) Insecure land and tree tenure.

National Forest and Beekeeping Programme (NFBP) programmes and sub programmes

Development Programme 1: Forest Resources Conservation and Management
Sub-development programmes
- 1.1 Participatory Forest Resources Management and Gender Aspects
- 1.2 Forest Biodiversity Conservation and Management
- 1.3 Land Use Planning
- 1.4 Forest Resources Information and Management Planning

Development Programme 2: Institutions and Human Resources
Sub-development programmes
- 2.1 Strengthening Institutional Set-up and Sectoral Co-ordination and Cooperation
- 2.2 Sectoral Human Resources Capacity Building
- 2.3 Forest and Beekeeping Financing
- 2.4 Strengthening Extension Services and Awareness Creation in Forest and Bee Resources Management
- 2.5 Forestry and Beekeeping Research
- 2.6 Policy Analysis, Planning, Coordination, Monitoring and Evaluation

Development Programme 3: Legal and Regulatory Framework and Law Enforcement
Sub-development programmes

3.1 Development of Laws, Regulations and Guidelines
3.2 Law Enforcement
Development Programme 4: Forestry Based Industries and Sustainable Livelihoods
Sub-development programmes
4.1 Forestry Products and Services Information Development
4.2 Marketing of and Awareness Building of Wood and Non- Wood Products
4.3 Forestry Industry Technology Development
4.4 Infrastructure Development
Development Programme 5: Beekeeping Development
Sub-development programmes
5.1 Conservation of bee resources and forage
5.2 Diversification and Improvement of quantity and quality of bee products

Preparation for REDD+

Tanzania is a pilot country of both UN-REDD and FCPF. The National Steering Committee, Technical Coordination Committee and National REDD+ Task Force were established under representation by MNRT (Ministry of Natural Resource and Tourism). Readiness Preparation Proposal (R-PP) was prepared and currently under assessment. According to the draft R-PP, key issues recognized in the National REDD+ strategy include the followings.

- Ownership and tenure security arrangements
- Capacity Building (Training and Infrastructure)
- Control and participation in the carbon trade and the role of national and local governments
- Baseline Establishment, Monitoring, Reporting and Verification
- Effective monitoring and evaluation of processes at national and sub-national levels
- Stakeholders engagement and involvement of local communities
- Effective functioning and of all institutional arrangements envisaged in the implementation framework at national and sub-national levels
- Financial Mechanisms and Incentive
- Benefit sharing mechanisms
- Anti-corruption laws and measures, national best practices for fiscal transparency
- Roles and responsibilities within a decentralized forest management system
- Coordination of REDD activities
- Information/knowledge dissemination and networking

R-PP is financially supported Norway-Tanzania Climate Change Partnership, NAFORMA, UN-REDD and CCI. The Action Plan for the implementation of REDD+ Strategy has been produced as well.

6.12.3 Legislative Framework for Forest Management

The Forest Act was passed by the parliament in 2002 and was promulgated in 2004. Three forestland tenure regimes are existent in managing forests and woodland in Tanzania: namely 1) State (Central government or National Forest Reserves, Local Authority Forest Reserves); 2) Private regime and 3) Village Land Forest regime. The act banned log exportation stipulates Participatory Forest Management (PFM) and restricts burning of vegetation (Part 5 and 9). There are two types of PFM: Community Based Forest Management (CBFM) and Joint Forest Management (JFM).

CBFM takes place on village land, on forests that are owned or managed by the Village Council on behalf of the Village Assembly and leads to the establishment of Village Land Forest Reserves (VLFR), Community Forest Reserves (CFR) or Private Forest Reserves (PFR). JFM takes place in forest on "reserved land" – land that has already been set aside by government authorities. The forest is jointly managed by different stakeholders, such as local communities, private sector, local or central government or anybody authorized by FBD. Joint Management Agreement (JMA) describing the method to share the costs and benefits of forest management will be made between the forest owner and the managing partner.

6.12.4 Institutional framework for Forest Management

Tanzania Forest Service

Tanzania Forest Service (TFS) as an Executive Agency under the Ministry of Natural Resources and Tourism. TFS has been given the mandate for the management of national forest reserves (natural and plantations), bee reserves and forest and bee resources on general lands. The establishment of the TFS as an Executive Agency will enhance the management and conservation of forest and bee resources for sustainable supply of quality forest and bee products and services. The Forest and Beekeeping Division will remain with the responsibilities of development of the forest policy, laws and regulations and overseeing their implementation in the sector.

TFS is headed by the Chief Executive who is assisted by three Directors who are responsible for Resources Management; Planning and Resources Utilization; and Business Support Services and four Heads of Units at the headquarters. The Units include; Internal Audit; Legal Services; Finance and Account and Procurement, headed by managers who report direct to the Chief Executive Officer.

All operational matters of the Agency will be handled in the Zones (7 zones headed by Zonal managers), and the Headquarters deal with strategic management issues.

Tanzania Forest Agency Strategic Plan was formulated for the period of 3 years from July 2010 to June 2013 as the first TFS Strategic Plan. The specific role and responsibilities of TFS stipulated in the plan are:

- Establishing and managing national natural forest and bee reserves;
- Establishing and managing national forest plantations and apiaries;
- Managing forest and bee resources in general land;
- Enforcing Forest and Beekeeping legislation in areas of TFS jurisdiction;
- Providing forest and beekeeping extension services in areas of TFS jurisdiction;
- Monitoring and evaluation of TFS activities;
- Developing TFS Human resources;
- Collecting Forestry and Beekeeping revenue;
- Safeguarding TFS Assets; and
- Marketing of forest and bee products and services.

The Strategic Plan was initially scheduled to cover a period from 2010/2011 to 2012/2013. However, delay in operationalization of TFS for one year led to an extension of SP up to June 2014. In order TFS to fulfill its vision and mission, five objectives have been developed as listed below:

- HIV/AIDS infections reduced and supportive services to people living with HIV/AIDS improved;
- Sustainable supply of quality forest and bee products enhanced;
- Stable ecosystem and biological diversity maintained;
- Institutional capacity to deliver services strengthened; and
- Good governance and gender balance enhanced.

6.12.5 Forest Area and Wood Volume

According to the FAO, 37.7% or about 33,428,000 ha of Tanzania is forests and woodlands (Table 6-29, Figure 6-18). About one third of forested areas are gazetted as forest reserves and the rest is unprotected. 1.6 million ha of the gazetted forest reserves are under management for water catchment protection (Figure 6-19). 80,000 ha is under plantations. Between 1990 and 2010, Tanzania lost an average of 403,350 ha or 0.97% per year. Tanzania's forests contain 2,019 million metric tons of carbon in forest.

Roughly five vegetation types are found in Tanzania (Table 6-30). Extensive miombo woodlands are found in the lowland areas across the central and southern parts of the country (Figure 6-18).

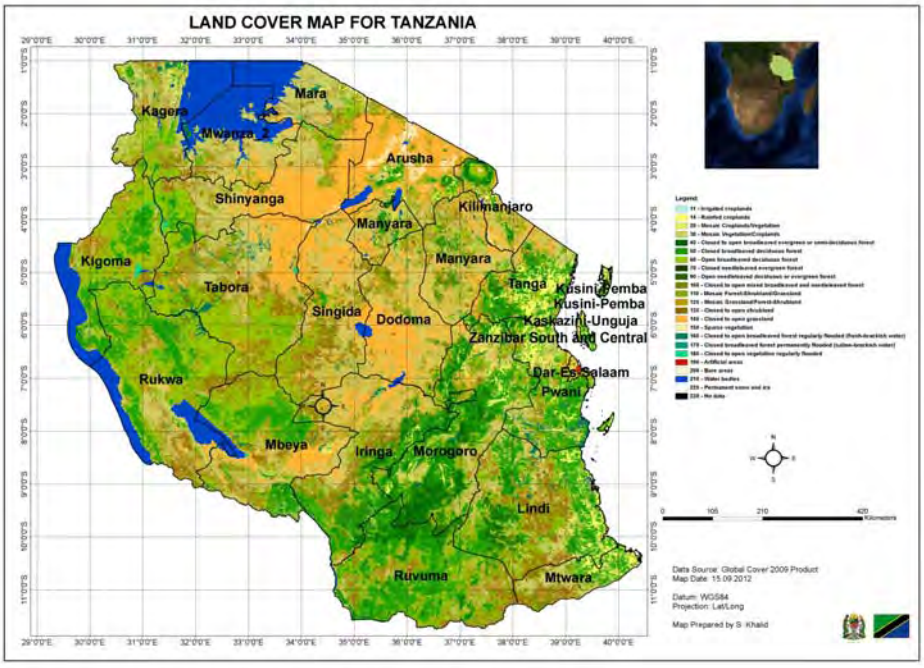
Table 6-29 Forest Area Change between 1990 and 2010

	Area (1000 hectares)			
FRA 2010 category/year	1990	2000	2005	2010
Forest	41,495	37,462	35,445	33,428
Other wooded land	18,183	14,901	13,260	11,619
Other land	28,902	36,217	39,875	43,533
Inland water bodies	6,150	6,150	6,150	6,150
Total	96,730	96,730	96,730	96,730

Source: FAO, 2010.

Table 6-30 Distribution of Vegetation Types in Tanzania

No.	Vegetation type	Distribution
1	Extensive miombo woodlands	In lowland areas across the central and southern parts of the country
2	Acacia woodlands	In the northern regions
3	Mangrove forests	Along the Indian Ocean coast
4	Closed canopy forests	On the ancient mountains of the Eastern Arc in the east, on the Albertine Rift and Lake Tanganyika in the west, and on the younger volcanic mountains in the north
5	The coastal forest/woodland	The east coastal strip



Source: TFS

Figure 6-18 Tanzania Land cover map

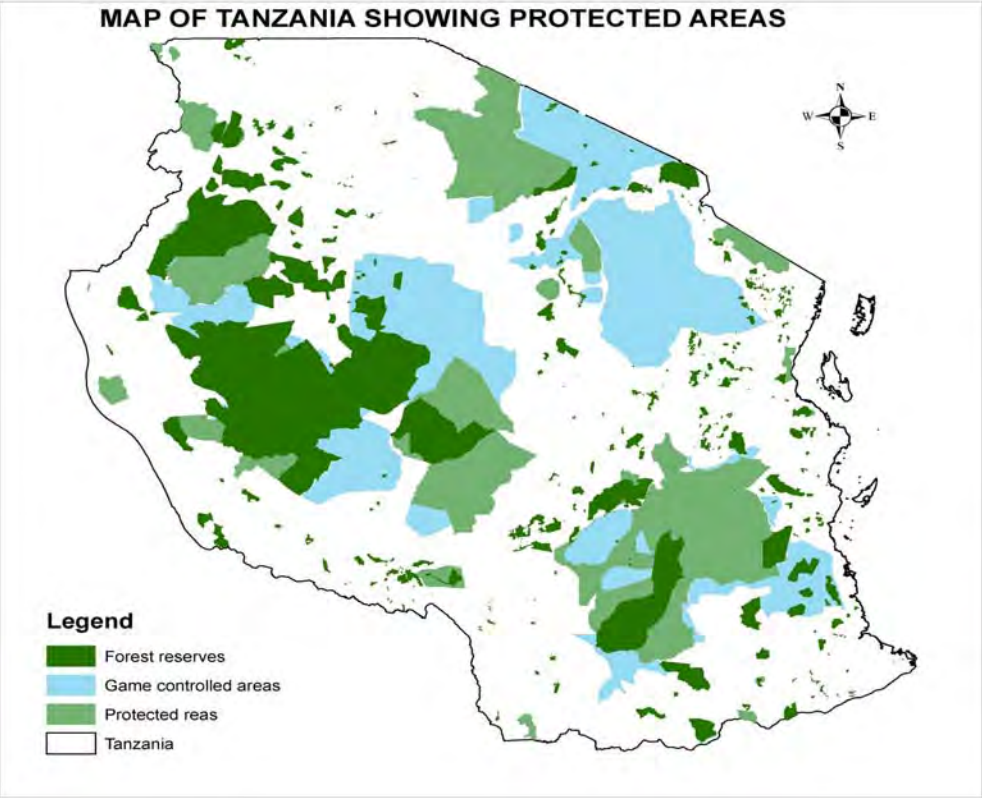


Figure 6-19 Tanzania Forest Reserve and protected area map

6.12.6 Utilization of GIS/Remote Sensing and Preparation of Forest Maps

Tanzania is using NAFORMA project to map all of its forest resources using satellite images.

The vegetation classification was mainly adopted from Hunting Technical Services (1995) map with few modifications to reflect actual ground conditions. The classification has five land cover types, four of which are natural vegetation (Table 6-31).

Table 6-31 Vegetation Type Classification

Land cover type	Subtype (Conditions)
Forest	Humid montane (Catchment forests, >800 m asl)
	Lowland (<800 m asl)
	Mangrove
	Plantation
Woodland	Closed (crown cover>40%)
	Open (crown cover between 10–40%)
	Woodland with Scattered Cropland
Bushland	Thicket
	Dense bushland
	Bushland with scattered cultivation
	Open bushland.
Grassland	Wooded grassland
	Bushed grassland
	Grassland with scattered cultivation
	Open grassland
Cultivated Land	Agroforestry systems
	Wooded crops
	Herbaceous crops
	Grain crops

Source: NAFORMA, 2012.

6.12.7 Research on Management for Forest and Wildfires

Tanzania Forest Research Institute (TAFORI) has fire management trials that have been established since 1930s. TAFORI has maps most commonly in which were produced by British Ordnance Survey in 1950s. Since 2010, digitization of old maps which are based on ArcGIS, ArcView is on-going. Forest vegetation map, forest maps and protected area maps are produced. Maps produced in 2010 and 2011 with scale of 1/50,000 are restored but database is not prepared. TAFORI has AFIS field terminal to monitor active fires and access GIS and Remote sensing fire data. Production of Database is expected but human resources and equipment is not sufficient for prompt actions.

6.12.8 Management of Forest and Wildfires

(1) Implementation of National Forest Program

Tanzania implemented national forest program for ten years. The lack of interest in private sector in forestry and weak linkage with NGOs (between FBD and TNRF as an umbrella organization) were suggested in the national review of BKFP in 2007.

(2) Wildfires

The problem of wildfires is a critical issue in Tanzania. It was reported that an average of 11 million hectares of land (10 – 12%) is annually burnt in Tanzania (Rucker and Tiemman, 2012). Most of the wildfires occur in Rukwa, Mbeya, Tabora, Kigoma and Lindi regions in the months from May to October, with the peak in July and August.

On-going efforts on fire management include awareness raising, firewise and fire suppression capacity building programme for communities and extension staff, Integrated Fire Management Institutional framework development, and Active Fire Information System using satellite field terminal, to generate data on distribution, extent of damage, trend and frequency of wildfires.

Local government system (ten families make one group) was established during 1960s, but traditional authorities are still strong in Tanzania. NAFORMA project is investigating local knowledge of fire use in order to figure out whether the government policy on fire management fits on traditional ways of thinking. In Tanzania ancestral superstition (e.g. smoke makes rains) or traditional activities (e.g. to play on fires to compete the size of burnt areas) to use fires disturb forest production. It was found out that powers of village chiefs as well as the position of women are varied in rural communities. Also it was found that it is uncommon to have fires in Sacred forests. Such knowledge supported by local traditions and culture are expected to be utilized in the government strategy on fire management.

(3) Participatory forest management

Participatory forest management (PFM) has been being implemented since 2004. PFM implementation has been spreading rapidly across the country and in a wide range of different environments such as mangroves, montane, catchment forests, miombo, coastal forests and acacia woodlands.

There are two types 1) Joint Forest Management (JFM) to manage state forests with communities in the vicinity, 2) Community–based forest management (CBFM) for forests in village lands. Forests of 1.7 million hectares (at 300 locations) for JFM, and 2.4 million hectares for CBFM are agreed with communities. JFM is mostly in watershed forests (except for one plantation) though it is possible for production or other protection forest. For CBFM a management plan needs to be accepted by District government. DANIDA and Finland have been supporting JFM at 18 District since 2003 and 27 Districts since 2006, respectively but both will soon terminate the projects. The expansion of JFM with proper management is expected to proceed.

A new JFM guideline to reduce the portion of the payment to community is proposed. It is proposed that entrusting forest management and paying to community in the new JFM. For watershed forest the payment will be for environmental services for watershed protection.

(4) REDD+ readiness preparation

Tanzania is the most advanced country for REDD+ preparation in Southern Africa. R-PP is prepared and expected to be approved soon. As for forest inventory data, preparation of national level one is on-going (2009-2013) using the satellite images of Landsat images 2010.

6.12.9 Aid Projects by Foreign Donors

(1) Finland

National Forestry Resources Monitoring and Assessment (NAFORMA)

FAO Finland is implementing National Forestry Resources Monitoring and Assessment (NAFORMA) since 2009 with the project budget USD 5.9 million. The project designs a methodology for National Forest Inventory, harmonize Forest/land use classification system and state maps based on remote sensing data. The project also produce new baseline information based on wide range of biophysical and socioeconomic data of the woody resources and designs and implements forest management oriented inventory in priority areas, and develops REDD+ monitoring tools, tested and integrated to the implementation. In integrated fire management subcomponent, local knowledge's of fire management at nine villages were studied through interviews village meetings and focus group discussions and implements pilot activities of Community-based fire management in Kigoma.

(2) Norway

Norway contributes significant support for REDD preparation through NGOS and research institutions. Main projects are as follows.

Making REDD and carbon markets work for communities and forests

Tanzania Forest Conservation Group is implementing Making REDD and carbon markets work for communities and forests in 2009-2014 with the project budget of USD 6 million. The objective of the project are: 1) Development of Community Carbon Cooperative with participatory forest management at 50,000 hectares of montane and lowland coastal/miombo forest in the Eastern Arc Mountains and Coastal Forests, 2) Introduction of participatory forest monitoring, 3) Establishment of REL baselines of deforestation rates, 4) Marketing carbon credits, 5) Testing benefit sharing mechanisms, and 6) addressing deforestation drivers.

National carbon stock evaluation

WWF is implementing National carbon stock evaluation with USD1.5million.

Climate Change Initiative in the Southern Highlands

Wildlife Conservation Society (WCS) implements Climate Change Initiative in the Southern Highlands during 2011-2014 with USD1.3million. The project carry out forest conservation activities at the Southern Highlands in Rungwe and Sumbawanga Districts including: 1) planting indigenous trees, 2) establishment of a locally managed Mt. Rungwe honey enterprise, 3) environmental education programme, 4) development of village woodlots and 5) a fire rapid response programme.

REDD+ Strategy Development and Implementation Process

Institute of Resource Assessment (IRA) is implementing a project for REDD+ Strategy Development and Implementation Process from 2011-2013 with budget of USD5.25 million (NOK 30 million). The activities include: 1) to strengthen the National REDD+ Secretariat, and 2) to support the establishment of the National Carbon Monitoring Centre.

Climate Change Impacts, Adaptation and Mitigation in Tanzania

In order to boost the capacity of research institutions to lead climate change research in the region. Universities (Sokoine University of Agriculture, University of Dar es Salaam, Ardhi University), and Tanzania Meteorological Agency Norway are implementing a research project, Climate Change Impacts, Adaptation and Mitigation in Tanzania during the period of 2009-2014 with budget of USD16.45 million (94 mil. NOK, 1.00NOK =0.175USD).

6.13 Zambia

Zambia is a landlocked country covering an area of 743,390 km², sitting on a gently undulating plateau with the elevation between 900 and 1,500 metres. Zambia's population is approximately 13,475,000 and mostly African people. English is the official language. Mining and quarrying account for a large proportion of Zambia's merchandise exports and have traditionally contributed the largest proportion of the country's total GDP.

6.13.1 Forest Policy

Zambia's forest policy was first established in the 1960s, focusing on the government's supervision of forest reserves. Later, in 1998, the National Forestry Policy (NFP) advocated community participation and sustainable forest management. The policy was revised in 2010, focusing on poverty reduction, the national economy, and climate change, and promoting active participation of stakeholders in forest resources management.

The general objective of the NFP is to ensure a sustainable flow of wood and non-wood forest products and ecosystem services, while ensuring the protection and maintenance of biodiversity for the benefit of present and future generations through active participation of all stakeholders. The NFP set the following goals for the Forestry Department:

1) Establish an effective forest management system and operating structures
2) Formulate and implement appropriate forestry policies (and regulations), and programmes for sustainable management and utilization of forest resources
3) Promote sustainable, participatory, and cross-sectoral management and utilization of forests by all stakeholders, towards effective conservation, production, and management
4) Establish incentives and equitable benefit sharing mechanisms for all stakeholders responsible for forest resources management

The NFP has the following 15 policy objectives, under seven categories.

Sustainable Forest Resources and Ecosystem Management

- Objective 1: Ensure the integrity, productivity, and development potential of forest resources
- Objective 2: Ensure adequate protection of forests by empowering local communities, promoting the development and use of wood and non-wood forest products, and developing services
- Objective 3: Promote investment in plantation forestry
- Objective 4: Ensure sustainable management of forest ecosystems and biodiversity through the application of both scientific and local knowledge
- Objective 5: Improve the role of forests in the provision of ecosystem services and abatement of climate change

Forest-based Industries and Non-wood Forest Products Development

- Objective 6: Promote the establishment and development of forest-based industries that respond to national sustainable development criteria
- Objective 7: Ensure the establishment and sustainable management of forest resources for fuelwood
- Objective 8: Recognize and support the development of value-adding to non-wood forest products

Forestry Research and Development, Extension and Capacity Building

- Objective 9: Develop research expertise, facilities, and an institutional framework, and create an enabling environment to meet forestry research needs
- Objective 10: Strengthen and develop human capacity with extension skills and a service delivery framework to effectively and efficiently meet stakeholders needs
- Objective 11: Develop and broaden skills and knowledge of personnel involved in forestry management and development, and provide support to training institutions

Forest Licenses
Objective 12: Regulate the exploitation of forest resources and products, and ensure efficient use
Export of Forest Products; Carbon Trading
Objective 13: Ensure the contribution of the forestry sector to the national economy, while preserving the forest industry for future generations
Mainstreaming Matters of Equality
Objective 14: Ensure gender equity, and that the interests of persons with HIV/AIDS or with special needs are mainstreamed in all matters to do with forestry management, industrial development, and production and utilization of forest products and services, including the forestry extension, training, and education subsectors
International Obligations
Objective 15: Ensure that international obligations are carried out, so as to contribute to international efforts aimed at increasing environmental and socio-economic benefits that accrue from sustainable management of forest resources and reduce emissions from deforestation and degradation

The National Policy on Environment (NPE) was approved in 2009 as the guiding framework for environmental and natural resources management and presents governmental priority measures for development for poverty reduction and improvement of people's living standards.

The NPE consolidates 14 cross-sectoral measures (governing institutions; legislation; environmental planning; environmental impact assessment; environmental education; private sector and community participation; human resource development and research; matters concerning gender youth, and children; demographic planning; human settlements and health; air quality and climate change; conservation of biological diversity and bio-safety; land tenure and land use; trans-boundary and regional conservation) and 10 economic sectoral measures (agriculture, tourism, fisheries, forest, wildlife, mining, water, industrial and commercial matters, energy, and heritage), and each has objectives, guiding principles, and strategies.

The objective of the forest sector is to manage the country's forest resources in a sustainable manner so as to maximize benefits to the nation, especially forest-dependent communities.

6.13.2 Forest Programmes

The government of Zambia established the Zambia Forest Action Plan 1998–2018 (ZFAP) as a strategic planning process aiming at managing forest resources on a sustainable basis. The twenty-year plan reviews forestry policies and legislation and specifies methodologies and technologies for implementation.

It should be noted that since the ZFAP was formulated in the 1990s, during the era of structural adjustment, the ZFAP's approach is mostly top-down, focusing on the volume of resources and its management, with little attention to local community participation. The FD is revising the ZFAP.

Programmes and strategies addressing climate change mitigation were prepared after the formulation of the National Environment Policy in 2005. The National Adaptation Programme of Action (NAPA) was prepared in 2007, followed by the National Climate Change Response Strategy in 2010 (awaiting approval), and the National Climate Change Communication and Advocacy Strategy in 2012. Fire management is recognized by NAPA and in the National Climate Change Response Strategy as one way of dealing with risks in national parks.

6.13.3 Legislative Framework for Forest Management

The Forest Act was enacted in 1973 and revised in 1999 (Forests Act, 1999), with the support of Finland, but the revised act has not been enacted.

Zambia's land tenure system, regulated by the Lands Act (1995), divides the land into state and customary lands, which account for 10 and 90 percent of national land, respectively.

The Wildlife Act (1998) defines the national park, game management area, bird sanctuary, and wildlife

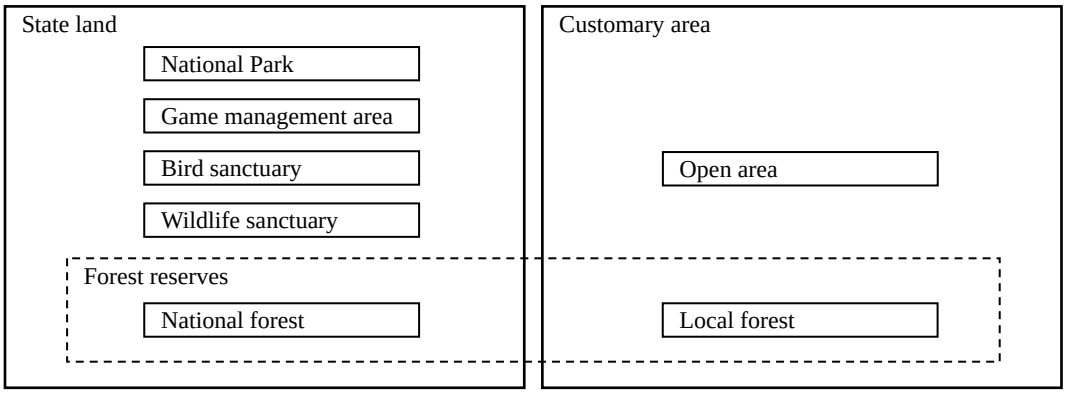


Figure 6-20 Conceptual Diagram of the Forest Land Tenure

sanctuary. These areas and national forests as defined in the Forests Act are included in state land. There exist 481 forest reserves in Zambia, which account for 9.1% of national land. The forest reserves are found not only in national forests but in customary areas. A conceptual diagram of the forest land tenure is shown in Figure 6-20.

Logging in forest reserves requires permission. Although no permission is required to cut trees for fuel and building materials for personal consumption in open areas, residents need to obtain permission from the Forestry Department for commercial logging.

Logging in forest reserves is permitted, depending on acceptance of management plans and management practice plans, and such concession is granted by the Forestry Department. Business entities need to acquire permission for conducting their activities from local government; permission for technical review from the Forestry Department; and the approval of the EIA from ZEMA, as an EIA is applied to such business activities.

6.13.4 Institutional Framework for Forest Management

(1) Forestry Department

The Forestry Department (FD), under the Ministry of Lands, Natural Resources & Environmental Protection (MLNREP), is responsible for the conservation and management of forest reserves and raising awareness among local people in accordance with the Forest Act (1973). The FD is responsible for issuing permission for commercial logging and for licensing plantation concessions.

The organizational structure of the FD is roughly divided into extension, research, and general administration divisions at the central level, and into regional offices at provincial and district levels (Figure 6-21). The FD has approximately 800 staff, including 80 senior forest technicians at the provincial level, and 200 senior extension assistants and 350 extension assistants at the district level.

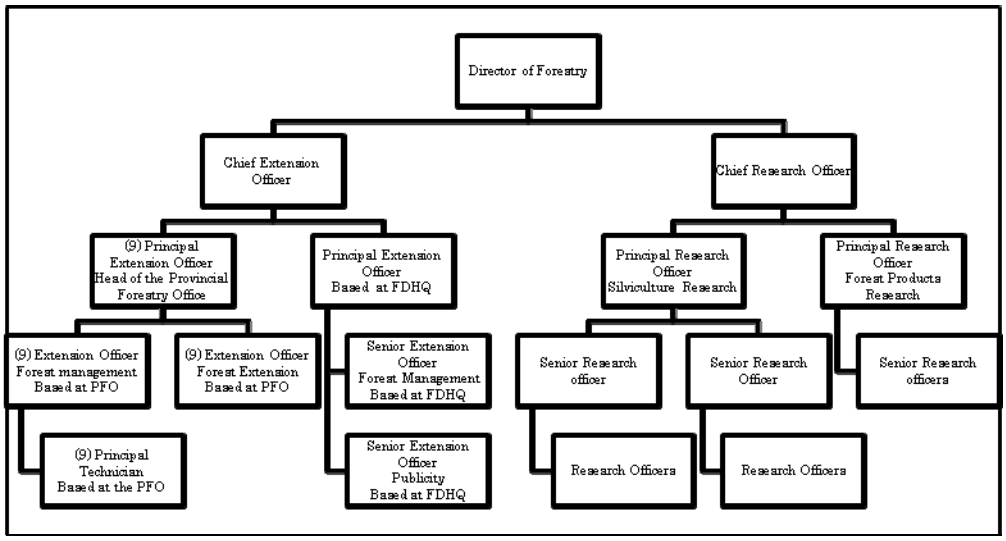


Figure 6-21 Organization Chart of Forestry Department (Zambia)

The FD used to have forestry management, research, and apiculture divisions, but these were closed with the reform of the civil service in 1997 during the structural adjustment supported by the World Bank. Fire prevention and firefighting measures has been undertaken by forestry administration since the 1940s; however, these activities, along with overall forestry administration, have been diminished due to the reduced human and financial resources for the sector.

Although the FD is responsible for overall forest protection, including forest fires, ZAWA is in charge of national parks and game management areas, tribal chiefs are in charge of customary areas, and the protection of forests on state land is managed in collaboration with local councils.

(2) Zambia Wildlife Authority (ZAWA)

The Zambia Wildlife Authority (ZAWA) is a parastatal agency, and the Ministry of Tourism and Arts is the responsible authority. ZAWA is in charge of wildlife protection and management, as established in 1998 in accordance with the Wildlife Act. The national land is categorized into national parks, game management areas, and open areas from the perspective of wildlife resources management. ZAWA is responsible for all areas, excluding open areas and forest reserves (approximately one-third of the national land).

1) National Parks

There are 20 national parks in Zambia, with a total area of approximately 60,000 hectares. Animals are conserved and protected under ZAWA management, and no one except for ZAWA staff is allowed to reside in the parks. The people who used to live there have resettled elsewhere; resettlement was not done forcibly but with the consent of the communities.

The national parks have a fire control plan in principle, and intentional burning is controlled in order to prevent massive fires. Intentional burning takes place at the end of the rainy season or in the early dry season to prevent extension of open burning. However, even with the control plan in place, it is not always implemented in all national parks, because of the shortage of ZAWA workers and materials. Although traditional burning conducted by local communities sometimes spreads to the national parks, ZAWA is not in charge of community activities and cannot prohibit such burning.

2) Game Management Area

There are 36 game management areas across the country, with the total designated area covering 172,000 hectares. People are allowed to reside in these areas and conduct farming, hunting, and other economic activities for their living, and they light fires for such purposes as clear-cutting, soil preparation, small animal hunting, apicultural activities, and animal feeding. Although they have a firefighting plan and land-use plan, these are not always implemented correctly. The authorities do not have enough human resources or materials for monitoring purposes.

Subsidies are provided for residents and communities in game management areas. Although recreational hunting is permitted in these areas, hunters pay commissions to ZAWA in accordance with the type of animal they hunt, and half of each commission goes to local communities. A Community Resource Board decides how to spend the subsidy.

(3) Zambia Environmental Management Agency (ZEMA)

The Zambia Environmental Management Agency (ZEMA), a parastatal agency under MLNREP, was established in 2011 with the promulgation of the Environmental Management Act 2011, as a follow-up organization to the Environmental Council of Zambia (ECZ), established in 1992.

ZEMA gives advice to government on general environmental issues, controls and monitors pollution, enforces environmental laws and regulations, and handles environmental impact assessments. It works as the secretariat for the forest fire component of the AMESD, and produces a national report to the Framework Convention on Climate Change.

ZEMA has 91 employees: 60 at the headquarters in Lusaka, 7 at the Livingstone branch office, 6 in Chirundu, and 25 in Ndola. The annual budget is approximately 30 billion Kwacha (6 million USD), more than 80% of which comes from the government. Although the law does not stipulate any clear responsibility for natural resources management in open areas, ZEMA takes responsibility for overall natural resource management in those areas. However, the number of the local branch offices is limited, and the main work is environmental monitoring, Thus the capacity of ZEMA is not sufficient for natural resource management, including the raising of awareness and measures against fire prevention and firefighting.

6.13.5 Forest Areas and Wood Volumes

The extent of forest and growing stock in forest in Zambia since 1990 is shown in Table 6-32, according to a Forest Resources Assessment in 2010. The forest in the country has decreased by 167,000 hectares per year on average since 1990.

Table 6-32 Forest Areas and Wood Volumes in Zambia

FRA 2010 categories	Area (1,000 ha)			
	1990	2000	2005	2010
Forest	52,800	51,134	50,301	49,468
Other wooded land	5943	6,009	6,042	6,075
Other land	15,596	17,196	17,996	18,796
Inland water bodies	922	922	922	922
Total	75,261	75,261	75,261	75,261
Total growing stock of forest (mil. m^3)	2940.96	2848.17	2801.78	2755.38
Growing stock of commercial species (mil. m^3)	359.04	347.71	342.05	336.38

Source: FAO. 2010.

The nation's first forest inventory was completed in 1965. Forest and woodland were estimated to cover 41.2 million hectares and 55.2 million hectares, respectively, with a total biomass of 3,000 million to 4,100 million cubic metres.

The second and third assessments were conducted through simulations based on data from the 1960s, plus other available data. In the late 1980s, the second forest resources assessment was conducted by SADC. The dry weight of wood biomass for indigenous forest was estimated to be 2,600 million tons and 3,640 million cubic meters (714 kg/m^3).

The third forest resources assessment was conducted as part of ZFAP in the late 1990s. It was estimated that the extent and biomass of forest and woodland covered 59.5 million hectares (43.6 million hectares of forest and 15.9 million hectares of woodland) and amounted to 4,202 million cubic meters (4,122 million cubic meters of forest and 80 million cubic meters of woodland), respectively.

According to the Integrated Land Use Assessment (ILUA), carried out with the financial assistance of

the Netherlands and Finland and the technical assistance of FAO from 2005 to 2008, forest and woodland areas covered 49.9 million hectares (66.4% of the national land) and 6.05 million hectares (8%), respectively. Wood volume was estimated at 2,785 million cubic meters, of which 72.4% came from miombo woodlands (Table 6-33).

Table 6-33 Forest Cover, Volume, Biomass, and Carbon Stock in Zambia

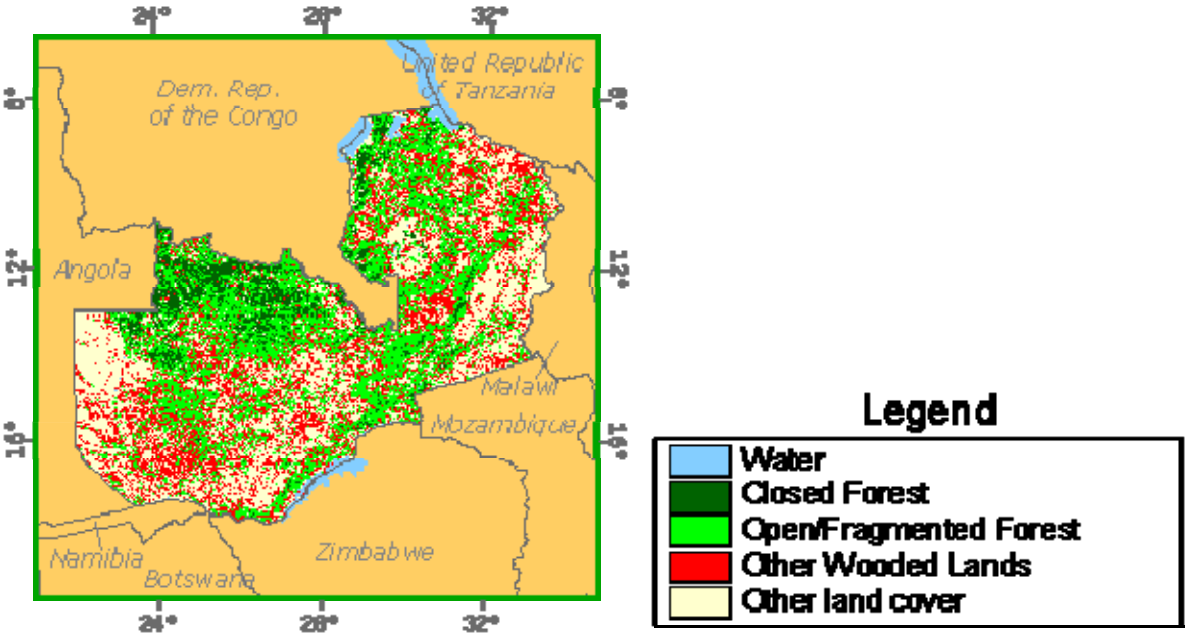
Land use class/forest types	Area cover		Growing stock		Biomass*		Carbon stocks	
	1,000 ha	%	1,000 m³	%	mill. metric tonnes	%	mill. metric tonnes	%
Forest (≥ 10% Canopy cover)	49,968	66.4	2,784,633	94.7	5,023.3	89.9	2,553.7	90.2
evergreen forest	*819*	*1.1*	*54,839*	*1.9*	*106.3*	*1.9*	*59.8*	*2.1*
semi-evergreen forest	*34,145*	*45.4*	*2,127,817*	*72.4*	*3,814.0*	*68.2*	*1,942.6*	*68.6*
deciduous forest	*14,865*	*19.8*	*595,380*	*20.2*	*1,091.8*	*19.5*	*544.6*	*19.2*
other natural forests	*139*	*0.2*	*6,597*	*0.2*	*11.2*	*0.2*	*6.7*	*0.2*
Other wooded land (5–10% Canopy cover or shrubs/bushes canopy cover ≥10%)	6,055	8	58,016	2.0	216.1	3.9	104.9	3.7
Other land (<5% Canopy cover or shrubs/bushes canopy cover <10%)	15,771	21	96,944	3.3	350.2	6.3	172.6	6.1
Inland Water	3,467	4.6	1,144	0.0	1.0	0.0	0.4	0.0
Total Country Area of Zambia	75,261	100	2,940,737	100.0	5,590.6	100.0	2,831.6	100.0

Source: Compiled by study team based on Integrated Land Use Assessment (ILUA) Zambia 2005–2008
* Aboveground and belowground biomass. Does not include deadwood biomass.

The ILUA project established 250 sample plots across the country, a trustworthy nationwide forest inventory. The ILUA points out that 33% of forest and woodland has not been disturbed at all and that forest in Zambia has good potential for recovery in general. The analysis of satellite images shows 250,000 to 300,000 hectares of annual deforestation over the last 15 years. Deforestation and forest degradation are caused by conversion of forest into farmland, illegal logging for commercial purposes, and encroachment into forest reserves.

The ILUA second phase (ILUA 2) is being carried out between 2011 and 2015 to acquire better inventory data in order to formulate provincial forest management plans.

Figure 6- 22 shows the forest cover in Zambia.



Source: FAO. 2000.

Figure 6- 22 Forest Cover Map in Zambia

ZEMA has developed another land cover map (Figure 6-23), showing that most forests are miombo woodlands, having a large water body in the Okavango delta, and patches of mopane forests in the east.

Nineteen national parks are also plotted.

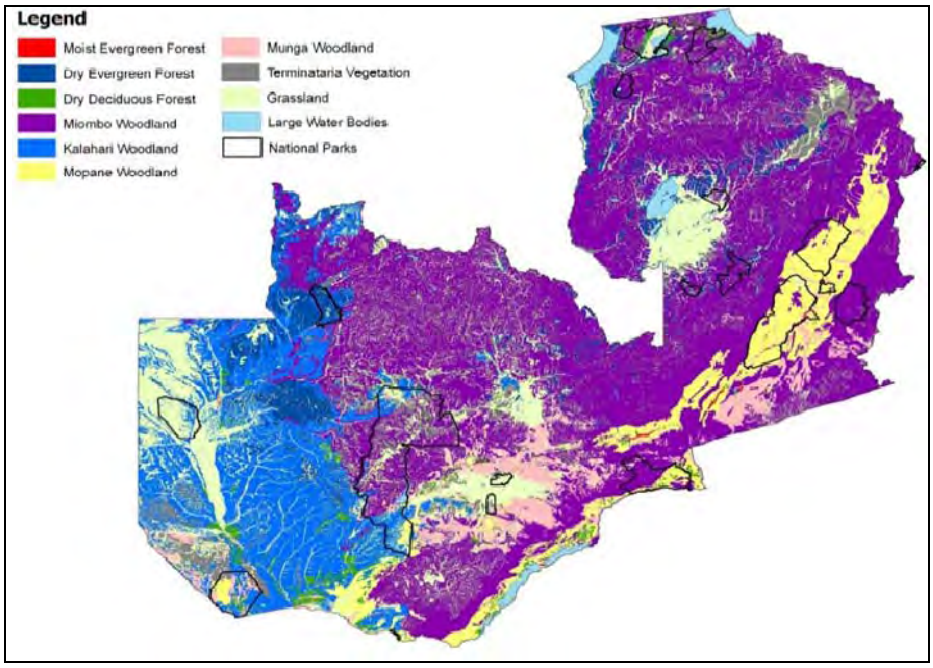


Figure 6-23 Land cover map in Zambia

6.13.6 Utilization of GIS/Remote Sensing and Preparation of Forest Maps

The FD has adopted GIS/RS technologies supported through the ILUA project and ZEMA with equipment and products from the forest fire component of the AMESD.

The National Policy on Environment developed in 2005 emphasizes developing a national integrated database incorporating GIS and RS information as a mechanism for systematic cross-sectoral data storage. ZEMA particularly recognizes the importance of the GIS/RS in the fields of climate change and forest management.

ZEMA receives and analyzes MODIS products from the AMESD forest fire component to estimate frequency, intensity, and burnt area of forest fires. They also download MODIS data directly from the USA because the northern part of Zambia is outside the range of the MODIS receiving station in South Africa. ZEMA's intention is to collaborate with users who need such information. ZEMA plans to develop the Zambia Environmental Information Network to share GIS/RS technology with related organizations in Zambia. Approximately ten ZEMA officials out of fifty engineers can handle satellite data.

GIS software installed in offices of the FD includes ArcGIS, ESRI, ECognition of Trimble, ArcInfo, and the other open source software. "Terra-Amazon," developed in Brazil, is also used. The FD develops classification maps based on mainly Landsat data generated by these software systems. The FD is interested not only in optical data but also in radar satellite and Lidar[4] data gathered by airplanes, and are planning to obtain and validate observation data in the northwestern part of Zambia in collaboration with Woods Hole Research Center in the USA.

The Survey Department, which is in charge of mapping, develops various thematic maps according to requests from other ministries, departments, and agencies. In the area of forestry, the Survey Department in collaboration with the FD developed a land use map through the ILUA project. In this land use map forest is categorized as "Forest," "Woodland," and "Grassland." The land cover map

[4] Lidar (Light Detection And Ranging) is an optical remote sensing technology that can measure the distance to, or other properties of, a target by illuminating the target with light, often using pulses from a laser.

developed by the National Remote Sensing Centre (NRSC) with satellite data from the ILUA project categorizes lands into eight classes, namely, "Water," "Miombo Clusters," "Open Forest," "Wooded Grassland," "Grassland," "Bare Land," "Built Up Rural," and "Others". In addition to the maps above, the Survey Department developed the following thematic maps.

- Vegetation map: 1/500,000 scale, 11 classes, developed in 1976, 7 sheets covering all Zambia
- Land use map: scale unknown, 45 classes, developed in 1975, 4 sheets covering all Zambia
- Forestry map: indicates Gazetted Forest, 1/1,500,000 scale, developed in 1988, 1 sheet covers all Zambia, with 3 classes: National Forest, Local Forest, Non-Forest. ("Local Forest" means government does not have 100% control.)

6.13.7 Research on Management for Forest and of Wildfire

Zambia Forestry College, under the MLNREP, is the main organization for conducting forest research and educating foresters. The forest management plans in some forest reserves were prepared by the FD based on an inventory survey by the college. The FD has a research section, and strengthening forest research is one of the goals in the NFP.

6.13.8 Management of Forest and of Wildfire

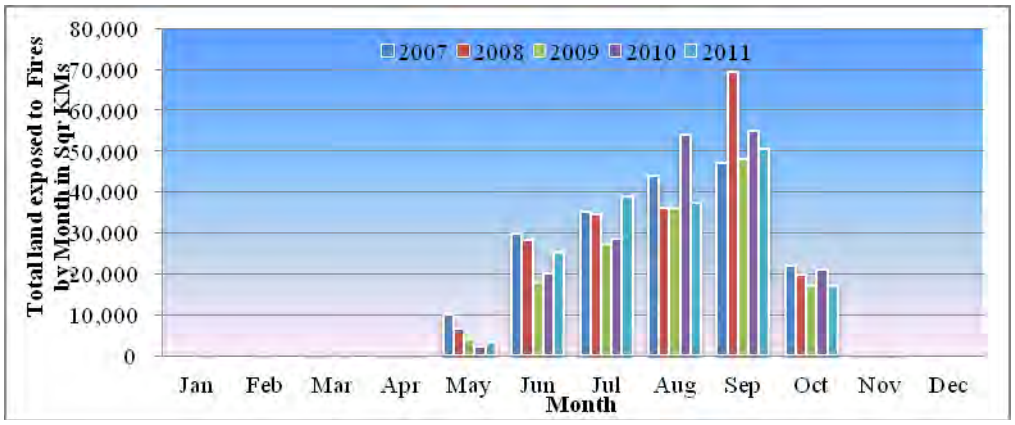
Zambia launched forestry and forest management in the 1930s. Similar to other southern African countries, their interest focused on plantation of exotic species. At the same time, the country also paid attention to the productivity of indigenous miombo woodlands. Later, in western Zambia, conducted forest inventory survey was conducted to determine the proper areas for logging. The demand for Rhodesian teak (*Baikiaea plurijuga*[5]) was particularly high.

More than 90% of the national territory consists of customary land, and open burning was carried out on these lands for farm development. Local leaders are customarily responsible for controlling open burnings. The Forests Act and the Wildlife Act stipulate that firebreaks should be built in the forest reserves and national parks, and that late burning is prohibited. No law prohibits open fire without permission. Slash-and-burn cultivation, known locally as *chitemene*, is a standard farming method used in the north and central north areas. *Chitemene* is categorized as a late-burning method, and fire sometimes spreads to unintended areas, causing significant damage to large trees.

The forest reserves are managed by the FD. There exist 481 forest reserves in Zambia, but no management plans are prepared for them. In the national parks and the game management areas, ZAWA makes efforts to conserve wildlife. Early burning or firebreak setting is carried out in some areas in a planned way. However, such activities by both the FD and ZAWA are insufficient for the vast areas involved, owing to limited human and financial capacities. No collaboration is undertaken between ZEMA and other organizations concerned with forest fire.

Monthly fire analysis by ZEMA shows that fire concentrates from July to October (Figure 6-24). The analysis results of the AMESD project shows that 25% of the national territory is burnt every year (150,000–200,000 km²/year). The actual burnt area could be larger, because some fires are undetected by the satellite. The fire statistics include areas subject to intentional burning; therefore, the burnt area is larger than the fire damage area. Open burning from April to June ranks as controlled fire (early burning), whereas that from July to October, during the dry season, ranks as uncontrolled (late burning). The scale and frequency of fire is not recorded.

[5] Leguminosae, Caesalpinioideae. It is also called Zambezi teak or Zambezi redwood.



Source：ZEMA

Figure 6-24 Monthly Burnt Area in Zambia (2007–2011)

Community-based forest management (CBFM) is stipulated under the Forestry Policy 1998 and Forests Bill 2012. The CBFM Programme supported by Finland aimed at managing forest and other natural resources to support livelihoods in a decentralized way.
There is no specific policy or law concerning REDD+. Activities such as the training of trainers, land cover mapping, and others were carried out under the UN-REDD programme.

6.13.9 Aid Projects by International Development Partners

(1) Japan
The main goal of Japan's ODA toward Zambia is the "promotion of sustainable and broad economic growth, after breaking away from the excessive dependence on mining." The important sectors are 1) activation of industries, 2) building and maintenance of basic infrastructure for economic activities, and 3) establishment of social infrastructure for sustainable economic growth. The sector of environment and forestry is raised as a cross-cutting issue. No project is currently implemented.

(2) Finland
Finland has been cooperating with Zambia in the forest sector since the 1970s. Finnish authorities have provided support for the revision of the Forests Act, but as mentioned above the act has not been promulgated. Their priorities in terms of development policies are 1) a democracy and responsible society that promotes human rights, 2) an inclusive green economy that promotes employment, 3) sustainable natural resources management and environment conservation, and 4) human development.

Along with Denmark, Finland is supporting the operation of the Environment Fund, contributing Euro 9 million to the forest sector. The fund supports capacity development based on work plans prepared by the departments responsible, as well as NGO projects related to forest, environment, and climate change, mostly small projects involving less than USD 100,000. The funds have been in operation for three years, and are currently under evaluation.

Finland had projects related to logging concessions as CBFM in six forest reserves and on one customary land. The projects attempted to establish a joint forest management model, under which sales are shared between the government and the community. The trial was conducted on the assumption that the revised Forests Act of 1999 would be passed. However, since the act has not yet been promulgated, sufficient results have not been obtained. The project demonstrated that communities can play important roles in forest fire management.

Finland is now supporting ILUA 2.

(3) United Nations Development Programme (UNDP)

The UNDP is executing the UN-REDD programme with the assistance of the FAO and the United Nations Environment Programme (UNEP). The UNDP and Norway supported the preparation of the National Climate Change Response Strategy between 2010 and early 2012. The UNDP is supporting the preparation of a national REDD strategy at present, aiming for completion at the end of 2013. The UNDP executed Reclassification and Effective Management of the National Protected Areas System Project (2006–2012) as a project within the environment sector. ZAWA was supported through this project, aiming at a framework establishment in policy, regulation, and governance.

(4) FAO

The FAO is supporting preparation of forest inventory, providing technical assistance to the ILUA project (Phase 1, 2005–2008; Phase 2, 2011–2015). In ILUA 2, a vegetation study will be carried out, setting plots for particular forms of vegetation based on Landsat satellite images. Measurement and record of tree species, tree height, DBH, density, litter, etc., measurement of biomass and carbon in the soil, and a social survey will be carried out in the ten target provinces. The required equipment (measurement equipment, GIS related tools, vehicles, etc.) and staff training will be provided for forest measurement. The involved organizations are the Departments of Forest, Statistics, Land, Agriculture, and Survey, the remote sensing centre, and others. Land cover maps and land use maps are prepared as part of the process.

(5) World Bank

The World Bank is supporting the Nyika Transfrontier Conservation Area Project (2011–2016) in the Nyika Transfrontier Conservation Area, executed by ZAWA in collaboration with Malawi, aiming to establish a more effective management system. This project has three components: 1) institutional planning framework, 2) sustainable funding, and 3) management of conservation area, fire monitoring, and the setting of firebreaks.

(6) SADC

SADC is supporting the AMESD project. The Department of Meteorology and ZEMA are working on the problems posed by drought and fire, respectively, as counterpart organizations.

SADC is supporting the Kavango Zambezi Transfrontier Conservation Area (KAZA TFCA) project that covers parts of Zambia, Angola, Namibia, Botswana, and Zimbabwe. This project, started in 2006, aims to manage the Kavango Zambezi ecosystem sustainably, to conserve the heritage and cultural resources of the region, and to propose a tourism model. KAZA TFCA has 287,132 km² and is composed of 36 protected areas (national parks, animal reserves, wildlife management areas, and tourism areas). Activities concerning forest fire management are included in this project.

6.14 Zimbabwe

Zimbabwe is a land-locked country having 386,850 km² in south central Africa, between the Limpopo and Zambezi rivers, sitting on a part of the great plateau which traverses Africa. Zimbabwe has a population of 12,754,000. The official and business language is English, with Shona and Ndebele also widely spoken. The economy is dependent on agricultural products including tobacco, cotton and sugar cane. Mining contributes 4.3 % to GDP, employs 7% of the country's labor force and earns 40 % of the foreign exchange.

6.14.1 Forest Policy

The policy of the forest sector is in accordance with the National Environmental Policy (NEP) 2004, in line with the government's national development goal: to alleviate poverty and improve the quality of life of the people of Zimbabwe. The NEP Policy Goal is to avoid irreversible environmental damage, maintain essential environmental processes, and preserve the broad spectrum of biological diversity so as to sustain the long-term ability of natural resources to meet the basic needs of people, enhance food security, reduce poverty, and improve the standard of living of Zimbabweans through

long-term economic growth and the creation of employment. It presents six policy objectives that include conservation of biodiversity, improvement of people's living standards, optimized use of resources and energy, and promotion of community participation.

The NEP indicates general environmental rights that every person shall have, specifically 1) a clean environment that is not harmful to health, 2) access to environmental information, and 3) protection of the environment for the benefit of present and future generations (including prevention of pollution and environmental degradation, security of ecologically sustainable management, and use of natural resources while promoting justifiable economic and social development).

The policy sets forth 60 Guiding Principles (GP) to achieve these objectives. As for the forestry sector, flora (GP 11 and 12), protected areas (GP 15 and 16), forestry (GP 38), natural resources management (GP 43) is provided.

GP 11	As a major component of Zimbabwe's natural heritage, and as an economic resource, plant diversity and the ecosystems of which it forms part must be protected, conserved, and used in sustainable ways.
GP 12	The economic, environmental, cultural, spiritual, and aesthetic functions and values of forests and woodlands need to be maintained, both for their intrinsic worth and for the contributions they make to human welfare.
GP 15	The conservation of biodiversity and other natural resources requires a multifaceted approach, including setting aside natural areas as strict nature reserves, wilderness areas, and national parks, complemented by the establishment of other areas in which varying kinds and degrees of use of the natural resources are permitted and encouraged.
GP 16	Given the complexities and uncertainties inherent in the functioning of natural systems, management of protected areas needs to be flexible and adaptive, and based on sound science.
GP 38	Continued development of the forestry sector should balance economic growth with the conservation of biodiversity and the maintenance of stability and resilience of forest ecosystems.
GP 43	Natural Resources Management in Zimbabwe is founded on the natural and cultural attractions of the country and so needs to be developed in environmentally sustainable and socially acceptable ways.

It is stated in the NEP that fires in the dry season are a cause of degradation of vegetation and forest.

A climate change strategy, which will contain the REDD+ policy, is currently under preparation.

6.14.2 Forest Programmes

Zimbabwe has no national forest plan or forest programme.

In 2006, the National Fire Protection Strategy and Implementation Plan was formulated, with a vision of reducing incidences of uncontrolled veld fires and associated environmental damage through implementation of effective fire protection strategies. It has the following four objectives.

- To formulate a comprehensive legal framework for effective management of fires
- To establish an appropriate institutional framework to effect fire management legislation and enforce legal provisions relating to the management of fires to ensure compliance
- To enhance public awareness of fire management
- To mobilize adequate resources for effective fire management

The implementation of the strategy is led by the Environmental Management Agency (EMA) and undertaken by related organizations. The table below lists the responsible institutions and their target general geographical areas.

Responsible Institution		Target Area
Rural district councils; land users	:	Resettlement areas
Individual landowners	:	Commercial farms
Rural district councils (with involvement of chiefs, headmen, and land users)	:	Communal areas
Forestry Commission (FC)	:	Demarcated indigenous forests
Individual private companies in consultation with FC	:	Plantation forestry
Parks and Wildlife Management Authority (PWLMA)	:	Parks estates
Responsible line ministry	:	State lands
Urban council/municipality	:	Urban area
Mine owner	:	Mining area
School headmaster	:	Schools

The Zimbabwe Integrated Fire Management Strategy 2009–2011 was formulated and the Community Based Fire Management Training Manual was compiled. According to the manual, open burning is expected to follow the stipulations outlined below.

1) For burning vegetation on any land a preliminary notice (at least 2 days prior) and a final notice (6–24 hours prior) of intention to burn is to be provided to occupiers of adjoining land and to a police officer.
2) If requested by a neighbour, one is required to provide assistance in the establishment of a fireguard on a common boundary or to contribute half of the labour or cost.
3) Landowners or users shall conduct appropriate fire prevention measures on their land.
4) Citizens are required to properly extinguish any fire that started on another person's land, or on any road or vacant land.
5) No person shall deliberately light a fire that he or she cannot extinguish.
6) No person shall light a fire outside residential or commercial premises during the period 31 July to 31 October.
7) The land user or landowner shall be responsible for extinguishing all fires on their land regardless of origin.
8) Any person within the vicinity of a fire shall carefully and properly extinguish the fire.
9) Land managers are required to investigate and document the causes of fire and the extent of damage.

6.14.3 Legislative Framework for Forest Management

The Forest Act (1949) stipulates the establishment of the Forestry Commission (FC), and provides regulations on such issues as management of gazette state forest, protection of private forest and forest produce, control of cutting timber for mining purposes, conservation of forest resources and reforestation, trade of forest product, and control of fires, including those started for the burning of vegetation.

The Communal Land Forest Produce Act (1987) limits the use of forest produce by local residents in customary areas to personal use only and requires permission from rural district councils for the selling of forest produce.

The Parks and Wild Life Act (1996) stipulates the establishment of Parks and Wild Life Management Authority (PWLMA) and the five types of protected areas.

The Environmental Management Act (2002) provides rules on sustainable natural resources management and environmental protection, prevention of pollution and environmental degradation, preparation of environmental plans, and environmental impact assessment, as well as the establishment of an Environmental Management Agency (EMA) and the Environment Fund.

The FC is in charge of forest resources management of communal areas and gazette state forest; the PWLMA is responsible for conservation and management of protected areas that account for 13% of national land; and the EMA monitors the overall environment, based on the rules under the Environmental Management Act.

The responsibilities for environment management are borne at the community level, under the related laws. Article 61 of the Rural District Councils Act requires the establishment of an environment committee at the district level and an environment subcommittee at the ward level, and that they shall make recommendations to the council on the management and protection of surrounding environment based on the Environmental Management Act. The committee shall consist of councilors and non-councilors who are appointed. The members of the subcommittees shall be traditional local leaders, including village chiefs. The committees and subcommittees are responsible for general environmental issues and, , a community-level forest fire monitoring system is established by them.

In addition, in response to the increasing interest in firefighting measures, firefighting committees are being established at each administrative level: the state, province, district, ward, and village levels.

6.14.4 Institutional Framework for Forest Management

(1) General

The Ministry of Environment and Natural Resources Management (MENRM) is responsible for forest resources management, including the managing of forest fire. The ministry consists of three departments: natural resources, environment, and human resource and general affairs. The Department of Environment is the national focal point for climate change issues and is formulating a national strategy for climate change with the support of UNDP. The National Adaptation Programme of Action on Climate Change (NAPA) has not yet been formulated.

The following three organizations are responsible for policy implementation.

(2) Forestry Commission (FC)

The FC contributes to the nation's socioeconomic development through effective control and capacity enhancement for sustainable use and management of forest resources. The national government provides 40% to 60% of the FC's budget in the form of subsidies.

The FC is comprised of the Conservation and Extension Division, Research and Training Division, Ngamo Safari Unit, and local offices in eight provinces and 58 districts (Figure 6-25). The FC has approximately 700 staff, including 70 staff at the headquarters. There are about 15 engineers and researchers, as well as experts in other fields.

Under the Forest Act, the FC manages 39 gazette state forests, covering 928,066 hectares, and 17 forests covering 841 hectares.

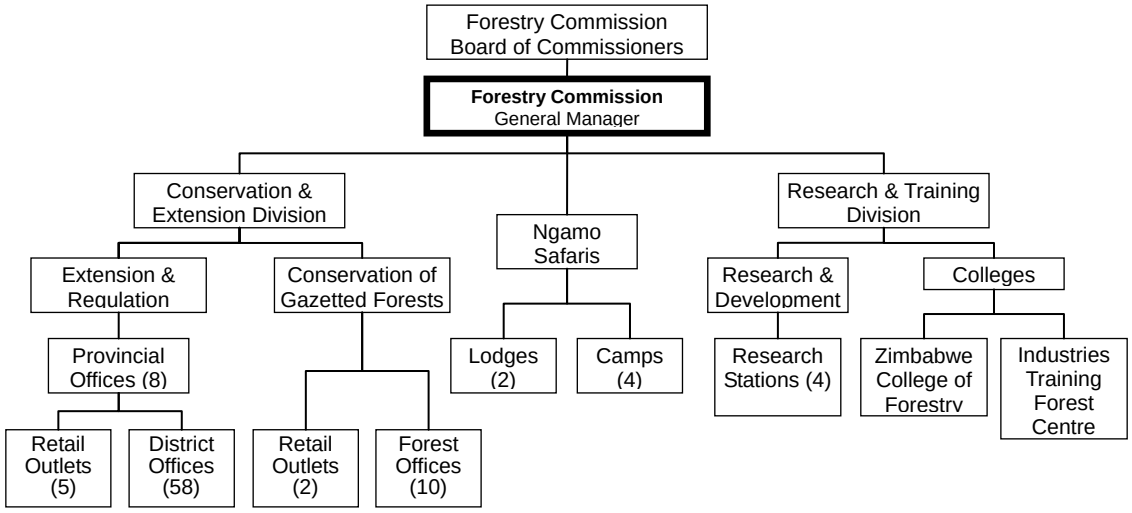


Figure 6-25 Organization Chart of Forestry Commission (Zimbabwe)

(2) Parks and Wildlife Management Authority (PWLMA)

The PWLMA is responsible for the conservation of state-owned protected areas. It has approximately 2,000 staff members across the nation. No government subsidy is granted, but is has an annual income of 80 million USD. It spends 24 million USD on implementing projects, which is an insufficient amount for proper project operation. The organizational chart is shown in Figure 6-26.

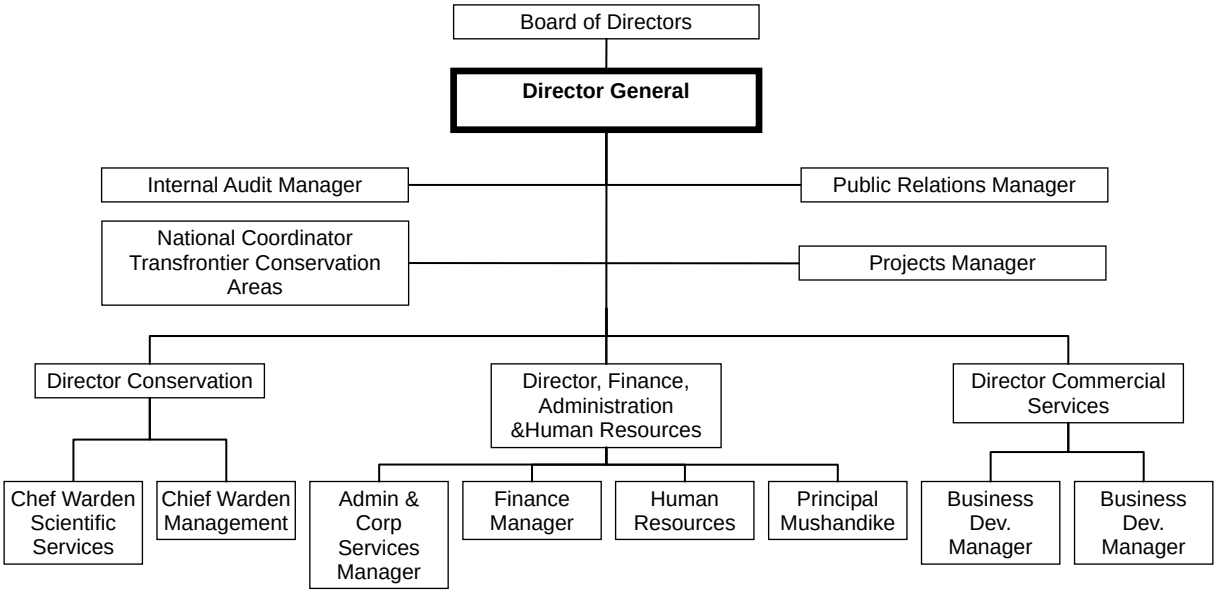


Figure 6-26 Organization Chart of PWLMA (Zimbabwe)

It is the PWLMA's mission to conserve wildlife through effective, efficient, and sustainable protection and use of natural resources. The PWLMA has formulated a five-year plan (ZIPWA 2011–2015) for project implementation.

The PWLMA aims to control, manage, and maintain park areas designated by the national government under the Parks and Wild Life Act. The act classifies protected areas into five categories, covering a total area of about five million hectares, which accounts for approximately 13% of the national land.

Table 6- 34 Zimbabwe's Park Area

Type of Park Area	Number	Area (ha)
National Parks	12	2,718,010
Botanical Reserves and Botanical Gardens	18	2,111
Sanctuaries	6	18,620
Safari Areas	17	1,897,200
Recreational Parks	15	357,161
Total	68	4,993,102

Source: Compiled by study team formed according to Parks and Wild Life Act

National parks have an annual management plan and an annual quota of wild animals whose population they control in keeping with the objectives of sustainable use and the conservation of ecology. The plan contains firefighting measures, and open burning is controlled to prevent massive spreading of fire. The PWLMA works at raising people's awareness, as there is a high risk of occurrences of fire caused by slush-and-burn agriculture, particularly around borders with farmland.

The PWLMA works in collaboration with the Environmental Management Agency (EMA) on forest fire countermeasures and environmental issues in general. It does not record fire occurrences. The skills of employees with respect to remote sensing and GIS are insufficient.

(3) Environmental Management Agency (EMA)

The EMA is given the mission of promoting sustainable natural resources management and environmental protection with participation of stakeholders. As it is under the natural resources department of the Ministry of Environment and Natural Resources Management, it handles general environmental issues, including water quality and air pollution. The organization chart of the EMA is shown in Figure 6-27.

The Environmental Management Services Department has under its auspices the Environmental Planning Unit, which is in charge of the monitoring of forest fires, and the Environmental Ecosystem Unit, which is in charge of the enforcement of laws related to forest fires.

The EMA has local offices in each of the eight provinces across the nation. The EMA has about 400 staff members, including those in the local offices. Two staff members are in charge of GIS in the EMA headquarters, and one in each provincial office. The provincial offices have internet connection, and about half of them share data on GIS.

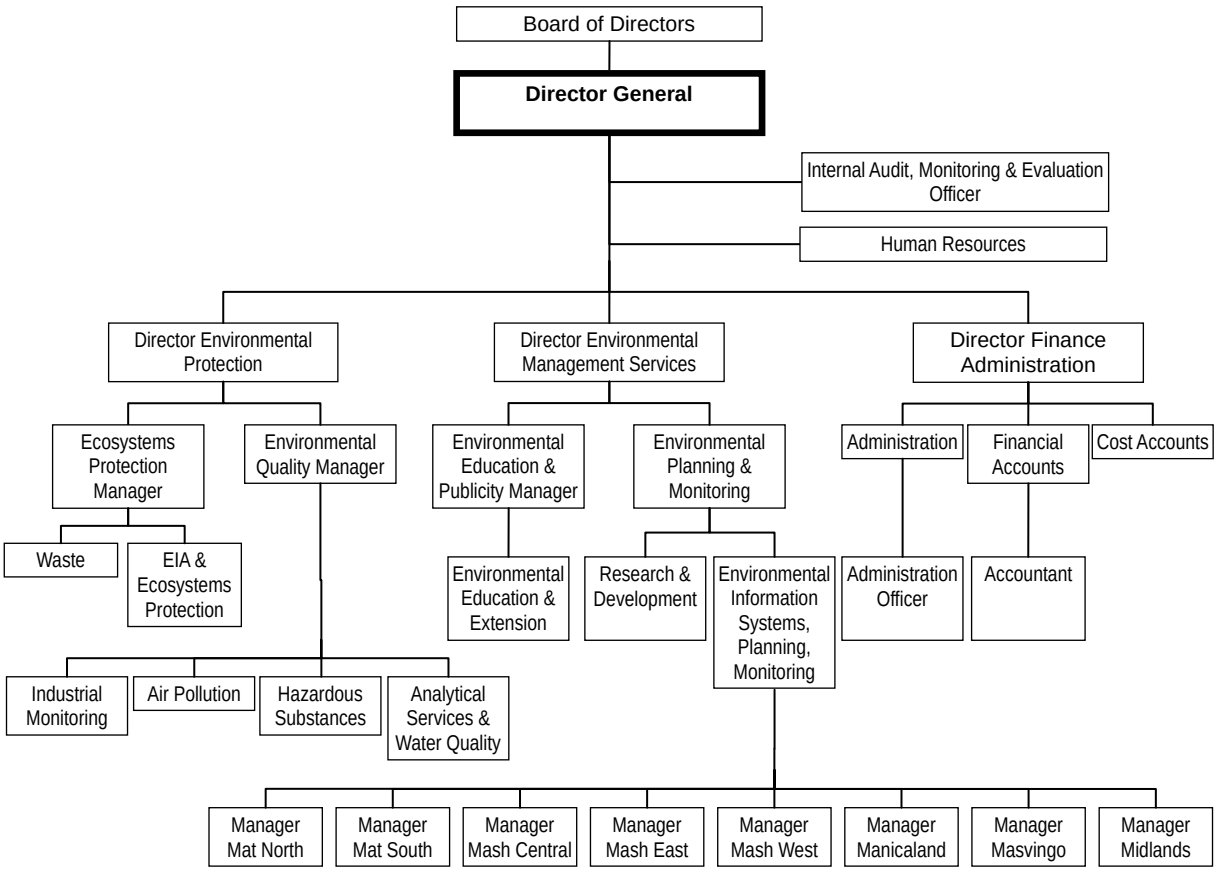


Figure 6-27 Organization Chart of EMA (Zimbabwe)

6.14.5 Forest Area and Wood Volume

According to FAO's Forest Resources Assessment 2010 (FAO, 2010), the total area of forest (which includes land types other than forest itself) in Zimbabwe was 15.62 million hectares (40% of the national land) in 2010, of which natural forest and planted forest were estimated to be 801,000 hectares and 108,000 hectares, respectively (Table 6-35). The growing stock was estimated at 596 million cubic meters. Since 1990, 327,000 hectares of forest has been lost annually to be converted into farmland. The growing stock is estimated to have decreased to 70% of that in 1990.

Table 6-35 Forest Area and Wood Volume in Zimbabwe

FRA 2010 Categories	Area (1,000 ha)			
	1990	2000	2005	2010
Forest	22,164	18,894	17,259	15,624
Other wooded land	0	0	0	0
Other land	16,521	19,791	21,426	23,061
Inland water bodies	391	391	391	391
Total	39,076	39,076	39,076	39,076
Total growing stock of forest (mil. m^3)	846	721	658	596
Growing stock of commercial species (mil. m^3)	14.70	11.47	10.32	10.32

Source: FAO. 2010.

The FC produced forest inventory in 1992 and 2008 with the support of the FAO. The challenge that the FC faces is biomass measurement methodology in forest resources assessment.

Table 6-36 shows the land cover change from 1992 to 2008. During the period, forest decreased by around 4 million hectares, and cultivated land increased by around 5 million hectares. Figure 6-28 shows the forest cover in Zimbabwe.

Table 6-36 Land Cover Change in Zimbabwe from 1992 to 2008

Class	Description	1992(ha)	%	2008 (ha)	%
1	Natural moist	11,477	0.03	11,508	0.03
2	Plantation forest	155,297	0.41	168,581	0.43
3	Woodland	20,790,234	53.20	16,544,210	42.34
4	Bush land	4,972,071	12.72	4,228,547	10.82
5	Wooded grassland	1,204,666	3.08	888,463	2.27
6	Grassland	689,186	1.76	479,883	1.23
7	Cultivated land	10,738,945	27.48	16,113,866	41.24
8	Rock outcrop	78,707	0.20	97,720	0.25
9	Water body	298,089	0.76	364,331	0.93
10	Settlement	139,341	0.36	180,904	0.46
		39,078,013	**100.00**	**3,9078,013**	**100.00**

Source: Presentation material from Bangkok workshop (September 2012)

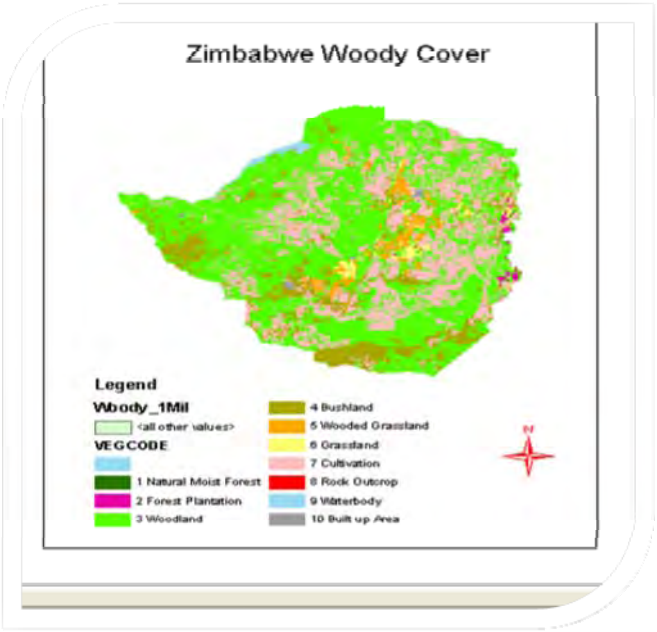


Figure 6-28 Forest Cover Map in Zimbabwe

6.14.6 Utilization of GIS/Remote Sensing and Preparation of Forest Maps

The Research and Training Division of the FC is responsible for mapping by means of GIS/RS technology, which three staff are working for. The GIS software they use is TNTmips by Microimages, with five licenses (three professional, two editorial). MODIS satellite data are used for forest fires, and Landsat, SPOT, ASTER, and other satellite data for vegetation surveys.

The FC launched a vegetation mapping and monitoring system, called VegRIS, and introduced GIS/RS technology, supported by GTZ (the former GIZ) in 1993. For VegRIS operation, the FC bought Landsat data, mainly from CSIR in South Africa, which covers all Zimbabwe by 24 scenes, and analyzed the data with TNTmips.

The mapping unit of the FC embarked on fire-scar mapping for two provinces (Manicaland and Matabeleland North), using MODIS data supported by the FAO in 2009. By the 2008–2009 fire season fire scars were mapped.

The FC developed a vegetation map for Zimbabwe in 1992 and 2008 and analyzed vegetation change at the state, province, and district levels. The analyses were used to formulate policies. For the vegetation map, the topographic data from the Department of the Surveyor-General (DSG) was digitalized and analyzed alongside ground survey data.

The EMA receives MODIS data products on forest fire as the forest fire component of the AMESD. The EMA provides the products to the FC, and the FC provides the information from the products to their local offices by telephone. The EMA established a receiving station for the AMESD in the suburb of Harare in 2011. The station updates its forest-fire risk prediction map every month using MODIS data, as well as the dry matter productivity (DMP) index and other tools. However, weather information, such as details concerning wind or humidity, is not reflected on this prediction map. The EMA developed a GIS Manual to describe remote sensing technology and how to use ArcView and ILWIS software in 2012, so that personnel could utilize GIS/RS technology.

6.14.7 Research on Management of Forest and Wildfire

The EMA conducted forest fire monitoring in 2011 and found that sixty percent of fires occurred in areas within 500 m from main roads. Table 6-37 shows the correlation between main roads and burnt areas and indicates that the greater the distance from the road, the larger the burnt area.

Table 6-37 Correlation between Main Roads and Burnt Areas in Zimbabwe

Distance from the main roads	1m	10m	50m	100m	250m	500m
Burnt area	800ha	8,009ha	40,925ha	81,253ha	208,267ha	434,601ha

Source： Fire report 2011,EMA

Fires that occur along roads are caused by human activities, and are often derived from the vandalous burning of bus stops, the irresponsible throwing away of cigarettes and other tobacco products, the burning of fires for the purpose of road construction, etc. However, the responsible persons usually cannot be identified. On the other hand, intentional fires set by responsible members of communities are extinguished by them.

The Geoscience and Environmental Science section of the Zimbabwe University has a researcher who works on the AMESD project, conducting research on wildlife conservation, biodiversity, carbon estimates for forests, basin management, etc., using remote sensing.

6.14.8 Management of Forest and Wildfire

(1) Forest management

The FC conducts an inventory survey on the timber of the gazetted forests periodically in order to decide the harvestable amount of timber. The landowner receives bids from logging companies based

on the decision. An EIA is required for logging, and the logging activities based on the plan are monitored by the FC. A part of the sales derived from the timber is returned to the government and allocated for forest management.

The communal land is owned by rural district councils, which are responsible for appropriate logging and forest management following the advice of the FC. Many of the forest reserves were designated from 1926 to 1960 so as to halt uncontrolled development. The FC manages those forests, and deicides the annual allowable timber harvest, which at present is 4,800 m^3 per year. Some of the forest is considered to be in risk of desertification without proper management, as it is located in transition areas from forest to savanna. Zimbabwe gets more than USD 15 million from timber sales annually, according to FC statistics.

Forest management plans are prepared in each forest reserve and updated every five years. Forest management plans are based on quantified and qualitative data, or on results of forest inventory surveys. There are two types of forest management plan, one operated by forest officers, and the other jointly operated by both forest officers and surrounding communities.

(2) Forest fire management

Present conditions

Many of the gazetted natural forests in Zimbabwe are located in Matabeleland North province. Residents live in and around the forests, and they need fuelwood from the forests. Open burning for agricultural purposes during the dry season, mainly from August to October, is common. Forests are broadly burnt from July to September, with significant damage due to strong wind in those months. Forest areas affected by fire covered 712,000 hectares in 2011 and 1,320,000 ha in 2012.

Timber plantation, mostly of pine trees, exists mainly in Manicaland province. Strong wind in September and October, overlapping with the peak season for open burning, may cause enormous damage to forests due to the large amount of biomass accumulation.

Fire management activities

Zimbabwe has acknowledged that wildfire causes environment degradation and has formulated policies and strategies on fire management. Zimbabwe reports the area damaged by forest fire to the FAO forest resource assessment, but many southern African countries do not even have wildfire statistics.

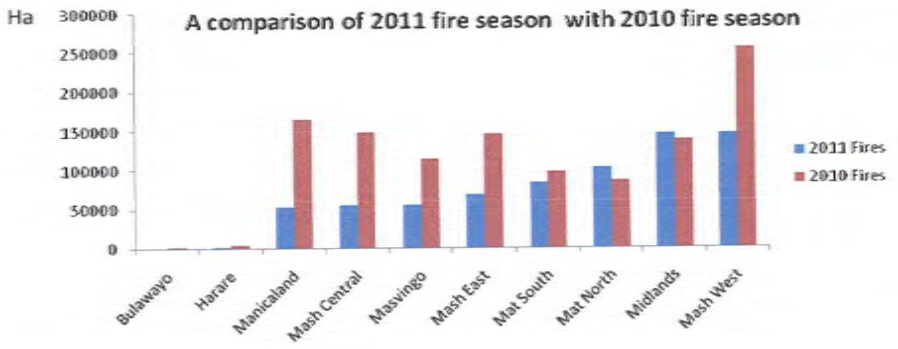
Land with clear boundaries, where joint fire management is carried out between neighboring communities, should be registered as a Fire Management Area with the FC, according to the Zimbabwe Integrated Fire Management Strategy. The Ward Fire Management Brigade, appointed by the local community, prepares the Fire Management Plan. Open burning is prescribed in the plan, and permission is issued as long as there are no problems. Permission for open burning is usually issued from April 1 to July 31 by forest officers. All local community members are responsible for finding fires and reporting them to the Ward Fire Management Brigade. If a fire exceeds the size that the Ward Fire Management Brigade can manage, a request for the FC's help should be made.

In the communal land that occupies most of the national territory, the Ward Fire Management Brigade conducts open burning with permission. On private land and leased land, each land manager appoints a Fire Controller, and burning is carried out with permission. A Fire Controller is appointed for state-owned land, gazette forest, and national parks. Forest fire management is carried out in gazette forests by the FC and in national parks by PWLMA.

The EMA has been preparing a monthly fire report since 2009, regarding the date and time of a fire, location, cause, and the burnt area. These reports have been submitted by telephone by local EMA staff. MODIS data is utilized to supplement the data. The weekly reports are prepared from June to December and compiled in an annual report.

According to the fire report published in 2011 by EMA, 25 human lives, infrastructure equivalent to USD 363,500, and 20 elephants were lost by burning 1,152,413 hectares in 2010, while five human lives and infrastructure of USD 227,214 were lost in 2011 (Figure 6-29). The decline is due to the change in people's attitudes. They have become more vigilant about letting fire occur, noticing if it occurs, and extinguishing it if the fire is still small-scale.

The EMA conducted 279 fire-fighting training sessions in 2011 throughout the country, to 2,786 members of Environment committees and subcommittees. Firebreaks with a total length of 615 km have been prepared in 15 provinces for demonstration purposes. It has been reported that 16 fires were prevented by those firebreaks. Because of this demonstration, 1,504 households have made firebreaks by themselves, and this contributed to the decrease in fires and fire damage in 2011.



Source： Fire Report 2011; EMA

Figure 6-29 Burnt Areas in 2010 and 2011

The FC and the PWLMA have been promoting early burning as a fire management measure. The EMA, a centrally located organization, monitors fire with the help of remote sensing technology and began to share data and knowledge with the FC and the PWLMA. Other related organizations have local offices, but both human resources and equipment are insufficient for utilizing the monitoring data.

Even if a fire can be detected with advanced remote sensing technology, the capacity to combat it might not be sufficient to avoid spreading. Therefore, fire prevention and minimizing damage through early burning and setting of firebreaks may be more realistic approaches.

6.14.9 Aid Projects by International Development Partners

(1) Japan

Japan's aid policy with respect to Zimbabwe is to provide humanitarian aid, specifically to provide forms of aid that can spread benefits broadly from the point of view of human security.

(2)UNDP

The UNDP is promoting Coping with Drought and Climate Change, a pilot project with the objective of coping with drought in the southeast of Zimbabwe to the support of the EMA through the GEF fund. In this project, the impact of climate change is assessed, and the way in which crop cultivation, livestock management, and natural resources management should be adapted to the climate change is studied. Ethiopia, Mozambique, Namibia, and Kenya are countries also running pilot projects, and the results and learned lessons are to be shared among the five countries.

A capacity development program on climate change, support for the preparation of the National Climate Change Strategy, and negotiation and coordination with other participants with respect to knowledge about climate change are activities of the Ministry of Environment and Natural Resources Management. The first draft of the National Climate Change Strategy was to have been prepared by

the end of 2012, and is to be finalized in 2013. The priority issues, activities, and cost will be made clear in the strategy, and the UNDP is going to formulate projects and search for partners based on these.

(3) FAO

The FAO executed the Fire Management Project in Zimbabwe (2008–2009). The project objective was decentralization of responsibility for fire management, and the activities were the provision of extinguishment tools, fire management training, and conducting study tours in the 55 pilot sites. The staff members of the FC, MEA, and Timber Federation were trained to become trainers and to learn the system by which they would conduct capacity development activities for the residents. Fire management plans were prepared and executed, and the trained facilitators began to work as a fire-fighting brigade through this pilot project. The data shows that the burnt area in 2009 declined remarkably compared with that in 2008.

The following recommendations were derived from the project: 1) harmonization of central and local governments, 2) planned early burning to prevent accumulation of combustible residue, 3) maintaining motivation by providing equipment and others, to the fire-fighting in the community by volunteers, 4) review of laws on fire management, with an eye to devolving authorization to local governments, 5) getting traditional leaders' cooperation regarding natural resources conservation, and 6) strengthening of grass-roots collaboration. The FAO is not going to fund this project; thus, another donor is being searched for so as to expand the project result to other areas. The same project is being carried out in Namibia, and an expert was sent there in response to a request from Mozambique.

The FAO conducted forest inventory preparation in 1992 and 2008.

(4) SADC

The EMA, SIRDC, and MENRM are working as counterpart organizations for fire, drought, and agriculture components of the AMESD project. Zimbabwe is a part of the SADC's Kavango Zambezi Transfrontier Conservation Area (KAZA TFCA), as mentioned in the section on Zambia.

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APPENDIXES

Appendix 1. Technical Workshop Agenda

The JICA Technical Workshop on Satellite Image Analysis for Wild Fire Detection and Climate Change Mitigation at Geoinformatics Center (GIC) of Asian Institute of Technology (AIT), 10-20 September, 2012

Program Schedule

Day 01: Seminar (Sep 10)			
From	**To**	**Title**	**Presenter**
8:45	9:00	Registration	
9:00	9:10	Welcome Remarks	Dr. Lal Samarakoon (AIT)
9.10	9.30	Program Summary and Self Introduction of Participants	Mr. Tsugito Nagano (JICA)
9:30	10:00	Keynote speech: Wildfire in Africa	Prof. Masami Fukuda
10:00	10:20	*Group Photograph and Coffee Break*	
10:20	10:30	Country Report (1)	Present by Angola
10:30	10:40	Country Report (2)	Present by Bostwana
10:40	10:50	Country Report (3)	Present by Malawi
10:50	11:00	Country Report (4)	Present by Mozambique
11:00	11:10	Country Report (5)	Present by Tanzania
11:10	11:20	Country Report (6)	Present by Zambia
11:20	11:30	Country Report (7)	Present by Zimbabwe
11:30	13:00	----- *Lunch Break* -----	
13:00	13:30	Cause & counter measure of Wildfires in Southern Africa	Dr. Wataru Yamamoto (RECS)
13:45	14:15	Satellite Remote Sensing for Environmental Monitoring	Mr. Eiichi Sakata (RESTEC)
14:15	14:45	----- *Break* -----	
14:45	15:30	Present & future sensors for forest & forest fire management	Dr. Koji Nakau
15:30	17:00	Discussion: Goal Setting	All
17:00		----- *Adjourn* -----	

Day 02: Module II (Sep 11)			
From	**To**	**Title**	**Presenter**
9:00	9:10	Opening talk	Mr. Tsugito Nagano
9:10	10:15	Earth Observation Science and ICT	Mr. Eiichi Sakata
10:15	10:30	----- *Break* -----	
10:30	12:00	Forest fire countermeasures in Indonesia	Dr. Koji Nakau
12:00	13:30	----- *Lunch Break* -----	
13:30	15:00	Lecture: Overview of MODIS data, rapid response system, MOD14	Dr. Vivarad Phonekeo
15:00	15:15	----- *Break* -----	
15:15	17:00	Hands-on: Download MODIS data from NASA, MODIS Level 1B analysis	Dr. Vivarad Phonekeo
17:00		----- *Adjourn* -----	

Day 03: Module II (Sep 12)			
From	**To**	**Title**	**Presenter**
9:00	9:10	Opening talk	Dr. Thip Limlahapun
9:10	10:00	Lecture: Enhancement of MODIS fire algorithm	Dr. Koji Nakau
10:10	10:15	----- *Break* -----	
10:15	12:00	Hands-on: Generation of MODIS fire product, extraction of active fire pixels	Dr. Vivarad Phonekeo
12:00	13:30	----- *Lunch Break* -----	
13:30	15:00	Hands-on: Download recent (last 7 days) fire product for Africa and visualize on Google Earth	Dr. Vivarad Phonekeo
15:00	15:15	----- *Break* -----	
15:15	17:00	Hands-on: Download FIRMS MODIS fire archive data (5 years) for Africa, visualize on GIS software	Dr. Vivarad Phonekeo, Mr. Kavinda Gunasekara
17:00		----- *Adjourn* -----	

Day 04: Module I (Sep 13)			
From	**To**	**Title**	**Presenter**
9:00	9:10	Opening talk	Dr. Thip Limlahapun
9:10	10:00	Lecture: Fundamentals of Remote Sensing	Dr. Lal Samarakoon
10:10	10:15	----- *Break* -----	
10:15	12:00	Lecture: Fundamentals of Remote Sensing	Dr. Lal Samarakoon
12:00	13:30	----- *Lunch Break* -----	
13:30	15:00	Lecture: About Landsat missions and data Hands-on: Landsat data download	Mr. Kavinda Gunasekara
15:00	15:15	----- *Break* -----	
15:15	17:00	Hands-on: Data import to remote sensing software, bands stacking, color composites, visual interpretation and discussion	Mr. Kavinda Gunasekara Mr. Syams Nashrrullah
17:00		----- *Adjourn* -----	

Day 05: Module I (Sep 14)			
From	**To**	**Title**	**Presenter**
9:00	9:10	Opening talk	Dr. Thip Limlahapun
9:10	10:00	Lecture: Digital Image Processing (preprocessing, enhancement, classification) Hands-on: Image enhancement	Dr. Lal Samarakoon, Mr. Kavinda Gunasekara Mr. Syams Nashrrullah
10:10	10:15	----- *Break* -----	
10:15	12:00	Hands-on: Image enhancement Hands-on: unsupervised/supervised classification	Mr. Kavinda Gunasekara Mr. Syams Nashrrullah
12:00	13:30	----- *Lunch Break* -----	
13:30	15:00	Hands-on: unsupervised/supervised classification	Mr. Kavinda Gunasekara Mr. Syams Nashrrullah
15:00	15:15	----- *Break* -----	
15:15	17:00	Hands-on: unsupervised/supervised classification	Mr. Kavinda Gunasekara Mr. Syams Nashrrullah
17:00		----- *Adjourn* -----	

Day 06: Module I & III (Sep 15)			
From	**To**	**Title**	**Presenter**
9:00	9:10	Opening talk	Dr. Thip Limlahapun
9:10	10:00	Lecture: GLOBCOVER product Hands-on: How to download, open land cover product, discussion	Mr. Kavinda Gunasekara Mr. Syams Nashrrullah
10:10	10:15	----- *Break* -----	
10:15	12:00	Hands-on: Open 5 years historical fire spot data, narrow down the data set, overlay with administrative boundary layer	Mr. Kavinda Gunasekara Mr. Syams Nashrrullah
12:00	13:30	----- *Lunch Break* -----	
13:30	15:00	Hands-on: Identify fire hotspots/highest occurrence provinces or districts	Mr. Kavinda Gunasekara Mr. Syams Nashrrullah
15:00	15:15	----- *Break* -----	
15:15	17:00	Hands-on: Fire spot data overlay with land cover data, discussion	Mr. Kavinda Gunasekara Mr. Syams Nashrrullah
17:00		----- *Adjourn* -----	

Day 07 (Sep 16)		
From	**To**	**Title**
(Holiday)		

Day 08-09 : Module IV (Sep 17 - Sep 18)		
From	**To**	**Title**
AM: Move to Kanchanaburi (Coordinator Mr. Tsugito Nagano/Dr. Thip Limlahapun) PM: filed guided by forest fire protection officers to know about Thai forests etc.		

Day 10 : Module III (Sep 19)			
From	**To**	**Title**	**Presenter**
9:00	9:10	Opening talk	Mr. Tsugito Nagano
9:10	10:00	Lecture: Estimation of forest biomass and carbon stock by using satellite images that could help in REDD+	Mr. Syams Nashrrullah (AIT)
10:10	10:15	----- *Break* -----	
10:15	11:00	Introduction of Sentinel Asia System	Dr. Kazuya Kaku
11:00	11:30	Freely downloadable GIS & RS software	Mr. Kavinda Gunasekara
11:30	13:00	----- *Lunch Break* -----	
13:00	14:00	Hands-on: Fire spot data overlay with land cover data (Continued from Sep 15)	Mr. Kavinda Gunasekara
14:00	15:00	Revision of previous exercises, discussion and guidance for report writing	All
15:00	15:15	----- *Break* -----	
15:15	17:00	Writing a report	All
17:00		----- *Adjourn* -----	

Day 11 : Module III (Sep 20)			
From	To	Title	Presenter
9:00	9:10	Opening talk	Mr. Tsugito Nagano
9:10	10:00	Writing a report	
10:10	10:15	----- *Break* -----	
10:15	12:00	Writing a report	All
12:00	13:30	----- *Lunch Break* -----	
13:30	15:00	Presentation & Discussion	Mr. Tsugito Nagano to coordinate
15:00	15:15	----- *Break* -----	
15:15	17:00	Presentation & Discussion (Cont'd) + Evaluation of this WS	Mr. Tsugito Nagano to coordinate
17:00		----- *Adjourn* -----	

Day 1, 11 February 2012

Time	Item	Format	Responsible
08.00-08.20	Registration of participants	Complete Registration form	GIZ / SADC Secretary /Administrator
08.20-08.30	Welcoming Remarks and Official Opening	Speech / Presentation	SADC Chair, Mozambique
08.30-08.35	Addressing Environment and Climate change issues in TICAD V	Presentation	Ms. Aya Saito
08.35-08.40	Remarks by JICA Representative	Speech / Presentation	Mr. Hirohito Takata
08:40-08:50	Remarks by the Director of Food Agriculture and Natural Resources of SADC Secretariat	Speech	Ms. Margaret Nyirenda
08.50-09.10	Introduction and objectives of the meeting	Presentation	SADC Secretariat
09.10-09.45	Introduction of participants	Facilitation	Facilitator
09.45-10.00	Photo session		Facilitator / Photographer
10.00-10.30	Tea Break / Photo Session		
SESSION 1: Status of forest resources, wildfires, deforestation and forest management; existing activities and achievements related to the implementation of the SADC programmes and participation of communities in forest management			
Country Presentations by Country representative (rep)			
10.30-10.45	Angola		Country rep
10.45-11.00	Botswana		Country rep
11.00-11.15	DRC		Country rep
11.15-11.30	Lesotho		Country rep
11.30-11.45	Malawi		Country rep
11.45-12.00	Mauritius		Country rep
12.00-12.15	Mozambique		Country rep
12.15-12.30	Namibia		Country rep
12.30-12.45	Seychelles		Country rep
12.45-13.00	South Africa		Country rep
13.00-14.00	Lunch Break		
14.00-14.15	Swaziland		Country rep
14.15-14.30	Tanzania		Country rep
14.30-14.45	Zambia		Country rep
14.45-15.00	Zimbabwe		Country rep
Stakeholder presentations			
15.00-15.20	Southern Africa CBNRM Forum: Community based Natural Resource management	Presentation	Mr Mutuso Dhliwayo
15.20-15.40	Tea Break		
15.40-16.00	Community forestry for livelihood development in Mozambique	Presentation	Mr. Yasuko Inoue
16.00-16.20	Fire as a Resource - 'Grass Roots' CBFiM in Developing Africa	Presentation	Mr. Robin Beatty
16.20-16.40	Community Based Fire Management – Experiences of TRICO Project, Tanzania	Presentation	Mr. Charles N'gatigwa
16.40-17.00	Fire Networking in Southern Africa	Presentation	Ms. Anja Hoffman & Prof. Johann G. Goldammer

Day 2, 12 February 2012

Session 1 Continued			
08.30-08.50	FAO´s approach on fire management and the use of the Fire Management Voluntary guidelines	Presentation	Mr. Pieter van Lierop
08:50-09:10	AMESD/AFIS fire theme	Presentation	Mr. Phillip Frost
09:10-9:30	Experiences with Remote Sensing for fire management in Asia and its implication for Africa	Presentation	Mr. Masami Fukuda
09:30-09:50	Activities of Japan Aerospace Exploration Agency (JAXA) for forest conservation	Presentation	Mr. Takao Akutsu
09:50-10:30	Tea Break		
SESSION 2: Background to SADC strategy and programmes to create a common understanding of existing strategic documents for regional natural resources management			
Presentation of strategic documents			
10:30-10:50	Protocol on Forestry & Forestry Strategy	Presentation	SADC Sec / Mr. N. H. Nyambe
10:50-11:10	SADC Fire Management Programme	Presentation	SADC Sec / Mr. M. Chakanga
11:10-11:30	SADC Support Programme on REDD+ & REDD+ MRV Project	Presentation	SADC Sec / Mr. N. H. Nyambe
11:30-12:10	Round Table discussion		Moderator
Survey results on forest conservation in Southern Africa (JICA)			
12:10-12:30	Constraints and Potential on Forest Conservation and Development in Southern Africa: Overview of the survey results	Presentation	Mr. Wataru Yamamoto
12:30-14.00	Lunch Break		
14:00-14:20	Experiences of implementation of REDD+ in Southern Africa	Presentation	Dr. Harrison Kojwang
SESSION 3: Analysis of constraints and potentials regarding implementation of regional programmes, especially with forest inventory/information system development, fire management, and community participation in forest management			
14.20-15:30	Introduction and formation of working groups;	Working Groups	Facilitator
	Group Work		
15:30-16:00	Tea Break		
16:00-17:00	Working Groups Report Back to Plenary	Working Groups	Facilitator

Day 3, 13 February 2013

SESSION 4: Identification of potential areas of regional support through international cooperation in line with the SADC forestry strategy and programmes, and for each identified area of cooperation definition of roles and responsibilities of Member States, SADC Secretariat and other relevant stakeholders			
08:00-08:30	Potential areas of JICA cooperation in the SADC framework	Presentation	Mr. Hiroki Miyazono
08.30-09.00	Introduction and formation of Working Groups on identification of potential areas of cooperation in SADC Forestry Strategy and SADC Fire Management / REDD Support Programmes	Working Groups	Facilitator
09.00-10.30	Group Work	Working Groups	Facilitator
10.30-11:00	Tea Break		
11:00-12:00	Group Work	Working Groups	Facilitator
12:00-13.00	Lunch Break		
13:00-14:30	Working Groups Report Back to Plenary	Working Groups	Facilitator
14:30-15:00	Way Forward / Recommendations / Including JICA Response		Facilitator
15:00-15:30	Workshop evaluation		Facilitator
15:30-16:00	Workshop closure	Speech / Presentation	JICA / Host Country, South Africa / SADC Chair, Mozambique
16.00	Tea Break		

Appendix 3. Results of Group Works at Policy Workshop

DAY2: Constraints and Potentials

Group 1 – Wildfire Management

Constraints	Necessary Interventions	Potentials	Necessary Interventions
National level			
1. Lack of CBFiM 2. Lack of political will to implement FM 3. Insufficient skills and technology 4. Insufficient knowledge on IFM 5. Weak cooperation amongst different land management agencies 6. Weak national capability and capacity 7. Integration of indigenousness knowledge	1. Raise the awareness within country governments of FM to create sustainable funding	1. Understanding of local knowledge 2. Training institutions 3. Policy and legislation frame works 4. Cross border chieftainship 5. Diverse knowledge exist of FM	1. Build a knowledge pipeline for sustainable growth and development 2. Create opportunities to share diverse knowledge
Regional level			
1. Lack of funding eg fire centre 2. Lack MOU's for cross border fire management 3. Lack of implementation of existing MOU's 4. Lack of technical support and funds 5. Lack of communication 6. Weak legal frameworks 7. Lack of regional coordination	1. Engage International donor organisations. 2. MOU SADC prototype required 3. SADC wide fire coordination required 4. Role of regional networks to help influence policy	1. Information systems - AFIS/AMESD 2. Existence of networks 3. Collaboration with international projects such as AMESD, GMES Africa, REDD+ 4. International cooperation	1. Optimal utilisation of existing systems 2. More support for existing networks

Group 2 - Community Participation in Forest Management

Constraints	Necessary Interventions
National level	
Land Tenure: Security of tenure	・Secure user rights & access ・Allowed ownership to communities
Lack of legitimate & functional community institutions	・Mobilise communities to form legitimate, accountable institutions ・Devolution of rights in real time
Inadequate incentives: Lack of tangible benefits	Assess forests and develop management plans to identify potential Provide non forest incentives (other incentive measurs) whilst waiting for long term forest benefits

Constraints	Necessary Interventions
Lack of community participation in decision making (bodies)	Involvement of communities in decision making to the lowest level possible
Lack of long term capacity building for communities	Create platforms at the lowest level of governance. Governance structures should adhere to bottom-up accountability
Lack of information: state doesn't make information or no translate into local language	Provision of simplified & accessible to information (e.g. in local languages)
Land conflicts	Land use planning
Lack of policies & guidelines and implementation	Develop & implement policies & guidelines
Lack of policy harmonization	Policy and guidelines harmonization
Regional level	
Lack of community participation in decision making (bodies)	Involvement of communities in decision making to the lowest level possible
Lack of exchange of good practice opportunities	Learning platforms through exchange tours across countries Create data repository (website with manager)on CBFM and encourage sharing of information
Lack of information	Provision of simplified & accessible to information (e.g. in local languages)

Potential	Necessary Interventions
Regional level	
Transboundary communities with similar socio-cultural configurations	Transboundary information sharing
Similar forest landscapes & transboundary, Transfrontier conservation Areas	Joint promotion and development of transboundary areas
Political will expressed through signing and acceeding to SADC forest protocol	There has to be audit on the Forestry protocol
Creation of Wealth in rural areas	・Formalize of transboundary trade between communities through cross border CBFM. ・Provide amenities, social services to communities to reduce migration
Informal trade of NTFPs through cross-border CBFM	Formalize transboundary trade between communities through cross border CBFM
Reduced migration to cities	Provide amenities, social services to communities to reduce migration
Political will and MOU signed	・There has to be Audit on the protocol ・Implement MOUs

Group 3 - Forest Inventory/InformationSystem Development

Constraints	Necessary Interventions	Potentials	Necessary Interventions
National level			
• Inadequate technology • Inadequate expertise • Inadequate funding • Weak institutions (academic, research etc.) • Low priority given to the Forestry Sector • Outdated information • Diverse	• Capacity Building Programmes (in specialised skills) • Improve infrastructure • Develop tools and equipment • Strengthen universities and research institutions • Allocate sufficient	• Supportive policies • Indigenous knowledge system • Existence of emerging programmes e.g. REDD+ • Existence of international partners	• Improve implementation capacity and coordination • Enhance community participation • Synergies between REDD+, FLEGT etc. • Promote collaboration on specific topics of interest

methodologies • Large forest size which causes inaccessibility (high financial costs) • Fragmentation of mandates	funds to Forestry on the National Budget • Involvement and sensitization of policy makers on Forestry • Valuation of forest resources (including Timber, NTFP and environmental services) • Conduct regular assessments • Develop common approaches and methodologies • Streamlining functions and reporting of institutions	• Existence of international guidelines	• Intensify efforts to comply with international guidelines
Regional level			
• Weak intraregional communication system • Low priority given to the Forestry Sector • Diverse methodologies • Inadequate coordination • Perceived low significance of forests • Inadequate funding	• One stop shop for forestry info in the region • Valuation of forest resources • Involvement and Sensitization of policy makers • Develop common approaches and methodologies • Identify and Monitor strategic forests/hotspots • Joint funding on MoU • Regular collaboration on funding	• Centres of specialization • Mechanisms for sharing technology • Existence of regional fora • Existence of international partners	• Utilise regional training centres • Networking and partnerships at regional level • Promote regional information sharing • Promote collaboration on specific topics of interest

DAY3: Relevant Interventions

Group 1 – Wildfire Management

Relevant Interventions	Relevant Actors	Potential Roles and Responsibilities	JICA's objectives
Regional level			
1. Engage International donor organisations.	JICA, GIZ, SADC MS SADC Secretariat,	Proposals	Information and knowledge sharing
2. MOU SADC prototype required	SADC technical committee, MS, JICA	Legislation; facilitation, policy reforms, negotiations, MOU budgets	Pilot activities
3. Open access to data	JICA; individual SADC MS; Earth Observation organisations	Obtain Japanese satellite data	Information and knowledge sharing
4. CBFIM training and mobilisation	SADC MS, Donor Agencies	CBFIM workshops, National fire management training programme, practical field work	Information and knowledge sharing/training
5. Regional Centres	JICA, SADC MS,	Structure in information flow; communication; identifying relevant info	Information and knowledge sharing
National level			
1. Location of AFIS stations	Individual MS JICA; AFIS station managers, University institutions; CSIR	Disseminate information	Information and knowledge sharing
2. Research	SADC MS, Universities; training institutions and others,	Research of usability of real time fire data Train fire managers Update legislation; incorporate fire management into policy frameworks	Pilot activities, Information and knowledge sharing
3. Development of curricula (E.g. GIS, CBFM)	JICA SADC MS Donor agencies,	National fire management training programmes	Information and knowledge sharing
4. Review, harmonisation and implementation of policy	SADC MS, Community stakeholders, communities	Updating policy, legislation	Information and knowledge sharing
5. CBFIM mobilisation and training	Training management institutions	Implement national training programmes	Information and knowledge sharing/training
6. National Centres	JICA, SADC MS, FM institutions; local communities	Structure in information flow; communication; identifying relevant info	Awareness raising, training,

Relevant Interventions	Relevant Actors	Potential Roles and Responsibilities	JICA's objectives
7. Capacity Building	JICA, SADC MS, Government sectors (e.g. Livestock, agriculture	Awareness, training, and knowledge sharing	Information and knowledge sharing/training
8. Communication strategy	SADC MS, individual institutions etc.	Structure in information flow; include in legal framework (e.g. Mandate)	Information and knowledge sharing

Group 2- Community Participation in Forest Management

Relevant interventions	Relevant actors	Potential roles and responsibilities
National and Regional and level		
Forestry Information/Knowledge sharing through ・Strengthening existing networks/fora ・Identification of best practices to share through the networks ・Application of ICT ・Identification of IKS to share ・Study tours, exchange visits (M&E) ・Promotion of interpretation of policies into relevant languages ・Identify, document community empowerment models in SADC **Training** ・Share models through training ・Provide leadership training **Pilot activities** ・Identification of community forest livelihood activities ・Promotion of NTFPs ・Value addition to NTFPs & marketing (including value chain analyses) ・Formalisation of trans-boundary trade between communities ・Joint promotion & development of trans-boundary areas ・Participatory land use planning ・Harmonisation of policies & guidelines ・Support of SACF; regional CBNRM network ・Patenting (IPR) ・Shared management model	• SADC • Government/State • Community leaders • NGOs • CBOs • Private Sector • Tertiary (R & D) institutions • Cooperating partners • TFCAs	・Regional coordination ・Bilateral agreements ・Counterpart staff & funding ・Law enforcement ・Creating enabling policy environment ・Mobilisation of communities ・Facilitate program implementation ・Empower communities ・Support marketing ・Research & development ・Technical & financial support ・Coordination of TFCAs

Group 3-Forest Inventory/Information System Development

Relevant interventions	Relevant actors	Potential roles and responsibilities
National level		
Pilot Implementation of MRV System/methods developed by GIZ	• Member States • Partners • SADC Secretariat	• Provision of funds • Expertise • Coordination
Pilot MRV in forest types not yet covered by GIZ (e.g. Mangroves)	• SADC Secretariat • Cooperating partners	• Coordination • Provision of sites • Resources
Establish Regional database on forest resources	• SADC Secretariat • Member States • Relevant partners	• Coordination • Provision of information • Resources
Awareness Raising	• Governments • International cooperating Partners	• Strategy formulation and execution • Resource mobilization
Identify strategic forest ecosystems/"hotspots" in the region	• Member states, • SADC Secretariat • Other partners	• Information • Facilitation provision • Coordination
Support institutional strengthening for information management (at SADC Level)	• SADC Secretariat • Member States • Cooperating Partners	• Needs assessment • Facilitation • Coordination
Regional level		
Training in national forest monitoring to promote REDD+	Universities, Research Institutions, Govt. Depts. and Cooperating partners	• Expertise, facilities • Resources
Support training in Verification	Experts	Expertise
• Support for forest inventories and baselines • Support for natural resources accounting for forests/forest evaluation	• Government • Cooperating partners • Communities • Others e.g. Universities	• Data provision • Tools, Equipment and Funds • Participation
Conduct training needs assessment	• Government • Training/Research Institutions	• Resources • Expertise and methodologies
Acquisition of tools and equipment	• Government • Partners	• Procurement • Financing
Support compliance with reporting guidelines	• Governments • International cooperating Partners	• Facilitation • Development of national systems
Establish National database of forest resources	• SADC Secretariat • Member States • Other Cooperating Partners	• Coordination • Expertise and Facilities • Financing
Awareness Raising	• Governments • International cooperating Partners	• Strategy formulation and execution • Resource mobilization

Appendix 4. Joint Resolution at the Policy Workshop

The SADC Regional Forestry Stakeholder Workshop, 11-13 February 2013, Birchwood, Johannesburg, South Africa

Joint Resolution

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1. The Southern Africa Development Community (SADC) Regional Forestry Stakeholder Workshop co-hosted by SADC, the Japan International Cooperation Agency (JICA) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) was held from 11th to 13th February 2013 in Johannesburg, South Africa. The objective of the workshop was to identify potential areas of regional cooperation in forestry with JICA in collaboration with other partners under the SADC framework.

2. The Workshop was attended by the following SADC Member States: Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, United Republic of Tanzania, Zambia and Zimbabwe. It was also attended by the representatives of SADC Secretariat, the Ministry of Foreign Affairs of Japan, JICA, GIZ, FAO, GOFC-GOLD, GWFN/GFMC, SAFNET and other relevant stakeholders.

3. Recalling the SADC Protocol on Forestry (2002) and the SADC Forestry Strategy 2010-2020, SADC Member States reaffirmed the importance of enhancing forest conservation and sustainable management of forest resources that extend about 381 million hectares in the region. The meeting underscored the threat of rapid deforestation and degradation due to several causes, such as agricultural land conversion, over-grazing, over-harvesting of wood and frequent uncontrolled wildfires.

4. Recognizing multiple roles of forests in poverty reduction at local community level and climate change mitigation and adaptation, the SADC Member States stressed the need to accelerate the regional efforts for addressing the issue of deforestation and forest degradation.

5. SADC Member States unanimously welcomed the idea of regional cooperation on forestry to be supported by JICA in collaboration with other partners under the SADC framework.

6. SADC Member States shared a common view that it would be appropriate to focus on: i) forest information system (for Reducing Emissions from Deforestation and Forest Degradation, REDD+); ii) integrated fire management; and iii) participatory forest management, as potential priority areas for regional cooperation on forestry to be supported by JICA.

7. SADC Member States emphasized that it would be timely and efficient to widely publicize the regional cooperation on forestry to be supported by JICA in collaboration with other partners under the SADC framework at the Fifth Tokyo International Conference on African Development (TICAD 5) to be held from 1st to 3rd June 2013 in Yokohama, Japan.

8. SADC Member States called upon the SADC Secretariat and JICA to take the necessary steps towards formulating a regional cooperation programme on forestry to be supported by JICA.

13th February 2013
Johannesburg, South Africa

Appendix 5: Logical Framework for SADC Forest Strategy 2010-2020

Climate change mitigation and adaptation

Strategic Programme Area	Five Year Target	Key Actions	Programme Level Indicators	Article of Protocol Covered
1. Climate Change Mitigation and Adaptation Objective: To improve the capacity of SADC member states to engage in International Processes and also have viable adaptation and mitigation projects in the forest sector	(i) All countries are participating in international forestry related policy processes (ii) At least 25 % of all new industrial plantations are CDM eligible by 2014. (iii) By 2012, 20% of Key Forests are managed under REDD Schemes (iv) A committee of core of REDD and CDM specialists (1 from each member state) established and supported by 2012 (v) Key Forest Reserves are linked to other ecosystems through corridors to enhance climate change adaptation and ecosystem resilience	• Secretariat to continue to use its convening power • SADC to host key training sessions on CDM, REDD and Marketing of Forest Products • Information dissemination on REDD • Launching of Specialist Working Groups	• Session Reports • Position and information papers • Working Group Reports to Secretariat • Field projects steered by working groups • List of CDM and REDD projects	Articles 8 and 11 on National Forest Programmes and Forest Related Laws respectively

Management of key catchment forests

Strategic Programme Area	Five Year Target	Key Actions	Programme Level Indicators	Article of Protocol Covered
2. Protection of key water catchment forests Objective: To safeguard and enhance the capacity of SADC forests to mitigate the effects of climate change and protect key water catchment areas	(i) Major River Catchment Forests proclaimed by 2015 Examples: Critical catchment forests in the basins of the Congo, Okavango, Kwando and Zambezi Rivers	• Mapping and Zoning • Land Use Planning • Requisite policy review and legislative processes • Promote Agroforestry systems • Promote food security for local farmers	• Maps • Land use plans and special management plans • Reviewed Policies and Legislation (Take to new table on Harmonized Polices and legislation) • Proclamation Documents	Articles 11 and 15 on forest laws and protection forests respectively

Forestry and poverty reduction

Strategic Programme Area	Five Year Target	Key Actions	Programme Level Indicators	Article of Protocol Covered
3. Energy supply and reduction of rural poverty Objective:To increase the levels of production from natural and man-made forests,	(i) New plants for finished wood products from planted and natural forests, established by 2016 in at least 3 countries (ii) New Industrial Plantations established for local industry in at	• Active introduction or acquisition of wood working, finishing technology • Initiate pilot projects in reconstituted wood products • Requisite policy	• New products in the market • Land use plans and special management plans and established plantations • Reviewed	Article 5 on tenure and ownership. Also Article 11 on forest laws

create more employment and help reduce poverty	least 3 countries and also supported by small scale out-grower schemes (iii) All new industrial plantation (pulp, timber & biofuel) investments invest in food security programmes (iv) Each country has at least one new value added NFTP in regional or international markets by 2015 (v) Countries have compatible and mutually reinforcing bio-fuel and plantation development policies (vi) All countries promote sustainable harvesting of biomass fuels and their efficient uses l	review and legislative processes • Promote the establishment of local commercial nurseries • Provision of improved planting materials • Promote Agro-forestry systems • Ensure that all large scale forest investment projects have viable food security programmes • Mandatory requirements for sustainable supply and use efficiencies particularly in urban areas • Incentives for adoption of alternative energy e.g. propane and natural gas	Policies and Legislation • Community based local wood based industries • Village run commercial nurseries	

Community based forest management

Strategic Programme Area	Five Year Target	Key Actions	Programme Level Indicators	Article of Protocol Covered
4. Enhanced participatory forest management Objective:To empower the rural communities of SADC to productively participate in forest management	(i) Co-Management Contracts with at least 5 community groups per country established by 2014 (ii) By 2015, an aggregate total of 1 million ha of natural forests under co-management schemes (iii) Community owned forests (natural or planted) legally recognized by at least 5 countries by 2015	• Support for policy and legislative reviews in Angola, DRC and Madagascar • SADC facilitates technology and information sharing from other countries • Physical and socio-economic Mapping of designated areas • Training of community organizations and formation of management committees -share existing methods • Drafting of partnership or co-management contracts -share existing models • Drafting of revenue sharing agreements • Models for community empowerment in forest management developed	• Documents • Maps • Draft agreements • Revenue sharing • Functional Committees	Article 12 on community based forest management. Also Articles 5 and 13 on tenure and Participation of women respectively

Enhanced trade in forest products

Strategic Programme Area	Five Year Target	Key Actions	Programme Level Indicators	Article of Protocol Covered
5. Enhanced Trade in Forest Products Objective: To increase the volume of legal trade in forest products within and outside SADC and reduce illegal and unreported logging and trade	(i) An agreed instrument to curb illegal logging and associated trade signed by all member states by 2014 (ii) SADC Forest Products Trade Forum formed by 2012 (iii) Volume of legal trade in timber increases by at least 50% above 2010 levels by 2015 (iv) Significant increase in local entrepreneurs in at least 5 countries by 2015 (v) Five countries have developed and adopted national management or product certification schemes by 2015	• Drafting of position paper on curbing illegal trade for discussion and processing in SADC • Promotion of trade through demand surveys, buyer-seller joint seminars • Promotion of common product standards and grading systems for popular wood products • Propose tax incentives to promote new investments • Searching and sharing information on market opportunities for forest products • Facilitating development of National Certification Standards and Authority	• Agreed 'plan of action' document • Trade statistics • Trade Forum Meeting Reports • Publication of a standards handbook • Tax incentives by individual governments • Guidelines for regional trade in forest products • Certification guidelines	Article 18 on Trade in Forest Products

Fire management and cross-border cooperation

Strategic Programme Area	Five Year Target	Key Actions	Programme Level Indicators	Article of Protocol Covered
6. Cooperation in trans-boundary forest and fire management Objective: To co-operate in the exemplary management of fires, particularly in shared forest and other ecosystems	(i) Fire management agreements between at least 3 pairs of countries by 2012 (ii) Forest and Wildlife Management Systems harmonized among countries sharing forest and wildlife ecosystems by 2014 (iii) Joint assessment and monitoring systems in use by 2014 for both forests and wildlife	• Promotion of common fire management regimes across countries • Co-operation agreements with local governments, traditional leaders and community groups • Fire scar monitoring service to inform and educate policy makers and the public • Supply of fire management equipment including (fire suppression) to collaborating partners • Construction of fire lines • Setting rules and by laws for safe burning e.g. (timing of early burns)	• Publications • Field deployment of fire management tools • Trained fire management personnel • Fire scar maps for all agreed areas	Articles 14 and 15 on Trans-boundary forests and protection forests respectively

Forest resource assessments

Strategic Programme Area	Five Year Target	Key Actions	Programme Level Indicators	Article of Protocol Covered
7. Forest resource assessment and Database management Objective: To coordinate the assessment and monitoring of the forest resources in the region, paying special attention to those of regional importance and facilitate information sharing among member states through a regional database	(i) Establishment of a regional database of agreed content in SADC 2014 (ii) Routine and periodic monitoring based on a common platform by 2016 (iii) Periodic publication on the ''State of the SADC Forests Report'' by 2015 (iv) A database and information sharing platform for all Community Based, Value Added and CDM/REDD Projects in SADC by 2012	• Develop a set of forest assessment guidelines • Design, establish • and promote the use of the database by member states • Facilitate the development of a regionally agreed monitoring system and launch its application on agreed strategic forests • Prepare the first status report on SADC Forests • Assess existing national and regional databases	• Agreed monitoring framework or platform • Existence of Database • Status of Forests Report	Article 10 on Regional Database. Also Articles 20 and 21 on research and information

Capacity building needs

Strategic Programme Area	Five Year Target	Key Actions	Programme Level Indicators	Article of Protocol Covered
8. Capacity building of member states and SADC Secretariat manage the forest sector Objective: To improve the capacity of the SADC Secretariat and member states to offer devoted services to the strategic areas of the forest sector and competently participate in the international policy dialogue on forests.	(i) All countries participating in international dialogue on forests (ii) All member states understand and participate in CDM and voluntary carbon markets by 2015 (iii) All forest departments have REDD Specialists by 201 (iv) By 2012 SADC Secretariat staffing level increased to facilitate Specialist Working Groups to lead the implementation of the strategy through member states (v) A core of REDD and CDM Specialists being supported by SADC Secretariat (vi) Research initiated in the key aspects of production and value - added processing and on aspects of REDD and climate change adaptation	• Secretariat to continue to use its convening power • SADC to host key training sessions on CDM, REDD and Marketing of Forest Products for member states • Information dissemination on REDD • Launching of Specialist Working Groups • Review of Secretariat staffing in view of the strategy • Increased funding for applied research in at least 3 institutions in SADC	• An upgraded SADC facility for the strategy • Session Reports • Position and information papers • Working Group Reports to Secretariat • Field projects steered by working groups • Government and donor allocations • Research projects in production technologies, REDD, Climate Change and bio-fuels	Article 19 on capacity building

Cate-gory	Project name	Execution Agency /Donor	Period	Funding	Purpose and Activities
Multi-country					
F	African Monitoring Environment in Southern Africa for Sustainable Development (AMESD) <Angola, Botswana, Lesotho, Malawi, Namibia, South-Africa, Swaziland, Zambia, Zimbabwe>	CSIR/European Development Fund (EU)	2007-2013	Euro 21 million	Partnership between the African Union Commission (AUC) and EU. To improve environmental monitoring towards sustainable management of natural resources in five regions of sub-Saharan Africa, CEMAC, ECOWAS, IGAD, IOC and SADC (RECs) regions. Activities are: provision of natural disaster services (Active fires, fire risks, early warning, drought indicators, Flood Mapping Service) to National Disaster Management Units, Forestry/Agriculture Departments and Meteorological Services.
F	Tanzania – South Africa Fire Management Coordination Project	GIZ/ DWA DAFF, CSIR	NA	NA	To support community based fire management at national and local level in Tanzania, To establish Fire Management Coordination Centre (FMCC)
C	Nyika Transfrontier Conservation Area (Nyika TFCA) Project <Malawi and Zambia>	WB	2011-2016	NA	Establishment of more effective trans-frontier management of biodiversity in the Nyika TFCA To establish planning functions, financial sustainability, and management effectiveness
C, F	Support for Kavango Zambezi Transfrontier Conservation Area（KAZA TFCA） Project < Angola, Botswana, Namibia, Zambia and Zimbabwe >	SADC	Since 2006	NA	Promotion of the wise use of natural resources and effective protection of the natural environment
C	Southern Africa Regional Environmental Program (SAREP) <Angola, Namibia, and Botswana>	USAID (USA)	2010-2013	NA	Bbiodiversity conservation, water supply and sanitation, and livelihood at Kubango-Okabango river basin.
C	Southern African Regional CBNRM Forum (SACF)	NORAD, USAID through WWF, Norway and	NA	US$ 1 million (to Dec. 2014)	Regional multi stakeholder network for advancement of CBNRM best practices in the SADC region, aiming for improved livelihoods at household level. Members: Botswana, Malawi, Mozambique,

Cate-gory	Project name	Execution Agency /Donor	Period	Funding	Purpose and Activities
		Namibia since 2002			Namibia, Tanzania, Zambia and Zimbabwe which have national CBNRM Forums
I	Development of integrated monitoring system	SADC/GIZ	2012-2015	Euro 5 million	Developing a Regional MRV System, Pilot Implementation of the, regional MRV system in (at least three) pilot countries, MRV capacity building in SADC pilot countries, support of a MRV pre-audit
I	provision of satellite images	AFD (France)	NA	NA	Provision of satellite images by Satellite Pour l'Observation de la Terre（SPOT）to related organizations in the Congo Basin
M,C	Transboundary Use and Protection of Natural Resources	SADC/GIZ	2012-2015	Euro 5 million	Implementation of regional TFCA, REDD and Fire programs Integrating climate change and biodiversity conservation into regional and national NRM programs
O	Coping with Draught and Climate Change <Mozambique, Namibia, Zimbabwe, Ethiopia and Kenya>	UNDP,GEF	2008-2012	NA	Promotion of adoption of policy oriented strategies for adaptation to climate change among rural communities <In Zimbabwe> -To develop a climate change knowledge base to support adaptation -To have Pilot demonstration projects -To promoting use of seasonal climate forecasts -To document and disseminate lessons learnt
Angola					
I	Support to prepare forest inventory	FAO	2010-2013	NA	Preparation of forest inventory done together with the similar project by the Governmental fund
M, C	Support for preparation of PFFSAC	FAO, Netherland	2009-2010	NA	Support of preparation of PFFSAC, the national policy for forest, wildlife and conservation
M	Sustainable Charcoal Project	UNDP Angola	2013-2017 (planned)	NA	Promotion of proper marketing of charcoal and to raise awareness on environment
Botswana					
F	Botswana Fire Management program	North South Wales Rural Fire Service/AUSAID	2011-	NA	Needs analysis on existing fire management plans and to train locals in rural fire management

Cate-gory	Project name	Execution Agency /Donor	Period	Funding	Purpose and Activities
F O	Forest Conservation of Botswana (FCB)	USA Debt for Nature Swap	2007-	US$ 700,000 by 2011	Funding CBO, VDO, University and BCA for Community nursery, tree planting, restoration, permaculture, palm planting, community forest reserve, etc.
C	Bio Chobe Project	UNDP	2012-2014	NA	Conservation at Chobe-Kwando-Linyanti (CKL) area in Chobe river watershed
I	Forest Resources Management Based on Sharing with Community and Wildlife	JICA	2012-2015	JY 300 million	Development of forest distribution map, Forest GIS database, and National Forest Inventory System
DRC					
I	Forest Preservation Programme	Japan	2009	JY 1000 million	Provision of equipment to collect data of forest such as software for satellite image analysis/GIS, computers, etc., and training to utilize those tools
I	The Project for Strengthening National Forest Resources Monitoring System for Promoting Sustainable Forest Management and REDD+	JICA (Japan)	2012-2015	NA	Preparation of national forest resources inventory system plan, and capacity development for this plan
I	Including Stakeholders in the Development of Social and Environmental Standards for REDD+	UN-REDD	2010-2013	US $5.5 million	Formulation of national social and environmental standards, which cover several areas including enhancing governance and capturing the multiple benefits of REDD+ by a participatory approach
I,C,M	support for forest sector	GIZ	NA	NA	Support for legislation system, countermeasures against illegal logging, forest certification, database preparation for maps and satellite images
I	preparation for REDD+ system in Bandundun province	WWF	NA	NA	Preparation of carbon stock estimation/monitoring system in Bandundun province through satellite image analysis and survey
M	Support project for capacity development (CD) for sustainable forest management	AFD (France)	2011-	NA	CD for forest management planning for concession by logging companies, CD for DIAF staff, etc.
Malawi					
F	Activities for fire-fighting	Mulanje Mountain Conservation	Since 2003	NA	Conservation of natural resources of Mulanje Mountain - To organize fire-fighting group - To promote early burning

Cate-gory	Project name	Execution Agency /Donor	Period	Funding	Purpose and Activities
		Trust, GEF,			- To make firebreak
I	National Climate Change Program	UNDP, Norway, DFID, Japan	2010-2012	NA	System building to support national/local governance for environment, economic development and food security through preparation of carbon unit and carbon finance portfolio
I	Forest Preservation Programme	Japan	2012-2014	JY 1,700 million	Mitigation of climate change through collection of forest inventory data, and to evaluate land use
M	The project for Community Vitalization and Afforestation in Middle Shire (COVAMS)	JICA (Japan)	2007-2012	JY 390 million	Conservation of catchment area in order to mitigate siltation into the Middle Shire river -To provide technical training courses of soil conservation to support villager's practice, and for productive activities based on villager's needs.
M	Lake Chilwa Basin Climate Change Program	Norway	2010-2015	NOK35 million (1.00NOK =0.175USD)	Securement of livelihood of 1.5 million people in the Lake Chilwa Basin and conservation of their natural resource base -To enhance the capacity of communities to adopt sustainable livelihood and natural resource management practices
M	Sustainable Land Management：SLM	UNDP	2010-2014	US$ 2.7 million (GEF Fund)	Addressing land degradation in the Shire basin through improved institutional, policy and PES arrangements, driven by poor agricultural practices and deforestation through -To make policy and institutional arrangement for basin -To have private public partnerships providing financial incentives -To improve knowledge and skills at all levels -To increase access to credits for crop insurance
M,C	Shire River Basin Management Program	WB	2012-2018	US$ 136.30 million	Development of Shire River Basin planning framework to improve land and water management for ecosystem and livelihood benefits -To finance development of a modern integrated Shire Basin knowledge base and analytical tools -To rehabilitate and manage the catchment to reduce erosion and improve livelihoods (including preparation of forest management plan)

Cate-gory	Project name	Execution Agency /Donor	Period	Funding	Purpose and Activities
					-To invest to water-related infrastructure to strengthen climate resilience
Mozambique					
I	Project for the Establishment of Sustainable Forest Resource Information Platform for Monitoring REDD+	JICA (Japan)	2012-2017	JY 500 million?	1) Establishment of database System functioning as the Forest Resource Information Platform, 2) Development of Basis of MRV for the Forest Resource Information Platform, 3) Production of RELs/RLs for the Forest Resource Information Platform, and 4) Preparation of dataset of biomass and carbon estimation.
I	Forest Preservation Programme	Japan	2012-	JY 700 million	Satellite images, GIS and image analysis software, and forest survey equipment
I,M,F	Forest management expert	JICA (Japan)	2010-2013	NA	Policy advice on sustainable forest management and climate change countermeasures, and coordination for developing framework of international cooperation with multiple donors and project formulation.
I	Brazil-Mozambique Initiative	Norway	NA	N.A.	1) Facilitating steps towards the design of a National REDD Strategy for Mozambique, 2) supporting the preparation of the RPP to the World Bank, 3) strengthening technical, institutional and legal capacity within the scope of REDD, and 4) conducting viability studies to identify potential areas to implement REDD projects .
I,M	Support to National Forest Program	Finland	2009-2014	Euro 11 million	1) Improvement of the capacity of DNTF to carry out policy making, establishing a necessary regulatory framework for policy implementation, 2) enhancement of forest utilization, industrial development and business environment in forest sector, and 3) introducing Community Based Natural Resource Management (CBNRM) at Nampula, Cabo Delgado, Zambezia, Niassa.
I, C	Gile National reserve project	AFD (France)	2009-2012	Euro 5 million	improvement of the reserve management, Wildlife restoration and ecological monitoring, Community development and governance structure valorization of the buffer zone, and project monitoring &

Cate-gory	Project name	Execution Agency /Donor	Period	Funding	Purpose and Activities
					evaluation
I, F,C	Gile National reserve project Phase II	AFD (France)	2012-2014	Euro 5 million	Preparation of REDD+ implementation. Estimation of REDD+ potential, estimation of reduction of GHG emission, community organizing, pilotting small-scale livelihood activities with low carbon emission (conservation farming, sport hunting and eco-tourism)
I	Climate change Expert	DANIDA	NA	NA	Capacity building on climate change in MICOA
I	Deforestation studies by radar images	Edinburgh University, EU	NA	NA	Deforestation studies using ALOS PALSAR at Sofala and Manica provinces
O	Coastal protection project	UNDP GEF grant (LDC fund)	2012-2016	US$ 14 million	Coastal protection as adaptation of climate change
Namibia					
C	Community Forestry in Namibia Programme	KfW, German Development Service (DED), WWF	2008-	NA	Improvement of forest resource management and the livelihoods of local people, based on the Community-Based Natural Resource Management (CBNRM) model
Tanzania					
I	Comprehensive REDD+ Capacity Needs Assessment	UN-REDD, UNDP	2009-2011	US$ 4.3 million	Identification of who needs to be trained on what, and what else is needed for necessary capacity for REDD+, based on which five-year capacity development plan (2012-2017) and a range of measures to develop REDD+ capacity was proposed
I,F	National forestry resources monitoring and assessment (NAFORMA)	FAO Finland	2009-2012	US$ 5.9 million	Preparation of design methodology for National Forest Inventory 1)Harmonization of forest/land use classification system and state maps based on remote sensing data, 2)Producing new baseline information based on wide range of biophysical and socioeconomic data of the woody resources, 3) Design and implement management oriented inventory in priority areas, 4)Development of REDD+ monitoring tools, tested and integrated to the implementation, 5) Stu of local knowledge of fire use

Cate-gory	Project name	Execution Agency /Donor	Period	Funding	Purpose and Activities
I, M	Making REDD and carbon markets work for communities and forests	Tanzania Forest Conservation Group Norway	2009-2014	US$ 6 million	1) Development of community carbon cooperative with participatory forest management at 50,000 hectares of montane and lowland coastal/miombo forest in the Eastern Arc Mountains and coastal forests, 2) Introduction of participatory forest monitoring, 3) Establishment of REL baselines of deforestation rates, 4) Marketing carbon credits, 5) Testing benefit sharing mechanisms, and 4) addressing deforestation drivers
I	National carbon stock evaluation	WWF, Norway		US$1.5million	Evaluation of national carbon stock
I, M	Climate Change Initiative in the Southern Highlands	Wildlife Conservation Society (WCS), Norway	2011-2014	US$1.3million	Forest conservation at the southern highlands in Rungwe and Sumbawanga districts through 1) planting indigenous trees, 2) establishment of a locally managed Mt. Rungwe honey enterprise, 3) environmental education programme, 4) development of village woodlots and 5) a fire rapid response programme
I, M	REDD+ Strategy Development and Implementation Process	Institute of Resource Assessment (IRA), Norway	2011-2013	NOK 30 million	Strengthening of the national REDD+ secretariat, and support of establishment of National Carbon Monitoring Centre
I	Combining REDD, PFM and FSC certification in South-Eastern Tanzania	Mpingo Conservation & Development Initiative	2010-2014	US$ 1.9 million	Formulation of a system under which forests are saved and the sold carbon offsets based on the stored carbon goes to communities to be used to restore forests, etc.
I	Climate Change Impacts, Adaptation and Mitigation in Tanzania'	Sokoine University of Agriculture, University of Dar es Salaam, Ardhi University, Tanzania	2009-2014	NOK 94 million (1.00NOK =0.175USD)	Boosting of the capacity of research institutions in Tanzania and bringing them to the forefront of climate change research in the region

Cate-gory	Project name	Execution Agency /Donor	Period	Funding	Purpose and Activities
		Meteorological Agency, Norway			
Zambia					
M	Support to forest sector	Finland, Denmark	Since 1970s	Euro 9 million	Strengthening of forest sector - To manage Interim Environmental Fund - To support central and local governments - To support NGO programs - To have a project of CBFM
M	Reclassification and Effective Management of the National Protected Areas System Project	UNDP	2006-2012	NA	Organizing policies, regulations and governance through support to ZAWA
M, I	Integrated Land-use Assessment (ILUA) II	FAO, Finland	2010-2013	Euro 4 million	Strengthening capacity in planning and implementation of sustainable forest management (SFM) and REDD - To conduct forest vegetation survey in 5,000 plots including providing equipment and staff training
Zimbabwe					
F	Fire Management Project in Zimbabwe	FAO	2008-2009	NA	Decentralization of responsibility for fire-fighting through provision of extinguishing tools and training
C	Coping with Drought and Climate Change	UNDP, GEF-SCCF	NA	US$ 1. 9 million	Developing a range of coping mechanisms for reducing the vulnerability of small-holder farmers and pastoralists in rural Zimbabwe to future climate shocks

Category
F: Forest fire, C: Forest conservation & livelihood development, I: Forest inventory & REDD preparation, M: Forest management, O: Other

Appendix 7.
Utilization of Remote Sensing Technologies in Other Sectors in Southern Africa

1 Angola

1.1 Weather Sector

National Institute of Meteorology and Geophysics (Instituto Nacional de Meteorologia e geofisica: INAMET) under the Ministry of Telecomunications and Information Technology (Ministério das Telecomunicações e Tecnologias de Informação) receives data from geostationary satellite of the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) with an antenna installed at INAMET headquarters building for weather forecasting. They take training courses through the Preparation for Use of MSG in Africa (PUMA) project by EUMETSAT and approximately ten officers of INAMET can handle satellite data.

1.2 Mapping Sector

Geographic and Cadastral Institute of Angola (Instituto Geografico e Codastral de Angola: IGCA) under the Ministry of Urbanization and Construction (Ministério do Urbanismo e Construção) is in charge of survey and preparation/update of topographic and cadastral maps. The number of officers in IGCA is approximately one hundred. They have the headquarters office in Luanda and their regional offices in eighteen provinces respectively. The scales of Angolan maps IGCA maintains are as below.

1/2,000
1/100,000
1/500,000
1/1,000,000

The 1/100,000 scale map was updated over Angola supported by Russia in 1990, and the 1/25,000 scale map of Luanda was updated supported by JICA in 2000. Aerial data are used to update some city maps. Satellite data such as SPOT, QuickBird and Russian satellites are used to update other maps as well. Approximately fifteen officers can use the GIS software, and they use software such as ArcGIS, ArcView and GeoMedia.

2 Malawi

2.1 Weather Sector

The Department of Climate Change and Meteorological Services under the Ministry of Environment and Climate Change Management (MECCM) collect and disseminate weather related data according to the National Metrological Data Policy, which was not officially authorized by the government. The number of officers of the department is around 170. They have twenty-one stations over Malawi and two officers stay at each station. The weather information observed at the stations is gathered at the headquarters in Blantyre. The department forecasts weather based on this data together with the satellite observation data. The forecast is disseminated to the people thorough television, radio, and the internet.

The department receives data from geostationary satellite of EUMETSAT with an antenna installed at the headquarters in Blantyre. About twenty officers of the department can handle the satellite data and about ten officers can use the GIS software. They have one license of ArcView. The department is in charge of the draught component of AMESD project and they have already installed an antenna and computers, but the system is not operational yet.

2.2 Mapping Sector

The Survey Department, under the Ministry of Lands and Housing, in charge of preparation and update of maps, has the headquarters in Lilongwe, three provincial offices and several offices in the district level. They installed GIS only in the headquarters office. The number of the staff of the Survey Department is approximately three hundred. The department digitalized and updated the 1/50,000 scale map over Malawi with SPOT satellite data supported by the World Bank and Denmark. ArcGIS, GIS software, was installed when this project was conducted. The scales of the maps over Malawi the department maintains are as below.

1/50,000 (digital and paper maps)
1/250,000 (digital and paper maps)
1/1,000,000 (only paper map, one sheet that covers whole Malawi)

2.3 Mining Sector

The Geological Survey Department under the Ministry of Energy and Mining has been developing mineral resource database with GIS technology for one year and half since March 2012 through “Project for Establishment of Integrated Geographic Information System (GIS) Database for Mineral Resources” by JICA. In this project, five computers, five licenses of ArcGIS and another five licenses of ENVI were installed and the department purchased Aster data and PALSAR data from the Earth Remote Sensing Data Analysis Center (ERSDAC) as well as the Landsat data, free of charge. They have been learning how to use the software and satellite data thorough the training courses.

2.4 Agricultural Sector

The Land Resources Conservation Department (LRCD), as the agriculture component of AMESD project, receives products such as Normalized Difference Vegetation Index (NDVI), Dry Matter Productivity (DMP), soil moisture, temperature, precipitation, etc. from South Africa. This system is not operational yet. The department conducts AMESD training courses inviting SADC members and participants from drought and forest fire components. In the training courses, software ILWIS and satellite data products were provided from AMESD, and the trainees learned how to use these products.

2.5 Others

(1) National Spatial Data Centre

A coordination body for development of spatial information infrastructure, the Malawi Geographic Information Council (MAGIC) is proposing to establish the National Spatial Data Cnetre (NSDC) as an organization to manage geographical information which can be used for various purposes. The office of NSDC was tentatively set up in the building of the Survey Department, but it is not legally authorized yet. The table below shows the remote sensing related data sets that are considered to be shared.

Table : Remote Sensing Related Data Sets Considered to be Shared

Data Set	Scale	Department
Elevation	1/250,000	Department of Survey
SPOT(2000/1)	~1/25,000	Department of Survey
Landsat-7(2000/1)	~1/50,000	Multi Agencies
Ladsat-5(1994, 1984)	~1/100,000	Multi Agencies
Land Cover	1/250,000	LRCD

Forest Cover	1/250,000	Department of Forestry
Land Use	1/250,000	LRCD &/or Physical Planning
Soils	1/250,000	LRCD

(2) Resilience Initiative

The Open Data for Resilience Initiative (OpenDRI) funded by the World Bank developed a portal site "Malawi Spatial Data Portal (MASDAP)" at http://23.22.63.123/ , at which collected spatial information in Malawi together with NSDC and Shire River Basin Management Program is available. This site is originally prepared to share the data for disaster management, but now it has fourteen categories, agriculture, biodiversity, boundaries, climate, economy, elevation, exposure, health, hydrology, infrastructure, land cover, points of interest, population/soil, and spatial information.

3 Zambia

3.1 Weather Sector

The Meteorological Department under the Ministry of Transport, Works, Supply, and Communications has 203 officers and forty-one offices over Zambia. Each office observes weather information such as wind, atmospheric temperature, ground temperature, precipitation, etc., which is collected at the headquarters in Lusaka. Each office uses radio communication to talk to each other, as the fixed and mobile phones don't cover whole Zambia. The department has a remote sensing division which receives and processes data from weather satellites (NOAA and Meteosat) and forecast rainfall areas generating weather information products. They use ILWIS and ArcGIS for GIS software.

The department, as the drought component of AMESD project, receives SPOT VGT and other drought products from South Africa. However, the system is not operational yet and they are in the phase of evaluating the satellite data products with ground observation data. Regarding software, they use the Drought Monitoring Software (DMS) which was developed by CSIR of South Africa and GRASS software.

The department also participates in SAFNet, and participated in SAFARI2000 project (1999-2003) in the past, through which they evaluated satellite data for forest fire detection.

3.2 Mapping Sector

The Survey Department under the Ministry of Lands, Natural Resources and Environmental Protection develops a base map over Zambia with aerial photos and satellite data. In addition, the department generates thematic maps according to the requests from the other government organizations. They have approximately 200 officers and mapping, survey, and cadastral branches in the department. Their main office is located at Lusaka and they have regional offices in nine provinces respectively. The scales of Zambian maps the Survey Department maintains are as below.

1/50,000 (partial)
1/250,000 (Whole Zambia)
1/750,000 (4 sheets that cover whole Zambia)
1/500,000 (1 sheet that covers whole Zambia)

The maps the department maintains are supposed to be updated every eight years, but actually it

is not done. They hope to digitalize and standardize 1/50,000 topographic map so that the map can be seen on GIS seamlessly and a part can be extracted, but enough budget for that is not allocated. They have experience to use satellite data such as Landsat, SPOT, IKONOS, GeoEYE, WorldView, Aster, etc. They don't have a data server for archives while they have two licenses of ArcGIS software.

3.3 National Remote Sensing Center

The National Remote Sensing Centre (NRSC) was established in 2008 according to statutory instrument No.137 of 1999 of the Science and Technology Act of 1997. The mission of the centre is to provide timely, integrated, provision of easily accessible, reliable, up-to-date, remote sensing data and other geo-information products and services as a basis for decision making at different levels. NRSC has fifteen staff members including seven technical staff.

NRSC used to report to the Ministry of Science, but it was incorporated to the Ministry of Education, Science, Vocational Training, and Early Education (MESTVEE) at the time of the reorganization of the ministries in 2011. Currently NRSC is a parastatal organization under MESTVEE. As the government will reduce NRSC budget in the future, NRSC sells the training programs of GIS and RS (a few times per year, about two weeks per course) to other organizations. In the training courses, the Landsat data and ArcGIS9.2.3 (NRSC possesses ten licenses) are used. The trainees are government officers including local governments, from agriculture and forestry sectors.

NRSC participates in AMESD and is planning to obtain an antenna and other equipment by their own fund.

4 Zimbabwe

4.1 Weather Sector

The Meteorological Services Department, under the Ministry of Transport, Communication and Infrastructure Development, has sixty-five resident stations to cover whole Zimbabwe. The department receives the observation data from the weather satellite of EUMETSAT for weather forecasting with two receiving stations in the capital city Harare and Bulawayo in southern part of Zimbabwe. They also use SPOT VGT product downloaded from the website free of charge. The department has approximately thirty officers who can handle the satellite data. They have GIS software such as ArcGIS and ENVI, but currently these systems are not updated and used anymore because of budget shortage.

The department analyzes the Fire Hazard Index (FHI) with weather information and provides the warning information on forest fire in the eastern part for mainly private forest owners through television, Zimbabwe Broadcasting Corporation (ZBC) every day. The Environmental Management Agency (EMA) in charge of forest fire component of AMESD project needs weather information to forecast forest fire, but EMA doesn't collaborate with the other organizations in the area of forest fire. On the other hand, the Meteorological Services Department takes charge of drought component of AMESD and receives the related products from South Africa. The department also participates in international projects, i.e. the Preparation for Use of MSG in Africa (PUMA) and Monitoring of Environment and Security in Africa (MESA).

4.2 Mapping Sector

The Department of the Surveyor-General (DSG) under the Ministry of Lands has 3 branches, i.e. cadastral map, survey and topographic map. DSG is supposed to register lands, survey and collect geographic information, but currently doing almost nothing after the economic crisis by hyperinflation in 2007-2009. DSG has not used satellite data since around 1995 when they purchased SPOT data. DSG is not able to utilize satellite data even if they can have it free of charge because DSG lacks both human and financial resources and can't install enough equipment. The scales of Zimbabwean maps DSG maintains are as below. These maps are updated rarely and irregularly.

1/1,000,000
1/500,000
1/250,000
1/50,000 (covering whole Zimbabwe)
1/25,000
1/5,000
1/2,500 (covering only a few cities)

4.3 Others

(1) Scientific & Industrial Research & Development Centre (SIRDC)

Established in 1993, the Scientific & Industrial Research & Development Centre (SIRDC) has twelve research institutes, one of which, the Geo-Information and Remote Sensing Institute (GRSI) is in charge of GIS and remote sensing technology. GSRI has capabilities of satellite data pre-processing, geo-referencing, ortho-rectification, image interpretation, and image classification in the remote sensing field.

GSRI mainly uses optical sensors. In addition to MODIS and Landsat, GSRI purchases and uses high resolution satellite data, e.g. SPOT and WorldView. GSRI, in charge of the drought component of AMESD project, installed an antenna and two PCs and receives MODIS products generated by South Africa through a communication satellite along with EMA. Free software Quantum GIS is used at GSRI because the budget is not enough for commercial software.

(2) University of Zimbabwe

The Department of Geography & Environmental Science of the University of Zimbabwe (UZ) conducts capacity building activities for GIS/remote sensing. The department conduct researches on forest classification by high resolution satellite data, e.g. WorldView and GeoEYE and carbon estimation by modeling.

The department participates in AMESD project as a capacity building partner, and provides training courses for participants from not only Zimbabwe but also other AMESD member countries. The department has fifteen lecturers, fifteen researchers and the training equipment with twenty computers. Sometimes UZ conducts AMESD training courses with coordination by SIRDC.

UZ receives products such as MODIS, MSG, SPOT VGT through AMESD and other projects. UZ also receives Envisat archive data from ESA thorough a communication satellite. UZ prepared a 15TB storage system and the other equipment was installed supported by ESA. In addition, UZ used to receive Landsat data from South Africa but currently obtain the data from the United States Geological Survey (USGS) directly. UZ prefers and uses mainly open source software.

Appendix 8 List of Interviewees

Name	Organization	Position	Topics
Angola			
Yumi Yasuda	JICA Angola		JICA's cooperation for Angola
Kayo Ohmachi	JICA Angola	Assessor de formullacao de projectos	JICA's cooperation for Angola
Joao José Bartolomeu	JICA Angola	Project Assistant	JICA's cooperation for Angola
Filipe Kodo	Ministry of Environment, National Dir. Of Biodiversity	Operation	Fire Management in Angola
Nelson Afonso	National Service for Civil Protection and Fire	Technical	Fire Management in Angola
Benjamin Domingos	INAMET	Director General	RS/GIS in Angola
Francisco Osvaldo	INAMET	Director Technico	RS/GIS in Angola
Joao Filipe da Fonseca Xavier	Parque Nacional da Quiçama		Forest fire management in Quicama National Park
Domingos Nazare da Cruz Veloso	DNAPF	National Director	Forest/ Fire management in Angola
Sidonio Mteus	DNAPF	Chef departement of agricultrure and forestry	Forest/ Fire management in Angola
Simao Paquise Daniel	DNAPF	Chef division forestry	Forest/ Fire management in Angola
Dr. Manuel Enock	IDF	Deputy Director General	
Rodrigues NANGA	IDF	Chef departement planning and project	IDF activity, Forest/ Fire management in Angola
Paulo G. Vicente	FAO	FAO Rep. Assistant (Program)	FAO projects in Angola
Stella Monteiro	FAO	Assistante de Programa	FAO projects in Angola
Jose Mannuel da Coneeica	IGCA	Vice Technical Director	IGCA activity, RS/GIS in Angola
Olaf Jeurgensen	UNDP	Deputy Country Director, Programme	UNDP activities in Angola
Jose Novais Felix	UNDP	Programme Specialist, Poverty Cluster	UNDP activities in Angola
Gabriela Nascimentoe	UNDP		UNDP activities in Angola
Albertina Nzuzi	DNB	Director	Forest / Fire management in Angola
Botswana			
Nyambe Nyambe	SADC		SADC forest policy/program/GIZ cooperation
Wibke Thies	GIZ/SADC	Project coordinator	TFCA project/GIZ cooperation for SADC
Alexandra Muller	GIZ/SADC	Project coordinator	REDD project/GIZ cooperation for SADC
Moses Chakanga	GIZ/SADC	Forest officer	GIZ cooperation for SADC
Hiroyuki Kutsuna	JICA/SADC	JICA advisor,	JICA cooperation for SADC
Hiroshi Kubota	JOGMEC	General Manager	RS/GIS training
Joshua Jojigam Moloi	Department of forestry and range resources	Deputy director	Forest/Fire management in Botswana
Jeremian Freeman Ramontsho	Department of forestry and range resources	Chief forest and range resources officer	Forest/Fire management in Botswana
Motsereganyu Sekgopo	Department of forestry and range resources	Principal science officer	Fire management in Botswana

Anthony Nsunungull Tema	Department of forestry and range resources	Forest officer	Fire management in Botswana
Timmy Sankwasa	Chobe enclave conservation trust		Fire management in Botswana
Tomoko Miyata	JICA, Botswana	Project formulation advisor	JICA cooperation for Botswana
Isaac Modise Kusane	Botswanan Department of Meteolorogical Services	Project Manager	AMESD SADC Thematic Action
Thembani Moitlhobogi	Botswanan Department of Meteolorogical Services	System Engineer	AMESD SADC Thematic Action
Malawi			
Katsuro Saito	JICA	Resident Representative	JICA cooperation in Malawi
Ariko Toda	JICA		JICA cooperation in Malawi
Kosaku Ohnaka	JICA	Policy Advisor for Forest Conservation	JICA cooperation in Malawi
Kasizo Z. S. Chirambo	Forestry Department	Assistant Director of Forestry, Planning and Training Services	FD activites, Forest/ Fire management in Malawi
William Mitembe	Forestry Department	Principal Forestry Officer, Planning and Training Services	FD activites, Forest/ Fire management in Malawi
Francis Chilimampunga	Forestry Department	Assistant Director of Forestry, Forestry Development Services	FD activites, Forest/ Fire management in Malawi
Titus Zulu	Forestry Department	Principal Forestry Officer	FD activites, Forest/ Fire management in Malawi
Stella Gama	Forestry Department	Assistant Director of Forestry, Biodiversity Conservation and Ecosystem Services	Projects informations
Jeffrey Mzembe	Survey Department	Senior Photogrammetrist	RS/ GIS in Malawi, Land tenue system
Ramosh Jiah	Sdepartment of National Parks & Wildlife	Deputy Director	Forest/ Fire management
Joseph Kanyangalazi	Department of Land Resources Conservatio	Principal Land Rexources Conservation Officer	AMESD
Shamiso Nandi Najira	Environmental Affairs Department	Chief Environmental Officer	Climate change issue
Gerard MANDA	Regional Forest Office	Responsible for Law enforcement	Dzalanyama Forest Reserve
George Matekeyia	Dzalanyama Forest Reserve	Forest Guard	Dzalanyama Forest Reserve
Dr. C. Chilima	Forestry Research Institute of Malawi (FRIM)	Deputy Director of Forestry (Research)	Reserch related to Forest / Fire management
T. Chanyenga	Forestry Research Institute of Malawi (FRIM)	Principal Forestry Officer (Research)	Reserch related to Forest / Fire management
Gerald Meke	FRIM	Principal Forestry Officer (Research)	Reserch related to Forest / Fire management
Erick MMbingwani	FRIM	Forestry Research Officer	Reserch related to Forest / Fire management
Michael Likoswe	FRIM	Forestry Research Officer	Reserch related to Forest / Fire management
Dr. Leonard S. N. Kalindekafe	Geological Survey Department	Director	GIS/ RS
Messrs Nicholas Mwafulirwa	Department of Climate Change and Meteorological Services	Chief Meteorologist	GIS/ RS, AMESD, Climate change
Charles Vanya	Department of Climate Change and Meteorological Services	Principal Meteorologist	GIS/ RS, AMESD, Climate change
Ben Chitsonga	Malawi Communications Regulatory Authority (MACRA)	Director of Finance & Administration	Telecommunication in Malawi
Dlvin Mwapasa	Malawi Communications Regulatory Authority (MACRA)	Deputy Director of Finance	Telecommunication in Malawi
Carl Bruessow	Mulanje Mountain Conservation Trust (MMCT)	Executive Director	MMCT activities

Mozambique			
Joaquim Armando Macuacua	Dept. Natural Resources and Inventory	Head	Fire management
Yasuko Inoue	DNRI	JICA expert	Fire management/JICA cooperation
Castelo David	Institute of Disaster mgt	Director	Community-based emergency operation
Agnaldo Vila	Institute of Disaster mgt		Community-based emergency operation
Igor Honwana	Institute of Disaster mgt		Community-based emergency operation
Almeida Sitoe	Univ. Eduardo Mondlane	Professor	Biomass measurement in Mozanbique
Romana Bandeira	Univ. Eduardo Mondlane	Professor	Forest fire research in Mozambique
Rieb Ghislain	AFD		AFID project in Gile NP
Hubert Boulet	IGF foundation		AFID project in Gile NP
South Africa			
Prof. Paxie WC Chirwa	University of Pretoria	Professor	RS/GIS facilities for traning course
Avhashoni Renny Madula	DAFF Directorate: forestry regulation and oversight	Director	Forest/Fire management in South Africa
Tom Vorster	DAFF Directorate: forestry regulation and oversight	Deputy director	GIS RS for forestry
Radebe R. L.	DAFF	Assistant director forestry	Forest/Fire management in South Africa
Richard Tswai	ARC institute for Soil, Climate Change	Senior Researcher	Remote Sensing & GIS
Nick Zambatis	Kruger NP	Fire officer	Fire management at Kruger NP
Dr. Jane M Olwoch	Space agency (SANSA)	Managing Director	Head Office
Ms Asanda Ntisana	Space agency (SANSA)	Space & Stakeholder Liaison Manager	
Bruno Meyer	Space agency (SANSA)	Impact Projects	Manager for Hartebeesthoek ground station
Frikkie Meyer	Space agency (SANSA)	Technical Support	Engineer for Hartebeesthoek ground station
Konrad Wesseles	CSIR Meraka Institute	Principal Researcher	AMESD project progress in fire management
Philipe Frost	CSIR Meraka Institute		AMESD project progress in fire management
Lisa du Toit	Dept of Science and Technology		International cooperation in Science
Eugene Poolman	South African Weather Service	Chief forecaster	Weather network/forecast by RS
Shigeki Omura	Embassy of Japan, South Africa	Second Secretary	JICA cooperation in South Africa
Ken Oniwa	Embassy of Japan, South Africa	Minister	JICA cooperation in South Africa
Toshiyuki Nakamura	JICA	Assistant resident representative	JICA cooperation in South Africa
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Charles Ngatigwa	Tanzania Forest Service		Fire management in Tanzania
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Stephan Shirima	Tanzania Forest Service, Mapping divisition	Assistant director	NAFORMA project

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Hajime Iwama	JICA		
Zambia			
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Mamiko Tanaka	JICA	Assistant Resident Representative	JICA cooperation in Zambia
Marja Ojanen	Embassy of Finland	Councellor	Finland cooperation in Zambia
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Winnie Musonda	UNDP	Assistant Resident Representative & Environment Advisor	UNDP cooperatin in Zambia
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Edward Falanga	Meteorological Department	System Administrato/ AMESD Drought Service Focal Point	Department activities, AMESD
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Christopher Mwanza	Survey Department	Cartographer	Fire management, RS/ GIS in Zambia
Mpotwa Mukwasa	Survey Department	Cartographer	Fire management, RS/ GIS in Zambia
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Chuma Simukonda	ZAWA	Head of Research	Forest/ Fire management in National Park and Game Land
Dr. Augustine Mulolwa	NRSC	Director	RS/ GIS in Zambia
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Lad Kazembe	NRSC	Technical Expert	RS/ GIS in Zambia
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Mwenya Mutale	ZICTA	Manager Standards & Type Approval	Telecommunication technology in Zambia

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Zimbabwe			
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Joseph MUCHICHWA	Forestry Commission	Mapping Officer	FC activities, Forest/ Fire management in Zimbabwe
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Reynold Ndoro	Meteorological Sevices Department	Meteorologist Forecaster	RS/GIS in Zimbabwe
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Liolo Maguma	EMA	GIS Officer	Fire Management in Zimbabwe, AMESD Project
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Veronica N Gundu	Direction of Environment	Principal Environmental Officer	Climate Changes Issue in Zimbabwe
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Chipo Chanesta	DSG	Chief Cartographer	Cartographe in Zimbabwe, Land tenure system
Pndan Mupambakashe	DSG	Cartographic Technicaian	Cartographe in Zimbabwe, Land tenure system
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Dr. Amon Murwira	Univ. Zimbabwe, Dep. Geography & Environmental Science	Profesor	RS/GIS in Zimbabwe
Japan			
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Masami Fukuda	Fukuyama City University	Professor	Fire managemet by RS in Asia
Thailand			
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Vivarad Phonekeo	Geoinformatics center, AIT	Senior Researcher	RS/GIS workshop in AIT

Appendix 9. List of Collected Documents

Category

GN	**General**
FR	**Foresst**
RS	**Remote**
MT	**Meteorolog**
CM	**Communic**
MP	**Map**
OT	**Other**

No.	Category	Title	Publisher／Authur	Year	Form
1 Angola					
AG_01	OT (Env)	Programa de Investimento Ambiental Relatório do Estado Geral do Ambiente em Angola 2006　環境投資プログラム：アンゴラ環境White Paper2006	Ministério do Urbanismo e Ambiente 都市化環境省	2006	Report
AG_02	OT (BD)	Primeiro Relatório Nacional para a Conferência das Partes da Convenção da Diversidade Biológica　生物多様性条約締約国会議へのファーストナショナルレポート	Ministério do Urbanismo e Ambiente 都市化環境省	2006	Report
AG_03	OT (BD)	QUARTO RELATÓRIO DA BIODIVERSIDADE EM ANGOLA アンゴラにおける生物多様性の第4回報告書	MINISTÉRIO DO AMBIENTE DIRECÇÃO NACIONAL DA BIODIVERSIDADE 環境省生物多様性国家局	2010	Report
AG_04	OT (BD)	National Biodiversity Strategy and Action Plan (2007-2012) (NBSAP)	Ministério do Urbanismo e Ambiente 都市化環境省	NA	Strategy
AG_05	OT (Env)	Decreto n.º 51/04 de 23 de Julho 環境影響評価に関する法律	Angola Gov.	2004	Law
AG_06	OT (BD)	BIODIVERSITY Angolan Environmental Status Quo Assessment Report	IUCN	1992	Law
AG_07	OT (Env)	PROJECTO DE ESTATUTO ORGÂNICO DO MINISTÉRIO DO AMBIENTE	Angola Gov.	2010	Law
AG_08	OT (Env)	LEI No 5/98 DE 19 JUNHO 1998 環境基本法	Angola Gov.	1998	Law
AG_09	OT (Land)	Lei n.º 9/04 de 9 de Novembro 土地法	Angola Gov.	2004	Law
AG_10	OT (Land)	Lei nº. 3/04 de 25 de Junho 領地・都市の整備に関する法律	Angola Gov.	2004	Law
AG_11	FR	Anteprojecto da Política Nacional de Florestas, Fauna Selvagem e Áreas de Conservação 森林、野生動物と保護地域に関する国家Policy（ドラフト）	Ministério da Agricultura e Ministério do Ambiente 農業省・環境省	2009	Law
AG_12	FR	Política Nacional de Florestas, Fauna Selvagem e Áreas de ConservacAG: Documento de DiscussAG (Segunda versAG) 森林、野生動物と保護地域に関する国家Policy:討議資料（第二版）	Ministério da Agricultura e do Desenvolvimento Rural e Ministério do Urbanismo e Ambiente 農業農村開発省・都市化環境省	2009	Law
AG_13	FR	Regulament de Caça 狩猟規則	植民地政府	1957	Law
AG_14	FR	Decreto presidencial n°92/10 de 4 de Junho Estatuo organico de Ministerio da Agricultura, do Desenvolvimento Rural e das Pescas 大統領令第92/10号　農業農村開発漁業省の構成	Angola Gov.	2010	Law
AG_15	MT	INAMET's Modernisation Programme Strategic Development Plan (SDP) - Operationalisation for 2012 - 2018	INAMET	2011	Strategy
AG_16	FR	ESTRATÉGIA NACIONAL DE POVOAMENTO E REPOVOAMENTO FLORESTAL 森林回復国家戦略	Angola Gov.	2011	Strategy
AG_17	FR	PROGRAMA DE DESENVOLVIMENTO E GESTÃO PARA O SECTOR FLORESTAL　森林セクター発展管理計画	Angola Gov.	2008	Plan
AG_18	OT (CC)	ANGOLA NATIONAL ADAPTATION PROGRAMME OF ACTION UNDER THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)	Angola Gov.	2011	Plan
AG_19	FR	Fire Management on Rural Lands in Burkina Faso	MINISTRY FOR FOREIGN AFFAIRS OF FINLAND	NA	Report
2 Botswana					
BT_01	**GN**	VISION 2016 - A LONG TERM VISION FOR BOTSWANA	Botswana Gov.		Policy
BT_02	**GN**	NDP10 final	Botswana Gov.	2009	Policy
BT_03	**FR**	GLOBAL FOREST RESOURCES assessment 2010 COUNTRY REPORT BOT	FAO	2010	Report
BT_04	**FR**	Mohembo East Pilot Forest Inventory	DFRR	2009	Report
BT_05	**FR**	Elephant Management Plan	MINISTRY OF ENVIRONMENT, WILDLIFE AND TOURISM		Plan
BT_06	**FR**	MAKOMOTO FOREST INVENTORY REPORT	DFRR	2008	Report
BT_07	**FR**	COMMUNITY BASED NATURAL RESOURCES MANAGEMENT POLICY	MINISTRY OF ENVIRONMENT, WILDLIFE AND TOURISM	2007	Policy
BT_08	**FR**	South African Regional Environmental Programme Quarterly report	USAID	2011	Report
BT_10	**FR**	Agroforestry development in Botswana	Otsyna and Walker	1990	Report

BT_11	**GN**	Botswana National Atlas	Botswana Gov.	2000	Report
BT_12	**FR**	Forestry Outlook Study for Africa Botswana	FOSA		Report
BT_13	**FR**	Forest Act	Botswana Gov.		Law
BT_14	**FR**	WILDLIFE CONSERVATION AND NATIONAL PARKS Act	Botswana Gov.	1992	Law
BT_15	**FR**	AMESD SADC – Thematic Action Fire Information Service	AMESD		Brosure
BT_16	**OT**	BOTSWANA TOURISM MASTER PLAN FINAL REPORT	Department of Tourism	2000	Plan
3 DRC					
CG_01	FR	State_of_the_Forest_2010	OFA	2010	Report
CG_02	FR	REDD+Inventory Project for 3 countries	JICA	2011	Report(Japanese)
CG_03	FR	DRC Forest Inventory Support	JICA	2012	Report(Japanese)
4 Lesotho					
LS_01	FR	Lesotho Country Report	FAO	2010	Report
LS_02	FR	Info sheet Lesotho	FAO	2007	Report
5 Malawi					
MW_02	FR	National Forest Policy of Malawi	Ministry of Natural Resources	1996	Policy
MW_03	FR	Community Based Forest Management: Supplement to the National Forest Policy of Malawi, 1996	Government of Malawi	2003	Policy
MW_04	FR	Community Based Forest Management: Supplement to the National Forest Policy of Malawi, 1996; 3rd Draft	Government of Malawi	2001	Policy
MW_05	OT (CC)	Malawi's National Adaptation Programmes of Action (NAPA) under the United Nations Framework Convention on Climate Change (UNFCCC) First Edition	Environmental Affaires Department, Ministry of Mines, Natural Resources and Environment	2006	Plan
MW_06	OT (Land)	Malawi National Land Policy	Ministry of Lands, Physical Planning & Surveys	2002	Policy
MW_07	FR	Forest Plantations and Reserves in Malawi	Department of Forestry	2012	Data
MW_08	OT	Malawi Growth and Development Strategy: from Poverty to Prosperity 2006-2011	Government of Malawi	2006	Data
MW_09	OT	Malawi Growth and Development Strategy II: 2011-2016	Government of Malawi	2012	Data
MW_10	FR	Environmental and Natural Resources Management Action Plan for the Upper Shire Basin	Millennium Challenge Corporation	2010	Plan
MW_11	FR	Private Public Sector Partnership on Capacity Building for Sustainable Land Management in the Shire River Basin	UNDP	2010	Report
MW_12	FR	Project Appraisal Doc Shire River Basin Management Project	World Bank	2012	Report
MW_13	FR	Building Capacity for Integrated and Comprehensive Approaches to Climate Change Adaptation in Malawi	UNDP	2010	Report
MW_14	FR	Forests Act, 1997	Government of Malawi	1997	Law
MW_15	FR	Forests Act, 1968 (repealed)	Government of Malawi	1968	Law
MW_16	FR	Mulanje Mountain Conservation Trust Annual Report 2010-2011	Mulanje Mountain Conservation Trust	2011	Report
MW_17	FR	Forest Resources Mapping and Biomass Assessment for Malawi	Department of Forestry, Ministry of Forestry and Natural Resources	1993	Report
MW_18	FR	Malawi's National Forestry Programme: Priorities for improving forestry and livelihoods	Department of Forestry	2001	Plan
MW_19	OT (Env)	Malawi State of Environment and Outlook Report: Environment for Sustainable Economic Growth	Ministry of Natural Resources, Energy and Environment	2010	White Paper
MW_20	FR	Forestry HIV and AIDS Strategy	Department of Forestry	2007	Policy
MW_21	RS	1st AMESD Forum Kinshasa, 1-4 December 2009 Synthesis Report	AMESD	2009	Report
MW_22	OT	Loca Government Act, 1998	Government of Malawi	1998	Law
MW_23	OT	Malawi Decentralization Policy	Government of Malawi	1998	Policy
MW_24	FR	Guide to the Registration of Local Forest Organisations: Improving forest governance -- Improving rural livelihood	Department of Forestry	2007	Guideline
MW_25	FR	Fire Report 2000-2011	Department of Forestry	2011	Report
MW_26	FR	National Report on Forest and Forest Fire Monitoring in Malawi	Department of Forestry	2012	Report
MW_27	FR	Technical Order on Regulating Wood Utilisation on Customary Land	Department of Forestry	不明	Law
MW_28	FR	Standards and Guidelines for Participatory Forestry in Malawi	Department of Forestry	2005	Guideline
MW_29	FR	Decentralisation in Forestry - Moving Forward Together : Improving forest management & governance - for improved livlihoods	Department of Forestry	2006	Guideline
MW_30	FR	A Guide to Community Based Forest Management in Malawi (Draft)	Department of Forestry	2001	Guideline
MW_31	FR	Guidelines for Co-Management	Forestry Research Institute of Malawi	NA	Guideline
MW_32	FR	Co-Management Plans	Forestry Research Institute of Malawi	2000	Guideline
MW_33	FR	Forestry Act, 1997 (No.11 of 1997) Forest Rules, 2001	Government of Malawi	2001	Law
MW_34	FR	Forestry Act, 1997 (No.11 of 1997) Forestry (Amendment) Rules, 2003	Government of Malawi	2001	Law
MW_35	OT (Land)	Land Act, 1982	Government of Malawi	1982	Law
MW_36	OT (Land)	Customary Land (Development) Act, 1972	Government of Malawi	1972	Law
MW_37	OT (Env)	Environmental Management Act,, 1996	Government of Malawi	1996	Law
MW_38	OT	Local Government Act, 1998	Government of Malawi	1998	Law
MW_39	FR	National Parks and Wildlife Act, 1992	Government of Malawi	1992	Law
MW_40	FR	National Parks and Wildlife Act, 2004	Government of Malawi	2004	Law
MW_41	FR	Wildlife Policy	Department of National Parks and Wildlife	2000	Policy
MW_42	FR	Pamphlet : Lilongwe Nature Sanctuary	Department of National Parks and Wildlife	NA	Leaflet
MW_43	FR	Pamphlet : Mzuzu Nature Sanctuary	Department of National Parks and Wildlife	NA	Pamphlet

MW_44	FR	Pamphlet： Michiru Nature Sanctuary	Department of National Parks and Wildlife	NA	Pamphlet
MW_45	FR	Pamphlet： Lake Malawi National	Department of National Parks and Wildlife	NA	Pamphlet
MW_46	FR	Pamphlet： Vwaza Marsh Wildlife Reserve	Department of National Parks and Wildlife	NA	Pamphlet
MW_47	FR	Pamphlet： Liwonde National Park	Department of National Parks and Wildlife	NA	Pamphlet
MW_48	FR	Pamphlet： Nyika National Park	Department of National Parks and Wildlife	NA	Pamphlet
MW_49	FR	Financing Agreement between The European Commission and The Republic of Malawi: Improve Forest Management for Sustainable Livlihoods Phase II (IFMSL II)	European Commission / Republic of Malawi	2009	Agreement
MW_50	RS	AMESD SADC – NATIONAL TRAINING PROGRAMME	AMESD/SADC	2012	Training manual
MW_51	OT	National Parks and Wildlife (Amendement) Act	Government of Malawi	2004	Law
MW_52	FR	The Miombo in Transition: Woodlands and Welfare in Africa	CIFOR/Bruce Campbel	1996	Book
MW_53	RS	Spatio-temporal distribution of fire activity in protected areas of Sub-Saharan Africa derived from MODIS data	I. Palumbo, J.-M. Grégoire, D. Simonetti and M. Punga	2011	Report
MW_54	FR	MANAGING THE MIOMBO WOODLANDS OF SOUTHERN AFRICA - POLICIES, INCENTIVES, AND OPTIONS FOR THE RURAL POOR	Program on Forest (PROFOR)	2011	Report
MW_55	OT	Malawi State of Environment and Outlook Report - Environment for Sustainable Economic Growth	Ministry of Natural Resources, Energy and Environment	2010	Report
MW_56	FR	ミオンボ林における火災対策について(特に学術的観点から)	マラウィ森林保全アドバイザー 大仲幸作	2012	Report
MW_57	OT	MINES AND MINERALS POLICY OF MALAWI (Draft)	Ministry of Natural Resources, Energy and Environment	2011	Policy
MW_58	FR	PROGRESS REPORT JANUARY TO JUNE 2012	Forestry Research Institute of Malawi	2012	Report
MW_59	FR	NATIONAL FORESTRY RESEARCH STRATEGIC PLAN 2002 – 2007	Forestry Research Institute of Malawi	2002	Plan
MW_60	FR	Forestry Research Institute of Malawi - Established Staff -	Forestry Research Institute of Malawi	2010	List
MW_62	FR	FRIM Leaflet No. 2012001	Forestry Research Institute of Malawi	2011	Leaflet
MW_63	FR	Community-Based Management of Miombo woodlands in Malawi: Proceedings of a Nationale Workshop	Forestry Research Institute of Malawi	1999	Report
MW_64	FR	Project Promotion Training Course Document	Forestry Research Institute of Malawi	2000	Report
MW_65	MT	Organizational Structure for Department of Climate Change and Meteorological Services	Department of Climate Change and Meteorological Services	NA	Chart
MW_69	MP	NATIONAL SPATIAL DATA CENTRE Conceptual System Design	Government of the Republic of Malawi Malawi Geographic Information Council (MAGIC) Promotion of Soil Conservation and Rural Production (PROSCARP)	2003	Plan
MW_70	MP	SURVEYS DEPARTMENTS STAFF RETURN	Survey Department	2012	Chart
MW_71	FR	Inception Report Forest Resource Mapping Project under The Japanese Grant for the Forest Preservation Programme to The Republic of Malawi	Aisa Air Survey	2011	Report
MW_72	MP	Memorandum of Understanding on Data Sharing among Government Ministries and Other Spatial Data Producers in Malawi	NA	NA	MOU
MW_73	CM	Malawi Communications Act		1998	Law
MW_74	CM	Malawi Informat ion and Communicat ions Technology (ICT) Policy	Republic of Malawi	2003	Policy
MW_75	OT (Env)	National Environmental Policy	NA	NA	Policy
6 Mauritius					
MR_01	FR, RS	Response to Questionnire	Forestry Service	2012	Report
MR_02	FR	Organization Chart of Natioal Parks and Conservation Services	Forestry Service	2012	Chart
7 Mozambique					
MZ_01	**FR**	モザンビークにおける森林火災対策の取組について	井上泰子	2012	Report
MZ_02	**FR**	Distribution de quemada de pais			Data
MZ_03	**FR**	PLANO DE ACÇÃO PARA A PREVENÇÃO E CONTROLO À SQUEIMADAS DESCONTROLADAS 2008-2018	MICOA	2007	Report
MZ_04	**RS**	Proposta para um Sistema de Alerta e Monitoria das Queimadas SAMOQUE	DNRI	2012	PPT
MZ_05	**RS**	Quantifying small-scale deforestation and forest degradation in African woodlands using radar imagery	Casey et al.	2011	Paper
MZ_06	**FR**	Reducing deforestation and degradation in the Miombo forests of the Reserve of Gilé and its periphery" pilot projectNational	AFD	2011	Report
8 Namibia					
NM_01	FR	Namibia Country Report	FAO	2010	Report
NM_02	FR	Forest Information Sheet	FAO	2007	Report
NM_03	FR	Integrated Forest Fire Management (IFFM) in Namibia	ISDR	NA	Article
NM_04	FR	CBFiM case studies	NA	NA	Report (Part)
9 Seychelles					
SC_01	FR	Seychelles Country Report	FAO	2010	Report
10 South Africa					
SA_01	**FR**	National Veldfire Risk Assessment: analysis of explosure of social, economic ane environmental assets to veldfire hazzards in South Africa	CSIR	2010	Report
SA_02	**FR**	FIRE PROTECTION ASSOCIATION ANNUAL REPORT	FPA		Report
SA_03	**FR**	Fire incidence in South Africa 2007-2010	DAFF	2010	Map
SA_04	**FR**	Forest and veld fire monitoring information	DAFF	2010	PPT
SA_05	**FR**	National Veldfire Risk Classification	DAFF	2010	Map

SA_06	**FR**	Savanna woodlands	DAFF	2010	Map
SA_07	**RS**	Forest fire information system	CSIR	2012	PPT
SA_08	**FR**	Organizational structure	DAFF	2012	Chart
SA_09	**FR**	National Statistical fire reporting form	DAFF	NA	Form
SA_10	**FR**	Overview of national veld and forest fire act	DAFF	2012	PPT
11 Swaziland					
SW_01	**FR**	Swaziland Country Report	FAO	2010	Report
SW_02	**FR**	Forest Bill 2010	Government	2010	Bill
SW_03	**FR**	Final draft forest policy	Government	NA	Draft policy
SW_04	**FR**	Response to Questionnire	Departmentof Forestry	2012	Report
12 Tanzania					
TZ_01	**FR**	Financial statements report of TAFORI	TAFORI	2011	Report
TZ_02	**FR**	REDD+ Preparationl, Tanzania	Tanzania gov.	2011	Report
TZ_03	**FR**	THE FORESTRY SECTOR IN TANZANIA		NA	Report
TZ_04	**FR**	LESSONS LEARNED FROM NATIONAL FORESTPROGRAMME FACILITY ACTIVITIES IN TANZANIA	FBD	2010	Report
TZ_05	**FR**	MISITU NI MALI Forest is wealth	TFS	2012	Brosure
TZ_06	**FR**	National Forest Policy	Tanzania gov.	1998	Policy
TZ_07	**FR**	National Forest Programme in Tanzania	FBD	2001	Policy
TZ_08	**FR**	Forest Act	Tanzania gov.	2002	Law
TZ_09	**FR**	National Strategy for Reduced Emissions from Deforestation and Forest Degradation (REDD+)	Tanzania gov.	2011	Policy
TZ_10	**FR**	Johannesbur Summit 2002 Tanzania Forest profile	UN	2002	Report
TZ_11	**FR**	TFS establishment order	TFS	2010	Law
TZ_12	**FR**	Situation Assessment Report for Training Tanzanian Communities in Firewise Awareness & Basic Fire Fighting	Tanzania - South Africa Fire Management Coordination Project (TSAFMCP)GIZ	2011	Report
TZ_13	**GN**	TANZANIA LAND POLICY AND GENESIS OF LAND REFORM SUB – COMPONENT OF PRIVATE SECTOR COMPETITIVESS PROJECT	Tanzania gov.	2011	Report
TZ_14	**GN**	NATIONAL STRATEGY FOR GROWTH AND REDUCTION OF POVERTY (NSGRP)	VICE PRESIDENT'S OFFICE	2005	Report
TZ_15	**FR**	Field Manual Biophysical survey	NAFORMA	2012	Report
TZ_16	**FR**	Species List	NAFORMA	2012	Report
TZ_17	**FR**	Field Manual Socioeconomic survey	NAFORMA	2012	Report
TZ_18	**FR**	Soil carbon monitoring usingsurveys and modelling	FAO	2012	Report
13 Zambia					
ZM_01	FR	Integrated Land Use Assessment (ILUA) Zambia 2005-2008	Forestry Department	2009	Report
ZM_02	OT (Env)	ZEMAPamphlet	Zambia Environmental Management Agency	NA	Pamphlet
ZM_03	OT (Env)	Environmental Council of Zambia 2010 Annual Report	Environmental Councill of Zambia	2011	Report
ZM_04	OT (CC)	The National Adaptation Programme on Action (NAPA)	Ministry of Tourism, Environment and Natural Resources	2007	Plan
ZM_05	OT (CC)	Information Needs Assessment and Identification of Gaps in Climate Change	Ministry of Tourism, Environment and Natural Resources	2010	Report
ZM_06	OT (CC)	The Economics of Climate Change in Zambia	Ministry of Tourism, Environment and Natural Resources	2011	Report
ZM_07	OT (CC)	National Climate Change Communication and Advocacy Strategy	Ministry of Local Government, Housing, Early Education and Environmental Protection	2012	Strategy
ZM_08	OT (Env)	National Policy on Environment	Ministry of Tourism, Environment and Natural Resources	2007	Policy
ZM_09	OT (CC)	National Climate Change Response Strategy (NCCRS)	Ministry of Tourism, Environment and Natural Resources	2010	Strategy
ZM_10	CM	ZICTA Booklet 2010-2012 "Promoting Access to ICTs for All"	Zambia Information and Communications Tdchnology Authority (ZICTA)	NA	Pamphlet
ZM_11	GN	Science & Technology Act No 26 of 1997	Government of Zambia	1997	Law
ZM_12	RS	Fire Management Experiences in Zambia - AMESD – 2nd National Training Workshop, Lusaka	Zambia Environmental Management Agency (ZEMA)	NA	Presentation
ZM_13	RS	Strategic Plan 2011-2015	National Remote Sensing Centre (NRSC)	2010	Strategy
ZM_14	MT	METEOROLOGICAL DEPARTMENT ANNUAL REPORT 2005	Meterological Department	2005	Annual Report
ZM_15	MT	METEOROLOGICAL DEPARTMENT ANNUAL REPORT 2006	Meterological Department	2006	Annual Report
ZM_16	MT	METEOROLOGICAL DEPARTMENT ANNUAL REPORT 2007	Meterological Department	2007	Annual Report
ZM_17	CM	Coverage_Analysis_July_2012	ZICTA	2012	Analysis resuts
ZM_18	OT	Protect the Sky: Use methyl bromide alternatives	Zambia Environmental Management Agency	NA	Pamphlet
ZM_19	MP	Hunting Areas of Zambia 2012	Zambia Wildlife Authority (ZAWA)	2012	Map
ZM_20	OT (Env)	Environmental Management Act No.12-2011		2011	Law
ZM_21	FR	Forests Act 1973 (repealed)		1973	Law
ZM_22	FR	Forests Act 1999		1999	Law
ZM_23	FR	Forests (Amendment) Regulation, 2003		2003	Law
ZM_24	MP	Land Survey Act (Cap.188)		NA	Law
ZM_25	MP	Land Survey Regulations		NA	Law

ZM_26	MP	Land Survey (Amendment) Regurations		1998	Law
ZM_27	OT (Land)	Lands Act, 1995		1995	Law
ZM_28	OT (Land)	Lands (Amendment) Act, 1996		1996	Law
ZM_29	OT (Land)	Lands (Amendment) Act, 2010		2010	Law
ZM_30	OT (Land)	Lands (Customary Tenure)(Conversion) Regulations		NA	Law
ZM_31	FR	Local Forests (Control and Management) Regulations		2006	Law
ZM_32	OT	Local Government Act		NA	Law
ZM_33	OT	Local Government (Amendment) Act, 2010		2010	Law
ZM_34	FR	Wildlife Act		1998	Law
ZM_35	FR	Wildlife (Amendment) Act		2001	Law
ZM_36	OT	STATUTORY INSTRUMENT NO. 141 OF 1996, The Environmental Protection and Pollution Control Act (Act No. 12 of 1990), The Air Pollution Control (Licencing and Emissions Standards) Regulations, 1996.	Government of Zambia	1996	Law
ZM_37	OT	STATUTORY INSTRUMENT NO. 28 OF 1997, The Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, 1997	Government of Zambia	1997	Law
ZM_38	OT	THE ENVIRONMENTAL MANAGEMENT ACT, 2011	Government of Zambia	2011	Law
ZM_39	OT	THE ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL ACT, 1990	Government of Zambia	1990	Law
ZM_40	OT	Statutory Instrument No125 of 2001, Environmental Protection and Pollution Control Act No 12 of 1990, The Hazardous Waste Management Regulations (Statutory Instrument No125 of 2001)	Government of Zambia	2001	Law
ZM_41	OT	NATIONAL ENERGY POLICY	Ministry of Energy and Water Development	2008	Policy
ZM_42	OT	NATIONAL WATER POLICY	Ministry of Energy and Water Development	2010	Policy
ZM_43	OT	STATUTORY INSTRUMENT NO. 27 OF 2001, Environmental Protection and Pollution Control Act (Laws, Volume 12, Cap. 204), Environmental Protection and Pollution Control Act (Ozone Depleting Substances) Regulations, 2000	Government of the Republic of Zambia	2001	Law
ZM_44	OT	STATUTORY INSTRUMENT NO. 20 OF 1994, The Environmental Protection and Pollution Control Act (Act No. 12 of 1990), The Pesticides And Toxic substances Regulations, 1994.	Government of Zambia	1994	Law
ZM_45	OT	STATUTORY INSTRUMENT No.72 OF 1993, The Environmental Protection and Pollution Control Act, 1990 (No. 12 of 1990), The Water Pollution Control (Effluent and Waste Water) Regulations, 1993	Government of Zambia	1993	Law
ZM_46	OT	NATIONAL POLICY ON ENVIRONMENT, FINAL DRAFT	Ministry of Tourism, Environment and Natural Resources	2005	Policy
ZM_47	OT	THE WATER RESOURCES MANAGEMENT ACT, 2011	Government of Zambia	2011	Law
ZM_48	OT	Kabwe District State of Environment Outlook Report	Kabwe Municipal Council and Environmental Council of Zambia	2010	Report
ZM_49	OT	LIVINGSTONE DISTRICT STATE OF ENVIRONMENT OUTLOOK REPORT	Livingstone City Council and Environmental Council of Zambia	2008	Report
ZM_50	OT	Lusaka City State of Environment Outlook Report	Lusaka City Council and Environmental Council of Zambia	2008	Report
ZM_51	OT	Chipata District State of Environment Outlook Report	Chipata District Council and Environmental Council of Zambia	2008	Report
ZM_52	OT	State of Environment Report	Environmental Council of Zambia	1994	Report
ZM_53	OT	State of Environment Report in Zambia 2000	Environmental Council of Zambia	2000	Report
ZM_54	OT	Zambia Environment Outlook Report 3	Environmental Council of Zambia	2008	Report
ZM_55	FR	Chart for FD	Forestry Department	NA	Chart
ZM_56	FR	Zambia Forest Action Plan (without cover page)	Forestry Department	NA	Plan
ZM_57	FR	National Forestry Plicy (without cover page)	Forestry Department	NA	Policy
ZM_58	FR	Orisins and Destinations : Proposals for the Establishment of the Zambia Forestry Commission	Forestry Support Programme	2004	Report
14 Zimbabwe					
ZW_01	FR	National Policy (Report FC)	Forestry Commission		Report
ZW_02	RS	Study Items on remote sensing (report FC)	Forestry Commission		Report
ZW_03	FR	Forest Act			Law
ZW_04	FR	Communal Land Forest Produce Act			Law
ZW_05	OT (Env)	Environmental Management Act			Law
ZW_06	FR	Parks and Wild Life Act			Law
ZW_07	OT	Councils Act			Law
ZW_08	OT	Chiefs and Headmen Act			Law
ZW_09	FR	FAO Fire Management Working Paper, Vth International Wildland Fire Conference			Report
ZW_10	FR	Zimbabwe Parks and Wildlife Management Authority: Five Year Strategic Plan 2011-2015	PWLMA	2010	Plan
ZW_11	RS	AMESD introduction			Movie
ZW_12	FR	NGAMO Safaris Ganda Lodge Jafuta Lodge	Forestry Commission	NA	Pamphlet
ZW_13	OT (Env)	Data Collection Survey on Forest Conservation in Southern Africa for Climate Change	Environmental Management Agency	NA	Report
ZW_14	OT (Env)	National Environmental Policy and Strategies	Ministry of Environment and Natural Resources Management	2009	Policy
ZW_15	OT (Env)	Protect Your Environment - Prevent Veld Fires	Environmental Management Agency	NA	Pamphlet

ZW_16	OT (Env)	Hazardous Substances	Environmental Management Agency	NA	Pamphlet
ZW_17	OT (Env)	Environmental Management Act (CAP 20:27) and the Entrepreneurs	Environmental Management Agency	NA	Booklet
ZW_18	OT (Env)	Environmental Management Agency Annual Report 2009	Environmental Management Agency	2010	Report
ZW_19	RS	Geographical Information System (GIS) Manual	Environmental Management Agency	2012	Manual
ZW_20	OT (Env)	Zimbabwe Environment Outlook: Zimbabwe's Third State of the Environment Report	Ministry of Environment and Natural Resources Management	2010	White Paper
ZW_21	OT (Env)	Zimbabwe Environment Outlook: Executive Summary: Zimbabwe's Third State of the Environment Report	Ministry of Environment and Natural Resources Management	2010	White Paper
ZW_22	OT (Env)	Fire Season is here. Is your community ready?	Environmental Management Agency	NA	Poster
ZW_23	OT (Env)	2011 Fire Report	Environmental Management Agency	2012	Report
ZW_24	OT (Env)	Fire Report as as 20 July 2012	Environmental Management Agency	2012	Report
ZW_25	OT	Zimbabwe United Nations Development Assistance Framework 2012-2015	Government of Zimbabwe	2012	Plan
ZW_26	OT (Env)	National Fire Protection Strategy and Implementation Plan	Ministry of Environment and Tourism	2006	Strategy
ZW_27	RS	Intellect - A University of Zimbabwe Academic Magazine -	University of Zimbabwe	2012	Magazine
ZW_28	FR	FOREST CONSERVATION AND MANAGEMENT IN ZIMBABWE A Presentation for the JICA Delegation, 23 July, 2012	Forestry Commission	2012	Presentation
ZW_29	RS	Remote Sensing Activities In Zimbabwe	Forestry Commission	2012	Presentation
ZW_30	RS	Land cover and land use Changes in the SADC Region - A GIS and Remote sensing Approach	University of Zimbabwe	NA	Presentation
ZW_31	RS	The response of elephants to the spatial heterogeneity of vegetation in a Southern African agricultural landscape	University of Zimbabwe	2005	Thesis
ZW_32	RS	Monitoring change in the spatial heterogeneity of vegetation cover in an African savanna	University of Zimbabwe	2006	Thesis
ZW_33	RS	Remote sensing of the link between arable field and elephant (Loxodonta africana) distribution change along a tsetse eradication gradient in the Zambezi valley, Zimbabwe	University of Zimbabwe	2009	Thesis
ZW_34	RS	Integration of mid-infrared spectroscopy and geostatistics in the assessment of soil spatial variability at landscape level	University of Zimbabwe	2010	Thesis
ZW_35	RS	Comparing direct image and wavelet transform-based approaches to analysing remote sensing imagery for predicting wildlife distribution	University of Zimbabwe	2010	Thesis
ZW_36	RS	Response of aquatic macro-invertebrate diversity to environmental factors along the Lower Komati River in Swaziland	University of Zimbabwe	2010	Thesis
ZW_37	RS	Simulation of streamflow using TOPMODEL in the Upper Save River catchment of Zimbabwe	University of Zimbabwe	2011	Thesis
ZW_38	RS	A common dominant scale emerges from images of diverse satellite platforms using the wavelet transform	University of Zimbabwe	2011	Thesis
ZW_39	RS	An IKONOS-based comparison of methods to estimate cattle home ranges in a semi-arid landscape of southern Africa	University of Zimbabwe	2011	Thesis
ZW_40	RS	The use of multi-temporal MODIS images with ground data to distinguish cotton from maize and sorghum fields in smallholder agricultural landscapes of Southern Africa	University of Zimbabwe	2012	Thesis
ZW_41	RS	Farming does not necessarily conflict with tree diversity in the mid-Zambezi valley, Zimbabwe	University of Zimbabwe	2012	Thesis
ZW_42	RS	The spatial prediction of tree species diversity in savanna woodlands of Southern Africa	University of Zimbabwe	2012	Thesis
ZW_43	RS	Explaining elephant (Loxodonta africana) and buffalo (Syncerus caffer) spatial distribution in the Zambezi Valley using maximum entropy modelling	University of Zimbabwe	2012	Thesis
ZW_44	RS	Relationship between remotely sensed variables and tree species diversity in savanna woodlands of Southern Africa	University of Zimbabwe	2012	Thesis
ZW_45	RS	Comparing terrain and vegetationbased visibility for explaining sable flight behaviour in a Southern African savanna	University of Zimbabwe	2012	Thesis
ZW_46	RS	Selection of Optimum Vegetative Indices for the Assessment of Tobacco Float Seedlings Response to FertilizerManagement	University of Zimbabwe	2012	Thesis
ZW_47	CM	POSTAL AND TELECOMMUNICATIONS ACT	Government of Zimbabwe	2000	Law
ZW_48	FR	Zimbabwe Integrated Fire Management Strategy 2009-2011: Community Based Fire Management Training Manual	Forestry Commission / Environmental Management Agency / FAO	2009	Manual
15 Workshop Results					
WS_01	OT	Technical Workshop Results	Local consultant ad others	2012	Report
WS_02	OT	Policy Workshop Results	Local consultant ad others	2013	Report
16 SADC policies and programs					
SD_01	FR	Protocol on Forestry	SADC		Policy
SD_02	FR	SADC FORESTRY STRATEGY: 2010-2020	SADC	2010	Policy
SD_03	FR	SADC SUPPORT PROGRAMME ON REDD	SADC	2011	Policy
SD_04	FR	SADC Regional Fire ManagementProgramme Document	SADC	2010	Policy
SD_05	FR	SADC REGIONAL CONSULTATIVE WORKSHOPONDEVELOPMENT OF A SADC FIREMANAGEMENT AND CROSSBORDERCOOPERATION PROGRAMME	SADC	2010	Report
SD_06	FR	TFCA project logical frame	SADC	2012	Paper
SD_07	FR	Status of new German technical support to SADC for Transboundary Use and Protection of Natural Resources	SADC	2012	PPT