REDD+ in Mopane woodlands of Southern Africa

Background

The region of the Southern African Development Community (SADC) is home to 375 million hectares of forest and forest-like formations. Dry forests account for the largest share of SADC's forests and are present in almost all 15 SADC countries. According to FAO, annual net forest loss in the region amounts up to 0.46% per year (2005-2012), resulting in high biomass losses and carbon emissions. Although the extent of forest cover change and the drivers of deforestation vary between different countries, forest cover change is mainly driven by agricultural expansion, energy production and logging activities. It is estimated that SADC is responsible for half of biomass carbon losses in Africa due to deforestation.

Against this background, there is a high potential for the SADC countries to participate in the financing mechanism REDD+, which is currently being developed at the international level to reward developing countries for avoided deforestation and forest degradation (DD).

Countries aiming for REDD+ participation have to meet a number of requirements including the development of monitoring systems to measure, report and verify changes in forest cover and related carbon emissions (MRV systems). However, most SADC countries have limited resources to develop and maintain those systems.

From 2011 to 2015 the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH worked together with the SADC Secretariat on a project to develop MRV systems. The testing of MRV systems was carried out at pilot sites that represented forest ecosystems typical for the region.

The technical development and implementation has been developed by the consulting consortium GAF/DFS, in close cooperation with the national forest directorates and other relevant national institutions.

This brochure outlines some characteristics of the dry forest type "Mopane" with a focus on biomass, forest cover changes and related emissions at the project's test site for Mopane. On condition that further data is collected, the data collected within the project can be used to establish a reference level against which future areal changes of forest and emissions can be measured.

Mopane

The broadleafed woodland-type "Mopane" includes the tree *Colophospermum mopane*

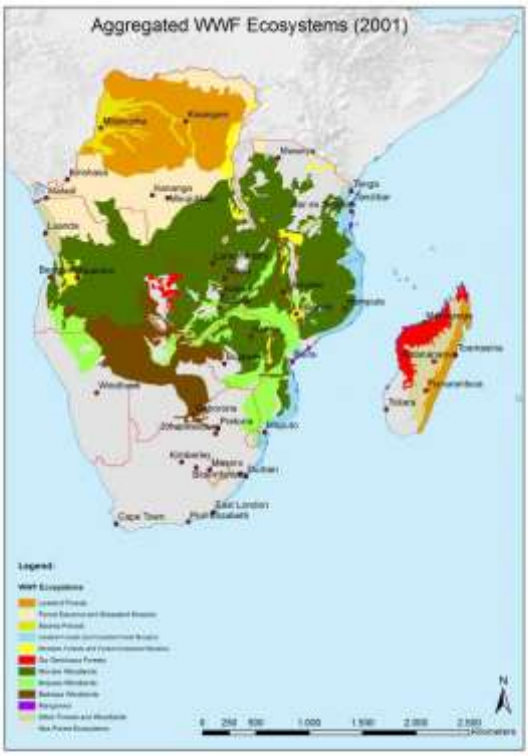
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of:

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

of the Federal Republic of Germany

that tends to outcompete many other trees (Timberlake et al., 2010). Mopane woodland is found on nutrient-rich soils of wide river valleys at low altitudes, such as the Limpopo, Zambezi, Okavango, Cunene, Shire and Luangwa rivers. It covers an area of 380,000 km² across southern Angola, northern Namibia, northern and eastern Botswana, Zimbabwe, northern South Africa, southern Zambia, southern Malawi and south and central Mozambique.



WWF Ecosystems (2001) map showing the distribution of Mopane woodland in light-green colour.

REDD+ MRV design

The MRV includes a forest inventory to determine biomass and so called Emission Factors (EFs) and satellite image interpretation to assess areal changes of the forest. Emissions released between 2000 and 2010/13 have been calculated by multiplying EFs with the area changes.

The project determined only gross emissions, which means that the carbon balance of the land replacing the forest, such as cropland, grassland and settlement, was ignored. Nevertheless, gross emissions resulting from deforestation are reported for each land use change category separately. The project achieved its objective to develop a MRV system that meets globally agreed upon criteria for reporting under REDD+.

Pilot site results

The project assessed two pilot sites of Mopane woodland, one in Mozambique and one in Namibia.

The pilot site in Mozambique covers approximately 26,000 km². It begins at the eastern shores of Lake Cahora Bassa, stretches along the Zambezi-river, and ends at the southern tip of the country.

Initially, the project aimed at testing the field inventory and the processing of satellite images from this pilot site. However, no field inventory was carried out, because there was a latent threat from land mines that remain from the civil war. Consequently, emissions from this test site could not be calculated.

The processing of satellite images from 1990, 2000 and 2010 provides the following results:

The loss of forest at the pilot site amounts to 198 km² between 1990 and 2000 and 648 km² between 2000 and 2010. Even though deforestation has been small, it has increased steadily. Among the deforestation drivers, agricultural expansion contributed the largest loss of forest, followed by deforestation due to grazing livestock.

There is a clear trend of increasing degradation: The areal extend of degraded

Inventory team working in Mopane woodland in Namibia. Picture: U. Flender.

forest appeared larger on images from 2010 (14,392 km²) than on images from 2000 (12,042 km²) that showed more degraded areas than images from 1990 (7,894 km²). Nevertheless, the rate of degradation slowed down in the second decade. In relationship to the area of intact forest land in 1990, the annual gross degradation rate was 3,13% during the first decade and rose marginally to 3,43% in the second decade. Degradation has a substantially greater impact on the forest at the test site than deforestation, which calls for further investigation into the drivers of degradation.

Given the cancellation of the forest inventory in Mozambique, the project relied on the test site in Namibia to ascertain biomass and emissions in Mopane woodlands. In Namibia data was collected between September and November 2014.

The test site covers 10,700 km² and is located in the North Western part of Namibia. It includes several protected areas and a small part of Etosha National Park.

The inventory revealed that tree stems contain on average 13.25 tonnes biomass per hectare. Thereof *Colophospermum mopane* trees store 6.4 to/ha. Further measurements of biomass took place within designated parts of the pilot site. On the basis of satellite image interpretation the pilot site had been stratified into intact and non-intact forest strata. The non-intact forest is an indicator for areas where degradation occurs. Very similar biomass amounts in the intact and non-intact forest strata suggest that degradation is insignificant. This was supported by what the inventory team saw. Thus, emissions resulting from degradation were not calculated.

Below, it is stated how much forest was converted into other land uses between 2000 and 2013; and how much emissions this released:

Forest to Cropland: 20 ha/year, 451 tonnes CO_2/year

Forest to Settlement: 26 ha/year, 591 tonnes CO_2/year

Mopane trees providing shadow to a lion. Picture: U. Flender.

Most deforestation took places in the form of conversion of forest land into settlement (mainly roads).

Conversion	Annual Change	Carbon Content	Emissions
Forest Land (FL) – Crop Land	**19.62 ha/year**	**6.27 t C/ha**	**-451.06 t CO_2/year**
FL – Settlement	**25.70 ha/year**	**6.27 t C/ha**	**-590.67 t CO_2/year**

Results from the test site in Namibia

This project is part of the International Climate Initiative (IKI). The German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) supports this initiative on the basis of a decision adopted by the German Bundestag.

References

Timberlake, J., Chidumayo, E.N. and Sawadogo, S. (2010). Distribution and Characteristics of African Dry Forests and Woodlands, in E. N. Chidumayo and Davison J. Gumbo (eds), The Dry Forests and Woodlands of Africa: Managing for Products and Services.

WWF (2001). Terrestrial Ecoregions of the World: A New Map of Life on Earth, November 2001 / Vol. 51 No. 11, Bio Science 933 Zambia

Published by

Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) GmbH

Alexandra Mueller, Project Coordinator
Development of integrated monitoring systems for REDD+ in SADC
Alexandra.mueller@giz.de
P/Bag X12 Gaborone
Botswana

Secretariat of the Southern African Development Community (SADC)
Nyambe Nyambe, Senior Programme Officer
Natural Resources Management
nnyambe@sadc.int
P/ Bag 0095 Gaborone
Botswana