REDD+ in Baikiaea 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

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 "Baikiaea" with a focus on biomass, forest cover changes and related emissions at the project's test site in Baikiaea woodland. 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

Baikiaea

Baikiaea, also called Zambezi teak, is a deciduous broadleaved woodland type that is dominated by *Baikiaea plurijuga.* This 6 to 10 meter high tree can keep its leaves until late in

giz 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

the dry season, because of its ability to access water from the deep soil (Timberlake et al., 2010). Other common species of Baikiaea woodland are *Pterocarpus angolensis*, *Guibourtia coleosperma* and *Schinziophyton rautanenii.* Within some parts of the Baikiaea zone, patches with a deviating tree composition are embedded. While *Baikiaea* dominates on the deeper Kalahari sands, *Burkea africana* thrives on the narrower sands. In western Zimbabwe, *Brachystegia spiciformis* comes in, forming a transition to more typical Miombo woodland (Timberlake et al., 2010).

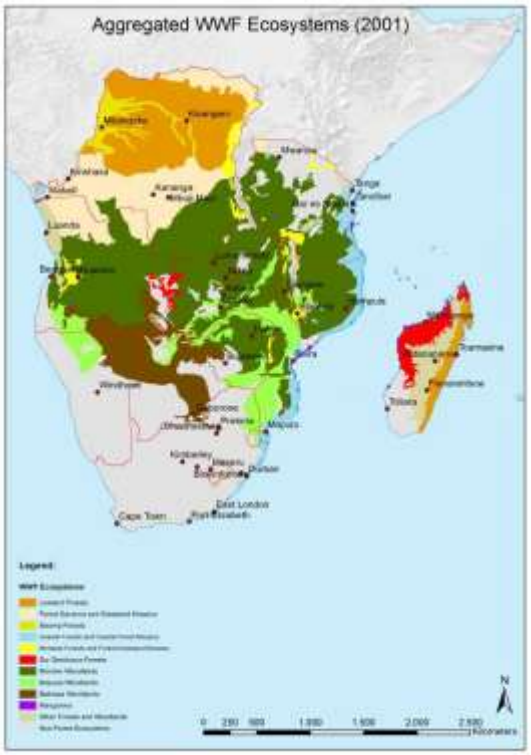
Distribution:

Baikiaea woodland covers an area of 265,000 km² that stretches from northwest Zimbabwe, across northeast Botswana and southwest Zambia to northeast Namibia and southeast Angola.

***Baikiaea plurijuga* tree. Source: en.wikipedia.org/**

Usage: *Baikiaea* is famous for its hard heavy timber.

Aggregated WWF Ecosystems (2001) map showing the distribution of Baikiaea woodland in brown 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 pilot site has a size of 26,000 km² and is located in Kasane district in the north of Botswana. Most of the pilot site is situated in Chobe National Park.

A substantial amount of the test site falls within the boundaries of a forest reserve, where no human activity is allowed.

The results of the biomass inventory are as follows:

On average 29.44 tons above ground biomass per hectare were measured. 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. The average biomass per hectare in the intact forest strata (29.57 to/ha) is similar to that in the non-intact forest strata (28.29 to/ha).

Below, it is stated how much forest was converted into other land uses between 2000 and 2010; and how much emissions this released:

Forest to Cropland: 7 ha/year, 456 tonnes CO_2/year

Forest to Grassland: 49 ha/year, 3165 tonnes CO_2/year

Forest to Settlement: 40 ha/year, 2624 tonnes CO_2/year

Due to the insignificant difference between intact and non-intact forest strata in terms of biomass, no emissions resulting from degradation were calculated.

Based on statistical calculations the structure of the non-intact forest can be described as more homogenous than that of the intact forest. The stocking volume of the non-intact forest strata increases with the vicinity to human settlements, whereas biomass decreases. The reason is that the number of trees declines, while volumes of individual trees increase. Especially, *Mopane* trees with

Baikiaea woodland in the dry season. Picture: U. Flender.

higher wood density than other trees occur in this area. The homogeneity of the forest structure may be a positive effect from the vicinity to human settlements. The human population protects bigger trees from wild fires and browsing by wildlife. On the other hand it clears the area of young trees, which inhibits regeneration.

Although the project did not include a detailed assessment of drivers of DD, a brief assessment was carried out as part of the inventory. The results are as follows:

Fire has damaged the forest particularly in the east in the proximity of agricultural land.

All over the pilot site much of the forest has been damaged by elephants that feed on the trees. Wild fires and intensive browsing destroy the bigger trees and encourage coppicing. Consequently, much of the forest regeneration is formed by coppice. Regeneration reaches with 30,000 trees per hectare a very high density. Poles and saplings amount to 3000 individuals per hectare.

However, it is unclear whether degradation caused by wildlife can be addressed under REDD+, because it may not fall within the category of human induced degradation.

It is questionable whether the results from the pilot site reflect the situation of less protected Baikiaea woodlands. However, they can provide lessons for countries with too high wildlife populations in national parks.

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, BioScience 933.

Department of Forestry Malawi, Department of Forestry 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