Assessing Forest Reserve Conditions in Ghana through Crown Cover Mapping

Technical Report

Background

Since the conclusion of REDD+ negotiations at the international level, the need to integrate REDD activities with forest restoration activities at the landscape level has become more imperative. Incorporating forest landscape restoration (FLR) into REDD+ implementation will not only ensure a more holistic and sustainable approach to reducing emissions and optimizing benefits, it will also contribute to the more efficient use of rather scarce resources. Recently IUCN, in cooperation with the World Resources Institute, the University of Maryland and the Global Partnership on Forest Landscape Restoration, mapped worldwide potential for landscape restoration. This analysis identified up to two billion hectares of degraded lands worldwide that are suitable for restoration, a number large enough to galvanize support for an international restoration movement. As an expression of this movement, the Bonn Challenge target was launched at a ministerial roundtable hosted by the German government in 2011. The Bonn Challenge calls for the restoration of 150 million hectares of deforested and degraded lands by 2020.

Ghana is one of the REDD+ participating countries with which IUCN has been involved in the REDD readiness process. The country’s remaining forest cover has been quite reduced and degraded in recent years. In order to continue to meet its nation’s forest resource needs, the government of Ghana recently initiated programmes and activities designed to restore lost forests. To contribute to this process, IUCN began to map forest landscape restoration (FLR) opportunities in Ghana throughout 2011, culminating in the production of an FLR Opportunity map. This mapping exercise was conducted under the “Assessing and Capitalizing on the Potential to Enhance Forest Carbon Sinks through Forest Landscape Restoration while Benefiting Biodiversity” project supported by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).

Despite covering most of Ghana, the FLR Opportunity map produced by IUCN only considered FLR opportunities outside of existing forest reserves. The condition of forest reserves, and the opportunities for restoration in these areas, remained to be assessed. The extent to which this
additional analysis was required only became clear after the production of the first opportunity map. This report presents the process and findings of a second, complementary mapping effort, which considered forest condition within existing reserves.

The exercise was based on detailed work by the Government of Ghana undertaken in the early to mid 1990s to the classify forest reserves into six condition categories, as reported in Hawthorne and Abu-Juam’s 1995 IUCN book *Forest Protection in Ghana*.

**Methodologies used to produce the Ghana Forest Reserve Condition Mapping**

The production of a forest condition map entails three broad categories of forest classification:

1) A broad classification based on forest canopy cover and different eco-zones.
2) Classification based on micro levels of forest reserves.
3) Classification based on real biodiversity levels.

Due to resource constraints, IUCN only supported mapping under the first two broad categories through the project here reported. The third and final category involves considerable fieldwork and financial resources. The Ghana Ministry of Lands and Natural Resources and the Forestry Commission have committed to undertake this aspect of the analysis after the canopy cover mapping exercise (#1) is completed.

The following were the activities carried out under this project:

a) **Development of a savannah zone classification criteria.**

As referenced above, in 1995 Hawthorne and Abu-Juam developed systems to assess the state and health of forest reserves in Ghana. This system was based on the degree of disturbance in the forest plot at any one time (the balance of disintegration and recovery in the forest mosaic) by which a forest could be judged healthy or otherwise. The condition score runs from 1 to 6, with condition 1 forest reserves showing minimal signs of disturbance and condition 5 forests being seriously degraded, with few upper canopy trees. Condition 6 reserves have no significant forest cover at all. Scores 1-3 are low to moderate disturbance, deemed ecologically tolerable, with healthy, vital parts of the mosaic in the ascendance and regeneration of timber trees and other forest plants usually abundant. Well-managed selective logging should generate condition 2-3 forest by the end of a felling cycle. Scores 4-6 are applied to forests that have suffered slight degradation over more than half the reserve or heavy degradation over more than one-quarter of it. Very often significant parts of the forest mosaic have poor regeneration of timber trees and other forest plants, generally because of lack of ‘good’ parts of nearby forest mosaics. Badly managed logging typically produces conditions 4-5 in a forest. In dry areas these forests are susceptible to repeated wildfires because of the density of flammable, young pioneer plants in
the dry season, and this has often lead to deterioration of forests to condition 5 or 6, particularly where agro-forestry has been encouraged. The scores applied in the work of Hawthorne and Abu-Juam (1995) were based on observation, conversations with forest staff working in the area, the results of tree inventories and spot satellite imagery (in decreasing order of importance).

Currently, reliance on the Hawthorne and Abu-Juam (1995) assessment has two obvious limitations: 1.) It has not been updated since 1995; and 2.) It is rather limited in scope (i.e., it only considered forest reserves in the high forest zone). Expanding the degradation assessment across the whole of Ghana’s reserves was of a high priority. This calls for re-thinking the landscape assessment approach into a larger process that takes into consideration other major vegetation types in Ghana, such as Savannah Zones, which constitute 66 percent of Ghana’s land area.

It is important to mention that the NORAD PILaR project contributed to the development of criteria and indicators to generate a forest condition scoring in the savannah zones of Ghana. It also helped identify gaps and inconsistencies in the earlier criteria and indicators for the high forest region of the country.

b) Production of a draft Forest Condition map based on canopy cover.

This mapping project built on contributions from the following institution: i.) The Forest Services Division and the Resources Management Support Centre (RMSC) of the Forestry Commission (contribution detailed below), and ii.) The Centre for Remote Sensing and Geographic Information System (CERSGIS) of the University of Ghana, which developed and provided of satellite data useful for the production of the draft forest cover maps.

The RMSC of the Ghana Forestry Commission was contracted to produce a national draft forest condition map based on the crown cover percentages using the most recent satellite imageries available and complemented by the recent Forest Protection Programme of the FC supported by the Government of Japan.

A total of four forest conditions were identified in the draft maps based on crown cover percentages (Map 1):

a) Closed Canopy Forests with 60 to 100% Crown Cover;
b) Open Canopy Forest I with 30 to 60% Crown Cover;
c) Open canopy Forests II with 15 to 30% Crown Cover; and
d) Open Canopy Forests III with less than 15% Crown Cover.
Map 1: Draft Forest Condition Map
c) Ground-Truthing by the Forest Districts.

The draft maps produced were printed and sent to all 56 forest districts of the Forest Services Division of the FC to allow District Managers and the Range Supervisors to ground-truth draft maps and become acquainted with the process of production and the objective of the mapping exercise. This also served as an opportunity for the various districts to involve local communities in the exercise.

d) Validation of Draft Map through Sub-Regional Workshops

The ground-truthing process was complemented by three sub-regional workshops with the participation of relevant forest authorities in order to further validate the draft maps. For this purpose, the following three geophysical zones were defined:

a) The Forest zone comprised of the Central, Greater Accra, Volta and Western regions;
b) The Transitional zone comprised of Ashanti, Brong Ahafo, and Eastern regions; and
c) The Savannah zone – comprised of the Northern, Upper East and Upper West regions.

Sub-Regional workshops were held at selected cities in each zone: Takoradi for the Forest zone; Kumasi for Transitional zone; and Tamale for the Savannah zone. The ultimate goal of these workshops was primarily to engage local knowledge to assess and improve the draft maps and, further, to identify gaps in the analysis.

The workshops began with the provision of general information about forest restoration and its importance to the environment and livelihoods. The processes employed during the production of the draft maps were also described.

The workshops were able to successfully: i.) Increase awareness among the participants of the project objectives and FLR concepts and principles, and ii.) Obtain institutional interest and commitment to collaborate in the development of final forest condition maps for Ghana. The outcome of the three workshops are summarised below:

**Savannah Zone Sub-Regional Workshop (Tamale)**

The Northern region workshop brought together District Managers and Range Supervisors from the ten (10) forest districts in Upper East, Upper West and Northern region. This workshop was organized on 17th March, 2014 at Nim Avenue Hotel, Tamale. It had 33 participants, including the IUCN-Ghana team and resource persons from RMSC. Initially, the savannah zones in Ghana were not classified as forest due to the low biodiversity components present but most parts qualify as forests according to the definitions of REDD. The total forest reserves were 57, with 22 in the northern region, 19 in the Upper East region, and 16 in the Upper West region. The groups validated their forest reserve crown covers and proposed changes to several of them based on the four categories. The groups concluded that the use of satellite imagery might have
captured other green vegetations that were not forest and also some forests which were not captured.

*Transition Zone Sub-Regional Workshop (Kumasi)*

The workshop was organized on 1st April, 2014 at the Excelsa Lodge, Kumasi. The workshop brought together the District Managers and Range Supervisors from Ashanti, Brong Ahafo and Eastern regions of Ghana as well as two (2) resource persons from RMSC and three (3) facilitators from IUCN-Ghana. These three regions have a total of nineteen (19) forest districts. The participants were grouped into the three regions present to validate the crown covers of their forest reserves based on the four classifications and indicate forests which were not mapped. Finally, many changes were made to the draft map and missing forests were identified by the groups.

*Forest Zone Sub-Regional Workshop (Takoradi)*

The workshop was organized on 15th April, 2014 at Akroma-Plaza Hotel in Takoradi. Participants of the workshop were district managers and range supervisors from Western, Volta, Central and Greater Accra regions with facilitators from IUCN-Ghana and RMSC. The four regions include 19 forest districts. The participants were organized into four groups, which helped validate the condition maps of their district forests. The district managers and range supervisors recommended many changes based on the current conditions of their forest reserves.

e) Production of the Final Forest Condition Map

The GIS Unit of the RMSC produced the final map by using all the information obtained during the ground truth processes at the various districts and the 3 sub-regional workshops. The final map also had four categories, as follows (Map 2):

a) Closed Canopy Forests with 60 to 100% Crown Cover
b) Open Canopy Forest I with 30 to 60% Crown Cover
c) Open canopy Forests II with 20 to 30% Crown Cover, and
d) Open Canopy Forests III with less than 20% Crown Cover.
Map 2: Canopy Cover map of Ghana Forest and Game Reserve
Conclusion

The approach and methodology employed in the implementation of this project have been approved and supported by the Government of Ghana, particularly the Ministry of Lands and Natural Resources and the Forestry Commission, which have a mandate to manage forest reserves in Ghana. The final forest reserves condition map based on canopy crown cover shows many existing forest reserves require restoration intervention, in addition to the areas outside of reserves identified in earlier maps. The mapping effort revealed the following:

- It provides evidence to support new strategies and initiatives, such as those related to REDD+ and FIP.
- It demonstrates the need to increase collaboration between projects and programmes in Ghana, as well as to share information about the outputs of existing projects, such as the Forest Preservation Program (FPP) supported by the Japanese Government. This sharing will enable cross-fertilisation of ideas and the spread of information. The FC has offered to share all useful information that has been gathered through the FPP, which will be necessary to upgrade the current forest reserve condition map from one based solely on crown cover to one that includes important biodiversity and human intervention components.
- It emphasizes the importance of district level knowledge in mapping and other knowledge gathering processes. This source of knowledge must be considered in national processes, a fact which cannot be over-emphasized.

Equipping Decision-Makers

The Government of Ghana has determined to complete the additional efforts needed to incorporate biodiversity and human interventions component into the existing map of forest reserves. This will guarantee the production of a more complete and useful forest condition map for Ghana.