Assessment of the Potential Carbon Financing of A REDD project in the Itombwe Reserve, Eastern Democratic Republic of Congo

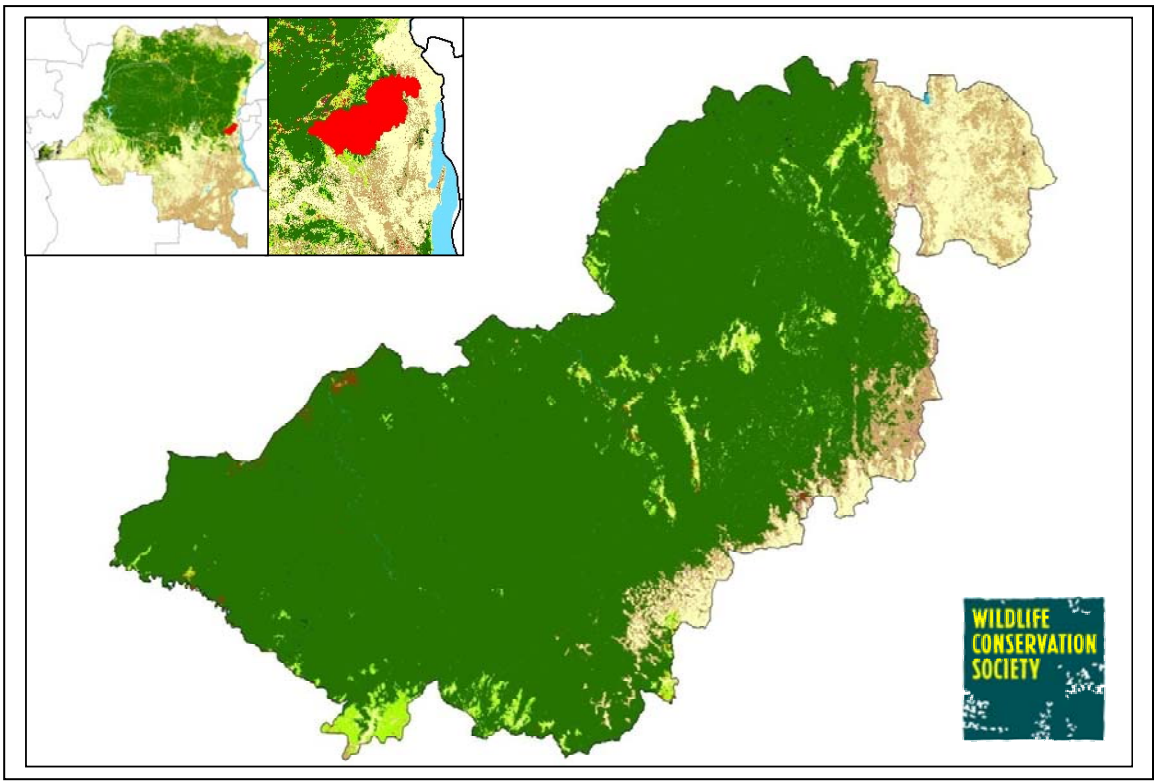

Figure 1: The Itombwe area (red in small map) in Google Earth, overlaid with the forest loss map of DRC (source: Hansen *et al.* 2010).

A Reduced Emissions from Degradation and Deforestation (REDD+) project

Through carbon credit sales from avoided deforestation, the Itombwe Project will protect a large track of sub- and montane rainforest, maintain ecosystem functions and services, conserve endangered montane biodiversity and create sustainable livelihoods for local communities. The establishment of the Itombwe Reserve Project is based on an integrated approach to reduce human threats to the region's forests, while at the same time addressing the needs of the local communities and engaging these communities in the management of the protected area. The project combats the principal cause of deforestation in the area—slash-and-burn agriculture, driven by subsistence and cash income for a growing population.

Project Location: Democratic Republic of Congo (DRC)

The Itombwe forest forms the south east corner of the Congo Basin rainforest in eastern DRC and represents an important tract of sub- and montane rain forest. The forests of Itombwe are a key, intact rainforest stronghold and of the most important site for threatened and endemic species in the Albertine Rift, itself the most biodiverse region in Africa for vertebrate conservation.

Project Area: 648,989 ha of which 605,806 ha are forest and 43,183 ha are woodland

Current Greenhouse Gas emissions: 222,434 tons of CO_2e per year from deforestation

Total emission reductions over 20 year project lifetime: 4.4 million tons of CO_2e by 2031.

Assuming 15% leakage and 90% successful reduction of deforestation this project would generate 17.0 million USD for the site at a carbon price of 5 USD/tCO2e

Carbon calculations

Future green house gas emissions are determining by the carbon density of the forest and the rate of deforestation. The historic deforestation rate is used to project deforestation over a minimum project life time of 20 years.

The carbon density was determined by measuring all trees with a diameter above 10cm at breast height in 84 circular plots with a 20m radius. The algorithm of Baker *et al.* 2004 was used to calculate biomass of all trees in the plot, which converted to carbon by multiplying it by 0.5 (C) and converted to carbon dioxide by multiplying it by 3.67(CO2e), divided by 1000 (tCO2e) to obtain tonnes carbon dioxide and multiplied by 7.96 to convert it to on hectare (tCO2e/ha) (Table 1.).

The rate of deforestation was determined overlapping in GIS the DRC forest loss map of Hansen *et al.* 2010, and the outline of the site (Figure 1). Inside the proposed reserve forest lost during the period 2000-2005 and 2006-2010 was calculated and used to calculate the mean annual deforestation rate (ha/yr) over the last 5 year (Table 2). This rate was used to calculate the projected deforestation over the project life time.

The yearly emissions from deforestation were calculated for primary and secondary forest, and woodland separately; inside the proposed reserve and in a 5km buffer zone around the reserve (Table 3). Deforestation inside the proposed park was used as a conservative estimate of emissions. Deforestation in the buffer zone was used to calculate a more realistic estimate of emissions. Deforestation of forest in the buffer zone is almost 5 times as high as in proposed reserve, 1063 and 221 ha per year respectively. Deforestation of woodland in the buffer is much lower than in the proposed reserve, 73 and 121 ha per year, respectively.

A conservative estimate based on deforestation inside the proposed reserve gives a current emission of 222,434 tCO2e per year, a total emission of 4,448,682 tCO2e over 20 years, regenerating a gross revenue of 22,243,410 USD at a carbon price of 5USD per tCO2e and a net revenue of 17 M USD. A more realistic estimate based on deforestation in the buffer zone gives a current emission of 613,576 tCO2e per year, a total emission of 12,271,518 tCO2e over 20 years, regenerating a gross revenue of 61,357,590 USD at a carbon price of 5USD per tCO2e and a net revenue of 46.9 M USD (Table 4).

Table 1. Mean carbon density in Itombwe (tCO2e/ha) based on 84 plots.

Trees with a	dbh*>10cm	dbh>30cm
Primary forest	1050	992
Secondary forest	350	331
woodland	263	248

*dbh=diameter at breast height

Table 2. Current forest cover, historic deforestation (ha) and annual rate of loss in Itombwe

	2000-2005	2006-2010	2011	Annual (ha/yr)
Primary forest	-274	-809	584,990	-162
Secondary forest	-337	-295	20,816	-59
Woodland	-292	-607	43,183	-121

Table 3. Yearly deforestation and emissions per vegetation formation

	Deforestation (ha/yr)		Emissions (tCO2e/yr)	
	inside	buffer	inside	buffer
Primary forest	162	318	169,949	334,001
Secondary forest	59	744	20,639	260,543
Woodland	121	73	31,847	19,032

Table 4. Emissions and revenue from avoided deforestation

	conservative	realistic
Emissions		
Annual	222,434	613,576
Project	4,448,682	12,271,518
Revenue $US		
Gross	22,243,410	61,357,590
Net	17,016,209	46,938,556

Project Description

In 1996, Wildlife Conservation Society (WCS) undertook surveys of the Itombwe massif, in particular its populations of the endangered Grauer's gorilla. Follow up surveys in the 2000s showed that the site was of global biodiversity importance with many endemic species confined to this site. In 2006 the Minister of the environment for DRC made a unilateral gazettment of a Natural Reserve to conserve the site but this decision did not have any clearly described boundaries leading to conflict over its establishment with local communities. WCS helped lead a process of conflict resolution with WWF and the Rainforest Foundation and the local communities which has led to the joint development of an agreed zoning plan for the area to include core protected areas, sustainable use zones and development zones for the communities. This zoning plan covers and area of 648,989 ha and we want to assess the ability to finance its conservation as well as help improve the livelihoods of the communities present here through carbon markets. A socio-economic study identified the main agents and drivers of deforestation and assessed the willingness of the local population to establish a protected area. Successful, establishment will ensure a reduction in green house gas emissions, bring rural sustainable development and reduce the loss of biodiversity.

Causes of deforestation

- **Slash and burn agriculture**: Slash and burn agriculture is the immediate cause of deforestation principally for subsistence and partially for cash income. Forests or fallow are, cut burned and planted with rain-fed crops. After a few years the fields are usually abandoned and cultivation moves elsewhere. Slash and burn agriculture can be a sustainable form of agriculture in tropical forests and does not require clearing of old growth forest as long as fallow periods are long enough and human population density remain slow.
- **In-migration and new planned roads**: A planned new road through Itombwe will make the adjacent forest accessible to a migrating rural population in search of unclaimed forest. Increased settlement in combination with sub-optimal yields from slash and burn agriculture will rapidly exacerbate the current low deforestation rate.
- **Small scale or illegal mining:** Mining, occurring on the western side of Itombwe, is becoming an increasingly important source of income for the local communities causing significant forest loss, due to open-air extraction and more and larger settlements**.** A Canadian Company BANRO has part of its concession overlying the proposed reserve and there is a need to work on a solution to this problem.
- **Unsustainable hunting practices:** The vicinity of larger towns around Itombwe with a high demand for bushmeat leads to overhunting. The new planned roads and improved accessibility will attract hunters and lead to extraction at a commercial scale eroding the viability of the existing fauna in the forest.

Underlying these activities are factors such as open access to forest resources, increasing pressure from people settling in the forest to avoid insecurity around the massif, poverty and increasing human populations that are driving unsustainable resource use. The Itombwe Project focuses its interventions at improving local farmer welfare and empowerment to address these underlining causes of forest clearance.

Climate benefits

The Itombwe Project will prevent more than 4.4 million tCO2e of greenhouse gas emissions at the most conservative estimate and possibly up to 12.3 million tCO2e if deforestation rates at the edge of the reserve spread into it over the course of 20 years. From 2006 to 2010, forest alone has been lost at a rate of 221 ha per year within the reserve and over 1000 ha per year outside. This is close to a fourfold increase of the deforestation rate from 2000 to 2005. Without the Itombwe Project, 4,416 ha of forest – 1 % of the project area –would be deforested based on the business as usual scenario inside the reserve and up to 21,240 ha (3.5%) if rates of deforestation at the edge spread into the reserve. This analysis is based on plot data for trees with diameter at breast height (dbh) of 10 cm and above and a carbon density of 1050 tons CO2e/ha.. The low baseline deforestation rate coupled with a very high carbon density accounts for the high emission reductions potential.

Biodiversity benefits

Itombwe forest is part of the Kivu subcentre of plant endemism which harbors high and unique plant diversity. Itombwe forest also contains hundreds of bird and animal species and more threatened and endemic species than any other site in the Albertine Rift Ecoregion, itself the most important region for vertebrate conservation in Africa. Several species are only found here including eight amphibians, two birds and some small mammal species. It is one of the most biodiverse sites in Africa, it is lilely to have been a Pleistocene refugium during the last ice age and its protection is critical for biodiversity conservation on this continent.

Ecosystem Service benefits

In addition to biodiversity benefits, the Itombwe forest serves as a zone of watershed protection and catchment, which are providing clean water to the neighboring towns and villages. A planned hydroelectric dam will rely on the water from this massif to generate power for the surrounding villages and towns. Keeping the forest also helps to mitigate climate change as the cooling effect of the forest will reduce the temperature increase predicted for the region as rains in this part of the Albertine Rift become increasingly monsoonal. By stemming deforestation, the Itombwe Project will not only reduce the loss of critical habitat, habitat degradation and fragmentation, but also have a net positive impact by preserving ecosystem service integrity.

Community Benefits

The main threat of deforestation agents and driving force are the in-migrating populations from outside Itombwe as well as unplanned expansion of villages within the massif. Many villages are little more than small hamlets of 5-10 huts, making it impossible to deliver development to the people. By establishing development zones we aim to identify areas where everyone is happy for development projects to be established and which will encourage voluntary migration to benefit from these projects, thereby reducing forest loss in mature forest areas. The rural population (about 13,000 households) currently in and around Itombwe are not a major threat to the forest. These households will be the main beneficiaries of the Itombwe project, both indirectly through improvements in ecosystem service provisioning and directly from governance structures, livelihoods interventions and benefit sharing agreements.

Management Approach

The Itombwe Project adopts an integrated approach to reduce human threats to the region's forest, while at the same time addressing the needs of the local communities by improving household welfare, strengthening governance and land use, and engaging these communities in the management of the protected area.

The Itombwe Project includes the following activities to reduce deforestation:

1. **Establishment of the reserve limits in a participatory manner**. A three-part zoning system is proposed which comprises core protected areas, sustainable use zones where harvesting of some forest products will be undertaken in a sustainable manner and development zones, where community development projects will be encouraged. To delimit the zones, WCS has been working with WWF, Rainforest Foundation and Africa Capacity to survey the massif, engage the communities, design a proposed zoning scheme based on the surveys and community responses and we are now taking the proposed scheme to the communities again for discussion and final approval.

2. **Building capacity for local sustainable resource management:** In the sustainable use zones there will be a need to agree on the products that can be harvested and amounts to be harvested. WCS will work with communities to identify sustainable offtake levels as well as establish community monitoring schemes to ensure that harvesting doesn't exceed sustainability.

3. **Rural development and alternative revenue creation:** The Itombwe Project will include a significant number of interventions to enhance the welfare of local communities and their management of resources in the development zones. We aim to encourage development agencies to support health and education projects in these zones.

4. **Engage with the Mining sector to minimize impacts:** We will be engaging BANRO and other companies planning on mining in the region to ensure that they do not mine in the reserve and that they make parts of their concessions within the reserve an offset for their activities elsewhere in their concession. We will also aim to engage artisnal mining groups to minimize their impacts in the reserve and avoid core protected areas within the zoning plan.

5. **Creation of equitable benefit sharing mechanisms:** In the event of a REDD project and a carbon sale, the Government of DRC and Itombwe communities will develop an agreement outlining the carbon revenue sharing and management mechanism for the Itombwe Project. A foundation or similar entity designated by the parties will be in charge of the transparent management and disbursement of funds made available under the agreement.