Greater Virunga Transboundary Collaboration
Collaboration Transfrontalière de la Grande Virunga

GREATER VIRUNGA TRANSBOUNDARY REDD+ ACTION PLAN

2013

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ABOUT the GREATER VIRUNGA TRANSBOUNDARY COLLABORATION (GVTC)

The Greater Virunga Transboundary Collaboration is the coordinated effort between the national park agencies of Democratic Republic of Congo (ICCN), Rwanda (RDB) and Uganda (UWA) to ensure the protection of the unique biodiversity of this landscape and to develop innovative approaches to reduce the intense human pressure on this landscape.

Leal, M.E., G. Nangendo and A. Plumptre and T. Evans (2013) Greater Virunga Transboundary REDD+ action plan, WCS Albertine Rift Program, Kampala, Uganda.

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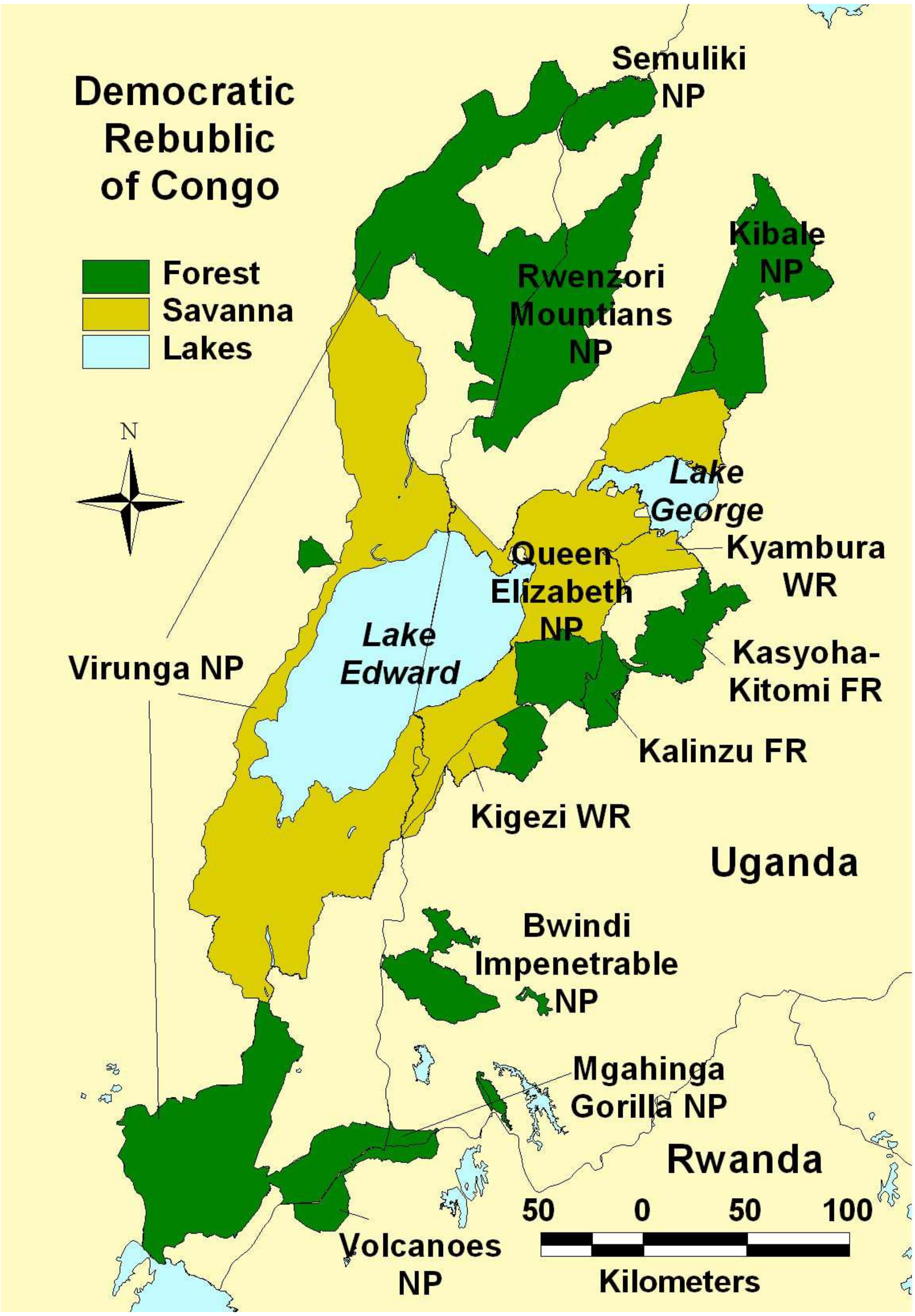

Figure 1. The Protected Areas (PAs) in the Greater Virunga Landscape (source A.J. Plumptre)

1 INTRODUCTION

The Greater Virunga Landscape (GVL) is a priority landscape for conservation straddling the borders of Democratic Republic of Congo (DRC), Rwanda and Uganda. Conservation challenges in this landscape include the intense pressure from the growing human population and its dependence on natural resources, and in DRC re-occurring insecurity. An emerging threat is the proposals to survey the landscape for oil extraction around Lake Edward.

The GVL is home to some 1,409 terrestrial vertebrate species of which 100 are endemic to the Albertine Rift and 56 are recognised as globally threatened. It also contains at least 3,755 plant species of which 141 are endemic to the Albertine Rift and 53 globally threatened (Plumptre, in press). As a result of this incredible biodiversity the GVL includes some of the first national parks created in Africa (Figure 1). It is the most species rich landscape on the continent and its habitat diversity ranges from snow peaks to active volcanoes, from rift lakes to smaller crater lakes, from savannah grasslands and woodlands with mega-fauna to forests with a wide diversity of primates (Plumptre et al. 2007).

The forests in the Greater Virunga Landscape add up to some 481,061 ha and makeup 35 % of the landscape (Figure 2). Besides their natural beauty, appreciation by tourists, and their importance for much of the biodiversity found in the landscape, these forests are important for the whole landscape for other reasons. Without forest the GVL would be much drier in general, subject to wildfires, smaller rivers and streams would be much more seasonal and the lack of available water would seriously limit the abundance of wildlife and biodiversity.

1.1 Climate change and forests

Since the industrial revolution greenhouse gases from fossil fuels have increased the capacity of the atmosphere to store heat. As a result the global average temperature of the atmosphere has increased and is now at the capacity to melt the polar ice sheets and glaciers on montane peaks (IPPC, 2007).

At the same time, the global human population has grown explosively and over time stripped millions of hectares of tall vegetation, such as forests and drained wetlands to create arable land. Removing these climate regulating vegetation feedback-systems is now causing climate to change to a far less favourable equilibrium for human society including agriculture.

Forests are important and provide two climate regulating services, first by regulating climate and buffering (strong) variability in rain and temperature and secondly acting as a sink for the greenhouse gas carbon dioxide (CO_2). In other words, forests provide shade and cover

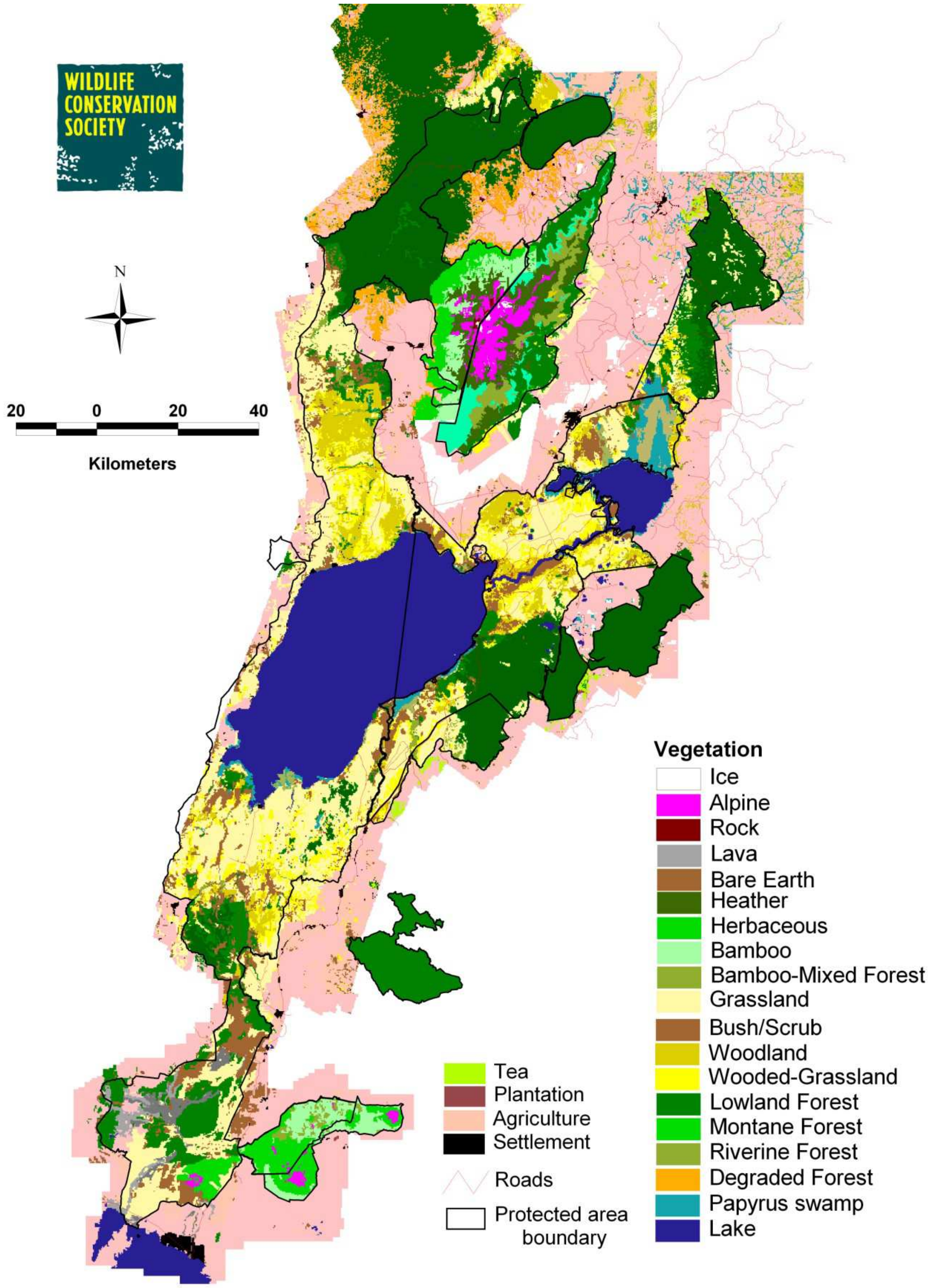

Figure 2. Vegetation map of the Greater Virunga Landscape (source A.J. Plumptre)

over the underlying land; they capture, hold and slowly release water moisture and they accumulate, and hold large amounts of carbon dioxide.

Without forest cover, the underlying land is subject to desiccation, erosion from increased wind and rainfall runoff and consequently increasing the heat transfer capacity of the land, warming up the atmosphere. Dried out land is much more efficient in transforming solar radiation into heat and warming up the air above it.

1.2 REDD+

REDD[1]+ is a performance-based system of incentives designed to slow down the amount of greenhouse gases emitted into the atmosphere and accelerate removals so as to mitigate ongoing climate change. Some 21% of all greenhouse gases (GHG) are emitted by Developing Countries due to clearance of forests primarily for agriculture and timber (Houghton, 2005).

Until recently most forests have only been valued for the timber they produce or as land for conversion to other land-uses, such as agriculture or cattle ranching. REDD+ puts a value on standing forest and highlights its “hidden” ecosystem services, such as climate regulation (as described above).

The REDD+ approach entails initial actions to conserve forest, and avoid GHG emissions. These results can be quantified using ‘*activity data*’ (land use change) and ‘*emission factors*’ (changes in carbon density per ha). The emission reductions are then converted into tradable carbon credits or paid for directly from public funds. At least a part of the revenues are then reinvested in further activities to pay for the next cycle of emission reductions.

For example, if slash and burn farming is the main cause of deforestation (driver) in a certain area then improving agricultural production on *existing* farmland is one potential approach to reducing pressure for deforestation in the future. The activity or intervention to improve farming in the area can be financed by selling carbon credits over the project life time.

REDD+ activities should achieve more than just reducing GHG emissions. They should also create strong community and biodiversity benefits. For instance, a REDD+ project about management of forests in or around a Protected Areas to reduce forest loss, should also be about bringing sustainable rural development and alleviating poverty by helping these households. In other words, it is not only dealing with the symptoms (people encroaching), but tackling the real underlying problem (why are these people encroaching), providing incentives not to encroach and alternative ways of making a living.

Existing systems of REDD+ rules mainly target forest areas predicted to be at risk of clearance. In the Greater Virunga Ecosystem this includes some but not all of the Protected Areas. The analysis finds some of the protected areas have no measurable deforestation. Under existing systems (e.g. the voluntary market) this means there are no predicted

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[1] REDD stands for Reduced Emissions from Deforestation and Forest Degradation. The plus (+) adds improved forest management (i.e. sustainable harvesting), enhancement of stocks in degraded forests and conservation of forest stocks (i.e. maintaining the protection of forests not at risk)

emissions in the future and so the park would not be eligible for any payments. By contrast, the UNFCCC definition does allow for rewarding the continued conservation of forests not at risk, but it is unclear how this will work in practice. One possible approach is that a country will receive payments for aggregated national level reductions in emissions, and will then be free to assign the money to various activities (including the maintenance of protected areas not at risk) according to its own internal priorities.

1.3 Threats

Human pressure on natural resources in the GVL is already high and will increase as the rural population keeps on growing. Climate change will have negative impacts on agricultural production and the ecosystem services rural communities depend on because it is likely to reduce the productivity of existing land and crops, and people may be forced to change the crops they farm.

The current pathway of socio-economic development includes illegal timber harvesting, unsustainable charcoal production and farming. As a result, at some point in the future, arable land will become scarce and resources will become depleted. This may force national governments to degazette parts of the GVL to avoid food insecurity and displacement of people due to climate shocks.

Degazettment is a potential threat on the DRC side which could potentially disrupt the connectivity between the northern and southern half of the Virunga NP, an area of land that has already been invaded illegally by people.

1.4 Strategy

The GVL REDD+ action plan follows a low carbon growth development strategy by establishing a zero emission agricultural sector, zero grazing cattle, sustainable forest management, stopping illegal timber trade and providing low carbon alternative livelihood options to the rural communities living around the Protected Areas in the GVL.

In DRC the approach is to create a buffer zone by developing REDD+ projects with communities around the protected areas to avoid encroachment into the protected areas at a later stage, and also because there is still a fair amount of intact forest or woodland outside the protected areas.

In Uganda and Rwanda there are hard boundaries with the protected areas and the approach here is to create a buffer zone around the protected areas by planting new forest with native species. A similar approach can be taken as has been developed for Mt Elgon by the Mont Elgon Regional Ecosystem Conservation Programme (MERECP), where plantations are created with a 20 to 30 year rotation using native species and where local communities benefit from the sale of timber harvesting (Mwayafu& Kimbowa, 2011).

Developing a REDD+ project inside protected areas will focus on restoring previously impacted areas. There is a fair amount of secondary forest in the different protected areas of the GVL which provides the opportunity to increase the biomass through enrichment planting of native species and rehabilitating deforested areas by planting new forest. A similar approach can be taken as developed by Face the FutureFoundation and the Uganda Wildlife Authority in Kibale NP (http://www.face-thefuture.com/en/projects/kibale-national-park-rehabilitation-project).

Deforestation and forest degradation caused by local communities in and outside the protected areas can be approached by developing an incentive package focused on improving their livelihoods. The incentive package can be financed using REDD+ revenue generated by stopping any further encroachment into the protected areas and creating a REDD+ revolving fund to develop alternative low carbon livelihood options such as beekeeping and reclaiming the investment from the local communities through a microfinancing scheme.

A different approach needs to be taken to tackle deforestation and degradation due to illegal and unregulated timber trade which is strongly controlled by the political elite. In this case, a watch-dog approach in collaboration with communities can be developed to stimulate political action. Again this can be financed with the REDD+ revenue to stop any further deforestation in protected areas or funding from Forest Law Enforcement Governance and Trade (FLEGT- http://www.euflegt.efi.int/portal/).

2 EMISSION REDUCTIONS AND BENEFITS

Historical rates and patterns of deforestation (e.g. flat rates, or trends) are often used as a basis for projecting how much forest would disappear under the 'business as usual' scenario (i.e. without the planned REDD+ activity taking place). For example, using flat rates, if the total amount of forest in the project area is 80,000 ha and deforestation over the last five years has been on average 1,000 ha per year, over a period of 30 years one might project that 30,000 ha more will be cleared and 50,000 ha will remain.

The level of emissions that this represents depends mainly on the carbon density of the forest cleared, and of the vegetation type that replaces it. Carbon density is determined by forest structure and species composition which can be estimated by measuring trees in plots. Total value is expressed in tonnes carbon dioxide per hectare (tCO_2/ha). For example, when the fall in carbon density is 300tCO_2/ha, greenhouse gas emissions in the above mentioned example are 300,000 tCO_2 per year or 9 million tCO_2 over 30 years.

In this example, the carbon revenue from selling the above mentioned emission reductions as carbon credits at a hypothetical price of 3USD per carbon credit (the current average price on the market –Peters-Stanley and Hamilton, 2012),and without deductions for risk, uncertainty etc, would be 900,000 USD per year and 27 million USD in total.

2.1 Land Use Change

For the GVL land use cover and land use change has been estimated between the periods 2000 to 2005 and 2005 to 2010. For DRC, Land Use Land Use Change (LULUC) was estimated using the existing map developed by OSFAC (2011). A similar map has been created for this project for Uganda and Rwanda by analyzing LANDSAT TM satellite images from those points in time. These maps were used to identify priority areas for REDD+ (see for chapter 3 for more information).

Land use was classified into the following units: primary forest, secondary forest, woodland, and non-forest which includes grassland, bushland, and farmland and on the Ugandan side woodland. Land Use Changes important for REDD+ are:
A) deforestation: 1) primary and 2) secondary forest to non-forest;
B) degradation: 3) primary to secondary forest and finally
C) sequestration: 4) non-forest (woodland) to primary forest, 5) non-forest to secondary forest (depleted) and 6) secondary to primary forest.

Historic deforestation, forest degradation and sequestration, in the protected areas and buffer zone, have been summarized for Uganda and Rwanda (table 1) and DRC (table 2), separately. Land Use Change outside the protected areas was calculated over a buffer zone of 2 km around the protected areas. High deforestation in this buffer zone and no encroachment in the adjacent protected area is an indication that law enforcement has been successful. Other patterns might suggest that the protected area is so-called paper park.

In Rwanda there were no detectable land use changes between 2000 and 2010.
In Uganda, deforestation inside the protected areas reduced from 976 ha per year in 2000-2005 to 862 ha per year in 2005-2010. Outside the protected areas in the buffer zone deforestation slightly increased from 1,193ha per year in 2000-2005 to 1,244 ha per year in 2005-2010. In 2000-2005 deforestation was higher in the buffer zone than in the protected areas (1193 vs. 976ha/yr), and remained so in 2005-2010 (862 vs. 1,244 ha/yr).

Overall differences are relatively small compared to sequestration. Sequestration inside protected areas almost tripled between 2000-2005 and 2005-2010 from 9,536 to 30,740 ha, where as the sequestration buffer zone halved in the same period from 4,989 to 2,643 ha. The high sequestration inside protected areas over the last five years is mainly due to the reforestation project Face the Future in Kibale NP and the conversion of woodland to forest in Queen Elisabeth NP.

In DRC land use changes could not be analyzed in the same detail as for Uganda using the OSFAC data. Deforestation in DRC has been less intensive compared to Uganda. Deforestation inside protected areas decreased from 293 ha per year in 2000-2005 to 80 ha per year in 2005-2010. Deforestation in the buffer zone increased from 1,622 ha per year in 2000-2005 to 2,260 ha per year in 2005-2010. Deforestation in buffer zone was 5.5 times higher in 2000-2005 than inside protected areas and 28 times higher between 2005 and 2010!

Deforestation rates between 2005 and 2010 will be used to calculate avoided greenhouse gas emissions as they are more representative of the future trend of deforestation over the project life time, than the average of the two periods.

Table 1. Historic changes in forest cover in *Uganda* both inside and outside the protected areas (PAs)				
	Inside PAs		Buffer zone	
2000-2005	ha	ha/yr	ha	ha/yr
Deforestation	4,878	976	5,965	1,193
Degradation	0	0	0	0
Sequestration	9,536	1,907	4,989	998
2005-2010	ha	ha/yr	ha	ha/yr
Deforestation	4,312	862	6,221	1,244
Degradation	183	37	55	11
Sequestration	30,470	6,094	2,643	529

Table2. Historic changes in deforestation in *DRC* in and outside the protected areas (PAs)				
	Inside PAs		Buffer zone	
2000-2005	ha	ha/yr	ha	ha/yr
deforestation	1,464	293	8,110	1,622
2005-2010	ha	ha/yr	ha	ha/yr
deforestation	402	80	11,302	2,260

2.2 Emission factors

How many greenhouse gas emissions the above mentioned deforestation represents is determined by the carbon density of the forest minus the carbon density of the vegetation that replaces it (also known as the emission factor). In scientific literature carbon density or the emission factor is expressed in mega grams (Mg; i.e. tonnes) of carbon dioxide.

The emissions factor of a forest is determined by its structure and species composition. The height of a tree, diameter at 1.30m (Diameter at Breast Height =DBH) and its wood density determine how much carbon is sequestered in the tree. A tall tree of 30m and a DBH of 25cm will contain more carbon than a small tree of 12m with a DBH of 7cm. A fast growing pioneer tree will have a lower wood density than a slower growing non-pioneer tree with the same dimensions and therefore the pioneer tree will have a lower carbon content.

Similarly, the structure of a forest will determine its carbon density, i.e. the number and height of the trees packed in a standard surface area. For instance, a *woodland* has a grassy understory and only one layer or storey of low canopy trees (15m) whereas a *lowland rain forest* has tall canopy trees (30m<), a storey of subcanopy trees, a middle and understory of small trees and shrubs. Therefore, *woodland* will have a lower carbon density than *a lowland rain forest*.

Forest structure and species composition change with environmental variables such as average annual rainfall, length of the dry season, elevation, topography and soil. The forests in the GVL are too large to measure every tree and therefore trees have to be measured in plots which are representative for the entire forest and/ or arranged along environmental gradients, e.g. elevation, because forest structure and species composition will change with altitude.

In general a larger plot captures more of the variation in the forest than a small plot e.g. a one-ha plot vs. plot of 20 x20m. When a forest is very variable in its structure more plots are needed than in a relatively homogenous forests to reduce the measure of variation around the estimated carbon content.

The amount of carbon in a tree is determined first by calculating its biomass. On average half of the biomass is carbon, e.g. 100kg of biomass is 50kg of carbon (C). Biomass studies have developed formulas which allow calculations of biomass from measurements of height and DBH and wood density through destructive sampling. In destructive sampling trees are first measured and then cut into pieces to determine their weight. This is done for many trees and different tree species. The data are plotted in a graph and a relationship between the points is determined by calculating a trend line for these points.

The formulas or algorithms developed by Chave *et al.* (2005) are the most widely used to calculate the above ground biomass (AGB) of trees. There are separate algorithms for *tropical lowland forest* and *tropical moist deciduous forest*. In addition, algorithms have been developed using only DBH and/or height, since the wood density of a tree is not always known or the height of a tree is difficult to measure. However, these algorithms with fewer parameters tend to overestimate above ground biomass and in REDD+ projects conservative estimates are mandatory.

Emission factors for the GVL were calculated using existing data collected in 13 sites across the landscape. In these data sets the forests of Uganda are best represented with 9 sites, followed by DRC with 3 sites and one site for Rwanda. In total 2000 plots were recorded. These plots are circular in shape with a diameter of 20m. In the calculations only trees with a DBH of 20cm and above were considered to obtain conservative and representative carbon density estimates. These trees probably contain 90-95% of the total non-soil carbon present, with the remainder in smaller trees, dead wood, shrubs, herbs and leaf litter. These plot values were multiplied by 7.96 to obtain values per ha.

Above ground biomass=exp(-2.977*ln(wooddensity*dbh^2*height) (tropical lowland forest)

In table 3 below all the emission factors for all the 13 sites are summarized. The carbon density varies between the sites with the lowest value for *woodland* in Queen Elizabeth NP (39tCO2/ha), followed by the high altitude woodland/forest in Volcanoes NP in Rwanda (71tCO2/ha) and the highest values in Kibale and Bwindi NP (449 and 398tCO2/ha, respectively). The total site average is 258 tCO2/ha and the median is 277tCO2/ha. During the REDD+ project the carbon density of these sites can still increase since most of these sites have been impacted in the past and are currently not fully stocked due to illegal activities, such as illegal timber cutting and encroachment.

Table 3. Emission factors for different sites within the GVL	
Uganda	*tCO2e/ha*
Bwindi NP	398
Echuya	299
Kalinzu	161
Kasyoha Kitomi	330
Kibale NP	449
Maramagambo	208
Mgahinga	277
QENP (woodland only)	36
Semuliki	359
Uganda average	280
DRC	
PNVI Semuliki/Virunga	337
Rwenzori	233
Virunga	160
DRC average	243
Rwanda	
Volcanoes NP	71
total average	**256**

2.3 Greenhouse gas emissions

Greenhouse gas emissions have been calculated separately for Uganda and DRC and separately for inside the protected area*s* and in the buffer zone (table 4.). Greenhouse gas emissions are calculated by multiplying the deforestation rate with the emission factor. For these calculations a landscape average of 275tCO2/ha has been used as emission factor, over a project life time of 30 years. Total emissions were calculated by multiplying annual emissions for 30 years or until complete deforestation of the current forest estate.

In Uganda the current forest estate comprises 299,159 ha in protected areas and 10,918 ha within 2km of the protected area boundaries. At an annual deforestation rate of 1,244 ha per year complete deforestation in the buffer zone is reached in 9 years around 2019. The protected area forest estate is much larger, and with an annual deforestation rate of 862 ha per year, complete deforestation not reached in centuries. Using the same emission factor the annual emissions from forests in the protected area are 237,169 tCO2, and 342,169 tCO2 in the buffer zone; total emissions over a 30 year period are: 7.1M and 3M tCO2, respectively.

In DRC the current forest estate comprises 71,068 ha in the protected areas and 571,256 ha outside. At an annual deforestation rate of 80 ha per year complete deforestation of the protected area forest estate is not reached within this century. The area outside the park is smaller, with an annual deforestation rate of 2,260 ha per year, and complete deforestation is also not reached within this century. Using the same emission factor the annual emissions from the park forests are 22,000 tCO2, and 621,500 tCO2 from the forests outside Virunga Park; total emissions over 30 years are: 660k and 18.6M tCO2, respectively.

In Uganda GHG emissions from protected area forests are higher than emissions from the forest within 2km of the protected areas, whereas in the DRC this is the opposite. In DRC deforestation and GHG emissions outside the protected area is more than 28x higher than inside the protected area.

Table4. Site comparison of GHG emissions based on activity data between 2005 and 2010	Uganda		DRC	
	PAs	Buffer zone	PAs	Buffer zone
forest (ha)	299,159	10,918	71,068	571,256
deforestation rate (ha/yr)	862	1244	80	2,260
years to complete deforestation	347	9	888	253
carbon density (tCO2e/ha)	275	275	275	275
annual GHG emissions (tCO2e)	237,169	342,169	22,000	621,500
total GHG (tCO2e)emissions over the project life time (30 years)	7,115,081	3,002,546	660,000	18,645,000

2.4 Gross revenue projection potential

Revenue from avoided GHG emissions has been calculated by applying a carbon price of 3USD per carbon credit (tCO2) and multiplying them by the annual and total GHG emissions calculated above for areas within and outside the protected areas (table 5.).

Over the project life time the carbon price can increase depending on international commitment. Since carbon credits are sold at intervals of usual 3 to 5 years the revenue can increase with increasing prices or when the carbon density of the forest increases over time, recovering after having been impacted.

In DRC gross revenue from avoided deforestation and GHG emissions is 66,000 USD per year in the park and 1.9M USD per year in the buffer zone. In Uganda gross revenue is 711,508 USD per year in the protected areas and 1M USD per year in the buffer zone.

In Uganda the annual revenue from REDD+ has to be distributed over 10 sites which reduces the annual amount available to 71,151 USD per site for protected area forests and 102,651 USD for forests in the buffer zone, with a total of 173,802 USD per site per year. In DRC the revenue would have to be split between the northern and southern sector of the Virunga NP. Combined revenue from *PAs* and *Buffer Zone* forests, each half would receive 643,500 USD per year.

This revenue should be used to tackle the drivers of deforestation and forest degradation. Failure to do so would not lead to the projected reducing GHG emissions and hence the

REDD+ project defaults. Therefore, to successfully implement a REDD+ project the drivers and agents of deforestation and forest degradation need to be identified to develop project activities.

Table 5. Site comparison of annual and total gross carbon revenue	Uganda		DRC	
	PAs	Buffer Zone	PAs	Buffer zone
annual GHG emissions (tCO2e)	237,169	342,169	22,000	621,500
total GHG emissions over the project life time	7,115,081	3,002,546	660,000	18,645,000
carbon price (USD/tCO2e)	3	3	3	3
annual revenue of carbon credits (USD)	711,508	1,026,506	66,000	1,864,500
Project life time	30	30	30	30
total revenue from carbon credits (USD)	21,345,242	9,007,639	1,980,000	55,935,000

3 A REDD+ PRIORITY MAP

To ensure and enhance the effectiveness of the REDD+ Transboundary Action Plan, priority areas have been identified on the DRC side of GVL where historically most of the recent deforestation occurred (see map below). The analysis also shows which sites should be prioritized and where the investment and donor funding should be spent.

Twelve protected areas were analysed, only five areas showed significant change in the past ten years – significant losses in the north and south parts of Virunga NP and Rwenzori NP, significant gains in Kibale NP and Queen Elizabeth NP.

3.1 Setting priority

DRC: *Northern Virunga NP*

The remote sensing analysis for northern Virunga Park showed that clearing of secondary forest (dark pink) inside the park stopped in 2005, but that deforestation of primary forest continued outside and east of the Virunga NP in the so-called "Northern Transit Corridor" between DRC and Uganda (deep purple). The main driver is illegal and unregulated timber extraction.

only slightly encroached into the park, but as timber becomes less available outside the park the risk of further encroachment will increase. The map also shows that there are still patches of primary forest within the Northern Transit Corridor and a fair amount of secondary forest.

The same analysis also showed that so far deforestation in the Northern Transit Corridor has

Ideally, forests in the Northern Transit Corridor would be managed sustainably outside the park; secondary forests can be enhanced through enrichment planting and satisfy the demand for timber in region.

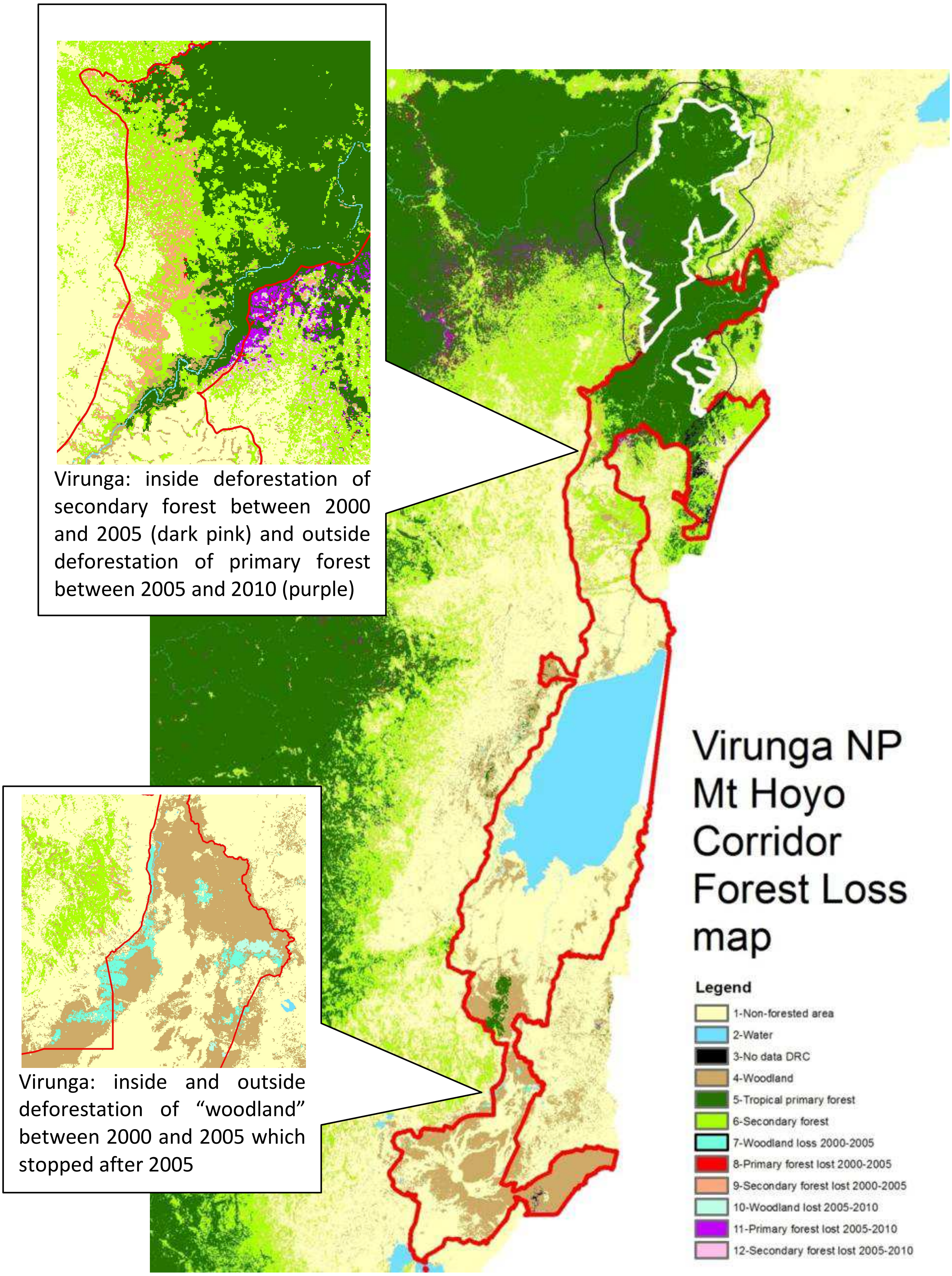

Figure 3. Land Use Change map for the Greater Virunga Landscape in DRC between 2000-2010 with main hotspots of forest loss shown as insets

DRC: Southern Virunga NP
In southern Virunga NP deforestation of woodland was high before 2005, in response of the insecurity in the region and refugees flocking to Goma and camps set up around the park. The increase of people increased the demand for fuel wood and charcoal. Deforestation slowed down afterwards but continued none the less (red arrow).

The main deforestation driver here is demand for energy satisfied by traditional energy sources. The introduction of so-called rocket stoves and biogas would be an option and the subsidized use of LPG by oil industry in towns like Goma and Beni (Griesen, van de E. 2008).
Rwanda
The remote sensing analysis showed that all forests around Volcano NP already had been cleared before 2000 and that until 2010 no encroachment has occurred. RwDB has been a good custodian in protecting its park, probably a result of the funds it generates from mountain gorilla tourism.

Unfortunately, rules within REDD+ have not been settled on how to reward good practice. Currently only those areas where encroachment has occurred will be able to rec
2005-2010
funding. This situation is referred within the REDD+ community as a perverse in
only those who performed badly are rewarded.

Uganda
Land use change in Uganda not only show deforestation like in DRC, but also very significant sequestration. Large scale deforestation between 2005 and 2010 occurred along the south-eastern side of the Rwenzori NP and along the north-eastern side of Mgahinga NP. Bwindi NP was the least affected NP.

The deforestation around the Rwenzori Mountains NP is outside the park limit and is due to people returning to farm their fields after a period of instability in the massif which led to people moving away. It may also be due to the boundaries of the park being marked in the late 1990s with pillars which highlighted areas of free land that was forested outside the park.

Large scale forest expansion is only found in Uganda and occurred in Kibale NP and Queen Elizabeth NP. The forest expansion in Kibale NP is explained by the reforestation project set up by Face the Future Foundation in collaboration with UWA. According to their website they replanted approximately 3,500 ha and they aim at 10,000ha.

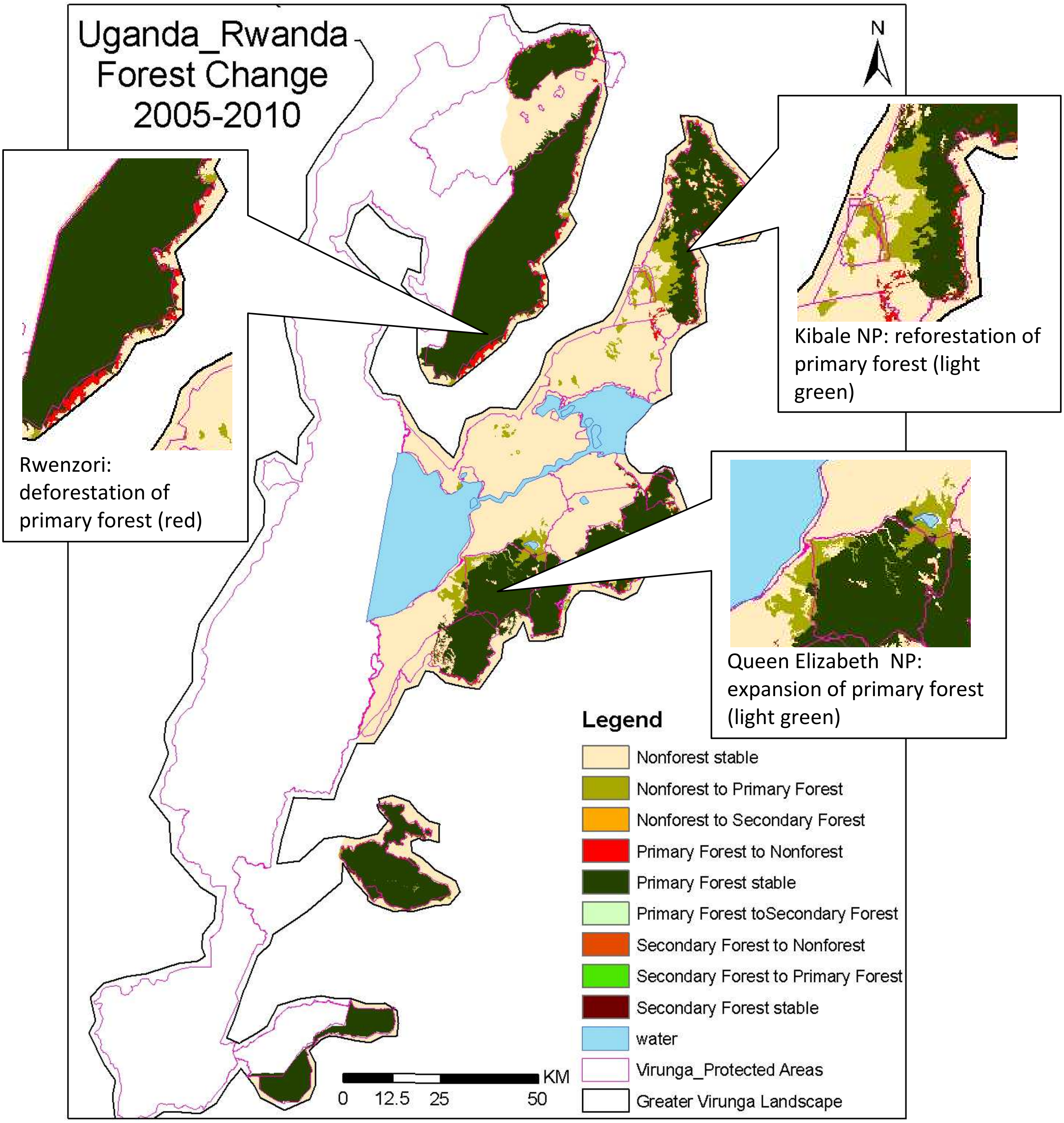

Figure 4. Land Use Change map for the Greater Virunga Landscape in Uganda and Rwanda between 2005 -2010 with three main hotspots of forest change shown as insets

Forest expansion in Queen Elizabeth NP is due to reduced elephant density from the poaching of elephants in the late 1970s, which allowed woodland to develop into primary forest. Elephants tend to keep the woodland open by knocking over trees and stop it from turning it into dense forest.

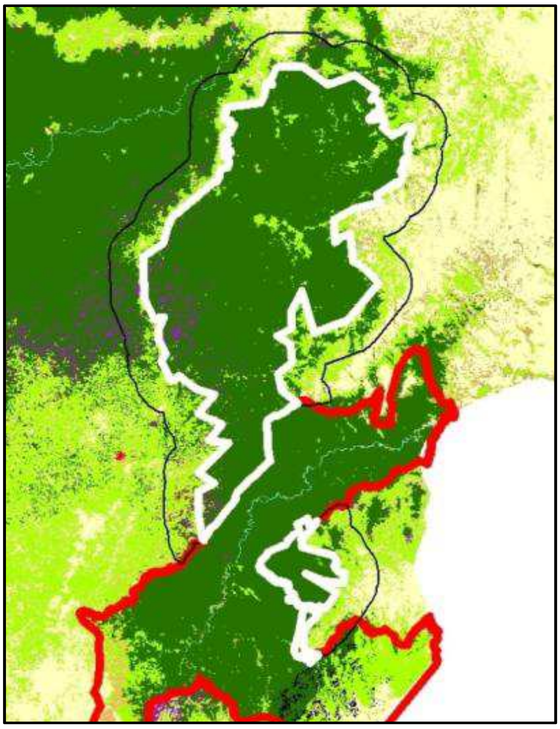

Figure 5. The Mt Hoyo REDD+ project area (outlined in white)

3.1 Other REDD+ projects

Developing the priority map, connectivity with other forested landscapes was also considered important and two important sites were identified, Mt Hoyo in DRC and Murchison-Semliki Landscape in Uganda.

Mt Hoyo

The Mt Hoyo site (outlined in white) lies north and partially east of the GVL and connects the GVL with the rest of the Congo Basin lowland forest. Without this connection the Virunga forest lies isolated from the rest of the forest and there is little leeway when forests potentially may start shifting with climate change.

Currently, a REDD+ project is planned to be developed for the Mt Hoyo area with funding from the Congo Basin Forest Facility (CBFF). Other forests in and around Virunga NP outside the planned Mt Hoyo REDD project area would need a separate project depending on how much forest can be conserved.

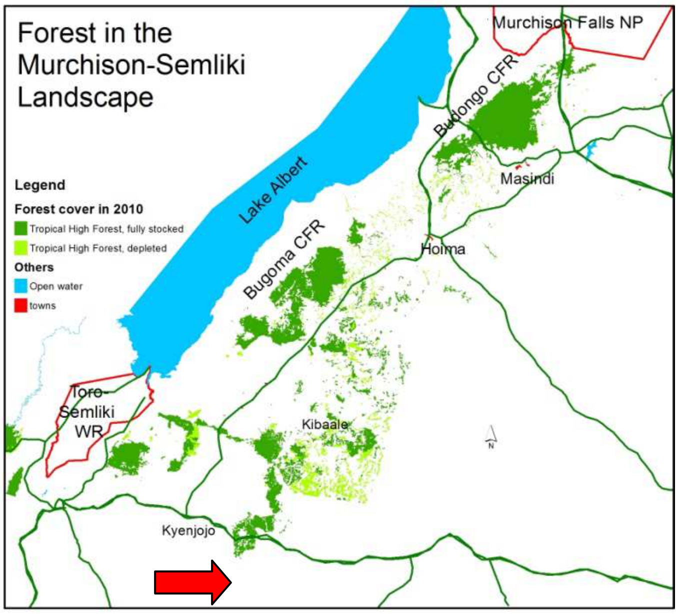

Figure 6. The Murchison Semliki REDD+ project area and location of corridor for connectivity (red arrow)

Murchison Semliki Landscape

North of the GVL on the Ugandan site lies the Murchison Semliki Landscape, covering the area between Murchison Falls NP in the north and Semliki Wildlife Reserve in the south. In this landscape there are some 113,657 ha of forest on private land which connects the different forest reserves such as Bugoma CFR and Budongo CFR creating so-called wildlife corridors.

The Northern Albertine Rift Conservation Group (NARCG) including Wildlife Conservation Society (WCS) is implementing a national demonstration REDD+ project and working with some 3,000 private forest owners to save their forest for the future. The GVL can be linked with the Murchison-Semliki Landscape by creating a corridor between this landscape and Kibale NP (red arrow in map); alternatively, link Semuliki Forest with the Semuliki wildlife reserve as cultivation between Kibale and Itwara Central Forest Reserves is extensive.

Currently, the North Albertine Rift Conservation Group has been requested by the REDD+ focal point of Uganda to expand their activities and develop REDD+ activities for the rest of the Western Region which includes the GVL on the Uganda side. As part of this extension a wildlife corridor connecting the two landscapes may be envisioned.

4 CAUSES OF GREENHOUSE GAS EMISSIONS

For the success of a REDD project it is important to identify what (drivers) and who (agents) is causing greenhouse gas emissions from deforestation and degradation. Within the GVL there are in-country and between country or transboundary drivers and agents. The R-PP of Uganda, DRC mention the following drivers which are supported by the recent assessment about timber, charcoal and wildlife trade in the GVL by WWF (Mapesa *et al.* 2013).

4.1 In-country drivers

Most of the drivers and agents of deforestation and forest degradation are the same throughout the GVL, but vary in intensity such as human population density, traditional slash and burn farming, and unsustainable fuelwood and charcoal production for nearby towns such as Goma and cross border into Rwanda.

Poor farming techniques
Farmers in the GVL traditionally grow crops for subsistence and cash by first slashing and burning forests and continue production afterwards without a fallow period which does not optimize yields and is prone to produce even less under on-going climate change. This farming technique is only sustainable where people live in low densities, ample forest is available and long recovery periods exist between cultivating old fields. Farmers already surpassed the carrying capacity of their land and turn-over periods are becoming increasingly shorter.

Climate change
Aggravating the already bad situation is the increasing variability in rainfall due to climate change which will further decrease soil fertility as fields become more exposed to rain and wind erosion.

Overpopulation
GVL is surrounded by one of the fastest growing populations in the world. Rural families on average comprise 6-8 members and teenage pregnancies are common. Even among well-educated and affluent nationals large families are favored. Currently, too many people depend on forests for subsistence and cash and rural households have to divide their land over an ever numerous next generation. Before rural households depended on their forest as a safety net, but as their forest is disappearing they are being trapped into increasing

poverty and forced to sell their land when emergencies or economic shocks arise (Debela *et al*. 2012).

Charcoal consumption

The large majority of the rural and urban community prepares their food on wood or charcoal in absence of gas or electricity as an alternative (Griessen, 2008). The demand for charcoal is high and a lucrative business. As a result huge tracks of forests and woodland are being cleared and turned into degraded forests or secondary shrubland. In the southern Virunga NP a lot of deforestation occurred in 1994 due to insecurity and refugees camping next to the park. The habitat is now slowly recovering from this encroachment.

Human Wildlife Conflict

The forests are also home to animal wildlife. As more and more forest habitat disappears, animals are living closer to human settlements than ever before. The animals come out of the forest for food as less wild food is available in the shrinking forests on private or community land. Consequently, farmers see their already small crop yields diminish even more, aggravating the already existing food scarcity. To get rid of crop raiding animals farmers have cut the remaining forests on their land.

Poverty

Rural households are poor and their income from forestry, agriculture and livestock husbandry is not enough to use some of it as investment capital to develop new economic activities or improve their business skills. Therefore, they are forced to continue with their traditional and outdated use of natural resources (Debela *et al.* 2012)

Insecurity in DRC

The continued insecurity in DRC is a source of illegal activities which is difficult to tackle in a situation which keeps the region in a state of lawlessness (Mapesa *et al.* 2013).

Lack of effective of law enforcement

Encroachment into protected areas and illegal activities are partially due to the undercapacity, underfunding of the park authorities and weak leadership, corruption and weak legal prosecution (Mapesa *et al.* 2013).

Oil industry

A relatively new threat for the GVL is the oil industry establishing itself inside protected areas. Associated threats are increased immigration of people seeking job opportunities causing increased deforestation as is already the case in the Murchison-Semliki Landscape east of Lake Albert in Uganda and displacement of wildlife.

4.2 Transboundary drivers

Charcoal trade

Recent assessments have shown that half of the charcoal for Rwanda is coming from DRC and mostly from within the park where rebel groups dominant the production and trade to finance their existence (Mapesa *et al.* 2013).

Timber
Most of the timber from the eastern DRC is transported across the border with Uganda through the Northern Transit Corridor (the road from Beni, Port Portal to Kampala) to satisfy the international, regional and local demand for tropical timber (Chevallier & du Preez 2012; Mapesa *et al.* 2013). The bulk of tropical timber in East African markets is unregulated and provides little revenue for the country of origin. Currently very little timber is exported beyond the region.

Within the GVL certain actors benefit more from this trade in financial terms than others, especially those with political connections. The lucrative part of the trade chain is managed by middlemen and a select group of traders. Much of the risk is carried by timber cutters and transporters (Chevallier & du Preez 2012). The demand for timber is high in the region and there is little motivation to regulate the production for the regional market like for the international trade.

5 INCENTIVE PACKAGE

The incentive package aims to tackle deforestation and forest degradation in the buffer zone and the protected areas 1) due to local communities, 2) due transboundary market forces for timber and charcoal and 3) finally stimulate rehabilitation of negatively impacted protected areas.

The incentive package is designed to overcome existing development barriers due to poverty and ignorance of the households about better agricultural practices and alternative livelihoods options. Households are now trapped in their traditional ways of life by having lots of children and forest as a safety net. As the forest diminishes and the population grows the households will reach a dead end when they run out of natural resources.

Besides improving their financial position and promote sustainable economic activities, the incentives also aims at adapting these households to climate change and reduce the risk of harvest failure causing nutritional emergencies and economic shocks and avoid the incidence of climate change refugees.

Each intervention or incentive corresponds to a low carbon emission alternative livelihood option or enterprise. Essential in establishing a viable and profitable enterprise is to establish or take over the value chain between producers and end users or exporters to eliminate the middle man and increase their profit margin.

5.1 Community approach

In all three countries a community approach needs to be taken to present and implement the incentive package. The below mentioned incentive activities should be tailored to the local context where the REDD activities will occur.

The entire local community will be taken into consideration since they need to give their consent for the REDD+ activities to some extent as they are part of the "project affected people" according the principles of FPIC. Therefore, the incentive package intends to make the REDD+ activities attractive for the entire community

The incentive package has to be developed with benefit options not only for households directly around the protected areas, but also for neighbouring households further away, because they may start to experience more crop-raiding by forest animals when animal populations recover or increase at the edge of the forest and beyond.

Benefits should also target landless or immigrants as they are more like to be engaged in illegal activities in the protected areas, such as encroaching, poaching, illegal tree cutting for timber or charcoal production. Offering no benefits and only increasing law enforcement will only shift their activities elsewhere or deeper into protected areas. This so -called leakage has to be deducted from the planned or avoided emission reductions.

5.2 Business approach

A REDD+ project is required to create net community benefits, monitor their well-being and comply with the principles of FPIC. Therefore, the developer of the REDD+ activities has to convince households to participate rather than force them. Therefore, to ensure their participation the REDD+ activities should aim for the long-term improvement of their financial position and well being.

Currently, short-term thinking focused on day to day survival dominates household decisions and trade off to convert forest to other land uses. To stimulate the long-term decision to keep the forest standing or not encroach on protected areas, the incentive package aims to stabilize and increase their current income and improve the sustainability of their economic activities on their existing agricultural fields and replace the need to convert forests in the future.

The enterprises promoted through the incentive package are meant to create synenergy by applying them together and catalyze the productivity of each other. For instance, keeping bees will increase the pollination of crops such as coffee and fruit trees, increasing the farmer's production and income. At the same time the farmer will earn income from honey. With the extra income the farmer can afford a root cellar to store his produce over longer periods and overcome low pricing during peak production. With the extra income the farmer can buy (micro-) insurance against harvest failure and pest animals etc.

5.3 Community revolving funds

Financing the enterprises will be done by providing microfinancing loans through community revolving funds to avoid that participants see this aid as "free money", and also to improve the sustainability of the REDD+ activities.

An additional advantage of this set up is that it also allows disbursing donor money and investments from private sector as corporate social responsibility (CSR) for rural development and contributing toward social and biodiversity benefits.

This will be essential at the start of the REDD+ activities before carbon credits become available in 3 to 5 years time. Once the REDD+ activities are producing carbon credits, annual carbon revenue can be deposited into these community revolving funds to continue and scale up financing enterprise activities over the project lifetime.

5.4 The package

The objective of the incentive package is to tackle the two major deforestation drivers, 1) unsustainable natural resource management through improving agriculture and 2) overpopulation through family planning. When participants decide to ask for a loan from the community revolving funds to develop enterprises of their choice, improving agriculture and sensitization on family planning will be compulsory.

Clarifying property rights (specific for Uganda and Rwanda)
In addition, participants generating carbon revenue from their own land by growing trees or conserving their native forest need to show some proof of land title to be able to sell them. In Uganda and Rwanda, the process to clarify land title is clear, but is relatively expensive at an individual basis. The REDD+ developer could group title requests to make the process less expensive and more expedient. In DRC the government owns the land and carbon credits so this would not be necessary but there will need an agreement between farmers and the government to show they are responsible for an area of land and can benefit from carbon credits.

Income from REDD+
In the buffer zone households can generate carbon credits from conserving their native forest, planting new forest, or (fruit/fire wood) trees as part of an agroforestry or sylvopasture system. These forests need to be monitored to ensure that participants are complying with the requirements to keep their forest standing and growing. For this an extension service of community base monitors need to be recruited and trained. Landless members of the communities (including youth) can get an income from REDD+ activities by participating in the monitoring.

Conservation farming
Traditional farming practices do not produce sufficient food for the ever growing rural households and the productivity of the existing field are not maintained. Adopting conservation farming will increase the yields from the existing fields by at least 60% on average (Fermont & Benson, 2011). In additional, conservation farming will also adapt them to ongoing climate variability due climate change as leaving the crop residue help conserve nutrients and buffer against high temperatures and heavy rains. In combination with agroforestry, the growing trees will provide shelter against storms and shade against dry spells.

Forest friendly cash crop
Farmers are currently growing cash crops for which forest is cleared such as palm oil. Alternatively, degraded forests can be turned into an agroforestry plantation with shade coffee and cocoa. This is also an adaption to future drier and more extreme weather

conditions. Coffee, cocoa and vanilla are also export cash crops which will fetch a good price. In combination with beekeeping the farmer will ensure a high production and in addition generate income from honey and related products.

Transition from charcoal to branch fuel wood and biogas
Currently, rural and urban households have no option but to use fuel wood or charcoal for cooking due to the lack of cost-effective alternatives. Therefore, the adoption of so-called rocket cook-stoves should be pursued, the generation of biogas promoted and the future use of propane gas.

Rocket cook stoves contrary to traditional cook stoves, are 60 to 80% more efficient and use branches as fuel wood. The use of branches allows keeping trees standing and harvesting their branches through coppicing, unlike traditional fuel wood or charcoal for which the entire tree is harvested. The turnover cycle for growing branches is much shorter and economically more attractive in the short-term for people than growing trees.

Family planning
This incentive is very important since it is the main driver of all other deforestation drivers in GVL. All participants will be made aware of the importance of family planning and especially young women will profit from this incentive.

Microfinance
The community revolving funds will provide access to microfinance including option to apply for an emergency loan when an economic shock or family emergency arises and to avoid that the households are forced to (illegally) cut a tree to sell for cash.

Beekeeping
Keeping bees for honey production is more than an alternative profitable low carbon emission enterprise because besides income from honey and related products it also contributes to the agriculture enterprises and planting fruit trees by ensuring pollination and boosting crop yields.

Off-farm employment
This incentive is particularly tailored towards the landless and youth which are less likely to get enough land to produce food to feed themselves and provide off-farm alternative livelihood options. Developing skills and knowledge in building adaptation structures such as root cellars, rainwater collectors proper sanitation and alternative energy sources such biogas digesters, solar panels and rocket cook stoves will become increasingly important and in demand.

5.5 Rehabilitation of forests in PAs

Over the last 5 years the protected areas have been encroached and almost 9,000 ha of forest have been cleared, excluding forest degradation. To rehabilitate or restore protected areas to their original size these cleared and or disturbed areas need to be replanted with native species typical for the surrounding forests. For example, in Kibale NP 3,500 ha have been successfully restoring starting in the early 1990’s.

Carbon credits can also be generated through agroforestry or silvopasture. Neighbouring households and even the landless can be can engaged in these activities as the effort of growing seedlings, replanting them and keeping the restoration site clean from weeds is labour intensive. The Face the Future project in Kibale NP employs some 125 people and few hundred seasonal workers. Rehabilitation of the protected areas should coincide with other incentive activities mentioned above because replanting forest is actually not directly addressing the drivers of the deforestation and forest degradation.

5.6 Reducing the unsustainable and illegal timber trade

The WWF report (Mapesa at al. 2013) lists several recommendations and two models to tackle illegal trade in among other timber. In addition to those recommendations another alternative is to have communities participate in the monitoring of the forests in return for benefits. Also a percentage of the REDD+ revenue can go to financing law enforcement activities.

Lack of enforcement and corruption are the two governance issues which allow illegal logging to continue. Often, only a few (usually well-connected) members within the rural communities are benefiting from the illegal trade and those doing the hard work only get a fraction of the market value. Community members often know who is engaged in illegal activities, but refrain from questioning those members because there is no benefit for them and/or acting is not worth the risk.

Generally, large trees have a higher market value and consequently their chance of being cut is higher. Unfortunately, large trees are also a dominant part of the total biomass in forests or woodlands. Saving large trees from illegal activities will therefore significantly reduce GHG emissions and contribute most to climate change mitigation.

Communities could participate in monitoring forests as REDD+ host countries are required to monitor their forest estate. Currently none of the submitted REDD+ Readiness Preparation Proposals (R-PPs) or UN REDD+ National Joint Programmes (NJPs) mentions how to monitor their forest estate on the ground and they only focus on remote sensing techniques.

Another major objective of REDD+ activities or national activities is to create benefits for rural communities depending on forests or woodlands. Again none of the R-PP and NJPs mentions how they are planning on creating benefits to rural communities.

Therefore, in the absence of a benefit sharing scheme and a ground level MRV system, local communities can help monitor the bigger trees on communal /private land monitored in return for monetary and non-monetary benefits generated by the REDD+ activity.

By mapping, tagging and measuring the potential trees and making it public that they are monitored will lower their chance of getting cut. Providing benefits at community level for saving standing trees will empower the community to stand up to the few members engaged in illegal activities and/or stimulate political action at a higher level when illegal activities are shared on social media with organizations among others the UNREDD+ programme and Forest Carbon Partner Facility.

5.7 Reducing transboundary charcoal trade

To tackle the transboundary demand for charcoal from DRC into Rwanda can be addressed by stimulating the use of biogas, rocket cook stoves and propane in cities and towns. But it is beyond the financial capacity of a REDD+ project/ activities. This needs a high level intervention by the Rwandan government for instance by establishing a biogas and electrification program through constructing pico-/micro hydropower dams to be able to satisfy the national demand of the country. This can be pursued through the Norwegian Energy+ initiative which is similar to REDD+, but focuses on saving forest and providing clean energy.

6 IMPLEMENTATION

6.1 Community consent

As mentioned before, REDD+ is not only about saving forests but also about bringing rural development and ensuring that the REDD+ benefits reach the local communities living around the Greater Virunga Landscape. This also includes the safeguard of Free, Prior and Informed Consent, i.e. informing local communities about the project; how it is going to positively and negatively impact their livelihoods; that they have the right to negotiate the benefits of the project and refuse consent when the benefits are insufficient or not to their liking within reason.

Therefore, REDD+ developer should first heavily engage with local communities before implementation and other stakeholders such as local government. For Uganda, WCS has already developed a FPIC protocol which can be adapted to circumstances in DRC and Rwanda (Wieland, 2012).

6.2 Organization

Implementation of a potential REDD+ project is greatly facilitated by grouping households as for example is already done in existing collaborative and community based forest management initiatives in Uganda. Other existing grouping alternatives are “private forest owner associations” and “farmers groups”. These groups should ideally be aggregated at the lowest administrative units such parish level in Uganda, “groupement” in DRC or sector in Rwanda, because that will be required under a jurisdictional approach.

In the absence of knowledge and know-how on REDD+, government agencies will initially have to rely on outside expertise such as the Northern Albertine Rift Conservation Group in Uganda and collaborate with civil society organisations. Fortunately, collaboration with civil society organizations will increase transparency of project implementation and hence enhance the confidence of donor countries willing to invest in any future initiative.

The development and implementation of REDD+ activities in the GVL should be coordinated to avoid deforestation activities shifting across borders into other member countries, which will be particularly the case of unregulated logging and illegal timber trade. The Greater Virunga Transboundary Collaboration is particularly well positioned to play this role.

To ensure that REDD+ initiatives in the GVL feed into the national REDD+ process of DRC and Uganda a regional REDD+ working group will need to be set up at province level in DRC or regional level in Uganda and Rwanda. Such an arrangement could later also accommodate other carbon initiatives or projects.

Currently, institutional arrangements at national level for REDD+ are being set up and will take some time before they become finalized and ratified by the different governments. However, this does not stop the GVTC to set up their own arrangements at the ground level between park authorities, local government, NGOs and the communities living in the buffer zone. Existing arrangements can be adopted to be able to receive carbon revenue for community REDD+ activities, such are the Mgahinga Bwindi Impenetrable Forest Conservation Trust.

7 FUNDING OPPORTUNITIES

Establishing REDD+ activities is capital intensive due to safeguards such as needs for the Free Prior and Informed Consent. In addition, the requirement to set up monitoring systems, a monitoring extension serve and negotiating agreements between all stake holders are expensive.

The carbon revenue streams are not very large. Therefore, donor money will be required to make any REDD+ initiative cost effective. Potential donors are Forest Carbon Partner Facility (FCPF), UNREDD and other initiatives such Government of Norway's International Climate and Forest Initiative. The oil industry could also be a potential investor if it willing to offset its environmental, carbon footprint and social impact and is therefore a potential source of support in Uganda where oil exploration is legally allowed. Seed money for the community revolving funds could similarly come from REDD donor countries or alternatively from Corporate Social Responsibility donations.

FLEGT is an appropriate funding source to combat unregulated logging and illegal trade, and could establish community watch dog networks. A community service fee can be deposited in the community revolving fund as payment from the government. Energy+ is an option to tackle the transboundary charcoal trade from DRC to Rwanda. This Norwegian initiative build upon the framework of REDD+ and in principle funding from Energy+ can the funnelled through the REDD+ framework.

8 NEXT STEPS

This “action plan” should be considered as a first step towards delivering REDD+ and a contribution towards capacity building. The REDD+ action plan high-lights the possibility of REDD+ as one of the mechanisms to finance activities which bring monetary and non-monetary benefits to the communities living around protected areas. It is clear from the land use change analysis that those parks generating income from for example tourism such Bwindi NP and Volcanoes NP have experienced little or no encroachment. REDD+ will not be at the scale as mountain gorilla tourism but it will create new options for local communities.

A future REDD+ project for the GVL requires collecting more data on biomass, identifying deforestation drivers per site, and engaging with communities among other activities to obtain their free, prior and informed consent. Immediate action for Rwanda is to: apply for partner country with the Forest Carbon Partner Facility or UN-REDD, and explore the opportunity of Energy+ to set up a national biogas and electrification program.

Al three countries should start the dialogue with stakeholders in the buffer zone, including local government as part of the FPIC process and develop for each protected area new or adopt existing arrangements to be able to implement REDD+ activities with donor money first and carbon revenue later.

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