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# COMMODITIES AND BIODIVERSITY IN THE GREAT LAKES REGION OF EAST AND CENTRAL AFRICA (GLR)

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IMPACTS OF COMMODITY  
DEVELOPMENT ON BIODIVERSITY  
AND ECOSYSTEM SERVICES



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## Prepared for

John D. and Catherine T. MacArthur Foundation

## Acknowledgements

Within UNEP-WCMC, support in preparing this report was provided by Marieke Sassen, Sarah Ivory, Sarah Walker; Neil Burgess served as an internal reviewer. Maaïke Manten (BirdLife International) served as an external reviewer and provided comments on the draft report.

Published: December 2014

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## LIST OF ACRONYMS

CPI	Corruption perceptions index
CEPF	Critical Ecosystem Partnership Fund
DRC	Democratic Republic of Congo
EAC	East African Community
EAM	Eastern Afromontane
ESIA	Environmental and Social Impact Assessment
EIA	Environmental Impact Assessment
FDI	Foreign Direct Investment
GLR	Great Lakes Region
GDP	Gross Domestic Product
HDI	Human Development Index
IIAG	Ibrahim Index of African Governance
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
LVBC	Lake Victoria Basin Commission
NEMA	National Environmental Monitoring Authority
NGO	Non-Governmental Organisation
SAGCOT	Southern Agricultural Growth Corridor for Tanzania
UHCI	Uganda Habitat Cover Index
UNDP	United Nations Development Programme
WDPA	World Database on Protected Areas
WWF	World Wildlife Fund for Nature

# 1. Key Points

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- The Great Lakes Region of East and Central Africa (GLR) supports extraordinary biodiversity and provides ecosystem services supporting the livelihoods of large numbers of often vulnerable people within and beyond the region.
- The region is endowed with significant natural resources such as land, water, oil and gas and mineral reserves. These resources are the focus of national economic development strategies, with potentially important consequences for the region's biodiversity and the ecosystem the services its inhabitants and economies depend on.
- Agriculture is the most important economic sector and the conversion of forests to agricultural lands is having serious impacts on both terrestrial and aquatic biodiversity, particularly through soil erosion and sedimentation of waterways.
- The energy sector is in strong development, particularly oil, hydropower and wind. The potential social and environmental impacts of oil and gas exploration in the Albertine Rift is of particular concern.
- Road infrastructure is improving. Previously inaccessible areas are being opened up to exploration, extraction and development, facilitating agricultural expansion and bushmeat hunting.
- Habitat loss - notably deforestation – is a significant result of most types of commodity development.
- Foreign Direct Investment into agricultural and oil and gas exploration is encouraged in most GLR countries; there is a need for sound land policies to ensure these do not have negative social, economic and environmental effects on local communities.
- Policy and legislative frameworks for environmental protection and natural resource management vary in their effectiveness across the GLR, both in terms of implementation and enforcement.
- National plans and policies regarding the environment are still insufficiently integrated into the national and regional policies and legislation that drive economic development.
- The capacity of regional agreements and initiatives to stop adverse impacts or control the implementation of large scale transboundary developments, such as dams and oil exploration, is unclear.
- Protected areas are threatened by rapid development of agriculture and extractive industries.
- Initiatives that aim to address some of these pressures and impacts exist in the region. They support civil society that play an important role in promoting environmentally sustainable policies and investor accountability.
- National governments are responsible for higher-level environmental policy and legal frameworks and national and international civil society organisations and donors should work together to support government processes and capacity to address the adverse impacts of commodity development on biodiversity and ecosystem services in the region.

## 2. Executive Summary

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**The Great Lakes Region of East and Central Africa (GLR) supports extraordinary biodiversity and provides ecosystem services supporting the livelihoods of millions of people within and beyond the region. The region is endowed with significant natural resources such as land, water, oil and gas and mineral reserves. These resources are the focus of national economic development strategies and investments in their exploitation are increasing, with potentially important consequences for the region's biodiversity and the ecosystem services its inhabitants and economies depend on.**

### *The Great Lakes Region of East and Central Africa*

The population in the GLR countries is rising rapidly and poverty in the region is widespread. Dependence on natural resources inside and outside protected areas is high. The UNDP Human Development Index (HDI) scores in the GLR are some of the lowest in the world and all countries in the GLR are classified as low income countries by the World Bank. GDP growth has improved compared to the 1980-2000 period and oscillates around 5%. Scores on governance-related indices such as the Ibrahim Index of African Governance and Transparency International's corruption perceptions index are medium to low.

The GLR is very important in terms of biodiversity and includes parts of 12 of the 426 freshwater Ecoregions and of 20 of the 119 terrestrial Ecoregions in Africa as defined by the World Wildlife Fund (WWF-USA). The GLR geographical coverage also includes parts of the Eastern Afrotropical Biodiversity Hotspot and other areas that are renowned for their rich biodiversity.

The GLR covers seven major lakes/river basins: the Upper Nile Watershed, Turkana/Omo Watershed, Lake Victoria Watershed, Lake Tanganyika Watershed and Lake Malawi/Nyasa Watershed. These provide important ecosystem services used

directly or indirectly by the human population of the region and beyond. Key ecosystem services common across all watersheds comprise water, timber, fuel wood, building materials, and medicine. The region's forests play an important role in carbon sequestration and storage, wetlands and other ecosystems regulate flooding and support soil-forming processes. Cultural services are primarily linked to tourism and education but also include spiritual and existence values.

### *Commodity development in the GLR and its impacts on biodiversity and ecosystem services*

**Agriculture** is the most important sector of the economy in the GLR countries, contributing more than 20% of gross domestic product (GDP). It occupies a large percentage of the total land area in GLR countries: for example from almost 60% in Malawi to more than 86% in Burundi. More than 60% of the population of the region is engaged in agriculture.

The conversion of forests into agricultural land is having serious impacts on both terrestrial and aquatic biodiversity, with the resulting soil erosion being a major contributor to sediment pollution of the lakes and rivers in the GLR. The annual cost of soil loss in Uganda was estimated at about 3-10% of GDP in 2002. In Malawi, an average annual agricultural yield loss of 4% - 11% was estimated as a result of soil erosion.

**Fisheries** play an important role in subsistence, income-generation and as a source of employment for people in the GLR. Lakes and rivers in the GLR are affected by the introduction of exotic species and the consequent ecological changes in community composition. There is an increase in aquaculture production.

**Forestry and forest resources** are crucial in supporting livelihoods, infrastructure development and energy in most GLR countries. Over 70% of households in the GLR use wood as their primary energy source for lighting and cooking. In Uganda, the total value of energy from forest is three times higher than Uganda's Energy budget for 2011/2012. In 2008, the commercialisation of charcoal was estimated to contribute US\$ 2.6 billion, representing 5% of the GDP. Bush meat hunting is widespread in the region, and is growing due to increasing populations. While assigning economic value is complex, there is no question that this 'free' resource is of great importance to many poor families and communities.

Increasing emphasis is being placed on the development of the energy sector, particularly from **oil, hydropower and wind farming** in the GLR. These sectors have the potential to boost national economies, but can have high impacts on biodiversity and ecosystem services, especially from infrastructure development and changed access regimes for local communities. Oil and gas exploration in the Albertine Rift in particular presents a major threat to biodiversity.

The GLR countries have significant **mineral reserves** and, although currently relatively little exploited, the industry is projected to expand greatly over the coming ten years. Related activities such as road construction, drilling and movement of heavy machinery will impact on wildlife behaviour, habitat availability and pollution. Previously inaccessible areas will be opened to human access for exploitation and resource use.

**Foreign Direct Investment (FDI)** into large scale agricultural development and oil and gas exploration is encouraged in most GLR countries. Sound land policies need to ensure that such investments and developments that are attractive to national level economic planners do not have negative social, economic and environmental effects on local communities in the short and the long term.

**Transport** links in GLR countries remain poor in many places but are improving with major road and rail networks being upgraded. There are concerns that the opening up of the region could fuel illegal logging and intensification of agriculture as access to markets becomes easier.

**Tourism** is a major foreign exchange earner for some of the GLR countries and large numbers of people visit GLR countries each year. In 2012, the sector accounted for 1.9-3.9% of all employment and contributed between 2.7 and 4% to the GDP in the four main GLR countries. There is little information on the negative impacts of tourism on biodiversity and ecosystem services.

### *Capacity to respond to the impacts of commodity developments*

Natural resources are a major part of the development strategies of the GLR countries, and, as they seek to accelerate economic growth and meet their development goals, threats to and impacts on natural resources are likely to increase.

Policy and legislative frameworks for environmental protection and natural resource management in the GLR exist, together with government institutions and a range of civil society organizations. However, the level of implementation varies. Weak enforcement of existing laws and regulations with regards to environmental safeguards is the consequence of a lack of political support, resources and underdeveloped capacity.

Several high profile transboundary natural resources related agreements and initiatives exist in the GLR. They focus on integrated natural resource management of the major basins, such as the Convention on the Sustainable Management of Lake Tanganyika, the Nile Basin Initiative, the East African Community Lake Victoria Basin Commission and Lake Malawi/Nyasa Basin Commission. But whether they are able to stop adverse impacts or control the implementation of large scale transboundary developments such as dams and oil exploration is unclear. At the national level, protected areas in all GLR countries play an important role in biodiversity conservation, but they are threatened by rapid development of agriculture and extractive industries.

Finally, the pressure and impacts from commodity development on biodiversity and ecosystem services in the GLR is increasing and this is unlikely to change in the near to medium future. Many initiatives that aim to address some of these pressures and impacts already exist in the region. However, most of these support civil society, and, whilst these play an important role in promoting environmentally sustainable policies and investor accountability as well as local rights to resources, national governments are responsible for higher-level environmental policy and legal frameworks.

It is important to strengthen the institutional capacity for environmental management by government institutions and national environmental management authorities, in particular for the implementation and enforcement of existing policies and laws in relation to environmental safeguards of commodity-driven developments.

National and international civil society organisations and donors should work together to support and strengthen government processes and capacity to address the adverse impacts of commodity development on biodiversity and ecosystem services in the region.

Over the past two decades, many new environmental policies and plans have been developed by governments, including as part of Multilateral Environmental Agreements supported by international processes. However, these plans are still insufficiently integrated into the national and regional policies and legislation that drive economic development, or not implemented at all. There are also often conflicts between policies from different sectors, which prevent the effective mitigation and reduction of negative impacts on biodiversity and ecosystem services.

## 3. Introduction

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**The Great Lakes Region of East and Central Africa (GLR) is one of extreme geophysical and habitat diversity. The region supports extraordinary biodiversity and provides ecosystem services supporting the livelihoods of millions of largely rural inhabitants within and beyond the GLR region. The region is endowed with significant natural resources such as land, water, oil and gas and mineral reserves that offer genuine economic development opportunities for the region, but with potentially important costs to the region's biodiversity and the ecosystem the services its inhabitants and economies depend on.**

The main objective of this report is to provide a synthesis of the impacts of major commodity developments on biodiversity and ecosystem services in the GLR region, and of the current capacity to respond to these pressures.

The report constitutes the first part of a two-part project that supports the targeting of conservation-related investments in the region by the MacArthur Foundation and other donors. The second part is a spatial analysis of the potential impacts of future scenarios for commodity-driven land use change on biodiversity and ecosystem services in the region's watersheds.

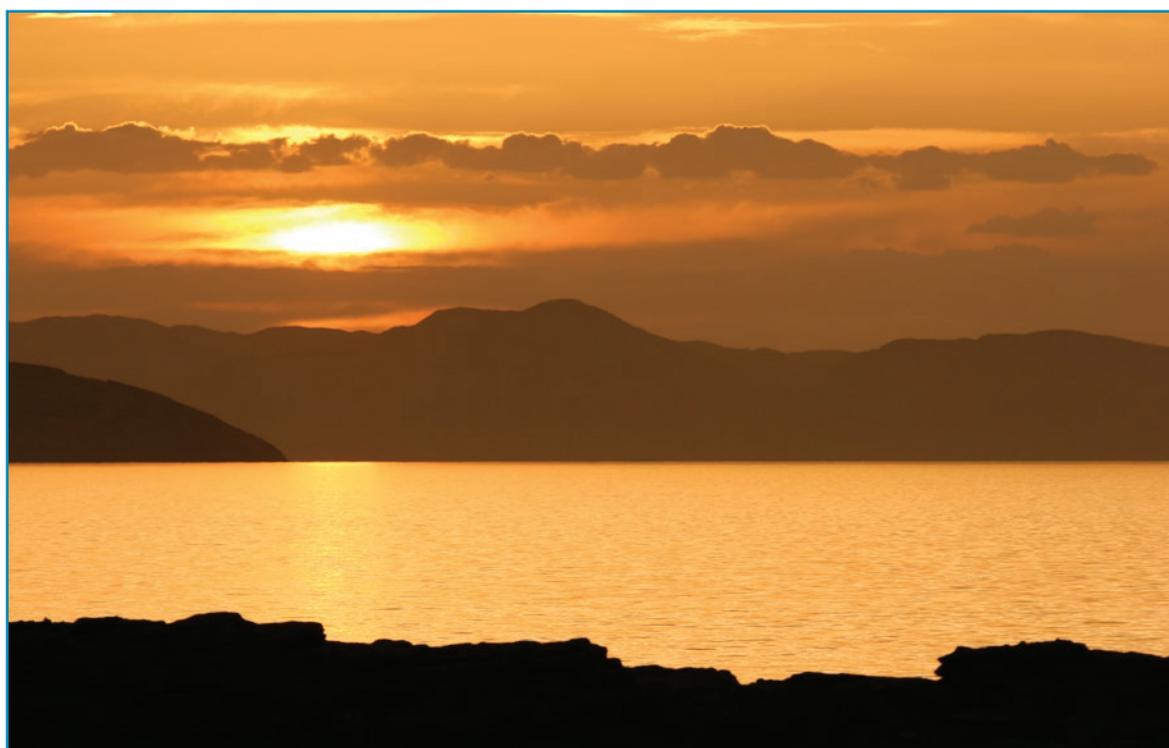


While not claiming to be comprehensive, this study has sought to collect the best available information and provide analysis on the impacts from major commodity developments on biodiversity and ecosystem services, and the current context for addressing these impacts. Information was collected using a detailed review of peer-reviewed and grey literature and targeted expert consultation. Existing datasets were used to analyse commodity development trends in the region. This report presents a synthesis of this work, bringing together a broad range of new and existing information with a particular focus on four countries, namely Burundi, Rwanda, Malawi, and Uganda, as these are the four countries that are fully covered by the MacArthur-defined GLR region. Other countries were considered where there was information relevant to their section of the GLR as far as possible.

This report first presents the biophysical context of the GLR as well as the socio-economic, political and governance context of countries in the region. Chapter 5 summarises the importance of the GLR for biodiversity and

ecosystem services including their status and trends. Chapter 6 presents status and trends in commodity development per sector (i.e. agriculture, fisheries, forestry, wildlife hunting and trade, energy, tourism, transportation, mining and manufacturing). Chapter 7 investigates the institutional context that determines policy and legal responses in the context of threats and drivers of biodiversity and ecosystem services loss in the GLR.

It is important to note that this report builds on BirdLife International's 2012 Conservation Strategy for the Great Lakes Region of East and Central Africa and the Critical Ecosystem Partnership Fund's (CEPF) 2012 Ecosystem Profile of the Eastern Afromontane Biodiversity Hotspot (BirdLife International 2012; CEPF 2012). Based on these comprehensive studies, this report investigates in further detail the evidence for the development of commodity-driven development and its impacts as well as the means to address them, and provides a number of recommendations for further action in the region.

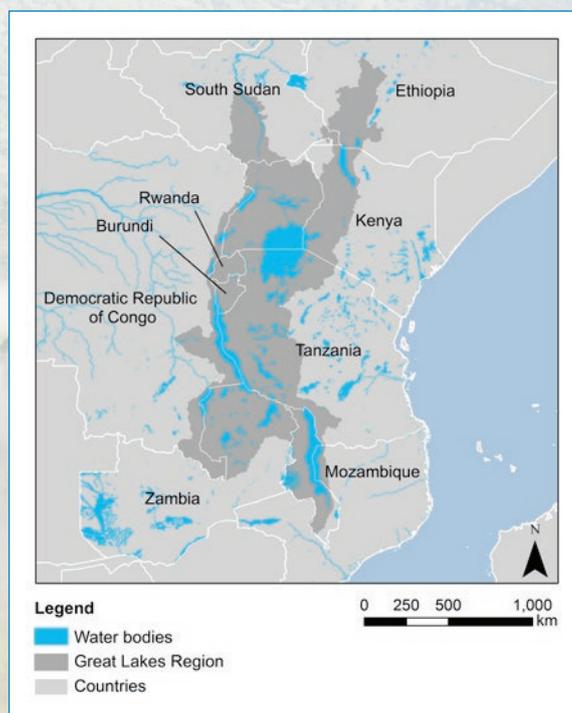


# 4. The Great Lakes Region of East and Central Africa (GLR)

This chapter describes some of the main geographical and biophysical characteristics of the study region, including major habitat and ecosystem types and areas considered of great ecological importance. It also gives a broad socio-economic profile of the countries of the Great Lakes Region.

## 4.1 GEOGRAPHIC BOUNDARIES

The GLR as recognised by the MacArthur Foundation encompasses eleven countries: Burundi, Democratic Republic of Congo (DRC), Ethiopia, Kenya, Malawi, Mozambique, Rwanda, South Sudan, Tanzania, Uganda and Zambia (Figure 1). Four of these are fully, or almost fully, covered by the study region – Burundi, Rwanda, Malawi, and Uganda, and seven are partially covered – southern South Sudan, south west Ethiopia, western Kenya, eastern DRC, north and north east Zambia, west, south west and north west of Tanzania, and north west Mozambique (Table 1). It is worth noting that other geographical definitions of the GLR exist (Mpangala, 2004).



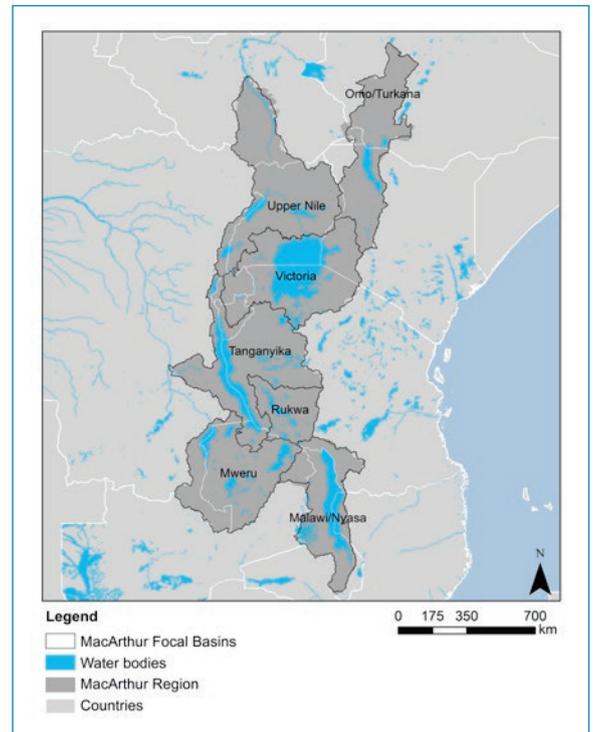
**Figure 1:** The GLR in East and Central Africa (MacArthur 2012; DIVA GIS 2014; NGA 2000)

**Table 1:** Countries covered by the assessment

Country	MacArthur area (million ha)	Total country area (million ha)	Proportion of country included in the GLR (%)
Burundi	2.72	2.72	100%
DRC	14.52	232.30	6%
Ethiopia	9.80	112.75	9%
Kenya	14.12	59.34	24%
Malawi	10.02	11.85	85%
Mozambique	1.57	78.60	2%
Rwanda	2.53	2.53	100%
South Sudan	8.53	62.43	14%
Tanzania	38.42	93.97	41%
Uganda	23.63	24.14	98%
Zambia	19.49	75.12	26%

## 4.2 BIOPHYSICAL CHARACTERISTICS

The GLR covers seven major watersheds or basins: five of these were identified as priority basins for the MacArthur Foundation (BirdLife International, 2012). These are the Upper Nile Watershed, Turkana/Omo Watershed, Lake Victoria Watershed, Lake Tanganyika Watershed and Lake Malawi/Nyasa Watershed (Figure 2). There are six major lakes within the GLR namely: Turkana, Albert, Victoria, Kivu, Tanganyika and Malawi (also known as Nyasa or Niassa). Also included are smaller outliers such as Baringo, Rukwa, Mweru and Malombe (BirdLife International, 2012). An overview of the five major basins is provided below (Table 2). All basins are considered under threat from deforestation and habitat degradation in the catchments, agricultural intensification, water extraction, over-fishing, siltation, and in some cases oil exploitation (ARCOS Network, 2013a; Nile Basin Initiative, 2012; BirdLife International, 2012). The Conservation Strategy for the Great Lakes Region of East and Central Africa written by BirdLife International (2012) provides a more detailed description of each of the basins.



**Figure 2:** The Great Lakes Region of East and Central Africa seven major basins (MacArthur Foundation 2014; MacArthur Foundation 2012; DIVA GIS 2014; NGA 2000)

**Table 2:** Key features of the five focal Lake Basins in the GLR (BirdLife International, 2012)

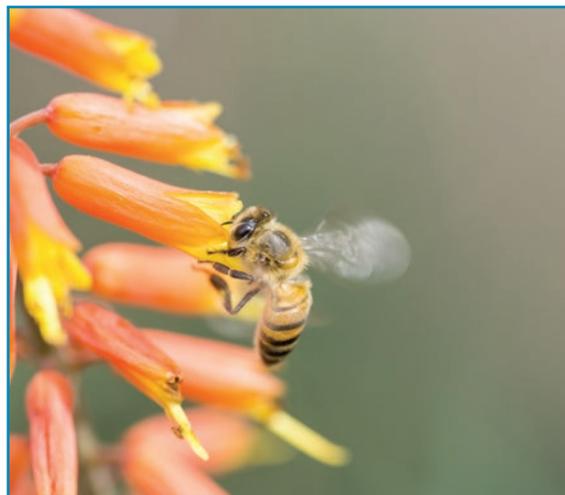
Lake Basin	Basin Countries	Basin Type		Water Type	Climate	Area (thousand ha)		Population density (p/ thousand ha)
		Riparian	Non-Riparian			Lake	Basin	
<b>Upper Nile</b>	DRC, Ethiopia, Tanzania, South Sudan, Uganda		Floodplain rivers and wetland complexes	Fresh	Dry: Arid to Tropical Humid: Savanna	NA	NA	NA
<b>Turkana*</b>	Kenya	Ethiopia	Closed	Saline	Dry: Arid	675-756	13,086	35
<b>Victoria</b>	Kenya, Tanzania, Uganda	Burundi, Rwanda	Surface Open	Fresh	Tropical humid: Savanna	6,880	18,400-19,300	1550
<b>Tanganyika</b>	Burundi, DRC, Tanzania, Zambia	Rwanda	Surface Open	Fresh	Tropical humid: Savanna	3,200-3,260	22,300-26,300	450
<b>Malawi/ Nyasa</b>	Malawi, Mozambique, Tanzania		Transitional	Fresh	Tropical humid: Savanna	2,950	10,050	680

\* Does not include the Omo Basin

### 4.3 ECOREGIONS AND HOTSPOTS

The GLR covers at least parts of 12 of the 426 freshwater and of 20 of the 119 terrestrial Ecoregions defined by WWF (Thieme *et al.*, 2005; Abell *et al.*, 2008; Burgess *et al.*, 2004). The 12 freshwater Ecoregions run from the Upper Nile and Lake Turkana in the North southwards to Lake Malawi/ Nyasa, Coastal East Africa and Middle Zambezi-Luangwa Ecoregions, extending into the Lower Zambezi Ecoregion. The 20 terrestrial Ecoregions include: the Sudd Flooded Grasslands in Sudan and the Ethiopian Lower Montane Forests; Woodlands, Bushlands and Montane Moorlands in Ethiopia; the Eastern Miombo woodlands of Tanzania and Mozambique; the South Malawi Montane Forest-Grassland mosaic; the Ruwenzori-Virunga Montane moorlands; the Albertine Rift Montane forests; the Central Zambezian Miombo and the Eastern Miombo Woodlands; the Northern and Southern *Acacia-Commiphora* Bushlands and Thickets and a third of the Central Zambezian

Miombo Woodlands (BirdLife International, 2012; CEPF, 2012). The GLR also covers the southern part of the Eastern Afromontane (EAM) Biodiversity Hotspot, first recognized as globally important for species conservation by Mittermeier *et al.* (2004).



## 4.4 SOCIO-ECONOMIC CONTEXT

### Population and poverty

The population in the four countries entirely included in the GLR was an estimated 73.6 million in 2012, or around 7.2% of the total population in Africa, and had grown to an estimated 76 million in 2013 (Table 3; 6.9% of the total population in Africa). Population growth is high in most countries. For example human population growth rates for Uganda exceed 3% per annum, in comparison to the average world population growth rate of around 1.3% (African Development Bank, 2014).

Poverty is widespread in the region. The proportion of people living below the poverty line is very high for most of these countries; more than 60 percent of the populations of Burundi, Rwanda and Uganda live on less than US\$1.25 per day (Table 3). Poor people in rural areas of the GLR are heavily dependent on natural resources and services from important biodiversity areas, including protected areas (Plumptre *et al.*, 2003). Resources used include fuel wood, timber, non-timber forest products, game meat and water. Urban dwellers in the region also largely still rely on wood fuels to meet their daily energy needs.

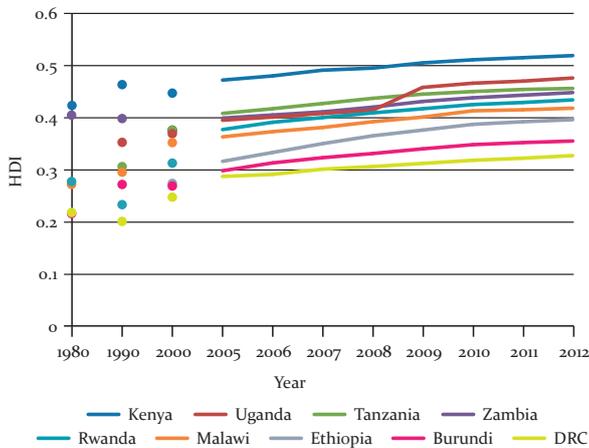
**Table 3:** Non-income indicators for Burundi, Malawi, Rwanda and Uganda (UNDP 2013, African Development Bank 2014)

Category	Burundi	Malawi	Rwanda	Uganda
Population in millions (2013)	10.2 million	16.4 million	11.8 million	37.6 million
UNDP Human Development Index (HDI) (2012)	0.456	0.434	0.418	0.355
Percentage of population living on less than US\$1.25 a day (2012)	81.3%	73.9 %	63.2 %	38%
Percentage of under 5 mortality rate (2011)	139.1	82.6	54.1	89.9
Life expectancy at birth (years) (2012)	50.9	54.8	55.7	54.5
Urban population (% of population) (2012)	11.2	15.8	19.4	16.0

Burundi, Malawi, Rwanda and Uganda have life expectancies below 56 years, compared with a developed world average of 69.3 (Table 3). Literacy rates are typically 55 to 75% for adults (15 and older; UNDP 2013). UNDP Human Development Index (HDI) scores are some of the lowest in the world: all GLR countries are in the bottom 25 countries (out of 186), except Kenya and Tanzania who rank 145 and 152 respectively (Table 4). The HDI is steadily increasing in most countries (UNDP 2013), for example in Burundi, Malawi, Rwanda and Uganda (Figure 3).

**Table 4:** UNDP Human Development Index (HDI) in the GLR countries excluding South Sudan (out of a total of 186 countries; UNDP 2013)

Country	HDI Rank
Kenya	145
Tanzania	152
Uganda	161
Zambia	163
Rwanda	167
Malawi	170
Ethiopia	173
Burundi	178
Mozambique	185
DRC	186

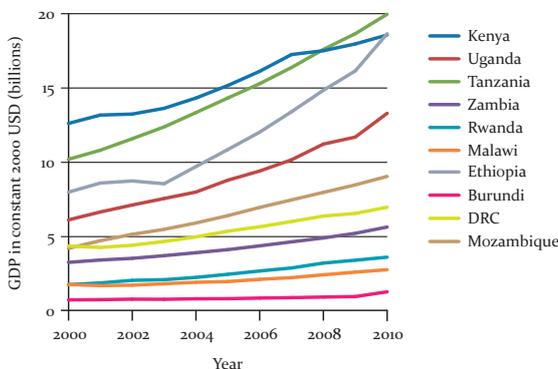


**Figure 3:** UNDP Human Development Index (HDI) in the GLR countries, except South Sudan and DRC and Burundi (UNDP 2013)

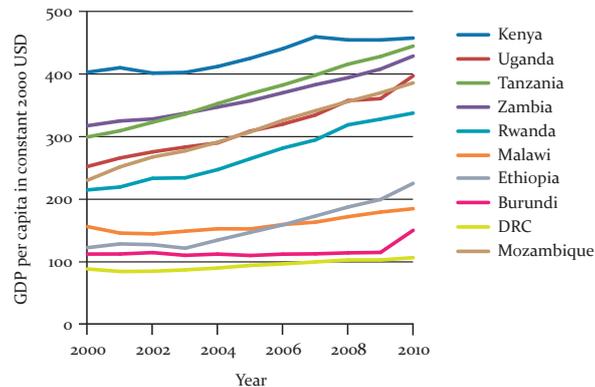
**Economic context**

All countries in the GLR are classified as low or lower-middle income countries by the World Bank (World Bank 2014). GDP (inflation adjusted, base year 2000) has been increasing since 2000 (Figure 4). GDP growth has also improved compared to the 1980-2000s and oscillates around 5%. More importantly, GDP per capita has also been increasing in most GLR countries (Figure 5).

Kenya is the largest economy in the region. Kenya’s GDP represents 40% of the East African Community (EAC) GDP, followed by Tanzania (28 %), Uganda (21%), Rwanda (8%) and Burundi (3%).



**Figure 4:** GDP trends of GLR countries excluding South Sudan (constant 2000 US\$) (data source: World Bank 2014)



**Figure 5:** GDP per capita trends of GLR countries excluding South Sudan (constant 2000 US\$) (data source: World Bank 2014)

Figures 6 to 9 show the changing contribution of agriculture, industry and the service sector to GDP. Agriculture has declined for all countries, most notably so for Uganda, Rwanda and Burundi. Meanwhile the service sector’s contribution has increased relatively continuously across all countries, while industry’s contribution to GDP has fluctuated somewhat, but in all countries has increased since 1970.

Burundi’s economy has grown an average 4% a year since 2005 (AfDB *et al.*, 2013; Table 5). This growth was mainly due to increased activity in the secondary and tertiary sectors the first having benefited from investment in industry, construction and public works (AfDB, OECD & UNDP, 2014a; Figure 6). The primary sector contracted by 2% in 2013, mainly because rainfall negatively affected coffee production (AfDB *et al.*, 2013).

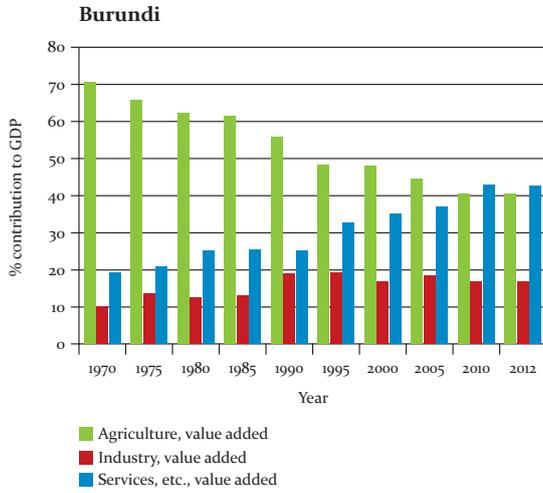


Figure 6: Sectoral contribution (%) to GDP for Burundi (World Bank 2014)

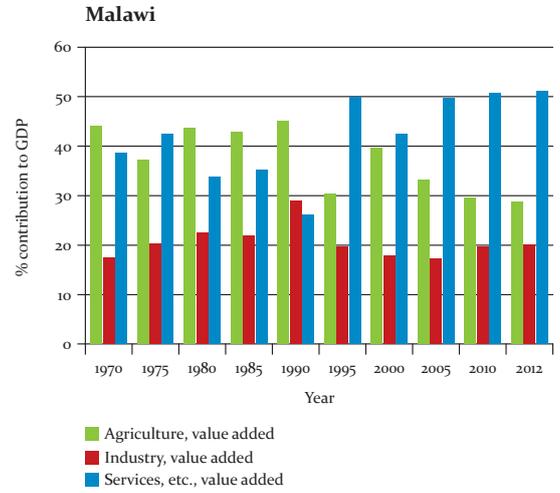


Figure 7: Sectoral contribution (%) to GDP for Malawi (World Bank 2014)

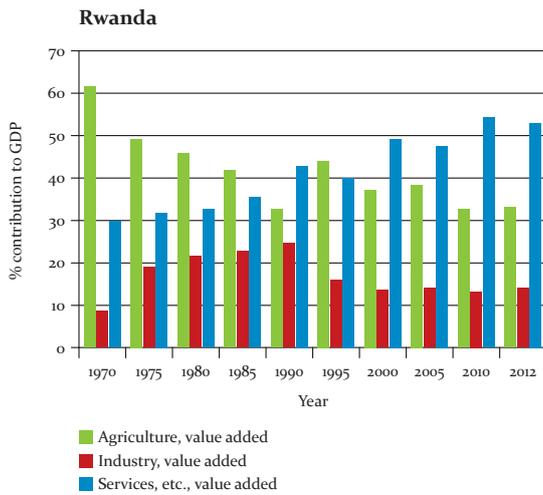


Figure 8: Sectoral contribution (%) to GDP for Rwanda (World Bank 2014)

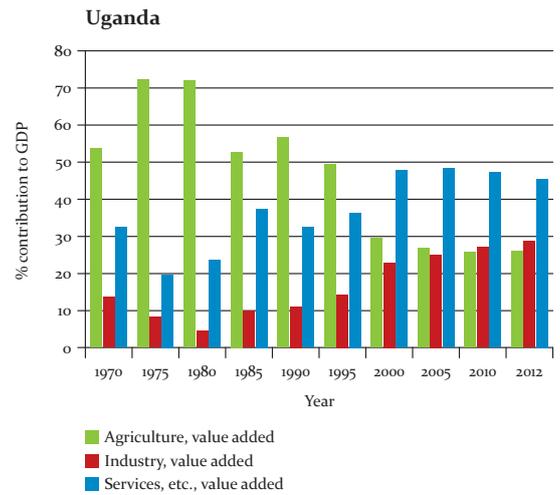


Figure 9: Sectoral contribution (%) to GDP for Uganda (World Bank 2014)

According to the African Economic Outlook 2014, Malawi’s real GDP growth is projected to accelerate in 2014 and 2015 (Table 5), driven by increased tobacco exports and continued growth in the agriculture, manufacturing and services sectors (AfDB, OECD, & UNDP, 2014b). The depreciation of the Malawian kwacha (MKW) led to an increase in tobacco prices

and subsequently tobacco output. This boosted growth in the wider agriculture sector, which contributed to an increase in agro-processing activities. Manufacturing was also boosted by the increased availability of foreign exchange (AfDB *et al.*, 2014b). The relative contribution of the agricultural sector to the GDP has however been decreasing in the past 10 years (Figure 7).

**Table 5:** Real GDP growth 2014 for Burundi, Malawi, Rwanda and Burundi (AfDB et al., 2014a, 2014b)

Real GDP growth (%)	2005-09	2010	2011	2012	2013(e)	2014(p)	2015(p)
<b>Burundi</b>	3.7	5.1	4.2	4.2	4.6	5.2	6.7
<b>Malawi*</b>	6.4	9.5	3.8	1.8	5	6.1	6.2
<b>Rwanda</b>	8.7	6.3	7.5	7.3	4.6	7	7.4
<b>Uganda*</b>	7.9	6.2	6.2	2.8	5.2	6.6	7

Note: (e) estimates; (p) projections. \* Fiscal year July (n-1)/June (n). \*\* Fiscal year April (n)/March (n+1).

Rwanda's real GDP growth (Table 5) was mainly driven by services for the past 15 years (AfDB *et al.*, 2013; Figure 8). The country's real GDP growth slowed down in 2013 from 2012 due to the lower agriculture performance and the suspension of budget support disbursements in 2012 (AfDB *et al.*, 2014a). Increased coffee and tea production and favourable prices for key mineral exports increased export earnings in 2013 (AfDB *et al.*, 2014a).

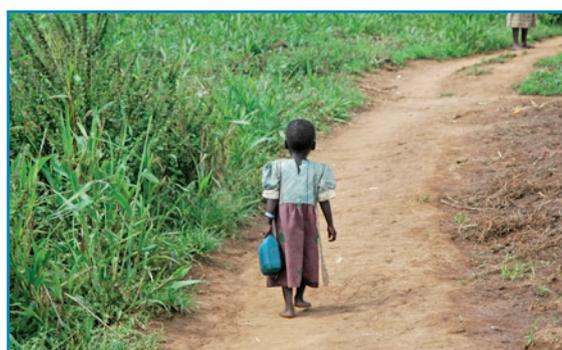
Uganda's economy stabilised in 2012 but growth was at its lowest in more than a decade (Table 5). In 2013 Uganda saw a gradual recovery of economic activity, with real GDP growth projected to reach 6.6% in 2014. Absolute poverty in Uganda is decreasing, from 24.5% in 2009/10 to 22.2% in 2012/13 (AfDB *et al.*, 2014a). For the past 20 years services have been more important than agriculture as contributors to GDP. Industry and value added sectors have become almost as important as agriculture in terms of GDP contribution (Figure 9).

Natural resources and official development assistance still play a crucial role in the economics of the GLR countries. The GLR countries are endowed with substantial natural resources, in particular for energy, which can attract investments, support economic growth and development, including hydropower potential, natural gas, oil, geothermal energy, coal, peat, biomass, solar, and wind. Hydropower has a particularly large energy generation potential, given the large volume of flowing water in the region, although this potential has so far been under developed (Nile Basin Initiative, 2012). The discovery of gas and oil in Uganda offers opportunity to boost the economy (AfDB *et al.*, 2013).

### Political Context

Since the early 1990s the Great Lakes Region of East and Central Africa (GLR) has experienced well-documented ethnic conflicts, genocide, civil wars, inter-state conflict, flawed democratic transitions and economic slowdown (Odwong, 2011). With the cessation of political tensions in the Great Lakes region, the countries have gone through a period of political stability and economic progress. There has been a move towards reform in governance and institutions in most countries in the region (AfDB *et al.*, 2014a; AfDB *et al.*, 2014b; African Development Bank 2011; African Development Bank 2013).

Most of the countries in the region now have multiparty systems. However political parties that liberated the countries from colonial powers and those that brought political and economic stability in the first place (*e.g.* National Resistance Movement (NRM) Party in Uganda, Rwandan Patriotic Army (RPF) and the National Council for the Defence of Democracy-Forces for the Defence of Democracy in Burundi (CNDD-FDD) tend to dominate the political space. Peace and stability are very important to continued economic growth and sound environmental management to support this growth in the GLR.



## Governance

Ratings of governance vary among the GLR countries, but most perform rather badly in the corruption rankings. Of all the countries fully covered by the GLR, Rwanda ranks best in the Ibrahim Index of African Governance (IIAG) - 11<sup>th</sup> of all 52 countries in sub-Saharan Africa - whilst Uganda scored best in Transparency International's corruption perceptions index

(CPI) - 49<sup>th</sup> out of 175 countries considered (Table 6). The other countries show more mixed performances among these two indices. (Mo Ibrahim Foundation 2014). In terms of Transparency International's CPI, in 2013 most countries had scores close to the "highly corrupt" end of the spectrum. (Transparency International 2013; Table 6).

**Table 6:** 2013 Ibrahim Index of African Governance (IIAG) country rankings (Mo Ibrahim Foundation 2014) and Corruption Perceptions Index (CPI) 2013 (Transparency International, 2013).

Country	IIAG		CPI	
	Rank (out of 52)	Score*	Rank (out of 175)	Score^
<b>Rwanda</b>	11	60.4	91	37
<b>Malawi</b>	16	57.6	140	26
<b>Uganda</b>	19	56.1	49	53
<b>Burundi</b>	40	43.8	157	21
<b>DRC</b>	47	34.1	154	22
<b>Tanzania</b>	15	58.2	111	33
<b>Zambia</b>	13	59.4	83	38
<b>Mozambique</b>	22	52.2	119	30
<b>Kenya</b>	17	57.4	136	27
<b>Ethiopia</b>	32	48.5	111	33
<b>South Sudan</b>	-	-	173	14

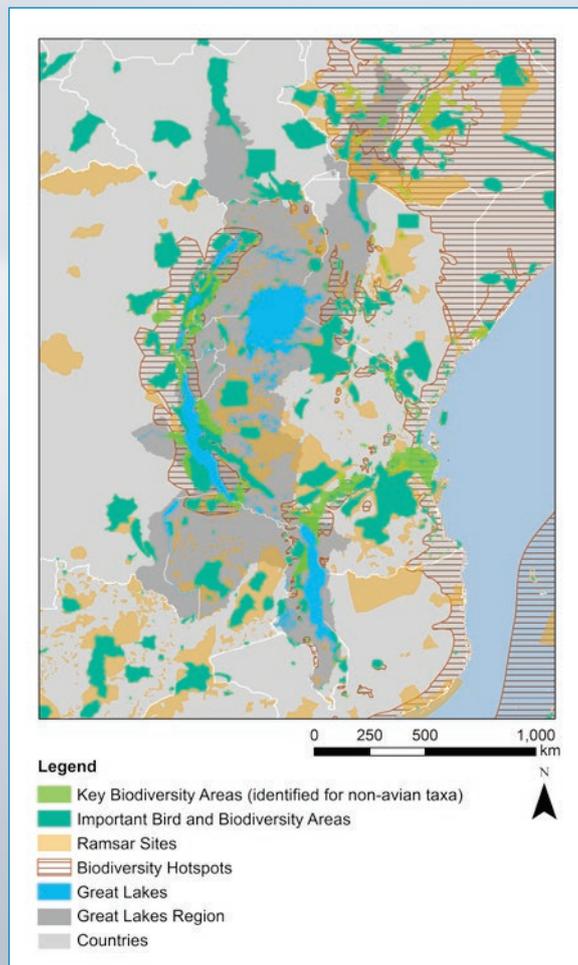
\* Scored on a scale of 0-100 for the four components: Safety and Rule of Law, Participation and Human Rights, Sustainable Economic Opportunity, Human Development

^Perceived levels of public sector corruption scored on a scale of 0-100 from Highly Corrupt to Very Clean.

# 5. Biodiversity and Ecosystem Services

This chapter aims to demonstrate the significance of the GLR in terms of biodiversity and ecosystem services. It first considers biodiversity, and in particular the high levels of species richness and endemism of the region, before discussing the supply of ecosystem services, looking at provisioning, regulating, supporting and cultural services in turn.

## 5.1 STATUS OF BIODIVERSITY



The GLR is one of the most ecologically important regions on the African continent (BirdLife International, 2012; Carr *et al.*, 2013; CEPF, 2012). The GLR hosts 168 terrestrial and 108 freshwater Key Biodiversity Areas (KBAs), including 135 (95 terrestrial and 40 freshwater) of the 310 KBAs identified for the Eastern Afromontane (EAM) Biodiversity Hotspot (Figure 10; CEPF, 2012), many of which are high priority forests that include charismatic and economically important species such as the mountain gorilla.

The GLR also includes 276 KBAs (73 terrestrial and 68 freshwater) outside the EAM hotspot boundaries (Figure 10). These KBAs were defined based on bird data alone. A further 21 terrestrial and 51 freshwater sites have been identified as candidate KBAs, on the basis of the presence of other taxa (BirdLife International, 2012).

**Figure 10:** GLR important biodiversity areas (DIVA GIS 2014; BirdLife International 2013; MacArthur Foundation 2012; NGA 2000)



In terms of species richness, the Albertine Rift in particular is home to about 14% (about 5,800 species) of mainland Africa's plant species, with more than 300 endemic species. Together with the Arc Mountains of Tanzania (not in the GLR), the Albertine Rift has the highest rates of endemism in the EAM hotspot (CEPF, 2012). Species richness is high at basin and country level and has been assessed relatively well for mammals, amphibians and birds (Tables 7 and 8). The status of plants, reptiles, molluscs, fishes and other invertebrates has been less well assessed (Table 8).

Despite this, there is evidence that the GLR's lakes are rich and diverse, particularly in terms of fish fauna. "At least 1,419 freshwater fish species have been recorded from the five focal basins in the GLR, comprising half of the total number of freshwater fish species for the whole of Africa and about 10% of the global total. The majority of these species are endemic, often to a single site, and 223 are currently recognized as globally threatened (40% of the African total of Red-Listed fishes)" (Holland & Darwall, 2011 cited in BirdLife International, 2012).

**Table 7:** IUCN Red List species and numbers of threatened species and their status in the five priority basins of the GLR (IUCN 2014)

Basin	Amphibians	Birds	Mammals	CR	EN	VU	NT	LC	DD	Total
Upper Nile	99	1053	377	2	23	46	52	1375	31	1529
Victoria	92	980	345	2	19	42	46	1285	23	1417
Tanganyika	121	951	321	3	17	43	39	1263	28	1393
Omo/Turkana	65	909	297	3	16	32	39	1165	16	1271
Malawi/Nyasa	98	669	216	3	15	21	26	905	13	983
Rukwa	67	637	202	1	7	14	22	855	7	906
Mweru	70	609	207	1	5	15	19	836	10	886

Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near threatened (NT), Least Concern (LC), Data Deficient (DD)

**Table 8:** Threatened species (CR, EN, VU) by country and taxonomic group, according to the IUCN Red List version 2014.3 (IUCN 2014)

Country	Mammals	Birds	Reptiles*	Amphibians	Fishes*	Molluscs*	Other Inverts*	Plants*	Total*
Burundi	11	13	0	5	17	4	3	7	60
DRC	34	36	5	13	84	43	10	107	332
Ethiopia	33	29	1	12	14	4	11	40	144
Kenya	31	38	9	10	69	17	67	187	428
Malawi	9	17	3	5	98	7	9	23	171
Mozambique	13	29	12	4	59	3	64	77	261
Rwanda	23	15	0	6	9	0	2	6	61
Uganda	28	23	3	6	61	9	10	49	189
Zambia	12	17	1	1	20	13	1	14	79
Tanzania	39	45	29	58	175	15	114	504	979
South Sudan	10	16	1	0	0	0	0	15	42

\* For these groups, there are still many species that have not yet been assessed for the IUCN Red List. The figures presented for these groups should be interpreted as the number of species known to be threatened within those species that have been assessed to date, and not as the overall total number of threatened species for each group (IUCN 2014).

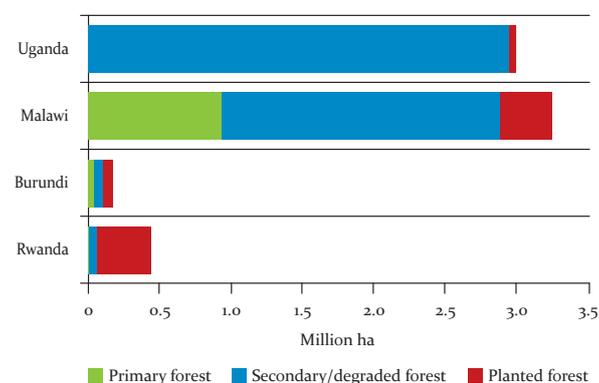
Burundi's fauna includes 716 bird, 215 fish, 163 mammal, 56 amphibian, and 52 reptile species while vascular flora comprises 2,909 species with a high endemism rate for species found at higher altitudes (Beck *et al.*, 2010). Fifty species native to Burundi are currently threatened with extinction, two critically are endangered, 15 are endangered, and 33 are vulnerable. Furthermore, another 39 are considered near threatened, indicating that they are close to qualifying for or are likely to qualify for a threatened category in the near future (Beck, Citegetse, Ko, & Sieb, 2010).

Rwanda is covered by diverse ecosystems: natural ecosystems consisting of mountain rainforests, gallery forests, savannahs, wetlands and aquatic lands. These ecosystems accommodate a great diversity of flora and fauna wealth. Rwanda hosts 2,150 known plant species, 151 mammal species, which 11 are currently threatened including *Gorilla gorilla berengei*, 87 amphibians and reptiles species and 670 birds' species (REMA, n.d.).

Approximately 6000 plant species and 192 recorded mammal species have been recorded in Malawi. It is estimated that approximately 47 species of the 172 species of molluscs, 12 species of reptiles and about seven species of amphibians, especially frogs, are endemic to Malawi. Malawi also contributes about 14% of world fresh water fish species and about 4% of world fishes (Malawi Environmental Affairs Department, 2010). About 95% of Lake Malawi fish species are endemic. 95% of these species are haplochromine cichlids, which are internationally recognized for their importance for the study of speciation, providing insights into the understanding of the evolutionary process (Malawi Environmental Affairs Department, 2010).

Uganda is one of the most bio-diverse countries in Africa, containing more than half of Africa's bird species and a very diverse set of vegetation types from the montane flora at 5,000 meters in the Ruwenzori to the lowland forest at 600 metres in the Semliki valley. In Uganda, there are 380 mammals, over 1050 birds and over 600 fish species. The cichlid fish species are endemic to Lake Victoria and other water bodies in the region. There are 5,000 species of flowering plants and 406 gymnosperms and ferns recorded in Uganda. Of these, there are 54 woody plants that are considered to be under threat. These species are distributed in diverse ecosystem types, both natural and modified, such as forests, woodlands, soils, wetlands and aquatic systems, agro-ecological zones and urban environments. Uganda has about 70 species of endemic butterflies (Uganda Clearing House Mechanism, 2013).

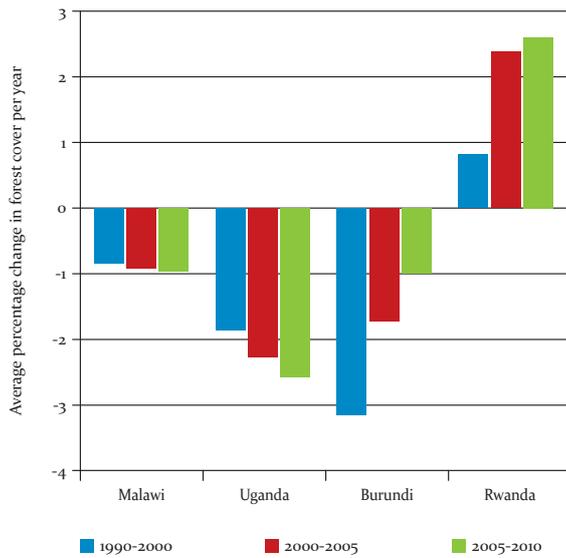
Forest area according to the FAO definition (>10% canopy cover) in Uganda, Malawi, Burundi and Rwanda is shown in Figure 11. Only Malawi has significant primary forest left. Most forest in Uganda has been degraded. Rwanda has mainly planted forest. Total forest cover represents less than 1.5%, 3.5%, 0.7% and 1.8% of total land area in Uganda, Malawi, Burundi and Rwanda respectively.



**Figure 11:** Forest cover in Uganda, Malawi, Burundi and Rwanda in 2010 (FAO 2010)

## 5.2 TRENDS IN BIODIVERSITY

Forest cover in most GLR countries is decreasing except in Rwanda (Figure 12). Rwanda has suffered from widespread deforestation in the past. Between 1990 and 2005 50% of its remaining natural forest cover was lost. However, as a result of government action, between 1990 and 2005 Rwanda gained more than 50% forest cover as plantations (Butler, 2006). In Burundi, most forest was lost before 1990. The government has made a lot of effort to establish forest plantations for conservation and wood resources. Between 1990 and 2010 Burundi lost 40.5% of forest cover (2% per year on average using a simple linear rate (Nduwamungu, 2011; Figure 12).



**Figure 12:** Forest cover change in Burundi, Rwanda, Malawi and Uganda between 1990 and 2010 (FAO 2010)

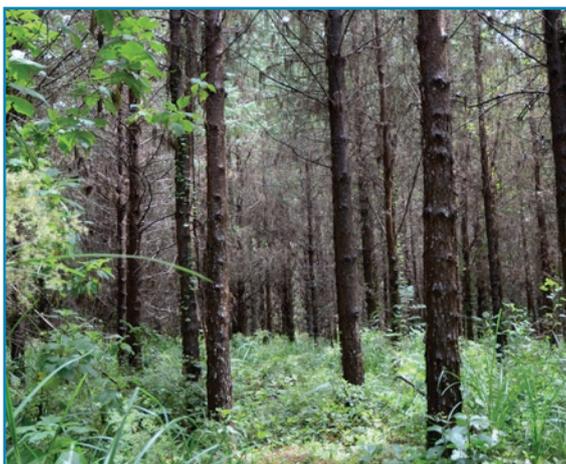
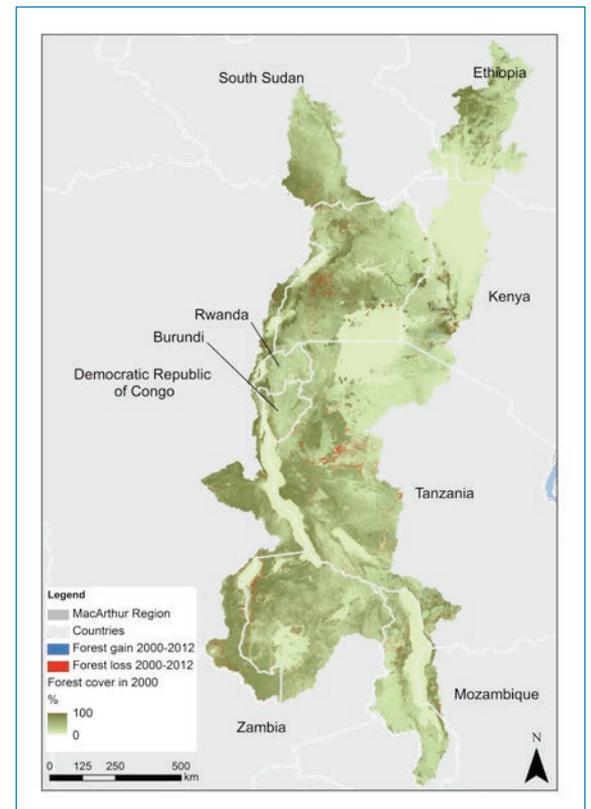
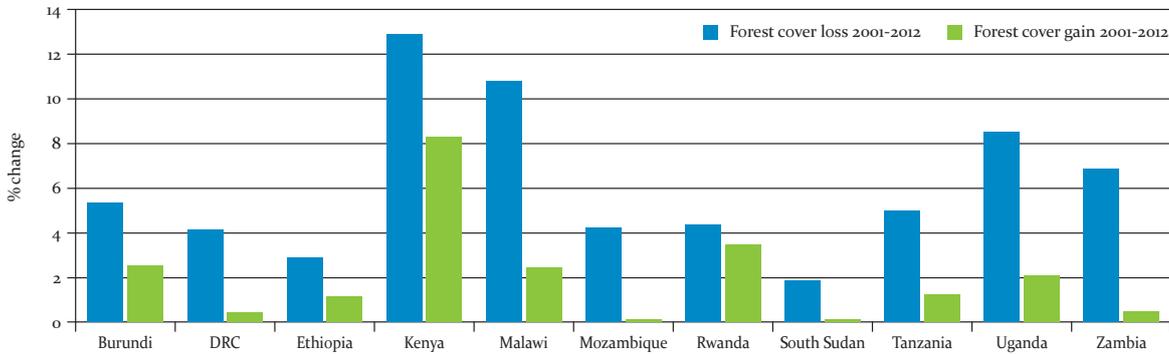


Figure 13 shows forest loss and gain between 2000 and 2012 in the GLR. Particular areas of deforestation are evident on the border of Zambia and the Democratic Republic of the Congo, in Tanzania and in Uganda. When looking at country averages within the GLR (so only for the area covered by the GLR), all show more loss than gain (Figure 14). The canopy cover cut-off here is 50%. Loss may be dense natural forest or plantation clear-cut, which is less likely except perhaps in Rwanda where plantations represent a large proportion of the forest cover. Forest cover gain is most likely plantations.

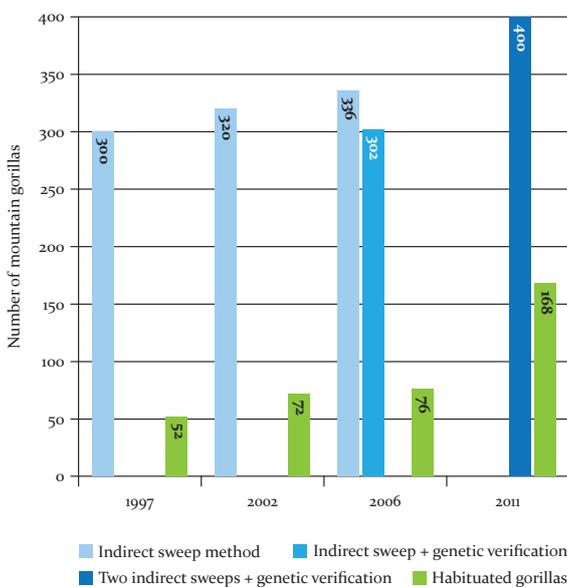
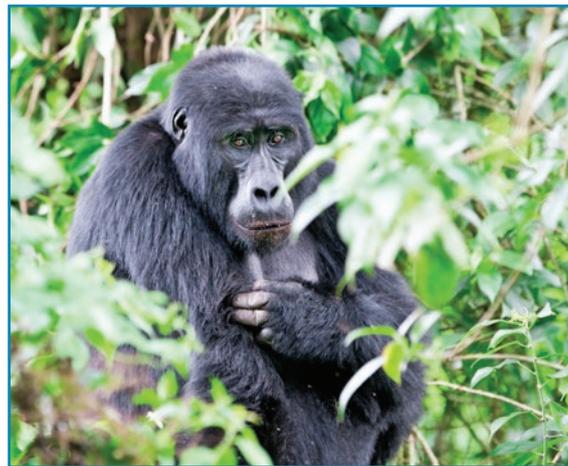


**Figure 13:** Forest loss (tree cover) in the GLR between 2000 and 2012 (Hansen *et al.*, 2013)



**Figure 14** Average forest loss and gain (50% canopy cover) for the area of each country that falls within the GLR region between 2000 and 2012 (Hansen *et al.*, 2013)

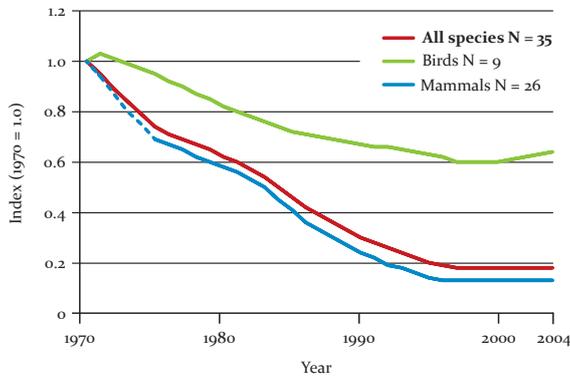
Data on trends in species in the focus countries is patchy except for Uganda, and even there they are mainly on large charismatic species, such as the mountain gorilla (*Gorilla beringei*). Results from a 2011 census have found that Uganda’s mountain gorilla population has grown. In Bwindi Impenetrable National Park, Uganda, confirms a minimum population of 400 mountain gorillas, up from 302 in 2006 (Figure 15). The total world mountain gorilla population now stands at a minimum of 880.



**Figure 15:** 2011 Bwindi census of mountain gorillas (AWF 2013)

The lack of data on biodiversity trends for other GLR countries possibly illustrates Uganda’s greater capacity in terms of biodiversity monitoring. UNEP-WCMC supported the development of a number of biodiversity indicators in Uganda through a Biodiversity Indicators Capacity Strengthening Project (BICSAfrica). A series of indices were constructed using the LPI method, showing the trends in abundances of individual species or groups of species such as for the Grey Crowned Crane, raptors, primates, the “big six” (mountain gorilla, chimpanzee, Uganda kob, Rothschild’s giraffe, elephant and lion). Most of these show steady declines in species abundances compared to the baseline of 1970, although with some fluctuations (McRae *et al.*, 2008; NEMA 2011 unpubl; Figure 16). An unpublished report by the National Environmental Monitoring Authority (NEMA) describes six aggregate indices namely:

## Uganda Living Planet Index (LPI)



**Figure 16:** The Living Planet Index for Uganda 1970-2004, (McRae et al., 2008).

“The Living Planet Index for Uganda combines the trends from the species population indices of Uganda’s forests, freshwaters and savannahs. The savannah data set is relatively extensive, comprising whole-country estimates for populations of 16 species of large mammal, while the data sets for forests and freshwater are smaller and less comprehensive (five and four species respectively)” (McRae *et al.*, 2008). The unpublished report by NEMA shows a small increase in the index in 2007-2008, but a sharp decline again in 2009-2010 (data unavailable at the time of writing this report; NEMA 2011 unpubl). Uganda species population index. For the species population index, whilst the general trend is downwards, fluctuations in the most recent years indicate some gains as well as losses. Since 1970, this index has dropped by some 20% - 30% (NEMA 2011 unpubl).

## Uganda species richness index

Data for this index come from two main sources. Firstly, the numbers of species of both birds and large mammals are relatively well-known in Uganda and the declines in one bird species and several species of large mammals (such as the Oryx and both species of rhinoceros) are well-documented in Uganda. It is also known that large numbers of fish species, mostly cichlids, have become extinct in Lake Victoria following the introduction of the Nile perch. Secondly, there are several groups of species of tree, butterfly and bird that have been sampled for two or more years in a wide variety of places. In one case – the numbers of bird species – there has been an increase in recent years but the overall trend of this indicator suggests a 10% loss from 1970 to 2010 (NEMA 2011 unpubl).

## Uganda habitat cover index (UHCI)

This index is based upon the areas of forest, woodland and wetlands in Uganda, using a wide variety of data sources, but the most recent wetland data are from 1999. The UHCI shows a 15% decline between 1970 and 2000 of forests and woodlands. Between 2000 and 2008 it dropped steeply to below the 50% mark. From 2008 to 2010 the Forest and Woodland Index returns to its pre-2000 rate of decline (NEMA 2011 unpubl). However inconsistencies among data sources and definitions of forest, woodland and wetland make the interpretation of fluctuations difficult (NEMA 2011 unpubl).

## Uganda habitat use index

The Uganda habitat use index combines counts in both aquatic and terrestrial habitats. The general trend is downward, partly due to the decline over the past 50 years of the populations of large mammals. The aquatic species data shows strong fluctuations which may be related to varying data collection efforts (NEMA 2011 unpubl).



### *Uganda land use index*

This index compares a whole range of species data from Protected Areas (mainly National Parks, but some Forest and Wildlife Reserves) with some from agricultural areas in Uganda. The PA index declines steadily from the 1970s to the 1990s, corresponding to a long period of political instability. More recently however, and especially in the 2000s, the index has increased again. From this it can argue that the PAs are indeed effective – but also that considerable biodiversity does remain in agricultural areas, although generally that is of less conservation concern as most threatened species are largely confined to PAs (NEMA 2011 unpubl).

### *Uganda Biodiversity Index 1962-2010*

The Uganda Biodiversity Index combines three indices on habitat cover, species populations and species richness to create an index spanning nearly 50 years. The overall Uganda biodiversity

index has declined from 100 in 1970, and appears still to be dropping. This index is regarded in Uganda as the best overall indicator of the success of their environmental policies related to biodiversity (NEMA 2011 unpubl).

### *Ecological footprint in the GLR*

One way to measure the intensity of use of the land is the ‘Ecological Footprint’. This measures how much land and water area a human population requires to produce the resource it consumes and to absorb its wastes, using prevailing technology. The ecological footprint and total biocapacity the GLR countries are generally very low and range from 1.5 global hectares per capita for consumption in Uganda to 0.7 global hectares per capita for consumption in Malawi. Total biocapacity (global hectares per capita) are low – from 0.8 for Uganda to 0.5 in Burundi; the global average is 1.8 (Table 9; Global Footprint Network, 2013).

**Table 9:** Ecological footprint and total biocapacity for Uganda (Global Footprint Network, 2013)

Country	Ecological Footprint of Consumption (global hectares per capita)	Total Biocapacity (global hectares per capita)
Burundi	0.9	0.5
Malawi	0.7	0.7
Rwanda	1.0	0.6
Uganda	1.5	0.8
World average	2.7	1.8

## 5.3 STATUS AND TRENDS OF ECOSYSTEM SERVICES

The GLR and its Lake Basins provides various ecosystem services used directly or indirectly by its inhabitants (Egoh *et al.*, 2012). Key provisioning services common across all watersheds comprise: water supply (drinking, livestock, irrigation), food (fish other wild foods), timber, fuel wood, building poles and medicinal plants and animals (CEPF, 2012). The key regulatory services include carbon storage and sequestration, water regulation, the maintenance of fertile soils and pollination services. Supporting services include nutrient cycling, soil formation and primary production. Cultural services are primarily linked to tourism and education, including the attractive scenery and rare and endemic wildlife. Spiritual and existence values are less widely recognized (Upton *et al.*, 2013). The following sections provide more detail per ecosystem service group.

### Provisioning services

Provisioning services are the products obtained from ecosystems, including: genetic resources, food, energy, fibre and fresh water.



### Fish

Fish is a critical source of protein to people in the GLR and a significant component of local livelihoods, as well as local and national economies in the GLR. Fish is relied upon directly for subsistence, as well as providing income and trade. Overall, the most heavily utilized taxa are the freshwater fishes and aquatic plants, with a total of 45% and 58% of all known species harvested respectively. Within the harvested species, 72% are exploited for human consumption; however, the proportion of species that are consumed is highly variable between taxonomic groups.

Fisheries on Lake Tanganyika land 165,000-200,000 tonnes of fish per year. This provides employment to some 95,000 fishers and an overall total of 1 million people with direct and indirect benefits to an additional 10 million people in the Basin (the fish are transported to regional markets as far as Dar es Salaam, Lubumbashi, and Lusaka; Hanek *et al.* 2011). Lake Malawi/ Nyasa has a commercial fishery accounting for an estimated 2,000 tonnes a year and an artisanal fishery of around 30,000 tonnes. It has been estimated to provide 70-75% of the animal protein consumed in Malawi (ILEC, 2005), in addition to important micronutrients, especially vitamin A, iron and zinc (Dugan *et al.*, 2010). An important feature of the fishing industry is the high proportion of women involved in the processing and marketing of fish caught in the lakes (Weeratunge & Snyder, 2010).

### Timber and non-timber forest products - food and medicinal products

Forest and woodland habitats provide sources of quality timber for furniture, doors and window frames. Diverse non-timber forest resources include firewood, building poles, medicinal plants, wild food (bushmeat and plants), minor forest products (animals for international pet trade and Khat for chewing; CEPF, 2012).

Medicinal plants are widely collected and form an essential component of primary health care for rural communities in many of the GLR countries where there are few medical facilities and far more traditional healers than medical doctors. For example, over 80% of the rural communities in East and Southern Africa depend on medicinal plants and animals for most of their health needs (Sileshi *et al.*, 2007). Medicinal plants are also a source of income. A study in Uganda estimated that the trade in wild and semi-wild food or medicinal plants provided an average of 36% to the household income of traders (mainly women with little education; Barirega *et al.*, 2012).

Forests in the GLR are a source of food such as honey and edible caterpillars. Several different types of caterpillars are of increasing socio-economic importance among local people. However, changes in forest composition could impact on livelihood practices and enterprises currently tied to specific forest species found in deciduous forests (Upton *et al.*, 2013). Shifts from deciduous forests to evergreen forests could affect species used for fuelwood, construction materials, medicinal uses of forests, and food (Upton *et al.*, 2013). Although forests are an important source of various non-wood products (such as mushrooms, bushmeat, fruits, juices, honey, and medicines), most of these products are produced and used in the informal economy and as a result, reliable estimates of quantities produced and their values in the GLR are unavailable.



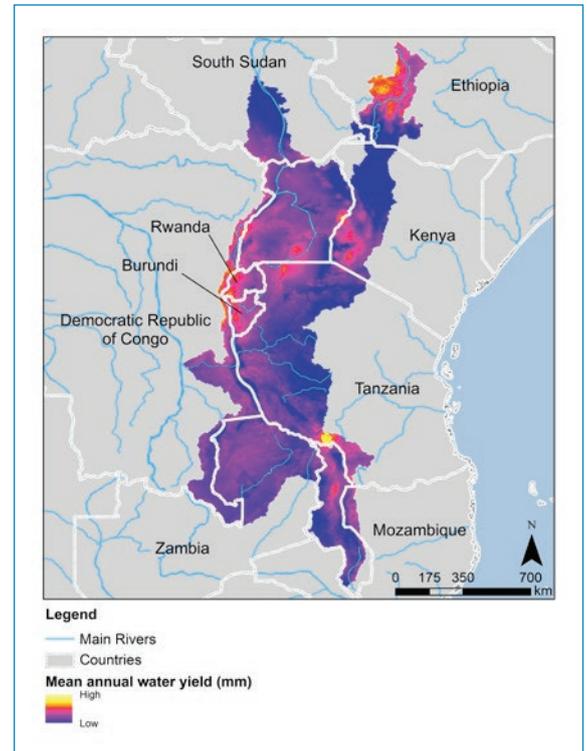
### Energy – fuelwood and charcoal

Fuelwood and charcoal are of high value in the GLR. Over 90% of the people in the GLR depend on fuel wood for their energy needs (Chilufya and Tegnäs, 1996). For example, in Malawi firewood is important for household energy, providing 95% of rural household energy supply and 55% for urban households, with charcoal providing around a third of urban household energy supply (Yaron *et al.*, 2011). In Rwanda, the 2009 consumption of fuelwood was 3.2 million tonnes (dry matter), 88% of which was consumed by rural households (Drigo *et al.*, 2013). Overall, 96% of all energy needs in Burundi are met by traditional biomass (Hakizimana, 2008). Deforestation has however reportedly forced farmers to use straw and other crop residues for fuel, thereby further damaging soil fertility. These factors have led to a disastrous shortfall in food production, with two-thirds of the population unable to meet even the minimum food energy requirement of 2,100 calories per person per day (GIZ n.d.).

## Water

Freshwater underpins human health and welfare in the GLR through fisheries, agricultural productivity, energy generation, transport, and environmental health. The GLR watersheds and, in particular, the highlands (see Figure 17) play a crucial role in the provision of clean water to downstream users. Water supply from mountains to lowlands is major source of hydropower, irrigation and dry season water supply to many large towns across the region. The water is also essential to sustain adaptation strategies for food security in the face of climate change (CEPF, 2012). The GLR is the source of the Nile and the Nile waters are important for the production of food, energy, supply of drinking water, for crop irrigation, and transport for nearly 300 million people (CEPF, 2012).

Supply of freshwater is under significant threat in the region through increased sediment loadings from erosion, increased salinity and changes in water levels (Upton *et al.*, 2013). These threats are likely to affect ecological rhythms, food webs, their dependent fisheries and associated freshwater supply services (BirdLife International, 2012).



**Figure 17:** Water yield in the GLR (Waterworld version 2, 2014)

The introduction of the water hyacinth (*Ecihornia crassipes*), also known as the waterweed and arguably one of the most environmentally harmful aquatic weeds in the world, was first reported on Lake Victoria in December 1989, having entered the Lake from River Kagera, and then on Lake Kyoga in May 1998. Given its high proliferation rate, the weed has spread rapidly over the years to the shores of Lake Kyoga, the banks of the River Nile and most of the northern tip of Lake Albert, impacting negatively on ecosystem services such as fish and on other aquatic species, and on water transport and trade.

## Regulating services

Regulating services are the benefits obtained from processes, including the regulation of climate, control of flood and some human diseases. The GLR and its river basin provides a wide array of regulating services, notable of which are water regulating services, erosion control and carbon sequestration.

### Carbon storage and sequestration in forests and woodlands

Forests, both within and outside protected areas in the GLR, play an important role in carbon storage and sequestration (CEPF, 2012). For example, Burundi's carbon stocks in above- and below-ground biomass total approximately 80 Mt. The areas with the highest biomass carbon density contain 12% of the country's biomass carbon but cover only 3% of its land area (*i.e.* around 71,000 ha). More than half of Burundi's land is low in biomass carbon. Burundi has 15 nationally designated protected areas covering around 110,000 ha, or 4% of its total land area, and containing about 6 Mt of biomass carbon. They cover all the land area that is both high in biomass carbon and of biodiversity importance (defined as being located within a KBA). Of the 9.3 Mt of biomass carbon stored in land that is high in carbon, almost 5 Mt (about 51%) are in protected areas (UNEP-WCMC, 2011a).



Rwanda's terrestrial carbon stocks total about 130 Mt, comprised of 67 Mt of carbon in above- and below-ground biomass and about 63 Mt in soils (to 1 m depth). Rwanda has 6 protected areas (nationally designated and internationally recognised) covering around 250,000 ha, or 10% of its total land area. In total they contain about 17 Mt of biomass carbon (and 41 Mt of soil carbon) and cover 98% of the land area that is both high in biomass carbon and of biodiversity importance (defined as being located within a KBA). Of the 13 Mt of biomass carbon stored in land that is high in carbon, about 89% (12 Mt) is in protected areas. Only 2% of the land area important for both carbon and biodiversity has no form of legal protection (UNEP-WCMC, 2011b).

Uganda's terrestrial carbon stocks total about 2.5 Gt, comprised of 1 Gt of carbon in above- and below-ground biomass and about 1.5 Gt in soils (to 1 m depth). Uganda also has 40 protected areas (nationally designated and internationally recognised) covering around 2,460,000 ha, or 10% of its total land area. They contain about 123 Mt of biomass carbon (and 217 Mt of soil carbon) and cover 62% of the land area that is both high in biomass carbon and of biodiversity importance (defined as being located within a KBA). Of the 169 Mt of biomass carbon stored in land that is high in carbon, 40 Mt (about 24%) are in protected areas. In total, 38% of the land area important for both carbon and biodiversity has no form of legal protection (UNEP-WCMC, 2011c).

### Erosion control and soil conservation

Forests and woodland play an important role in regulating water flows and in the prevention of flooding, landslides and erosion of topsoil into streams. However, conversion of forests and woodlands to crop land in the GLR countries has led to soil erosion, continuous loss of nutrients and degradation.

### Pollination services

Pollination is one of the most vital services provided by biodiversity, playing a pivotal role in the provision of food, habitat and other life-sustaining functions for all organisms. The economic significance of pollination services from honey bees and other native bee communities in the GLR is high. For example, studies in Uganda and Rwanda found that pollinators increased yield of pollinator-dependent crop species by more than 99% of total crop production registered per annum (Mazeyose, 2011; Munyuli, 2010). More than 60% of crop species grown in Uganda are likely to yield poorly in the absence of pollinators in the farm landscape (Munyuli, 2010). Among these vulnerable crops are all fruits and almost all vegetables grown, such as: coffee; all legumes like beans, peas and groundnuts (some varieties); tomatoes; mangoes; avocados and passion fruits among many others. For example, the value of pollination services delivered to coffee is the equivalent of 2-3% of the national GDP for the whole country (Munyuli, 2010). A study produced under the project 'Conserving Biodiversity on Farmed Landscapes of Uganda (COBA)' revealed that pollination services from bees total US\$149 million particularly towards coffee production in the banana coffee zones of Uganda (UWS/BTO, 2012).

### Supporting services

Supporting ecosystem services are those that are necessary for the production of all other ecosystem services. They are difficult to assess and quantify. Some examples include biomass production, production of atmospheric oxygen, soil formation and retention, nutrient cycling, water cycling, and provisioning of habitats.

The high variety of ecosystems in the GLR provides a great diversity of habitats, which in turn supports high levels of biodiversity. Together they underpin the ecosystem services that people depend on at all scales. The region's remaining forests and agricultural landscapes are important for carbon sequestration and storage.

### Cultural services

Cultural services are the non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience, including knowledge systems, social relations, and aesthetic values.

Tourism is a major contributor to national economies in the GLR, with large numbers visiting its constituent countries *e.g.* 817,000 tourists to Uganda to 699,000 to Rwanda (CEPF, 2012). While most tourists visit coastal areas and savanna game parks (some of which are found in the GLR), there is considerable scope for diversifying and expanding the industry in the region.

Gorilla tourism is a high-profile and increasingly important niche within the tourism sector. According to the International Gorilla Conservation Programme, current direct revenues are around US\$3 million per year with spinoff earnings, for example hotels and restaurants, of up to US\$20 million, shared between Rwanda, Uganda and DRC. Revenue-sharing mechanisms also help to improve the livelihoods of local communities around the protected areas where gorillas are found (Blomley *et al.*, 2010).

## 6. Commodity Development

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The dominant land-use types in the GLR are agriculture, forestry, fisheries and aquaculture, energy production, mining, and tourism. Population growth, urbanisation, natural resource-based development agendas and climate variability lead to changes in land and resource use threatening biodiversity and ecosystem services in the region. This section provides an overview of the current status and trends of the major commodity sectors of the GLR, as well as reported impacts that the development of these commodities have on biodiversity and ecosystem services.



## 6.1 AGRICULTURE

### Status and trends

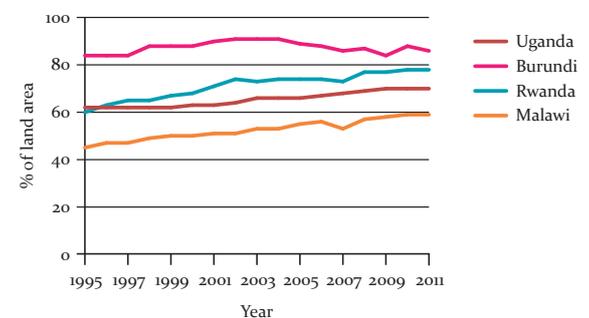
Agriculture occupies a large and increasing percentage of the total land area in the GLR countries (Figure 18). Only in Burundi does the proportion of agricultural land stagnate or decrease slightly, but the majority of the land in the country is already cultivated.

The agricultural sector is a major sector in the economy of the GLR. It remains a core sector for economic growth, food security, income, and employment (see also 6.1.2). Agriculture accounts for a significant proportion of foreign earnings (76%, 48% and 47% of exports from Burundi, Rwanda and Uganda respectively in 2006). In Malawi agriculture accounts for about 83% of foreign exchange earnings. Major export cash crops in terms of value grown in the GLR countries include coffee (Burundi and Uganda), tea (favourable climate and soil conditions enable Uganda, for instance, to develop some of the world's best quality tea), cotton, tobacco, wheat and barley (Byrnes, 1990).



In Uganda, agriculture's share in total GDP has declined since the 1990s (see Section 4.4), but socially it remains the most important sector because most Ugandans derive their livelihood from it: in 2009/10, the sector employed 66% (8.8 million) of the working population (Barungi *et al.*, 2013).

In Burundi and Rwanda, over 90% of the economically active population work in the agricultural sector. The majority are subsistence farmers. In Rwanda, small (less than 1 ha) family farms dominate the agricultural sector. Food crops account for 92% of the cultivated area, and two thirds of food crops are earmarked for family consumption. A small number of farmers grow higher-value cash crops such as coffee and tea, which occupy 3% and 1%, respectively, of total cultivable land (IFAD, 2011).



**Figure 18:** Agricultural land as a percentage of land area (FAO 2014)

In Malawi agriculture accounts for 85% of the labour force. National surveys estimate that crop production accounts for 74% of all rural incomes. Small holders contribute more than 70% to the GDP, while large estate farming contributes less than 30% (Chirwa, Kumwenda, Jumbe, Chilonda, & Minde, 2008; Government of Malawi, 2010).

Table 10 shows the top ten agricultural commodities in terms of area harvested by country for Burundi, Malawi, Rwanda and Uganda as calculated from ten year averages, over the years 2001 to 2011. Beans, plantains/bananas and maize are important staple crops in all four countries but also in the wider region.

**Table 10:** Top ten agricultural crops in terms of area under production, based on a 10 year average (in hectares; FAOSTAT 2013)

Burundi	Malawi	Rwanda	Uganda
Bananas	Maize	Plantains	Plantains
Beans, dry	Beans, dry	Beans, dry	Beans, dry
Sweet potatoes	Groundnuts	Sorghum	Maize
Maize	Potatoes	Cassava	Sweet potatoes
Cassava	Cassava	Sweet potatoes	Cassava
Sorghum	Tobacco	Maize	Millet
Vegetables fresh	Sorghum	Potatoes	Sorghum
Rice, paddy	Rice, paddy	Wheat	Groundnuts
Fruit Fresh	Vegetables fresh	Groundnuts	Bananas
Groundnuts	Fruit Fresh	Rice, paddy	Vegetables fresh

There has been a limited increase in the area harvested for these crops, with some increase in bananas in Burundi, cassava in Rwanda, and beans and maize in Uganda (FAOSTAT 2014, data not presented). Trends for major cash crops in Burundi, Rwanda, Malawi and Uganda are given in Figures 19-22. Most crops in the GLR countries are increasing in terms of harvested area (Figures 19-22).

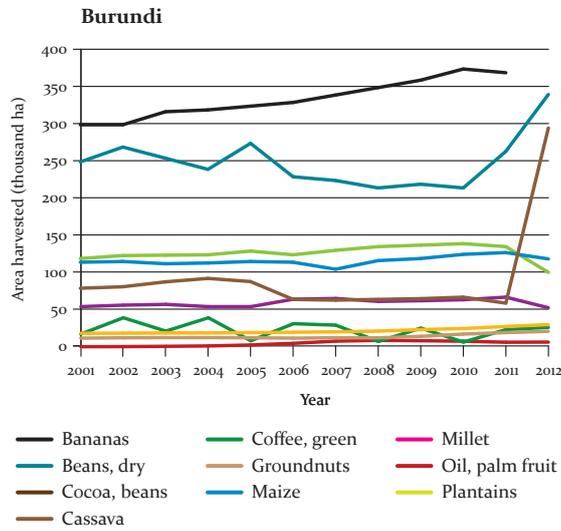
Oil palm is not yet a major crop in most countries, but in terms of oil crops, the harvested area for groundnuts is increasing in particular in Malawi and Uganda (Figure 21 and Figure 22). In Burundi the harvested area of soybean more than doubled between 2001 and 2011 (figures based on FAO estimates).

Tea increased by 10 % between 2010 and 2011 in Burundi (Figure 19), and by more than 20% in Uganda.

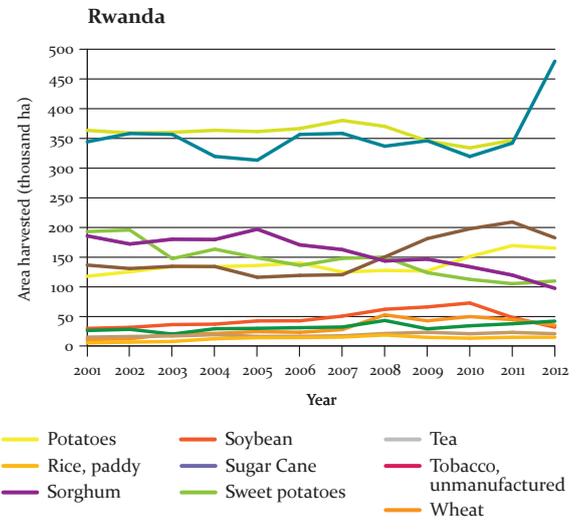
In Burundi cassava seems to have increased dramatically in 2012, but for the previous years the figures were FAO estimates and may not have reflected reality (Figure 19).

In Malawi, maize was not represented in the graph as this crop takes up the largest area, oscillating around 1.6 million ha over time (Figure 21). In Uganda, the major crop in terms of area harvested in plantains. This is also a major staple in Uganda. The trend in area harvested oscillates around 1.7 million ha over time. In Rwanda rice almost tripled since 2001 but it still represents a relatively small area of less than 15,000 ha (Figure 20).

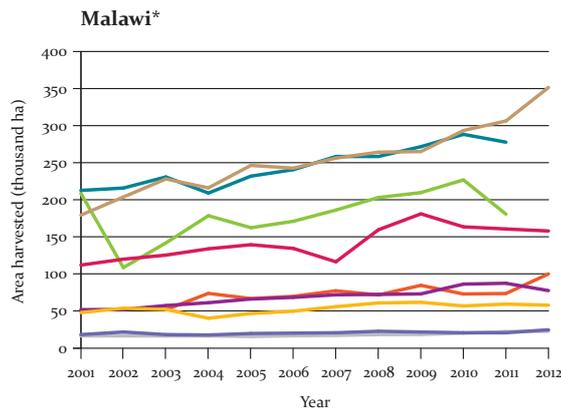




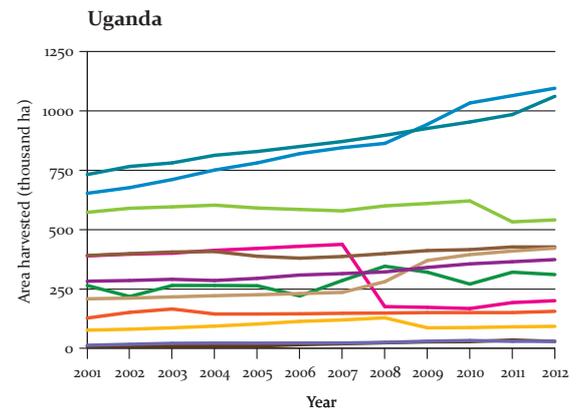
**Figure 19:** Burundi - area harvested of major cash crops in hectares (FAO, 2013)



**Figure 20:** Rwanda - area harvested of the major cash crops in hectares (FAO, 2013)



**Figure 21:** Malawi - area harvested of the major crops in hectares (FAO, 2013). Maize was not included, as it oscillates at around 1.6 million ha over time)



**Figure 22:** Uganda- area harvested of the major cash crops in hectares (FAO, 2013). Plantains are not included, as they oscillate at around 1.7 million ha over time

Increases in area of land under cultivation in the GLR are still limited (see also Figure 18). Africa's agricultural productivity is the lowest in the world, but it is also where most suitable uncultivated land is found, meaning that most agricultural expansion is likely to take place there.

Indeed, there is an increased interest in developing large scale intensive agriculture in Africa, in particular through long term land leases through Foreign Direct Investment (FDI). For example, in Tanzania the Southern Agricultural Growth Corridor for Tanzania (SAGCOT) is a public-private partnership aiming to increase investment in agricultural intensification and commercialization. The corridor covers a third of the country and overlaps with the south of Lake Tanganyika Basin and the north of Lake Malawi basin watersheds.

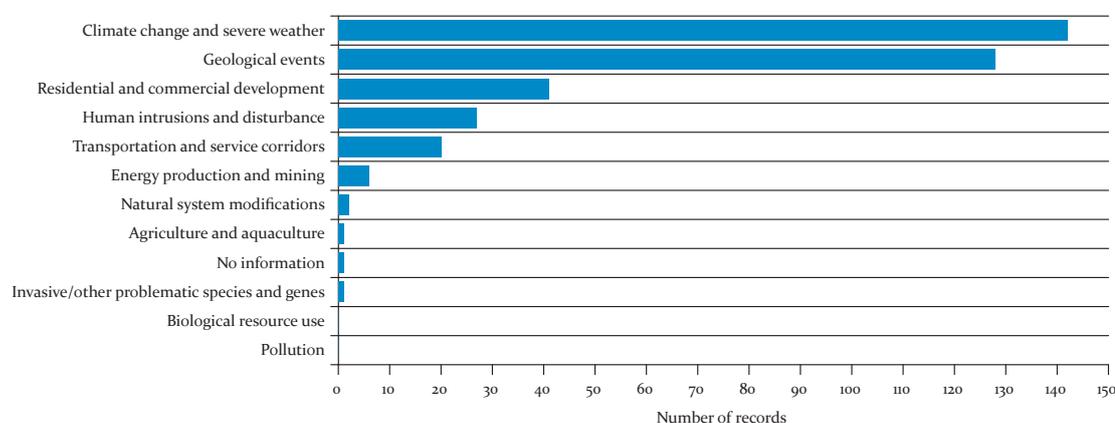
The cultivation of biofuels is still in development in the GLR. Most biofuel projects in the wider region have been developed in the low-lying areas nearer the coast. Many initiatives have failed, but the governments of Uganda, Rwanda, Burundi and Tanzania promote the development of biofuel production. In Uganda, an assessment of land resources suitable for the production of biofuels was conducted by NEMA and UNEP/GRID-Arendal and projects are underway, often funded by international donors (e.g. Box 1). In Rwanda, a bio-diesel policy that provides for the

promotion of bio-energy industries, support for farmers and business engaged in green energy development, as well as tax incentives for cars and industries that use bio-fuel was submitted to the Government in 2009, but has yet to be implemented. Various projects do exist in Rwanda, such as for example a 10,000 ha biofuel project by EcoTrust (Eco Positive n.d.).

### Impacts

Small scale agricultural expansion is the main direct cause of forest loss in the region. Agricultural activities and the conversion of forests into land for crops and livestock is leading to widespread habitat degradation and soil erosion in the water catchments, with serious impacts on both terrestrial and aquatic biodiversity in the GLR (BirdLife International, 2012).

An analysis by BirdLife International (2012) identified the main threats to species included in the IUCN Red List in the GLR, as documented by IUCN. Figure 23 shows clearly that pollution and the use (or over-exploitation) of biological resources are considered a threat to the greatest number of red listed species. Soil erosion is a major contributor to pollution of lakes and rivers in the GLR, resulting in sedimentation and siltation and increased turbidity, with associated eutrophication (BirdLife International 2012; Figure 23).



**Figure 23:** Major current threats to freshwater biodiversity in the Great Lakes Region (adapted from BirdLife International 2012)

Soil erosion leads to high economic losses in the GLR. For example, it has been estimated that the annual cost of soil erosion in Uganda is about US\$625 million per year (Yaron *et al.*, 2004). Malawi loses between US\$350 million worth of nitrogen and phosphorus through erosion each year, which translates to a gross annual loss of income of US\$6.6-19.0 million. This is equivalent to 3% of the agricultural GDP (Bojo, 1996). Estimates of soil loss based on a limited number of sample sites in Malawi indicate an average loss of soil of approximately 20 tonnes/ha/year. Studies that have translated this into yield losses suggest a 4% - 25% loss each year. A conservative estimate is that the annual on-site loss of agricultural productivity as a result of soil degradation costs MK7.5 billion (US\$54 million) in 2007, which is 1.6% of GDP (Yaron *et al.*, 2011). In addition to damaging agricultural productivity, soil erosion negatively affects hydro-electric power generation. Using data from Electricity Supply Corporation of Malawi (ESCOM) on the costs of minimising this impact, Yaron *et al.* (2011) estimated annual costs of some US\$10 million in 2007 prices.

Rwanda is among the African countries that suffer from heavy soil erosion; about half of Rwanda's farm land has shown evidence modest to severe erosion. Erosion is responsible for soil nutrient losses estimated at 945,200 tonnes of organic materials, 41,210 of nitrogen, 280 of phosphorus and 3,055 tonnes of potash annually (IRIN, 2008). It is also estimated that erosion affects Rwanda's ability to feed 40,000 persons per year. At least 37.5% of the land in Rwanda needs to be managed before being cultivated, and overall an estimated 39.1% of the land has a high erosion risk (IRIN, 2008).

Water availability is a strong driver for large scale agricultural development through FDI, and FDI agricultural schemes have also been described as "water grabbing" with potentially severe impact on water resources, ecosystems and livelihoods. There is however little empirical information on the impacts of such schemes in the region on biodiversity and other ecosystem services.

#### **Box 1: The Kalangala Oil Palm Project, Uganda.**

An Environmental Impact Assessment was carried out on behalf of the government before the IFAD and World Bank funded project started. This found that the project would not have significant climate or hydrological impacts on the island, but that it was likely to reduce forest cover (World Bank then pulled out). The loss of forest cover would then in turn result in a whole suite of impacts, including loss of endemic species, increased siltation in Lake Victoria, reduction of the potential for ecotourism, food insecurity, cultural erosion, loss of sacred places and cultural conflicts. Despite the fact that these threats were identified, the project went ahead, with little evidence that they had been considered.

Between 2003 and 2009, the Bugala Island plantations had already resulted in a large number of social and environmental impacts. Because large areas of forest were cleared to make way for oil palm plantations there was pressure on the remaining forest resources, which traditionally provide building materials, boat-making materials, food and importantly, firewood for the local population (Kalangala District NGO Forum, 2009). Promised jobs went mainly to outsiders who were virtually all male, disrupting the social balance. As a result of the increased demand for land on Bugala Island, land prices have increased considerably. The introduction of oil palm has affected the local economy, which used to be based around fishing, timber harvesting and food crops. With land previously used for food now planted with oil palm, local food supplies have been reduced, and farmers who have lost access to their land have also lost their income. This has increased food insecurity.

*Source: Friends of the Earth Europe (FoEE) Friends of the Earth International (FoEI) (2011)*

## 6.2 FISHERIES AND AQUACULTURE

Inland capture fisheries are of great importance to the GLR, notably so in Uganda and Tanzania. Figure 24 shows the production of inland capture fisheries in tonnes across the four countries entirely included in the GLR, but also in Tanzania due to its overlap with large areas of the region's freshwater lakes. Perches, tilapias and catfish are some of the most productive (FishStat, 2014; data

not presented). Aquaculture in Malawi, Burundi and Rwanda is relatively low, although increasing rapidly in Malawi and possibly in Tanzania. Aquaculture is generally practiced by small scale farmers in small ponds. Uganda has the highest aquaculture production in the region (Figure 25). In all countries the majority of farmed species are tilapia and other cichlids.

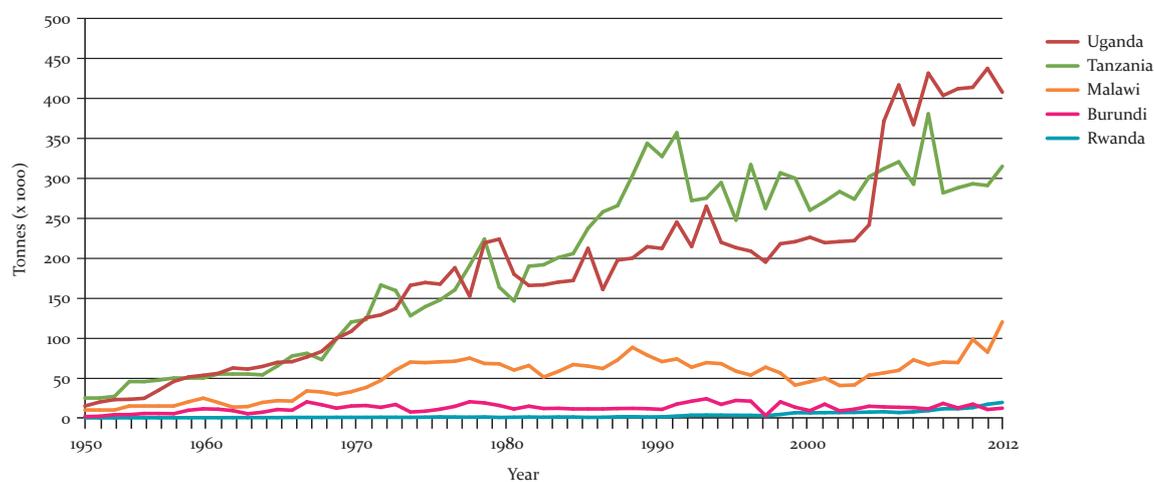


Figure 24: Inland capture fisheries production of major fisheries in selected GLR countries (FishStat 2014)

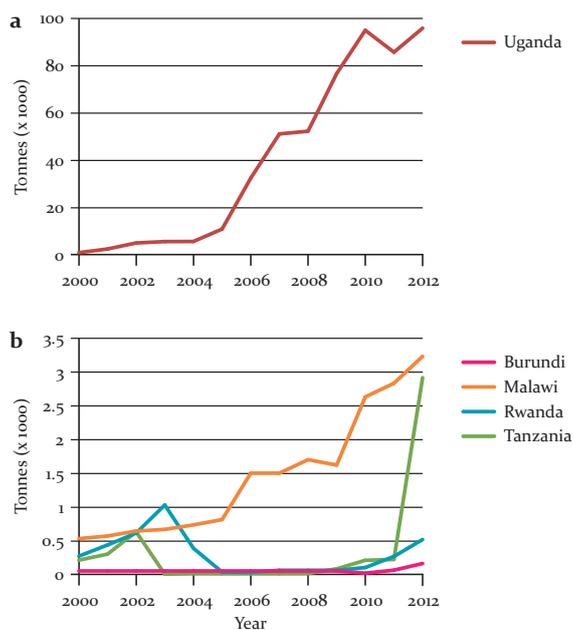


Figure 25: Aquaculture production in Uganda (a), Burundi, Malawi and Rwanda (b), all fish species (FishStat 2014)

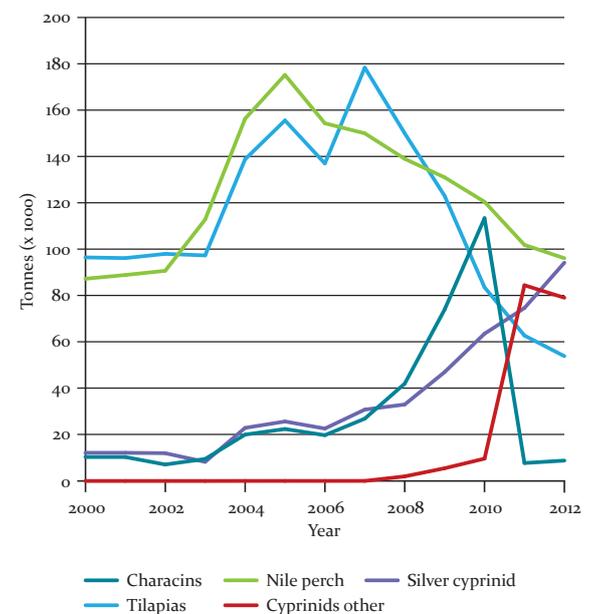
## Uganda

With four Great Lakes on its borders, Uganda ranks as one of the world's largest producers of freshwater fish. In Uganda, fish is the second most important export commodity after coffee, provides the main source of income for approximately 1.2 million people (4% of the population) and contributes 2.8% to the GDP (Maurice, 2011). However, Yaron *et al.* (2004) estimated that once underreporting, smuggling and other auxiliary services are taken into account, the Ugandan fish industry could be worth up to 5.8% of the GDP (Yaron *et al.*, 2004). While fishing is likely to be particularly important for people living close to lakes, the majority of fishers were found to have additional income-generating strategies, suggesting that the income derived from fishing alone is not usually sufficient to meet their needs (Carr *et al.*, 2013).

Data from Fishstat (2014) suggest that in Uganda catches of the main species Nile perch and tilapia taxa have declined in recent years, particularly since 2008, while catches of Dagaa(s) (often meaning dried, unspecified, sardine-like fish, though sometimes meaning a specific taxa such as silver cyprinid) and characins (small, colourful fish such as tetras) have increased, with characins increasing by over five times between just 2007 and 2010 - although they show a strong reduction in 2011 and 2012 (Figure 26).

Silver cyprinid is in high demand for animal feed, and this might account for much of the volume caught. Consumption of African lung fishes (*Protopterus*) is increasing in Uganda, particularly amongst the urban population, as tilapia and Nile perch catches decline (Kabahenda & Hüsken, 2009). But their production was still little more than 10,000 t in 2012 (FishStat, 2014).

A combination of the rising prices of fish, declining wild fish populations, government intervention and a drive for profit has led to a sharp increase in aquaculture production (FAO, 2005). According to FAO data (FishStat, 2014), aquaculture production has increased markedly in Uganda since the mid 1980s. Production was close to 100,000 t in 2012, more than 100 times the production in 2000 (FishStat, 2014; Figure 25). The most common species farmed are tilapia and other cichlids (55%) and catfish. Carp, prawn and perch are farmed to a far lesser extent (FishStat, 2014).



**Figure 26:** Inland capture fisheries production by main groups of species in Uganda (FishStat 2014)

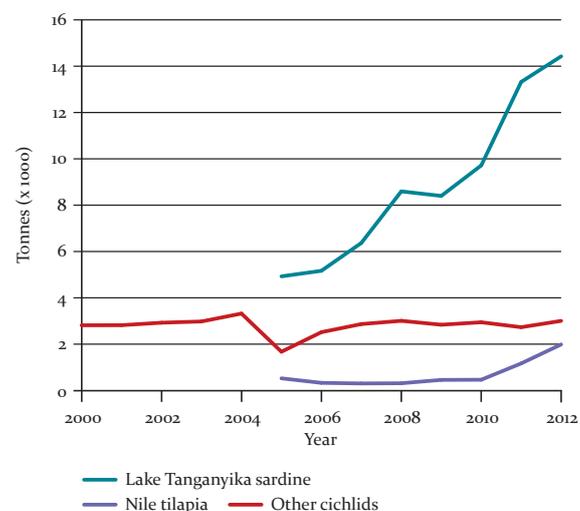


## Rwanda

The fisheries sector in Rwanda employs approximately 8,700 people directly, and contributes up to 0.3% of the GDP (FAO, 2004), a figure which is relatively low compared with other countries in the GLR. Fishing is unlikely to be the main occupation of most Rwandans as even households close to Lake Kivu are more likely to derive their living from agriculture due to the high suitability of the land for agriculture (USAID, 2011).

Production has increased slowly since 1950, with freshwater fish exports (excluding Nile Tilapia) reaching 5,100 tonnes in 2010. Catches of introduced Nile tilapia have also increased since the mid 1990s to 3,950 tonnes in 2010. In Rwanda almost all production is comprised of Lake Tanganyika sardine and to a lesser extent mouthbrooding cichlids and Nile tilapia (FishStat, 2014; Figure 27).

In Rwanda aquaculture is growing slowly, but still is not significant relative to the production of freshwater capture fisheries (Figure 25). Tilapia and other cichlids are the primary species farmed (> 95%), with catfish production having risen over recent years.



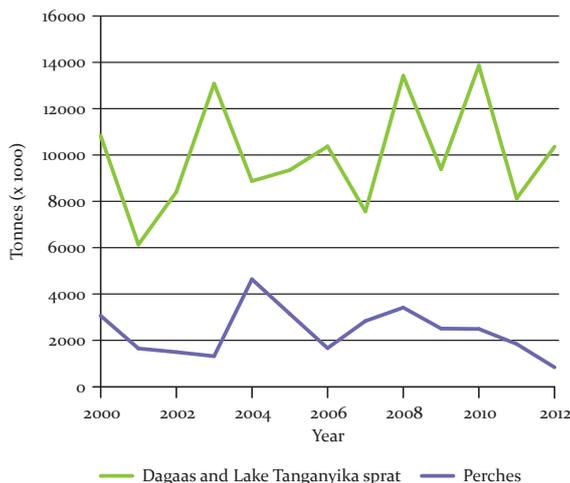
**Figure 27:** Inland capture fisheries production by main groups of species in Rwanda (FishStat 2014)

## Burundi

Fisheries contribute just 0.5% toward Burundi's GDP, but provide food and employment for a large proportion of people living close to Lake Tanganyika (Reynolds & Molsa, 2000). However, it was found that in rural lake zone areas, only 2% of adults were engaged in fishing as their main economic activity (Adelski & Rosen, 1991), although this may have changed since this assessment.

Dagaas (include silver cyprinids and others) and Lake Tanganyika sprat production varies between 8,000 and 12,000 thousand tonnes (FishStat, 2014). Dagaas, sprat and perches make up almost three quarters of total production, but catches of perch and other freshwater fish remained low (Figure 28; FishStat, 2014).

Aquaculture in Burundi is almost entirely comprised of tilapia and other cichlids (almost 99%), with a very small production of catfish (FishStat, 2014). Production is relatively insignificant when compared with freshwater capture fisheries (Figure 24 and Figure 25).



**Figure 28:** Inland capture fisheries production by main groups of species in Burundi (FishStat 2014)



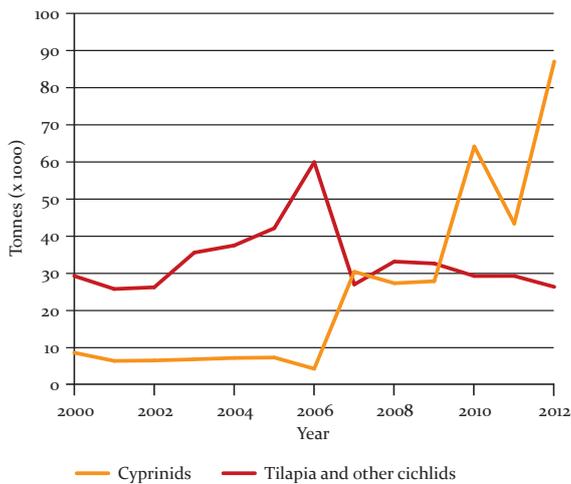
## Malawi

Fisheries resources contribute to the livelihoods of more than 1.6 million Malawians. In 2008, slightly less than 4% of these were employed as fishers but almost 30% were engaged in fisheries-related economic activities. In 2008, the landed value of fish was US\$67.1 million (Yaron *et al.*, 2011). Traditionally, fish has been the most affordable source of animal protein, but the real price of fish (after accounting for inflation) increased about 3.5 times between 1987 and 2007. This was due to a 20% decrease in total fish supply, rising prices but also export of fish to neighbouring countries. As a result the per capita fish consumption fell from 9.4 kg to 5.4 kg between 1990 and 2008. (Yaron *et al.*, 2011).

During the 1990s, official fish production estimates went down from about 70,000 t to about 50,000 t per year (Yaron *et al.*, 2011). It was up to 120,000 t in 2012 however (Figure 24). Malawi experienced an annual decline of about 9,000 t of the main catch: Chambo fish (*Tilapia rendalli*, *Oreochromis karongae* and *Oreochromis shiranus*) production between 1980 and 2000 (Yaron *et al.*, 2011). Catch of tilapia and other cichlids has increased again until 2007 when it experienced a new decline (Figure 29).

Declining stocks due to over-fishing, weak enforcement of regulations and absence of clear property rights have been cited as some of the factors responsible for the decline in total catches (GoM, 2008). Overexploitation of shallow waters and a lack of investment in technologies suited for fishing in deeper waters have also been documented as major problems experienced in the sub-sector (Yaron et al., 2011).

While the output of aquaculture in Malawi, valued at US\$1.4 million in 2008, has grown by 52% over the period 2000 - 2008, it still only contributes about 2% of total fish production (Yaron et al., 2011). Tilapia and other cichlids compose 87% of all farmed fish (Fishstat, 2014).

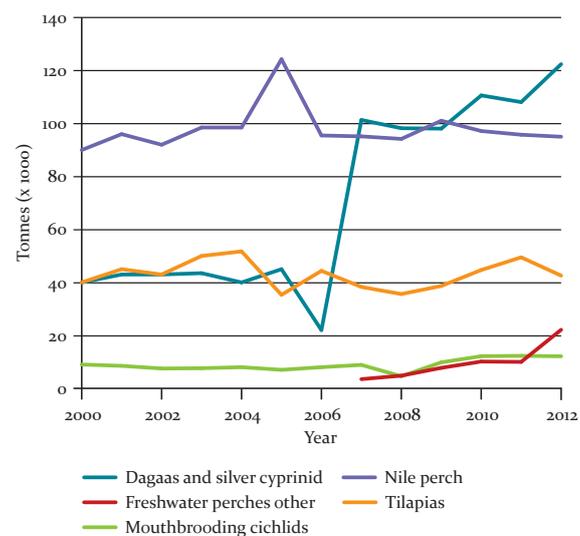


**Figure 29:** Inland capture fisheries production by main groups of species in Malawi (FishStat 2014)

## Tanzania

Freshwater fish catches account for 80% of Tanzania's fish catches. Dagaas and silver cyprinids and Nile perch comprise the majority of the inland capture fisheries production in Tanzania, with a strong increase of the former group in 2007, although this could be due to improvements in recording (Figure 30). For Lake Victoria, according to an economic survey from 1999, the value of Nile Perch production in 1998 was more than US\$ 69 million and contributed to 1.8% of the GDP. The contribution of Nile perch to the total fisheries sector output in Tanzania was estimated at 75.7% in 1998 and 45.3% in 1999 due to a EU ban (Kulindwa, 2001).

Aquaculture in Tanzania is almost entirely comprised of tilapia and other cichlids, with a very small production of catfish (FishStat, 2014). Production is however still relatively insignificant when compared with freshwater capture fisheries (Figure 24 and Figure 25). The United Republic of Tanzania is currently estimated to have a total of 14 100 freshwater fishponds scattered across the country (FAO 2006). Data reliability may be an issue, seeing the jump in aquaculture production in 2012 (Figure 25).



**Figure 30:** Inland capture fisheries production by main groups of species in Tanzania (FishStat 2014)

## The Basins

With massive declines in traditionally fished species in Lake Victoria and a more recent decline in Nile perch catches, other native species (for example, *H. laparogramma*) are increasingly important, particularly for local subsistence. These shifts in reliance between different species highlight the importance of maintaining a rich diversity of species that can adapt to changing pressures (Holland *et al.*, 2011).

Some 95,000 fishers on Lake Tanganyika land 165,000-200,000 tonnes of fish per year (mainly pelagic clupeids), worth US\$80-100 million (Hanek *et al.*, 2011).

In Lake Malawi/ Nyasa, 'chambo' (*Oreochromis* spp.) are the most valuable food fishes and, as a result, some species are being overexploited to the point where they have become threatened. For example, populations of *O. karongae*, one of three chambo species endemic to Lake Malawi, collapsed in the 1990s as a result of overfishing, and it is now considered Endangered. Other species that have drastically declined include catfish (*Bagrus* and *Bathyclarias* species), 'mpasa' (*Opsaridium microlepis*), and 'nchila' (*Labeo mesops* and *L. cylindricus*; Turner, 2004; Nindi, 2007).

Overall catches have remained reasonably stable in Lake Malawi due to increased fishing pressure and the use of nets with a smaller mesh size. However, these developments have resulted in declines in both fish catch per unit effort and contributions to per capita incomes. Fish consumption has also declined from 14kg/person/year in the 1970s to less than 6kg per person per year by the turn of the century (ILEC, 2005). Efforts are under way to extend the fishing effort to the untouched deeper pelagic fishes such as *Diplotaxodon* and *Ramphochromis* but logistical challenges have hampered these attempts. Lake Malawi/Nyasa also supports a poorly regulated and monitored ornamental fish trade whose which, even though its economic importance is relatively minor, may be impacting on near-shore cichlids (Chafota *et al.*, 2005).

Where species have been introduced, the overall impacts on the ecosystem, such as dramatic declines of native species, may be masked by an overall increase in catch. In Lake Victoria for example, the introduction of Nile perch has created a multi-million dollar industry. However, 64 out of the 74 threatened cichlids are threatened due to the Nile perch, and 73% of these are now considered Critically Endangered and possibly even extinct (such as *Haplochromis dentex* and *H. flavipinnis*). Approximately 150 or 40% of the haplochromine cichlids have disappeared (Holland *et al.*, 2011).

A study by IUCN noted that some fishes in the GLR are important for animal feed or fish-bait *e.g.*, silver cyprinid. In Uganda, certain haplochromines are increasingly being caught for use as live bait for Nile Perch, which has driven up the price, often making it too expensive for local people to afford. Heck *et al.* (2004) found that on Lake Victoria fish from the genera *Clarias* and *Labeo* were being targeted for use as Nile Perch bait. As the global demand for animal protein from livestock increases, it is likely that the demand for fish for animal feed will increase also, potentially generating conflict between those wanting the fish for human food and those wishing to use it as animal food (Carr *et al.*, 2013).

## 6.3 FORESTRY AND FOREST PRODUCTS

Forestry resources are crucial in supporting livelihoods, infrastructure development and energy in the region. Apart from providing a diverse range of wood and non-wood products that are vital to the economy (including providing materials for widespread artisan activities), the sub-sector is important for: soil and water conservation for agricultural and household use, provision of animal habitat, beautification of the countryside, enhancement of ecotourism and biodiversity, and regulation of climate change through, for instance, carbon sequestration (Agrawal *et al.*, 2013). Of all forest resource uses, wood harvesting and logging are the most problematic in the region.

### Wood fuel

Approximately 95% of households in Burundi use wood as their primary energy source (mainly for cooking), 46.4% use wood for lighting and more than 79.4% of the urban population rely on wood coal as their energy source for cooking (FAO AGL, 2003). In Malawi, the Department of Forestry reports that forestry employs an estimated 29,000 people, of whom 20,000 are in the informal sector dominated by carpentry and pit-sawing activities. It is further estimated that 92,800 people owe their livelihoods to charcoal, and about half of these through production (46,500 people). About 38% of all the charcoal is produced by some 338 large-scale producers, 27% by medium scale producers, and 35% by small-scale producers (Yaron *et al.*, 2011).

Evidence from the Malawi BEST (2009) shows that woodfuel alone accounts for about 4.3% of GDP. In Malawi, due to high poverty levels as well as low coverage of electricity and other alternative sources of energy, biomass (using firewood, charcoal, as well as crop and industrial residues) is the main source of energy. The Malawi's National Energy Policy (2003) estimated that biomass accounted for over 93% of total energy consumption and about 99% of household energy demand in 2000. According to the Department of Forestry (Government of Malawi (GoM), 2008), firewood and charcoal accounted for 80%

and 8.8% of household biomass consumption respectively. The other sources of energy included liquid fuels (accounting for only 3.5% of all energy sources), electricity (2.3%), coal (0.2%) and renewable energy (1%; Yaron *et al.*, 2011).

Wood is the principal source of energy in Rwanda. 96.2% of households use wood as a source of energy and 31.4% use it as a source of lighting. More than 60% of the urban population use charcoal as a source of energy. In 2008, the commercialisation of charcoal was estimated to contribute US\$ 2.6 billion, representing 5% of the GDP (Njoroge & Muli, 2011). Wood is also very much used in construction (Republic of Rwanda 2003). The sale of wood processed products generates significant incomes to the different actors involved. Rwanda does not have the land available to expand its forests and plantations, yet the majority of the population depends on wood for cooking (Silesi *et al.*, 2007).





In Uganda the share of the forestry sub sector in GDP was 2.2% in 1988 and 1.7% in 1997, rising to 3.4% in 2008 (Republic of Uganda, 2010). The increasing share of forestry in GDP is a positive development. The small and medium forest enterprises (SMFEs) employees, as a total of forestry employment, was 60% in Uganda (Agrawal *et al.*, 2013). However, the improvement in the contribution of forestry has been characterized by recent declining performance. Between 1988 and 1997, forestry grew at an average rate of 4.7% per year and between 1998 and 2002 at an average rate of 7%. From 2004 to 2008, the sector grew by 3.9% per annum, a trend that needs to be accelerated. This trend is partly due to declining forest cover which decreased from 4,933,746 hectares in 1990 to 3,604,176 hectares in 2005, representing a 27% reduction (Republic of Uganda, 2010).

Shepherd *et al.* (2012) attempted to put a national level value on forest products in Uganda (Shepherd *et al.* 2012; Table 11). This was done by using regional per capita income figures for rural people, in a context where the percentage of income coming from a variety of sources (including non-timber forest products) was known in sampled villages. The calculations made give a figure of US\$4.01 billion for the value of forest products to rural people in Uganda. For example, energy from the forest, used by rural people not only for cooking but often also for lighting and space-heating, is worth almost US\$1.6 billion - three times as much Uganda's Energy budget for 2011/2012 which rose to US\$514 million (Agrawal *et al.*, 2013).

**Table 11:** Total annual value of forest products to rural people in Uganda, in millions of dollars (adapted from Shepherd *et al.* 2012)

Forest Products category	Cash US\$ millions	%	Non cash US\$ millions	%	Total value US\$ millions	%
Fuel	406	10.1	1,186	29.5	1,592	39.6
Building materials	346	8.6	655	16.3	1,001	24.9
Forest Foods	241	6	510	12.7	752	18.7
Fibre (for ropes, baskets, mats etc)	68	1.7	257	6.4		8.1
Herbal medicine	44	1.1	145	3.6	189	4.7
Timber	32	0.8	129	3.2	161	4
<b>Total</b>	<b>1,137</b>	<b>28</b>	<b>2,882</b>	<b>72</b>	<b>4,019</b>	<b>100</b>

### Timber

Industrial logging in the GLR forests has been ongoing since the 1920s, but is generally declining in response to the shrinking areas of remaining forests. In the GLR, only the DRC still has potential for significant timber extraction. Official estimates of its legal contribution to GDPs are less than 5%, but there is a great deal of lucrative illegal logging, especially of high quality species such as *Afromosia*, serving markets in Uganda, Kenya and Rwanda (Debroux *et al.*, 2007).

Softwood plantations were established in colonial times for (railway) building. Some of these plantations remain for timber production. However, large scale commercial tree plantations are not a major activity in the GLR. The largest areas are found in areas dominated by tea plantations where the wood is used in tea processing.

The impacts from wood harvesting and logging have been documented for a number of the remaining forest areas within the GLR. These included impacts on forest structure and species composition, including on Mt Elgon in Uganda/Kenya and in Kibale forest in Uganda (Hitimana *et al.*, 2010; Naughton-Treves *et al.*, 2007; Sassen & Sheil, 2013). Many protected forests in the regions are increasingly isolated as wood and timber resources from less protected forests around them disappear (Naughton-Treves *et al.*, 2007). The National Forestry Authority in Uganda estimates that 80,000 hectares of private and protected forests are being cleared annually in Uganda for the unsustainable production of charcoal and timber.



## 6.4 WILDLIFE USE AND TRADE

Hunting within the GLR is essentially for bushmeat, although trophy hunting by foreigners occurs in the game reserves in the lowlands. Bushmeat hunting is widespread in the region, including in protected areas, believed to be growing and may be economically important for some families and communities (BirdLife International, 2012). Wild meat is often preferred in terms of taste, and believed to hold additional health benefits compared with domesticated meat and fish.

In Uganda, red-tailed monkey (*C. ascanius*) and L'hoest's monkey (*C. lhoesti*) were found to be popular in certain areas such as the Rwenzori Mountains (Olupot *et al.* 2009). The blue monkey (*C. mitis*) was also found to be utilized in the wild meat trade and eaten within Uganda (Olupot *et al.*, 2009). The latter is of particular concern as this species includes the Critically Endangered subspecies Schouteden's blue monkey (*Cercopithecus mitis ssp. schoutedeni*; Carr *et al.* 2013).

There is little information in the literature on the consumption of wild meat specific to Burundi, though there has reportedly been widespread poaching of hippopotamuses for their meat in the country (Lewison & Oliver, 2008). Primates are not commonly eaten in Burundi, but harvesting may take place in areas close to DRC for the purpose of cross-border trade (Hobbs & Knausenberger, 2003). Hill *et al.* (2002) determined that around Volcanoes National Park in Rwanda, the species most often purchased for their meat were Bushbuck and duikers. Apes are highly protected in Rwanda and are not generally targeted; however, they can become caught in snares set for other mammals.

Primates are hunted for their meat in DRC where civil strife has aggravated problems of weak law enforcement. For example, three years of civil war led to a halving of the number of Grauer's gorillas in the highlands of Kahuzi Biega National Park in DRC by 2000 because of insecurity affecting park ranger patrols.

The legality of hunting varies between countries and can be species-specific. For example, in Uganda wild meat hunting of all species is illegal (except licensed sport hunting and some vermin; Olupot *et al.*, 2009). Hunting for bushmeat has severely affected big mammals, leading to their decline in the GLR. The larger ungulates such as buffaloes have been the most impacted, for example in Uganda, buffaloes had been driven to extinction in most of the forests except where these were connected to savanna areas by 2003 (*e.g.* in the Kibale National Park and the Virunga Volcanoes). In Malawi, intensive illegal off-take has resulted in rapid decline of the populations of most of the big mammals such as Nyala, with most of the species confined to protected areas. The largest groups of the big mammals that occur in Malawi are ungulates and eighteen of these species are threatened (Government of Malawi, 2010).

Currently, communities in the GLR countries practice traditional honey hunting, which can be destructive to both bees and trees. Trees are usually felled in order to extract honey from hollows in their trunks and bees are killed off by the excessive fire that is used to subdue them. (Sileshi *et al.*, 2007). The harvesting of ground honey often leads to out-of control bushfires.

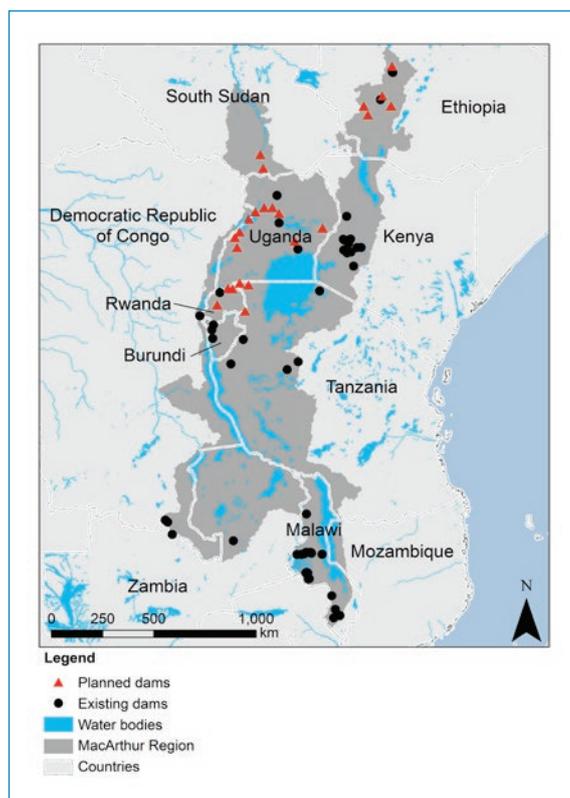


## 6.5 ENERGY PRODUCTION

Countries in the GLR have ambitious national development plans with a goal of not just reducing the proportion of the population living in poverty but aim to ensure middle-income status, reverse their level of dependence on aid and use new found natural wealth to drive economic growth (Hickey, 2013). Important developments are occurring in the energy sector with new sources of energy, particularly from hydropower, oil and wind.

### Hydropower

The most significant energy source for electricity production in the GLR is hydropower. According to the Tropical Database of Dams (TDD) there are almost 50 dams in the GLR (BirdLife International, 2012). Some of the largest dams found in the region are listed in Table 12. A map of the location of existing and planned dams is in Figure 31.



**Figure 31:** Existing and planned dams in the GLR (Mulligan et al. 2011; van Soesbergen 2012; DIVA GIS 2014; MacArthur Foundation 2013; NGA 2000 ; Natural Earth 2014)

In Malawi 98% of the hydro-electric power is generated by Nkula, Tedzani and Kapichira (Phase 1) hydropower plants, all installed along the Shire River and the remaining 2% is produced by Wowve power plant in the Northern Region (Government of Malawi, 2010). Overreliance on the Shire River for generation of electricity is risky because there is a high chance of outflow from Lake Malawi receding below the minimum elevation of 474 m above sea level, as was the case between 1915 to 1935 (Government of Malawi, 2010). If this happens Malawi will not generate enough electricity for both industrial and domestic use. To manage the risk, electricity generation is being diversified beyond Shire River through development of several mini hydropower schemes on other rivers in Malawi (Government of Malawi, 2010). Malawi has also been exploring possibilities of importing electricity from the SADC (Southern African Development Community) Region.

Most of the electricity supply in Burundi is generated by 24 hydroelectric plants with a combined installed capacity of 37.63 MW (as of 2008). These plants generated nearly 100 % of the total national electricity production (Hakizimana, 2008). Burundi also benefits from imports from the regional hydro plants of Rusizi I and II. The supply deficit currently varies between 12.9 MW during the wet season and 23.5 MW during the dry season when the country's main hydro power plants are running at reduced capacity (Hakizimana, 2008). Ruzizi II, is currently the largest hydropower dam in the region and a joint project of Burundi, Rwanda and the DRC, dating back to the three countries' original cooperation through the Communauté Economique des Pays des Grands Lacs (Economic Community of the Great Lakes Countries; CEPGL) and Société Internationale d'électricité des Pays des Grands Lacs (International Society for Electricity of the Great Lakes Countries; SINELEC). Ruzizi III with a capacity of 145 MW is planned to start construction in 2016.

Burundi and Rwanda are significantly more dependent on regional cooperation for energy production due to their lesser domestic hydropower potential. The main hydropower potential for Burundi is dependent on shared rivers located close to national borders with the Eastern DRC and Rwanda. Rwanda is exploring using methane gas from Lake Kivu for energy production which is also a shared resource between the DRC and Rwanda. These

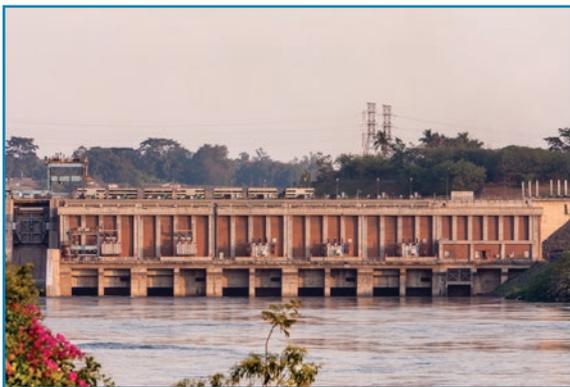
circumstances make energy cooperation among Burundi, the DRC and Rwanda important. The World Bank also recently approved funding of US\$340 million for the Regional Rusumo Falls Hydroelectric Project, which aims to benefit people in Burundi, Rwanda and Tanzania under the World Bank Group Great Lakes Regional Initiative (World Bank, 2013).

Table 12 gives a non-exhaustive list of some of the important dams of the Great Lakes Region:

**Table 12:** Important large dams in the Great Lakes Region (adapted from BirdLife International 2012)

Dam name	Country	Capacity
Gibe I	Ethiopia (River Omo)	184mw
Gibe II	Ethiopia (River Omo)	420mw
Gibe III (will be operational 2015)	Ethiopia (River Omo)	1870mw
Kamuzu Dam I	Malawi	
Kamuzu Dam II	Malawi	
Mudi	Malawi	
Mulunguzi Dam	Malawi	
Lucume Dam	Mozambique	
Rubanda	Burundi	
Ruziba	Burundi	
Ruzizi I and II	Rwanda/Democratic Republic of the Congo	21.2mw
Ruzizi II	Rwanda/Democratic Republic of the Congo	43.8mw
Ruzizi III (Construction starting 2016)	Rwanda/Democratic Republic of the Congo	145mw
Ntaruka	Rwanda	11.5mw
Ellegirini	Kenya	
Turkwel	Kenya	106mw
Nkula A	Malawi (River Shire)	24mw
Nkula B	Malawi (River Shire)	100mw
Tedzani	Malawi (River Shire)	46mw
Kapichira	Malawi (River Shire)	128mw

The Gibe III dam (completion planned for 2014) on the Omo River is possibly the most controversial of all dams in the GLR. The Omo River, originating from the southern Ethiopian highlands, provides over 90 % of Lake Turkana's water and by regulating the flow of the Omo River, will modify river's annual flood regime upon which the livelihoods of the agro-pastoralist communities downstream towards Lake Turkana depend. The dam will enable the development of large-scale irrigation development in the lower basin. There are plans for a large scale irrigated sugar project (Avery, 2010). The change in inflow into Lake Turkana are expected to lead to a significant drop in water levels and increased salinity, affecting both local fisheries and small scale irrigated agriculture. Declines in lake levels have already been reported (BirdLife International, 2012). Historical violent conflicts over resources among communities of farmers and pastoralists are likely to be exacerbated. Smaller inflows into Lake Turkana from the Turkwel have also been affected by a hydro-electric dam (Avery 2012).



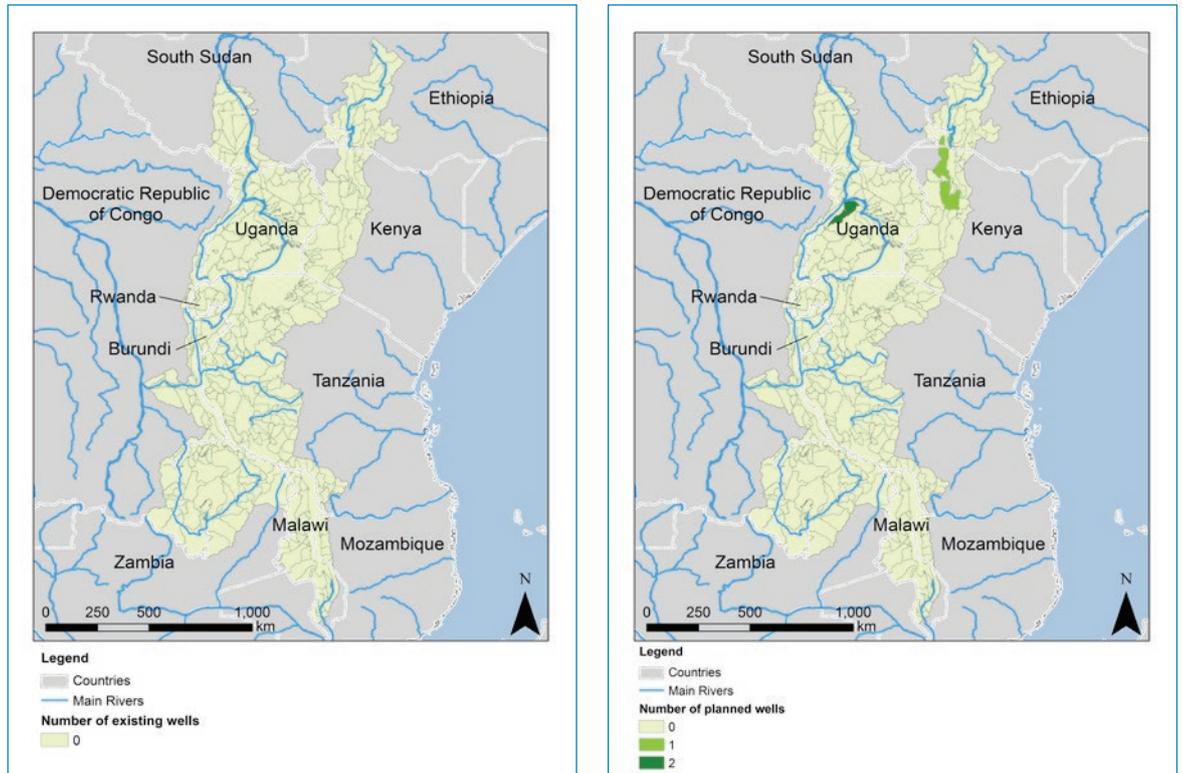
### *Oil and gas*

In Uganda the discovery of oil on the eastern shores of Lake Albert, and onshore to the north of the lake has triggered a flurry of activity across the region. To date almost 80 wells have been drilled by Tullow Oil PLC. The estimated reserve is around 1.7 billion barrels of oil (Tullow, 2012). The Government's potential share of oil resources is estimated to be US\$50 billion. Tullow's 2012 total direct economic contribution in Uganda will be an estimated US\$271 million, which includes a US\$4.8 million social investment. According to Tullow Oil PLC 88% of employees will be Ugandan Nationals (Tullow, 2012). Small-scale oil and gas production for the local power market is expected to begin in 2013, with major production ramping up by 2016.

Tullow Oil PLC have also secured exploration rights over large areas of the Omo/Turkana Basin in Kenya, including within the lake itself and together with Africa Oil began drilling in January 2012 in the Lokichar Basin to the south west of the lake (Reuters, 2012).

Both the Lake Albert and Turkana oil exploitation activities are seen in Figure 32.

Ecosystem and environmental impacts from the oil sector are likely to occur at different points of exploration, extraction, processing and transportation. Population concentration in response to new economic opportunities is expected to lead to increased pressure at the protected area boundaries of the Albertine Graben and exacerbate existing conflicts over resources in the arid area of the Omo/Turkana Basin. In the Albertine Graben, the activities have already led to intense speculation and conflicts over land as well as increased immigration into the area (Oil in Uganda, 2014), which will lead to land clearing for small-scale agriculture and increased poaching. Exploration and drilling could also result in a variety of direct and indirect impacts to biodiversity such as: fragmentation of populations and/or their habitats, disruption and/or blockage of dispersal and/or foraging routes (for example in the case of elephants) and habitat destruction.



**Figure 32:** Existing and planned oil wells in the GLR watersheds (IHS 2013)

### *Wind*

A new source of energy in development in the GLR is wind power. The Lake Turkana Wind Power Project (LTWP) in Kenya aims to provide 300MW of power to the Kenya national grid (or approximately 20% of the current electricity generating capacity). The project has leased an area of 66,000 ha near the Southern tip of Lake Turkana in Loyangalani District in north-eastern Kenya. The project plans to improve road access to the site and will include building a 428 km transmission line to deliver the power to the national grid. The potential and actual social and environmental impacts of wind power development are not clear, but they are likely similar to those of other resource exploitation activities in remote areas.

### 6.6 MINING

The GLR countries have significant mineral reserves, including gold, cassiterite and coltan (in Rwanda), and uranium (Malawi). The new Kayelekera uranium mine in Malawi is close to three hotspot sites and with demand for these minerals increasing, mining is likely to expand considerably (CEPF, 2012). For instance, a World Bank study found that mineral exploitation in Malawi could provide up to 25% of export earnings and account for some 5-6% of projected GDP within a decade. Mining is also projected to increase in northeast Tanzania (Figure 33).

Understandably, concerns have been expressed by civil society groups in the country (e.g. Centre for Human Rights and Rehabilitation) over the environmental and social impacts of many of these mining, oil and gas investments (Masebo, 2013).

In Uganda the share of mining in GDP was 0.1% in 1988 and 0.6% in 1997, declining to 0.3% in 2008. Between 1988 and 1997, mining grew at 34.6% per annum on average and 8% between 1998 and 2002 (Republic of Uganda, 2010). From 2004 to 2008, the sector on average grew by 13% per annum. The share of the labour force employed in the mining sub-sector remained almost constant over the period 2002/03 to 2005/06, increasing from 0.93 to 1.0% respectively (Republic of Uganda, 2010).

According to BirdLife International (2012), mining for minerals has led to invasions of some Protected Areas in DRC, including in the Eastern DRC part of the Albertine Rift (Figure 33), where mining is also associated with ongoing conflict and violence (BirdLife International, 2012).

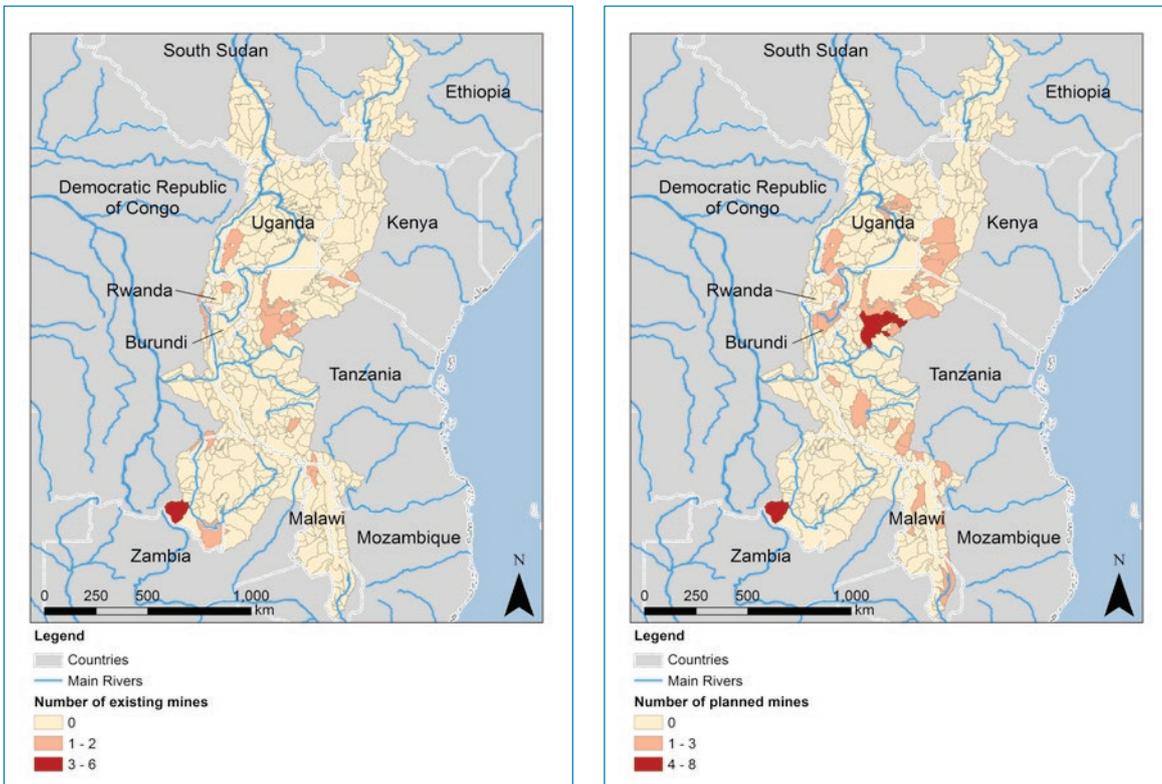


Figure 33: Existing and planned mines in the GLR watersheds (SNL 2013)

## 6.7 ROAD INFRASTRUCTURE

Transport links in GLR countries remain poor in many places, although they are improving, with major road and rail arteries being upgraded. One major development in East Africa has been the 1,400 km 'Northern Corridor' project whose aim was to provide an investment and economic development corridor linking central and east Africa and to the Indian Ocean. The route links the Port of Mombasa in Kenya to the Great Lakes countries of Uganda, Rwanda, Burundi and the DRC, with links to northern Tanzania, southern South Sudan, Ethiopia and Somalia.

There are a variety of infrastructure facilities along the route, which include a road network, rail network, rail-lake transport, inland water routes, inland container depots, and an oil pipeline. According to the Transit Transport Coordination Authority of Northern Corridor, combined transit and transshipment traffic through the Corridor exceeds 2.2 million tonnes every year, and has been growing at a rate of 20% annually (TTCANC, 2013). In this context, it is

important to note that transport costs account for about 30% of the value of goods within the Corridor (TTCANC, 2013). These non-tariff barriers also aggravate the prices of consumer goods. There are concerns that the opening up of the region could fuel illegal logging and intensification of agriculture within the hotspot as access to markets becomes logistically easier (CEPF, 2012).

The development of sectors such as logging, mining, energy and also large scale agriculture, is likely to drive the expansion of road networks and other infrastructure in the region. As is well known in the case of logging and the expansion of bush meat hunting and charcoal sourcing, improved access to previously remote areas can increase opportunities for (illegal) exploitation of natural resources. Mining and oil camps generate internal demands for bush meat, agricultural products and energy as well as opportunities for additional incomes through supplying those markets.



## 6.8 TOURISM

Tourism can generate increased wealth and employment, and can stimulate the protection and enhancement of biodiversity, environmental and cultural resources. Tourism is a major foreign exchange earner for some of the GLR countries, and large numbers of people visit GLR countries each year. The sector also employs significant numbers of people and contributes a significant portion to GDP.

As can be seen in Table 13, tourism is of greatest value to Uganda, but contributes a comparative percentage of GDP across all four countries. This tourism is largely based around natural resources and biodiversity – for example, in Rwanda tourism is due largely to gorilla tracking in Volcanoes National Park, and ecotourism in Nyungwe Forest and Akagera National Park (King & Cole, 2011). In all countries this contribution is expected to rise between 2013 and 2023, in particular in Malawi (by 4.4% per annum) and in Rwanda (by 5.5% per annum; WTTC 2013a, b, c, d).



**Table 13:** Tourism and recreation value in the GLR (WTTC 2013a,b,c,d)

Country	Contribution to GDP in 2012 (million US\$)	% of total GDP in 2012	Expected contribution to GDP in 2023 (million US\$)	Directly supported jobs 2012	% of total employment 2012	Expected % of total employment 2023
<b>Burundi</b>	55	2.3	65	34,500	1.9	1.3
<b>Malawi</b>	124	4.7	206	135,000	3.9	3.1
<b>Rwanda</b>	200	3.1	335	55,000	2.6	2.3
<b>Uganda</b>	820	3.7	1,400	199,500	3.1	2

Tourism FDI has become a significant source of investment capital in the tourism sector and is expected to increase in all the GLR countries (Christie *et al.*, 2013). Malawi, Rwanda and Uganda are projected to more than double their investments in travel and tourism by 2023. Only in Malawi is proportional investment in tourism expected to increase however (Table 14).

**Table 14:** Travel and tourism investments in the GLR (WTTC 2013a, b, c, d)

Country	Travel and tourism investment in 2012 (million US\$)	% of total investment	Expected increase to 2023( million US\$)	% of total investment
<b>Burundi</b>	3.3	0.7	4.3	0.6
<b>Malawi</b>	13	2.2	29.7	2.5
<b>Rwanda</b>	114. 5	8.4	227. 5	6.8
<b>Uganda</b>	211.5	4.4	411.9	4.4

The GLR's current tourist products are nature-based (International Gorilla Conservation Programme, 2013; King & Cole, 2011; Republic of Uganda, 2010). Several of these are linked to national parks, wildlife reserves, forests reserves or specific attractions, and activities such as white water rafting. For example, the main attractions in Rwanda and Uganda include: gorilla tracking; chimpanzee viewing, guided walks, bird watching etc. Revenue from tourism based on gorilla viewing and other activities brings in about US\$20 million to the GLR region annually (Pickrell, 2004).

The Volcanoes National Park is the flagship of Rwandan tourism, with gorilla tourism one of the largest foreign exchange earners. In 2007 earnings from tourism were estimated at US\$42 million, according to Rwandan Office for Tourism and National Parks (ORTPN) , exceeding tea and coffee (REMA, 2011)



# 7. Context and Capacity for Responding to the Impacts of Commodity Developments

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This chapter reviews the institutional context and capacity for initiating or respond to commodity-driven change in the GLR. These include the environmental policy and legal framework, transboundary cooperation, civil society and land management and planning (including protected areas). Building on previous assessments, this section addresses aspects of the policy and institutional contexts and processes that are important for the management of adverse impacts of commodity-driven developments.



## 7.1 ENVIRONMENTAL POLICY AND LEGAL FRAMEWORK

Natural resources are the basis for national development policies in the GLR. Strategies to increase economic growth are based on increasing agricultural production, extractive industries and energy production. These are however often implemented at the expense of conservation or environmental management. Biodiversity conservation and natural resource management falls under ministries and agencies such as environment, water, agriculture, fisheries, mines and energy. Ministries or departments of environment typically receive less funding than those responsible for agriculture and extractive industries.

Biodiversity, ecosystems and ecosystem services monitoring in the GLR falls under national environmental agencies/authorities in the region such as Uganda's National Environment

Management Authority (NEMA), Rwanda Environment Management Authority (REMA), Department of Land and Environmental Management in Burundi and the Environmental Affairs Department in Malawi. In Uganda, the National Biodiversity Data Bank (NBDB) monitors the national biological resources in the country and provides information to conservationists, government agencies, NGOs, and others interested in the conservation and sustainable utilisation of these resources (NBDB, 2013). However, according to an analysis conducted by the CEPF, implementation is extremely poor, reflecting "a lack of capacity and resources, particularly in the environmental management authorities that have the responsibility for such assessments" (CEPF, 2012).



### *Investment policies and legislation*

Much of the GLR, and the wider continent, does not have adequate systems to guarantee private sector investment, negotiate favourable contracts, monitor activities and impacts, report, and ensure accountability (Cotula & Vermeulen, 2009). In all the countries in the region, the land rights administration institutions face institutional, technical, financial and human incapacities. Investments in land-based development such as in biofuel development are sometimes funded by large international donors such as the World Bank or IFAD. Economic interests are high and local claims sometimes easily put aside (e.g. see Box 1). Even where land responsibilities are vested with local bodies, the central government retains considerable control. In addition, decentralized land institutions are largely dependent upon support from the central government in terms of finance and technical expertise which further limits the autonomy of local bodies.

In Tanzania, the Southern Agricultural Growth Corridor (SAGCOT) attempts to reconcile the modernisation and commercialisation of agriculture with environmental sustainability: apart from agribusinesses, development actors and financial institutions, this public-private partnership also includes conservation actors such as the African Wildlife Foundation, the Nature Conservancy and IUCN. The SAGCOT Blueprint identified climate change, environmental conservation, and natural resource management as critical factors to the Corridor's long-term economic development. However, even though it was designed to support plans for investment in the Corridor it does not provide ways of addressing these factors in investment plans. A large consortium of partners, lead by EcoAgriculture Partners has since developed a 'Greenprint', or strategy for Agriculture Green Growth (AGG) "to reduce

poverty, improve food security and strengthen resilience to climate change that also conserves the natural resource base that supports agriculture, mitigates climate change and ensures the long-term health and values of the region's rich forest, water and wildlife resources" (Scherr *et al.*, 2013). Corruption in the public sector is an important issue in almost all countries in the GLR. In Tanzania for example, tourism is a major foreign exchange earner and therefore provides an important driver for environmental policy, but corruption in the public sector and ineffective application of EIA regulations means that important biodiversity areas, in particular wetlands, still get converted to large scale agriculture (e.g. rice). In the DRC corruption has led to unchecked and destructive exploitation of natural resources. This is exacerbated by conflicts, which have severely impacted biodiversity directly (through poaching and hunting) and indirectly (through the breakdown of law and order and the displacement of people).



### *Safeguards and monitoring*

Environmental and social impact legislation exists in all the GLR countries with Environmental Impact Assessment (EIAs) and Environmental and Social Impact Assessment (ESIAs) provisions. However EIAs and ESIs are generally poorly implemented in the region (Kityo, 2011; Box 1). In Uganda, environmental and social impact legislation has been formulated to mitigate the harmful environmental effects of some development projects. For example, Uganda has a National Oil and Gas Policy, with environmental provisions such as EIAs, and also clearly states that oil and gas activities should be undertaken in a manner that conserves the environment and biodiversity (Republic of Uganda, 2008; Tullow, 2012).

However, the effectiveness of such tools have been questioned (Kityo, 2011).

In 2014, UNEP-WCMC conducted a study on oil governance in Kenya and Uganda, with the aim to catalogue and analyze existing baseline indicators on the impact of the oil sector in these two countries. For both countries, the study found that gaps in the legal frameworks, the resources and monitoring (UNEP-WCMC 2014; further details in Box 2). This study was funded by the MacArthur Foundation but other donors such as USAID, Ford Foundation, and the Royal Netherlands Embassy are also funding work on addressing the impacts of oil and gas exploitation and governance.

#### **Box 2: Oil governance in Uganda and Kenya, findings**

“The National Development Plan (republic of Uganda, 2010) envisions the private sector driving economic growth and specifically recognises the need to strengthen the policy, legal and regulatory framework for the oil and gas sector. The Oil Policy (2008) and Oil and Gas Revenue Management Policy (2012) set out the framework for oil development and for managing revenues, including requiring the highest standards of transparency, and a commitment (although not yet delivered) to joining the Extractives Industry Transparency Initiative (EITI). [...] The two (upstream and midstream) Petroleum Acts (both 2013) regulate the industry and include provisions relating to licensing, protecting the environment, and maximising local benefits” (UNEP-WCMC, 2014).

“The new (2010) Constitution of Kenya sets the scene for substantial legislative reforms including those relating to land tenure, environmental protection, citizen participation and benefit sharing, transparency and access to information, which are all of relevance to oil development. These are being addressed through a raft of new policies and legislation including: Vision 2030 (Republic of Kenya, 2007), and its second implementation plan (Republic of Kenya 2013) which identify that oil development is for the benefit of the people with priority given to local communities; the Access to Information Bill (2013); Amendments to the Environmental and Coordination Act (2013); the New Wildlife Policy, Wildlife Protection Act and Draft Wetlands Policy (all 2013) as well as the Land Act and Land Registration Act (both 2012) and the Community Land Bill (2013). In order to address the specific needs of the oil sector, Kenya also published in 2013 its National Energy Policy, Energy Bill and the Natural Resources (County Royalties) Bill.” (UNEP-WCMC, 2014)

The study found, however, that the existing environmental legislation in the two countries is sometimes dated and may need to be amended to address the requirements and specific environmental impacts of the oil sector. Despite the recent changes in legislation that provide encouraging signs of the establishment of a policy and legal framework for oil and gas exploration and production, there are still significant gaps in the specific implementation instruments. The study found indications that overall the countries lacked adequate resources, that the legal and institutional framework as well as monitoring efforts were unprepared and that there was a lack of integration in data collection between different government agencies.

*Source: UNEP-WCMC, 2014*



There is an urgent need to review and harmonise the regulatory frameworks for the petroleum and mining sectors and other cross-sectoral laws affecting the sectors *e.g.* land, water, forest, wildlife and other environment legislation so as to minimize the negative impacts of oil and mineral exploration on biodiversity in the GLR region as a whole (BirdLife International, 2012; CEPF, 2012; Kityo, 2011). Stringent environmental conditions and management will be required to protect the local environment from environmental risks associated with oil drilling. Comprehensive environmental management systems that includes good planning practices (prior to production), a clear and transparent licensing regime to ensure that only oil companies with top environmental records are invited to participate in GLR countries and safeguards to avoid, mitigate, and offset foreseeable environmental damage is required (Kityo, 2011).

### *Land tenure*

Access to and availability of land resources are critical to ensuring real and long-lasting improvement in social, economic and political well-being, especially in vulnerable societies that are prone to instability and conflicts.

With more than 60% of inhabitants in GLR countries living in rural areas, land tenure and governance regimes play an important role in socio-economic development and natural resources management (AUC-ECA-AfDB Consortium, 2010). In Tanzania for example, where ecotourism is a major economic sector, the government recognises the importance of community based natural resource management, especially forest management.

Land tenure regimes are important in the context of investments in large scale agricultural development (also sometimes referred to as “land grabbing”), for oil and gas exploration (*e.g.* biofuels, carbon offsets, sugarcane plantations etc). Sound land polices need to ensure that such investments and developments that are attractive to national level economic planners do not have negative social, economic and environmental effects on local communities in the short and the long term.

## 7.2 TRANSBOUNDARY AGREEMENTS FOR ENVIRONMENTAL MANAGEMENT

Several high profile transboundary agreements exist in the GLR. These initiatives include the Convention on the Sustainable Management of Lake Tanganyika, the Nile Basin Initiative, the East African Community, Lake Victoria Basin Commission (LVBC) and Lake Malawi/ Nyasa Basin Commission (Table 15 and Box 3).

Together with the Lower Nile, the Upper Nile Basin falls under the Nile Basin Initiative to which all five riparian countries that share this Basin belong and aims to promote the sustainable and cooperative use of the Nile's water resources. The LVBC, now an institution of the East African Community (EAC) but formerly known as the Lake Victoria Development Programme, was established in 2001 as a mechanism for coordinating the various interventions on the Lake and its Basin, and to serve as a centre for promotion of investments and information sharing among the various stakeholders (Lake Victoria Basin Commission, 2013). The Lake Tanganyika Authority (LTA) was established by the governments of Burundi, Democratic Republic of Congo, Tanzania, and Zambia to promote regional cooperation required for socio-economic development and sustainable management of the natural resources in the Lake

Tanganyika basin (Lake Tanganyika Authority, 2013b). It aims to address the major threats to the basin from over-fishing, siltation, agricultural practices and climate change (ARCOS Network, 2013a; Lake Tanganyika Authority, 2013a).

However, many of these agreements are limited to larger basins. Several new dam projects are currently underway in international river basins which do not have transboundary agreements in place, such as for example the Gibe dam projects in Ethiopia with their potential impacts on lake Turkana. Many small transboundary basins where dams and irrigation are being developed do not have agreements or cooperative arrangements (UNEP 2013).

The countries in the GLR are also members of Regional Economic Communities, some of which have developed initiatives in the field of development, such as the Common Market for Eastern and Southern Africa (COMESA), the Intergovernmental Authority on Development (IGAD) and EAC. Central African countries such as DRC, Rwanda and Burundi also have created a specialised organisation on forest management and conservation: COMIFAC, under the Communauté Economique des Etats d'Afrique Centrale (CEEAC; CEPF 2012).

**Table 15:** Transboundary basin management agreements or cooperation

Lake Basin	Transboundary cooperation	GLR Country Signatories	Governance
<b>Tanganyika</b>	The Convention on the Sustainable Management of Lake Tanganyika	Burundi, DRC, Tanzania, Zambia	Ministers of the Country States, Lake Tanganyika Authority
<b>Upper Nile</b>	The Nile Basin Initiative	DRC, Ethiopia, Tanzania, South Sudan, Uganda	Nile Council of Ministers, Nile Basin Secretariat, Technical Advisory Committee,
<b>Victoria</b>	The East African Community Lake Victoria Basin Commission	Kenya, Tanzania, Uganda (liaising with Rwanda and Burundi)	Sectoral Council of Ministers for Lake Victoria, Lake Victoria Basin Commission Secretariat, Lake Victoria Regional Local Authorities Cooperation, Lead Partners Interagency Network Forum
<b>Malawi/ Nyasa</b>	Lake MalawiNyasa Basin Commission	Malawi, Mozambique, Tanzania	Council of Ministers, Steering Committee chaired by a Permanent Secretary, Standing Committees

### Box 3: Case study The Nile Basin Initiative.

The Nile Basin Initiative (NBI) is an important case study as it shows capacity by GLR to address transboundary natural resources management in a coordinated manner. The NBI is a regional intergovernmental partnership that seeks to develop the River Nile in a cooperative manner, share substantial socio-economic benefits and promote regional peace and security. The partnership continues to be led by 10 Member States namely Burundi, DR Congo, Egypt, Ethiopia, Kenya, Rwanda, South Sudan, The Sudan, Tanzania, and Uganda. Eritrea participates as an observer. The NBI was conceived as a transitional institution until the Cooperative Framework Agreement (CFA) negotiations were finalized and a permanent institution created. The NBI includes the following countries: Burundi, DR Congo, Egypt, Ethiopia, Kenya, Rwanda, South Sudan, Sudan, Tanzania and Uganda. Cooperative effort in water resource management and development in the Nile Basin. Broadly and at a basin-wide level the achievements include the establishment of a transitional regional institution, the advancement of more than US\$1 billion in investment financing and the creation of tools and capacities to jointly plan and manage the shared waters of the Nile Basin.

Source: Nile Basin Initiative, 2012

## 7.3 CIVIL SOCIETY

The GLR as a whole has a diverse and active civil society sector, however, its development across the region is highly variable. Civil Society Organisations (CSOs) concerned with development outnumber those concerned with conservation. The CSOs are most strongly developed in Kenya, Uganda, Tanzania and Ethiopia and least in Burundi, Sudan, Malawi and DRC (BirdLife International, 2012; CEPF, 2012). Most of the regional organisations in the Albertine Rift face challenges in advocating for sustainable development in the region. The main constraints are inadequate human and financial resources (CEPF, 2012).

Tanzania, has strong local civil societies backed up by international NGOs. Similarly in Kenya strong local civil societies, including in environmental conservation, are backed up by international NGOs. Malawi is considered to have an enabling environment for civil society organisations. Unfortunately, there is constrained funding and only a moderate number of organisation/initiatives that are insufficient to tackle the challenges at stake. In Ethiopia, there are relatively high levels of corruption in the public sector and the legal framework constrains the activities for civil society organisations, although it still receives high levels of international conservation funding. As a result of civil unrest, there are very few civil society

organisations and initiatives in South Sudan and it receives very low levels of external investment.

The MacArthur Foundation has invested in conservation initiatives by civil society in GLR, such as in integrating and coordinating activities that address the threats affecting freshwater services in the region, by for example the ARCOS foundation, Lake Tanganyika Authority (LTA), the Ramsar Centre for Eastern Africa (RAMCEA), Nile Basin Discourse (NBD), BirdLife International and IUCN.

Civil society is also active in data and information sharing. For example, the ARCOS Network is the coordinating Secretariat on the collaboration in biodiversity data and information sharing in the Albertine rift region with data centers for Burundi, DRC, Rwanda, Tanzania and Uganda. Activities include monitoring of populations, and applied research on flora and fauna that affect local human population (UB, CRSN, CGIS, TAWIRI, MUIENR & ARCOS 2010).

In relation to the impacts of commodity development in the region the ARCOS network for example runs a project on “Civil Society Alliance for Enhanced Implementation of EIAs in Key Biodiversity Areas (KBAs) of the Albertine Rift Region” (funded by CEPF). The project is building capacity of NGOs and government institutions to collectively and effectively advocate for the application of site safeguard

policies and procedures through transparent EIAs in terrestrial and freshwater KBAs of the Albertine Rift (ARCOS Network, 2013b).

However, the power for such organisations to influence decision-making is still limited, in particular in the face of enormous economic interests, notably in the hydropower and extractive industry sectors.

## 7.4 LAND MANAGEMENT AND PLANNING

### *Protected areas*

Protected areas are a critical strategy not only for biodiversity conservation, but for securing ecosystem goods and services, enabling climate change adaptation and mitigation, and helping countries achieve their development goals (SCBD 2008). All GLR countries have a sizeable number of protected areas as shown in Table 16 and Figure 34. These protected areas are home to some of the world’s most charismatic species such as mountain gorillas. Just over 40% of all KBAs within the GLR have formal protection status. IBAs (more than 65%) and Ramsar sites (100%) are doing better in this regard (Table 17).

In most countries the protected area coverage has not increased significantly over the past 20 years, except in Uganda (Table 16).

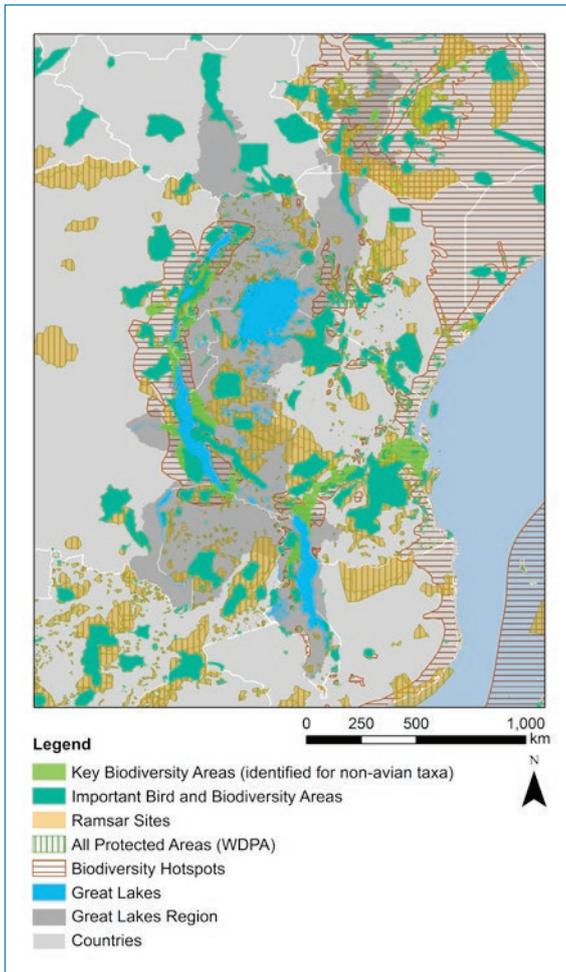
**Table 16:** Terrestrial protected areas (as a % of total land area) (World Development Indicators 2013).

Country	Terrestrial protected areas % of total land area	
	1990	2010
Zambia	36	36
Tanzania	26.6	27.5
Ethiopia	17.7	18.4
Mozambique	14.8	15.8
Malawi	15	15
Kenya	11.6	11.8
Uganda	7.9	10.3
DRC	10	10
Rwanda	9.9	10
Burundi	3.8	4.8
South Sudan	..	..

Burundi has 14 protected areas, which represent a wide array of relatively small and diverse ecosystems (Beck et al., 2010). However, only 5% of the land area is in a national protected area system, which protects only 18% of the tropical forest cover remaining (GIZ n.d.). Rwanda’s only three national parks (Parc National des Volcans (PNV), Nyungwe and Akagera) are vital to the protection of these ecosystems and biodiversity, and consequently, the goods and ecological services they provide (Republic of Rwanda, 2011).

**Table 17:** Proportion of important biodiversity areas within protected areas in the GLR

	Total area (ha)	Area within protected areas (ha)	%
<b>IBA</b>	17,685,704	11,668,219	66
<b>KBA</b>	30,836,004	12,607,403	41
<b>Ramsar</b>	37,262,524	59,794,725	100



**Figure 34:** Protected areas in the GLR and their overlap with important biodiversity areas (DIVA GIS, 2014; BirdLife International, 2013; MacArthur Foundation, 2012; NGA, 2000; IUCN & UNEP, 2014)

However, pressure on protected areas is increasing: several nationally protected areas ranging from forest reserves and community wildlife reserves to fully protected national parks lie within or close to oil wells. This includes, for example, as many as 14 of Uganda's protected areas (Kityo, 2011), including Murchison Falls National Park, one of Uganda's largest and most visited parks.

Weak legal protection is an important factor affecting the effectiveness of protected areas in the region. Forest Reserves are more likely to be converted to commercial agriculture than national parks. In Uganda this was the case for example of parts of Mabira forest and forest reserves on the Ssesse Islands.

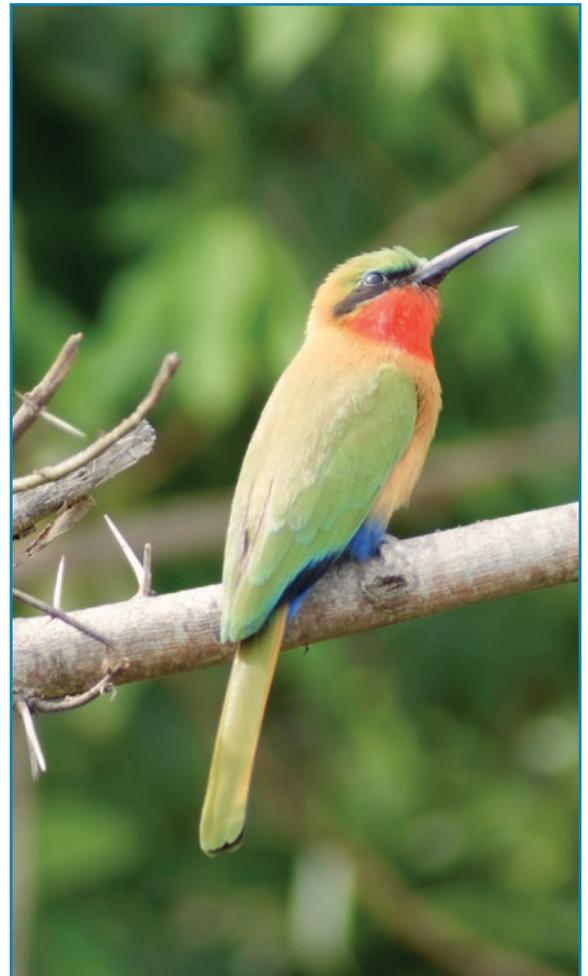
A CEPF study showed that the largest flows of biodiversity and environment investments in the GLR go to protected area systems, climate change and, to a lesser extent, species conservation—noting that almost 70% of the species-oriented funding benefits the hotspot's primates (CEPF, 2012). Yet, a lack of resources is a major problem in enforcing boundaries on the ground. This is compounded by the fact that in some areas, in particular in the Albertine rift and other mountainous areas of the GLR, population densities are extremely high and demand for land and resources from poor local communities is leading to forest degradation and resource depletion. Far greater support needs to be given to managing these protected areas for the benefits they provide for biodiversity conservation and to various facets of human well being.

### *Climate Resilient Altitudinal Gradients*

Climate Resilient Altitudinal Gradients (CRAGs) are a new concept developed by Birdlife International during the formulation of their conservation strategy for the GLR. CRAGs integrate both biodiversity and ecosystem services, together with climate resilience options for both key sites and landscape level biodiversity (BirdLife International 2012).

CRAGs are defined as “landscape units with a minimum altitudinal range of 1,000 meters, and are characterized by climate resilient biodiversity and ecosystem service values” (BirdLife International 2012). This minimum range allows for upward shifts in species distribution and for intervention options to increase resilience to climate change (BirdLife International 2012). CRAGs are a useful planning tool that aim to reduce harmful impacts from climate change, which are exacerbated by poor land management and land use practices, and enhance the beneficial impacts, by focussing on parts of landscapes most sensitive to climate change, and that integrate the management of biodiversity and ecosystem services in the face of this change (BirdLife International 2012). The criteria for a CRAG are specified in Birdlife International (2012).

This new approach emerged through Birdlife International’s work developing its conservation strategy for the GLR, and despite being at an early stage, a number of CRAGs have been identified in the GLR which could serve as manageable climate-resilient units of high priority for the biodiversity and ecosystem services they provide.



## 8. Conclusions

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The GLR region is extremely important for biodiversity, not only in terms of its intrinsic value but also for the ecosystem services it provides. These ecosystem services also underpin almost all of the sectors of development in the GLR countries, which are largely natural resource based.

However, the pressures from commodity developments on biodiversity and ecosystem services in the GLR are growing and this is unlikely to change in the near to medium future. Population growth in the region is high, GDP per capita is increasing, aspirations and consumption patterns are changing. The demand for energy and electricity is increasing. Services and industry are growing sectors in national economies. National policies are also, understandably, focussing their development strategies on the exploitation of natural resources such as newly discovered oil and gas but also hydropower and agricultural land.

There are many practical barriers to effectively manage the threats and reduce the negative impacts from commodity-driven development in the GLR. Poverty remains high, the HDI is low and low scores for indicators of governance highlight the constraints to the effective application of existing policy and legal frameworks. Conflicting decisions by different sectors of government easily lead to negative impacts, e.g. the promotion of large scale agricultural development or oil exploitation without proper environmental impact assessments, even when legislation exists, which can contradict forest conservation or local development policies.

Initiatives that aim to address some of the pressures and issues identified in this report already exist in the region. For example, the CEPF is working in the Eastern Afromontane Biodiversity Hotspot, which overlaps in parts with the GLR, in particular to strengthen the capacity of civil society organisations to advocate and support conservation. In addition, Birdlife International has developed a strategy for the GLR, which includes addressing threats to biodiversity in the GLR. Various donors are funding work on addressing the impacts of oil and gas exploitation. Some of the region's protected areas have a long history of conservation and development projects aiming to address both conservation and local livelihoods.

However, most of these initiatives support civil society, and whilst these play an important role in promoting environmentally sustainable policies and investor accountability as well as local rights to resources, national governments are responsible for higher-level environmental policy and legal frameworks. Such frameworks include those surrounding watershed planning, transboundary collaboration, EIAs, and MEA implementation. National and international civil society organisations and donors should work together to support and strengthen government processes and capacity to address the adverse impacts of commodity development on biodiversity and ecosystem services within the region.

The integration of environmental concerns into regional economic agreements should be supported. For example, regional organisations and programs that aim to promote and support agriculture development through sustainable land and water management, such as the Comprehensive Africa Agriculture Development Program (CAADP), an initiative of COMESA, can provide entry points for increasing the consideration of environmental concerns into agricultural development policy.

Building on the needs already identified by the CEPF and Birdlife International, this review therefore proposes the following further actions for the GLR region:

- Strengthen the institutional capacity for environmental management by government and national environmental management authorities, in particular for the implementation and enforcement of existing policies and laws in relation to environmental safeguards of commodity-driven developments.
- Strengthen the capacity for protected area management in the face of pressures from such developments.
- Support initiatives to improve awareness and understanding of the relationships between biodiversity, ecosystem services and livelihoods particularly in the context of commodity development.
- Support partnerships between civil society and the private sector.
- Identify the specific national and regional policies and laws that influence the governance of development sectors with potential impacts on biodiversity and ecosystem services so that they can be targeted for capacity development.

- Support initiatives to identify and evaluate the existing structures for data collection, management and monitoring in relation to each sector's performance with regard to national environmental, social and governance objectives.
- Support projects focusing on the data collection and monitoring of the impacts of commodities on biodiversity and ecosystem services.
- Support initiatives to better understand the responses of threats, such as mining, land-use or livestock, to climate change.

The new land policies and land laws that many countries in the region have adopted in recent years provide for greater decentralization in land administration and management. Trends in current reforms are placing more emphasis on environmental protection, protection of the commons, and enabling traditional systems of land tenure and land management, although weak land tenure systems, still provide potential for appropriation of resources by elite or foreign investors

These ongoing reforms in environmental policy and legislation in the GLR countries have however been largely driven by international processes. The development of the National Biodiversity Strategic Action Plans (NBSAPs) and National Environment Action Plans (NEAPs) in line with agreement under the Convention on Biological Diversity have supported some of these changes. There is, however, a need to ensure that these plans become an integral part of the national and regional policies and legislation that drive economic development.

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