



Netherlands Commission for
Environmental Assessment
Dutch Sustainability Unit

Climate Change Profile: EAST AFRICAN GREAT LAKES AND RUZIZI PLAIN

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Climate Change Profile: East African Great Lakes and Ruzizi Plain

This climate change profile is a comparison of climate change vulnerability and adaptive capacity in four countries of the East African Great Lakes Region – Burundi, east DRC, Rwanda and Uganda – with a focus on the Ruzizi Plain. The Ruzizi Plain covers 1,750 square km of land in northwest Burundi, east DRC and southwest Rwanda¹ and consists of lowlands along the borders of the Ruzizi river between Lake Kivu in the north and Lake Tanganyika in the south (see map).



Location of the Ruzizi Plain

Source: <http://africa.theworldatlas.net/burundi/map.html>

Additional information for each of the four countries can be found in its Climate Change Country Profile.

Overall ranking

Variable	Indicator	Burundi	DRC	Rwanda	Uganda
ND GAIN index 2014 rank out of 180 (and trend) ²		174 (^)	176 (=)	130 (^)	160 (=)
	Vulnerability rank out of 180	4	14	21	27
	Readiness rank out of 180	160	175	93	155

Worst ranks per indicator are indicated in red, best ranks in green.

Biophysical vulnerability

The table below summarizes the current climate and projected changes for the four countries, including main effects on water availability and food security (for references, see Climate Change Country Profiles).

Rwanda and (southwest) Uganda have similar characteristics and are therefore combined. The main difference between the four countries is in terms of current precipitation, which is significantly more in amount and intensity for east DRC than for the other three countries – with the Ruzizi River as a rough line dividing the two zones (see [Map set 1](#) and [Map set 2](#)). Projected

¹ The Ruzizi Plain is also called Imbo Plain in Burundi and Bugarama Plain in Rwanda.

² ND GAIN index summarizes a country's vulnerability to climate change and other global challenges in combination with readiness to improve resilience. Source: <http://index.gain.org/ranking>

changes are the same over the region (except from frequency of dry spells during rainy seasons, which will decrease in east DRC but increase in the other countries). The current more extreme circumstances in east DRC will however be further exacerbated by these changes.

Table 1: Climate in the Great Lakes Region

	Variable	Burundi	DRC (east)	Rwanda + Uganda (southwest)
Current climate	Average temperature	<ul style="list-style-type: none"> • 23–25 °C in the Ruzizi Plain • 15 °C in the surrounding mountains 		
	Average annual precipitation	<ul style="list-style-type: none"> • 900 mm in Ruzizi Plain • 1500 mm in surrounding mountains 	<ul style="list-style-type: none"> • 900 mm in Ruzizi Plain • 2000–2400 mm in surrounding mountains 	<ul style="list-style-type: none"> • 900 mm in Ruzizi Plain • 1500 mm in surrounding mountains
	Rainfall pattern	<ul style="list-style-type: none"> • Heavy rain events 15–20 mm/day • 10 day maximum rainfall 150–200 mm • Total rainfall per season 800–1200 mm 	<ul style="list-style-type: none"> • Heavy rain events 20–25 mm/day • 10 day maximum rainfall 200–300 mm • Total rainfall per season 1000–1400 mm 	<ul style="list-style-type: none"> • Heavy rain events 15–20 mm/day • 10 day maximum rainfall 150–200 mm • Total rainfall per season 800–1200 mm
	Seasons	Bimodal: <ul style="list-style-type: none"> • Feb–May (long rains) • Sep–Dec (short rains) Length of rainy seasons: 150–160 days	Bimodal: <ul style="list-style-type: none"> • Mar–May (long rains) • Sep–Nov (short rains) <i>(North and South DRC have different seasons)</i> Length of rainy seasons: 170–180 days	Bimodal: <ul style="list-style-type: none"> • Mar–May (long rains) • Sep–Nov (short rains) <i>(North Uganda has different seasons)</i> Length of rainy seasons: 150–160 days
Projected climate changes	Temperature	Changes around +0.4 °C per decade, up to +2.5–3 °C between 2000 and 2050 and +6 °C by 2100. Increase is most pronounced in the long dry season (Jun–Aug).		
	Precipitation	Decrease in precipitation by 2030 (–3 mm/month) but increase by 2090 (+25, around Lake Tanganyika and in November up to +50 mm/month).		
	Rainfall pattern	<ul style="list-style-type: none"> • Modest decrease for Feb–Aug (long rainy season + long dry season) • Increase for Nov–Feb (short dry season; up to +25% by 2100) Higher intensity of rainfall in heavy rain events		
	Extreme events	<ul style="list-style-type: none"> • Increased frequency/intensity of floods + erosion in lowlands (incl. Ruzizi Plain) • Increased erosion and landslides in highlands • Increased frequency of droughts in lowlands (not Ruzizi Plain) • Increased frequency of hot days/nights 		

Water/food security effects		<ul style="list-style-type: none"> • Increased frequency of dry spells during rainy season
	Seasons	<ul style="list-style-type: none"> • Increased duration of long dry season (up to May–Sep), including increase in temperature and dryness • Decreased duration of rainy seasons
	Food security	<ul style="list-style-type: none"> • On average 5–25% decline in crop yields between 2010 and 2050 • Burundi and Rwanda, but also neighbouring areas in DRC and Uganda, will be food insecurity hotspots in the future (see socio-economic vulnerability)
	Water availability	<p>Overall, no significant water stress expected, but temporal and local problems:</p> <ul style="list-style-type: none"> • Decreasing water level of Lake Tanganyika • Salinization in Ruzizi plain • Increased rainfall in heavy events leading to long term increase of 40% in average flow of Ruzizi and Ruvubu rivers (2000–2050) • Increased evapotranspiration due to temperature increase • 0.03% reduction of humid areas and 0.05% increase of drylands per year • Lack of good water management to adapt to these changes

The Ruzizi Plain is a central area in this region. Ruzizi River, flowing 117 km from Lake Kivu to Lake Tanganyika, descends from ca. 1,500 to 770 meters above sea level, with the steepest gradient over the first 40 kilometres. A belt of swamps, up to 3 km wide for the lower half of the river's course, accompanies the river up to its delta^{3,4}. The Ruzizi Plain is characterized by a dry savannah climate, with a dry season of 6–7 months (April–October; but longer in the south than in the north of the Plain) and an average temperature of 24 °C⁵. Total annual rainfall is 800–900 mm/year in the lower plain and 1200–1300 mm/year on the valley slopes. April is the wettest month, with 140–160 mm rainfall in the lower plain and 180–200 mm in the hills^{6,7}. The soils in the Ruzizi Plain are sandy, and the combination of intense rains and steep valley slopes causes high rates of erosion. This is a main reason of the Plain's high soil degradation and low suitability for agricultural production, despite good natural soil fertility^{8,9}. The area is

³ Blench, R. (2013): *Rice Production in the Ruzizi Valley*. http://www.academia.edu/3624682/Rice_in_the_Ruzizi_Valley_DRC

⁴ Hughes, R.H.; J.S. Hughes (1992): *A Directory of African Wetlands*. IUCN, Gland, Switzerland and Cambridge, UK.

⁵ Ilunga, L.; Paepe, R. (1990): Climatic Oscillations as Registered through the Ruzizi Plain Deposits (North Lake Tanganyika) Zaire – Burundi – Rwanda. In: Paepe, R. et al. (eds.): *Greenhouse Effect, Sea Level and Drought*, pp. 287–299.

⁶ Hughes and Hughes (1992)

⁷ Ngenzebuhoro, E. (2010): *Presentation of Burundi's Second National Communication on Climate Change*. https://seors.unfccc.int/seors/attachments/get_attachment?code=QMHC8DUWFSZ6EE74NCAG4PSTHZ5YBLA

⁸ Walangululu, M.J.; S.D. Yohali; B.B. Bisimwa, M.R. Nankafu, K.L. Buzera, B.J. Bashagaluke, B.E. Bisimwa (2012): *Performance of Introduced Irrigated Rice Varieties in Ruzizi Plain, South Kivu Province, DR Congo*. http://www.ucbukavu.ac.cd/IMG/article_PDF/Performance-of-introduced_a54.pdf

⁹ Ministry of Foreign Affairs of the Netherlands; IFDC (2012): *CATALIST: Catalyze Accelerated Agricultural Intensification for Social and Environmental Stability: Project Summary*. http://www.ifdc.org/getattachment/6135cf26-daf0-47e9-8f08-b2dd54e0d769/catalist_project_summary.pdf/

also susceptible to floods due to the presence of rivers and its location between mountains. Historically, floods have led to severe crop yield reductions in the Ruzizi Plain and surrounding areas¹⁰.

Socio-economic vulnerability

Table 2: Socio-economic vulnerability indicators Great Lakes Region

Variable	Indicator	Burundi	DRC	Rwanda	Uganda
National wealth ¹¹	GDP (PPP, 2015) USD per capita	736	783	1,759	1,825
Population	Population (2016), millions ¹²	11.5	79.7	11.6	40.4
	Population projection 2050, millions ¹³	28.7	195,3	21.2	101.9
	Population density per km ² (2015) ¹⁴	421	33	460	188
Human development ¹⁵	Human Development Index (2014), rank out of 188	184	176	163	163
Corruption ¹⁶	Corruption Perception Index (2014), rank out of 168	150	147	44	139
Gender equality ¹⁷	Gender Inequality Index (2014), rank out of 188	109	149	80	122
Education ¹⁸	Adult literacy (2015), % of total population	86%	64%	71%	78%
	Adult literacy (2015), % of adult males	88%	78%	73%	85%
	Adult literacy (2015), % of adult females	83%	50%	68%	71%

Worst ranks per indicator are indicated in red, best ranks in green.

The table above suggests that DRC and Burundi are most vulnerable to climate change in terms of their socio-economic situation, compared to Rwanda and Uganda (although Rwanda, Uganda are vulnerable in terms of population density and growth,). Vulnerability of the region as a whole, and especially of the Ruzizi Plain, arises to a great extent from its very high population density (2,000 people per km² on the Ruzizi Plain) combined with high natural resource de-

¹⁰ Ngenzebuhoro (2010)

¹¹ World Bank Data – GDP per capita, PPP. <http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD>

¹² World Population Review. <http://worldpopulationreview.com/countries/>

¹³ UNDESA (2015). *World Population Prospects: The 2015 Revision*. <http://esa.un.org/wpp/>

¹⁴ World Bank Data – Population density. <http://data.worldbank.org/indicator/EN.POP.DNST>

¹⁵ UNDP (2015). <http://hdr.undp.org/en/content/table-1-human-development-index-and-its-components>

¹⁶ <http://www.transparency.org/cpi2015/results>

¹⁷ <http://hdr.undp.org/en/content/table-4-gender-inequality-index>

¹⁸ CIA (2015). The World Factbook. Available via <https://www.cia.gov/library/publications/the-world-factbook/>

pendency and very low agricultural productivity, which increases poverty and decreases opportunities for income diversification. Climate change is expected to increase the effects of erosion, which already cause extensive soil degradation, while simultaneously decreasing yields of widely consumed crops such as maize and beans. Rice cultivation in the Ruzizi Plain may benefit from climate change, but rice has high production costs and may not be sufficient to keep up with rapidly increasing population and simultaneously decreasing productivity of other crops as well as the fishery sector. Moreover, increased frequency and intensity of floods imply greater risks of yield losses in the Plain. Increased pressure for food production on highlands surrounding the Ruzizi Plain is expected due to land fragmentation in the lowlands and increasingly favourable temperatures in highlands. Most vulnerable populations to climate change in and around the Plain are farmers' households (especially in Burundi and Rwanda, where many skilled labourers migrate to DRC) as well as those who suffer from conflicts.

Vulnerability is to a large extent caused by the extremely high population density in the Great Lakes Region. The highest density is found in Rwanda and Burundi, while DRC and Uganda have lower population densities although the situation along the lakes is similar to the situation in the other two countries (see [Map 3](#)). Within these countries, population densities are highest in the Ruzizi Plain where 3.5 million people live on 1,750 square km of land (equal to 2,000 people per square km)¹⁹.

More than 330,000 Mt of food is imported annually into the Great Lakes region in order to meet the population's food demand. This supplements local food production from crop cultivation, fisheries and cattle breeding. The fishery sector is a main income source for those living near the lakes, but it suffers from increasing water temperatures and changing oxygen contents. The latter have resulted in a 20% reduction in biological productivity in the lake over the past 100 years, and a significant decrease in fish stocks since the 1980s²⁰. This trend is expected to continue, with water temperatures increasing at 1 °C per 100 years²¹.

For the majority of people in the Ruzizi Plain, however, crop cultivation remains the primary source of income. A total of 175,000 ha is cultivated in the Ruzizi Plain, using extensive farming methods and water from precipitation and mountain rivers²². Farm sizes are very small: in DRC, for example, 14,000 hectares of agricultural land in the Plain are allocated to about 45,000 farmers – equal to ca. 0.3 ha per farmer²³. Most of them cultivate one season per year, but

¹⁹ Ministry of Foreign Affairs of the Netherlands; IFDC (2012)

²⁰ WWF (2006): *Climate Change Impacts on East Africa: A Review of the Scientific Literature*. https://www.wwf.or.jp/activities/lib/pdf_climate/environment/east_africa_climate_change_impacts_final.pdf

²¹ Borre, L. (2013): *Warming Lakes: Climate Change Threatens the Ecological Stability of Lake Tanganyika*. <http://newswatch.nationalgeographic.com/2013/03/07/warming-lakes-climate-change-threatens-the-ecological-stability-of-lake-tanganyika/>

²² Ministry of Foreign Affairs of the Netherlands; IFDC (2012)

²³ Walangululu et al. (2012)

those who live closer to water sources and enjoy more reliable water flow can sometimes harvest two or three seasons²⁴. The main crop cultivated in the Ruzizi Plain is rice, followed by maize, groundnut, beans, soybeans, tomatoes and other vegetables²⁵.

Climate change projections suggest different effects on these and other crops that are cultivated in the Great Lakes Region:

- rice yields are expected to increase along Lake Kivu;
- maize yields are expected to decrease by 5–25% between 2000 and 2050, most profoundly along the lakes and rivers and in Ruzizi Plain (see [Map set 4](#));
- bean yields will decrease because they require lower temperatures – even though currently unsuitable higher areas may become productive due to temperature increase (see [Map set 5](#));
- sorghum will become a new suitable crop for higher areas that are currently too cold;
- sweet potato yields are likely to decrease;
- cassava yields will certainly be affected by climate change, but effects are highly uncertain as some projections suggest yield increases and others decreases;
- banana/plantain yields may experience small decreases (see [Map 6](#));
- potato yields are likely to increase;
- coffee production is highly susceptible to climate and may shift to other areas.

Climate change will have profound effects on food security, not only in Ruzizi Plain but also for the four countries as a whole:

- Burundi's main crops, in order of importance, are banana, beans, sweet potato, maize and sorghum. Its primary crop will not be affected significantly by climate change, while beans and sorghum production may have to be relocated. For sweet potato and maize, however, yields will decrease – in the case of the latter especially in Ruzizi Plain. This is problematic since maize is the primary consumption crop for the country's poor.
- DRC's main crops, in order of importance, are cassava, maize, groundnuts, rice, and plantains. Its future food security situation is very uncertain due to unclear climate change effects on its primary crop and negative effects on its second crop. There may however be growing potential for rice cultivation.
- Rwanda's main crops, in order of importance, are banana/plantain, beans, sorghum, potato and sweet potato. Its effects from climate change are similar to those in Burundi, although improved potato yields may benefit Rwanda while Burundi will suffer from reducing maize yields.
- Uganda's main crops, in order of importance, are plantain, beans, maize, sweet potato and millet. It will experience similar climate change effects as Burundi and Rwanda, although effects on millet are unclear²⁶.

For the Ruzizi Plain, rice is the most important crop and may become even more important in the future, when productivity of other crops may decrease. However, current productivity in

²⁴ Blench (2013)

²⁵ Walangululu et al. (2012)

²⁶ Waithaka, M.; G.C. Nelson, T.S. Thomas, M. Kyotalimye (2013): *East African Agriculture and Climate Change: A Comprehensive Analysis*. IFPRI.

the Ruzizi Plain is low (below 2.5 t/ha) and rice from the area does not appear on the market. This is partly due to the production costs of paddy rice in this region, which is among the highest in the world: USD 0.23/kg in Burundi, USD 0.29/kg in Rwanda, and USD 0.39/kg in DRC²⁷. Uganda has somewhat lower rice production costs than its neighbours. Production costs are high due to defective irrigation infrastructure, high labour costs and a lack of access to credit. Another factor is extensive soil degradation that causes a nutrient loss of 60 kg/ha/year. This calls for extensive fertilizer use, but in reality the Great Lakes Region is known to have the world's lowest rate of fertilizer use, around 4 kg/ha/year^{28,29}. Other factors that hamper production of rice and other crops include the lack of a secure market, weakness of farmer organizations, and a high and increasing degree of land fragmentation³⁰. The latter is due to increasing population pressure and ownership of very large parcels by few farmers, leaving smaller plots and/or rented plots of ca. 0.5 hectare for the majority of farmers' households^{31,32}.

Small fragmented plots decrease farmers' adaptive capacity to climate change because it limits their options for agricultural diversification and experimentation with climate change-resistant crops, while also contributing to poverty and malnutrition, which are known factors of climate change vulnerability. Insecure land tenure further limits farmers' opportunities and incentives for investing in conservation technologies and methods that could prevent severe long-term climate change effects of erosion. Increasing plot fragmentation and a lack of secure ownership have already forced farmers in Burundi to start cultivating on steeper slopes that are more susceptible to erosion. At the same time, climate change effects will further limit the amount of suitable agricultural land that is available.

Another factor that was mentioned to influence crop production and food security in the area is the high price of labour. This price differs per country: farmers in DRC, for example, often bring in labourers from Burundi because population pressure and poverty in their home country forces them to work for much lower rates³³. This implies that skilled and strong labourers often migrate from their farming households in Burundi, leaving behind more vulnerable household members (which is indeed suggested by the higher percentage of female labourers in Burundi as well as Rwanda). This 'skill drain' makes the country as a whole also more vulnerable to climate change effects. Artisanal mining in DRC further increases labour migration, being a more profitable – but also more dangerous – source of income than crop production³⁴.

Socio-economic vulnerability to climate change in the Great Lakes Region is increased by the many conflicts in the region, which increase poverty and internal migration, limit access to land, and erode social networks. Examples are the civil wars in Uganda (1978–1986), Rwanda (1990–1994), Burundi (1990–2006), and DRC (1996–2006, but also on-going conflict in

²⁷ Ministry of Foreign Affairs of the Netherlands; IFDC (2012)

²⁸ Walangululu et al. (2012)

²⁹ Ministry of Foreign Affairs of the Netherlands; IFDC (2012)

³⁰ Walangululu et al. (2012)

³¹ Blench (2013)

³² Ministry of Foreign Affairs of the Netherlands; IFDC (2012)

³³ Blench (2013)

³⁴ Blench (2013)

eastern DRC)³⁵. The Ruzizi Plain is characterized by a history of conflicts, such as those over natural resources between Bafuliro and Barundi clans at the DRC–Burundi border, existing since colonial times and still violent today³⁶. Another ongoing conflict exists between cattle owners who water their animals along the rivers in the Ruzizi plains and crop farmers in the same area, with the former opposing increasing rice cultivation in the area and the latter claiming that cattle cause damage to their crops. The unfavourable security situation in the area, with conflicts on various levels, discourage farmers’ long-term investments – including those in climate change adaptation technologies, infrastructure and irrigation facilities³⁷.

The four countries’ vulnerability levels to climate change effects – combining natural factors and socio-economic vulnerability – has been summarized in DARA’s Climate Vulnerability Monitor (2012)³⁸. This monitor assessed vulnerability levels associated with different types of environmental disasters, aspects of habitat change, various health impacts, and different industries. The Monitor investigates how these factors (22 in total) will develop between 2010 and 2030. It also calculated additional economic costs, mortality, and affected population due to these effects. Some outcomes that are relevant for water/food security are presented in the table below.

Table 3: Vulnerability indicators for the Great Lakes Region

Variable	Indicator	Year	Vulnerability level			
			Burundi	DRC	Rwanda	Uganda
Environmental disasters	Drought	2010	high	high	high	high
		2030	high	high	high	high
	Floods and landslides	2010	moderate	moderate	moderate	moderate
		2030	high	moderate	moderate	moderate
	Storms	2010	low	low	low	low
		2030	low	low	low	low
	Wildfires	2010	low	moderate	low	low
		2030	low	moderate	low	low
Industry stress	Agriculture	2010	acute	high	acute	severe
		2030	acute	severe	acute	acute
	Fisheries	2010	high	severe	moderate	severe
		2030	acute	acute	moderate	acute
Health impact	Hunger	2010	severe	acute	high	severe
		2030	severe	acute	high	severe
		2010	severe	severe	high	high

³⁵ Plumptre, A.J.; D. Kujirakwinja, S. Nampindo (2008): Conservation of Landscapes in the Albertine Rift. In: Redford, K.H.; C. Grippio (eds.): *Protected Areas, Governance, and Scale*.

³⁶ International Crisis Group (2013): *Understanding Conflict in Eastern Congo (I): The Ruzizi Plain*. <http://www.crisis-group.org/en/regions/africa/central-africa/dr-congo/206-comprendre-les-conflits-dans-lest-du-congo-i-la-plaine-de-la-ruzizi.aspx>

³⁷ Blench (2013)

³⁸ DARA Climate Vulnerability Monitor (2012): <http://daraint.org/climate-vulnerability-monitor/climate-vulnerability-monitor-2012/country-profile/>

Total climate (including the factors above + 15 others)	2030	acute	acute	severe	severe
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This vulnerability is also reflected in economic developments in the region. One study found that increased average annual rainfall may benefit countries in this region positively – especially Burundi and Rwanda, where it has been reported to be responsible for 3–20% of estimated GDP growth rates by 2100. This is contrary to almost all other regions in Africa, where rainfall trends are expected to affect GDP growth in a negative way. The study also notes, however, that increased rainfall variability and unpredictability may have stronger – and negative – impacts on economic developments³⁹.

National and regional strategies and policies

Burundi, DRC, Rwanda and Uganda all have ratified the UN Convention on Biological Diversity (CBD), the Convention to Combat Desertification (CCD), the Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. All four countries produced NAPAs for climate change adaptation, with a range of priority activities

- Burundi: climate change resistant crops, water availability, early warning forecasts;
- DRC: water resources, coastal area, agriculture, land and ecosystem degradation;
- Rwanda: IWRM, early warning, income diversification, intensive agriculture, resistant varieties;
- Uganda: land degradation, water resources, drought adaptation, pest/disease control.

A relatively small number of the proposed NAPA activities were funded and implemented. Countries are now developing National Adaptation Plans (NAPs). For Least Developed Countries (LDCs), the NAP process is supported by several initiatives, one of which is the UNDP and UNEP's NAP Global Support Programme (NAP-GSP). The four countries in the Great Lakes Region all attended a NAP-GSP workshop in April 2014 and agreed with NAP-GSP on support for their NAP process.

The DRC government organised a national workshop with support from UNDP and GIZ in October 2014. This workshop served to plan and develop sector activities for longer term adaptation planning and to facilitate stakeholder dialogue to determine the appropriate institutional arrangements for the NAP process. The DRC government is aiming to integrate the NAP process and the development of its national 'Vision 2035 Strategy', which will also include aspects of climate change adaptation⁴⁰. Burundi drafted its roadmap for advancing its NAP and officially requested support from NAP-GSP in March 2016. Negotiations about this support are still ongoing⁴¹. To date, none of the four countries has submitted its NAP on the UNFCCC NAP-portal⁴².

³⁹ Ludwig F., Franssen W., Jans W., Beyenne T., Kruijt B., Supit I. (2013): Climate change impacts on the Congo Basin region. In: *Climate Change Scenarios for the Congo Basin*. [Haensler A., Jacob D., Kabat P., Ludwig F. (eds.)]. Climate Service Centre Report No. 11. http://www.climate-service-center.de/imperia/md/content/csc/csc-report11_optimized.pdf

⁴⁰ UNDP-ALM website: <http://www.undp-alm.org/projects/democratic-republic-congo-drc-nap-process>

⁴¹ <http://www.adaptation-undp.org/projects/supporting-burundi-advance-their-nap-process>

⁴² <http://www4.unfccc.int/nap/Pages/national-adaptation-plans.aspx>

Beside the development of these NAPAs and NAPs that focused on adaptation, a number of developing countries started to develop NAMAs (Nationally Appropriate Mitigation Actions). Of the four countries described in this profile, only Rwanda and Uganda have to date registered NAMAs (seeking support for preparation): Uganda has registered nine and Rwanda seven with a range of focus including solid waste, transport, renewable energy, energy efficiency, livestock production, and wastewater treatment⁴³.

The four countries have also developed policies and strategies on climate change:

- Burundi: a National Climate Change Strategy and Action Plan (2012) and a National Policy on Climate Change Adaptation (in progress);
- DRC: no climate change policy/strategy; only a National Environment Action Plan and a National Biodiversity Strategy (2002) and a Poverty Reduction Strategy Paper (PRSP, 2013);
- Rwanda: a Green Growth and Climate Resilience Strategy (GGCRS, 2011) and an Economic Development and Poverty Reduction Strategy Paper (2013) with a strong climate change component;
- Uganda: a Climate Change Policy (2015) and a Green Growth Strategy (with a primary focus on Low Emissions Development (LED)) to be completed in 2016), and a National Vision 2040 (2012) with a strong climate change component.

For further information on countries' strategies and policies, see the respective country profiles.

For the region as a whole, the Nile Basin Initiative (including Burundi, Rwanda, Uganda and east DRC) has developed a Climate Change Strategy. It defines the following challenges that need to be overcome to achieve successful outcomes on climate change activities in the basin:

- insufficient data, information and knowledge;
- multi-sector complexities and lack of integrated policy and decision-making;
- limited institutional arrangements and capacities;
- lack of coordination between existing regional and national climate change response measures.

Strategic objectives governing NBI's Climate Change Strategy are:

- strengthen the knowledge base to enhance common understanding of climate change risks and its impacts on water resources, ecosystems and the socio-economic system of the Nile Basin;
- strengthen long-term capacities for addressing climate risks and uncertainty in the Nile Basin at national and trans boundary levels;
- support climate resilient planning and implementation addressing climate risks and uncertainty in NBI's programs;
- promote scalable low carbon development through enhanced trans boundary cooperation in areas such as protection of wetlands as well as clean energy use and development;

⁴³ <http://www4.unfccc.int/sites/nama/SitePages/country.aspx>

- strengthen basin-wide climate finance access and the capacity for development of feasible projects in the Nile Basin.

Beside the Nile Basin Initiative, the East Africa Community (EAC) which includes Burundi, Rwanda and Uganda also has a Climate Change Master Plan 2011–2031 with eight pillars: adaptation, mitigation, technology, capacity building, education, gender/youth/marginalised groups, disaster risk reduction, and climate finance⁴⁴. The EAC also developed a Climate Change Policy (2011) with three pillars: adaptation, mitigation and research^{45,46}. The Greater Virunga Transboundary Collaboration, an inter-governmental organization of three countries–DRC, Rwanda, Uganda – with its headquarters in Kigali, is finalizing a climate change strategy that primarily focuses on strengthening resilience and preparing for the impact of climate change in the Greater Virunga Landscape.

Climate finance

In December 2014, ODI presented a global ranking of the 135 countries receiving multilateral climate finance in terms of the amount of money approved⁴⁷. The countries in the Great Lakes Region rank as follows:

Table 4: Climate finance for Great Lakes Countries

	Burundi	DRC	Rwanda	Uganda
Climate finance approved rank (out of 135)	80	20	40	57
Mitigation finance approved (million \$)	0	72	0	4
Adaptation finance approved (million \$)	12	19	28	15
Financial instrument	100% grant	100% grant	100% grant	100% grant

Worst ranks and scores are indicated in red, best ranks and scores in green.

Within the Great Lakes region, there is a large difference between countries. Rwanda has been characterized as a ‘less successful country’ in obtaining adaptation finance, but still attracts more climate finance than Burundi and the DRC, which were characterized as ‘unsuccessful’ in obtaining adaptation finance⁴⁸. The image of climate finance for the DRC may be somewhat distorted since the country receives large funds – but mainly for mitigation (forest related), and mainly in the Congo basin. The east of the country is virtually excluded in terms of finance.

⁴⁴ EAC (2011a): *East African Community Climate Change Master Plan 2011–2031*

⁴⁵ Nile Basin Initiative (2013): Climate Change Strategy. www.nilebasin.org/index.php/media-center/publications/doc_download/104-nbi-climate-change-strategy

⁴⁶ EAC (2011b): *EAC Climate Change Policy (EACCCP)*

⁴⁷ Nakhooda, S.; Norman, M. (2014): *Climate Finance: Is it making a difference? A review of the effectiveness of Multilateral Climate Funds*. ODI. <http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9359.pdf>

⁴⁸ Tippmann, R.; Agoumi, A.; Perroy, L.; Doria, M.; Henders, S.; Goldmann, R. (2013): *Assessing Barriers and Solutions to Financing Adaptation Projects in Africa*. IDRC

Climate change projects

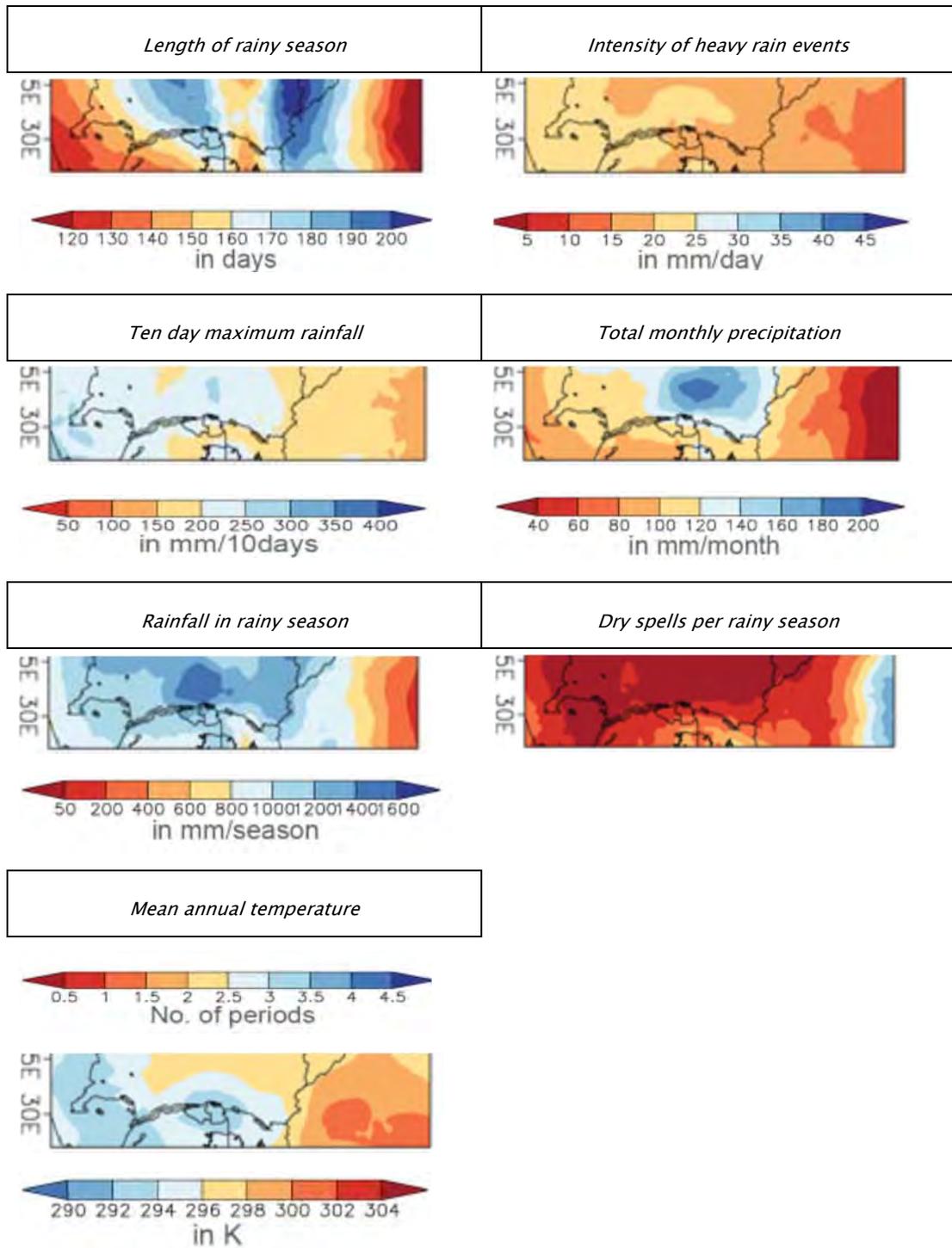
See the Country profiles for more information on projects related to climate change and water or food security.

Climate contribution of the Netherlands Embassy: Pitch & Bid

Beginning in 2014, embassies with development programs have annually been preparing a climate Pitch & Bid. The *Pitch* communicates the embassy's climate-smart actions that will address climate change. Based on the actions described in the Pitch, assignment of the Rio Markers and budget information, the embassy prepares a *Bid* which is an estimate of how much of its budget is likely to be spent on projects that are relevant for climate in the coming three years. For the Great Lakes region, the Bid estimates a climate contribution for 2016–2018 of € 14, 81 million (3.35 million for 2016; 5.76 million for 2017; 5.71 million for 2018), one project focuses on *mitigation*; all of the other projects focus on adaptation.

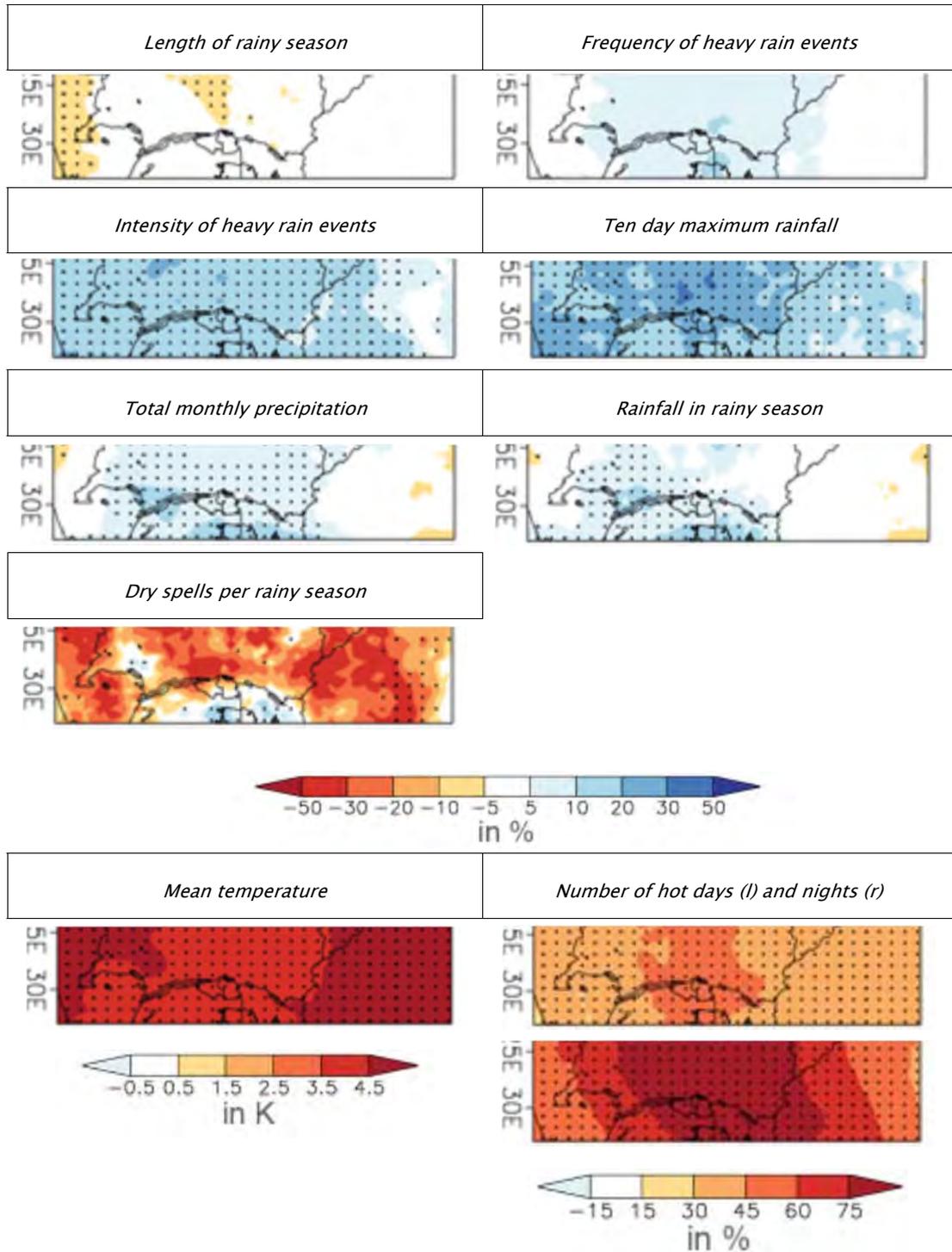
- **Productive and income generating capacity:** this will enable people to cope with climate shocks.
- **Gender:** activities will specifically target women since they often bear the largest burden of climate change effects.
- **Trans boundary, collaborative, integrated and inclusive natural resource management:** dialogue and cooperation will help to cope with climate change risks, including resource-based conflicts, while integrated and inclusive management of water resources will build resilience of natural resources for agriculture, fisheries, industry and drinking water.
- **Improved disaster risk management:** taking into account the region's high vulnerability to climate change improves disaster risk management and resilience.
- **Biodiversity of the Greater Virunga Landscape:** production of an annual conservation report of the Greater Virunga landscape gives insight into biodiversity, endangered species and the current state of climate change.
- **Integrated Water Management:** more attention to integrated, inclusive management of regional water resources and watershed, will build resilience of natural resources for agriculture, fishery, industry and drinking water.
- **Improved soil fertility and adapted seed varieties:** soil fertility research, integrated soil fertility management (ISFM) and climate change adapted seed varieties will help to build climate-robust regional food security interventions.
- **Improved land rights:** climate smart choices in land use will be supported and access to agricultural inputs and finance enhanced.

Map set 1: Current climate and differences within the region



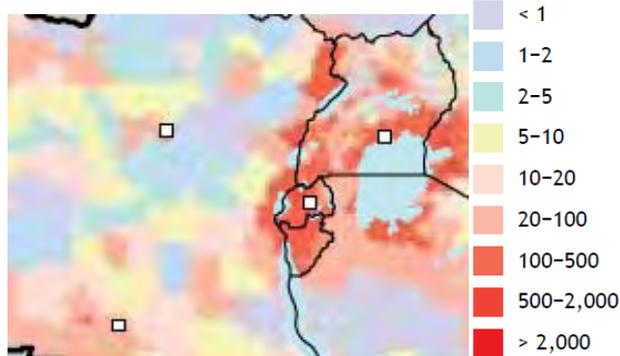
Source: CSC (2013): *Climate Change Scenarios for the Congo Basin – Collection of Maps.*
[http://www.climate-service-center.de/imperia/md/images/csc/pro-
 jekte/kongo/kongo_pdf/interactive_pdf_supplementarymaterial_english_final.pdf](http://www.climate-service-center.de/imperia/md/images/csc/projekte/kongo/kongo_pdf/interactive_pdf_supplementarymaterial_english_final.pdf)

Map set 2: Climate change and differences within the region – change between 1975 and 2100

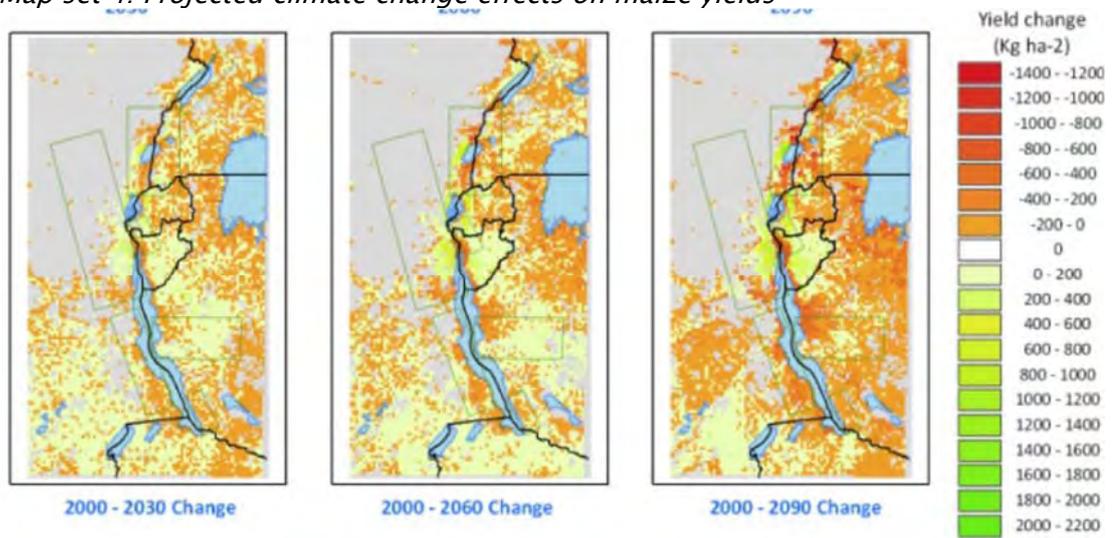


Source: CSC (2013)

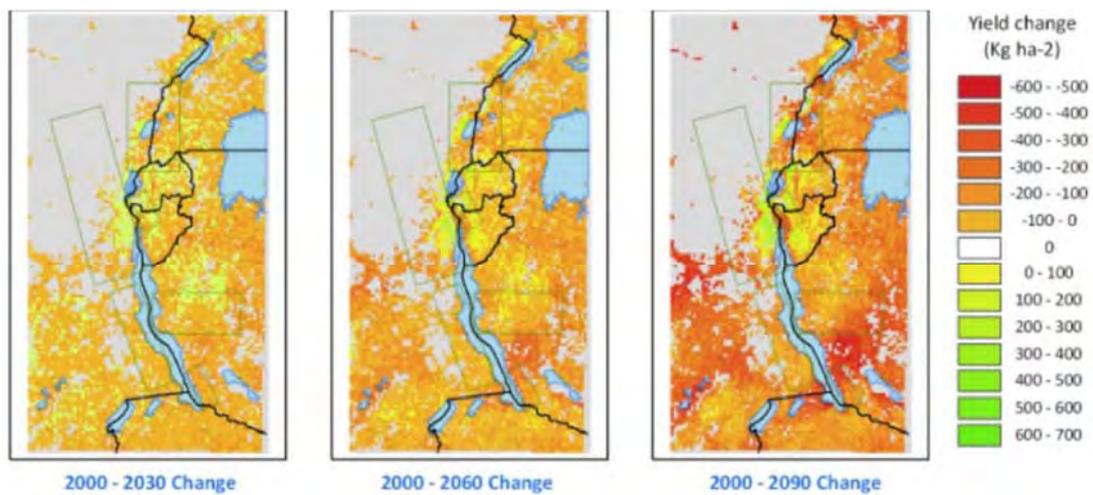
Map 3: Population distribution, 2000, persons per km²



Map set 4: Projected climate change effects on maize yields

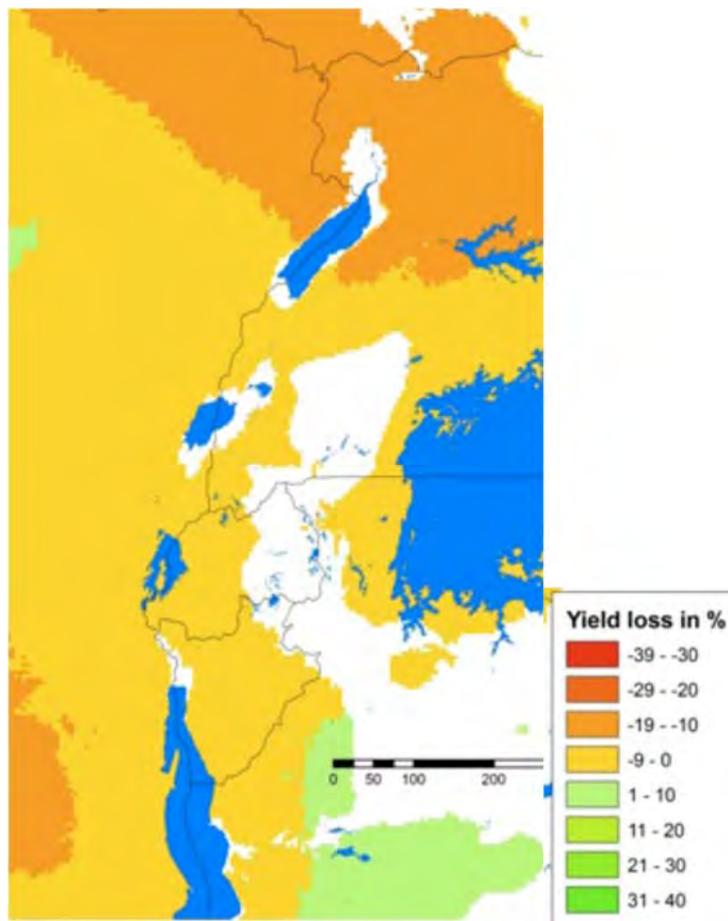


Map set 5: Projected climate change effects on bean yields



Source: BirdLife International and partners (2012): Conservation Strategy for the Great Lakes Region of East and Central Africa.

Map 6: Projected climate change effects on banana yields



Source: Bouwmeester, H. (2011): Rural Agricultural and climate change in the Albertine Rift. Building Consensus on Albertine Rift Climate Change Adaptation for Conservation Workshop.