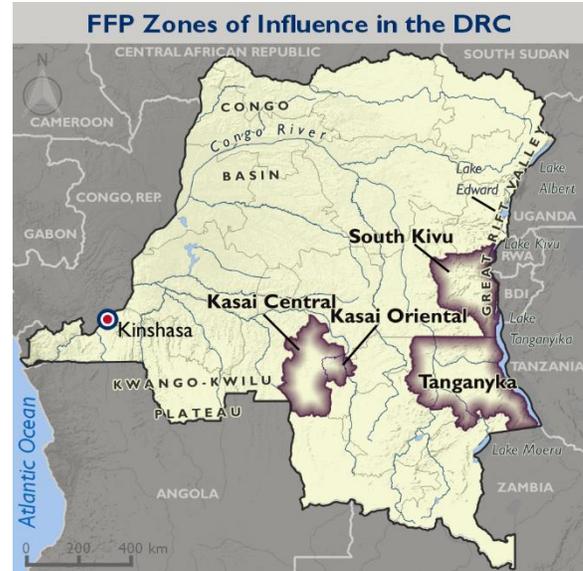




# CLIMATE RISKS IN FOOD FOR PEACE GEOGRAPHIES DEMOCRATIC REPUBLIC OF CONGO

## OVERVIEW

Increased temperatures and more frequent and extreme weather events plague the regions where USAID’s Food for Peace (FFP) investments are focused in the Democratic Republic of Congo: the lakes central areas of South Kivu Province, Tanganyika Province in the northern part of the former Katanga Province, and Kasai Province in the central region of the country. These regions are already characterized by significant social vulnerability, including food insecurity (Kasai 61 percent, South Kivu 64 percent, Katanga 57 percent), high levels of poverty and undernourishment. Dependence on rainfed agriculture dominates and current climate variability already negatively impacts crop productivity through floods, erosion and heavy rains. Increased temperatures and more intense rainfall events alter the distribution and ranges of insect pests, weeds and pathogens and damage already limited transport networks. Climate projections suggest these extreme events will become more common in the target regions. Investments in these areas will therefore need to be adapted to these changing conditions to reduce the risks posed by climate variability and change. (5, 6, 8, 9)



## CLIMATE PROJECTIONS



2–3°C increase in temperatures by 2050



More extreme weather, with intense precipitation



Increased incidence of flooding

## KEY CLIMATE IMPACTS TO FFP PROGRAM AREAS

### Agriculture and Livelihoods



- Increased crop losses/failure
- Increased livestock mortality
- More pests, weeds, pathogens
- Damage to limited transport networks

### WASH and Health



- Reduced water quality
- Spread of waterborne diseases
- Increased malnutrition and food insecurity
- Expanded range of disease-carrying vectors

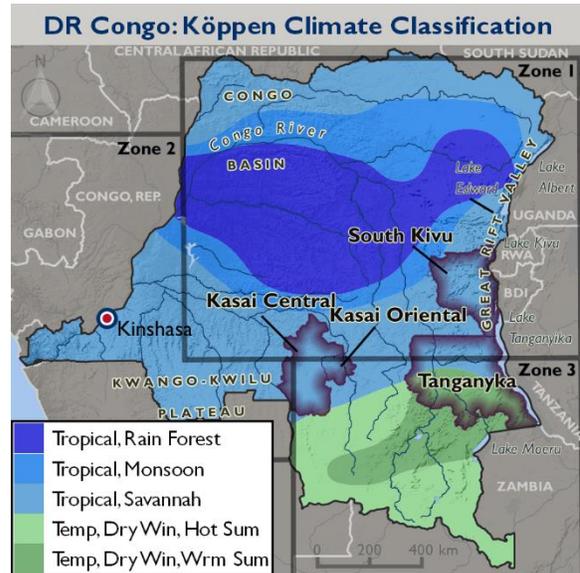
## February 2017

This document was prepared under the Climate Change Adaptation, Thought Leadership and Assessments (ATLAS) Task Order No. AID-OAA-I-14-00013 and is meant to provide a brief overview of climate risk issues. The key resources at the end of the document provide more in-depth country and sectoral analysis. The contents of this report do not necessarily reflect the views of USAID.

## CLIMATE SUMMARY

Meteorological observations across the DRC are scarce and offer limited information on the country's climate variability, but three major climatic zones are recognized (see map and descriptions below). *The majority of the FFP investments are planned in Zone 3, though reference is made within each zone to the focus provinces.*

- Zone 1** – (South Kivu and parts of Kasai and Tanganyika) Tropical rainforests along the Congo River and its tributaries characterized by two rainy seasons, occurring from March–May and September–December, followed by two short dry seasons in June–August and January–February. Average temperatures range from 24–25°C with limited variability throughout the year.
- Zone 2** – (parts of Kasai) Mountainous terraces and dense grasslands with predominantly tropical wet and dry climates and a dedicated rainy season (July–August). Average temperatures range from 24–25°C with limited variability throughout the year.
- Zone 3** – (parts of Kasai and Tanganyika) Subtropical climates of savannas in the south and southeast with a single rainy season occurring between December–February. Slightly lower but consistent temperatures range from 22–23°C.



Source: CSC 2013

Given the paucity of meteorological observations, future levels of rainfall in the Congo Basin are highly uncertain, with some models projecting significant decreases in rainfall while others project increases. Nevertheless, although the annual total precipitation amounts might not change dramatically, the rainfall characteristics are projected to undergo some substantial changes. These are highlighted below. (1, 2, 3)

Table 1: Key Climate Trends and Projections		
	Observed Climate Trends	Climate Projections
<b>Temperature</b> 	<ul style="list-style-type: none"> <li>Increases in warm extremes (i.e., warmest day increased by about 0.25°C per decade)</li> <li>Increased temperatures of deep waters in Lake Tanganyika by 0.2 to 0.7°C since the early 1900s</li> </ul>	<ul style="list-style-type: none"> <li>Increased average daily temperatures</li> <li>Rise in minimum temperatures will exceed rise in maximum temperatures</li> </ul>
<b>Rainfall</b> 	<ul style="list-style-type: none"> <li>Increased frequency of intense rainfall</li> </ul>	<ul style="list-style-type: none"> <li>Continued increased frequency of intense rainfall events</li> <li>Possible decreases in dry season rainfall (June–August and September–November) in the southern region of the country by 2050.</li> </ul>

## SECTOR IMPACTS AND VULNERABILITIES

### CROP PRODUCTION

Agriculture is a central engine of the DRC economy. It accounts for 40 percent of the national GDP, employs 70 percent of the country’s population, and is the primary source of livelihood for the majority of Congolese. The sector is mainly subsistence in nature, combining farming, hunting, small animal husbandry and some fishing in communities close to lakes. Crop production varies by region, but maize and cassava are major staples, and most areas support livestock. The principal staple crops are cassava, plantains, maize and mangoes/ mangosteens. The main agricultural exports in terms of value are unmanufactured tobacco, green coffee, raw centrifugal sugar, bran of wheat and natural dry rubber. The major challenge to the DRC’s agriculture sector is the relative lack of financial resources, institutions and infrastructure to support agricultural growth. Only 10 percent of the DRC’s arable land, concentrated in the plateaus of the Katanga region, is currently cultivated. Promoting agricultural development is the cornerstone of the country’s national economic development plan, which aims to improve productivity, access, and technical and organizational capacities of producers and private institutions to support production. Climate variability and change, through increased rainfall intensity and rising temperatures, can affect these goals by impacting crop productivity and altering farming practices. Addressing climate change is thus critical if the DRC is to meet its development goals.

A systematic consideration of these risks to crop production should be grounded in an understanding of the climate sensitivities of the key value chain crops targeted for promotion by FFP, which include soy, dry beans and coffee (Table 2) as increased temperatures alone can reduce yield potential, modify production costs and require alterations to farming practices. Rising minimum temperatures in and of themselves can alter pest and pathogen dynamics. Damage to the country’s already severely limited infrastructure through increased floods can also raise transport costs, negatively impacting farmer household livelihoods. (5, 6, 7, 8, 9)

<b>Crop Province</b>	<b>Climate Sensitivities</b>
<b>Soy</b> <i>Kasal</i>	<ul style="list-style-type: none"> <li>• Sensitive to temperatures above 35°C</li> <li>• Increased ozone concentrations have been linked to yield losses of 8.5–14 percent globally as ozone impacts the reproductive process, leading to reduced fruit and seed development</li> <li>• Sensitive to soil moisture conditions throughout the growing cycle</li> <li>• Sensitive to waterlogging and excessive humidity, particularly at harvest and during storage</li> <li>• Stores best at &lt;1 percent humidity and at 15–20°C</li> </ul>
<b>Dry beans</b> <i>Katanga</i>	<ul style="list-style-type: none"> <li>• Sensitive to heat stress, drought and flooding</li> <li>• Susceptible to pests and disease (fungal and root rot), including Mosaic virus (BCMV) and leaf rust; requires dry conditions at harvest</li> </ul>
<b>Coffee</b> <i>South Kivu</i>	<ul style="list-style-type: none"> <li>• Sensitive to temperature increases, which can reduce yields, particularly during flowering</li> <li>• Susceptible to fungi and insect attacks due to increased humidity</li> <li>• Sensitive to berry borer and other pests well-adapted to hotter climates</li> </ul>

Agricultural production systems are associated with a series of interconnected natural resource management challenges. A climate lens offers the opportunity not only to safeguard the sustainability of investments, but also to add flexibility, allowing for adjustments to interventions as improved information and experience are gained in the field. Central to this task is building farmers’ awareness of climate impacts and of the larger community on crop production and potential adaptation measures that can be used to address these impacts. Testing, learning and building

adaptive capacity for climate change is about adding a new layer to existing best practice in agricultural development or sustainable natural resource management. Table 3 summarizes the potential stressors and risks.

Table 3 CROP PRODUCTION – Climate Stressors and Risks	
Climate Stressors	Climate Risks
Increased temperatures	Yield changes, including potential increases, reductions; crop failure/loss
Increased frequency of intense precipitation	Increased post-harvest losses (6)
	Soil nutrient leaching
Increased humidity and extreme temperatures	Increased fungal attacks due to high levels of humidity
	Reduced fruit and seed development

### AGRICULTURE VALUE CHAINS

The most apparent constraint to value chain development at the national level is the lack of transport infrastructure and corresponding high transportation costs. However, a recent climate risks screening study of key value chains conducted by USAID detailed the climate sensitivities of key target crops (4, 5). In brief, the study indicated that:

- In South Kivu, bananas are the most sensitive value chain, followed by dry beans, with high resilience expected for soy.
- In Katanga, high resilience is expected for soy under a changing climate.

### PESTICIDE USE

Although chemical pesticide use is historically low throughout most of Sub-Saharan Africa compared to other parts of the developing world, some increase in pesticide use is occurring as income levels rise. While there are no data for pesticide use in the DRC for specific crops, donor-funded programs sometimes support pesticide use. Therefore, it is important to be aware of climate risks that may have implications for pesticide use in the agriculture sector. Table 4 summarizes the potential stressors and risks.

Table 4 PESTICIDE USE – Climate Stressors and Risks	
Climate Stressors	Climate Risks
More intense rainfall	Increased surface runoff
	Increased percolation/groundwater infiltration
	Increased threat from current pests/introduction of new pests
Longer dry periods	Reduced effectiveness of pesticides applied topically
Increased temperatures	Stored pesticide leakage
	Reduced effectiveness of pesticides that are activated/distributed by water
	Increased threat from current pests/introduction of new pests

### LIVESTOCK

Livestock are an important source of protein and are therefore central to food security in the DRC, namely through small-scale household livestock production (e.g., pigs, chickens, goats). The potential impacts of climate variability and change on this sector hinder both the tolerance of the animals (Table 5) and the potential productivity of the system. With more than 87 million hectares of grassy plains and wooded grasslands, the DRC has enormous potential to expand livestock production. The current livestock sector has been in decline since the end of the civil war in 2003,

however. While livestock production is found throughout the country, several locations were highlighted for intensification and investment due to their favorable climate and transport conditions: (5, 7, 8)

- The southern savannahs and the mountainous regions of the southeast and east (Kasai and Katanga Provinces), which provide meat, milk and wool and have a growing processing sector.
- The mountains of South Kivu, Maniema and North Kivu Provinces, which produce the majority (over 90 percent) of the country’s beef cattle, sheep, goats, pigs and poultry.

<b>Climate Stressors</b>	<b>Climate Risks</b>
<b>Increased temperatures</b>  <b>Increased frequency of intense precipitation</b>	Reduced productivity due to higher temperatures
	Reduction of feed sources
	Increased incidence of disease outbreaks as disease vectors change and grow
	Flooding and infrastructure damage, limiting sale potential, increasing transport costs and reducing access to markets
	Increased spoilage of meat and milk due to higher average temperatures
	Increased difficulty of maintaining healthy animals in a sanitary environment due to changing water systems
	Increased food insecurity and/or hunger

## **WATER RESOURCES**

The DRC has one of the highest volumes of freshwater in Africa, and surface water and groundwater sources are critical elements in the food security equation throughout the country. While disagreement exists on both the future of rainfall in the region and its resultant effects on available water resources, increased intensity of single rainfall events will clearly alter water resource availability and quality at more local scales.

*Surface water.* The rivers and lakes of the DRC are a vast source of freshwater and contain arteries linking the country’s economy through over 12,000 km of navigable networks. In spite of this hydrological wealth, access to water remains a critical issue for rural populations due in large part to lack of investment in the water resources management sector. Even in areas where water supplies are readily available, concerns arise about quality, particularly in and around major urban areas, as increased rainfall intensity, flooding and increasing temperatures can impact storage, infiltration, and the transport of potential contaminants – all of which affect water quality. Furthermore, current intensity of rainfall events already results in rivers and streams overflowing their banks, disrupting transportation and damaging critical infrastructure. Climate projections anticipate increased intense rainfall events that will exacerbate these issues.

Fisheries provides a critical source of protein for communities living along the country’s water bodies and are mostly artisanal. The sector has high growth potential, as it currently only exploits 35 percent of estimated potential harvest. However, water temperatures are reportedly increasing in various lakes in the Great Lakes region, including Lake Kivu and Lake Tanganyika at the DRC’s eastern border. Variations in climate can cause wide fluctuations in freshwater thermal dynamics. For example, warming surface waters can increase algal growth and reduce dissolved oxygen,

while increasing deep water temperatures reduce upwelling of the nutrient-rich deep water that supports fish populations.

*Groundwater.* Given the perilous state of the DRC’s water infrastructure and limited recognition or enforcement of surface water effluent standards, many rivers, streams and lakes do not provide potable water. Therefore, most DRC residents rely on groundwater sources – shallow wells and springs – as their primary household water source. In rural areas, most people collect water from these sources and carry it back to their homes. These shallow groundwater sources, which generally are open at the extraction point, could be vulnerable to increased evaporation due to rising temperatures. Table 6 summarizes the potential climate stressors and risks.

(1, 3, 5, 6)

Table 6: FRESHWATER RESOURCES – Climate Stressors and Risks			
Climate Stressors	Climate Risks		
Increased surface and deep water temperatures of lakes	Surface water	Reduced water quality	
		Increased sedimentation and erosion	
	Increased frequency of intense precipitation		Reduced aquatic biodiversity and productivity
			Increased damage to water infrastructure and transportation networks
Decreased dry season precipitation	Groundwater	Reduced water quantity and quality (in areas where groundwater contamination is occurring) in shallow wells and springs due to increased rates of evaporation	

### HEALTH, NUTRITION AND WASH

The nutritional situation in the DRC is critical, especially for vulnerable groups such as children and pregnant and lactating women. Stunting or chronic malnutrition affects 43 percent of children under five, and one in four children are underweight. An estimated 465,000 children die in the DRC each year from preventable diseases like malaria, pneumonia and diarrheal disease. Climate change is likely to exacerbate these risks, particularly through increased temperatures and increased intensity of rainfall events, as noted in Table 7.

Basic water supply and sanitation needs are immense: an estimated 50 million Congolese (75 percent of the country’s population) lack access to safe water and 80–90 percent lack access to improved sanitation. While this is largely due to damages to infrastructure during the prolonged conflicts of the 1990s and 2000s, climate risks could exacerbate the situation by reducing water quality and increasing the incidence of flooding, which damages existing infrastructure. Table 7 summarizes the potential climate stressors and risks. (3, 4, 8)

Table 7: HEALTH, NUTRITION, AND WASH – Climate Stressors and Risks	
Climate Stressors	Climate Risks
Increased temperatures	Increased incidence of infectious diseases from flooding and standing water
	Increased food insecurity and hunger
Increased frequency of intense precipitation	Reduced access to health services due to transportation breaks and infrastructure damage
	Reduced water quality and increased incidence of diarrheal disease
	Extended range of disease vectors such as mosquitoes to higher elevations

## KEY RESOURCES

1. CSC. 2013. [Climate Change Scenarios for the Congo Basin](#).
2. CSC. 2013. [Fact Sheet – Climate: DRC](#).
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8. USAID Office of Food for Peace Food Security. 2015. Desk Review for Kasai Occidental and Kasai Oriental, DRC.
9. USAID Office of Food for Peace Food Security. 2015. Desk Review for Katanga, North Kivu, and South Kivu, DRC.