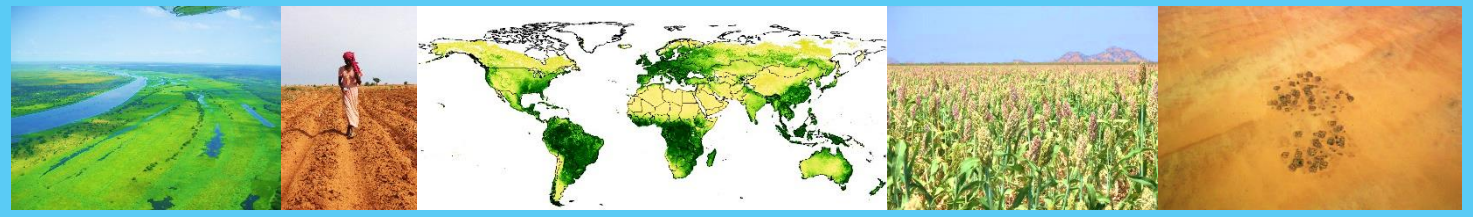

East Africa Short Rains 2015

Under El Nino: a Year of Drought and Floods

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HIGHLIGHTS

- The current **Short Rains** season (October-December 2015) in the Horn of Africa is taking place during the **peak phase** of one of the most **intense El Nino** events on record. This event, declared in March 2015 has already had **major consequences** across the region, with extensive, **severe droughts in Ethiopia**.
- As the Short Rains started, El Nino influences switched to **wetter than average conditions**, leading to expectations of **prime conditions** for marginal agriculture and **pastoralist livelihoods** but also of **possible large scale flood** events. The latter had to be considered seriously since this El Nino would reach (maybe exceed) the intensity of the 1997 event, responsible for catastrophic flooding in Kenya and Somalia.
- **So far**, wetter than average conditions have materialized, but at **levels** close to the **average for El Nino seasons** – if considering rainfall forecasts to late December, a **repeat** of the **1997 event** is **ruled out**. However, there has been more modest but locally **significant river flooding** in mid October in **Somalia** and **flash floods, landslides** and localized flooding in **Kenya** as typical of El Nino seasons.
- In **Kenya** these conditions should **continue throughout December**, as above average rainfall is forecast until early 2016, but no more flooding is expected in Somalia as little rainfall is anticipated across the country.
- **Vegetation** cover is at **well above average** levels across **most of the region**, leading to a recovery of previously drought affected areas and very **good prospects** for pastoralists. However, vegetation conditions remain **poor in northeastern Kenya**, due to localized, drier than average conditions. As the season comes to an end, these areas may remain a point of concern.

The Story So Far: March to October 2015

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Timings of El Nino Impacts

Overview of El Nino impacts in East Africa

The current El Nino event has influenced East Africa since its official onset in March 2015. To better understand the geography and timing of El Nino impacts, East Africa's complex pattern of growing seasons is represented by two broad fairly simplified regions and a transition region shown on the map below:

Region A:

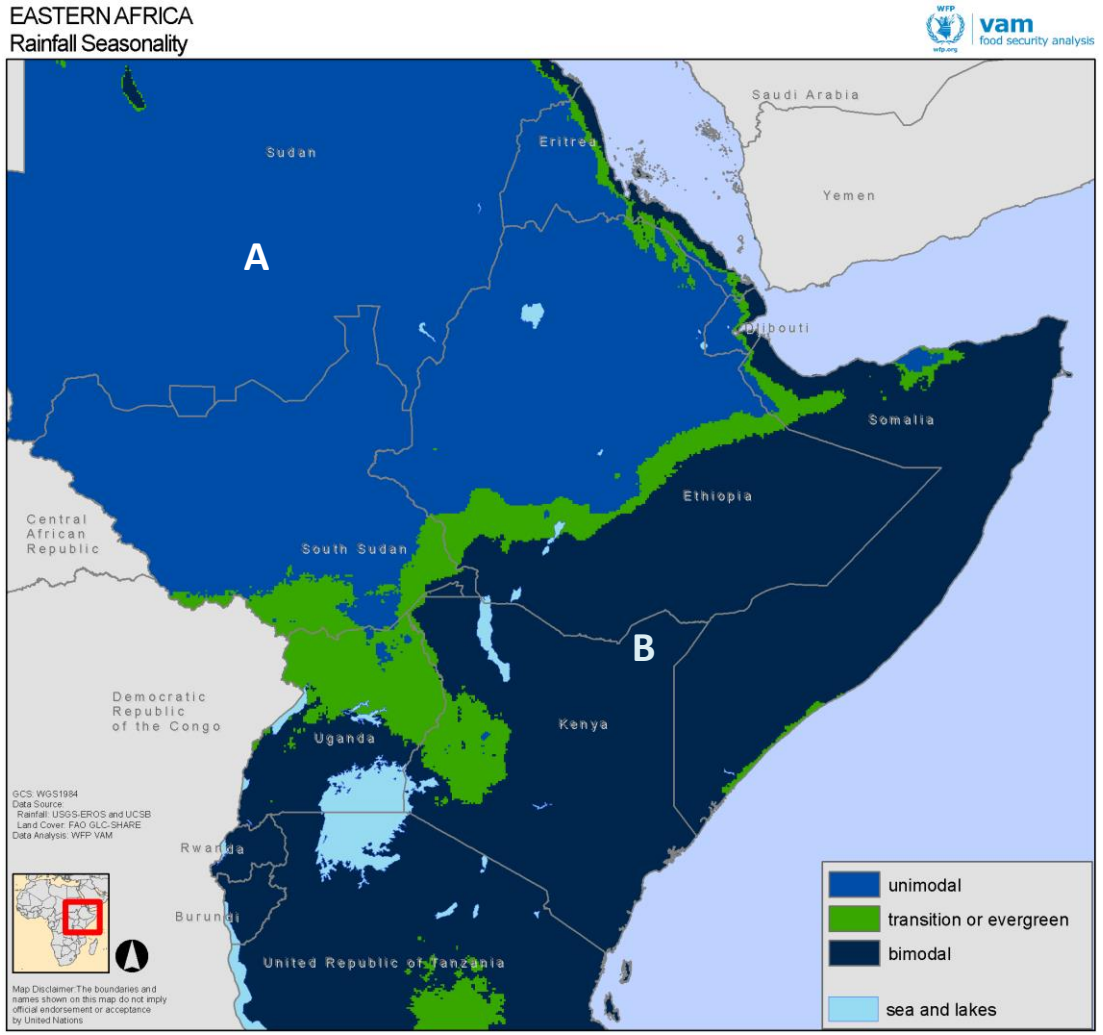
Most seasonal rains fall from March to October, mostly in a single continuous season, though some areas register two separate rainfall seasons (Ethiopia's Belg and Meher seasons, March to May and July to September).

In region A, rainfall is effectively over and **El Nino impacts** are **now resolved**; they have resulted primarily in **drier than average** conditions ranging from transient **rainfall deficits** to full blown **droughts** with crop and pasture shortfalls as an outcome.

The consequences for households and livelihoods will be mostly felt during the typical hunger period in the early stages of the next growing season (March to July 2016).

Transition:

Areas with complex rainfall patterns, frequently with a long season with pronounced peaks in rainfall. Likely to suffer a mix of two El Nino influences, drought in July-September and wetter than average conditions from October onwards.



Region B:

Seasonal rains fall within October to May, mostly in two separate rainfall seasons, October to November and March to May (e.g. Kenya's Short Rains and Long Rains).

In this region, the first rainfall season is currently under way and **El Nino impacts** are **now developing**; they are expected to result mostly in **wetter than average** conditions that may cause significant **flood** events but may also **enhance crop and pasture** production.

In the absence of major flood events, consequences for households and livelihoods should be beneficial and result in shorter hunger gaps in early 2016.

Timing of El Nino Impacts

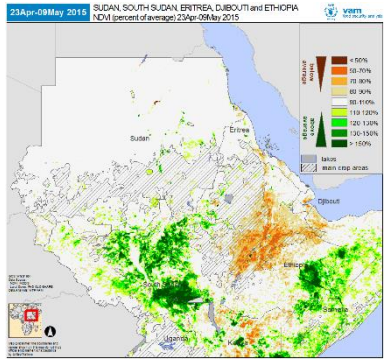
2015												2016					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun

El Nino Evolution — **Peak Intensity**

A: Impacts Resolved | **B: Impacts Developing**

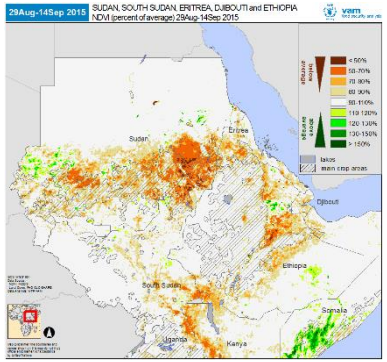
ETHIOPIA (BELG)

Drought



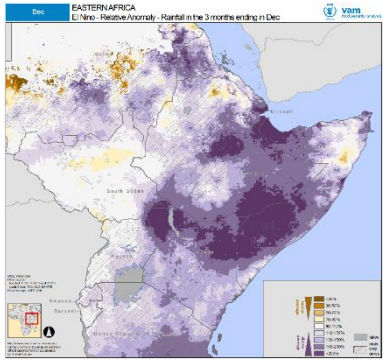
ETHIOPIA (MEHER), ERITREA, SUDAN, SOUTH SUDAN, KARAMOJA

Drought



HORN OF AFRICA (SHORT RAINS)

Flood Risk, Good Vegetation



ETHIOPIA (BELG)

HORN OF AFRICA (LONG RAINS)

Outlook Undefined

East Africa seasons, their outcomes and perspectives in relation to the El Nino 2015 time line

Expectations for October-December 2015

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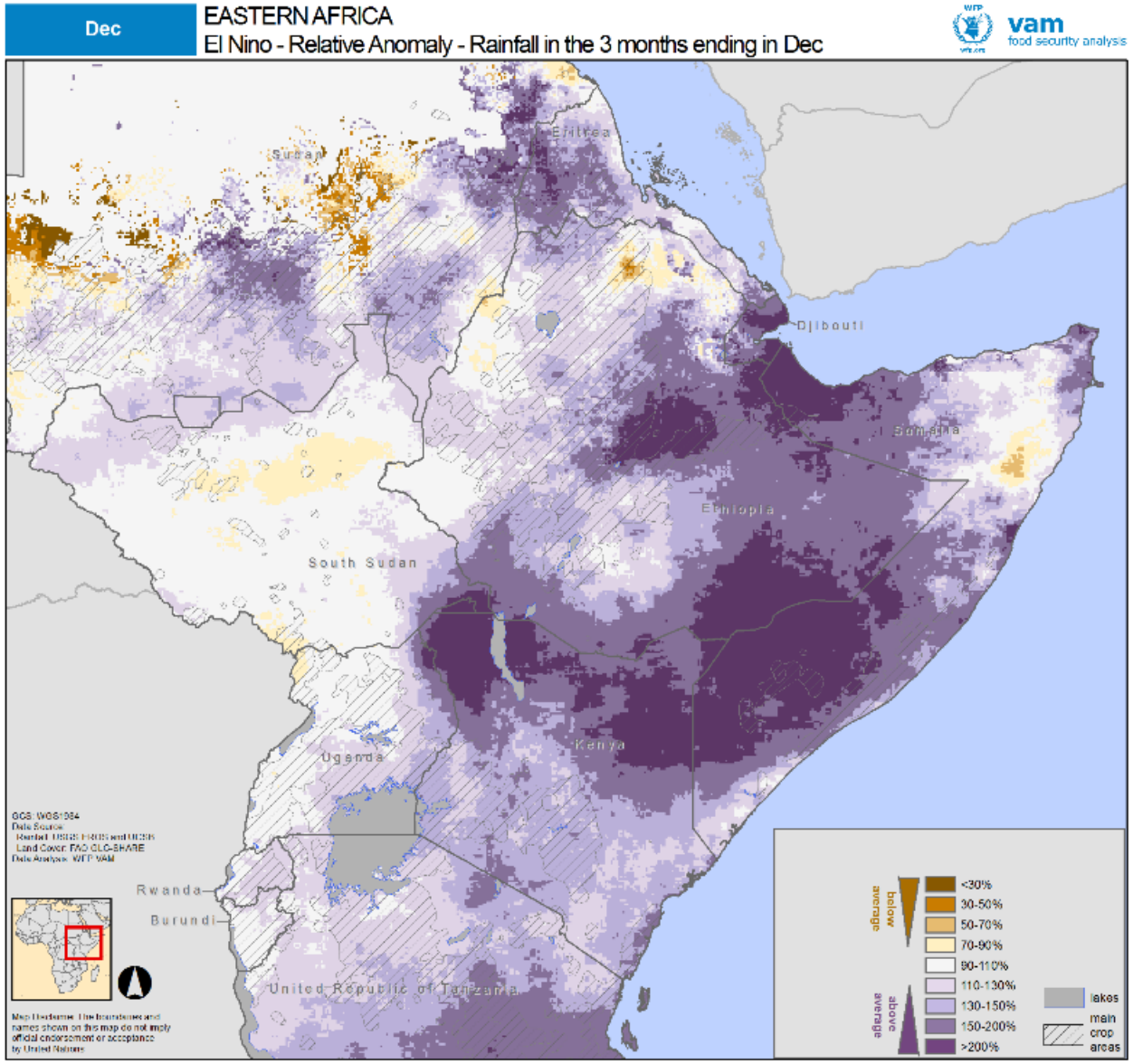
The Historical Evidence: El Nino Rainfall Patterns



Average October-December rainfall during El Nino seasons compared to that of Neutral seasons.
Hashed pattern indicates main agricultural areas.
Yellow-brown shades indicate below-average rainfall; purple shades indicate above-average rainfall.

Widespread above average rainfall is the El Nino norm

One way to understand how and where the current El Nino is affecting the ongoing Short Rains in East Africa is to look at the evidence provided by long term records.

The map to the left shows the difference in October-December rainfall totals between El Nino seasons and Neutral seasons (i.e. those not affected either by El Nino or La Nina events).

The purple shades clearly show that **El Nino seasons** are on average characterized by **much wetter than average** Short Rains. In many areas, El Nino rainfall during this period is more than double that of neutral seasons.

This is more pronounced in **northern Kenya** from Turkana to the Somalia borders, **southeast Ethiopia**, **southern Somalia** and the **Djibouti-Somaliland** region.

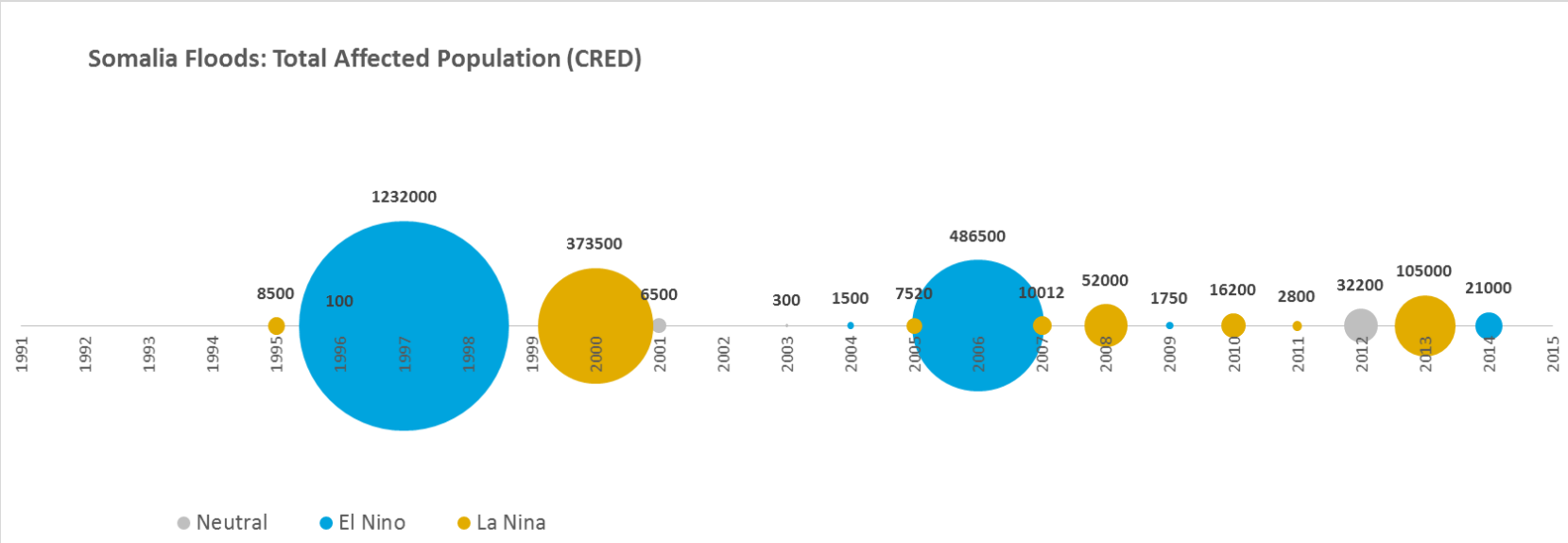
The pastoral southeastern areas of South Sudan and Karamoja in Uganda also benefit from enhanced rainfall, which also extends to the remainder of Kenya, Uganda and Tanzania.

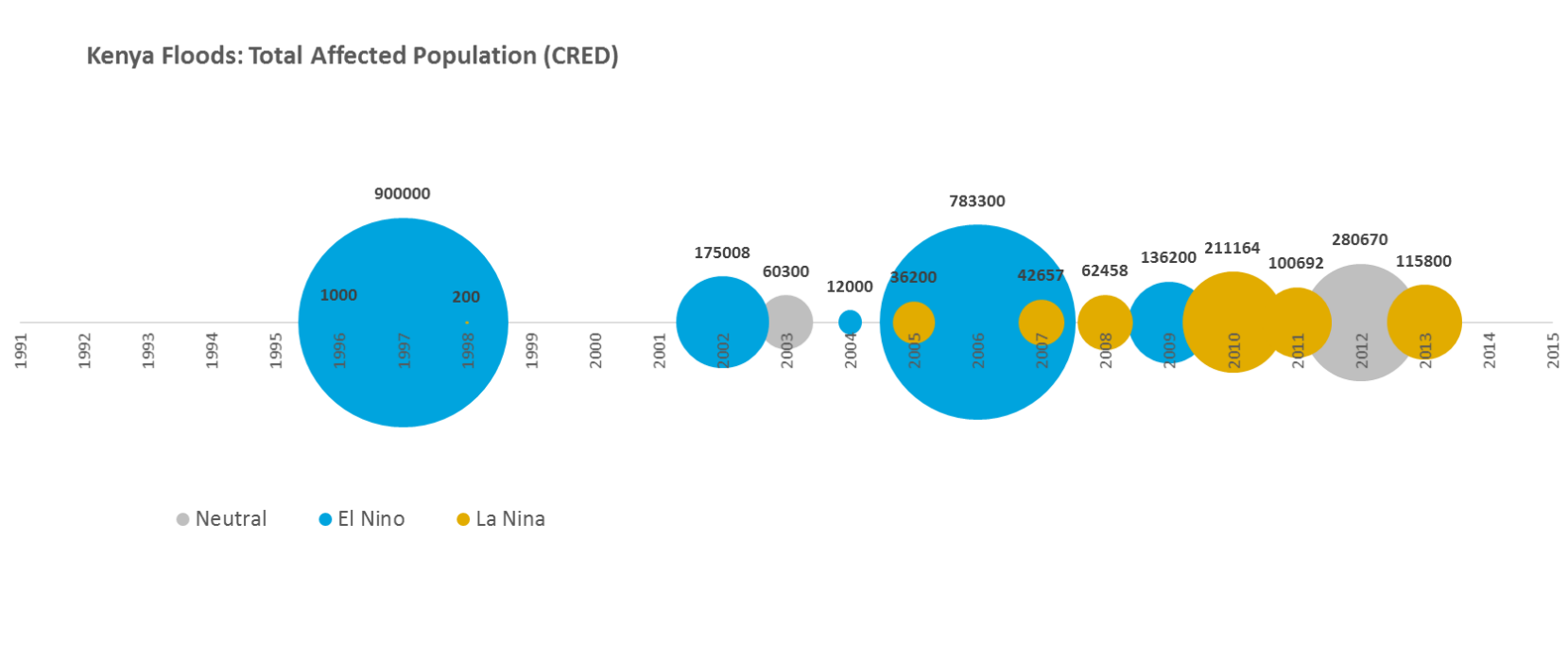
The implications of this El Nino rainfall pattern are twofold:

- Increased flood risk along the river systems of Somalia and Kenya, possibly leading to a repeat of the catastrophic flooding of 1997 and 2006.
- Improved production in marginal agricultural areas and in particular in semi-arid grasslands dominated by pastoralist livelihoods

These are assessed more in detail in the next sections.

The Historical Evidence: Past Flood Occurrence and El Nino Events





(*) SOURCE: CRED

Historical flood impacts in Kenya and Somalia

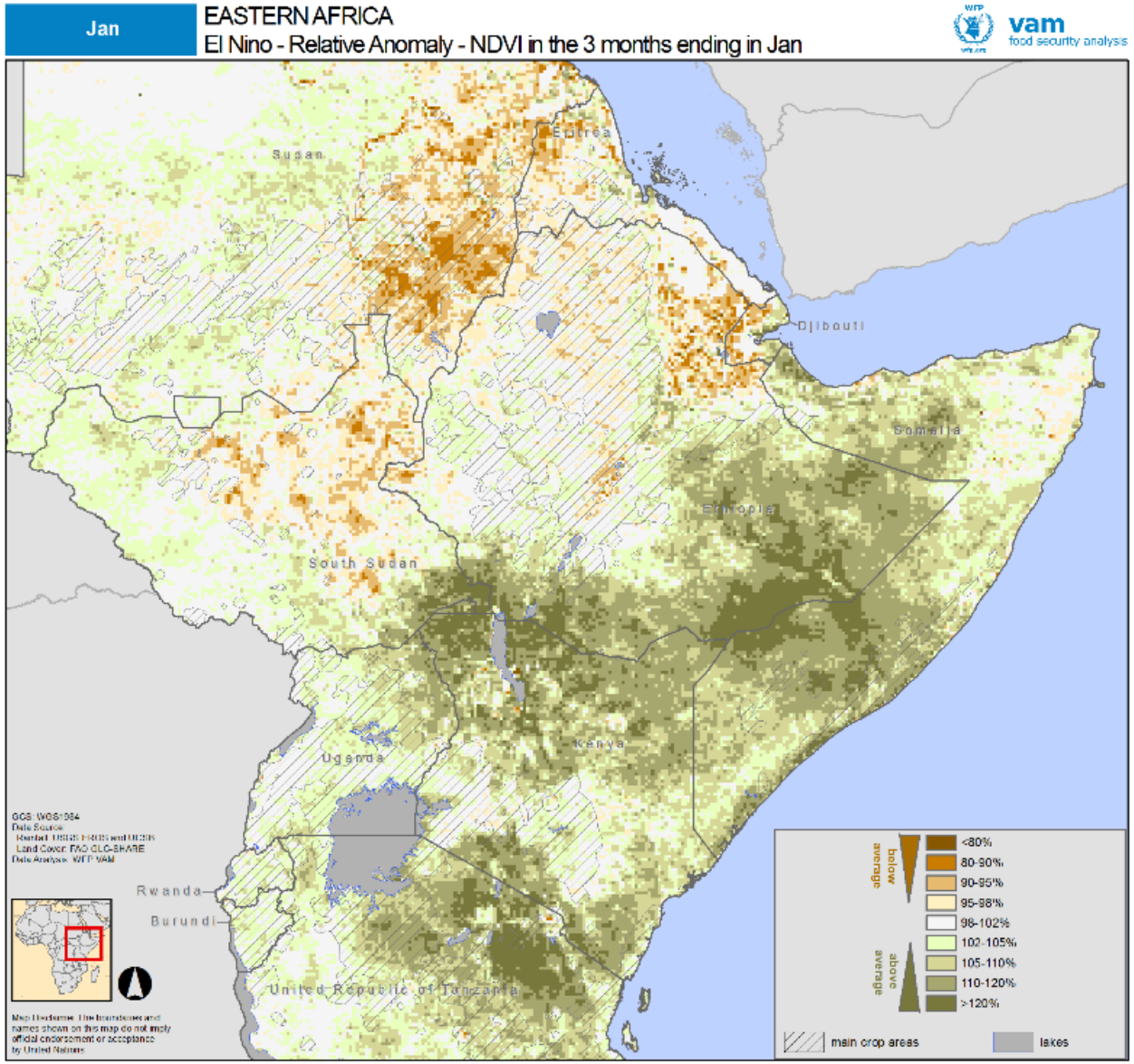
Floods are a regular occurrence in Kenya and Somalia as shown in the plots to the left, showing numbers of flood affected population (*) in Kenya and Somalia from 1991 to 2014. The circles are coloured according to the type of season (El Nino, La Nina and Neutral).

The plots show that floods are not exclusively associated with El Nino - they also take place in La Nina or Neutral seasons.

However, the two most extreme flood events (1997 and 2006) have both taken place during El Nino seasons, something which has shaped perceptions of the relationship between El Nino and flooding in East Africa.

In fact, the link between the strength of El Nino and the numbers of people affected is fairly weak. Though the most intense El Nino so far (1997) led to the largest numbers of affected people, the second worst flood event (2006) occurred during a fairly weak El Nino (second weakest since 1982).

The Historical Evidence: El Nino Impacts on Crop and Pasture Development



Average November-January Vegetation during El Nino seasons compared with that during Neutral seasons.
Hashed pattern indicates main agricultural areas.
Yellow-brown shades indicate below-average vegetation; green shades indicate above-average vegetation.

El Nino leads to extensive denser than usual vegetation growth

Long term satellite records on vegetation development shed light on what might be expected from the typical El Nino rainfall patterns.

The map to the left shows the variations in November-January average vegetation between El Nino seasons and Neutral seasons (i.e. those not affected either by El Nino or La Nina events).

Overall, the extent and depth of the green shades clearly show that **El Nino seasons** are on average characterized by **more intense vegetation** development across most of the region. The El Nino vegetation patterns mirror those of rainfall to a large degree as typical of semi-arid regions.

As was the case for rainfall, **enhanced vegetation** development in El Nino seasons has been more pronounced along a region extending from the **South Sudan-Kenya-Uganda** border, across northern **Kenya**, south and southeast **Ethiopia** and into most of **Somalia**, including Somaliland. Southern Kenya and northern Tanzania are also positively affected. Elsewhere, **below average** vegetation patterns in places such as **Sudan** and **Afar** (NE Ethiopia) are related to **lingering impacts** of El Nino induced drier than average conditions during the rainfall season of July-September rather than October-December rainfall patterns.

Overall, **enhanced** availability of pasture and water resources for **pastoralist livelihoods** is expected for the current season. Crop production in marginal agricultural areas should improve, though riverine production systems (e.g. Somalia) are subject to potentially severe losses if there are significant flooding episodes.

Current Status and Near Future Perspectives

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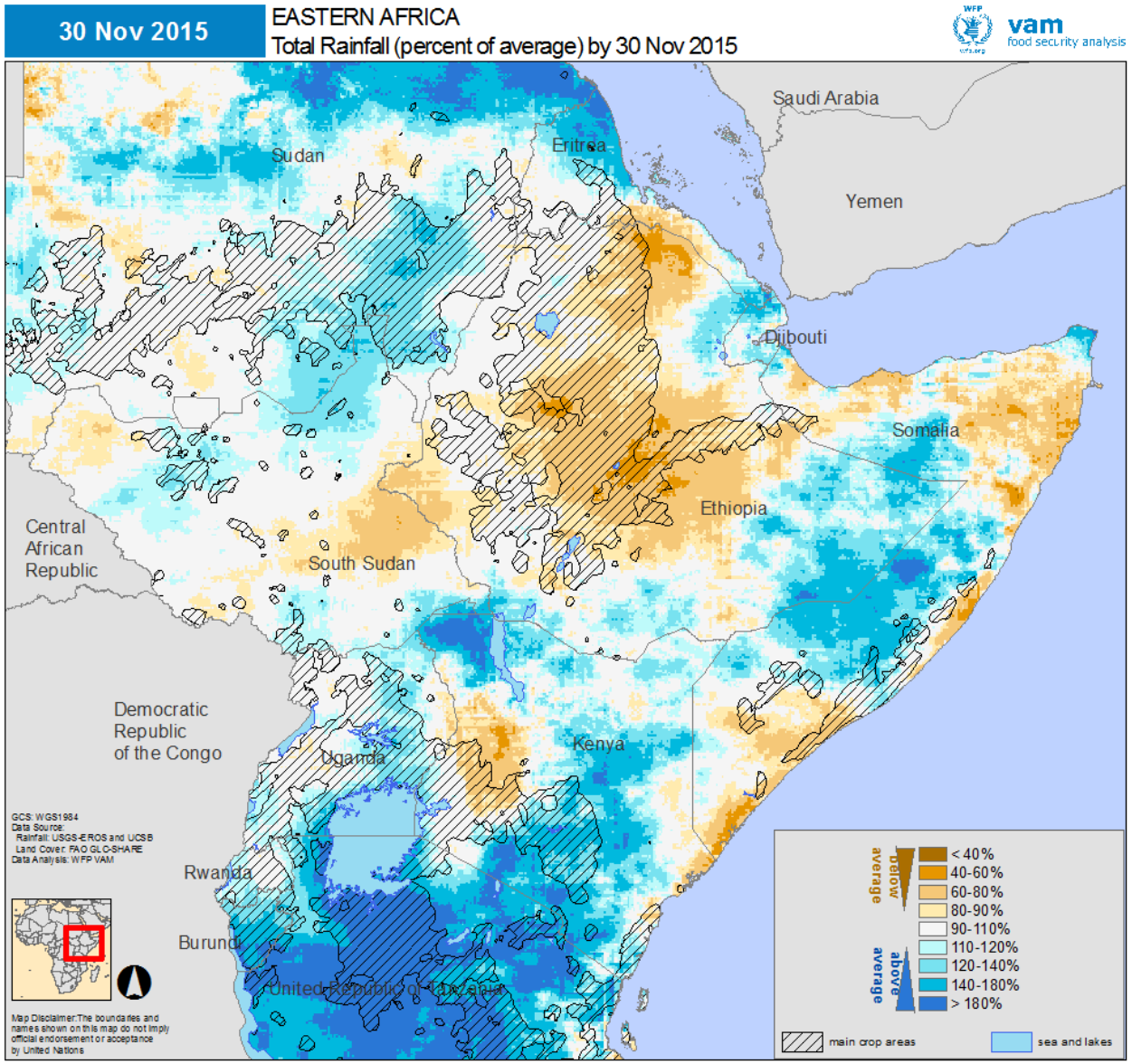
Seasonal Performance: Rainfall



Seasonal cumulative rainfall until end of November 2015, as a percentage of the 20-year average.
Hashed pattern indicates main agricultural areas.
Brown shades indicate below-average rainfall; blue shades indicate above-average seasonal rainfall.

A variable rainfall pattern...

The pattern of cumulative rainfall since early August, reflects contrasting behaviours of the two major rainfall regimes of East Africa during El Nino seasons:

1. The main June-October rainfall season that has now come to an end across Sudan, most of South Sudan, parts of Uganda, central and northern Ethiopia and Eritrea.

These regions were generally affected by drier than average conditions, with severe droughts hitting Ethiopia reflected in below average seasonal rainfall. Below normal rainfall also affected Sudan during most of the season, which later wetter then average conditions could not alleviate.

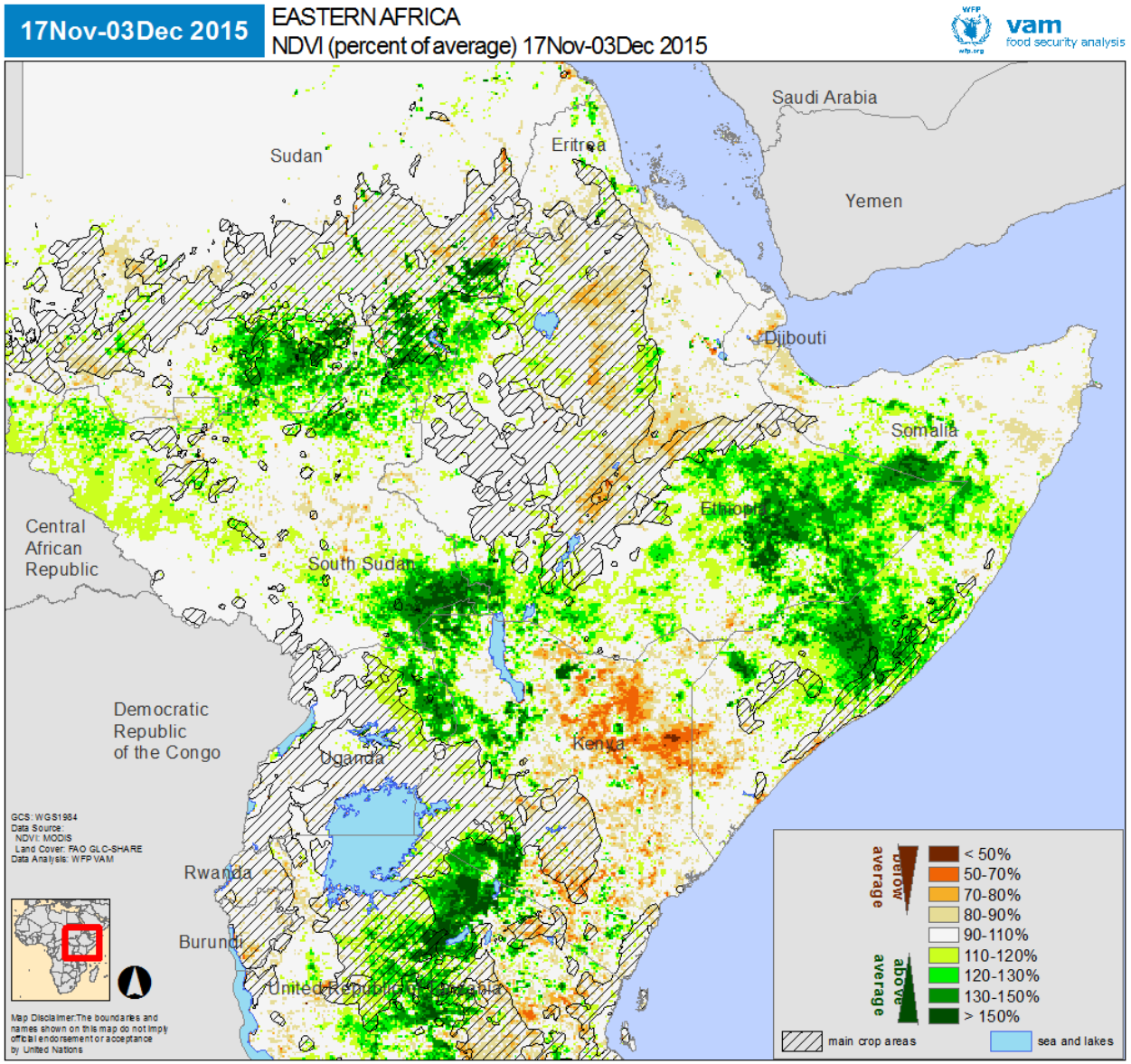
2. The first half of the October-December “Short Rains” season that is now extending across Kenya, SE Ethiopia, most of Somalia, southern Uganda and southeast South Sudan.

During El Nino events, this season is usually characterized by above average rainfall across the region. Despite the current El Nino event being one of the strongest ever recorded, the situation so far is variable, with moderately above average rainfall across SE Ethiopia and central Somalia, and patchy performance in northern and eastern Kenya and SE Somalia. Tanzania and the Great Lakes have been fairly wetter than average.

This underlines the fact that El Nino strength does not necessarily relate to the strength of the expected influences.

Given that November is the core month of this rainfall season, the current situation may not change appreciably. In Somalia, more significant rainfall is not expected. In Kenya and Uganda-Tanzania region, an intensification of wetter than average patterns depends on continued rainfall at enhanced levels during the month of December.

Seasonal Performance: Vegetation



NDVI by mid November 2015 as a percentage of the 12-year average.
Hashed pattern indicates main agricultural areas.
Brown shades indicate below-average vegetation; green shades indicate above-average seasonal vegetation.

Vegetation development below expectations

Current vegetation patterns reflect the highly variable performance of the rainfall so far:

- In SE Ethiopia (Ogaden in particular) and central Somalia (especially Hiraan and Middle Shabelle), the wetter than average conditions that have dominated here since late September led to well above average vegetation levels.
- In contrast, there is below average vegetation across northeastern regions of Kenya because of drier than average conditions that dominated here from mid October to early November. Recent wetter than average conditions (from mid November), if continued, should engender improvements in the situation very soon. A similar situation had developed in Tanzania, where there is now a strong recovery.
- The situation in the Karamoja/Turkana/East Equatoria region (Uganda-Kenya-South Sudan borders) has now improved. Very poor vegetation had dominated until early October caused by drier than average conditions lasting since mid August. East Equatoria in particular is enjoying a notable recovery due to abundant rains.
- Above average vegetation levels in Sudan reflect the favourable conditions at the end of the May-October rainfall season. Much of this pattern is due to a shift in the normal growth cycle towards later stages of the season as a result of the severe delays in the arrival of the rains in May-June 2015. As the rainfall season is over in this region, this pattern will now revert to near average conditions as vegetation returns to dry season levels.

Overall, the situation is now conforming broadly to the usual El Nino patterns, with the clear exception of the eastern half of Kenya.

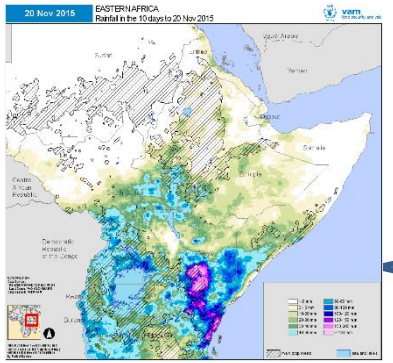
Are Very Large Scale Flood Events Likely?

No repeat of the huge floods of 1997 and 2006 is foreseen…

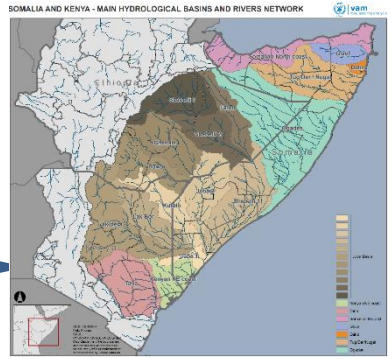
A broad overview of the regional flood situation framed in the context of past El Nino events, is obtained by tracking cumulative rainfall over river basins through the current and previous seasons. The plots on the right compare river basin rainfall for the current season (thick red line), the average of past El Nino seasons (thick black line) and individual El Nino seasons (other lines). The plots make clear that the 1997 and 2006 seasons are clear outliers.

In 2015, nearly all river basins have evolved around or below the average for El Nino seasons, with the sole exception of Lake Tana (Kenya), where cumulative rainfall has risen above the average since early November. In general, the situation for all basins is now too far off the 1997 and 2006 events for a similar situation to be considered as a possibility.

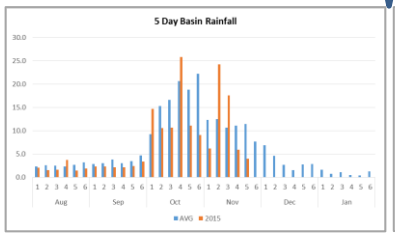
This does not imply that no flooding whatsoever will take place. This analysis is not applicable to flash floods and a host of other factors intervene between basin rainfall and actual river flooding. But it does make clear whether past flood magnitudes are likely to be repeated.



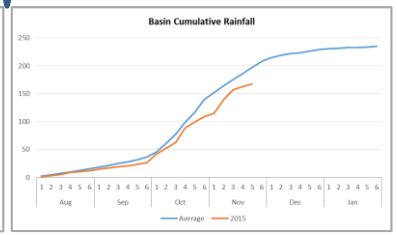
Rainfall Data



River Basins

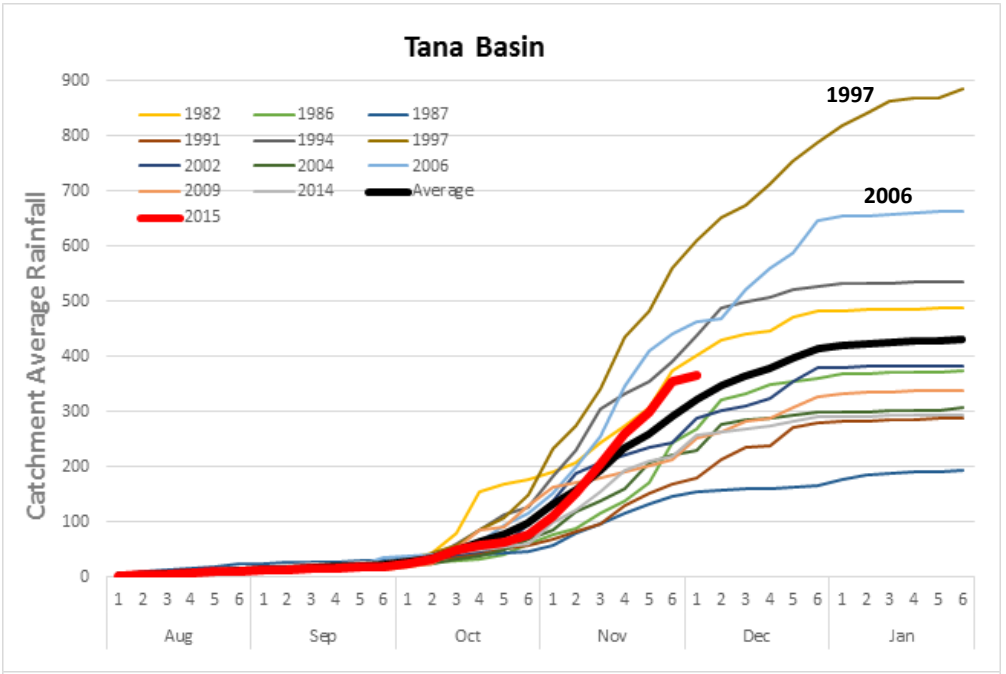


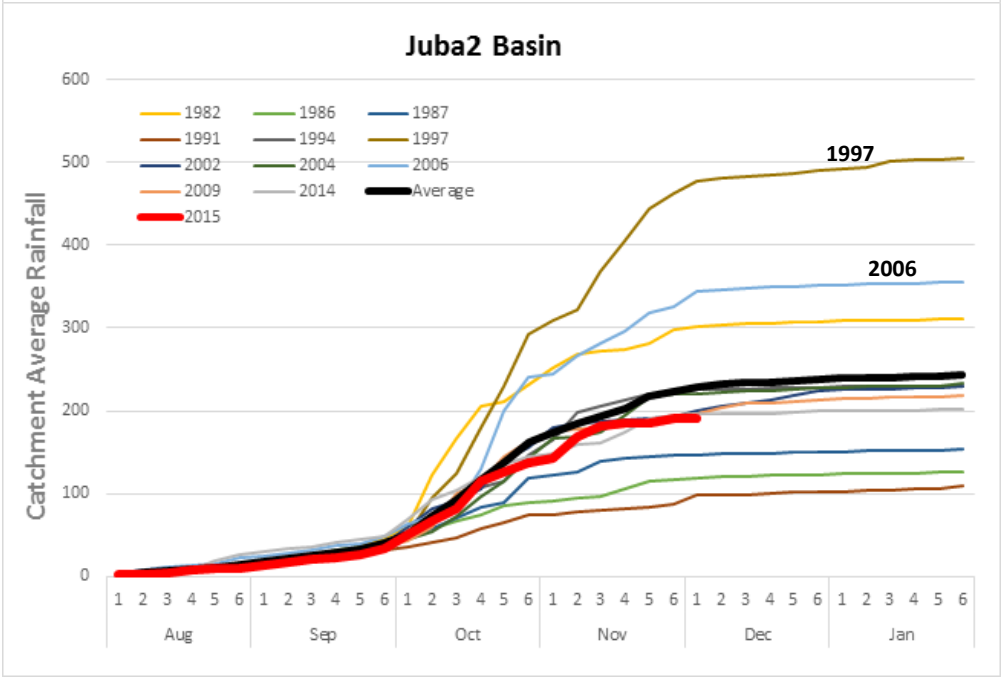
Basin Average Rainfall



Basin Cumulative Rainfall

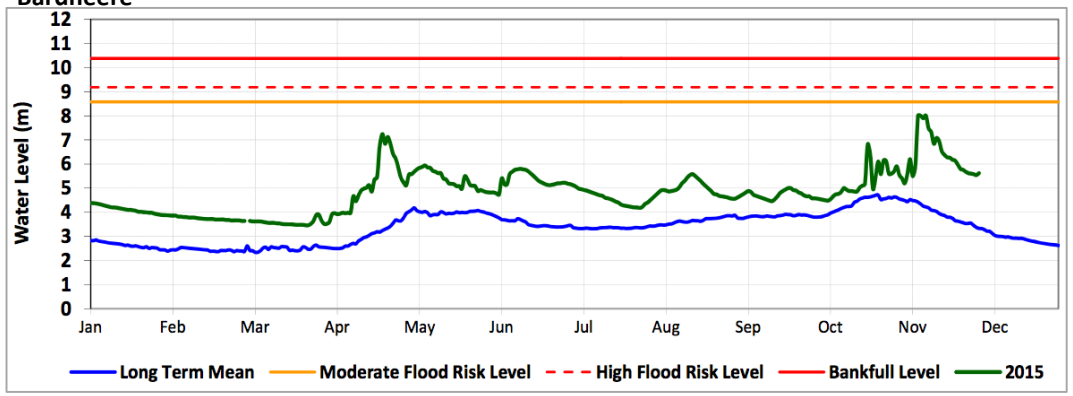
Calculating rainfall over the major river basins. Tracking the results through the season.
The comparison to historical data places current situation in context.



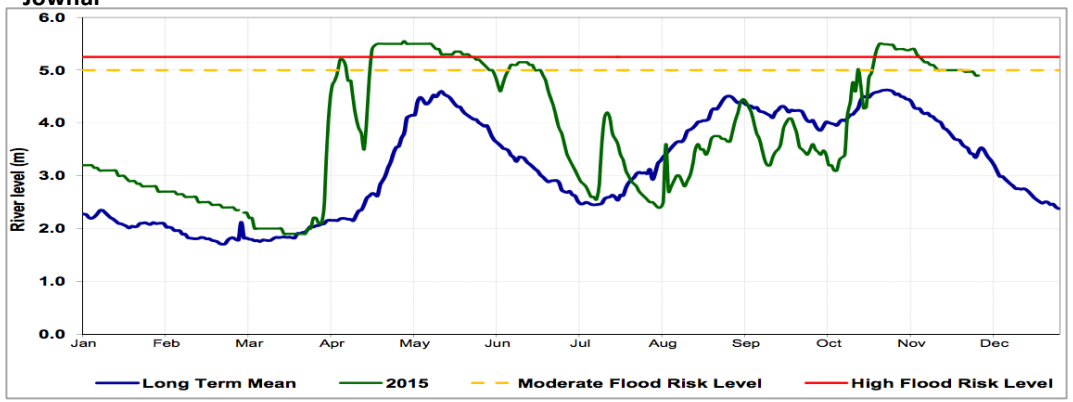


Current Flood Situation in East Africa

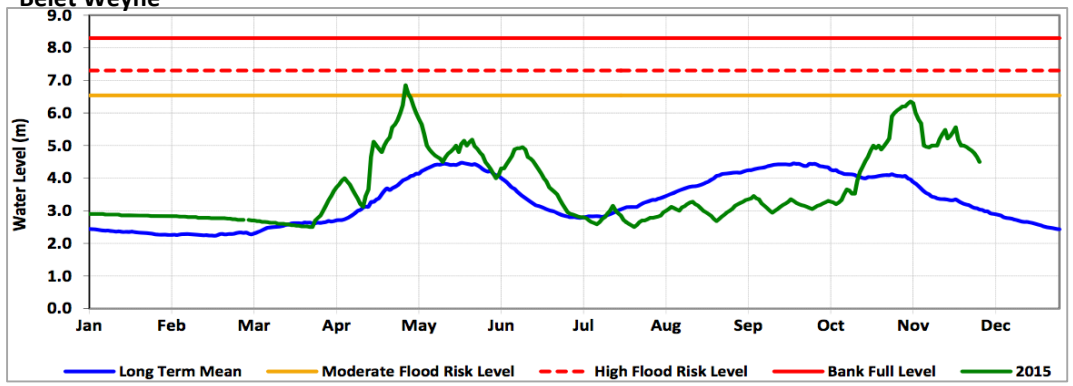
Bardheere



Jowhar



Belet Weyne

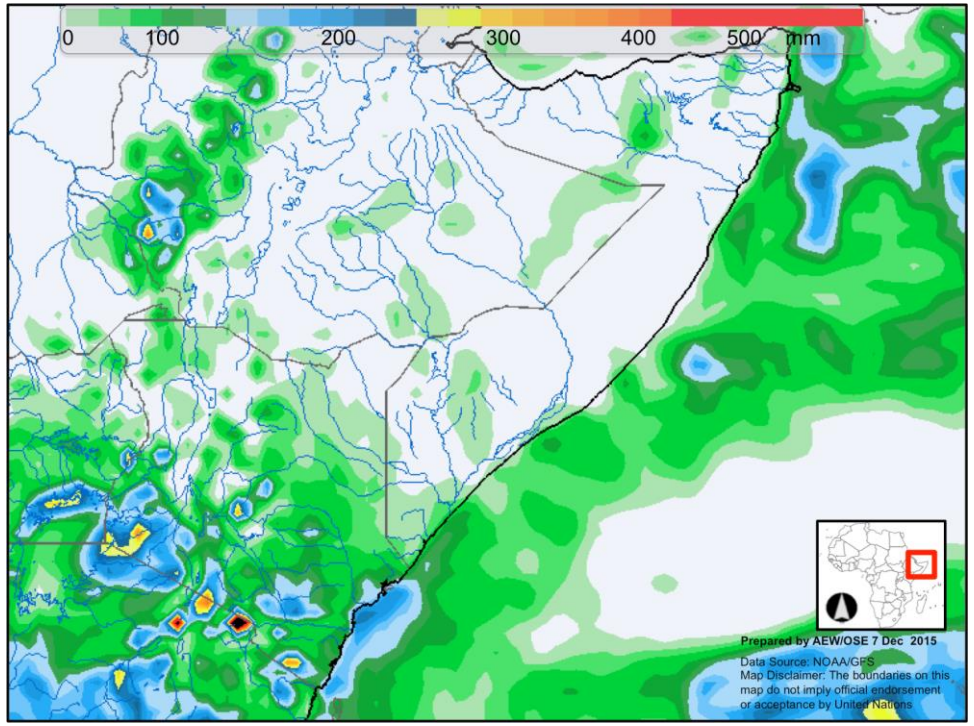


See: http://faoswalim.org/resources/site_files/Flood_Watch_Bulletin_01122015-Eng.pdf

…But Flash Floods and River Floods Take Their Toll Across Kenya and Somalia

Heavy rainfall in mid October in Somalia led to flooding along the Juba and Shebelle rivers; in the north east (Somaliland and Puntland) the passage of cyclones Chapala and Megh caused localized flooding. As rainfall amounts eased, the situation improved and river levels fell from flood thresholds, as shown on the left (data from FAO-SWALIM). Rainfall forecasts until the last week of December practically rule out any significant flooding in Somalia until the end of the rains.

In Kenya, perspectives are more pessimistic: heavy rains since early November, mainly in the central and western part of the country have led to flash floods, landslides and localized river flooding. This situation is likely to be maintained as continued rainfall saturates soil and more rainfall is forecast until late December (see below). In any case, though the situation requires monitoring, a repeat of the large catastrophic floods of 1997 is very unlikely.



Forecast for total rainfall from Dec 7 to Dec 22 for East Africa. Note low rainfall over Somalia and SE Ethiopia, but high rainfall for Kenya and regions to the SW.

Forecast and Map prepared by WFP/Analysis and Early Warning – Emergency Response Service

Outlook for the Remainder of the Season

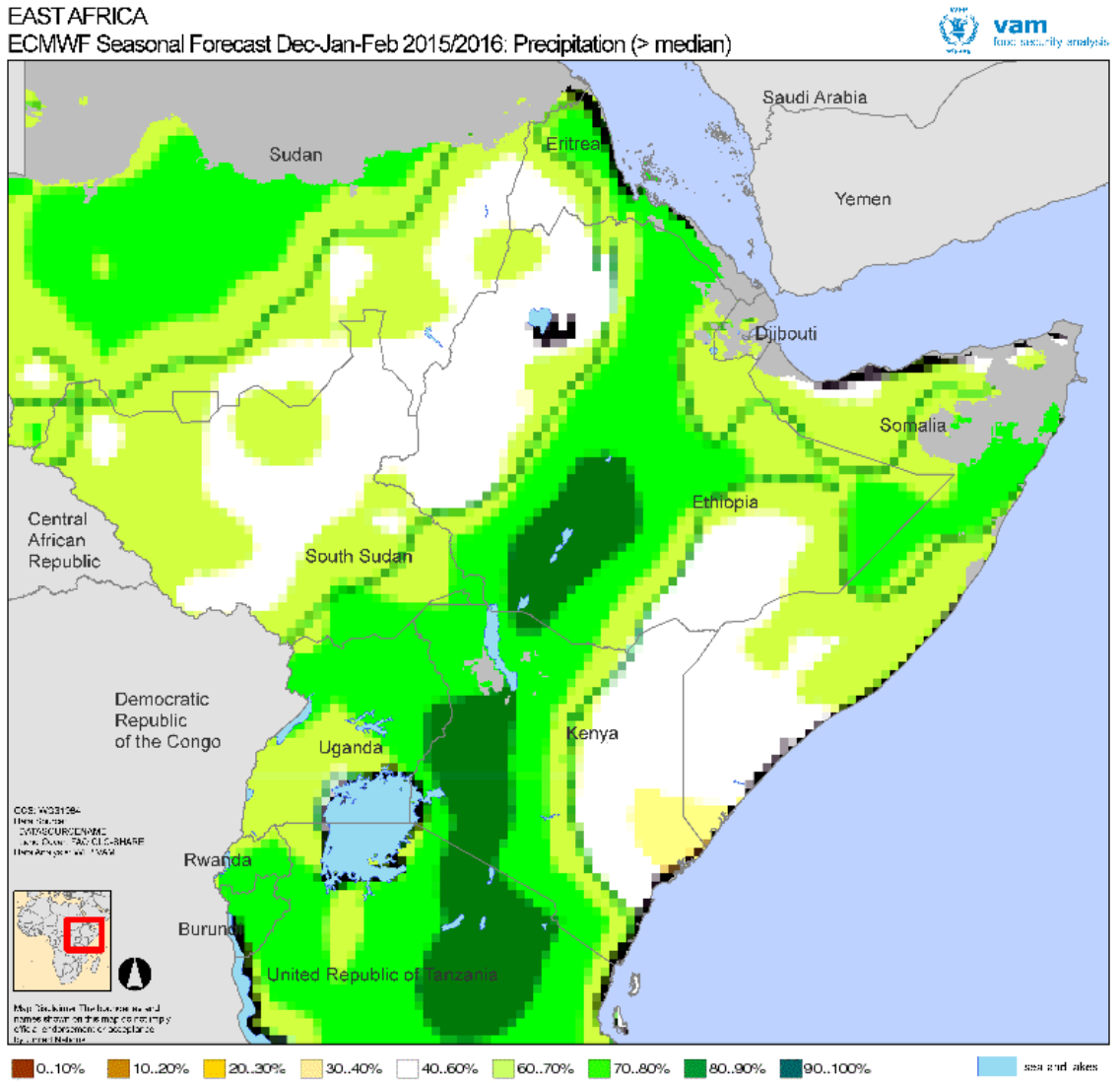
Expectations for the remainder of the Short Rains season

For the December-February period, the forecasts indicate wetter than average conditions for the region.

Areas of northern Tanzania, the western half of Kenya, and SW Ethiopia should expect much wetter than average conditions for this period – for these Kenyan regions, this raises the likelihood of continued flash flood events, landslides and river floods.

The widespread, moderately wetter than average conditions forecast elsewhere, point to a longer than usual rainfall season. Continued rainfall will enhance the positive perspectives for semi-arid pastoral and marginal agricultural areas such as East Equatoria in South Sudan, Turkana in Kenya and south west Ethiopia regions.

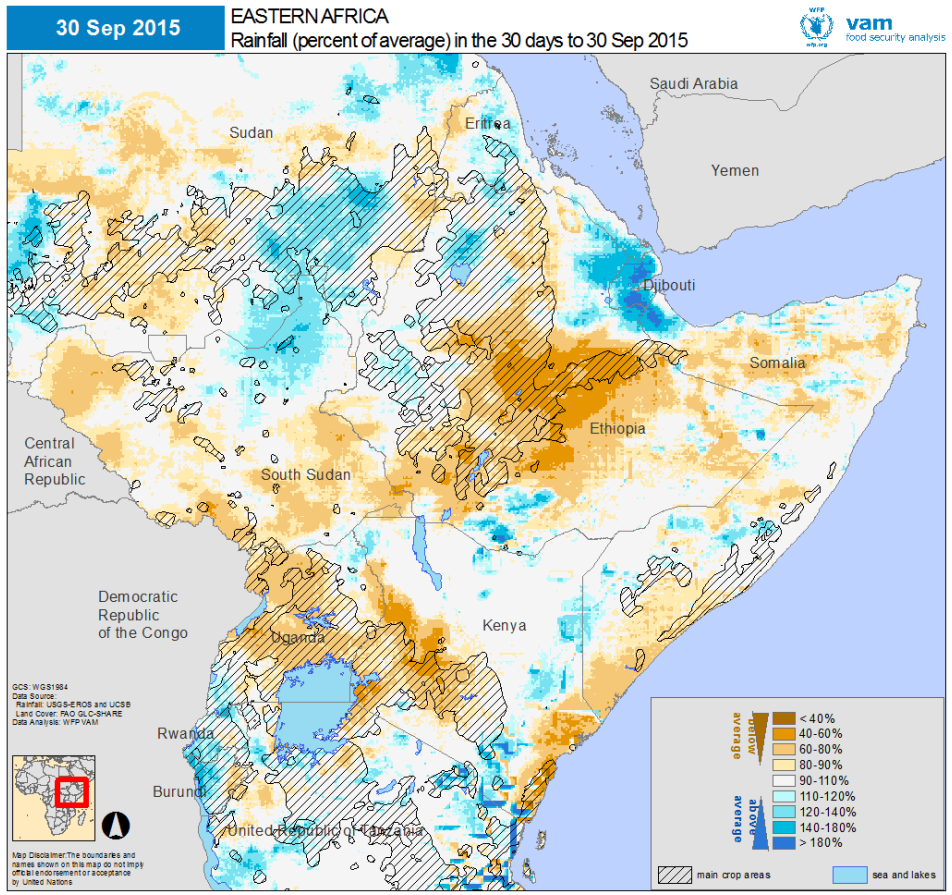
For southern Somalia and eastern Kenya, average rainfall levels are expected which should provide a modest recovery from the mid season dryness that these regions experienced.

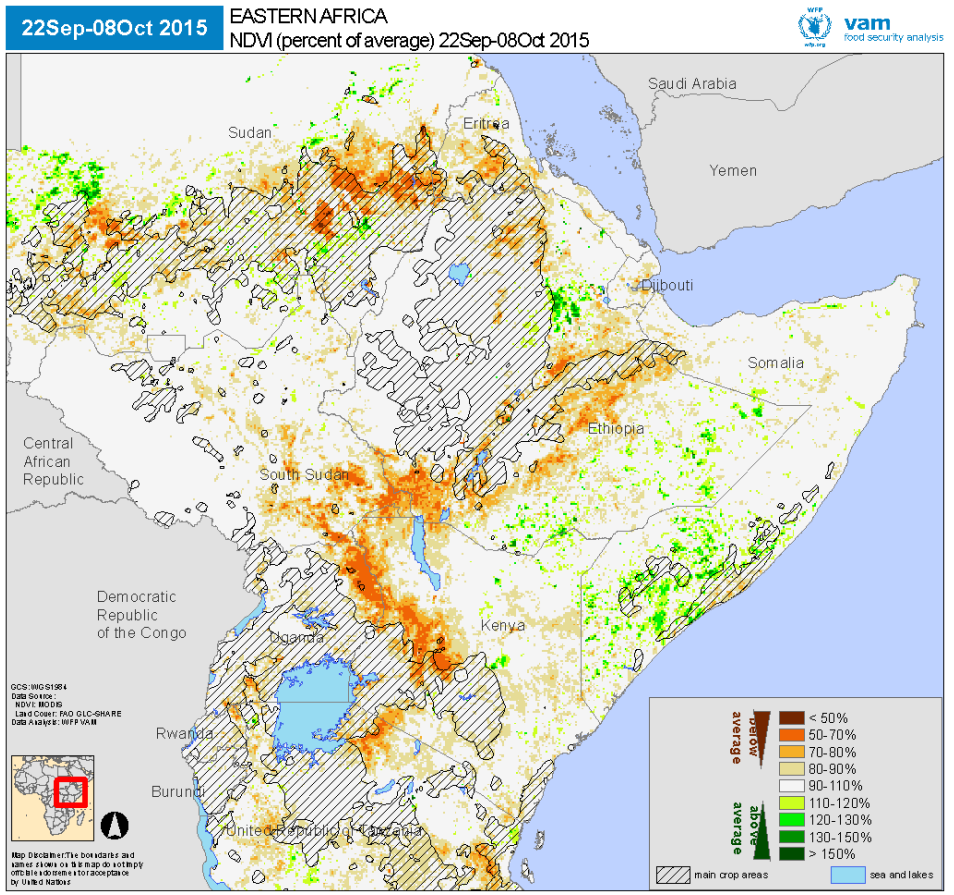


ECMWF forecast for October-December 2015 rainfall. Probability of exceeding the long term standard (median) Green shades = wetter than average conditions more likely. Brown shades = drier than average conditions more likely

The Season: Month by Month

September 2015





September 2015 rainfall as a percentage of the 20-year average (left).

Brown shades for drier than average, blue shades for wetter than average conditions.

Early October 2015 vegetation index as a percentage of the 12-year average (right).

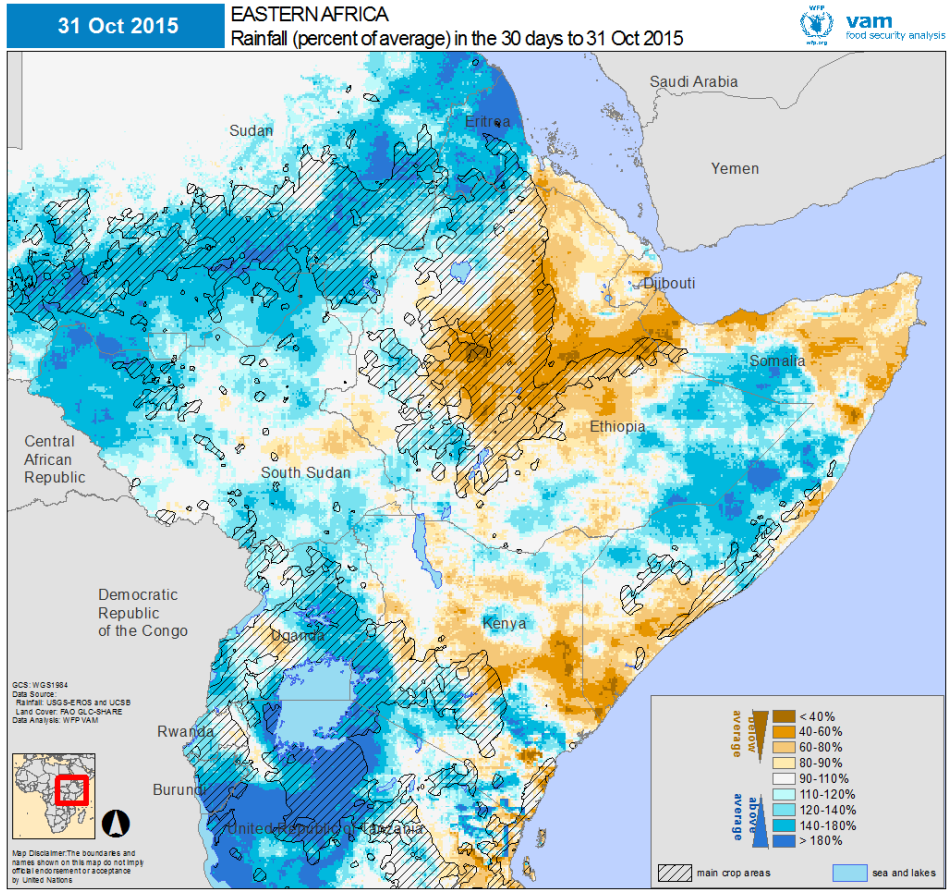
Orange shades for below-average, green shades for above-average vegetation.

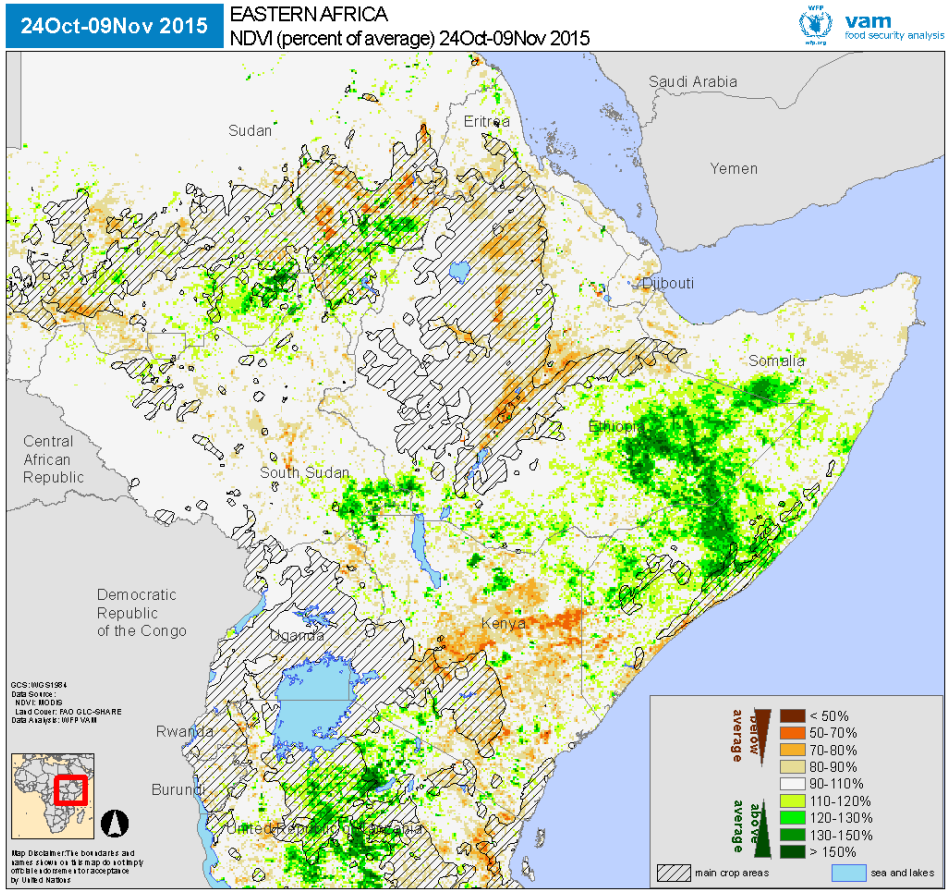
Hashed pattern indicates main agricultural areas.

In September the main rainfall season in Sahelian Africa, Sudan and northern Ethiopia (May-October) enters its last stages. Rainfall steadily retreats southwards and in October, the Horn of Africa “Short Rains” start. During El Nino seasons, this switch between seasons is accompanied by a switch from a tendency for drier than average conditions across Sudan, Ethiopia and the border areas between South Sudan, Uganda and Kenya (East Equatoria, Karamoja and Turkana) to a tendency for wetter than average conditions across Kenya, Somalia and SE Ethiopia. Areas where the two regimes overlap, may see a sudden transition from drier to wetter than average conditions.

In 2015, East Africa was broadly dominated by drier than average conditions, in particular Ethiopia (a disastrous year for the country), South Sudan and Uganda – western Kenya. This is typical of an El Nino influenced May-October main season. Widespread below average vegetation cover is evident as a result.

October 2015





October 2015 rainfall as a percentage of the 20-year average (left).

Brown shades for drier than average, blue shades for wetter than average conditions.

Early November 2015 vegetation index as a percentage of the 12-year average (right).

Orange shades for below-average, green shades for above-average vegetation.

Hashed pattern indicates main agricultural areas.

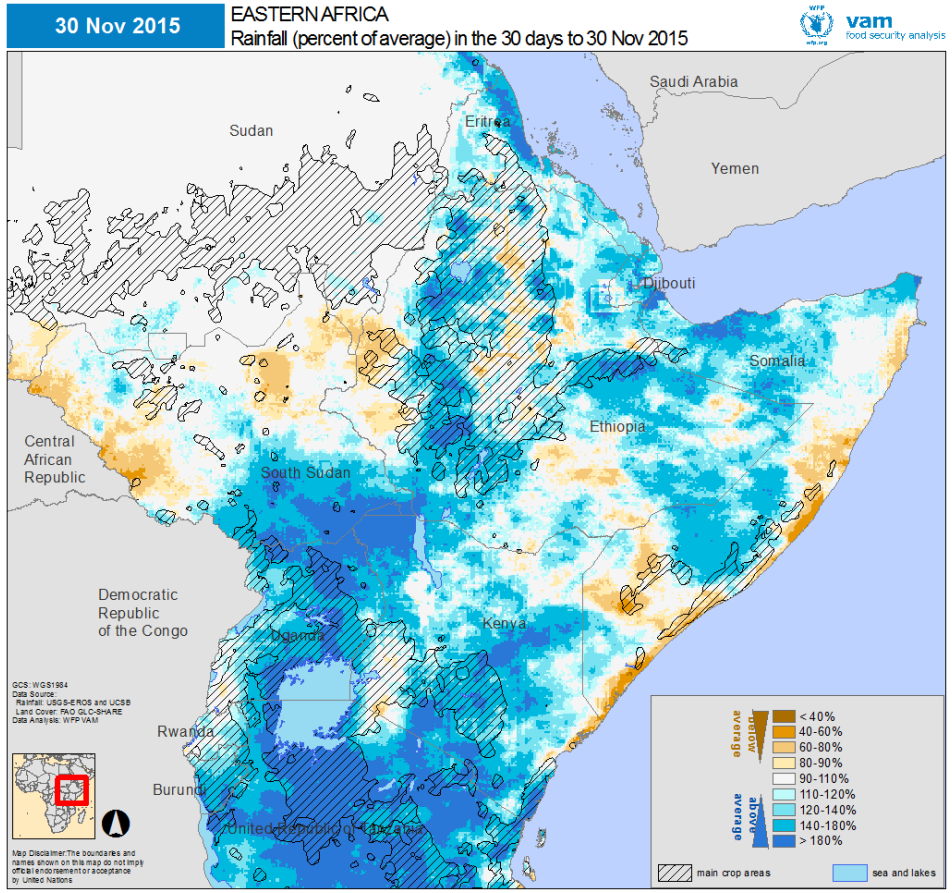
In October, the Horn of Africa "Short Rains" start. During El Nino seasons, wetter than average conditions tend to dominate across the region. Another outcome of El Nino influences, though less frequent in historical terms, is the lengthening of the May-October rainfall season across Sudan, South Sudan and northern areas of Ethiopia.

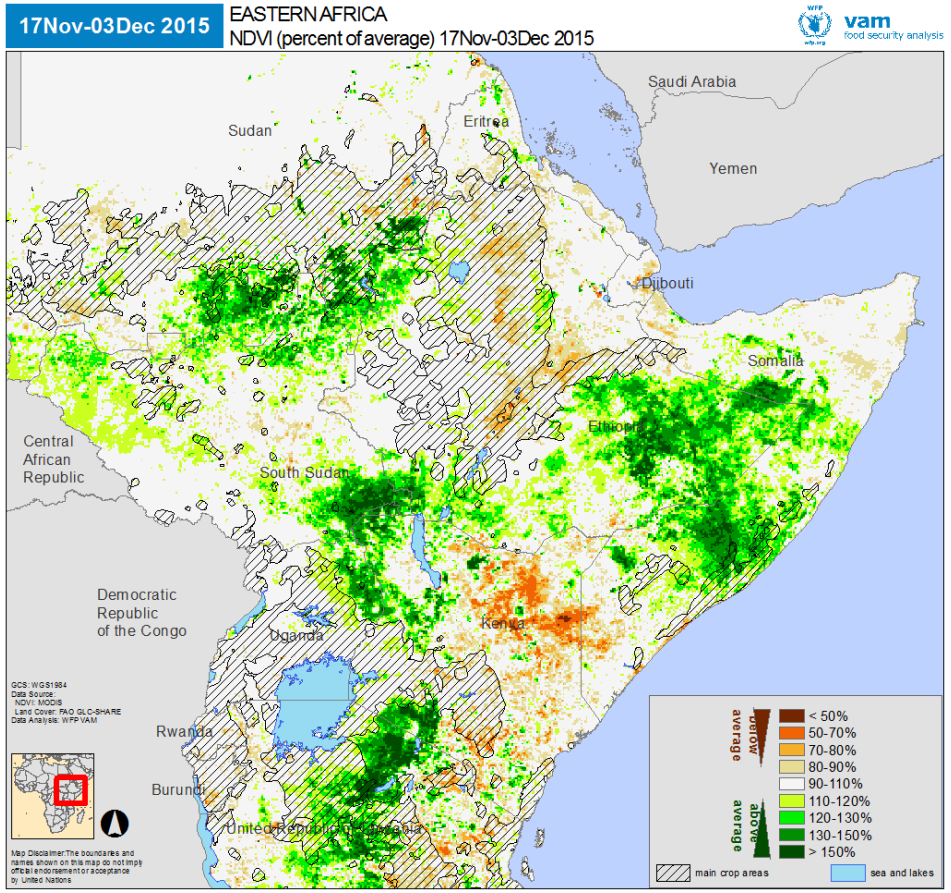
In 2015, indeed, wetter than usual conditions dominated across Sudan and most of South Sudan as well as some areas of northern Ethiopia; in central-eastern Ethiopia there was no respite from the persistent dryness. Elsewhere from Tanzania, across Uganda, south Sudan, SE Ethiopia and central Somalia, typical El Nino wetter than average conditions dominated. These favourable conditions did not extend to eastern Kenya and southern Somalia where drier than average conditions persisted.

Places such as the South Sudan-Uganda-Kenya borders underwent a reversal in rainfall tendencies that led to a remarkable recovery in vegetation cover (compare with preceding slide). In fact this was a well defined tendency across the region.

East Africa under El Nino: a Year of Drought and Foods

November 2015





November 2015 rainfall as a percentage of the 20-year average (left).

Brown shades for drier than average, blue shades for wetter than average conditions.

Late November 2015 vegetation index as a percentage of the 12-year average (right).

Orange shades for below-average, green shades for above-average vegetation.

Hashed pattern indicates main agricultural areas.

November is the peak rainfall month of the “Short Rains” season. In 2015, the typical El Nino induced wetter than average conditions and longer than usual rainfall season dominated across the region. In Ethiopia, above average rainfall was widespread but except for the southern regions, absolute amounts are low and will be of no help for regions previously stricken by drought. Much wetter than average conditions intensified across southern areas of South Sudan, part of a wider pattern that spread across Uganda, the Great Lakes, Tanzania and into Kenya and central Somalia. Drier than average patches were evident in southern and coastal Somalia.

Vegetation cover intensified across the region, to values much above average in SE Ethiopia, central Somalia, the South Sudan-Uganda-Kenya borders and the Kenya-Tanzania region. In contrast in eastern Kenya, drier than average conditions lasting until early November maintained vegetation cover at below average levels. Given recent stronger rains this may recover in the weeks to come.

Data Sources:

Rainfall: CHIRPS, Climate Hazards Group, UCSB

Vegetation: MODIS NDVI, EOSDIS-NASA

Land Cover: FAO GLC-Share

Forecasts (16 days): WFP AEW/OSE

Processing:

VAM software components, ArcGIS

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