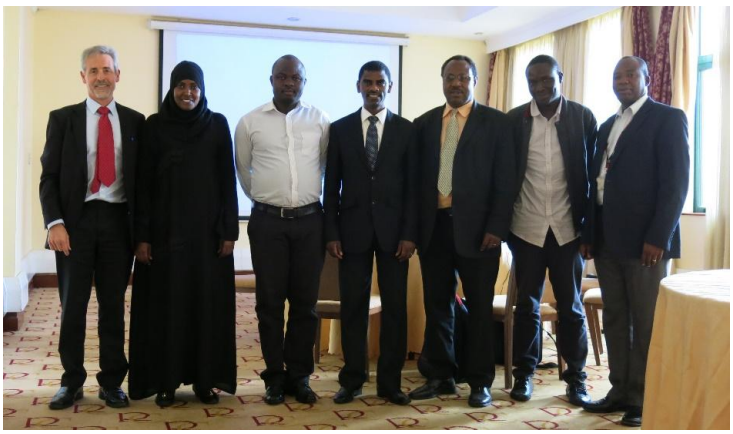
SCIPEA Kenya Consortium Service Development Team meeting between Kenya Red Cross Society (KRCS), Kenya Meteorological Department (KMD), Institute of Meteorological Training and Research (IMTR) and Met Office at Kenya Red Cross Offices and Boma Hotel, Red Cross Road, South C (Bellevue), Nairobi

30 November – 1 December 2016

Participants day 1: Front row, left to right: Gilbert Mahulo (Kenya Red Cross volunteer, Western Region), Richard Muita (IMTR), Richard Graham (Met Office), Kelvin Kiprono (Disaster Management Surveillance Officer), Maimuna Shambaro (Red Cross Acting County Coordinator, Tana River County), Venant Ndighila (Red Cross, Emergency Operations Manager).



Day 2 at Boma Hotel: Left to right: Richard Graham, Maimuna Shambaro, Kelvin Kiprono, Richard Muita, James Muhindi (KMD), Gilbert Mahulo, Venant Ndighila.

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Present:
Kenya Red Cross Society: Venant Ndighila (Emergency Operations Manager), Kelvin Kiprono (Disaster Management Surveillance Officer), Maimuna Shambaro (Acting County Coordinator, Tana River County), Gilbert Mahulo (Volunteer, Western Region)
KMD: James Muhindi (1 December only)
IMTR: Richard Muita
Met Office: Richard Graham

Summary
A SCIPEA Service Development Team workshop took place at Kenya Red Cross Society (KRCS) Office, Nairobi, 30 November – 1 December 2016. Participants from KRCS, Kenya Meteorological Department (KMD), the Institute for Meteorological Training and Research (IMTR) and Met Office were present. Embedded working types of activities took place: these included KRCS operatives from both Headquarters and from branch offices (Western Region and Tana River County) sharing their operational decision frameworks and their need for and usage of seasonal climate information from KMD as well as the status of food security across the country. In particular, the decision processes driving KRCS interventions in the current October – December 2016 (OND 2016) season were analysed. KMD described and explained the climate drivers behind the OND 2016 forecast and gave an update on the current performance of rainfall – which has been below normal particularly in the south east of the country. The exchange of perspectives was agreed to be extremely useful and had not occurred before with the degree of detail and one-to-one discussions achieved. Based on the discussions a prototype climate service for KRCS was drafted and areas where research is needed to develop the service were identified and flagged for attention in an upcoming visit of KMD and IMTR to the Met Office.

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Detailed notes from the meeting

The meeting agenda is at Annex 1. Participant contact details are in Annex 2.

Day 1: 30 November 2016

Opening:
Venant Ndighila welcomed all to the Kenya Red Cross Society offices and expressed wishes for a successful meeting. Richard Graham thanked Venant Ndighila for hosting the meeting and Kelvin Kiprono for local organisation and coordination. He also expressed appreciation at the participation of operatives from the field, at the meeting and thanked the representatives for their long travel.

The meeting began with a round of self-introductions and continued with a broad discussion of KRCS operational activities and decision environments with perspectives from both HQ and the field from operatives for Tana River County and Western Region.

Headquarters (HQ): *Venant Ndighila (Emergency Operations Manager), Kelvin Kiprono (Disaster Management Surveillance Officer)*

KRCS operations are organised in 8 regions of Kenya, with each region covering approximately 6 administrative counties. There is approximately one KRCS branch per county. UNOCHA (United Nations Office for the Coordination of Humanitarian Affairs) has aligned its operational regions closely with those of KRCS.

HQ conduct national level surveillance of need for humanitarian assistance to alleviate suffering. A key focus is on impacts of climate related hazards (mainly flood or drought), but responses to conflict (stemming from climate stress and/or e.g. conflicts during elections) and other incidents requiring relief of suffering are also part of operations.

During the El Niño rains of the OND 2015 season KRCS worked closely with KMD, KenGen and mobile phone companies to generate flood warnings and disseminate them by SMS. Warnings were targeted to vulnerable parts of the country identified using flood vulnerability/risk maps – based on historical data – prepared by KRCS. KenGen kept KRCS informed of reservoir spillage – giving advance warning of the need to spill and then a second warning when spillage started. KRCS warnings of flood were generally provided up to 3 days in advance. Three days is considered a maximum warning lead – communities are less prepared to react (e.g. evacuate) in response to longer-lead warnings.

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KRCS has a number of income generating activities which help support its humanitarian activities. This include 157 ambulances nationally (working both in field operations and for income generation) and the Boma chain of hotels.

Tana River County: *Maimuna Shambaro (Acting County Coordinator, Tana River County)*

Tana River County is vulnerable to both flood and drought hazards. Some degree of flooding occurs in most years in both the March-May (Long Rains) and October-December (Short Rains) seasons. The flooding is mainly riverine - along the borders of the Tana River – where agriculture is a prime activity. Farming communities have adapted in that main dwellings are located above flood levels. However, temporary dwellings for farm workers and buildings for equipment are located in flood risk areas. This adaptation has reduced the risk of loss of life from flooding, but farm workers, crops and equipment (livelihoods) are still at risk. The region itself has little rainfall and thus flooding is associated with rainfall in upstream regions of Kenya and also from spillage from the Seven Forks Hydro Power Cascade. Communities can be reluctant to leave the area following a flood warning but are becoming more responsive.

Tana River County is semi-arid and away from the river basin communities are largely pastoralists dealing in livestock farming with some (purely rain fed) agriculture. The soil is very fertile and productivity is high if rains are sufficient – however, there is vulnerability to drought – and drought was present in the OND 2016 season and neighbouring Garissa County was also affected. The drought developed because a very poor MAM season was followed by a poor OND season – although some rain has been received in the last week. Water pans are used to increase resilience to prolonged deficiency in rainfall – but frequently the pans dry out before rain returns. KRCS together with the World Food Programme (WFP) are assisting the region by supplying water (water trucking) and also food supplies. KRCS are also involved in a Food for Asset programme in which communities work on resilience building projects in return for food aid.

In times of drought, pastoralists may bring their animals to the Tana delta region to graze and serious conflicts can occur when animals graze on cultivated crops. In a recent episode of conflict over 200 deaths occurred. Conflict has led to much displacement of communities and there are Internally Displaced Persons Camps sited along the river. Recently the Kenya government has passed a “grazing bill” which partitions the region into areas where grazing is permitted and areas reserved solely for cultivation.

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Western Region: *Gilbert Mahulo (Volunteer, Western Region)*

Operations in Busia, Kakamega, Vihiga and Siaya were discussed. They are counties in Western Region, which have a much wetter climate than Tana River County. Consequently, flooding is the main hazard and can be severe, including through flooding of the Nyando river. The main rainfall and flooding season is MAM, but floods can also occur in OND. Despite the generally wetter climate, depressed rainfall and dry spells can still trigger food insecurity. The perception is that the MAM and OND seasons are becoming shorter so that rainfall is not distributed over the 3-month periods. Key risk factors include early cessation of the MAM season – preventing maturation of maize (the main crop) and/or prolonged dry spells in the transition season, June-July-August (JJA) (Western region typically receives some rain in JJA through incursion of Congo air masses associated with the West African Monsoon – but rainfall is sporadic and cannot always support agriculture).

A long-term adaptation activity is planting Cassava crops. Cassava is a perennial plant with a continuous cropping cycle providing a food source between the main seasons and helping resilience when poor distribution of MAM and OND rains results in a poor maize crop. A variety with a short maturing time of 8 months is being planted (replacing longer maturing varieties – which can be poisonous). This is being supported by an Integrated Food Security and Livelihoods (IFSL) initiative. Forecasts of rainfall are important for planting Cassava as plentiful rain is required for the seedlings to germinate.

In a partnership with KMD and the Ministries of Agriculture and Forestry KRCS are providing advice to farmers on which crops to plant and also providing weekly weather updates to the region. The weather updates are tailored by KMD's County Directors of Meteorology (CDMs) with formats developed under the WISER-Western project. Two seasonal forecasts for the region from the KMD CDM using the WISER-Western format have also now been distributed. An example seasonal forecast for Siaya County (courtesy Gilbert Mahulo) is provided in Annex 3. It is reported that farmers generally believe the forecasts – but there are still some who doubt them. KRCS also distribute fertiliser in partnership with KARI (Kenya Agricultural Research Institute).

KRCS operations planning and information gaps

Key planning meetings are held in February and September kicked off by the release of the KMD seasonal forecast (but see below). Thereafter, monthly forecasts are used and when drought develops planning meetings are convened as required. Activities are planned on the basis of ongoing vulnerability and the changes to this

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expected due to forecast impacts. Since two thirds of Kenya's counties are classified as ASALs, droughts are usually the major concern.

The KMD OND forecast forms a key input to the September planning meeting. However the MAM forecast is generally not available in time for the February planning. Better synchronisation or a monthly "rolling" forecast service would address this gap. ("Rolling forecasts" mean e.g. issue in January a forecast for FMA, in February a forecast for MAM and so on, for all 12 months)

For surveillance activities and to assist planning, KRCS need the county downscaled forecasts – to assess local scale impacts. These are not available for all counties and frequently only become available some weeks after the national forecast which is the basis of general strategic KRCS planning. KRCS need the county forecast to follow in quick succession after the national forecast. It was noted that KRCS could provide useful input to an extension of the WISER-Western project by prioritising the most vulnerable counties in most need of the downscaled information.

Tana River County KRCS branch is not receiving CDM downscaled forecasts, either seasonal or monthly timescale – though these may be available. It was recommended at the meeting that the Tana River County KRCS branch keeps in close contact with the county CDM to obtain the best forecast information. They do receive climate bulletins from the National Drought Management Agency (NDMA) which contain advisories that are passed on to Community Managed Disaster Risk Reduction (CMDRR) operatives. Weekly forecasts (such as those received in West Kenya region) are also not received in Tana River County.

In Western region, there is a need for forecast information between the main seasons (MAM and OND). For example, a forecast received in January for February and Feb-May would be useful to act on potential early start to the season. Also, forecasts for the JJA season (when prolonged dry spells can endanger long-maturing maize varieties) are not yet downscaled to county level.

Forecast and information accessibility is an issue. Under current arrangements KRCS cannot get access to the forecast ahead of its official release. It is needed before that, even if under an embargo agreement. One option that can be explored here is the KMD Business Support Service – service rates apply but would be negotiable. A "forecast on request" service would also be of value to KRCS.

In addition, KenGen provide KRCS with reservoir level information to assist preparedness for spillage events. However, KRCS are not permitted to publish the

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levels and lack of published levels hinders their ability to justify intervention actions and to gain support.

The opportunity to link the developing SCIPEA KenGen climate service with that for Red Cross was noted. However, it was recognised that the best way to do this was not clear at present.

It was noted that knowledge of meteorological conditions outside the national borders of Kenya are sometimes needed. For example, in northern Kenya, flooding sometimes occurs in response to heavy rainfall in Ethiopia. Similarly, rainfall in the region of Mount Kilimanjaro (Tanzania) can cause flooding in southern Kenya. Since these hazards are quick onset – they are largely relevant to short range forecasting and access to output from the Met Office's Global Hazard Map (GHM) – which will be developing under the DFID SHEAR programme project ForPAc (towards Forecast based Preparedness Action) may assist. Also, data from the Global Flood Assessment model may also be useful.

Impact forecasting

The work of the Red Cross Climate Centre in identifying weather/climate thresholds associated with severe impacts on communities was noted and the potential of linking observed seasonal drought and flood indices with e.g. number of Red Cross interventions or number of persons in need of assistance was discussed. It was noted that KRCS detailed records on interventions made have only been kept for the last 4 years. Desinventar records are also not extensive, going back to around 2008. It is possible that NDMA and NDOC may have longer records and the team should check this. It was noted that the aforementioned ForPAc project in which KMD, Red Cross, NDMA and Met Office are partners, will be examining these issues further.

If a direct link to impact quantities cannot be made because of lack of long-term impact data, a proxy variable such as a drought index could be developed as an interim approach (the drought index h would include components from 1) recent rainfall anomalies and 2) predicted rainfall anomalies).

In terms of potential health impacts it was noted that Cholera is becoming increasingly common in Western Kenya.

KRCS use of the KMD OND 2016 forecast

Planning commenced in September on release of the KMD seasonal forecast for OND 2016 season. The main information used is the KMD seasonal forecast map

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issued on the KMD website (and subsequent 1-month updates). The forecast indicated most likely average or below average rainfall over much of the country though with southwestern areas expected to receive average or above average rainfall (Fig. 1).

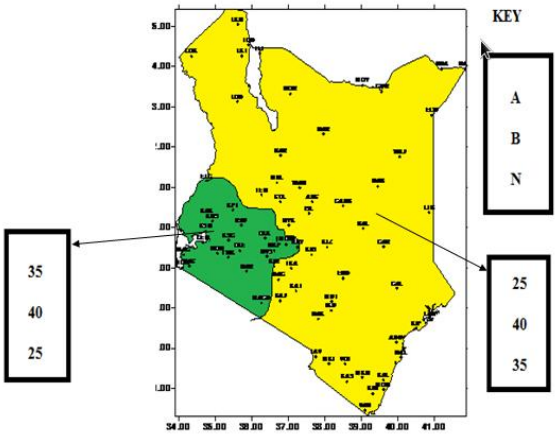

Figure 1: KMD's seasonal forecast for October-December 2016

In regions where average or below average were indicated this led to a two-pronged response strategy:

1. Intervention in Kilifi county where food insecurity was already present due to rain failures in previous seasons. Activities commenced included water trucking and food supply. Following consideration of the likely impacts of the seasonal forecast – "on the ground" assessments are made to determine the need for and type of intervention. Assessments carried out in September established that markets in Kilifi were still viable and therefore cash transfers were also introduced as a mitigating strategy.

2. Wider national strategy based on potential for larger-scale drought issues based on appeals to support livestock "off take" (purchasing of livestock before their condition deteriorates through drought). Garissa and Turkana are regions particularly at risk.

Interventions to exploit favourable aspects of climate variability are also made. For example, in 2009 additional seed sufficient to support 1 additional acre of crop was supplied to 70,000 farmers – leading (with El Niño-enhanced rains) to a bumper harvest. This strategy was repeated in 2015 with distribution of maize and beans. Seeds were distributed even to Kitui which typically gets insufficient rain to support

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much cropping and crops were indeed successful. KRCS also played a role in persuading farmers to plant and capitalise on expected rains.

In addition, KRCS are active in advocacy work speaking on national platforms with the National Disaster Management Agency (NDMA) to raise awareness. Partly as a consequence the Kenya government has now allocated funding to support interventions to mitigate the drought impacts.

Based on the KMD forecast KRCS also generate “impact” forecasts that incorporate existing vulnerability. These are expressed in terms of affected regions; numbers of persons affected, and needs (generally around water, food and health). An example impact forecast for flood risk in Tana River County during the OND 2015 season is provided in Annex 4.

Preparation for flooding in Western Kenya was also part of planning. For OND 2015, this included flash flooding and also fluvial urban flooding in Nairobi and Mombasa. Boats were brought from Mombasa to Nairobi in preparation. KRCS also uses the forecasts to increase preparedness for heavy-rain related building collapse in urban areas.

Discussion of Prototype Climate Service (PCS)

The conclusions of the Nairobi July meeting were reviewed in the context of the discussions documented above. At the Nairobi meeting the two PCSs prioritised were:

1) Predictions of the amounts of seasonal rainfall expected as well as the expected distribution and risk of heavy rain periods, and
2) Services with forecast lead time that is long enough to allow users more time to plan.

The meeting discussions on operational planning confirmed these priorities and added some additional needs. Forecasts of amounts are needed to assist in judging the potential severity of impact; spatial distribution is needed to assist targeting of on the ground assessment and placement of resource (temporal distribution is also needed to judge impact on crop yields). Methods of presenting forecasts of amounts will need experimentation – this could take the form of a “best estimate” with a confidence range, or probabilities of exceeding a number of agreed rainfall thresholds. Forecasts of temporal distribution will need some research to confirm capability – but could be provided by predictions of onset/cessation timing and number of rain days in the season.

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The need for forecasts with earlier lead time was confirmed for example by the lack of available forecasts for the February planning session. A further need for a rolling forecast service was identified. For example, the KRCS Risk and Hazard Bulletin incorporates an impact outlook based on KMD seasonal forecasts for the OND and MAM seasons – but similar information for the transition months JJA and JF is not widely disseminated by KMD, but could be generated and provided. The Risk and Hazard Bulletin is the main instrument for communicating the KMD forecast and its interpretation to KRCS regions and branches. The KRCS assessment of potential impacts of the OND 2016 forecast – from the July-September bulletin – is provided in Annex 5.

It was noted that with a rolling seasonal forecast, issued with earlier lead time and giving onset timing and forecasts of amounts, the forecast was developing a similar framework to that agreed for KenGen – this will help economy of production at KMD. KenGen require the Seven Forks Catchment to be delineated on the forecast map and it was considered whether regions and risk should be delineated on the KRCS service. It was decided this would not be practical because the regions are not static.

It was noted that KRCS need information downscaled to the county level. It is not clear how SCIPEA can help meet this requirement directly since SCIPEA is working primarily to strengthen the national forecasting process and downscaling is a function of the County Directors of Meteorology. The new service will however provide enhanced information over the current KMD national-scale products used in KRCS planning. The new methodologies used to generate the services will also result in enhanced large-scale forecast information being available to the Counties which should improve their downscaled forecasts.

Following discussions on impact forecasting it was concluded that while a true impact forecast may not yet be viable because of limited historical records of impact, inclusion of an impact related variable (such as 6, 8, 12 month SPI) should be considered.

It was agreed that the prototype climate service developed should be relevant to both flood and drought hazards.

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Day 2: 1 December 2016

Richard Graham began proceedings by providing an overview of the WISER-SCIPEA project. The project aims to strengthen climate partnerships on three levels:

1. Enhancing links and data exchanges between global, regional and national climate organisations – strengthening resources and tools for seasonal forecasts;
2. Climate information providers and users – to co-develop prototype tailored services;
3. NMHSs and Universities/Training Centres – strengthening resources for capacity training and climate service development as well as capacity retention.

Strengthened partnerships in these areas are expected to lead to increased capacity for mainstreaming climate services and for national/regional early warning as well as more effective responses to issued warnings.

The SCIPEA structure comprises 5 consortia: 1 Regional consortium and 4 national consortia (Kenya, Uganda, Ethiopia and Tanzania) with ICPAC providing regional coordination. Each consortium includes a climate information provider, a university or training centre partner and two user partners (Fig. 2).

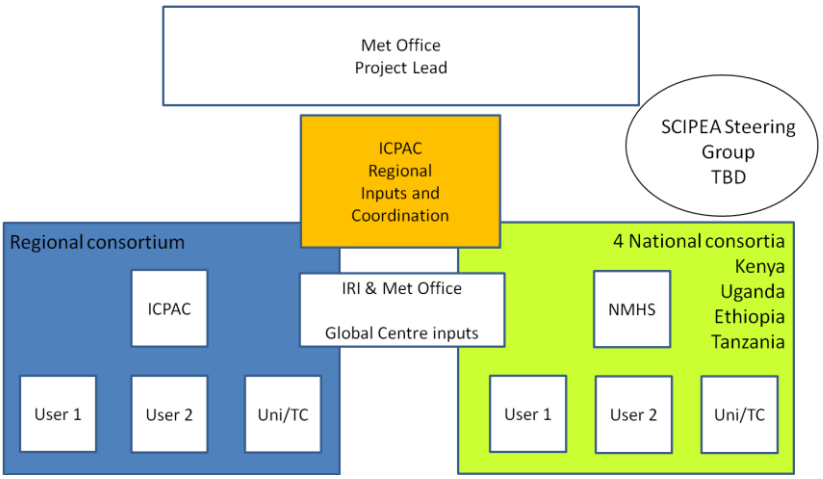

Figure 2: Partners and consortia in SCIPEA

James Muhindi then gave the climate background to the OND 2016 Short Rains season explaining the role of La Niña (Figs. 3&4) and the Indian Ocean (Fig. 4 - specifically a negative phase Indian Ocean Dipole (IOD) with warm waters in the

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south east of the basin and cooler waters in the west near the coast of East Africa). These large-scale influences tend to set up circulation patterns that divert moisture away from the Greater Horn region and suppress rainfall. Predictions from September had indicated relatively strong probabilities for below normal rainfall on average for the 3-month OND period. The current episodic heavy rainfall being seen in November is not unusual and partly caused by overall dry conditions setting up strong surface heating – which then triggers convective storms. The observed accumulated rainfall November 26th shows substantial deficits – particularly in the south coastal regions (Mombasa) representative of the drought impacted area of Kilifi (Fig. 5) – consistent with the forecast.

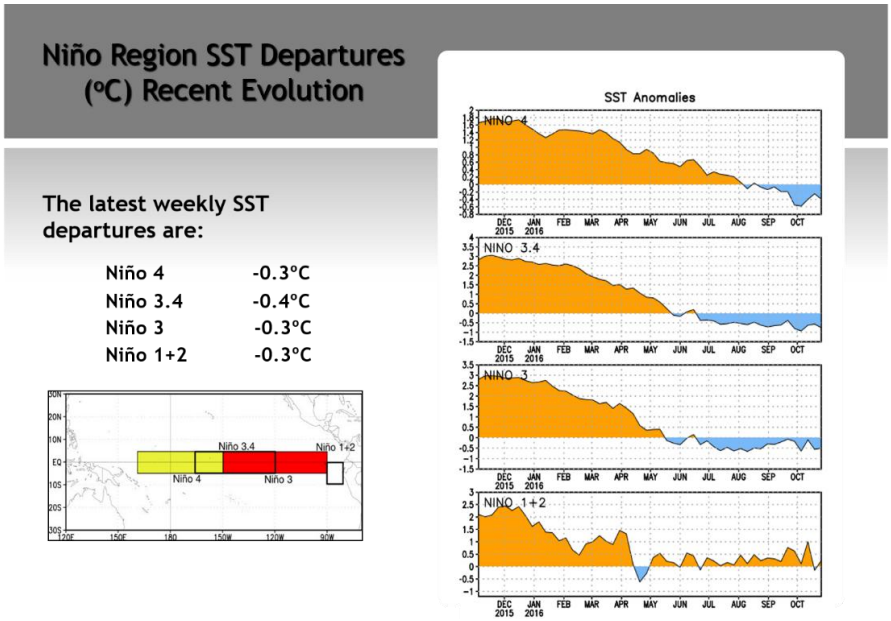

Figure 3: Regional sea surface temperature expressed as a difference from long term average (left) and the evolution since December 2015 showing evolution from El Niño in 2015 to the current weak La Niña conditions.

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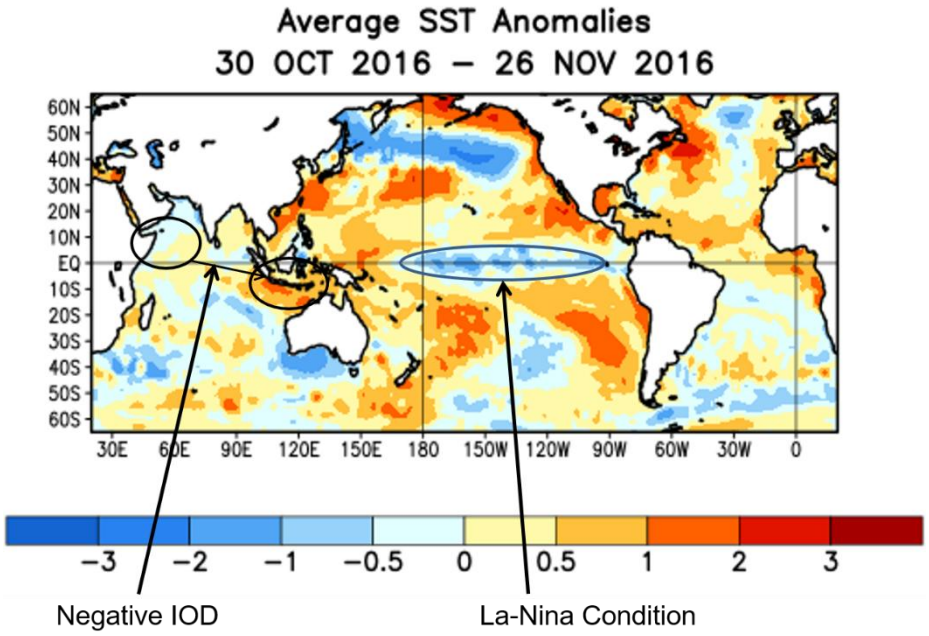

Figure 4: SST differences from long-term averages 30 October – 26 November 2016, with weak La Niña conditions and (negative) Indian Ocean Dipole highlighted.

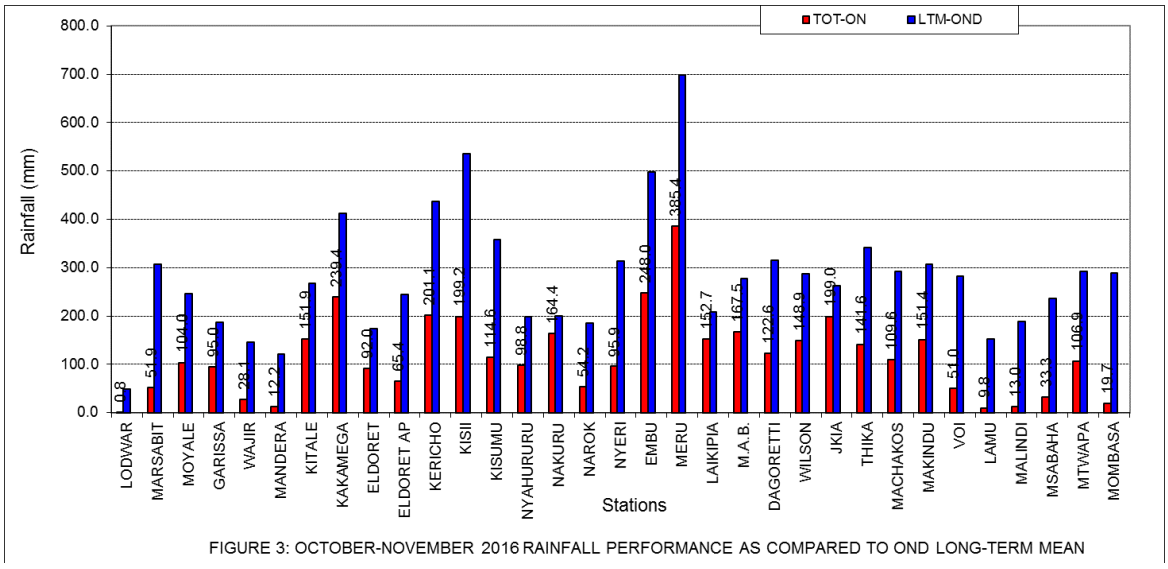

Figure 5: October-November 2016 performance compared to Oct-Dec long-term average. Note very dry conditions particularly in e.g. Mombasa, Lamu and Malindi.

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The KRCS representatives at the meeting expressed appreciation at the opportunity to be briefed on and to question the seasonal climate information presented – which demonstrates the value of the embedded working concept.

Summary of agreements for the Prototype Climate Services for KRCS

The final session of Day 2 was spent crystallising all discussions into a template for the SCIPEA prototype climate services for the Kenya Red Cross Society – which is presented in Table 6.

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Co-developed Prototype Climate Service: KMD – Kenya Red Cross

Delivery: On 15th day of each month, by email		**Format:** 2-3 page pdf document		
Section No.	**Content**	**Details**	**Notes**	**Actions**
1	Season onset timing nation wide	Maps showing geographical variations	KMD already produce and issue Only included in relevant forecasts ahead of main seasons Cessation dates could be updated.	Science visit: predicting onset with CPT and validation.
2	Spatial distribution of rainfall across Kenya Temporal distribution	Actual amounts will be given. (Vulnerability mapping partly informed by forecast – so not clear how to include or if desirable) Temporal distribution could be addressed by rain-day frequency	The precise way in which amounts are presented is to be determined (e.g. value with confidence range, probabilities of threshold exceed etc.) Present long term mean with prediction superimposed (Kelvin)	Science visit: experiment with ways of presenting amounts Investigation of rain-day frequency predictions (and evaluation)
3	**Impacts**: Link rainfall thresholds with number of drought/flood interventions – to determine		Links to number of historical KRCS interventions may not be possible yet	Science visit: Prediction of drought/flood

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	"triggers for action" Drought indices that will combine precedent rainfall with forecast rainfall and help identify drought flood "hotspots"		SPI to be tried as interim "impact" index	indices
4	Large scale climate context	E.g. expected status of ENSO and IOD	-	-
5	Historical/analogue information:		Could include: Histograms of previous month's rainfall performance over the catchment; cumulative rainfall graphs showing mean; outer deciles; max and min years etc. (predicted years?)	
6	Link to KenGen product to enhance spillage warnings			

Table 6: Content of the proposed KMD Prototype Climate Service (PCS) for Kenya Red Cross Society and suggested activities for the science visit to Met Office.

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Annex 1
SCIPEA Service development team meeting and embedded working Kenya Red Cross Society, KMD, IMTR and Met Office: 30 November – 1 December 2016, Kenya Red Cross Society (KRCS), Red Cross Road, South C (Bellevue), Nairobi

Draft Agenda

Day 1	
09:00	Arrivals
10:00-13:00	- Understanding KRCS operational decisions in the need for seasonal forecast information - Perspectives from Tana River County and Kisumu County
13:00-14:00	lunch
14:00-16:00	Discussion of KMD forecast products used and any gaps from KRCS point of view - Case study for OND 2016 - Use of analogue years
16:00	Close
Day 2	
10:00	Arrivals
10:00-13:00	- List the priority information needed – referring also to Nairobi and Kampala meetings – include new types of information if needed - What would a tailored forecast document for KRCS look like? - Draft the document
13:00-14:00	Lunch
14:00-16:00	- Refine the document - Identify steps needed to be ready for experimental trial for MAM season
16:00	Close

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Annex 2

Participant contact details

No.	Name	Organisation/Position	Contact details
1	Mr Venant Ndighila	KRCS, Emergency Operations Manager	ndighila.venant@redcross.or.ke
2	Mr Kelvin Kiprono	KRCS, Disaster Management Surveillance Officer	kiprono.kelvin@redcross.or.ke
3	Ms Maimuna Shambaro	KRCS, Acting County Coordinator, Tana River County	shambaro.maimuna@redcross.or.ke
4	Mr Gilbert Mahulo	KCRS, Volunteer, Western Region	mahulo.gilbert@gmail.com
5	Mr James Muhindi	KMD, Assistant Director Climate Modelling	muhindi@meteo.go.ke
6	Dr Richard Muita	IMTR	rukwaro2003@yahoo.co.uk
7	Richard Graham	Met Office, SCIPEA Project Lead	richard.graham@metoffice.gov.uk

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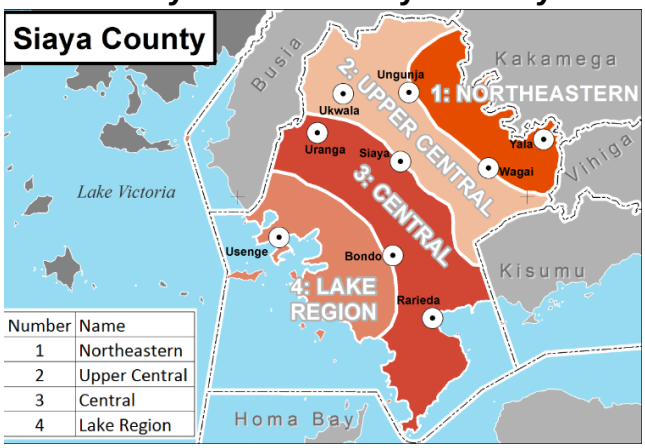
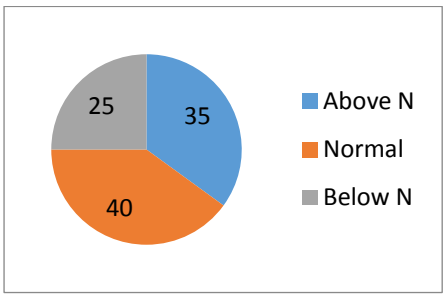
Annex 3
Kenya Meteorological Department

Seasonal weather forecast for October, November, and December 2016
Rainy season in Siaya County



Number	Name
1	Northeastern
2	Upper Central
3	Central
4	Lake Region

Name(s) of climatic zone(s) 1 and 2
Onset: 3rd and 4th week of September
Cessation: 3rd and 4th week of December
Probable volume of rainfall: between 400 and 450mm
Probable distribution of rainfall during the rainy season: Irregular



Normal rainfall is the average volume of rainfall that fell during this rainy season in this area of the county over the past 30 years

Commentary of County Meteorological Director:

- The season is expected to receive **Normal** to **slightly above normal** rainfall with **irregular** distribution throughout the season.

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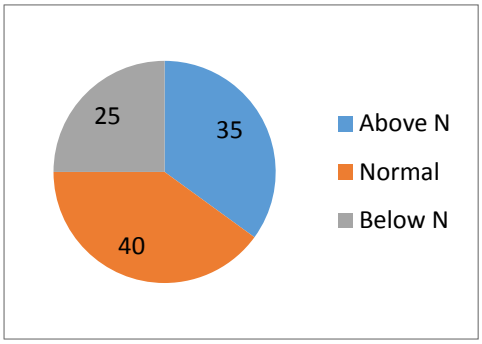
- The **onset** is expected During the **Third** and **Fourth** week of September and **Cessation** in the **Third** and **Fourth** week of December.
- The rains are expected to be accompanied by lightning and thunderstorms thus there should be no taking shelter under the trees.
- Strong winds are also likely during the season.
- Flooding of areas along the river Nzoia is also likely because Normal to slightly above normal rainfall is expected in the Nzoia catchments.
- The arm of the County responsible to set aside funds in readiness for disasters related to winds and floods

Advice to farmers from Ministry of Agriculture:

- Need for fast maturing and drought resistant crops.
- Water harvesting for both domestic and irrigation
- Farmers to liars with the agricultural experts for the most appropriate varieties of maize for their areas in relation to the expected seasonal forecast.

Name(s) of climatic zone(s): 3 and 4
Onset: 3rd and 4th week of September
Cessation: 3rd and 4th week of December
Probable volume of rainfall: between 200 and 350mm
Probable distribution of rainfall during the rainy season: Irregular



Normal rainfall is the average volume of rainfall that fell during this rainy season in this area of the county over the past 30 years

Commentary of County Meteorological Director:

- The season is expected to receive **Normal** to **slightly above normal** rainfall with irregular distribution throughout the season.
- The **onset** is expected During the **Third** and **Fourth** week of **September** and **Ceasation** in the **Third** and **Fourth** week of **December.**

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- The rains are expected to be accompanied by lightning and thunderstorms thus there should be no taking shelter under the trees.
- Strong winds are also likely during the season.
- Flooding of areas along the river Nzoia is also likely because Normal to slightly above normal rainfall is expected in the Nzoia catchments.
- The arm of the County responsible to set aside funds in readiness to wind related disasters

Advice to farmers from Ministry of Agriculture:

- Need for fast maturing and drought resistant crops.
- Water harvesting for both domestic and irrigation

Date of issue: 14th Sep. 2016

For further information, please contact:
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Mobile : 0713817279
Email: arodioginga@yahoo.com

(*More détail forecast shall be released during the County Climate Outlook Forum (CCOF) Schedule on 28th of Sep. 2016*.)

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Annex 4: Impact forecast for potential flooding: Tana River County OND2015

Flood Risk Analysis for -Tana River County **January 9, 2017**

Tana River County has a population of **240,075** according to the 2009 Kenya National Census. 76.9% of the county's population live below the poverty. The County is located at the Coastal plains and along the lower parts of River Tana which is prone to floods effect caused by upriver rains.

KMD Forecast for O-N-D 2015

The KMD forecast for October – November – December "short rains" season indicated that enhanced rainfall was expected in most parts of the country including parts of Western Kenya, parts of Rift valley, Central highlands including Nairobi, parts of Southeastern lowlands, and the Coastal region. Enhanced rains in the Kenya Central Highlands could lead to flooding along the lower parts of Garissa, Bura, Hola and Tana Delta areas. The rains were expected to be driven mainly by then evolving El Niño conditions in the Pacific Ocean coupled with the warming of the Sea Surface Temperatures (SSTs) in the western Equatorial Indian Ocean (known as the Indian Ocean Dipole) that are favorable for enhanced rainfall in East Africa including Kenya (KMD).

The cessation of the October-December 2015 short-rains occurred during the third to fourth week of December over most areas. However, in the western, central and southeastern regions, occasional rainfall continued into January 2016.

Floods Hazard Profile

Tana River County is a flood prone county with recurrent floods affecting mainly the Tana Delta and Bura Sub-counties which host about 63% of the county's population (151,246 people). Out of these, half (75,623 people) reside in flood prone areas along the banks of River Tana and are frequently displaced by floods. In the most recent flooding experienced as a result of the 2015 El Nino rains, an estimated 40,000 people were displaced.

To identify the number of people likely to be affected in case of flooding as advised by KMD seasonal forecasts, KRCS, in its planning, uses the approximate number of people living in flood prone areas and living below the poverty line. This gives KRCS

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the approximate number of people who will likely require urgent humanitarian assistance (see table below).

Sub-county	Population	Population in Flood Prone Areas (50% of sub-county populations)	Population Living Below Poverty Line (76.9%)	Population in Households (HHs)
Garsen	68,061	34,031	26,170	4,362
Bura	45,374	22,687	17,446	2,908
Galole	37,811	18,905	14,538	2,423
Total	**151,246**	**75,623**	**58,154**	**9,693**

From the table above, approximately 9,693 households (58,154 people) comprising of populations living below the poverty line and residing in flood prone areas are likely to be affected by floods.

Potential Interventions

a) Mapping of flood prone areas and identification of evacuation sites
b) Continuous monitoring and dissemination of early warnings to the population at risk.
c) Coordinating with other agencies involved in development and dissemination of early warning messages like KenGen, KMS, County government, etc.
d) Increased disease surveillance in communities for early detection of outbreaks.
e) Increased hygiene promotion activities to prevent waterborne disease outbreaks in Tana River County.
f) Increased preparedness to respond to the effects of floods on the target population.

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Annex 5:

Outlook through December 2016 from the KRCS Risk and Hazard Bulletin, July-Sept 2016

PROJECTED OUTLOOK THROUGH DECEMBER 2016

- **The Kenya Meteorological Department's** seasonal outlook for October-November-December 2016 season indicates that the evolving La Niña conditions coupled with the Indian Ocean Dipole (IOD) will result in depressed rainfall in much of the country, characterized by poor distribution in time and space – (http://www.meteo.go.ke/pdf/seasonal.pdf). **The Greater Horn of Africa Climate Outlook Forum 44 (GHACOF 44)** forecast point to an increased likelihood of below normal rainfall in countries within the equatorial region of Greater Horn of Africa – (http://www.icpac.net/wp-content/uploads/GHACOF44_Statement.pdf). Similarly, **the FEWS NET Food Security, outlook update for August 2016** indicates a further decline in food insecurity as dry spells continue to be experienced through January 2017 - (http://www.fews.net/east-africa/kenya).

- The expectation is that the depressed rainfall towards the end of the year will negatively affect the secondary agricultural season crop harvested in February–March 2016 thus worsening food security situation in the country. Dry conditions could also worsen body conditions and trigger increased livestock migration, expanding the spread of livestock diseases and increased malnutrition rates due to reduced milk consumption in pastoral communities. The risk of drought and the resultant food insecurity therefore remains high due to combination of anticipated poor amounts, and low production in high potential agricultural areas of the country. While food prices have remained below the 5-year average, there is a likelihood that this could rise due to the anticipated dry season in the country. Going into late 2016 and early 2017, food insecure populations will continue to increase significantly hence the need to invest in early actions to prevent the situation from deteriorating to critical levels. In addition, the nutrition situation is expected to deteriorate further with Garissa and Tana River Counties likely to record critical malnutrition rates by November this year. Key issues to monitor include areas with high malnutrition rates, the upcoming short rains season and the sporadic cases of conflicts in the pastoral areas of the country.

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