



This report has been produced by University of Reading for Evidence on Demand with the assistance of the UK Department for International Development (DFID) contracted through the Climate, Environment, Infrastructure and Livelihoods Professional Evidence and Applied Knowledge Services (CEIL PEAKS) programme, jointly managed by DAI (which incorporates HTSPE Limited) and IMC Worldwide Limited.

The views expressed in the report are entirely those of the author and do not necessarily represent DFID's own views or policies, or those of Evidence on Demand. Comments and discussion on items related to content and opinion should be addressed to the author, via enquiries@evidenceondemand.org

Your feedback helps us ensure the quality and usefulness of all knowledge products. Please email <u>enquiries@evidenceondemand.org</u> and let us know whether or not you have found this material useful; in what ways it has helped build your knowledge base and informed your work; or how it could be improved.

DOI:http://dx.doi.org/10.12774/eod_cr.february2016.hironsletal3

First published January 2016 © CROWN COPYRIGHT

SECTION	1ŕ	1
Introduction		1
1.1	Update of current event	1
1.2	Forecast Model Data	2
SECTION	2	3
Description of	of Monthly Outlook Analysis and Tables	3
2.1	Monthly Outlook Analysis	3
2.2	Interpretation of the Forecast Maps	4
2.3	Interpretation of the Impact Tables	4
2.4	Impact, Symbol and Level of Confidence Keys	4
SECTION	3	7
Impact Table	es with February 2016 Monthly Outlook	7
3.1	Southern Africa	8
3.2	West Africa	9
3.3	East Africa10	0
3.4	Central Africa1	1
3.5	MENA – Middle East and North Africa12	2
3.6	Indonesia13	3
3.7	Southeast Asian Peninsular14	4
3.8	Southern Asia1	5
3.9	Caribbean10	6
3.10	British Overseas Territories	-
3.11	Southern Europe1	7
3.12	Indian Ocean1	
3.13	Pacific Ocean1	7

Contents

List of Annexes

Annex 1 Forecast Maps	18
Annex 2 Detailed Technical Methodology	23



SECTION 1

Introduction

During the summer and autumn of 2015, El Niño conditions in the east and central Pacific strengthened, disrupting weather patterns throughout the tropics and into the mid-latitudes. For example, rainfall during the summer's Indian monsoon was approximately 15% below normal. The continued strong El Niño conditions have the potential to trigger damaging impacts (e.g., droughts, famines, floods), particularly in less-developed tropical countries, which would require a swift and effective humanitarian response to mitigate damage to life and property (e.g., health, migration, infrastructure). This analysis uses key climatic variables (temperature, soil moisture and precipitation – see section 1.1) as measures to monitor the ongoing risk of these potentially damaging impacts.

The previous 2015-2016 El Niño Impact Analysis was based on observations over the past 35 years and produced Impact Tables showing the likelihood and severity of the impacts on temperature and rainfall by season. The current report is an extension of this work, providing information from observations and seasonal forecast models to give a more detailed outlook of the potential near-term impacts of the current El Niño conditions by region.

This information has been added to the Impact Tables in the form of an 'Observations and Outlook' row. This consists of observational information for the past seasons of JJA 2015, SON 2015 and DJ 2015/2016, a detailed monthly outlook from 5 modeling centres for Feb 2016 and then longer-term seasonal forecast information from 2 modeling centres for the future seasons of MAM 2016 and JJ 2016. The seasonal outlook information is an indication of the average likely conditions for that coming month (or season) and region and is not a definite prediction of weather impacts. There is no seasonal forecast information yet available for Aug-Nov 2016, seasons which include these months are marked by 'X'.

JJA	SON	DJF 1	5/16		1 2046	JJA	2016	SON 2016
2015	2015 DJ-15/1		Feb-16		1 2016	JJ-2016	Aug-16	SON 2016
	Observatio	ine		Out	llook		X- No inf	ormation yet
	Observatio	115	5 Models		2 N	lodels		ormation yet

Summary Table of Observations and Outlook Information

1.1 Update of current event

Strong El Niño conditions continue to be present in the east and central Pacific. However, the peak of this event has already occurred in November and December 2015 with conditions starting to weaken in January 2016. Most models predict that El Niño conditions will continue (although weaker) during January-March 2016 and further weaken transitioning to ENSO-neutral conditions during late spring or early summer (CPC/IRI consensus forecast; A2.2). There is potential after that to transition into La Niña conditions, which are characterised by cooler than normal tropical Pacific sea surface temperatures. Such a



transition from strong El Niño conditions to La Niña conditions has been observed in nearly 90% of past El Niño events between 1950 and 2011.

Broadly speaking, global climate impacts of La Niña, especially in the tropics, tend to be opposite to those of El Niño. A full report on the historical impacts of past La Niña events will be available soon.

1.2 Forecast Model Data

The data used to produce the monthly outlook comes from 5 seasonal forecast models. The models used in this analysis are the Bureau of Meteorology (BoM; Australia), the European Centre for Medium Range Weather Forecasts (ECMWF; Europe, based in UK), the National Centers for Environmental Prediction (NCEP; United States), Météo-France (MetFrance) and the UK Met Office (UKMO). These models were chosen because they are known to be reputable, reliable seasonal forecast models. Data for the extended range outlook is only available from 2 models (NCEP and UKMO). The current tables and maps are based on forecasts made in January 2016. The length and frequency of the forecast data available differs between modeling centres, the details of these different data are described in section A2.1 of Annex 2.

Seasonal forecasts: The chaotic nature of the atmosphere means that it is hard to predict exactly what will happen months in advance. There are some aspects of the global weather and climate system that are more predictable than others and it is because of these that we are able to make seasonal forecasts. Such forecasts are able to show what is more or less likely to occur but acknowledge that other outcomes are possible.

Uncertainty at longer forecast lead times: Due to this chaotic nature of the atmosphere, it is easier to predict what will happen in the near-term over the next month or so than it is to predict what will happen 3 or 6 months from now. Therefore, as the length of the seasonal forecast increases, the level of skill decreases. This means we have higher confidence in the near-term forecasts than in the extended-range forecasts. In addition to this, we have higher confidence in the monthly outlook because information from more models has gone into the monthly outlook (5 models) compared with the extended-range outlook (2 models).

Data variables:

Precipitation: In the report and tables this is referred to as rainfall but in fact encompasses any form of water, liquid or solid, falling from the sky. The seasonal forecasts are compared to observations from the Global Precipitation Climatology Project (GPCP) from 1979-2014.

Soil Moisture: This is the moisture content in the soil over the top 20cm. The seasonal forecasts are compared to the global ECMWF Reanalysis (ERA-Interim/Land) of land-surface parameters from 1979-2010.

Temperature: This is the near-surface temperature (2 metre). The seasonal forecasts are compared to the global ECMWF Reanalysis (ERA-Interim) from 1979-2014.



SECTION 2

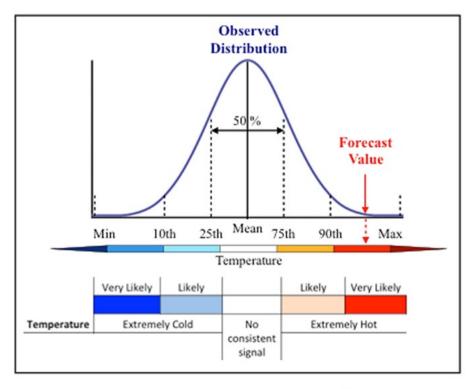
Description of Monthly Outlook Analysis and Tables

2.1 Monthly Outlook Analysis

The 'Observations and Outlook' row of the Impact Tables refers to what has already occurred in observations during this el Niño event (JJA 2015, SON 2015 and DJ 2015/2016), what is forecast to occur for the next Monthly Outlook, in this case February 2016, and the extended-range forecast over the following five months (MAM 2016 and JJ 2016). The current season (DJF 2015/16) is broken down into the observations (DJ 2015/2016) and the monthly outlook (Feb 2016) so that the near-term monthly forecast, in which we have more confidence and more models have contributed, can be seen separately. Boxes in future seasons (Aug-Nov 2016) where there is no information yet available are marked by an 'X'.

The analysis for the outlook part of the Impact Table takes the forecast of rainfall, soil moisture and near-surface temperature for the forecast period and compares it with the observed distribution of the same period over the past 35 years. This method of comparing the forecast to the observations is explained schematically in Figure 2.1 and more technical details of this method are described in section A2.2.

Figure 2.1. Schematic representation of the methodology. This is an example for Temperature comparing the forecast value to the observed distribution. The top colour scales represents that used for Temperature in the Forecast Maps in Annex 1. The bottom colour scale refers to how this links to the colours used in the impact tables. See the description of this 'worked example' in the text in section 2.





If the forecast value lies within the middle 50% of the observed distribution (i.e. between the 25th and the 75th percentile) then there is no deviation from normal conditions predicted and these regions are left white in the Forecast Maps (see Annex 1) and labeled 'no consistent signal' in the Impact Tables. If, as the example in Figure 2.1 shows, the forecast value is above the 90th percentile of the observed distribution it will be coloured red in the temperature maps in Annex 1. An assessment will be made about whether this is a consistent signal across the models. If it is both a strong signal (above the 90th percentile) and robust across the forecast models then it will appear as dark red in the Impact Tables referring to "Very Likely Extremely Hot".

If either the signal is weaker (e.g., only above the 75th percentile) or the signal is not consistent across all the model forecasts then this would appear in the Impact Tables as only a "Likely" signal rather than a "Very Likely" signal.

2.2 Interpretation of the Forecast Maps

- The Forecast Maps (Annex 1) are designed to put the current seasonal forecast in the context of the observed record over the past 35 years by comparing to the same period in observations (see Figure 2.1).
- In the **temperature** maps, regions coloured in orange or red indicate areas where it is forecast to be warm or very warm compared with previous observations of that period. Blue regions show areas where it is forecast to be cold or very cold compared to the normal for that period.
- In the **rainfall and soil moisture** maps, regions coloured blue show areas where it is forecast to be wet or very wet compared with previous observations of that period. Brown regions show areas where it is forecast to be dry or very dry compared to the normal for that period.

2.3 Interpretation of the Impact Tables

For each region/country and variable, the Impact Tables are divided into two separate rows. The top row, labeled 'Analysis of Past El Niño Events' refers to the mean impact of past, observed El Niño events that have occurred over the last 35 years. The bottom row, labeled 'Observations and Outlook' refers to what has been happening during this current El Niño event. For past seasons/months, JJA 2015, SON 2015 and DJ 2015/2016, this is information from observations (see section A2.1 for details of the data used). The monthly outlook, in this case February 2016, is the forecast from 5 models (BoM, ECMWF, MetFrance, NCEP, UKMO). The following five months of outlook, MAM 2016 and JJ 2016, is the extended-range forecast from 2 models (NCEP, UKMO). The 'X', marks future seasons where there is no forecast information yet available.

The remainder of the table, the Risk and Evidenced Impacts columns, refers to analysis of past, observed El Niño events over the last 35 years and remains unchanged from previous analysis.

2.4 Impact, Symbol and Level of Confidence Keys

Meteorological Analysis

As in previous analysis, for each country or region, the **likelihood** of temperature and rainfall¹ extremes occurring is shown by the coloured boxes according to the Impact key below. For example, dark blue colours for temperature – corresponding to "Very Likely

Rainfall in the Impact Tables refers to analysis of both Rainfall and Soil Moisture.

¹



Extremely Cold" conditions – can be interpreted as extreme² cold conditions in that season, in that country as being at least twice as likely to occur during El Niño. If the impact is limited to a particular region of that country then that region is represented in that box (e.g., S referring to South) and there is no consistent signal in the rest of that region or country.

mpact Key					
	Very Likely	Likely		Likely	Very Likel
Temperature	Extreme	ly Cold	No	Extren	nely Hot
Soil Moisture and Rainfall	Extreme	ly Wet	consistent signal	Extrer	nely Dry
E.g., S = S Outside		re in no con		letters:	

Impact Analysis

An extensive **literature search** has been carried out. Scientific literature has been reviewed using the *science direct, web of knowledge* and *google scholar* databases. Grey literature and media reports were also analysed (*e.g., NGO reports*). In addition specific case study details were analysed using databases of past natural disasters (*e.g., EM-DAT – International Disaster Database*).

Potential **socio-economic impacts** that were identified in the literature search have been categorized by sector e.g., 'Food Security' and 'Health'. The evidenced impacts, based on past events, are summarised using sector symbols (see the Symbol key below). The uncertainty of the impact in these sectors is represented by the coloured borders around the symbols: red, green and beige correspond to high, medium and potential impacts respectively (see Level of Confidence key below).

It should be noted that the impacts are not updated with the seasonal forecast data but are the impacts of past El Niño events.

Time evolution of Impacts

It is not possible to break the sector impacts down by season because each event is slightly different and therefore the timing or occurrence of particular impacts can vary considerably. However, in some regions there is a clear distinction between the impacts that occur during the developing phase of El Niño (June– February) and those which occur during the decaying phase of El Niño (March- November of the following year). Where impacts differ significantly between the developing and decaying phases this is made clear in the Risk column of the Impact Tables. For example, in Indonesia, analysis of previous events shows that drought is likely during the developing phase of the El Niño while flooding is likely during the decaying phase after the peak of the event. Where this distinction is appropriate it is

² In the grey dotted boxes extreme refers to an event being in the upper or lower quartile - the bottom or top 25% of the observed record for that country for that season.



made clear on the Impact Table by showing sector symbols for the 'developing' phase and 'decaying' phase separately. If there is no clear distinction between impacts in the developing and decaying phases then the impacts are assumed to occur most strongly during the peak of the El Niño event.

	Analysis of Past El Niño events	-
Symbol	Description of threat	Level of Confidence
Ŵ	Crop productivity	High – well evidenced
۵	Water availability	Medium –
	Flooding	some evidence
AP	Drought	Potential – possible pathway to impact
ST.	Migration /displacement of people	-
	Infrastructure	 Developing – Phase of El Niño up to and including the peak (June – February).
Res Contraction	Economy	Decaying –
	Health	 Phase of El Niño after the peak (March - November of the following year).
(1)	Food Security	1



SECTION 3

Impact Tables with February 2016 Monthly Outlook

Below are Impact Tables by region. The information is split into (a) 'Analysis of Past El Niño Events' – based on past, observed El Niño events over the last 35 years, and (b) 'Observations and Outlook' – based on current observations of this El Niño event for past seasons and seasonal forecast information for the next 6 months (month 1 from 5 models and months 2-6 from 2 models). The 'X', marks future seasons where there is no forecast information yet available.



3.1 Southern Africa

			JJA 2015	SON	DJF 1	5/16	MAM		2016	SON		
Country	Variable	Туре		2015	DJ 2016	Feb-16	2016	JJ 2016	Aug-16	2016	Risk	Evidenced Impact
		Analysis of		no			C.	no	no			
		Past El Niño		consistent				consistent	consistent		● ¥ ❹ ①	
	Temperature	Events		signal				signal no	signal X	X		
		Observations						consistent	^	~		Reduced water
Southern		and Outlook						signal				availability, reduction crop yields. Increase
Africa		Analysis of		no			1			no		risk of drought-relat
		Past El Niño		consistent						consistent		humanitarian disast
	Rainfall	Events	no	signal no				no	x	signal X		
		Observations	consistent	consistent				consistent				
		and Outlook	signal	signal				signal				
							-					
		Analysis of Past El Niño		no consistent			E	no consistent	no consistent	no consistent		
		Events		signal				signal	signal	signal		
	Temperature	Observations		-			2	no	x	x		1
		and Outlook						consistent				Increase water stree reduction in crop yie
South Africa					_	-	NE	signal				(e.g., Maize and
		Analysis of Past El Niño		no consistent	E	E	NE			no consistent		Soybean). Below nor
	p_!_f #	Events		signal						signal		instances of Malari
	Rainfall	Observations	S	no	SW	w	W	no	х	х		
		and Outlook		consistent				consistent				
		Analysis of	no	signal no	S	S		signal N	N	S		
		Past El Niño	consistent	consistent				1.00		Ŭ	v 🚯 🚺 🙆 🐵	
	Temperature	Events	signal	signal								
	remperature	Observations	N	no				no	х	x		
		and Outlook		consistent signal				consistent signal				Drought, and crop fai
Mozambique		Analysis of	no		leading to potential f							
		Past El Niño	consistent		shortages.							
	Rainfall	Events	signal									
		Observations		no			no	no	х	х		
		and Outlook		consistent signal			consistent signal	consistent signal				
		Analysis of	no	no				no	no	no		
		Past El Niño	consistent	consistent				consistent	6.2 4.2	1.453 222	¥ 🚯 🕦 🌮	
	Temperature	Events	signal	signal				signal	signal	signal		
	22	Observations						no consistent	x	x		
Malawi		and Outlook						signal				Drought affecting cr
walawi		Analysis of	no	no	no	no		no	no	no		productivity.
		Past El Niño Events	consistent signal	consistent signal	consistent signal	consistent signal		consistent signal	consistent signal	consistent signal		
	Rainfall		Signa	no	S	Signal	no	no	X	X		
		Observations and Outlook		consistent			consistent	a sea de distance				
		and Outlook		signal		_	signal	signal				
		Analysis of	no consistent	no consistent	S	S						
	120 12	Past El Niño Events	signal	signal								
	Temperature	Observations	E		S		S	no	х	х		10. And 10.
		and Outlook						consistent				Increase water stres
Zambia		Analysis of		E	E	E		signal	P.O.	E		crops vulnerable to drought. Increase Ea
		Analysis of Past El Niño	no consistent	C	E	C	no consistent	no consistent	no consistent			Coast Fever in cattle
	Rainfall	Events	signal				signal	signal	signal			
	naman	Observations	no	no	S		no	W	х	x		
		and Outlook	consistent signal	consistent signal			consistent signal					
		Analysis of	no	no			agnar	no	no			
		Past El Niño	consistent	consistent				consistent	consistent		1 🔂 🖉 🚺	
	Temperature	Events	signal	signal				signal	signal		TO	
		Observations	no						x	x		
		and Outlook	consistent signal									Drought leads to
Zimbabwe		Analysis of	no	no			no			no		significantly reduce
		Past El Niño	consistent	consistent			consistent			consistent		Maize yield.
	Rainfall	Events	signal	signal			signal			signal		
		Observations	no consistent	no	E		no	no consistent	x	x		
		and Outlook	consistent signal	consistent signal			consistent signal	signal				



3.2 West Africa

		<u> </u>	JJA 2015	SON 2015		15/16	MAM 2016		Corrent of	SON 2016	536	1 202 0
Country	Variable	Туре		2015	DJ 2016	Feb-16	2010	JJ 2016	Aug-16	2010	Risk	Evidenced Impact
		Analysis of		no				no	no	no		
		Past El Niño		consistent				consistent	consistent			
	Temperature	Events		signal	N	S		signal	signal X	signal		
	0.339	Observations		no consistent		3		no consistent	X	х		Risk of drought an reduced crop
		and Outlook		signal				signal				productivity. Drough
West Africa		Analysis of										related migration
		Past El Niño										leading to increase
	Rainfall	Events										disease risk.
	Naiman	Observations		no	S	S	S		х	х		
		and Outlook		consistent								
0	11			signal	1. Y				n (4			0.0
		Analysis of	no		no	no	S	no	no	no		T
		Past El Niño	consistent		consistent	and the second second		consistent	consistent	consistent	🐐 🚳 🔄 😭 🚺	
		Events	signal		signal	signal		signal	signal	signal		
	Temperature	Observations	E	no	N	S	no	no	x	х		Drought results in
		and Outlook		consistent			consistent	consistent				reduced Maize yield
Nigeria				signal			signal	signal				Drought-related
		Analysis of	no	N	no	no	S			no		migration increases r of spreading infectio
		Past El Niño Events	consistent signal		consistent signal	consistent signal				consistent signal		disease.
	Rainfall		Signal	no	Signal	no	S	S	x	X		discuse.
		Observations	Ŭ	consistent	222	consistent		Ŭ	<u> </u>	0		
		and Outlook		signal		signal						
		Analysis of	no	no	S	S		no	no	no		1
		Past El Niño	consistent	consistent				consistent	consistent	consistent		
	Temperature	Events	signal	signal		0	0	signal	signal	signal		
	111111	Observations		no consistent	N	S	S	no consistent	x	x		Cinnificaneth (Inco en in
A REAL PROPERTY.		and Outlook		signal				signal				Significantly less rain May-Jun major rain
Ghana		Analysis of	S	no			S	S	S	no		Reduced water
		Past El Niño		consistent						consistent		availability and droug
	Rainfall	Events		signal						signal		
	Naman	Observations	S	no	S	no	S		х	х		
		and Outlook		consistent		consistent						
	<u>.</u>			signal		signal			50			+
		Analysis of Past El Niño		no consistent			no consistent	no consistent	no consistent	no consistent		
		Events		signal			signal	signal	signal	signal		
	Temperature				no		no	no	X	X		
		Observations			consistent		consistent	V62826		3,0		
Sierra Leone	02	and Outlook			signal		signal	signal				Some risk of drough Reduced Rice and Ma
acita Leofle	8	Analysis of	no	no			no	no	no	no		crop yields.
		Past El Niño	consistent				consistent	2000 (1990) (1990) 1990 (1990) (1990) (1990) (1990) (1990) (1990) (1990) (1990) (1990) (1990) (1990) (1990) (1990) (1990) (1990) (1 1990) (19900) (1990) (1990) (1990) (1990) (1990) (1990) (19	consistent	A. 6. 2 19 19 19 19 19 19 19 19 19 19 19 19 19		- sp yread.
	Rainfall	Events	signal	signal			signal	signal	signal	signal		
		Observations		no consistent	no consistent		no consistent		x	x		
		and Outlook		signal	signal		signal					



3.3 East Africa

				SON	DIC	r hc	MAM	ALL	2016	SON		
Country	Variable	Туре	JJA 2015	2015	DJF 1	5/16 Feb-16	2016	JJ 2016	Aug-16	2016	Risk	Evidenced Impacts
country	Valiable	Analysis of		no	05 2010	160-10	-	5 2010	Aug-10	no		Evidenced impacts
	Temperature	Past El Niño Events		consistent signal						consistent signal		
	remperature	Observations and Outlook						no consistent	х	х		Risk of flooding causi damage to infrastruct
East Africa		Analysis of					no	signal				and displacement o people. Increase risk
	Rainfall	Past El Niño Events					consistent signal					Rift Valley Fever, Mala and Cholera.
	Naman	Observations		no			no	no	x	х		
		and Outlook		consistent signal			consistent signal	consistent signal				
		Analysis of	1				8 28	no	no	no		1
		Past El Niño						consistent	consistent			
	Temperature	Events			E	SE	NE	signal	signal	signal		
		Observations and Outlook			E	SE	INE	no consistent signal	x	x		Risk of flooding causi displacement of peop
Ethiopia		Analysis of	no	E			no			W		Increase incidence of Valley Fever, Malari
	100000000	Past El Niño Events	consistent signal				consistent signal					and Cholera.
	Rainfall	Observations	N			E	no	W	х	x		
		and Outlook					consistent signal					1
		Analysis of	no	no	SE	SE	SE	no	no	no		1
		Past El Niño	consistent	consistent				consistent	consistent	consistent		1
	Temperature	Events	signal	signal		S	no	signal no	signal X	signal X		1
		Observations and Outlook					consistent	consistent				Flooding affecting
South Sudan		2010/10342-51 (3480-3710) 			SE	SE	signal	signal				infrastructure and acc to basic relief for
		Analysis of Past El Niño	no consistent	no consistent		SE						vulnerable people.
	Rainfall	Events	signal	signal								
	200000000000000	Observations	no consistent	no consistent	no consistent	no consistent	no consistent		х	x		
		and Outlook	signal	signal	signal	signal	signal					
		Analysis of	no	no	no	no	no	no	no	no		
	397 B	Past El Niño Events	consistent signal	consistent signal	consistent signal	consistent signal	consistent signal	consistent signal	consistent signal	consistent signal	TA INC.	
	Temperature -	Observations	no		E		no	no	x	x		
		and Outlook	consistent signal				consistent signal	consistent signal				Flooding affecting acc to food. Increase risk
Kenya	· · · · · ·	Analysis of	no		-		no	Signal		no		Rift Valley Fever, Mala
		Past El Niño	consistent				consistent			consistent		and diarrhoea.
	Rainfall	Events	signal W	по	-		signal no	W	х	signal X		
		Observations and Outlook		consistent			consistent			100		
		Analysis of	no	signal no	no	no	signal	no	no	no		
		Past El Niño	consistent	consistent				consistent	consistent	11 S G D D D S 11		
	Temperature	Events	signal	signal	signal	signal	no	signal no	signal X	signal X		
		Observations and Outlook					consistent	consistent				Significant displaceme of people following
Uganda		Analysis of	no				signal no	signal				flooding and landslid
		Past El Niño	consistent				consistent					Increase risk of Chole and highland Malari
	Rainfall	Events	signal				signal					and ingritatio materi
		Observations		no consistent		no consistent	no consistent		х	х		
		and Outlook		signal	-	signal	signal			-		
		Analysis of Past El Niño	no	no consistent	N	N		E	E	NE		
	Temperature	Events	signal	signal								
	remperature	Observations		no			N	no	x	x		
		and Outlook		consistent signal		_		consistent signal				Continuous heavy rai causing river bank
Somalia		Analysis of	no	S	N	N	no	1		no		collapse and floodin
	2007200420000	Past El Niño Events	consistent signal				consistent signal			consistent signal		Increase risk of RVF
	Rainfall	Observations	no	no			no	no	х	Х		1
		and Outlook	consistent signal	1 1 2 1 H 1			consistent signal	consistent signal				1
		Analysis of	signal no	signal no			signal no	NW	NW	no		1
		Past El Niño	consistent	consistent			consistent			consistent	🔇 🞯 🛈 🌮 🏹 🖏	1
	Temperature	Events	signal	signal		no	signal no	no	х	signal X		1
		Observations and Outlook				consistent	consistent	consistent				Flooding and mudslid
Sudan	ļ					signal	signal	signal		6		cause displacement people and affects
		Analysis of Past El Niño	no consistent		no consistent	no consistent	no consistent	NE	NE	S		access to food.
	Rainfall	Events	signal		signal	signal	signal					19.000 MAR 6000 MAR 6
	00.00000000000	Observations	no consistent	no consistent	no consistent	N	N	no consistent	x	x		1
		and Outlook	signal	signal	signal			signal				
							-		_			



	Terreture	Analysis of Past El Niño Events		NW	no consistent signal	no consistent signal		E	E	no consistent signal	
Tanzania	Temperature	Observations and Outlook			E	no consistent signal	no consistent signal	no consistent signal	x	x	Flooding during el Niño peak. Warm temperatures during
Rainfall	Analysis of Past El Niño Events					no consistent signal	no consistent signal	no consistent signal	SE	Mar-May lead to decreased crop productivity. Increase RVF risk.	
	Nannan	Observations and Outlook	no consistent signal	no consistent signal	E	no consistent signal	no consistent signal	no consistent signal	x	x	NVI IIJA.
	Temperature	Analysis of Past El Niño Events	no consistent signal		no consistent signal	no consistent signal		no consistent signal	no consistent signal	no consistent signal	
-	remperature	Observations and Outlook	no consistent signal	no consistent signal	no consistent signal		no consistent signal	no consistent signal	x	х	Flooding destroys home and schools and leads to large numbers being
Rwanda	Rainfall	Analysis of Past El Niño Events					no consistent signal	no consistent signal	no consistent signal	no consistent signal	displaced. Increased incidents of highland Malaria.
	nainfall	Observations and Outlook	no consistent signal	no consistent signal	no consistent signal	no consistent signal	no consistent signal		x	x	Anno 2012/2012/10

3.4 Central Africa

			JJA 2015	SON	DJF 1	5/16	мам	JJA 2	2016	SON		
Country	Variable	Туре	JJA 2015	2015	DJ 2016	Feb-16	2016	JJ 2016	Aug-16	2016	Risk	Evidenced Impacts
	Temperature	Analysis of Past El Niño Events	no consistent signal					no consistent signal	no consistent signal	no consistent signal		electron ductors
Control Africa	remperature	Observations and Outlook			no consistent signal		no consistent signal	no consistent signal	x	x		Flooding during developing phase. Increased Rift Valley Fever risk. Reduced crop productivity during hot temperatures in decaying phase.
Central Africa	Rainfall	Analysis of Past El Niño Events					no consistent signal			no consistent signal		
	raintâli	Observations and Outlook	no consistent signal	no consistent signal	no consistent signal		no consistent signal	no consistent signal	x	x		uccaying phase.
	Temperature	Analysis of Past El Niño Events	no consistent signal	S				no consistent signal	no consistent signal	no consistent signal		
Democratic	remperature	Observations and Outlook			no consistent signal		no consistent signal	no consistent signal	x	x		
Republic of Congo R	Rainfall	Analysis of Past El Niño Events	SE	no consistent signal	no consistent signal	no consistent signal	no consistent signal	S	S	N		
	rantali	Observations and Outlook	NW	no consistent signal	no consistent signal		no consistent signal	no consistent signal	x	x		



3.5 MENA – Middle East and North Africa

				SON	DIE	15/16	MAM	, ALL	2016	SON		
Country	Variable	Туре	JJA 2015	2015	DJ 2016	Feb-16	2016	JJ 2016	Aug-16	2016	Risk	Evidenced Impacts
country	Valiable	Analysis of Past El Niño		no consistent	072010		no consistent		Aug 10	no consistent		Enacheed impacts
	Temperature	Events	no	signal no		no	signal	no	x	signal X		Potential for flooding
MENA		Observations and Outlook	consistent signal	020305 181		consistent signal		consistent signal				before el Niño peak. Potential for drought
		Analysis of Past El Niño Events	no consistent signal									following peak, resulting in reduced crop productivity.
	Rainfall	Observations	no	no consistent	no consistent	no consistent			х	x	9	
		and Outlook	signal	signal	signal	signal						
	6	Analysis of Past El Niño	no consistent	no consistent	no consistent	no consistent		W	W	no consistent		
	Temperature	Events	signal no	signal	signal S	signal no	S	S	х	signal X		
Libya		Observations and Outlook	consistent signal			consistent signal				2000		
Libya		Analysis of Past El Niño	no consistent		no consistent	no consistent	no consistent			N		
	Rainfall	Events	signal no	no	signal no	signal no	signal no	no	Х	x		
		Observations and Outlook	consistent signal	consistent signal	consistent signal	consistent signal	consistent signal	consistent signal				
		Analysis of Past El Niño	no consistent	no consistent	no consistent	no consistent	no consistent	SW	SW	no consistent		
	Temperature	Events	signal	signal	signal	signal	signal	no	x	signal X		
		Observations and Outlook					10,003	consistent signal		Â		Agricultural land and houses flooded during e
Egypt	0.	Analysis of Past El Niño	no consistent		N	N	N	Ē	E	N		Niño peak. Reduction ir Maize and Wheat crop yields.
	Rainfall	Events	signal no		no	no	no	no	X	x		yicius.
		Observations and Outlook	consistent signal		consistent signal	consistent signal	consistent signal	consistent signal				
		Analysis of Past El Niño	no consistent	no consistent			no consistent	S	S	no consistent	¥ 🚯	
	Temperature	Events	signal no	signal			signal no	S	x	signal X		
		Observations and Outlook	consistent signal				consistent signal					Affected by reduced
Algeria		Analysis of Past El Niño	W	E	no consistent	no consistent	no consistent	no consistent	no consistent	no consistent		crop productivity and drought.
	Rainfall	Events	S	no	signal no	signal no	signal no	signal no	signal X	signal X		
		Observations and Outlook		consistent signal	consistent signal	consistent signal	consistent signal	consistent signal		20228		
	0	Analysis of Past El Niño		no consistent	no consistent	no consistent	no consistent			no consistent		
	Temperature	Events	no	signal	signal no	signal no	signal no	no	x	signal X		
Lebanon		Observations and Outlook	consistent signal		consistent signal	consistent signal	consistent signal	consistent signal				Flooding and high winds during el Niño peak
Lebanon		Analysis of Past El Niño	no consistent									destroys infrastructure and disrupts power.
	Rainfall	Events	signal no	2	no	no	no	no	X	x		
		Observations and Outlook	consistent signal		consistent signal	consistent signal	consistent signal	consistent signal				
		Analysis of Past El Niño	E	no consistent	no consistent	no consistent	no consistent	no consistent	no consistent	no consistent		
	Temperature	Events	no	signal	signal no	signal no	signal no	signal no	signal X	signal X		
Jordan		Observations and Outlook	consistent signal		consistent signal	consistent signal	consistent signal	consistent signal				Flash flooding experienced before el
Joidan	6	Analysis of Past El Niño	no consistent									Niño peak.
	Rainfall	Events	signal no	8	no	no		no	х	x		
		Observations and Outlook	consistent signal		consistent signal	consistent signal		consistent signal				
		Analysis of Past El Niño	no consistent	no consistent	no	no consistent	no consistent			no consistent		
	Temperature	Events	signal no	signal	signal no	signal no	signal no	no	x	signal X		
Palestinian		Observations and Outlook	consistent signal		rio consistent signal	consistent signal	consistent signal	consistent signal	Â	^		
Faicsundi		Analysis of	no									
Territories		Past El Niño	1000									
	Rainfall		consistent signal no		no	no		no	x	x		



	Temperature	Analysis of Past El Niño Events	S	no consistent signal	no consistent signal	no consistent signal	no consistent signal			no consistent signal	
Syria	remperature	Observations and Outlook	no consistent signal			no consistent signal	no consistent signal	no consistent signal	x	x	Heavy rain causing flooding prior to peak. Drought following el
Syria	Rainfall	Analysis of Past El Niño Events	no consistent signal				W			no consistent signal	Niño, reduced water availability.
C a	Observations and Outlook	no consistent signal		no consistent signal	no consistent signal		no consistent signal	х	x		
	Temperature	Analysis of Past El Niño Events	w	no consistent signal							
Iraq	remperature	Observations and Outlook	no consistent signal			signal	no consistent signal	no consistent signal	x	x	Flooding destroyed infrastructure and
n aq	Rainfall	Analysis of Past El Niño Events	no consistent signal		NW	NW	no consistent signal			S	causes displacement o people.
	Kannan	Observations and Outlook	no consistent signal	N		no consistent signal		no consistent signal	х	x	
	Temperature	Analysis of Past El Niño Events	no consistent signal		no consistent signal	no consistent signal	no consistent signal	no consistent signal	no consistent signal	no consistent signal	
Afghanistan	remperature	Observations and Outlook	no consistent signal		no consistent signal	no consistent signal		no consistent signal	x	x	Potential for flooding during developing phas of el Niño causing
AIGNOIDSCOIL	Rainfall	Analysis of Past El Niño Events	no consistent signal		N	N	N			N	damage to crops, livestock and homes.
	Naimaii	Observations and Outlook	no consistent signal			no consistent signal	no consistent signal	no consistent signal	x	x	

3.6 Indonesia

			JJA 2015	SON	DJF 1	15/16	мам	JJA	2016	SON		
Country	Variable	Туре		2015	DJ 2016	Feb-16	2016	JJ 2016	Aug-16	2016	Risk	Evidenced Impacts
Indonesia –	Rainfall -	Analysis of Past El Niño Events		S				no consistent signal	no consistent signal	no consistent signal	t Developing	Drought during developing phase, reduction in water availability, crop production, threat of forest fires with health- related risk. Flooding and landslides following peak with increased Dengue Fever.
		Observations and Outlook	no consistent signal						x	x		
		Analysis of Past El Niño Events					no consistent signal					
		Observations and Outlook					no consistent signal		x	х		



3.7 Southeast Asian Peninsular

			JJA 2015	SON	DJF 1	15/16	MAM	ALL	2016	SON		48
Country	Variable	Туре	36 2013	2015	DJ 2016	Feb-16	2016	JJ 2016	Aug-16	2016	Risk	Evidenced Impact
		Analysis of	no		no	no				· · · ·		
		Past El Niño	consistent		consistent	consistent					¥ 🚳 回 🏠 🕦 🚳	
	Temperature	Events	signal		signal	signal						
	remperature	Observations				no			Х	Х		
Southeast		and Outlook				consistent						Increased risk of dro
Asian		and Outlook				signal						and forest fires. Redu
Peninsular		Analysis of	no	no				no	no	no		crop productivity
cimbala		Past El Niño	consistent	consistent				consistent	consistent	consistent		crop productinty
	Rainfall	Events	signal	signal				signal	signal	signal		
	rumun	Observations		no	no	no			х	х		
		and Outlook		consistent	consistent							
		and Outlook		signal	signal	signal				10 V		5
13			0				KIT A			-		
		Analysis of	SE	no	no	no	NW	no	no	no		
		Past El Niño		consistent	consistent	consistent		consistent	consistent			
	Temperature	Events		signal S	signal	signal		signal S	signal	signal		
		Observations	no consistent	5	N	no	no		x	x		Flooding resulting
		and Outlook	signal			consistent signal	consistent signal					displacement of peo
China	-	Analysis of	no	SE	SE	SE	N	SE	SE	N		Reduction in Maize
Rainfall		Past El Niño	consistent	OL	OL	OL.	IN	OL	OL.	IN		productivity. Increa
		Events	signal									risk of dysentery in e
	Rainfall	Lycius	no	S	SE	N	SE	no	х	Х		227 26560
		Observations	consistent	Ŭ			UL	consistent	^	Ŷ		
	and Outlo	and Outlook	signal					signal	6			
		Analysis of	no				no	N	N			
		Past El Niño	consistent				consistent	1000			A Company and A Compan	
		Events	signal				signal					
	Temperature		no	no		no			х	х		
		Observations	consistent	consistent		consistent			(34753)	2.5		
		and Outlook	signal	signal		signal						Increase incidences
Vietnam		Analysis of	no	no	N	N		N	N	no		forest fire and smol
		Past El Niño	consistent	consistent						consistent		related deaths.
	Rainfall	Events	signal	signal						signal		
	Namian	Observations			N	S			х	Х		
		and Outlook										
		Analysis of	no	no	no	no	no			no		
		Past El Niño	consistent	consistent	consistent	consistent	consistent			consistent	¥ 🚯 📵 🕕	
	Temperature	Events	signal	signal	signal	signal	signal		-	signal		
	Sector Constrained	Observations	no	no	S	S			x	x		Affected by moder
		and Outlook	consistent	consistent								drought and reduction
Myanmar (Ruma)	-		signal	signal		1).	0		220	NIM		Maize and Rice cro
(Burma)		Analysis of	no	no	no	no	S	no	no	NW		Increase risk of Cho
		Past El Niño Events	consistent signal	consistent signal	consistent signal	consistent signal		consistent signal	consistent signal			and Malaria.
	Rainfall	Events	-	Signal		SiBugi	S	signal	signal X	x		
		Observations	no consistent		no consistent		3	3	^	^		
		and Outlook	signal		signal							
		e for Wall	SIGLIGI		JIGI IGI							



3.8 Southern Asia

1121 88	1000 00000		JJA 2015	SON 2015		15/16	MAM 2016		2016	SON 2016	1933.03	
Country	Variable	Туре			DJ 2016	Feb-16		JJ 2016	Aug-16		Risk	Evidenced Impact
		Analysis of		no	no	no	no			no	V Developing	
		Past El Niño Events		consistent	1000 2 S	122. 922	122 54			consistent	Developing	Below normal monso
	Temperature	Lvents		signal	signal	signal	signal	no	x	signal X		rainfall, drought risk a
		Observations						consistent		~		reduced crop
		and Outlook						signal				productivity during
outhern Asia		Analysis of		no			no	no	no		Decaying	developing phase. Potential for floodir
		Past El Niño		consistent			consistent		consistent		est of the second secon	following peak wit
	Rainfall	Events	-	signal			signal	signal	signal	×		increased Cholera a
	0.000.0000.000	Observations		no consistent	no consistent	no consistent	no consistent	no consistent	x	x		Malaria risk.
		and Outlook		signal	signal	signal	signal	signal				
	·											
		Analysis of	N	S	no	no	no	W	W	no		
		Past El Niño			consistent	111110000000000000000000000000000000000	1 - 5 - 6 - 6 - 6 - 6 - 6 - 6 - 6 - 6 - 6			consistent		
	Temperature	Events			signal	signal	signal			signal		Slow onset of monso
		Observations	S					no	x	х		in developing phase
		and Outlook						consistent signal				drought risk and redu
India		Analysis of	N	no			no	S	S			Soybean crops.
		Past El Niño		consistent			consistent					Increased water
	Rainfall	Events		signal			signal					availability and reduce rice crop failure in sou
	Naimaii	Observations	SW		no	no	no	no	х	х		nce crop failure in soc
		and Outlook			consistent			consistent				
		Carlog Constraints and Constraints			signal	signal	signal	signal				-
		Analysis of Past El Niño			no consistent	no consistent	no consistent	no consistent	no consistent	no consistent		
	Events			signal	signal	signal	signal	signal	signal	48		
	Temperature		no	по	no	no	Jightar	SiBuar	X	X		
		Observations	consistent	consistent	consistent	consistent			0521	0.000		Affected by drought
Pakistan	2	and Outlook	signal	signal	signal	signal			_			North. Increased risk
Fakistan		Analysis of	N			i i i	no			NE		Malaria epidemics af
		Past El Niño					consistent					el Niño peak.
	Rainfall	Events					signal		×	×		
		Observations	no consistent	no consistent	no consistent	no consistent	no consistent	no consistent	x	x		
		and Outlook	signal	signal	signal	signal	signal	signal				
		Analysis of	no	no			no	no	no			
		Past El Niño	consistent	consistent			consistent	consistent	consistent			
	Temperature	Events	signal	signal		. J	signal	signal	signal			
		Observations	no		no	no		no	x	х		
		and Outlook	consistent signal		consistent	10.000		consistent				Drought risk in
Bangladesh	-	Analysis of	no		signal no	signal no	-1. I	signal no	no			developing phase. Increase Cholera ris
		Past El Niño	consistent		consistent	consistent		consistent	consistent			after peak.
	Rainfall	Events	signal		signal	signal		signal	signal			
	Naimaii	Observations	no	no	no		no	no	х	х		
		and Outlook	consistent	consistent			consistent	- ^				
			signal	signal	signal		signal	signal				
		Analysis of Past El Niño	no consistent		no consistent	no consistent	no consistent	no consistent	no consistent		A	
	9975 /8	Past El Nino Events	signal		signal	signal	signal	signal	signal			
	Temperature	1000 at 1	- Sum		no	2.Buar	Signal	no	X	x		
		Observations			consistent			consistent				
Nepal		and Outlook			signal			signal				
webai		Analysis of	no		no	no	no	no	no			
		Past El Niño	consistent		consistent			consistent	consistent			
	Rainfall	Events	signal		signal	signal	signal	signal	signal			
	Conservation of the	Observations	no	no	no	no	no	no	x	x		
		and Outlook	consistent signal	signal	consistent signal	consistent signal	signal	consistent signal				
		A CONTRACTOR OF A CONTRACT OF	3161101	3-Budi	Signar	SIELIOI	alenar	aignui		S		



3.9 Caribbean

			JJA 2015	SON	DJF 1	5/16	MAM	AIL	2016	SON		
Country	Variable	Туре	JJA 2015	2015	DJ 2016	Feb-16	2016	JJ 2016	Aug-16	2016	Risk	Evidenced Impacts
	Temperature	Analysis of Past El Niño Events	no consistent signal	E	E	E	E			no consistent signal	Developing	Risk of drought and
Caribbean	remperature	Observations and Outlook	no consistent signal						х	х		reduced water availability during
	Rainfall	Analysis of Past El Niño Events	no consistent signal		E	E	no consistent signal	NW	NW	NW	Decaying	developing phase. Potential for flooding following peak. Increase risk of Dengue Fever.
		Observations and Outlook			N	E		S	x	x		hist of Deligue rever
	Temperature	Analysis of Past El Niño Events	no consistent signal		S	S		no consistent signal	no consistent signal	no consistent signal		
Guuana	remperature	Observations and Outlook	no consistent signal						х	x		Increased drought rist during developing phas
Guyana	Rainfall	Analysis of Past El Niño Events	no consistent signal				N			no consistent signal		Reduction in Maize an Rice crops. Potential increase in Malaria.
	nainfall	Observations and Outlook	no consistent signal						х	х		

3.10 British Overseas Territories

			JJA 2015	SON	DJF 1	15/16	MAM	JIA 2	2016	SON		
Country	Variable	Туре	JJA 2015	2015	DJ 2016	Feb-16	2016	JJ 2016	Aug-16	2016	Risk	Evidenced Impacts
	Temperature	Analysis of Past El Niño Events	no consistent signal	no consistent signal			no consistent signal	no consistent signal	no consistent signal	no consistent signal		
northern subtropical Atlantic		Observations and Outlook	no consistent signal			no consistent signal		no consistent signal	х	x		Increase hurricane activity (north of the normal development
	Rainfall	Analysis of Past El Niño Events	no consistent signal							no consistent signal		region in Caribbean). Potential increase Dengue Fever.
		Observations and Outlook	no consistent signal	no consistent signal				no consistent signal	х	х		
	Temperature -	Analysis of Past El Niño Events			S	S	no consistent signal	no consistent signal	no consistent signal	no consistent signal		
southern		Observations and Outlook		no consistent signal			no consistent signal	no consistent signal	x	x		Potential for Island flooding during peak. Potential for large
outh Atlantic	Rainfall	Analysis of Past El Niño Events	no consistent signal	S	N	N	no consistent signal					temperature departure from the mean.
	Naniidii	Observations and Outlook	no consistent signal	no consistent signal			no consistent signal	no consistent signal	х	х		



3.11 Southern Europe

	Variable		JJA 2015	SON	DJF 1	5/16	MAM	JJA 2	2016	SON		49.
Country	Variable	Туре	JJA 2013	2015	DJ 2016	Feb-16	2016	JJ 2016	Aug-16	2016	Risk	Evidenced Impact
Tr Southern Europe		Analysis of Past El Niño Events	no consistent signal	no consistent signal			no consistent signal	no consistent signal	no consistent signal	no consistent signal	*	
	Temperature	Observations and Outlook		no consistent signal			no consistent signal	no consistent signal	х	x		
	Painfall	Analysis of Past El Niño Events			no consistent signal	no consistent signal	no consistent signal			no consistent signal		
	Rainfall	Observations and Outlook	no consistent signal	no consistent signal		no consistent signal	no consistent signal	no consistent signal	X	x		

3.12 Indian Ocean

			JJA 2015	SON	DJF 1	5/16	MAM	JJA	2016	SON		
Country	Variable	Туре	JJA 2013	2015	DJ 2016	Feb-16	2016	JJ 2016	Aug-16	2016	Risk	Evidenced Impact
Central Indian Ocean	Temperature Past EI N Event Observal and Outi Past EI N Past EI N Event Observal	Analysis of Past El Niño Events	no consistent signal									
		Observations and Outlook						no consistent signal	x	x		
		Analysis of Past El Niño Events	no consistent signal		no consistent signal	no consistent signal				no consistent signal		
		Observations and Outlook	no consistent signal					no consistent signal	х	x		

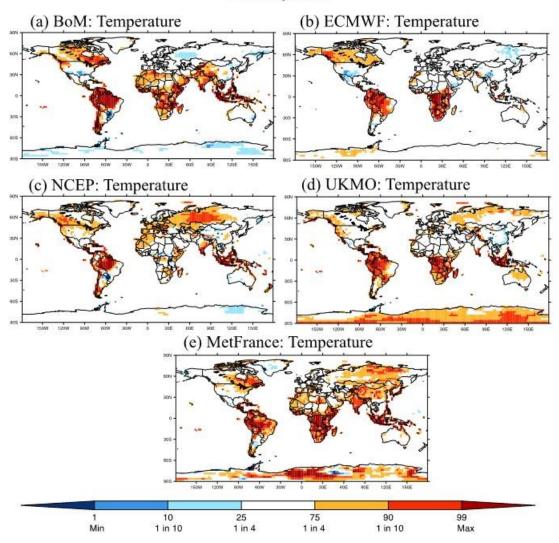
3.13 Pacific Ocean

			JJA 2015	SON	DJF 1	15/16	MAM	JIA	2016	SON		
Country	Variable	Туре	34 2013	2015	DJ 2016	Feb-16	2016	JJ 2016	Aug-16	2016	Risk	Evidenced Impacts
Central Pacific	Temperature Rainfall	Analysis of Past El Niño Events						no consistent signal	no consistent signal	no consistent signal		
		Observations and Outlook							x	x		Increase risk of flooding during the peak for
		Analysis of Past El Niño Events	no consistent signal				no consistent signal	no consistent signal	no consistent signal	no consistent signal		Islands in the South Pacific Convergence.
		Observations and Outlook				E	E	E	х	x		
Reading	National Centr Atmospheric S	clence Wal	ker 🐉								High Medium Potential	18-10



Annex 1 Forecast Maps

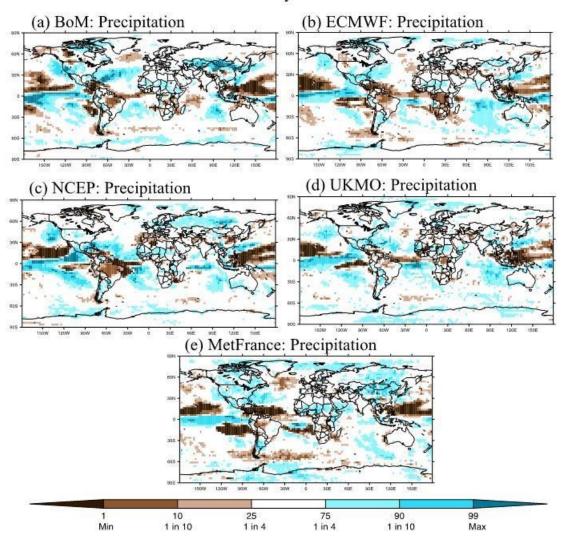
Figure A1.1 Forecast percentile maps for the Temperature. Blue colours show areas likely to be colder than normal, red colours show areas likely to be warmer (see explanation in section 2.1-2.2). These maps are based on forecasts from January 2016 and are compared to the observations for the period from February 1st 2016 to the end of the forecast (see section A2.1 for exact details for each model).



February 2016



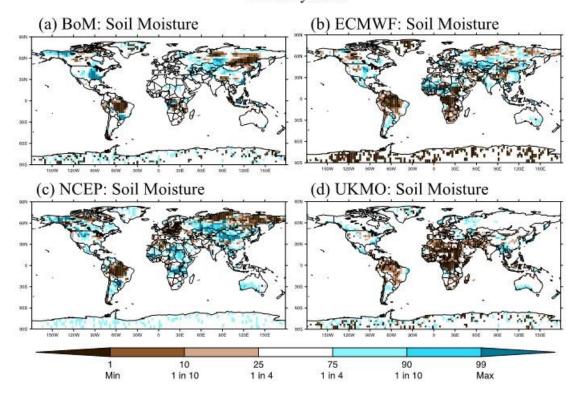
Figure A1.2 Forecast percentile maps for Rainfall. Blue colours show areas likely to be wetter than normal, brown colours show areas likely to be drier (see explanation in section 2.1-2.2). These maps are based on forecasts from January 2016 and are compared to the observations for the period from February 1st 2016 to the end of the forecast (see section A2.1 for exact details for each model).



February 2016



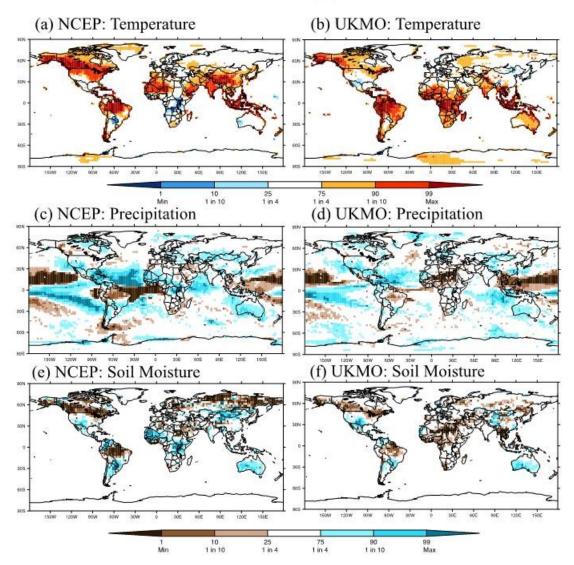
Figure A1.3 Forecast percentile maps for Soil Moisture. Blue colours show areas likely to be wetter than normal, brown colours show areas likely to be drier (see explanation in section 2.1-2.2). These maps are based on forecasts from January 2016 and are compared to the observations for the period from February 1st 2016 to the end of the forecast (see section A2.1 for exact details for each model).



February 2016

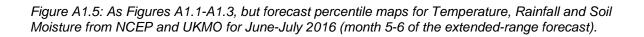


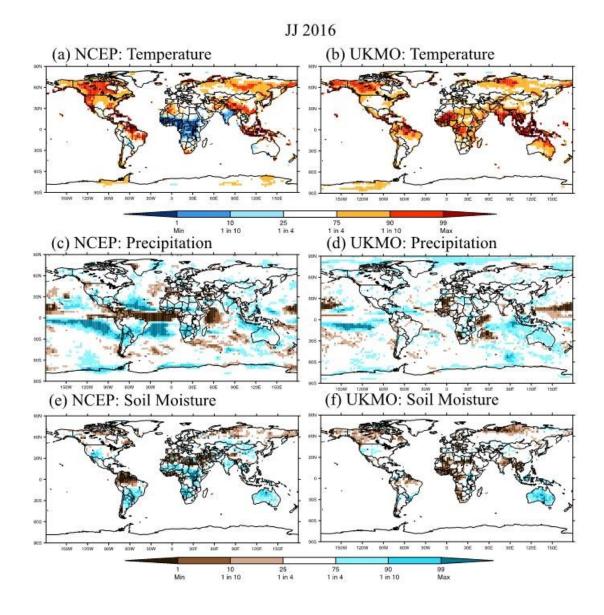
Figure A1.4: As Figures A1.1-A1.3, but forecast percentile maps for Temperature, Rainfall and Soil Moisture from NCEP and UKMO for March –May 2016 (months 2-4 of the extended-range forecast).



MAM 2016









Annex 2 Detailed Technical Methodology

A2.1 Data

The current tables are based on forecasts made in January 2016. The length and frequency of the forecast data available, as well as the climatological period available to calculate the anomalies from, differ between centres. These differences are summarised below, spilt by those models from which only the monthly forecast data is available (BoM, ECMWF and MetFrance) and those which have an extended-range forecast available for the next 6 months (NCEP, UKMO).

Monthly forecast data:

BoM forecasts are updated twice per week and run for 60 days. The forecasts are bias-corrected using hindcasts for 6th January with 33 ensemble members for the period from 1981-2013.

Current forecast start date: 7th January 2016 with 33 ensemble members.

ECMWF forecasts are updated twice per week and run for 46-days. The forecasts are bias-corrected using hindcasts for 7th January 2016 with 11 ensemble members for the period from 1996-2015.

Current forecast start date: 7th January 2016 with 51 ensemble members.

MetFrance forecasts are updated once per month and run for 60-days. The forecasts are bias-corrected using hindcasts for 1st January 2016 with 15 ensemble members for the period from 1993-2014.

Current forecast start date: 1st January 2016 with 51 ensemble members.

Extended-range seasonal forecast data:

NCEP: The hindcast period available, from which the forecast anomalies are calculated, is 1982-2010. For the hindcast, there is one start date (26^{yh} January 2016), with 4 ensemble members per day.

Current forecast period is 22^{nd} January 2016 – 27^{th} January 2016 with 7 ensemble members per day for 6 days (total 42 ensemble members).

UKMO: The hindcast period, from which the forecast anomalies are calculated, is 1996-2009. For the hindcast, there are five start dates (17^{th} , 25^{th} January 2016 and 1^{st} , 9^{th} February 2016), with 2 ensemble members per start date.

Current forecast period is $12^{th} - 21^{st}$ January 2016 with 2 ensemble members per day for 10 days (total 20 ensemble members).

Observational data for past seasons:

Observational data was used to analyse what has been observed over the two previous seasons (JJA 2015 and SON 2015). For Rainfall monthly data from the Global Precipitation Climatology Project (GPCP), Climate Prediction Centre Merged Analysis of Precipitation (CMAP) and Global Historical Climatology Network (GHCN) was used. For Temperature monthly data from GHCN and the Hadley Centre of the UK Met Office Climate Research Unit (HadCRUT) was used. These were compared with Rainfall, Temperature and Soil Moisture from the NCEP/NCAR Reanalysis.



A2.2 Methodology

To produce the forecast outlook information in the impact table the forecast anomaly, defined as the difference from that model's own climatological value at that location for the hindcast period available (see section A2.1 for details for each model), is compared to the distribution of observed anomalies for the same period as the forecast³. To make this comparison at each longitude and latitude between observations and the models, each data were interpolated onto a common 2.5 x 2.5 degree grid using a bilinear interpolation method.

This is a method of understanding where the forecast anomalies fall compared with the observed distribution of anomalies. This method is described schematically in the main report in Figure 2.1 with a worked example.

Forecast Period covered: The most up-to-date forecasts available have been used to make the final tables and maps. Only forecast information from 1st February 2016 onwards is shown on the monthly outlook maps. For example, for BoM forecasts - with a start date of 13th December - only information from January 1st onwards is used to create the forecast map shown in A1.1-A1.3.

CPC/IRI consensus forecast: http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

3

24

Note, this is a slightly different period in observations depending on the model.

