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Statement on the Status of Tanzania Climate in 2014

TANZANIA METEOROLOGICAL AGENCY
(TMA)

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Tanzania Meteorological Agency (TMA)

FOREWORD

Climate change is one of biggest challenges of the 21st century and is affecting global climate system. There is now strong and overwhelming evidence that global climate is changing. The evidence comes from direct measurements of rising surface air temperatures and subsurface ocean temperatures and from phenomena such as increases in average global sea levels, retreating glaciers, and changes to many physical and biological systems.

Trend analysis of meteorological parameters in most parts of the world has indicated a significant increase in temperature and a slight decrease in rainfall. In Tanzania, over the last few decades analysis indicates that, most parts of the country have experienced substantial increase in air temperature and slightly decrease in rainfall which was associated with devastating socio-economic implications. Efforts are required in monitoring the current state of the climate and establishing communication strategies that ensure the public, policy makers, the government and all stakeholders are well informed about the state of the climate and the associated socio-economic implications on regular basis. Tanzania meteorological Agency (TMA) issues series of “Statement on the Status of Tanzania Climate” on annual basis to ensure that public awareness on weather, climate and climate change is enhanced and that the Government, policy makers, scientific communities and all stakeholders are provided with up-to-date and reliable information about the status of the country climate.

This fourth issue of the statement provides comprehensive information on the status of climate in Tanzania for the year 2014, focusing on spatial distributions of maximum and minimum temperature; rainfall percentages and drought analysis; severe weather and extreme climate events; and their associated socio-economic implications.

TMA would like to encourage all stakeholders, including the general public to continue following up and utilize information from the statement on the status of the climate and contribute on reporting extreme weather events especially the localized ones. Also TMA is looking forward to receiving comments and suggestions for improvement of this statement.

Dr. Agnes Kijazi

Director General
Tanzania Meteorological Agency

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF PLATES

LIST OF ABREVIATIONS

TMA	Tanzania Meteorological Agency
ITCZ	Inter-Tropical Convergence Zone
SSTs	Sea Surface Temperature
IPCC	Inter-Governmental Panel for Climate Change
IRI	International Research Institute
OND	October, November and December
MAM	March, April and May

1.0 INTRODUCTION

Over the last few decades most parts of the country have experienced substantial increase in frequency and severity of droughts and floods that were associated with devastating socio-economic implications. Addressing these challenges requires concerted efforts in monitoring the current state of climate and establishing communication strategies that ensure the public, policy makers, the government and all stakeholders are well informed about the state of the climate and the associated socio-economic implications on regular basis. In order to ensure that awareness on weather, climate and climate change is enhanced, there is a need to provide up to-date and reliable information to all stakeholders on the status of the National climate.

Therefore Tanzania Meteorological Agency (TMA) issues annual report on the status of the climate in the country. The statement (report) provides detailed information on temperature anomalies; rainfall percentage, cumulative rainfall analysis and; severe weather and extremes climate events from January to December. The year 2014 observed some extended dry conditions over the northern part of the country during the months of January and February. Torrential rainfall observed during March to May rainfall season (long- rains) over the most parts of the country. This rainfall was mainly caused by a series of depressions and easterly waves over the cost of the Indian Ocean. The rainfall contributed to flooding in some regions of eastern and southern Tanzania.

The impacts of the observed rainfall were disastrous as some people were reported dead, hundreds displaced and some of the infrastructure and personal belongings were swept away by water. Therefore, it is essential to monitor climate change and variability; and their impacts for community preparedness and response. This statement provides spatial distribution of temperatures anomalies and rainfall percentage for the year 2014. It also includes cumulative rainfall plots for selected stations across climatic zones. Incidences of severe weather and extreme climate events; and their socio-economic impacts are also discussed.

Spatial and temporal temperature distribution are presented in section 2; annual and monthly rainfall percentages and cumulative rainfall analysis in 2014 are presented in section 3; the incidences of severe weather and extreme climatic events, and the associated socio-economic impacts are presented in section 4; Section 5 describes factors associated with severe weather and extreme climatic events and conclusion on the status of Tanzania climate in 2014 is presented in section 6.

2.0 Spatial and temporal temperature distribution in 2014

2.1 Annual maximum temperature anomalies

The year 2014 was characterized by above average temperature anomalies over most parts of the country, except the North-Eastern highlands (Arusha) characterized by below average maximum temperature anomaly. The average maximum temperature in 2014 was +0.6 °C above the long-term average (1971–2000), Figure 1.

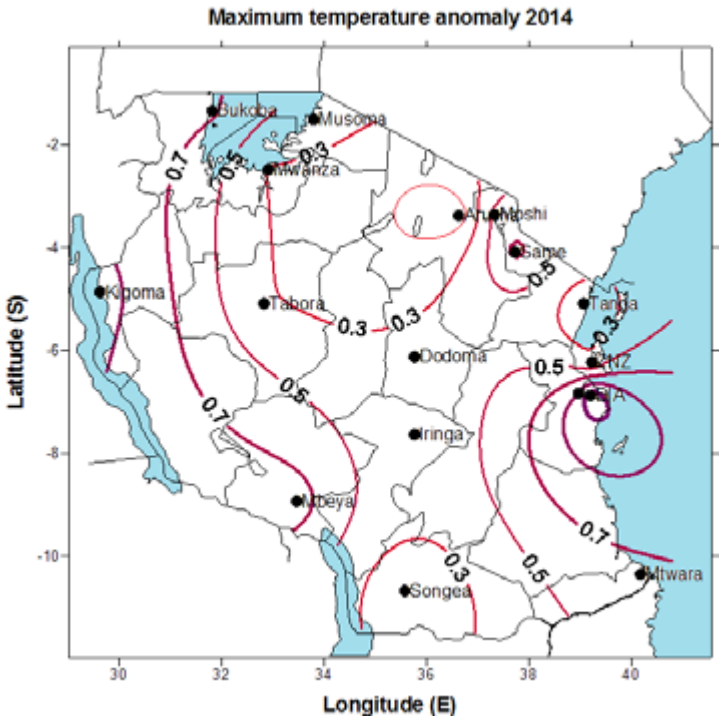

Figure 1: Annual maximum temperature anomalies (°C) in 2014

2.2 Monthly maximum temperature anomalies

Monthly maximum temperature in 2014 were above long-term average (1971-2000) by 0.6 ºC across the country from January to December, with the highest monthly maximum temperature anomaly of 2.5ºC observed in November at Dar es Salaam. In contrast, decreases in temperature anomaly were observed at North-Eastern highlands (Moshi, Same, Arusha and Tanga), during February and March, Figures 2a and 2b.

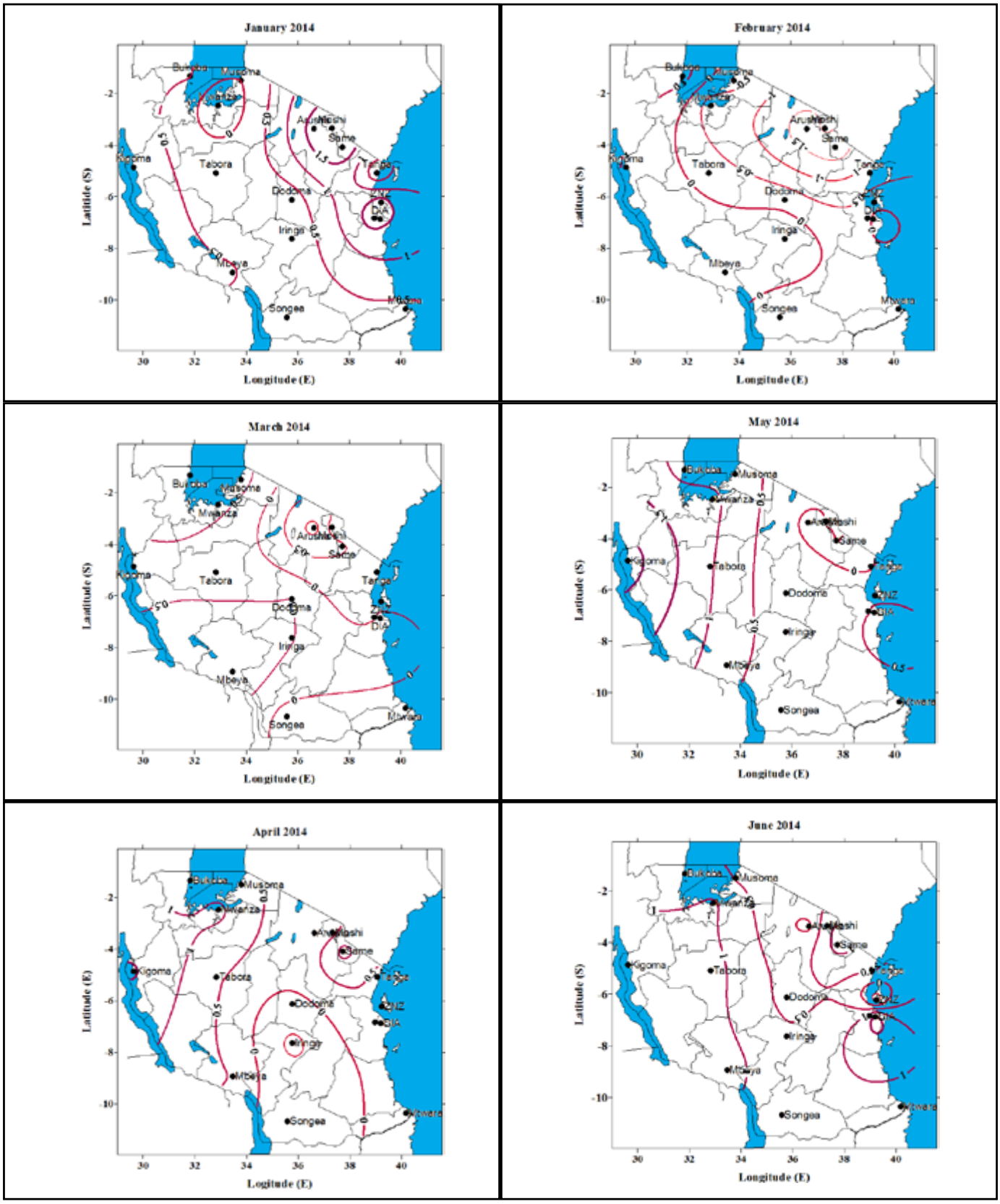

Figure 2a: Monthly maximum temperature anomalies (°C) from January – June 2 014

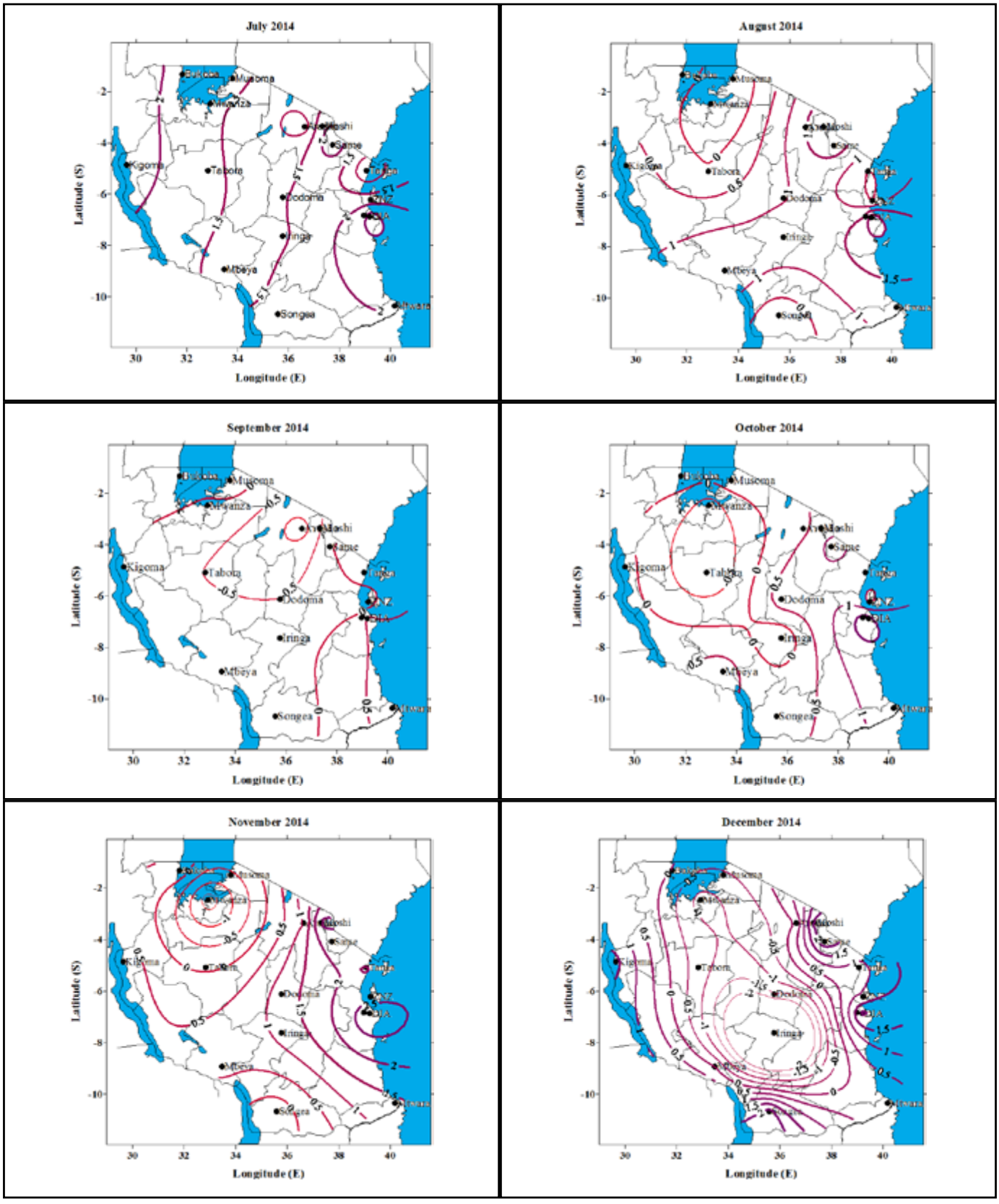

Figure 2b: Monthly maximum temperature anomalies (°C) from July-December 2014

2.3 Annual minimum temperature anomalies

The average annual minimum temperature was above long-term average (1971-2000) by 1.0 °C across the country. The presence of above average minimum temperature indicates nocturnal warming over the most parts of the country. In contrast, the southern part of the country (Songea) observed decrease in minimum temperature by 1.8°C below long-term average (1971-2000). The temperature was cooler compared to the previous year 2013 by 0.3 °C. (Figure 3)

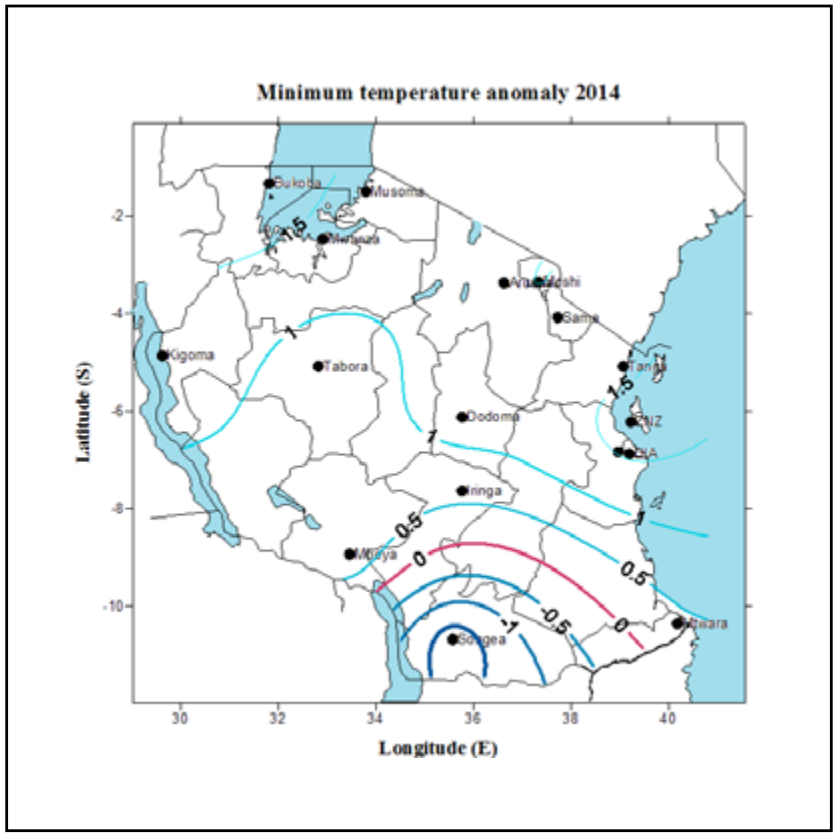

Figure 3: Annual minimum temperature anomalies (°C) in 2014

2.4 Monthly minimum temperature anomalies

Monthly minimum temperatures were above long-term average (1971-2000) over the most parts of the country. However, the southern part observed a decrease in minimum temperature anomalies from January to December except the month of August which experienced increase in temperature anomalies. The highest minimum tempeature anomalies of 2 °C was observed in June at Tabora Shinyanga, Kangera, Simiyu, Geita, nothern part of Mbeya and eastern part of Rukwa regions while the lowest minimum tempearature anaomaly was 2.0 °C , observed in May over Songea region (Figures 4a and 4b).

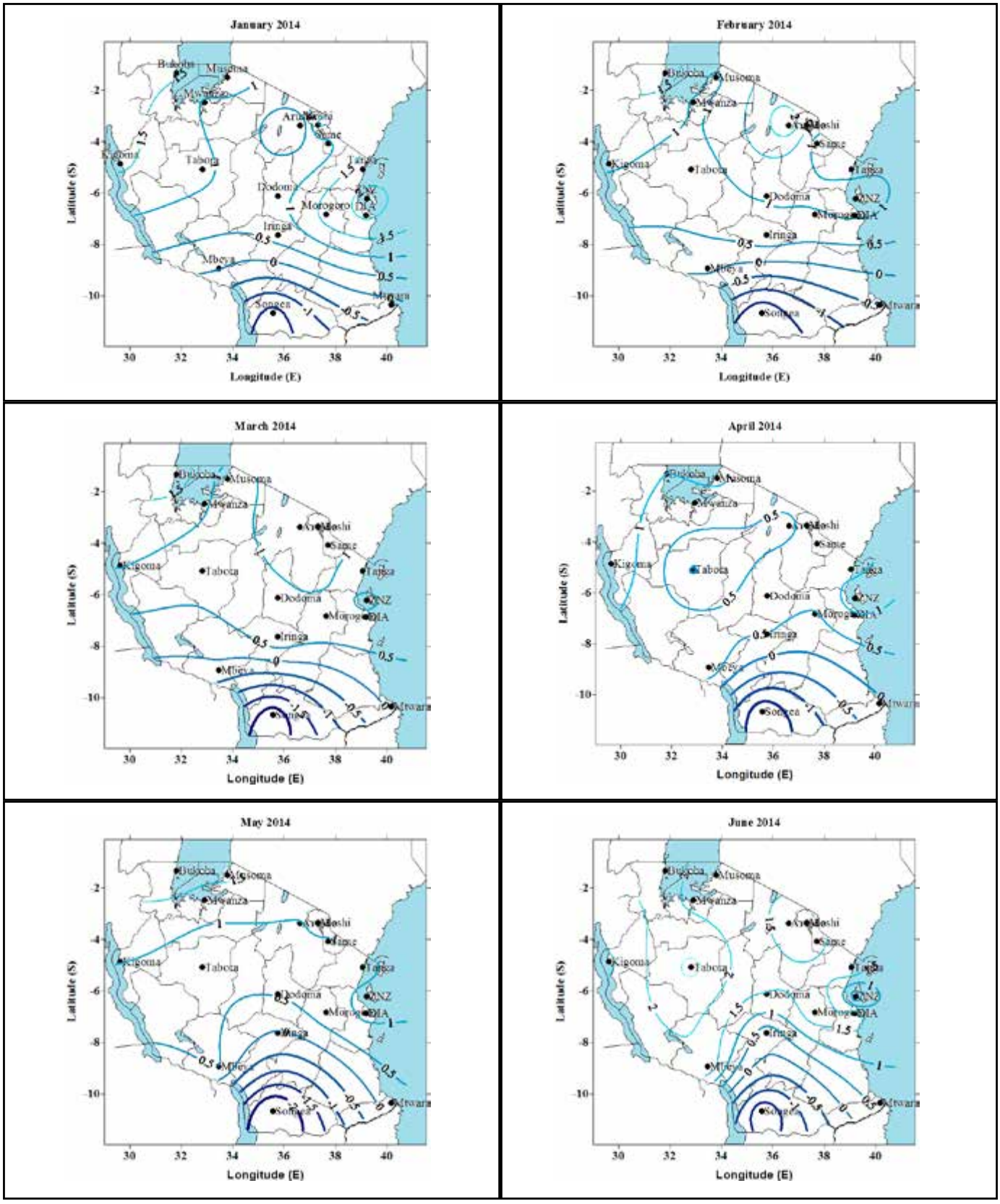

Figure 4a: Monthly minimum temperature anomalies (°C) for January- June, 2014

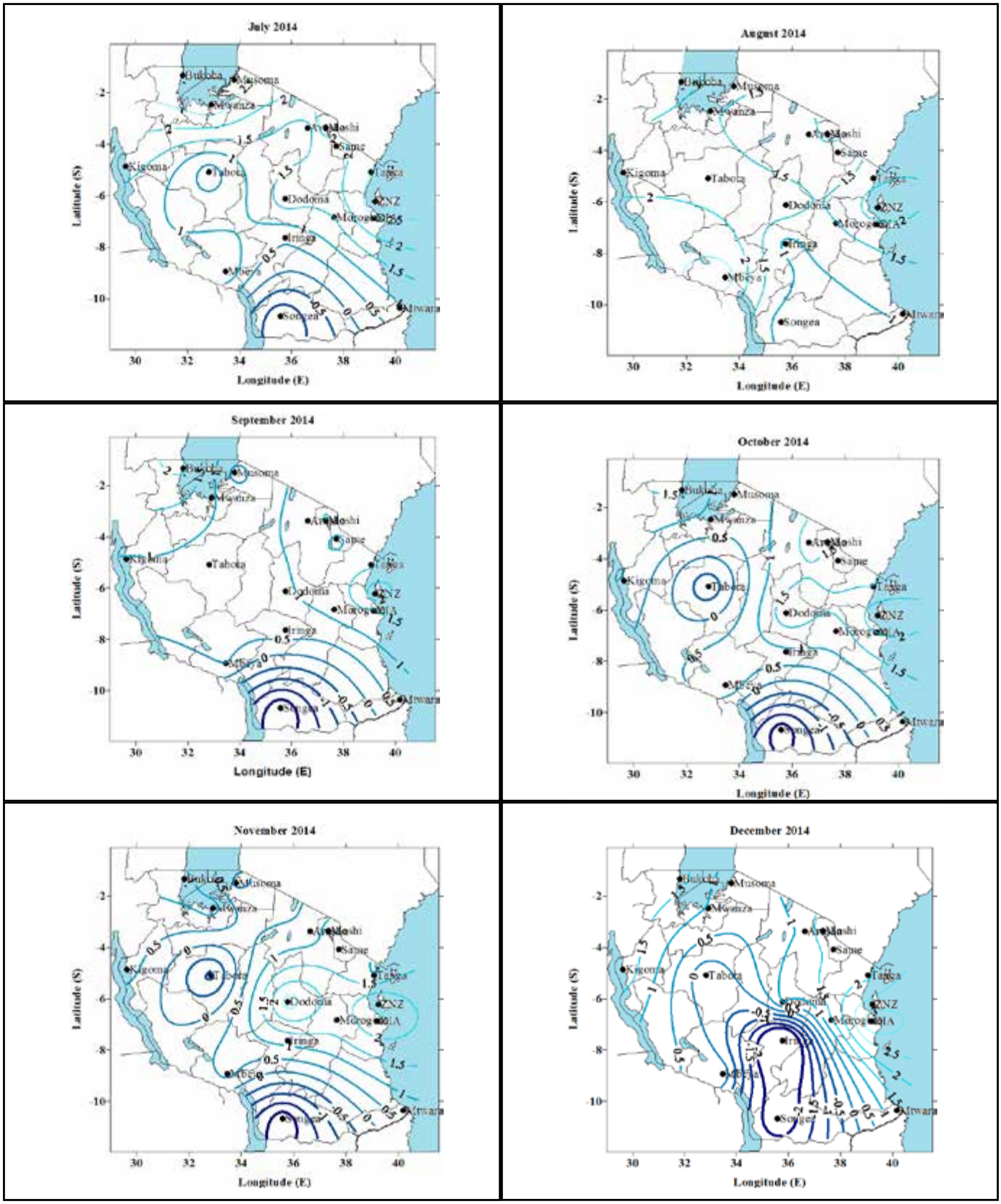

Figure 4b: Monthly minimum temperature anomalies (°C) for June- December 2014

3.0 Rainfall distribution in 2014

3.1 Annual rainfall distribution as percentage of the long-term average (1971-2000)

A summary of the rainfall distribution in 2014 as a percentage of the long-term average is presented. The long-term average is computed from the baseline period of 1971-2000. Percentages between 0 and 50 indicate extremely below normal rainfall, 51 and 74 below normal rainfall, 75 and 125 normal rainfalls while percentages greater than 125 indicate above normal rainfall.

In 2014 most parts of the country experienced normal rainfall. The western part of Lake Victoria Basin, Northern-Eastern and South-Western highlands featured above normal rainfall. Bukoba recorded the highest rainfall percentage of 226% in 2014. However, Sumbawanga recorded the lowest rainfall percentages of 58.8% (of the long-term average).

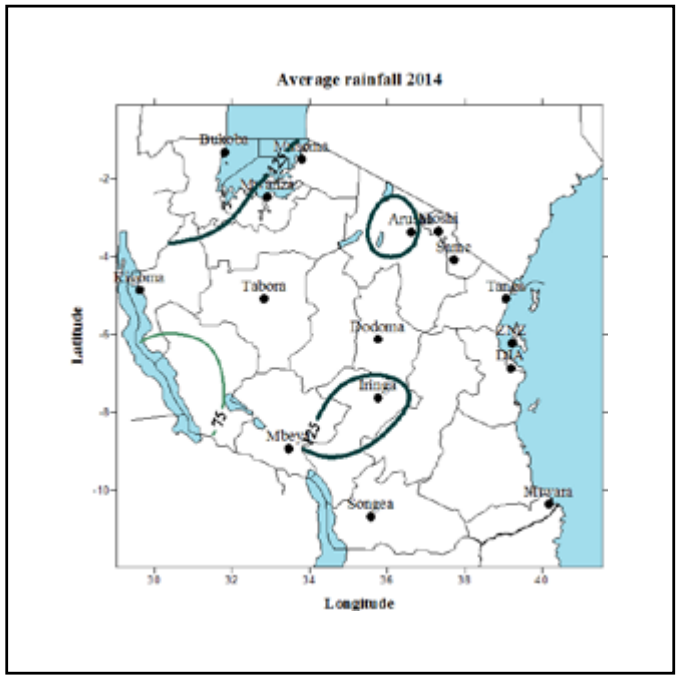

Figure 5: Annual rainfall distribution as percentage of the long-term average (1971-2000)

3.2 Monthly rainfall distribution as percentage of long-term average (1971-2000)

Average monthly rainfall percentage between 75% and 125% of the long-term average dominated most parts of the country for the whole year except May and July where most parts of the country experienced below average rainfall percentage. In contrast, extremely below average monthly rainfall percentages of less than 50 % were observed in July except northern coast (Tanga, Zanzibar, Dar es Salaam) and northern Morogoro, which experienced average rainfall percentage, Figure 6a and 6b.

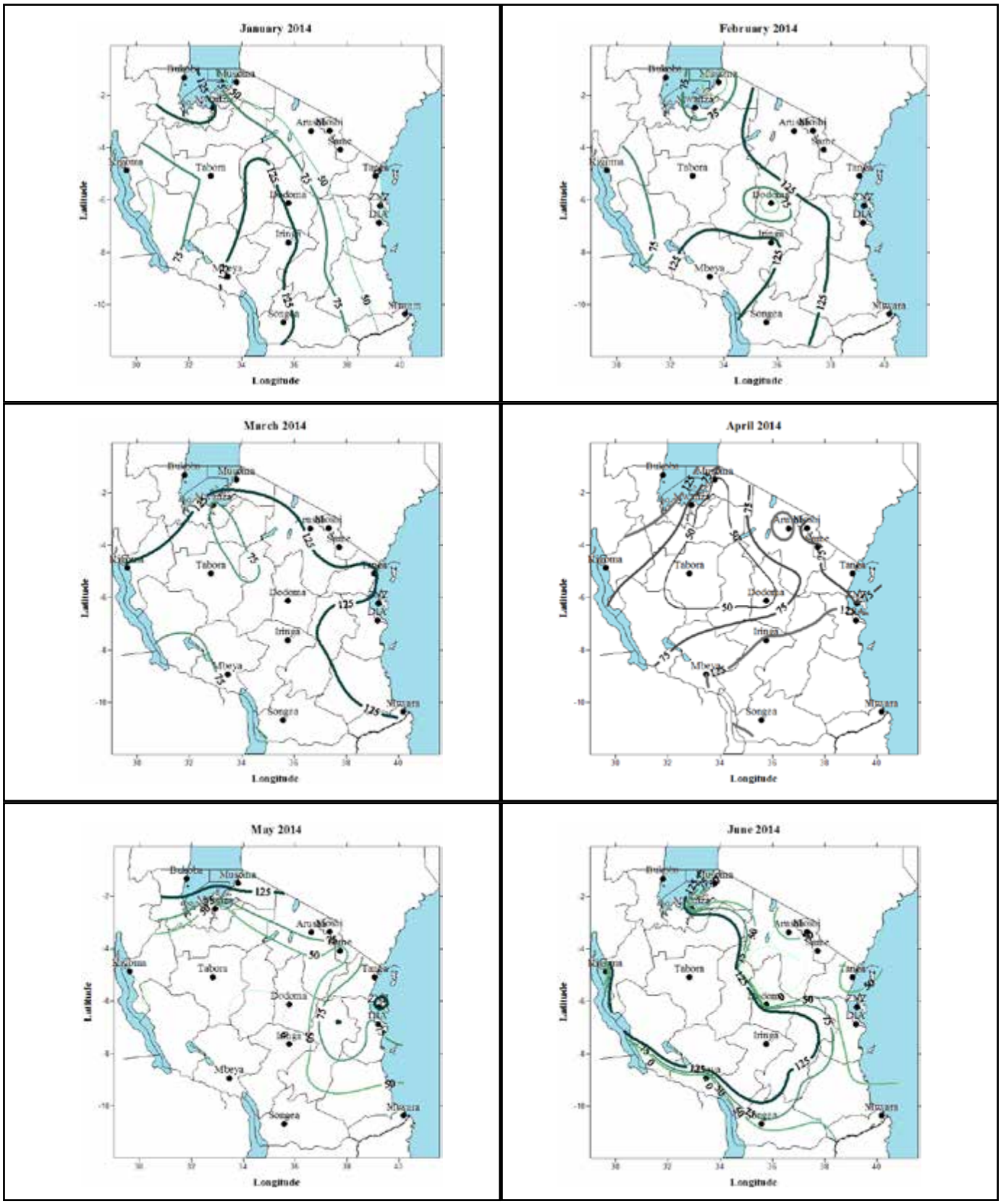

Figure 6a: Monthly rainfall distribution as percentage of long-term average (1971-2000), from Janyary - June, 2014

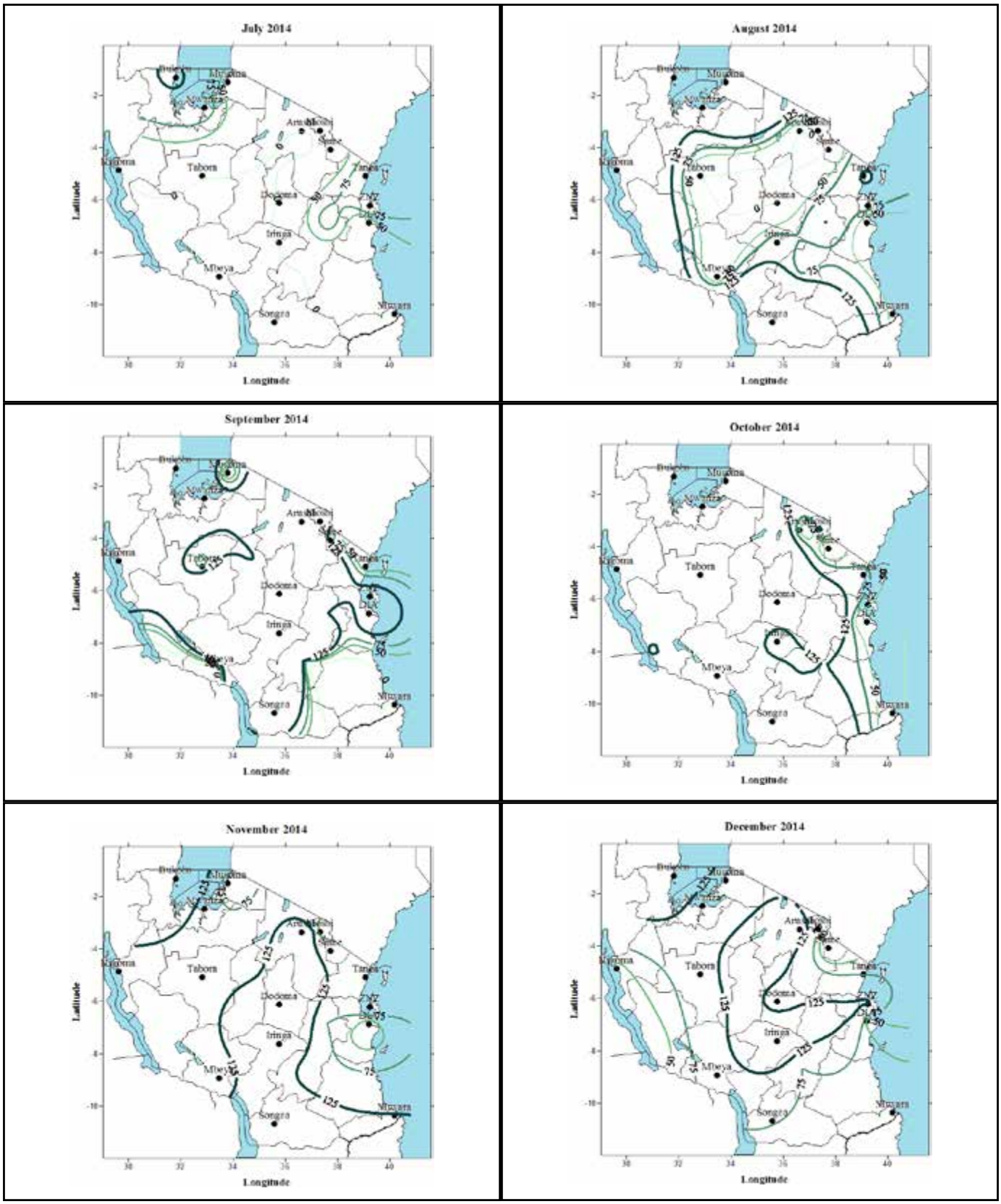

Figure 6b: Monthly rainfall distribution as percentage of long-term average (1971-2000), from July - December, 2014

3.3 Cumulative rainfall analysis in 2014/2015

The cumulative rainfall is defined as the rainfall that has accumulated in a given period of time compared to the long term mean, this concept in meteorology usually used to characterize rainfall trends. In this statement, areas with below normal monthly cumulative rainfall, when compared to long-term average of 1971-2000 are considered to experience meteorological droughts.

In 2014 most parts of the country observed below average to average monthly cumulative rainfall, except Southern region (Songea) which experience above average cumulative rainfall. Generally in 2014 cumulative total rainfall indicated deficiency in rainfall accumulation across the country and that was an indication of drought conditions for the selected stations except Songea (Figure 7a to 7d).

SOUTH-WESTERN HIGHLANDS

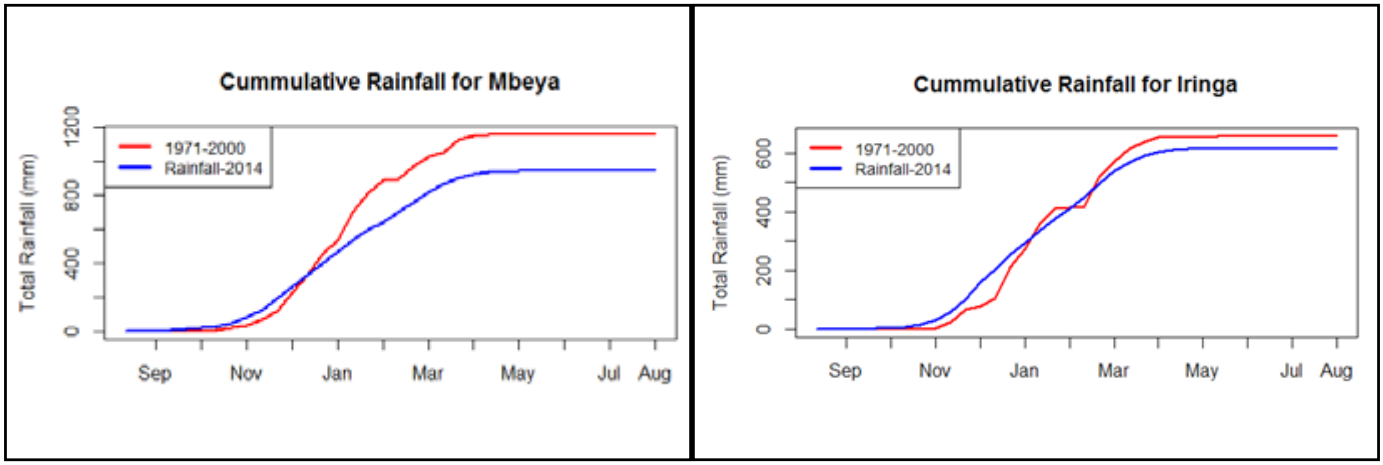

Figure 7a: Cumulative rainfall (mm) for South-Western highlands of Tanzania

NORTHERN COAST AND CENTRAL TANZANIA

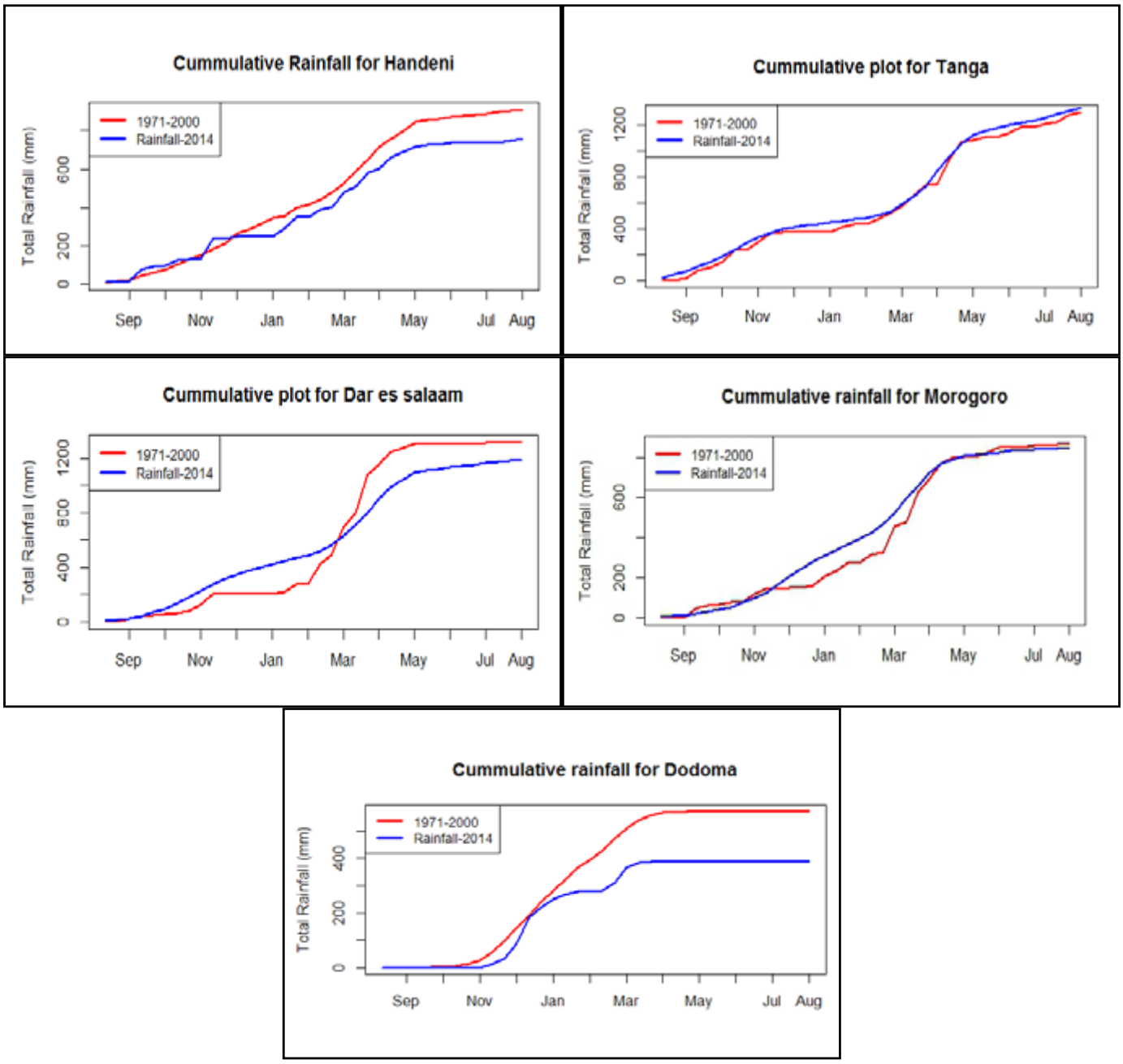

Figure 7b: Cumulative rainfall (mm) for Northern coast and Central Tanzania

WESTERN, LAKE ZONE AND SOUTHERN COAST OF TANZANIA

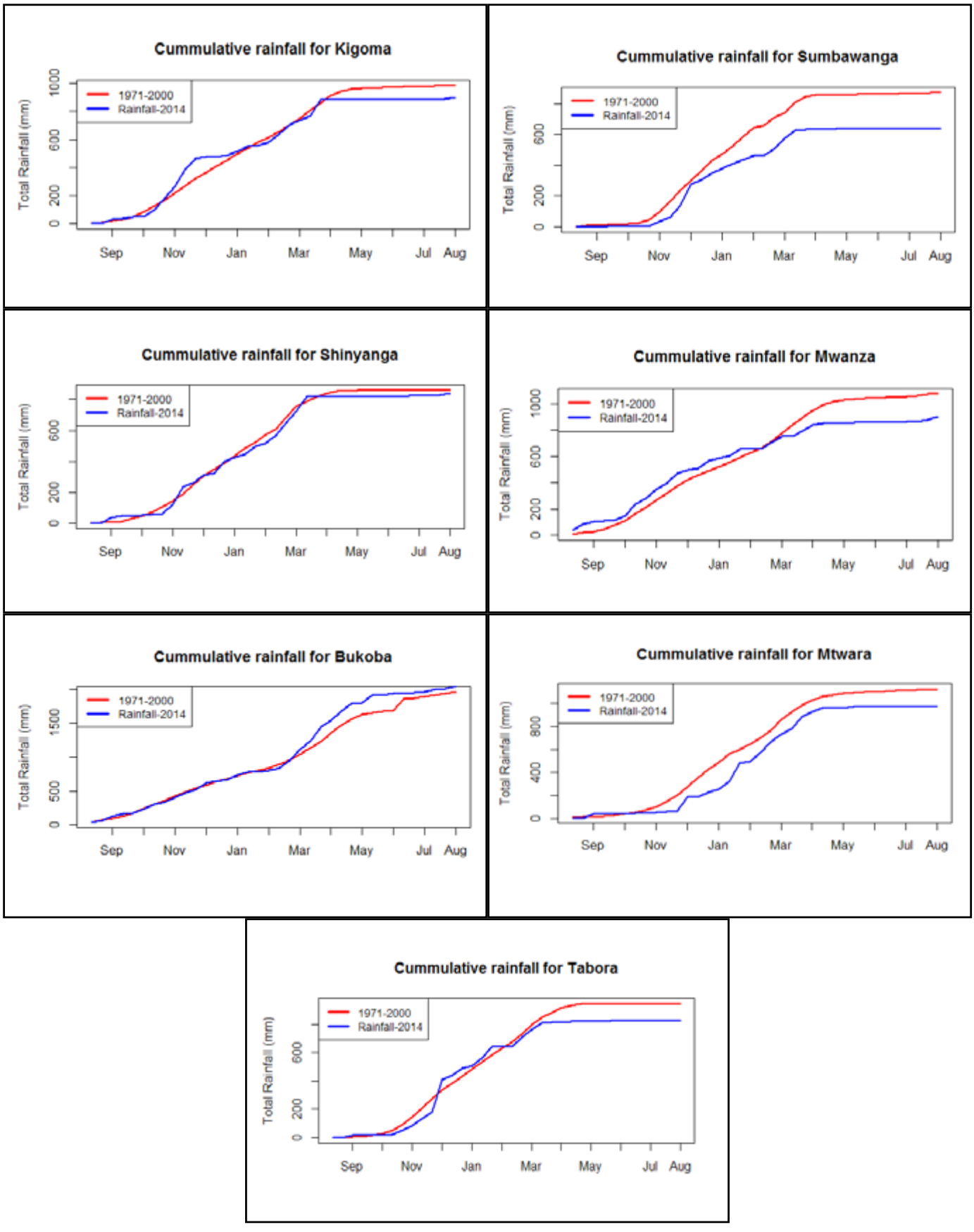

Figure 7c: Cumulative rainfall (mm) for Western, Lake zone and Southern coast of Tanzania

NORTH-EASTERN HIGHLANDS AND SOUTHERN REGION

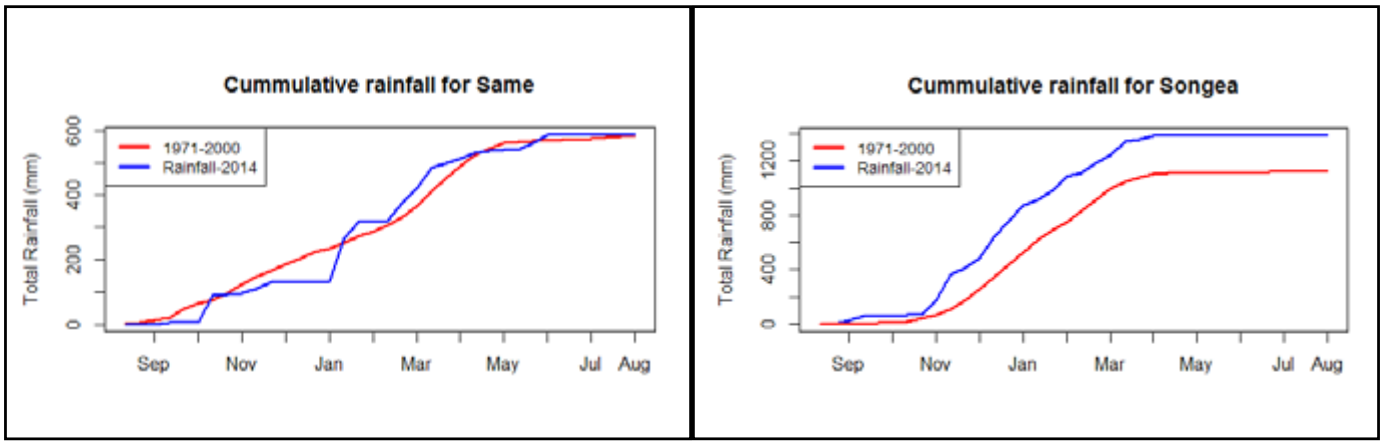

Figure 7d: Cumulative rainfall (mm) for North-Eastern highlands and Southern region

4.0 Severe weather and extreme climatic events 2014

In 2014, several incidences of 24 hours extreme rainfall events of more than the threshold values of 50 mm were reported in various parts of the country. The first highest extreme rainfall for 2014 was 138.1mm of rainfall and was recorded in 12th April 2014 at Dar es Salaam and ranked fourth highest value on record since 1953 where the highest value was 167.4 mm. The second highest daily extreme rainfall for 2014 was 111.8 mm and was recorded on 18th October at Kibondo and ranked second highest value on record for Kibondo station since 1971 where the highest value was 138.4mm. The third highest daily extreme rainfall on record for 2014 was 102.6 mm and was recorded in April 19th at Tukuyu and ranked fourth daily rainfall on record for Tukuyu station since 1941 when 321.5 mm rainfall was recorded; Sumbawanga recorded 93.2 mm of rainfall on 20th November 2014 which was the highest value on record since 1989 when the station was established and the fourth highest on record daily extreme rainfall for 2014; Other extreme rainfall events of more than the threshold values of 50mm were reported, in Babati on 21st January 2014 whereby 67.5mm of rainfall was reported; Kibaha reported 76.0mm of rainfall on 6th February, 2014 and Bukoba recorded 77.0mm of rainfall on 29th September 2014.

5.0 Factors associated with severe weather and extreme climatic events in 2014

Severe weather and extreme climatic events in Tanzania during long rain (March to May) and short rain (October to December) was contributed by different climatic factors. Severe weather and extreme climatic events occurred during March to May rainfall season were influenced by a low level trough in Lake Victoria Basin; Convergence of long track easterly winds, which enhanced low level moisture along the central coastal areas of Tanzania; Intensification of Mascarene high and extended ridge from over southern parts of the country especially towards the south-western and southern parts which was squeezing the zonal arm of the Inter-tropical Convergence Zone (ITCZ). These caused enhancement of the (ITCZ) associated with the atmospheric easterly wave's propagation from east towards the Tanzanian coast and its hinterlands. Due to this condition significant increase of low-level moisture occurred over the Southern, South-Western and Western part of Tanzania.

During October to December, 2014 rainfall season, anomalous warming over Western and South-Western Indian Ocean coupled with neutral SSTs over Eastern Indian Ocean (Indonesia) enhanced easterly to north-easterly wind flow. Slightly warming over Central Equatorial Pacific persisted during the OND rainfall season and contributed to enhance rainfall over bimodal areas. Cooling over Atlantic Ocean supported moist westerly wind flow from Congo Basin, Figure 8.

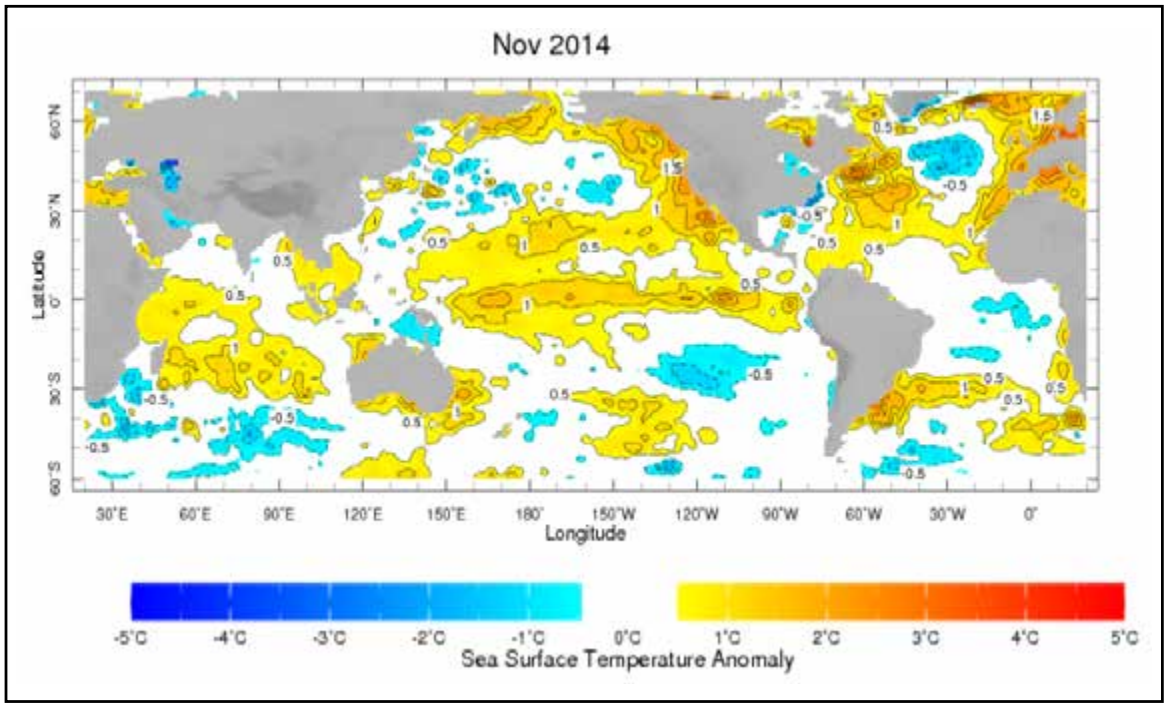

Figure 8: sea surface temperature for November 2014 (Source; IRI)

6.0 Socio-economic implications of severe weather and extreme events

Socio-economic implications of severe weather and extreme events for 2014 included loss of lives and property and severe infrastructural damages. Transport and communications have been badly disrupted; particularly roads and a bridge, which was damaged in Kilosa District, blocking the highway that connects Morogoro and Dodoma regions following heavy rainfall on Tuesday 21 January 2014. Between 6th and 7th February, heavy rainfall occurred in Tanga region and caused severe flooding which destroyed around 80 houses, leaving 100s of people homeless. Prolonged heavy rain across areas of Tanzania triggered floods that began on Thursday 27th March 2014. The flooding was so severe that a cargo train en route from Dar es Salaam to Mwanza was derailed in Gulwe, Mpwapwa district, in central Tanzania's Dodoma Region. This heavy rain continued to fall for few days, resulted in to the destruction of 70 houses by floods in the villages of Themi, Simba and Bwawani, all in Bwawani ward, Arusha Rural District. The disaster left around 1,000 people being homeless and stayed in temporary accommodation including churches and community buildings.

A devastating flooding occurred in Dar es Salaam from 11th to 12th April 2014 killed at least 41 people. The floods washed away Mpiji Bridge at Bunju B in Kinondoni district. The road linking Chanika and Mbagala was rendered impassable. Floods in Kyela District killed at least 3 people following 19th April 2014 heavy rainfall, also Unyakyusa and Ipinda wards were completely cut-off after bridges and roads were damaged. Plates 1 to 4 indicate some of the events.

Plate 1: President Jakaya Mrisho Kikwete visited flooded Ruvu River Bridge (Habari Leo 14/04/2014)

Plate 2: Tanzanian police officers inspect part of the damaged road in Dar es Salaam in 12th April, 2014. (Deodatus Balile /Sabahi)

Plate 3: Submerged houses in Dar es Salaam, Jangwani area in 12th April,2014 [Deodatus Balile / Sabahi]

Plate 4: Pedestrians cross the flooded Old Bagamoyo Road [Daniel Hayduk / AFP]

Conclusion

Most parts of the country experienced increase temperature anomaly. However, the southern part of the country maintained relatively decrease minimum temperatures anomalies for the entire year. Most parts of the country experienced normal rainfall, with incidences of severe and extreme weather events with significant socio-economic implications across the country. The climatic factors that attributed enhanced rainfall with severe flooding included the existence low level trough and enhance easterly winds, which enhanced low-level moisture along the central coastal of Tanzania.

The impacts associated with extreme climatic events included loss of life and properties, severe infrastructural damage, destruction of farms crops and buildings. Unfortunately the incidences of severe and extreme weather events are projected to increase under the changing climate as highlighted in the fifth IPCC report.

Loss of life and property could be much reduced if the forecast and warning issued by Tanzania Meteorological Agency are closely followed and mainstreamed by the public in planning socio-economic activities. It is therefore recommended for more sensitization and awareness among the public on the importance of weather and climate information and the need to mainstream and factor in weather and climate information in planning socio-economic activities, including informing policy maker for sustainable decision options.