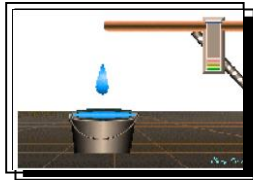


**NATIONAL METEOROLOGICAL AGENCY**  
*Meteorological Data and Climatology Directorate*  
**ANNUAL CLIMATE BULLETIN**  
**For the year 2015**

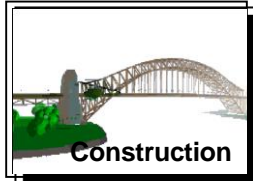
*Some Applications of Climate Information*



**Disaster Management**



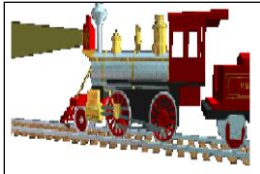
**Water Resources Management**



**Construction**



**Environment & Health**



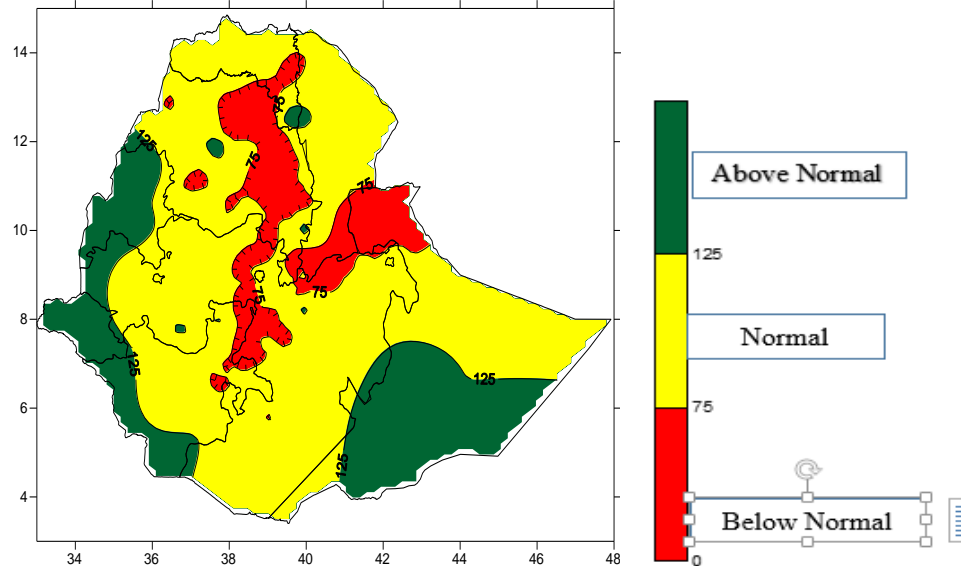
**Transport**



**Recreation & Tourism**

**HIGHLIGHTS**

The rainfall performance of the year 2015 was normal to below normal over most parts of the country. However, Southern Somali and western Benshangul and western Gambela had experienced above normal rainfall during this year 2015. On the other hand central Amhara, pocket area of Oromia and eastern Somalia are much wetter than 2014 annual rainfall. Higher values of extreme maximum temperature values were recorded, mostly during the hot season (Belg) 2015. In particular, the extreme maximum temperature values had exceeded 45°C over Aditsetser, Berehale, Mandura, Shinfa and Banat. On the other hand, nights and early mornings were cold over the highlands of northeast, central and southern Ethiopia during the dry season (Bega). In association with this, minimum temperature values below (-3°C) were recorded over Debre Berhan, Adigrat, Botorbocho, TikurEnchini, Belle Gebreguracha and Chenek. -5.8°C, -5°C, -5°C, and -5°C respectively.



**Percent of Normal Rainfall of the year 2015**

## **Foreword**

This climate bulletin is prepared and disseminated by the National Meteorological Agency (NMA). It is aimed at providing climatological information to different services of the community involved in various socio- economic activities and giving some highlights about major synoptic situations.

The information contained in the bulletin is believed to assist planners, decision-makers and the community at large by providing details of the climatic conditions of the nation in a given period.

This bulletin differs from the other real time and near real time bulletins issued by the Agency, which for their input depend only on meteorological stations equipped with single side band radio for data transmission. Though this bulletin is not real time, published with a delay of at least two months, the information contained in this bulletin is based on data coming from a much larger number of meteorological stations. Moreover, the information contained in this bulletin is not sector-specific and a wide range of users can benefit from it.

The Agency disseminates monthly, seasonal and annual climatological bulletins in which all-necessary climatological information and significant climatic anomalies are highlighted.

We have a strong belief that various socio-economic activities related to planning disaster mitigation, water resources management, construction, environmental protection, transportation, recreation, tourism and others will be benefited most by the careful and continuous use of this bulletin. Meanwhile, your comments and constructive suggestions are highly appreciated to make the objectives of this bulletin a success.

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## 1. Introduction

### 1.1. General

In this bulletin the annual climate summary of the country for the year 2015 is presented. For convenience the climate summary of the year is done on seasonal basis.

From meteorological point of view, there are three seasons in Ethiopia; **Belg**, **Kiremt** and **Bega**.

**Belg** is a short rainy period from **February to May** over much of the Belg-growing areas, whereas over the southwestern parts of the country it denotes the start of the long rainy season. Over the western parts of the country also the rainy season starts during March/April. However over the northwestern parts of the country, this season is predominantly dry except for the month of May. Southern and southeastern parts of the country are expected to get their long rainy season during this time starting in March and peaking in April. The climate of the season is mostly hot and moist.

**Kiremt** is the period from **June to September**. It is the main rainy season in which the major food crops of the country are produced. The magnitude of rainfall is higher as compared to the other seasons for many parts of the country. Normally, the southern and the southeastern lowlands of the country receive little or no rain during this season, except for little amount of rainfall that occurs towards the end of the season.

**Bega** is the period from **October to January**. It is a harvesting season for various parts of Ethiopia. Bega is normally a dry season characterized by cool nights and early mornings over the highlands of northern, northeastern, central and eastern Ethiopia and by hot days over various parts of the country. It is also a short rainy season for places over southern, southeastern and southwestern parts of the country. Depending on the influences from mid-latitude rain-bearing systems, some places over central, northern and northeastern Ethiopia also receive occasional showers.

### 1.2. Summary

The rainfall performance of the year 2015 was above normal to normal over most parts of the country. However Northern Somali and rift valley had experienced below normal rainfall during this year. Higher values of extreme maximum temperature values were recorded, mostly during the hot season (Belg) 2015. In particular, the extreme maximum temperature values had exceeded 45°C over Aditsetser, Berehale, Mandura, Shinfa and Banat. On the other hand, nights and early mornings were cold over the

highlands of northeast, central and southern Ethiopia during the dry season (Bega). In association with this, minimum temperature values below ( $-3^{\circ}\text{C}$ ) were recorded over Debre Berhan, Adigrat, Botorbocho, TikurEnchini, Belle Gebreguracha and Chenek.

### **2.1. Surface**

- The mean central pressure value of the Mascarin High was ranging from about 1015hpa to 1020hpa and it was centered between  $30^{\circ}\text{S}$  to  $45^{\circ}\text{S}$  latitudes and  $50^{\circ}\text{E}$  to  $120^{\circ}\text{E}$  longitudes.
- The mean central pressure value of the Azores High was ranging from about 1020hpa to 1022hpa and it was centered between  $30^{\circ}$  to  $45^{\circ}\text{N}$  latitude and  $5^{\circ}\text{W}$  to  $50^{\circ}\text{E}$ .
- The mean central pressure value of the St. Helena High was ranging from about 1020hpa to 1024hpa and it was centered between  $25^{\circ}\text{S}$  to  $40^{\circ}\text{S}$  and  $0^{\circ}$  to  $30^{\circ}\text{W}$ .

### **2.2. Lower Troposphere (850 hpa Vector Wind)**

Towards the end of the Belg season, weak cross equatorial flow was observed over the Horn of Africa, the adjoining areas of northern and southwest Indian Ocean. The cross equatorial flow further intensified and strong during the Kiremt season and the speed of the average wind exceeded 6-12 m/sec during at begin to end of wet season. This cross equatorial flow weakened at the Bega season. However replaced by northeasterly flow during Bega 2015/2016 the first month October to January up to end of the season.

### **2.3. Middle Troposphere (500 hpa Geopotential Height)**

The geopotential height values were dominantly near normal over much of the Mediterranean Sea and the adjoining areas.

### **2.4. Maximum Wind at 200 hpa level**

Strong upper tropospheric easterly flow, associated with the Tropical Easterly Jet (TEJ), was dominant over the tropical areas between West and East Africa during Kiremt, while strong westerly flow, associated with the Subtropical Westerly Jet, and prevailed over the subtropical areas during the rest of the year 2015.

### **2.5. ENSO conditions**

The oceanic and sub-surface oceanic conditions across the Tropical Pacific showed normal to above normal condition during the year 2015.

**Reference:** <https://www.esrl.noaa.gov/psd/cgi-bin/data/composites/printpage.pl>.

### 3. Weather

#### 3.1. Temperature

Higher values of extreme maximum temperature values were recorded mostly during the hot season (Belg 2014/2015), refer to table 3.1.1 and the extreme maximum temperature values had exceeded 45°C over Aditsetser, Berehale, Mandura, Shinfu and Banat. On the other hand, nights and early mornings were cold over the highlands of northeast, central and southern Ethiopia during the dry season (Bega). In association with this, minimum temperature values below (-3°C) were recorded over Debre Berhan, Adigrat, Botorbocho, TikurEnchini, Belle Gebreguracha and Chenek.

**Table 3.1.1 Annual Extreme Maximum Temperature Values Greater Than or equal to 44°C during the year 2015**

<b>Name</b>	<b>Extreme Maximum Temperature</b>	<b>Month</b>	<b>Day</b>
<b>Aditsetser</b>	<b>48.5</b>	<b>5</b>	<b>22</b>
<b>Berhale</b>	<b>48.5</b>	<b>9</b>	<b>12</b>
<b>Mandura</b>	<b>48.0</b>	<b>2</b>	<b>13</b>
<b>Shinfu</b>	<b>46.5</b>	<b>3</b>	<b>14</b>
<b>Banat</b>	<b>45.5</b>	<b>4</b>	<b>22</b>
<b>Mayhanes</b>	<b>45.0</b>	<b>3</b>	<b>25</b>
<b>Shinfu</b>	<b>45.0</b>	<b>4</b>	<b>30</b>
<b>Aisha</b>	<b>44.5</b>	<b>7</b>	<b>10</b>
<b>Bambudi</b>	<b>44.5</b>	<b>2</b>	<b>7</b>
<b>Banat</b>	<b>44.5</b>	<b>6</b>	<b>11</b>
<b>Metema Yohannes</b>	<b>44.5</b>	<b>3</b>	<b>11</b>
<b>Adimehemeday</b>	<b>44.0</b>	<b>5</b>	<b>23</b>

**Table 3.1.2. Annual Extreme Minimum Temperature Values less than or equal to -3°C during the year 2015**

<b>Name</b>	<b>Annual Extreme Minimum Temperature</b>	<b>Day</b>	<b>Month</b>
<b>Debre Berhan</b>	<b>-5.8</b>	<b>3</b>	<b>1</b>
<b>Adigrat</b>	<b>-5</b>	<b>8</b>	<b>1</b>
<b>Botar Bacho</b>	<b>-5</b>	<b>1</b>	<b>2</b>
<b>Tikur Enchine</b>	<b>-5</b>	<b>6</b>	<b>1</b>
<b>Belle</b>	<b>-4</b>	<b>2</b>	<b>1</b>
<b>Gebere Guracha</b>	<b>-4</b>	<b>3</b>	<b>1</b>
<b>Chenek /Semen Terara</b>	<b>-3.8</b>	<b>1</b>	<b>1</b>
<b>Sarmider</b>	<b>-3.6</b>	<b>12</b>	<b>1</b>
<b>Mekaneyesus</b>	<b>-3.5</b>	<b>1</b>	<b>1</b>
<b>Wegel Tena</b>	<b>-3.5</b>	<b>2</b>	<b>1</b>
<b>Sarmider</b>	<b>-3.2</b>	<b>28</b>	<b>2</b>
<b>Agere Genet</b>	<b>-3</b>	<b>4</b>	<b>1</b>
<b>Botar Bacho</b>	<b>-3</b>	<b>21</b>	<b>12</b>
<b>Guguftu</b>	<b>-3</b>	<b>2</b>	<b>1</b>
<b>Ketema Negus</b>	<b>-3</b>	<b>16</b>	<b>2</b>

### **3.2. Rainfall**

The rainfall performance of the year 2015 was above normal to normal over most parts of the country. However Northern Somali and rift valley had experienced below normal rainfall during this year 2015 (fig 3.2.3).

The annual total rainfall amount of the year 2015 exceeded 1500mm over most part of the country specially the highland of Amhara, and Western part of Oromia and most part of SNNPR and Gambella. In association with this, the annual total rainfall amount reported over Aditasetser, wereta,,Dengelber,Arjo and Limugenet was 2764.2mm , 2520.3 mm,2480.9mm,2368.1mm and 2257.4mm respectively. On the other hand, the annual total rainfall amount was below 500mm over most portions of Afar and Somali. Refer to figure 3.2.1 and table 3.2.2.

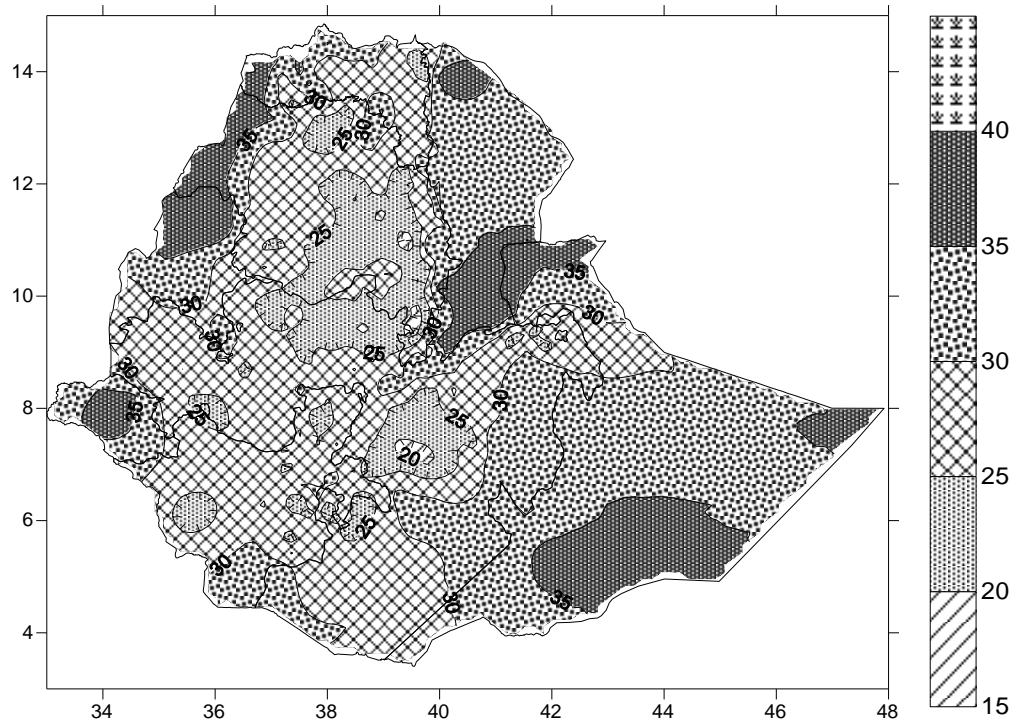
**Table 3.2.1. Heavy fall of greater than 86 mm within 24 hrs during the year 2015**

<b>Name</b>	<b>Maximum rainfall greater than 86 mm</b>	<b>Day</b>	<b>Month</b>
<b>Adi_Arkay</b>	<b>159</b>	<b>8</b>	<b>8</b>
<b>Wereta (Add)</b>	<b>120</b>	<b>19</b>	<b>10</b>
<b>Gidayana</b>	<b>100.8</b>	<b>29</b>	<b>7</b>
<b>Wereta (Add)</b>	<b>100.5</b>	<b>13</b>	<b>8</b>
<b>Guliso</b>	<b>99.5</b>	<b>18</b>	<b>10</b>
<b>Boneya</b>	<b>98</b>	<b>9</b>	<b>6</b>
<b>Gode Met</b>	<b>98</b>	<b>7</b>	<b>5</b>
<b>Dimeka</b>	<b>96.4</b>	<b>2</b>	<b>12</b>
<b>Metema</b>	<b>96</b>	<b>6</b>	<b>8</b>
<b>Bahir Dar (Airport)</b>	<b>95.6</b>	<b>21</b>	<b>7</b>
<b>Gasechere</b>	<b>94.8</b>	<b>27</b>	<b>5</b>
<b>Efeson</b>	<b>88.6</b>	<b>29</b>	<b>8</b>
<b>Cheffa</b>	<b>86.5</b>	<b>11</b>	<b>11</b>

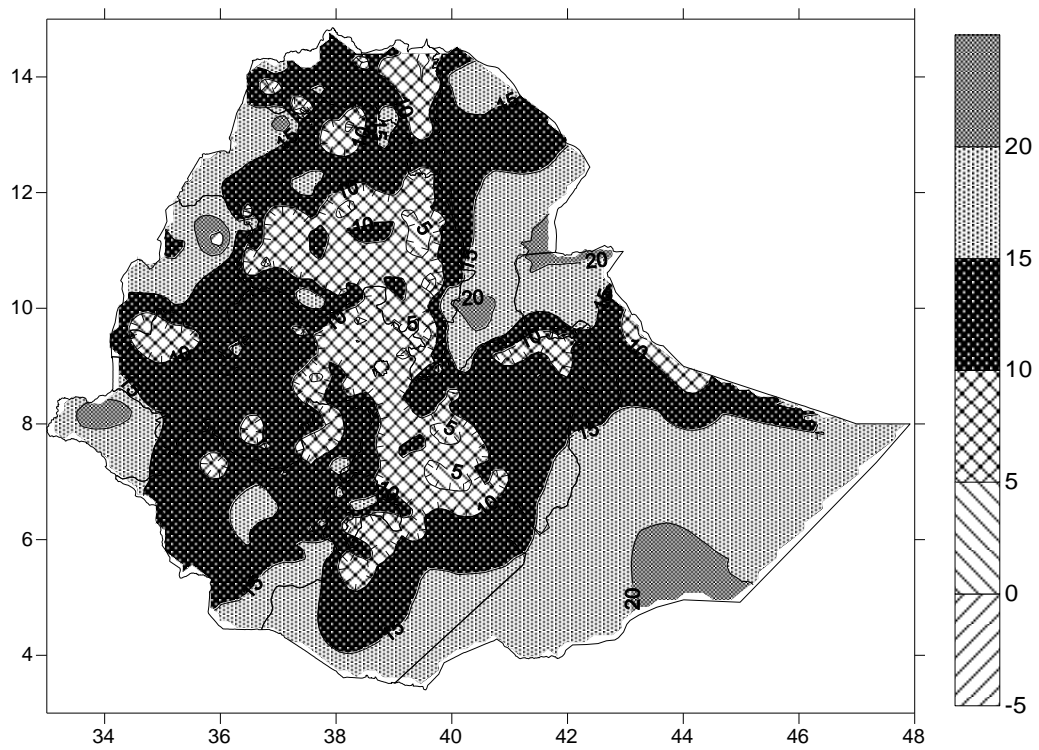
**Table 3.2.2 Annual total Rainfall Amount in excess of 1700 mm during the year 2015**

<b>Name</b>	<b>Total Rainfall in (mm)</b>
<b>Aditsetser</b>	<b>2764.2</b>
<b>Wereta (Add)</b>	<b>2520.3</b>
<b>Dengel Ber</b>	<b>2480.9</b>
<b>Arjo</b>	<b>2368.1</b>
<b>Limu Genet</b>	<b>2257.4</b>
<b>Kercha</b>	<b>2195.2</b>
<b>Gundil</b>	<b>2181.5</b>
<b>Gasechere</b>	<b>2158.1</b>
<b>Agaro</b>	<b>2110.9</b>
<b>Ambesame</b>	<b>2066.0</b>
<b>Ketema Negus</b>	<b>2058.3</b>
<b>Kachise (Rs)</b>	<b>2024.1</b>
<b>Elias</b>	<b>1986.2</b>
<b>Gimbi</b>	<b>1941.7</b>
<b>Jimma</b>	<b>1935.0</b>
<b>Gidayana</b>	<b>1897.8</b>
<b>Debre Zeit</b>	<b>1826.9</b>
<b>Tikur Enchine</b>	<b>1818.7</b>
<b>Genabossa</b>	<b>1797.1</b>
<b>Chagni</b>	<b>1787.7</b>
<b>Adi_Arkay</b>	<b>1762.6</b>
<b>Dangila</b>	<b>1731</b>
<b>Gazer</b>	<b>1708.4</b>

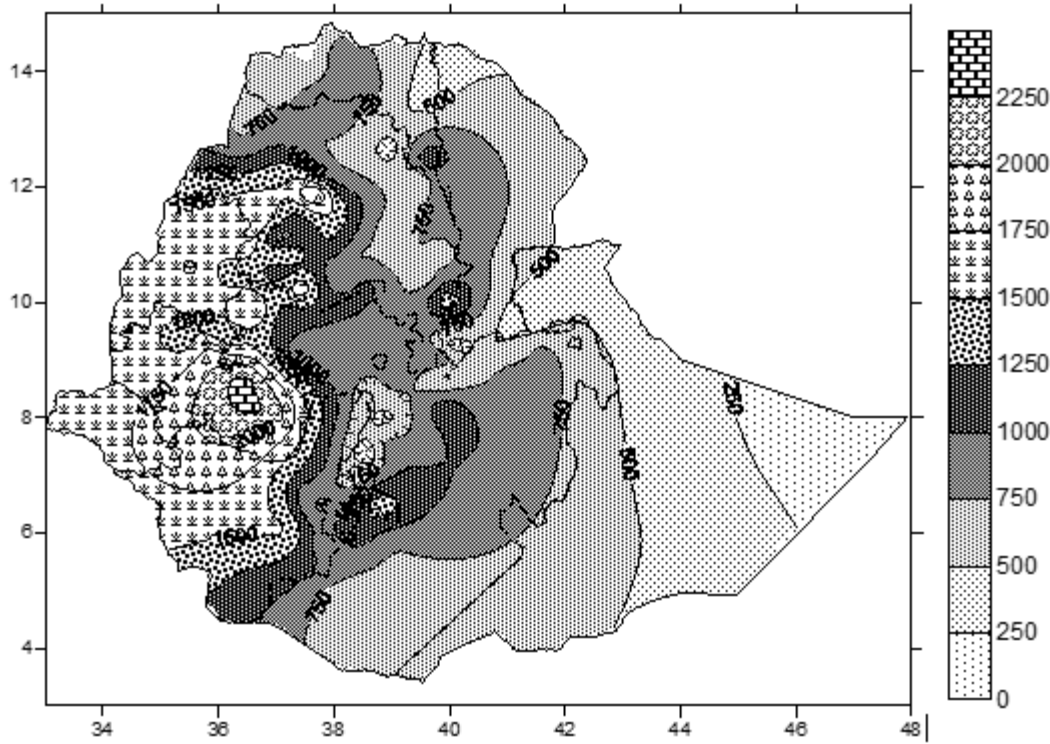




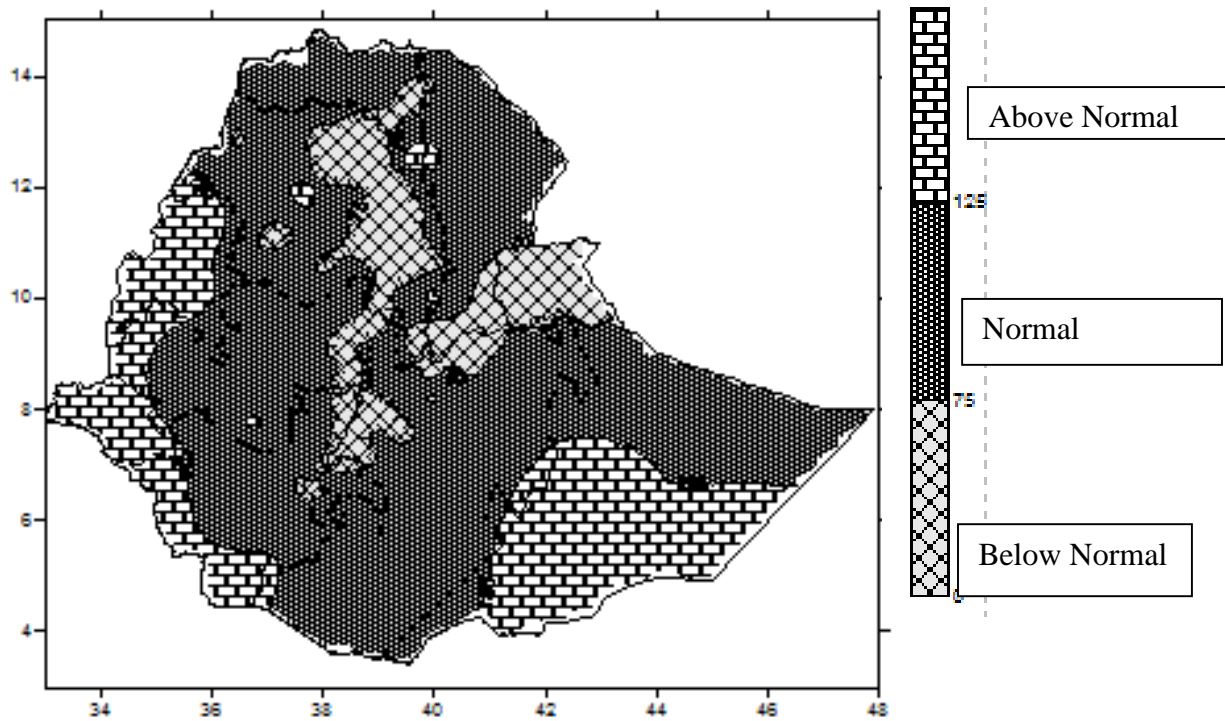
**Figure 3.1.1. Mean Maximum temperature in °C for the year 2015**



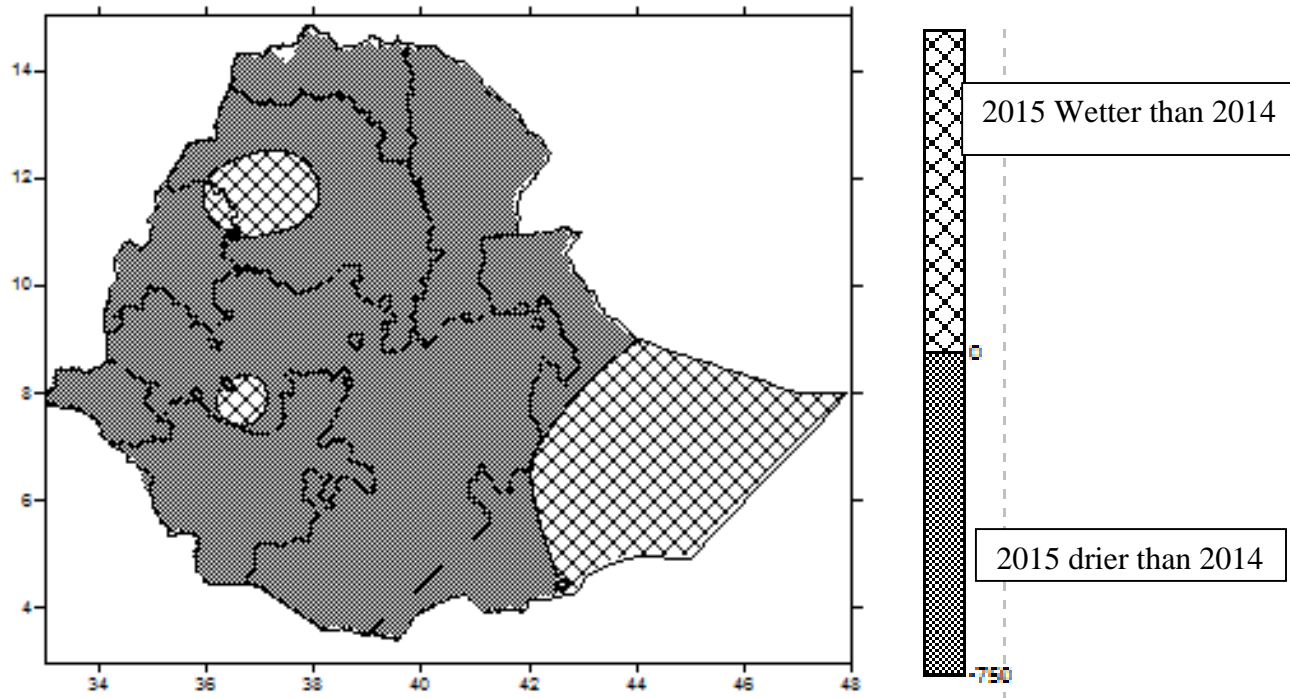
**Figure 3.1.2. Mean minimum temperature in °C for the year 2015**



**Figure 3.2.1. Annual total Rainfall amount in mm of the year 2015**



**Figure 3.2.2. Percent of normal rainfall for the year 2015**



**Figure 3.2.3. Annual Total Rainfall Amount of 2015 minus Annual Total Rainfall Amount of 2014**

### 3.3 Wind

The *WIND ROSE* diagrams presented in table 3.3.1a to 3.3.1d show the wind conditions that prevailed during the three seasons over Addis Ababa Observatory, Mekele, Bahir Dar and Awassa, respectively of the long term conditions.

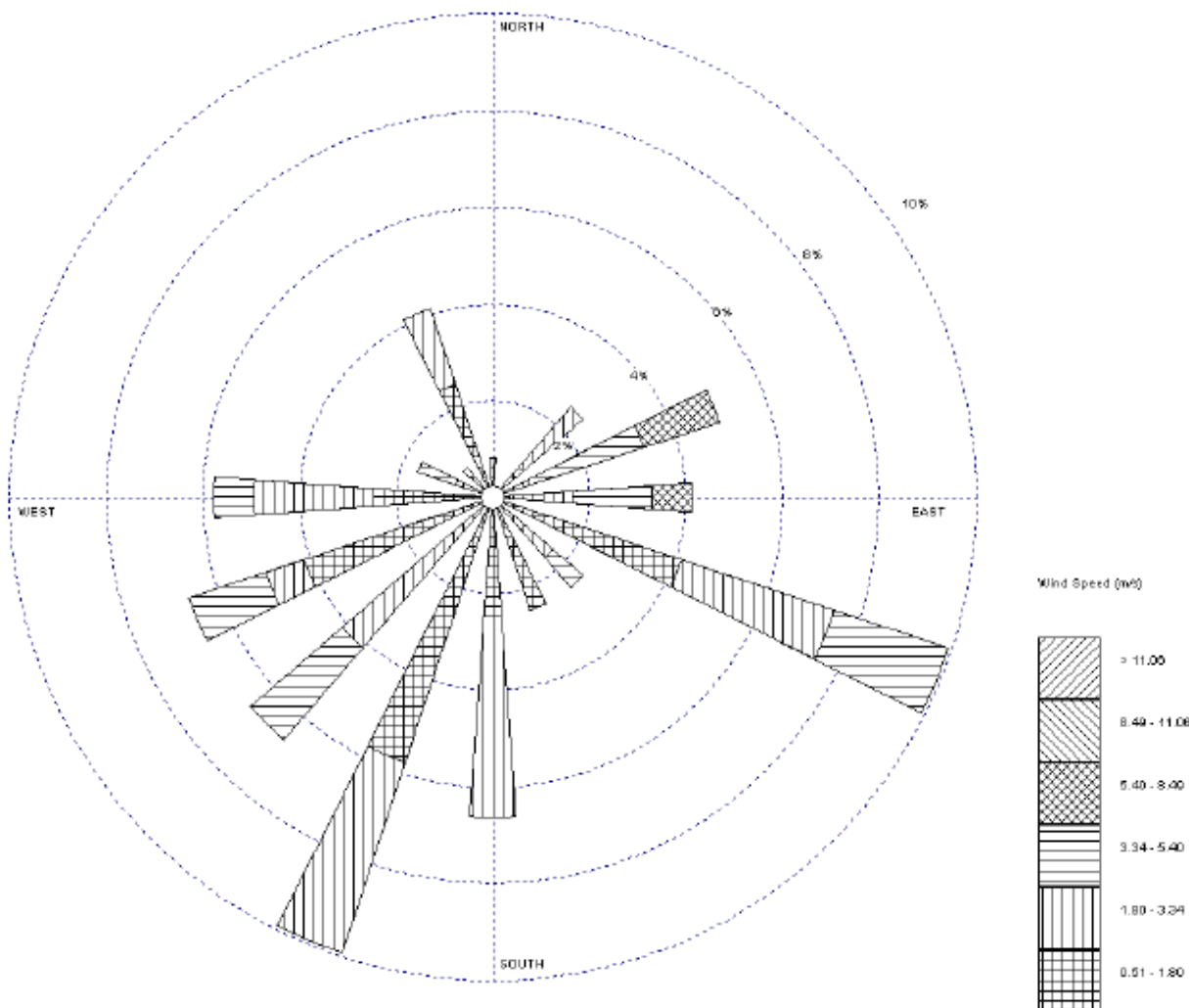


Figure 3.3.1 Sample wind rose diagram. The centre on the diagram (where the head of each bar ends) represents a meteorological station into which the wind blows, while its tail shows where the wind comes from. The length of the bar is proportional to the frequency of the wind having a specific direction and speed range. The percentage points on the concentric circles can be used to make comparisons among the lengths of the bars and so as to easily identify the more prevalent direction. The shadings on the bar represent a specific speed range in meters per second as shown on the key.

**Table 3.3.1 WIND ROSE diagrams over selected stations showing the prevalent wind in the three seasons:  
 Awassa, b. Bahir Dar, c. Mekele and d. Addis Ababa**

Station (Season) (a)	Based on long term data (1981-2010)
Awassa (Bega)	<p>Wind Direction Frequency in %</p>
Awassa (Belg)	<p>Wind Direction Frequency in %</p>
Awassa (Kiremt)	<p>Wind Direction Frequency in %</p>

Station (Season) (b)	Based on long term data (1981-2010)
Bahir Dar (Bega)	<p>Wind Direction Frequency in %</p> <p>Legend: 0-2 (red), 2-5 (blue), &gt;5 (green), Calm: 0.0</p>
Bahir Dar (Belg)	<p>Wind Direction Frequency in %</p> <p>Legend: 0-2 (red), 2-5 (blue), &gt;5 (green), Calm: 0.0</p>
Bahir Dar (Kiremt)	<p>Wind Direction Frequency in %</p> <p>Legend: 0-2 (red), 2-5 (blue), &gt;5 (green), Calm: 0.0</p>

Station (Season) (c)	Based on long term data (1981-2010)
Mekele (Bega)	<p style="text-align: center;"><b>Wind Direction Frequency in %</b></p>
Mekele (Belg)	<p style="text-align: center;"><b>Wind Direction Frequency in %</b></p>
Mekele (Kiremt)	<p style="text-align: center;"><b>Wind Direction Frequency in %</b></p>

Station (Season) (d)	Based on long term data (1981-2010)
Addis Ababa Bole (Bega)	<p>Wind Direction Frequency in %</p> <p>Wind speed categories: 0-2, 2-5, 5-15. Calm: 0.0</p>
Addis Ababa Bole (Belg)	<p>Wind Direction Frequency in %</p> <p>Wind speed categories: 0-2, 2-5, 5-15. Calm: 0.0</p>
Addis Ababa Bole (Kiremt)	<p>Wind Direction Frequency in %</p> <p>Wind speed categories: 0-2, 2-5, 5-15. Calm: 0.0</p>