FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
*MINISTRY OF WATER AND ENERGY*
Ethiopian Meteorological Institute
*DATA AND CLIMATOLOGY DIRECTORET*

# ANNUAL CLIMATE BULLETIN
## For the year 2022

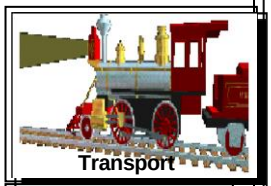
*Some Applications of Climate Information*

Disaster Management

Water Resources Management

Construction

Environment & Health



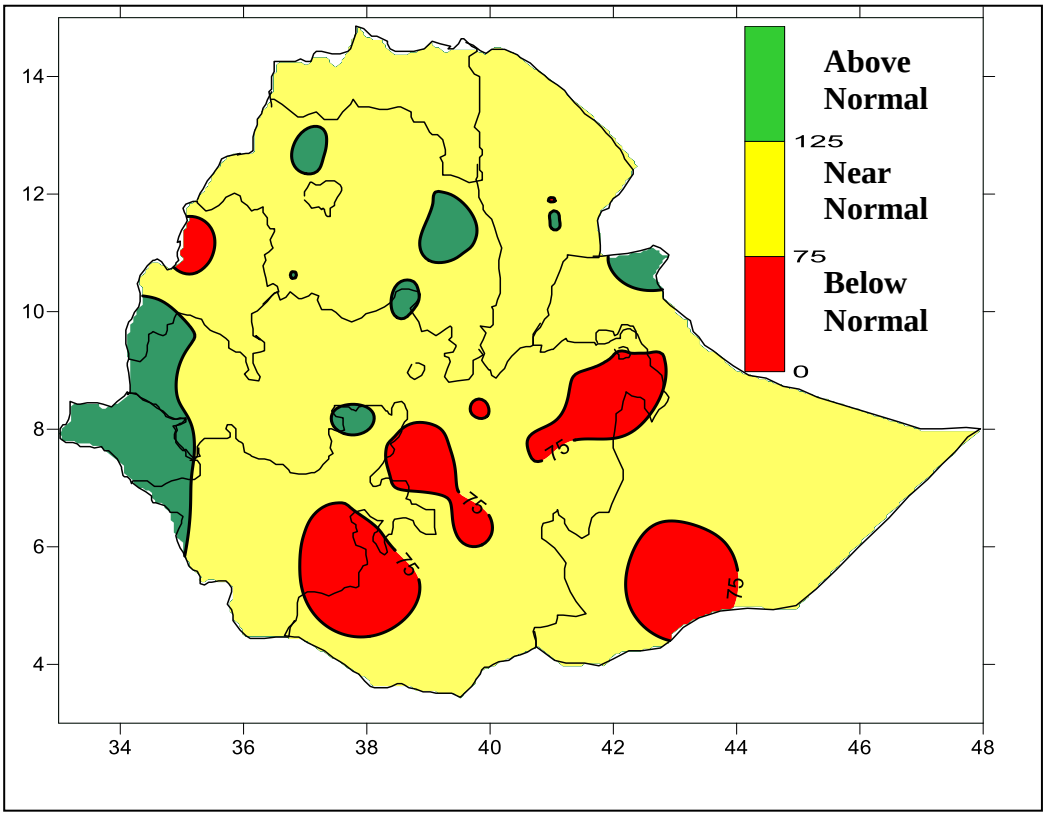
Transport

Recreation & Tourism

## HIGHLIGHTS

Except over some places in Oromia, Somali, SNNPR and Benishangul Gumuz, the rainfall activity of the year 2022 was near normal to above over most parts of the country. Gambella, the adjoining SNNPR & west Oromia areas and pocket areas of Amhara, Oromia & Afar had recorded above normal rainfall. But some places over Oromia, Somali and Benishangul Gumuz encountered a rainfall deficiency.

Higher values of extreme maximum temperature values were recorded in February, March, April, May, June, July and September. In particular, the extreme maximum temperature values had exceeded 42°C over Awash Araba, Aysha, Dubti, Elidar, Fugnuido, Gewane, Gode, Metema, Mille, Semera and Sherkole. On the other hand, nights and early mornings were cold over the highlands of Ethiopia mostly during the dry season (Bega). In association with this, minimum temperature values below the freezing point (0°c) were recorded over Adelle, Alemaya, Debre Birhan, Wegel Tena, Bale Robe, Kulumsa and Mehal Meda.




Percent of Normal Rainfall of the year 2022

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## Foreword

This climate bulletin is prepared and disseminated by Ethiopian Meteorological Institute (EMI). 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 2022 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 as well 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*

Except over some places in Oromia, Somali, SNNPR and Benishangul Gumuz, the rainfall activity of the year 2022 was near normal to above over most parts of the country. Gambella, the adjoining SNNPR & west Oromia areas and pocket areas of Amhara, Oromia & Afar had recorded above normal rainfall. But some places over Oromia, Somali and Benishangul Gumuz encountered a rainfall deficiency.

Higher values of extreme maximum temperature values were recorded in February, March, April, May, June, July and September. In particular, the extreme maximum temperature values had exceeded 42$^{o}$C over Awash Araba, Aysha, Dubti, Elidar, Fugnuido, Gewane, Gode, Metema, Mille, Semera and Sherkole. On the other hand, nights and early mornings were cold over the highlands of Ethiopia mostly during the dry season (Bega). In association with this, minimum temperature values below the freezing point (0$^{o}$c) were recorded over Adelle, Alemaya, Debre Birhan, Wegel Tena, Bale Robe, Kulumsa and Mehal Meda.

## *2. Synoptic Situation*

### *2.1 Surface*

- The mean central pressure value of the Mascarene High was ranging from about 1020 hPa to 1025 hPa and it was centered between 30°S to 40°S latitudes and 45°E to 90°E longitudes.
- The mean central pressure value of the Azores High was ranging from about 1020 hPa to 1020 hPa and it was centered between 30° to 40°N and 15°W to 45°W.
- The mean central pressure value of the St. Helena High was ranging from about 1020 hPa to 1030 hPa and it was centered between 25°S to 35°S and 5°E to 23°W

### *2.2 Lower Troposphere (850 hPa Vector Wind)*

In the year 2022, the wind at 850 hPs shifts its direction from northwesterll in January to southwesterly & southeasterly during Kiremt and finally back to northwesterly in December. In terms of speed the lowest observed speed is 2 m/s and th highest is 16 m/s. The lowest occurred in April and the highest in August, at the peak of the Kiremt season.

### *2.3 Middle Troposphere (500 hPa Geopotential Height)*

The geopotential height values were above average over Northern Pacific and North Atlantic Ocean in January, February, March, July and September. On the contrary, in April and June the geopotential height was below average over North Atlantic and North Pacific Ocean respectively.

### *2.4 Upper Troposphere (200 hPa wind vector)*

Strong upper tropospheric easterly flow, associated with the Tropical Easterly Jet (TEJ), was dominant over the tropical areas between West Africa and India during Kiremt with speed 15-30 m/s in August and September, while weak westerly flow associated with the Subtropical Westerly Jet prevailed over the subtropical areas during the Bega 2022.

### *2.5 ENSO conditions*

The oceanic and sub-surface oceanic conditions across the central and eastern equatorial Pacific remained below average throughout the year. Hence, weak La Niña to a moderate-strength La Niña condition during the year 2022 observed particularly over Niño 3.4 region and Nino 1+2 regions.

**Reference:** January to December 2022 Climate Diagnostics Bulletins

## **3**. **Weather**

### *3.1 Temperature*

The year 2022, the Belg and Kiremt seasons were the season with higher values of extreme maximum temperature. Days remained hot at some low land places and the extreme maximum temperature values had exceeded 42$^{o}$C. In particular, Awash Araba, Aysha, Dubti, Elidar, Fugnuido, Gewane, Gode, Metema, Mille, Metema, Mille and Semera and Sherkole recorded extreme maximum temperature in excess of 42$^{o}$C. On the other hand, nights and early mornings were cold over the highlands of Ethiopia mostly during the dry season (Bega). In association with this, minimum temperature values below the

freezing point (0ºc) were recorded over Adelle, Alemaya, Bale Robe, Debre Birhan, Fiche, Haromay, Indibir, Kulumsa Mehalmeda and Wegel Tena (Table 3.1.1 and Table 3.1.2).

**Table 3.1.1 Annual Extreme Maximum Temperature Values in excess of 42ºC in the year 2022**

| Station Name | Maximum Temperature | Month | Date |
|---|---|---|---|
| Awash Arba | 43.5 | May | 22 |
| Awash Arba | 44 | Jun | 25 |
| Aysha | 43 | May | 29 |
| Aysha | 43 | Jun | 13 |
| Aysha | 43 | July | 8 |
| Aysha | 43 | July | 8 |
| Aysha | 43 | Sep | 17 |
| Dubti | 43.5 | May | 22 |
| Dubti | 44 | Sep | 19 |
| Dubti | 44.5 | Jun | 12 |
| Dubti | 46.5 | July | 2 |
| Dubti | 46.5 | July | 2 |
| Elidar | 42.8 | July | 19 |
| Elidar | 44.8 | Jun | 12 |
| Elidar | 46 | Sep | 30 |
| Fugnido | 44 | Apr | 10 |
| Fugnido | 43.5 | Apr | 2 |
| Gewane | 44 | May | 23 |
| Gewane | 43.4 | Jun | 15 |
| Gode | 43 | February | 20 |
| Gode | 43.4 | March | 24 |
| Metema | 43.6 | March | 10 |
| Metema | 42.7 | April | 6 |
| Mille | 43.5 | May | 23 |
| Semera | 44.6 | May | 31 |
| Semera | 45.8 | Jun | 13 |
| Sherkole | 43 | April | 3 |

**Table 3.1.2 Annual Extreme Minimum Temperature Values less than 2$^{o}$C during the year 2022**

| Station Name | Minimum Temperature | Month | Date |
|---|---|---|---|
| Adelle | 1.5 | February | 27 |
| Adelle | -4.0 | December | 5 |
| Haromaya | 1 | February | 1 |
| Haromaya | -3.2 | Jaunuary | 26 |
| Haromaya | 1.6 | October | 31 |
| Haromaya | 0.2 | December | 2 |
| Bale Robe | 0 | February | 27 |
| Debre Birhan | -2.4 | February | 4 |
| Debre Birhan | -0.2 | March | 15 |
| Debre Birhan | 1.4 | May | 16 |
| Debre Birhan | 1.2 | October | 29 |
| Debre Birhan | 0.2 | November | 3 |
| Debre Birhan | -2.4 | Jaunuary | 25 |
| Debre Birhan | -0.8 | December | 1 |
| Fiche | 0.8 | November | 8 |
| Haromay | 1 | November | 14 |
| Indibir | 1.8 | November | 23 |
| Kulumsa | 0.0 | Jaunuary | 23 |
| Mehalmeda | 1.2 | November | 3 |
| Mehalmeda | 0.0 | Jaunuary | 27 |
| Wegel Tena | -1.0 | Jaunuary | 26 |
| Wegel Tena | -0.2 | December | 5 |

### *3.2. Rainfall*

Near normal rainfall domination noticed over much of the country in the year 2022. However, though the area coverage is not significant, some places in Oromia, Amhara, northern Somali, SNNPR and Benishangul Gumuz recorded above normal rainfall. Places which recorded a rainfall deficiency found in Oromia, Somali and Benishangul Gumuz faced (Fig. 3.2.2).

The annual total rainfall amount of the year 2022 exceeded 1500 mm over northwestern, western and southwestern parts of the country. In association with this, the annual total rainfall amount reported over Arejo was as high as 2602.2 mm. On the other hand, the annual total rainfall amount was below 500 mm over most of Afar and the southern and southeaster portions of Somali. Refer to Figure 3.2.1 and Table 3.2.2. The annual rainfall of 2022 is lower than the one for 2021 over parts of eastern, southeast, southwest, south and western Ethiopia (Fig. 3.2.3).

**Table 3.2.1 Heavy fall in excess of 70 mm within 24 hours in the year 2022**

| Stations | Heavy Fall | Month | Dates |
|---|---|---|---|
| Dolomena | 70.5 | March | 23 |
| Moyale | 97.7 | April | 17 |
| Negele | 77.0 | April | 16 |
| Gundo meskel | 80 | August | 9 |
| Ginir | 80 | September | 5 |
| Lare | 82 | August | 23 |
| Bati | 83 | August | 1 |
| Imdiber | 84 | June | 4 |
| Lare | 88 | September | 3 |
| Limugenet | 88.2 | September | 5 |
| Gundomeskel | 90.6 | September | 1 |
| Bati | 91.5 | July | 28 |
| Aabole | 96 | July | 13 |
| Dire dawa | 98.7 | August | 15 |
| Gambella | 109 | August | 19 |
| Bahirdar | 110 | July | 2 |
| Nejo | 113 | July | 2 |
| Gore | 125.4 | August | 22 |
| Debark | 127 | July | 31 |
| Nekemte | 135 | June | 18 |
| Fugnuido | 140 | September | 29 |
| Dilla | 75.2 | January | 11 |

**Table 3.2.2 Annual total rainfall amount in excess of 1500 mm during the year 2022**

| Station Name | Annual rainfall amount in mm |
|---|---|
| Arejo | 2602.2 |
| Nekemte | 2515.9 |
| Aman | 2428.7 |
| Masha | 2423.1 |
| Limugenet | 2395.2 |
| Gatira | 2332.9 |
| Bedelle | 2177.2 |
| Kachise | 2140.2 |
| Gidaayana | 2100.2 |
| Gore | 2021.0 |
| Gimbi | 1936.6 |
| Nejo | 1923.3 |
| Chira | 1873.4 |
| Jimma | 1825.7 |
| Indiber | 1819.8 |
| Abobo | 1758.1 |
| Chagini | 1754.9 |
| Gundomeskel | 1741.1 |
| Tepi | 1699.2 |
| Aira | 1662.9 |
| Aykel | 1637.2 |
| Bahir dar met | 1628.4 |
| Shambu | 1614.6 |
| Gambella | 1612.8 |
| Ayhu | 1563.6 |
| Assossa | 1528.6 |
| Dangla | 1524.8 |
| Ejaji | 1520.9 |

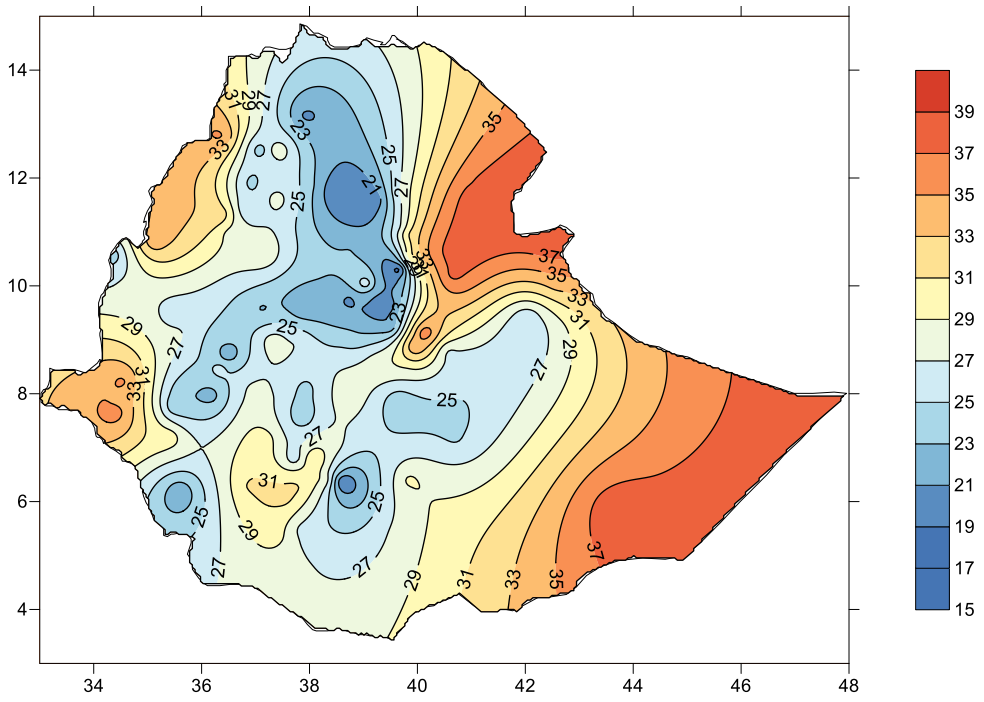



Figure 3.1.1 Mean Maximum temperature in $^{o}$C for the year 2022

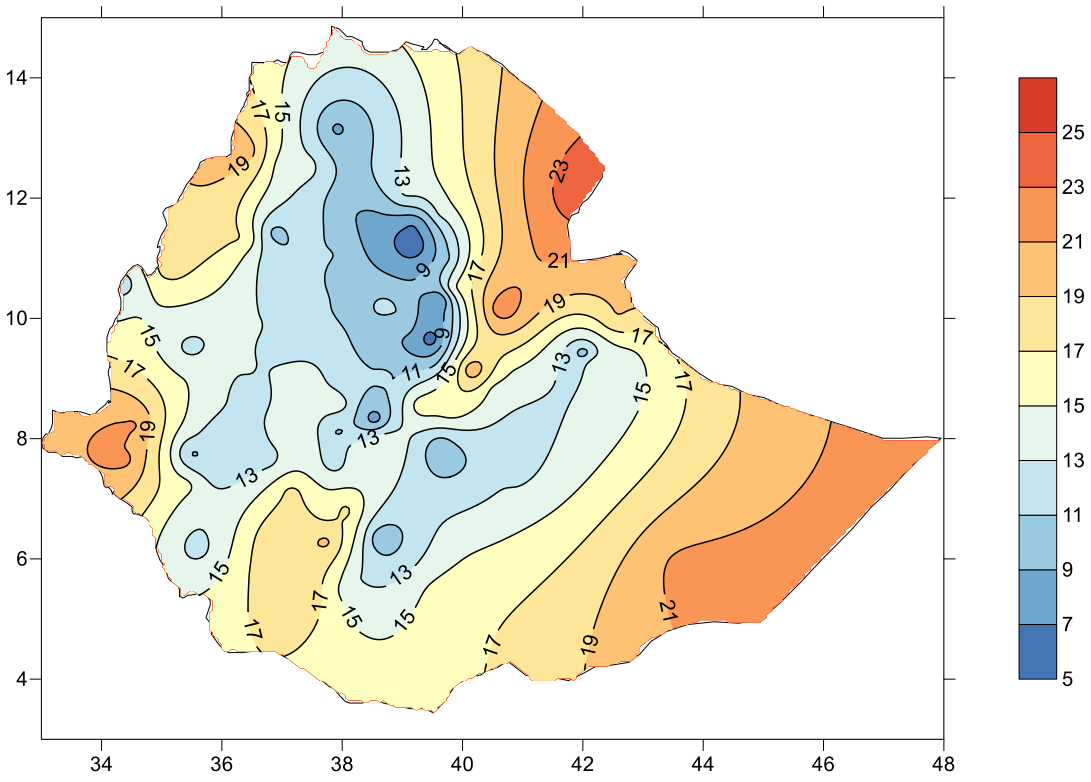



Figure 3.1.2 Mean minimum temperature in $^{o}$C for the year 2022

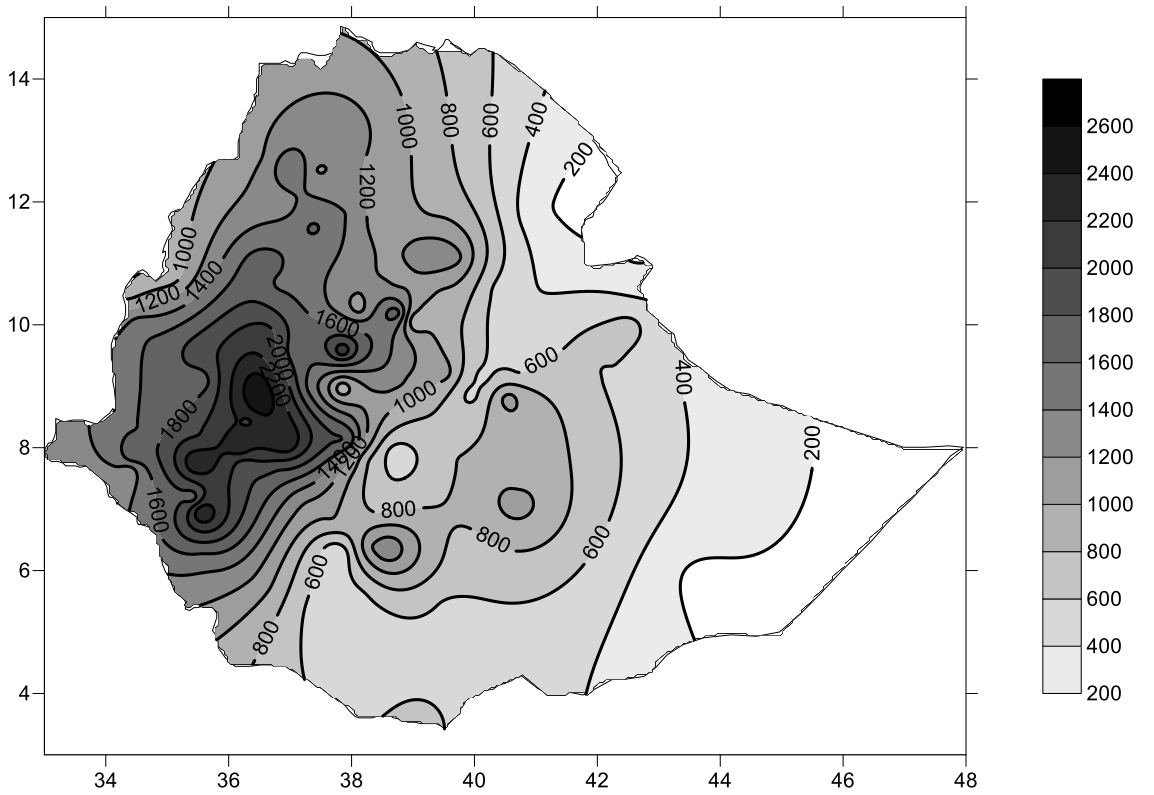



*Figure 3.2.1 Annual total Rainfall amount in mm of the year 2022*

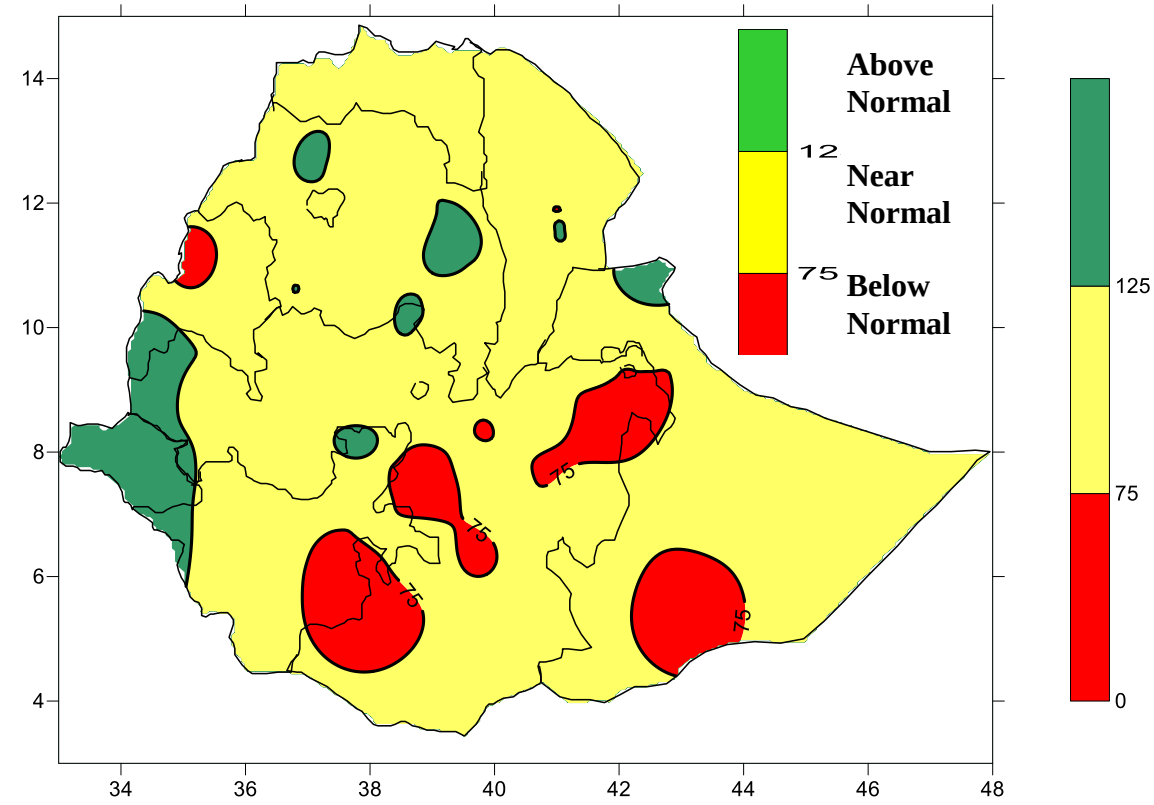



*Figure3.2.2. Percent of normal rainfall for the year 2022*

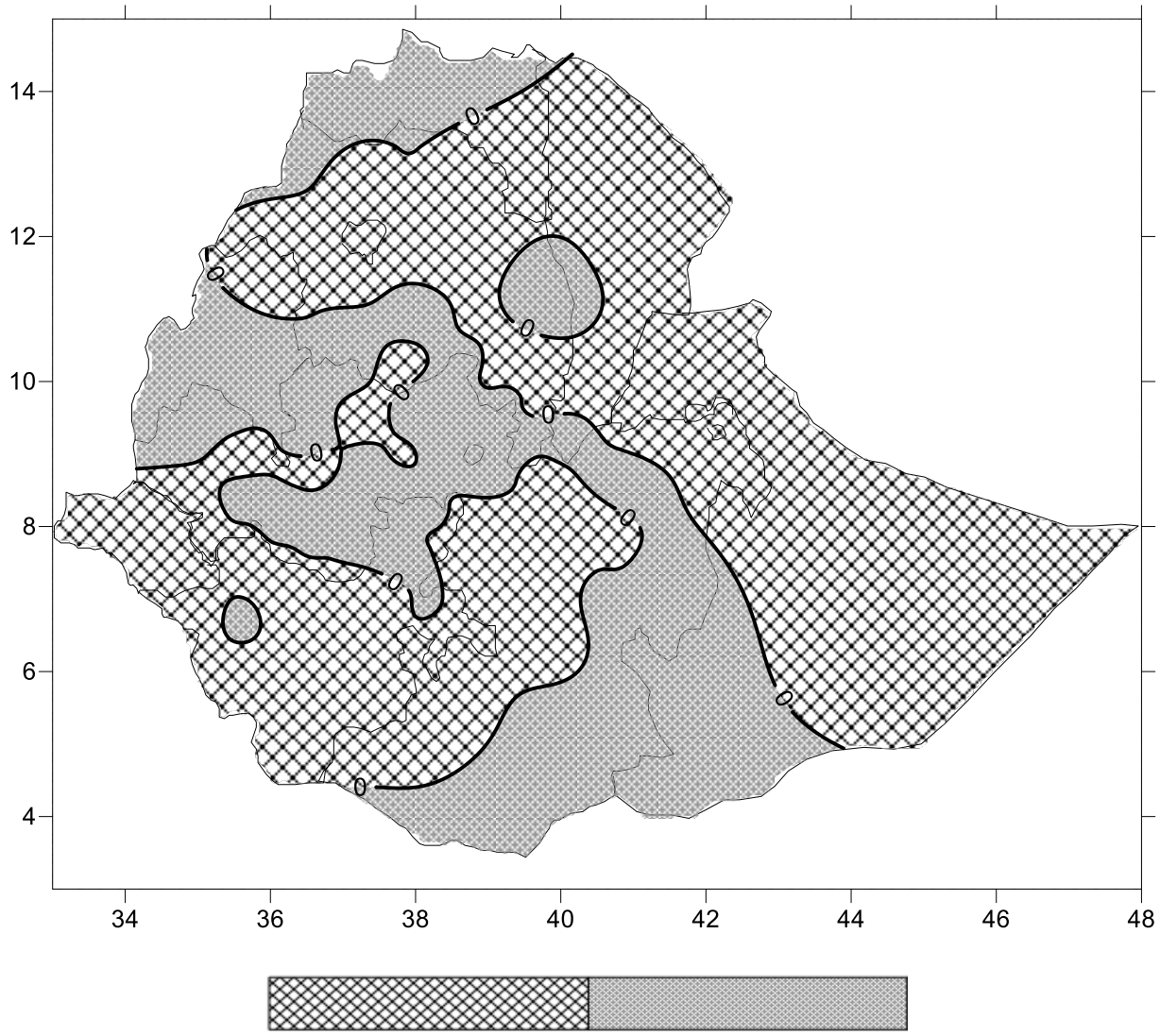



*Figure 3.2.3 Annual Total Rainfall Amount of 2022 minus Annual Total Rainfall Amount of 2021*

### *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 for Addis Ababa Obs., Mekele, Bahir Dar and Awassa.

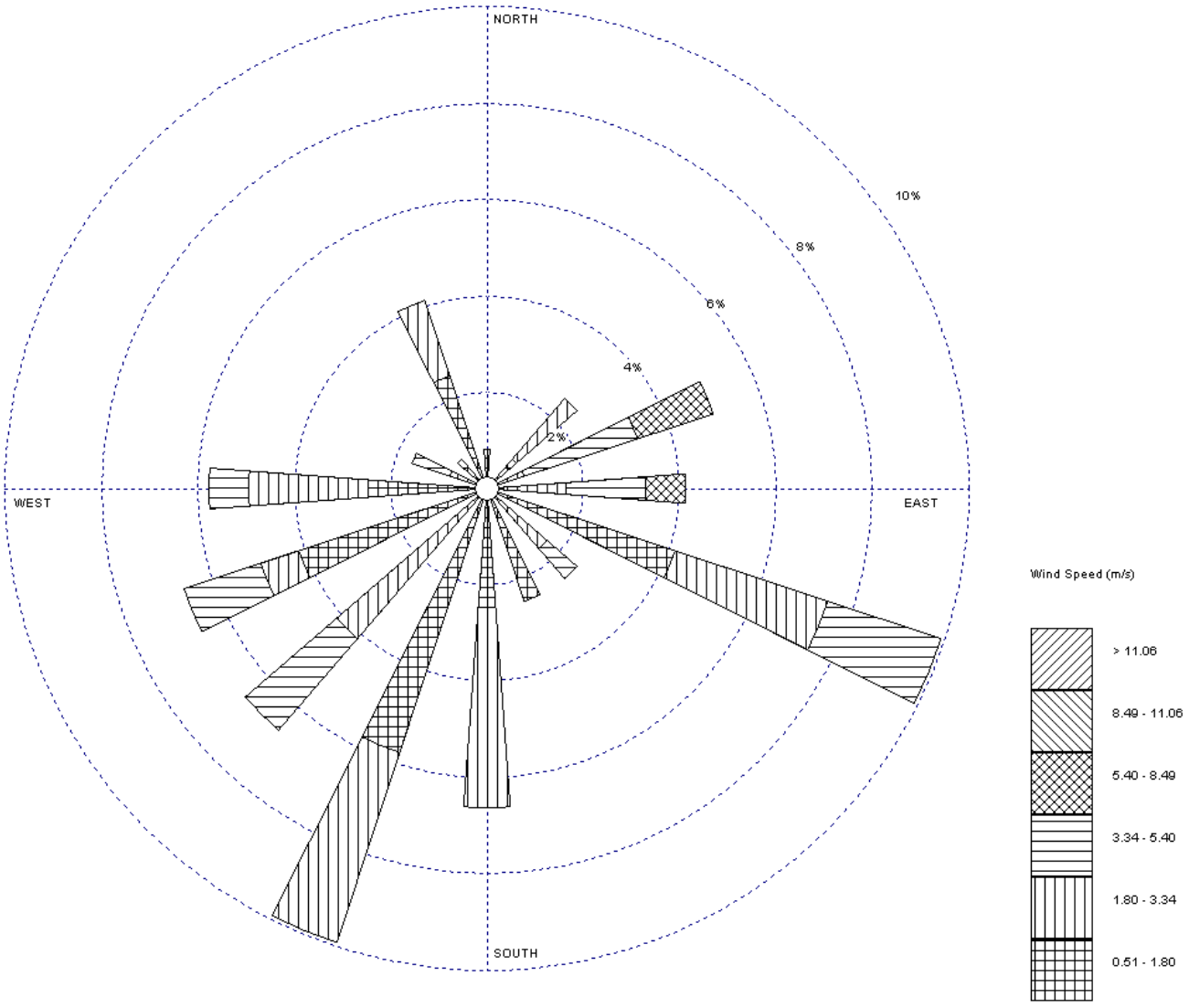
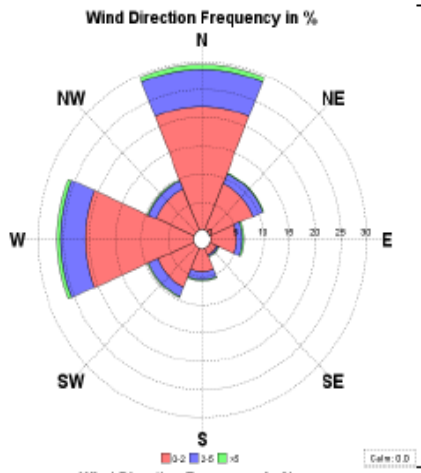
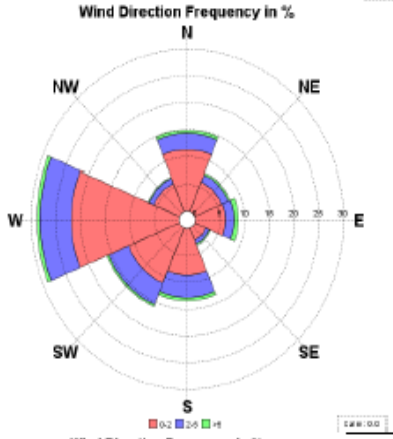
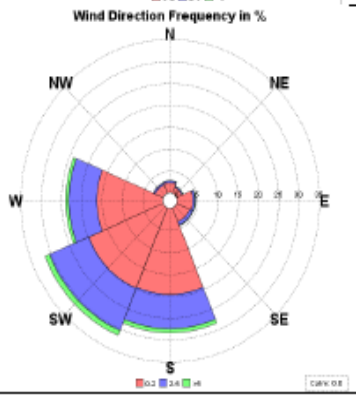
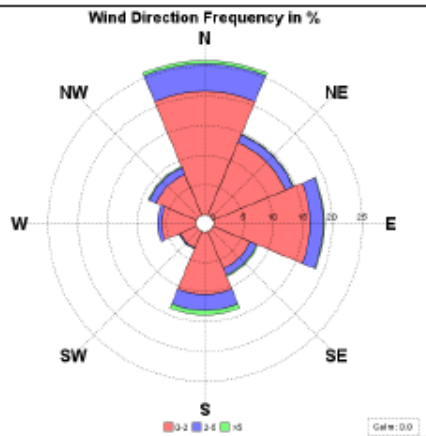
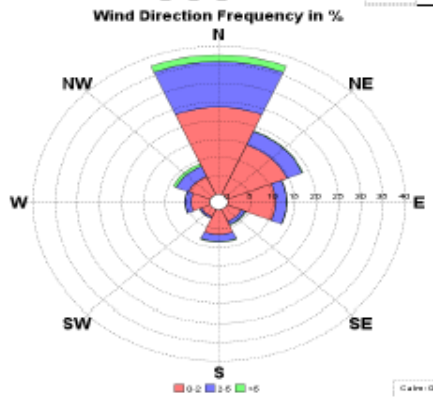
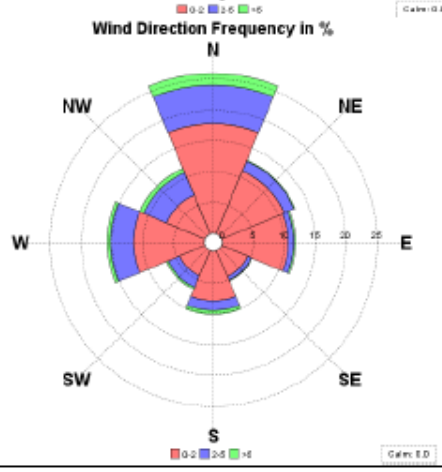


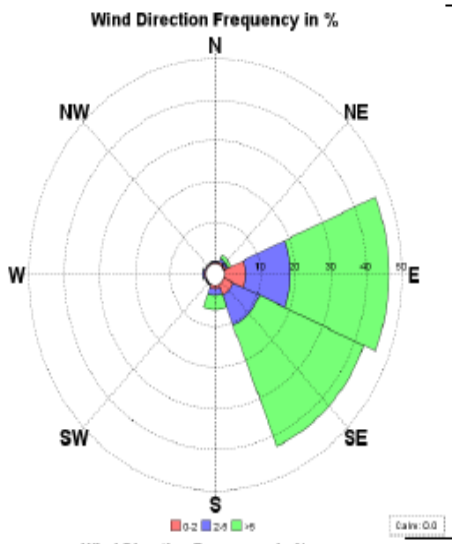
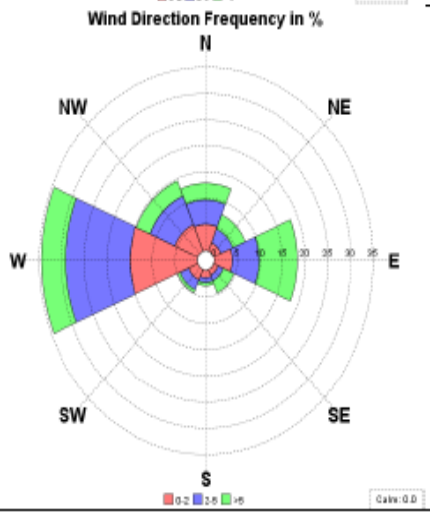

**Figure 3.3.1 Sample wind rose diagram. The center on the diagram (where the head of each bar ends) represents a meteorological station into which the wind blows, while its tail shows where the wind comes from. The length of the bar is proportional to the frequency of the wind having a specific direction 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.**

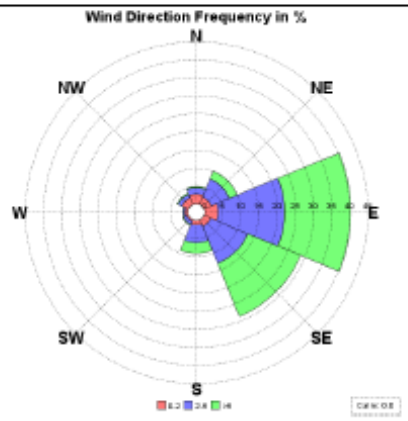
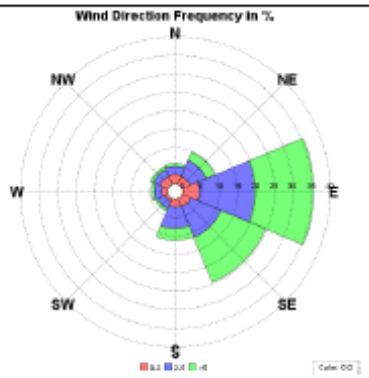
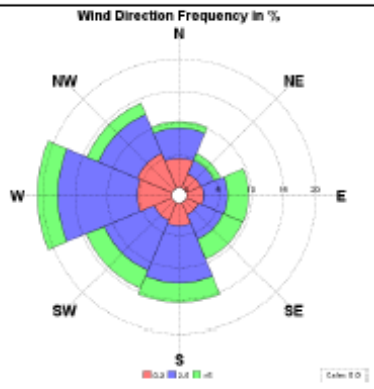
**Table 3.3.1 WIND ROSE diagrams over selected stations showing the prevalent wind in the three seasons:**

**a. Awassa, b. Bahir Dar, c. Mekele and d. Addis Ababa**

| Station (Season) (a) | Based on long term data (1981-2010) |
|---|---|
| Awassa (Bega) |   |
| Awassa (Belg) |   |
| Awassa (Kiremt) |   |

| Station (Season) (b) | Based on long term data (1981-2010) |
|---|---|
| Bahir Dar (Bega) |  |
| Bahir Dar (Belg) |  |
| Bahir Dar (Kiremt) |  |

| Station (Season) (c) | Based on long term data (1981-2010) |
|---|---|
| Mekele (Bega) |   |
| Mekele (Belg) |   |
| Mekele (Kiremt) |   |

| Station<br>(Season)<br>(d) | Based on long term data (1981-2010) |
|---|---|
| Addis Ababa Bole<br>(Bega) |  |
| Addis Ababa Bole<br>(Belg) |  |
| Addis Ababa Bole<br>(Kiremt) |  |