

**Federal Democratic Republic of Ethiopia**

**Ministry of Water, Irrigation and Electricity**

**National Meteorological Agency**

**Applied Meteorological Services Case Team**

**Climate Information  
For  
The Health Sector**

*August 2018*

## **Foreword**

This "Climate Information for the Health Sector" Bulletin has been designed to convey essential information regarding the monitoring of human comfort conditions based on the analysis of temperature and humidity data and also for the monitoring of Malaria outbreak areas based on the analysis of temperature and precipitation data.

Since the monitoring of temperature and rainfall over a given area can be used to assess the likelihood of outbreak of Malaria with a lag of two months, this information can be an important for early warning tool if used judiciously.

The major objective of this bulletin is in line with the National Meteorological Agency's strategy of diversifying climate application products to the basic developmental sectors (such as Health, water, agricultural sector etc...). This bulletin can be a very important source of information to Health professionals engaged in the monitoring of Public Health, to Tourism Agents and institutions who advise tourists regarding the comfort conditions of the places to be visited by the tourists and to the researcher who is interested in the field of Bio-Climatology.

We have the opinion that careful and continuous use of this bulletin can benefit to the improvement of early warning and preparedness in the Health sector.

Meanwhile, your comments and constructive suggestions are highly appreciated to make the objective of this bulletin a success/

This same bulletin can be accessed online at: <http://www.meteo-ethiopia.net/health.htm>

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**Analysis of climateparameters which trigger malaria outbreak**

## 1. Rainfall

Rainfall is largely responsible for creating the conditions which allow sufficient surface water for mosquito breeding sites and is, therefore, recognized as one of the major factors influencing malaria transmission.

According to Grover-Kopek et al. 2006, When total monthly rainfall exceeds 80mm and above, this parameter has a role for malaria outbreak in a given area. Hence, most of the areas in the country received rainfall amount which exceeds 80 mm in the month of August, but non kiremt season rainfall beneficiary areas received like South and South East including Somali regions.

As presented in Figure 1, Tigray, Amhara, Oromia (except South and South East), Benshangul Gumuz, Gambella, SNNPR, and Southern and Central Afar Regions of the country.

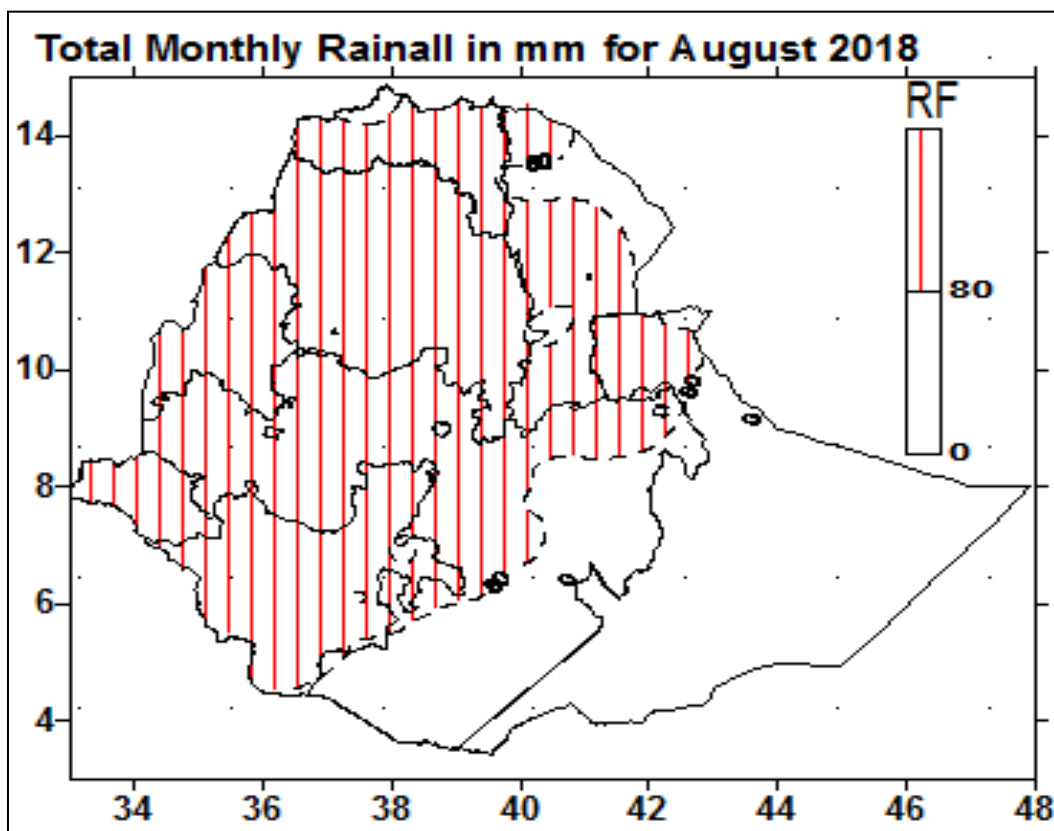


Figure1. Total monthly rainfall for August 2018

## 2. Temperature

Temperature also plays an important role in the variability of malaria transmission by regulating the development rate of mosquito larvae and influencing the survival rate of adult mosquitoes. Mosquitoes generally develop faster and feed earlier in their life cycle and at a higher frequency in warmer conditions. In addition, the Plasmodium parasite multiplies more rapidly in the mosquito in higher temperatures. Taking in to account the above assumptions and Grover-Kopek et al. 2006 findings, mean monthly temperature ranging from 18-32 °c were recorded over most of the areas in the country in August months except central parts of SNNPR, Oromia, Amhara and Tigray (Figure 2).

Some parts of the country recorded temperature below 18 °c and pocket areas of Northern Somali and Eastern Afar region recorded mostly mean temperature which exceeds 32 °c.

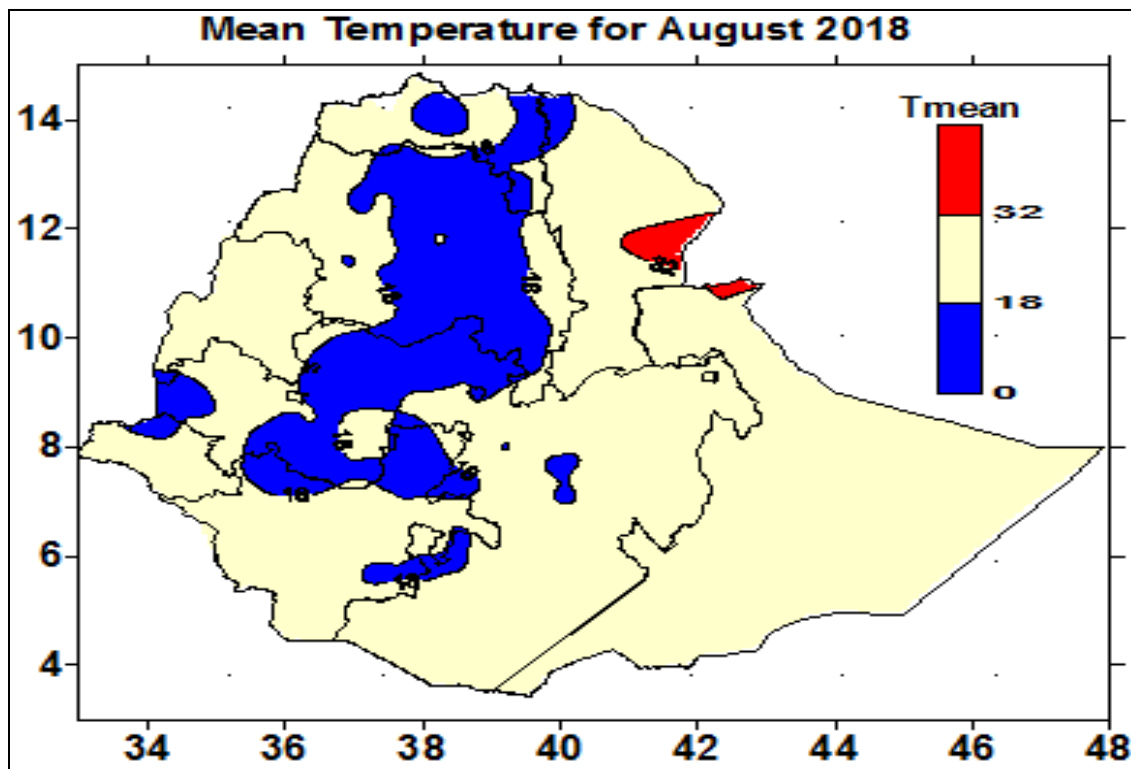


Figure 2. Mean monthly temperature for August 2018

### 3. Relative Humidity

Humidity impacts the survival rate of the mosquito as well. Mosquitoes will generally not live long enough to complete their transmission cycle where and when the relative humidity is consistently less than 60%. Therefore, most kiremt rainfall benefiting areas of the country experienced monthly relative humidity values exceeding the expected threshold but most parts of Afar, Easten Oromia some pocket areas of SNNPR and Somali regions recorded relative humidity whose monthly mean values less than the expected threshold for malaria outbreak ( 60 %) (Figure 3).

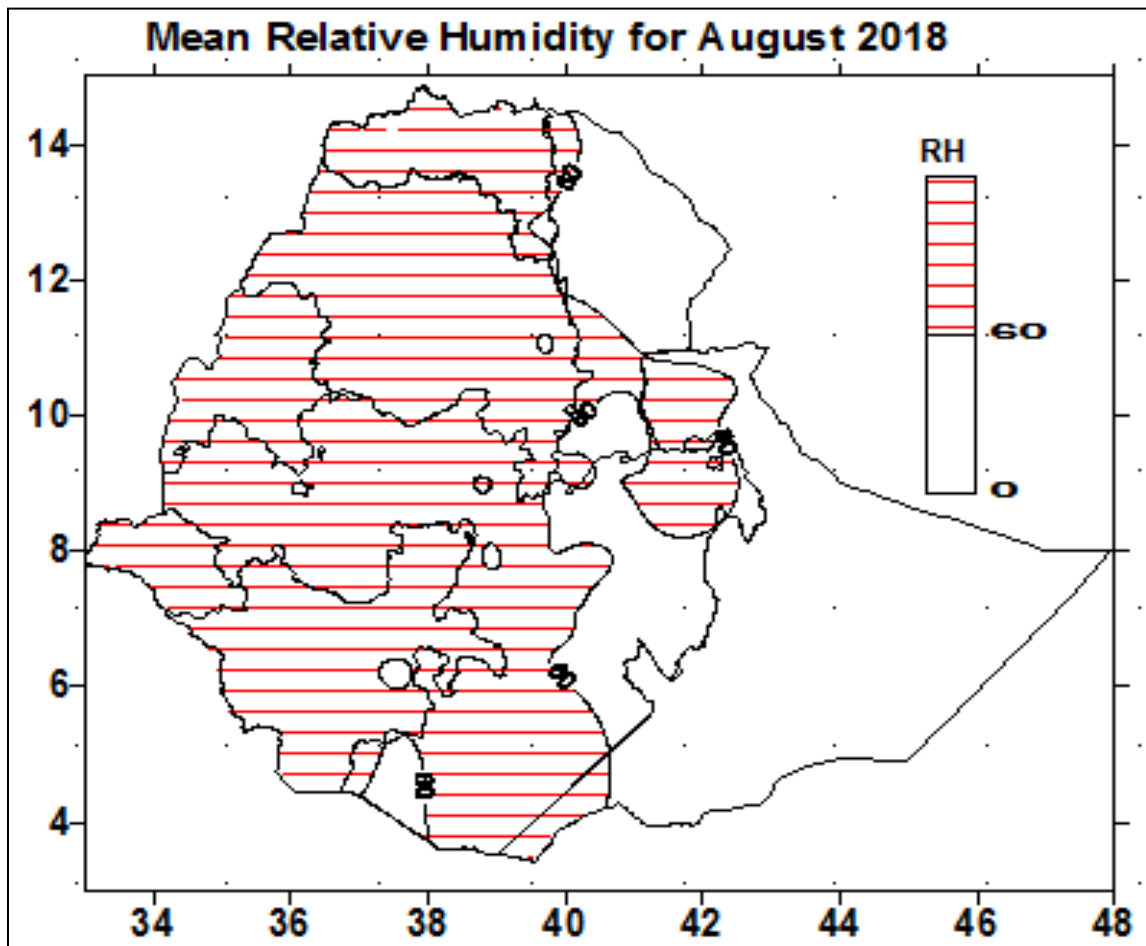


Figure3. Mean monthly relative humidity for August 2018

## Combined Effects of Climatic Conditions for Malaria Transmission

In endemic regions these three variables usually create conditions suitable for malaria transmission every year. In the epidemic prone regions one of these variables is typically not sufficient to support transmission. Having this assumption, climatic conditions suitable for malaria outbreak were seen dominantly over Benishangul Gumuz, North Eastern Amhara, Southern and Eastern parts of Gambella, Central and Western parts of Afar, Central and Southern Oromia, Harar and Diredawa, North Eastern Tigray, Western and some parts of Eastern Amhara (Figure 4).

Further more, Central and Southern parts of Amhara, pocket areas of Central and Eastern Tigray, Central and Western tips of Oromia, pocket areas of SNNPR experienced unfavorable climatic conditions for malaria outbreak. Overall, red squared patterns with light yellowish background colors in figure 4 below satisfied thresholds suitable for the existence and distribution of malaria over the country.

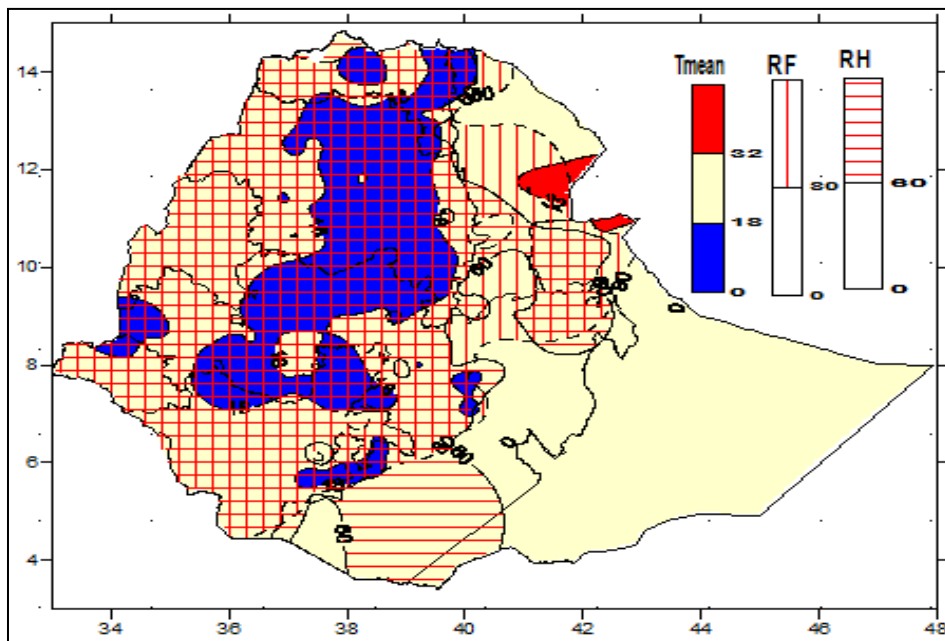


Figure 4. Combined temperature, rainfall and relative humidity analysis for August 2018.

## Temperature Humidity Index (THI) Conditions during August 2018

Scientifically, if the ‘THI’ values exceed 26 almost all the population feel uncomfortable (here we refer to it as "uncomfortable"), if the ‘‘THI’’ values between 21 to 26 half of the population feel uncomfortable (here we refer to it as "moderate") and if the THI values are less than 21 almost all the population feel comfortable (here we refer to it as "comfortable") with Respect heat stress. Hence, most of the areas in the country experienced uncomfortable conditions during August months in relation to heat stress, but some places in Amhara, Dire Dawa SNNPR regions experienced moderate weather conditions (Table 1).

| No | Station     | <21 (comfortable) | 21-26 (moderate) | >26 (uncomfortable) | Total |
|----|-------------|-------------------|------------------|---------------------|-------|
| 1  | Mekele      | 0                 | 0                | 30                  | 30    |
| 2  | Gondar      | 5                 | 5                | 21                  | 31    |
| 3  | Bahir Dar   | 10                | 10               | 10                  | 30    |
| 4  | Kombolcha   | 10                | 21               | 0                   | 31    |
| 5  | D/Markos    | 0                 | 0                | 31                  | 31    |
| 6  | Nekemte     | 0                 | 0                | 31                  | 31    |
| 7  | Jimma       | 7                 | 7                | 16                  | 30    |
| 8  | Gore        | 0                 | 0                | 31                  | 31    |
| 9  | Addis Ababa | 0                 | 0                | 30                  | 30    |
| 10 | Debre Zeit  | 6                 | 6                | 19                  | 31    |
| 11 | Metehara    | 24                | 1                | 5                   | 30    |
| 13 | Awassa      | 12                | 11               | 8                   | 31    |
| 14 | Dire Dawa   | 13                | 11               | 7                   | 31    |
| 15 | Robe        | 1                 | 1                | 29                  | 31    |
| 16 | Gode        | 2                 | 2                | 27                  | 31    |
| 17 | Arbminch    | 0                 | 1                | 30                  | 31    |
| 18 | Negele      | 5                 | 5                | 21                  | 31    |

**Table 1. Average Monthly THI values for August 2018**