

**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**

*September 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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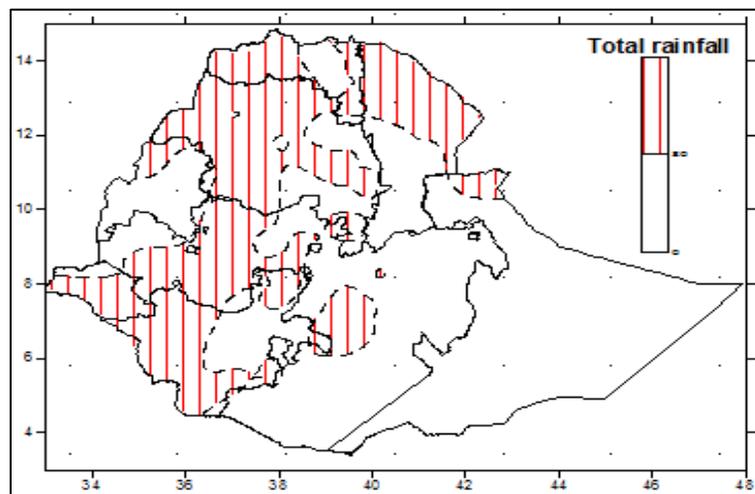
# Analysis of climate parameters which trigger malaria outbreak

## 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, some areas in the country received rainfall amount which exceeds 80 mm in the month of September, but non-kiremt season rainfall beneficiary areas like South and South East including Somali regions do not receive rain like the previous months.

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



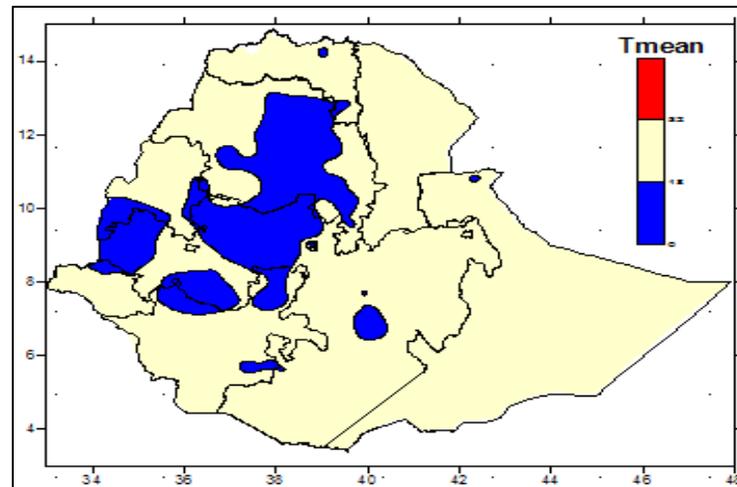
**Figure 1. Total monthly rainfall for September 2018**

## 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 September months except tip parts of SNNPR and Benishangul Gumuz, Central and Wesetern Oromia, Amhara and Tigray(Figure 2).

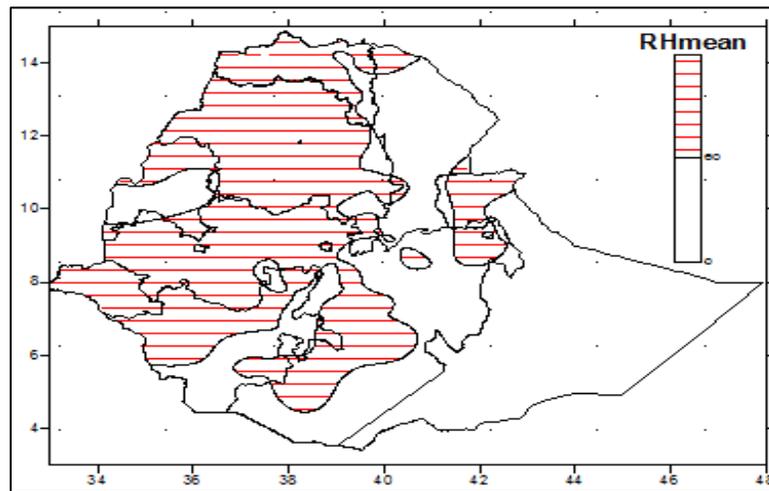
Some parts of the country recorded temperature below 18 °c ,overall most of the areas were suitable for the occurence of malaria in satisfying the given threshold value.



**Figure 2. Mean monthly temperature for September 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 consistantly 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 except the Northern tip, Easten Oromia some pocket areas of SNNPR and Somali regions recorded relative humidty whose monthly mean values less than the expected threshold for malaria outbreak ( 60 %) (Figure 3).

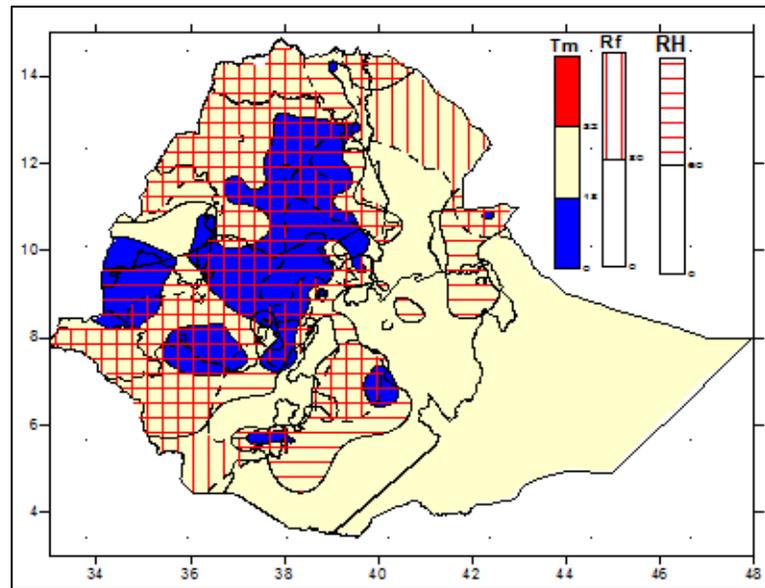


**Figure3. Mean monthly relative humidity for September 2018**

### **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 Western Amhara, Central Oromi, North Western Tigray, Noth Wesetrn Amhara (Figure 4).

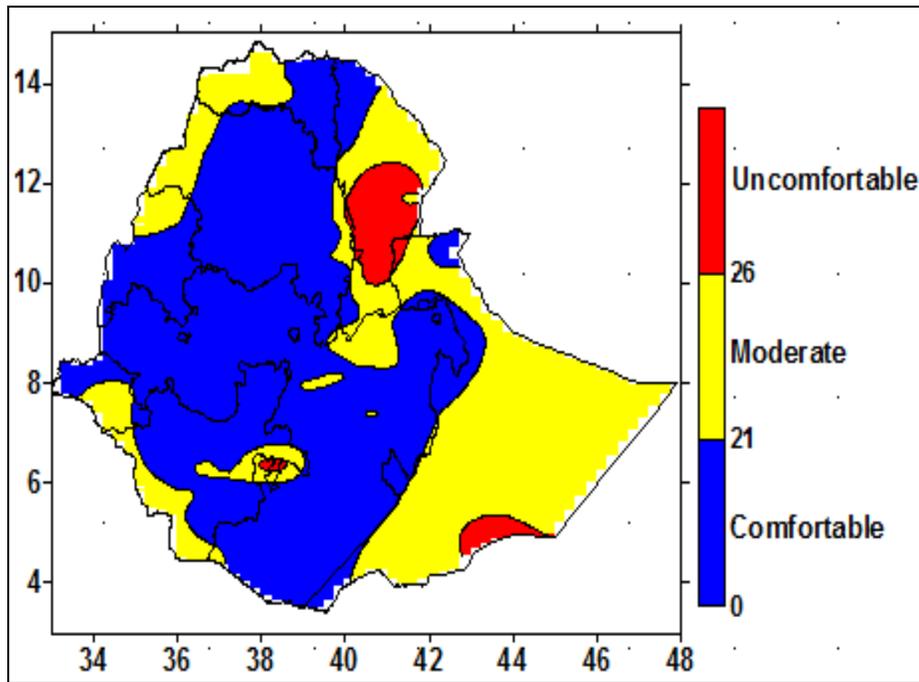
Further more, Central and Southern parts of Amhara, pocket areas of Central and Eastern Tigray, most parts of Oromia, pocket areas and Central of SNNPR exerienced unfavorable climatic conditions for malaria outbreak. Overall, red squared patterns with light yellowish background colors in figure 4 below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



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

### **Temperature Humidity Index (THI) Conditions during September 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 comfortable conditions during September months in relation to heat stress, but places like Somali, North Western tips, Afar, tips of Tigray ,Gambella experienced moderate to uncomfortable climatic conditions which might brought heat related health probles (Figure 5).



**Figure 5. Average Monthly THI values for September 2018**

**Recommendations for Bega (October-January 2018) season**

Based on the forecast issued for bega season, the country will dominantly Experienced wet condition, malaria prone areas of the country should take appropriate action to offset outbreak of malaria following kiremt season besides the coming wet bega season.