Federal Democratic Republic of Ethiopia

Ministry of Water and Energy

National Meteorological Agency

Applied Meteorological Services Case Team

Climate Information

For

The Health Sector

JULY 2017

Volume XII, No. 01

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 the Health, the water, the 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 Heath sector.

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

Director General

NMA

P.O.Box 1090

Tel: 251(0)11 6615779

FAX 251(0)11 6625292

E-mail: nmsa@ethionet.et

Web: www.ethiomet.gov.et

Addis Ababa

Ethiopia

1. Rainfall, Temperature and Humidity Conditions during July 2017.

Based on the meteorological data of July 2017, above 80 mm amount of monthly total rainfall was recorded over most western half of the country moreover similar areas have recorded above 60% relative humidity and temperature between 18°C to 32°C. As a result, favorable climate condition for the existence and distribution of malaria was recorded over most western lowland parts of SNNPR, Oromiya, Benishangulgumz, Amhara, and a few areas of western Tigray regional states during the month of July 2017. Similarly the rainfall deciles map of July 2017 shows normal to highest in the record rainfall distribution over most areas of the country. On the other hand, below normal rainfall distribution was recorded over some pocket areas of the country during the month of July 2017 (fig. 1b).

As per Grover-Kopek et al. 2006, the suitable climatic conditions for transmission of malaria in Africa are; when the monthly precipitation accumulation is at least 80 mm, the monthly mean temperature is between 18°C and 32°C and the monthly mean relative humidity is at least 60%.The same approach was applied on Temperature, Rainfall and Humidity using meteorological data of July 2017 collected from some representative meteorological stations of the Ethiopia in order to demarcate all the possible malaria expected areas of the country (fig. 4).

On the basis the above standard, the rainfall, temperature and humidity assessments regarding the distribution of malaria during July 2017 were; mean temperature 18^{0}C to 32°C was observed over most lowland areas except the central and eastern highland parts of the country and that portion was shaded in deep blue color (fig. 2a). At the same time meteorological stations over most western half of the country recorded above 80 mm of monthly total rainfall amount (fig. 1a). Moreover, 60% and above monthly mean relative humidity was recorded over most portion of the country (fig. 2b). Regarding all the above indicated values of monthly rainfall, humidity and temperature assessment, favorable climate condition for the existence and distribution of malaria was observed over most western lowland parts of SNNPR, Gambela, Oromiya, Benishangulgumz, Amhara and Tigray regional states during the month of July 2017 (fig.4).

For further and detailed information with respect malaria, the monthly mean minimum and maximum temperatures summary maps of July2017 were posted on page four, (fig. 3 (a) and 3(b)).

Based on the above given standard and the climate assessment of July 2017, favorable climate condition for the existence and distribution of malaria was recorded over most western lowland of the country during the month of July 2017.

Regarding the distribution of malaria, areas of favorable climate conditions for the existence and distribution of malaria can be summarized as follows; if a portion of an area which satisfy the above three significant conditions based on the current monthly rainfall, temperature and humidity data; that specific portion of the country will be clearly marked in light yellowish background and superimposed with red square pattern (fig.4).

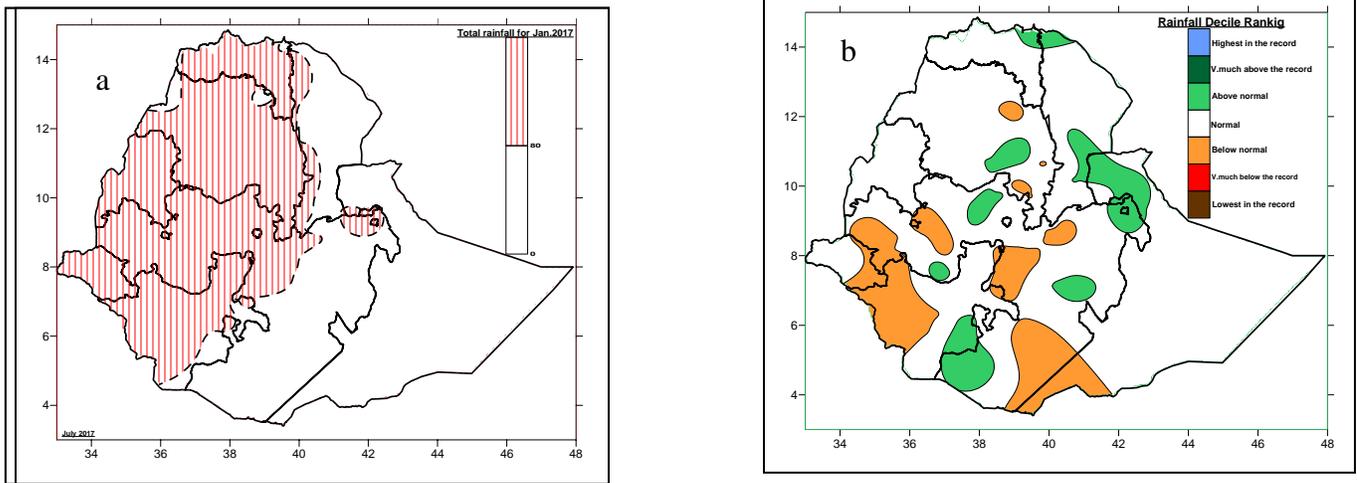# Rainfall, Temperature and Humidity Assessment during the month of July 2017.

Fig. 1:- Rainfall assessment of July 2017.

(a) Monthly total rainfall amount of July 2017 in mm. Hatched areas had monthly rainfall amount of 80mm and above

(b) Rainfall deciles of July 2017. Areas shaded in green color indicate wetter than normal condition, while areas shaded
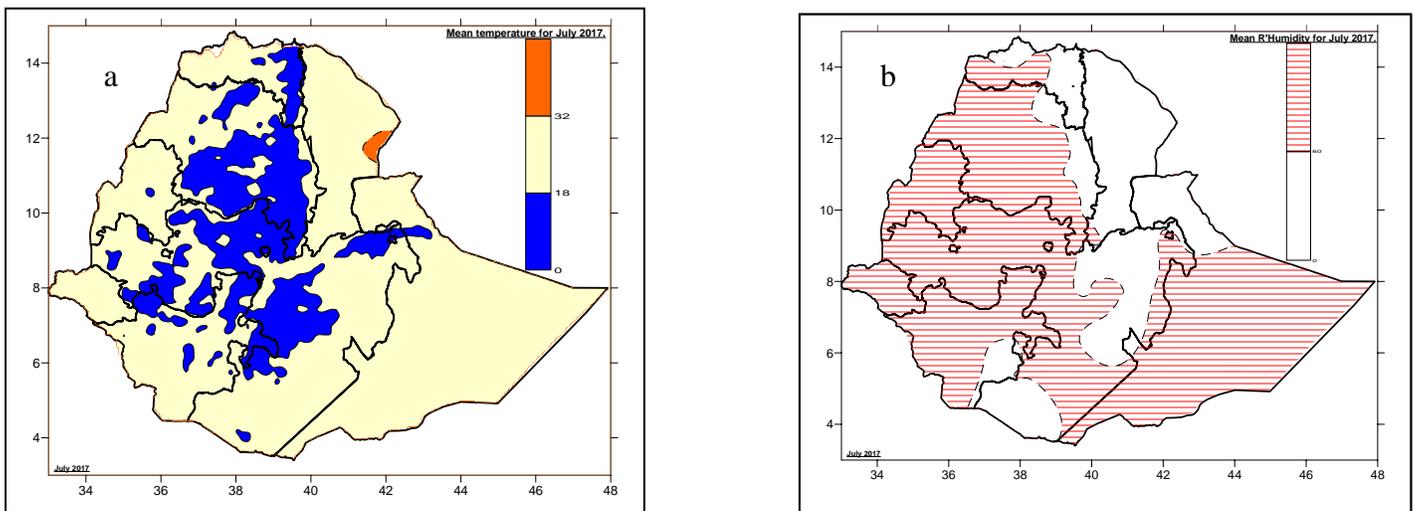
in red color indicate rainfall deficiency.

Fig. 2:- Temperature and relative humidity assessment of July 2017.

(a) Monthly mean temperature in degree centigrade of July2017. Areas shaded in light yellowish color had monthly mean temperature of 18 to 32 oC and areas with temperature greater than 320C shaded in red color while areas shaded in deep blue color had monthly mean temperature less than 18 0C

(b) Monthly average relative humidity in % of July2017. Hatched areas had monthly average Relative humidity of 60% and above.

3

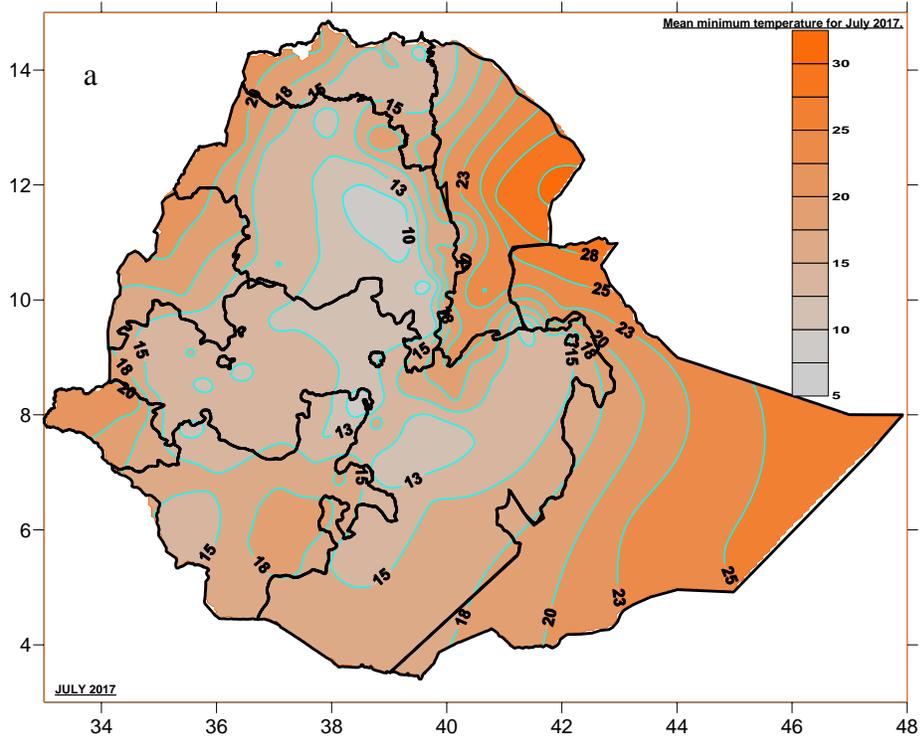# Average temperatures for the month of July 2017.

Fig 3:- (a). Mean minimum temperature in degree Celsius during July 2017.
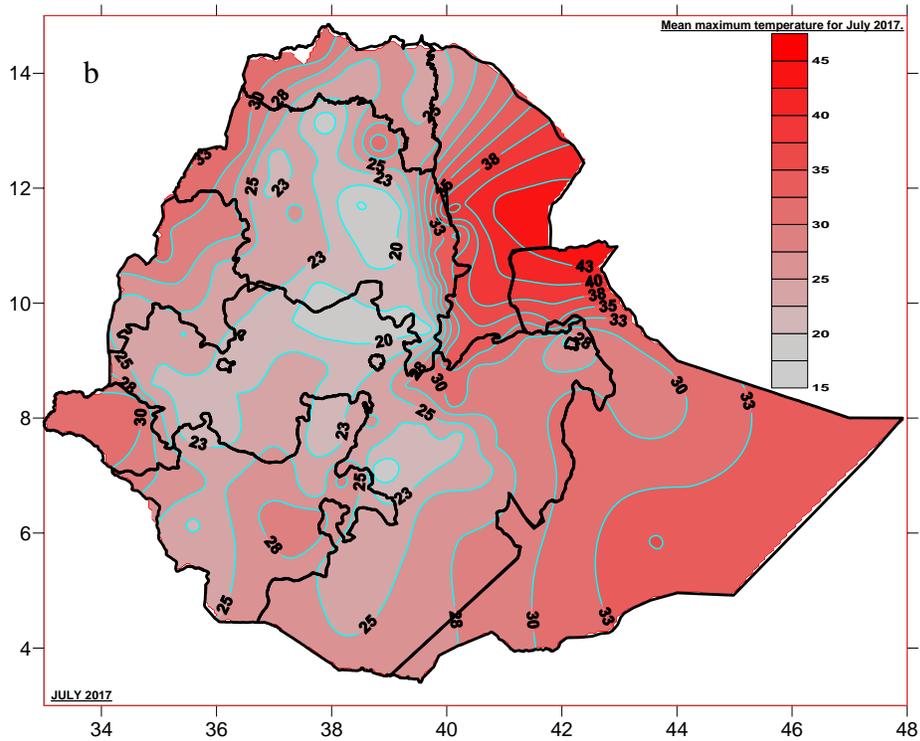

Fig 3:- (b). Mean maximum Temperature in degree Celsius for the month of July 2017.

4

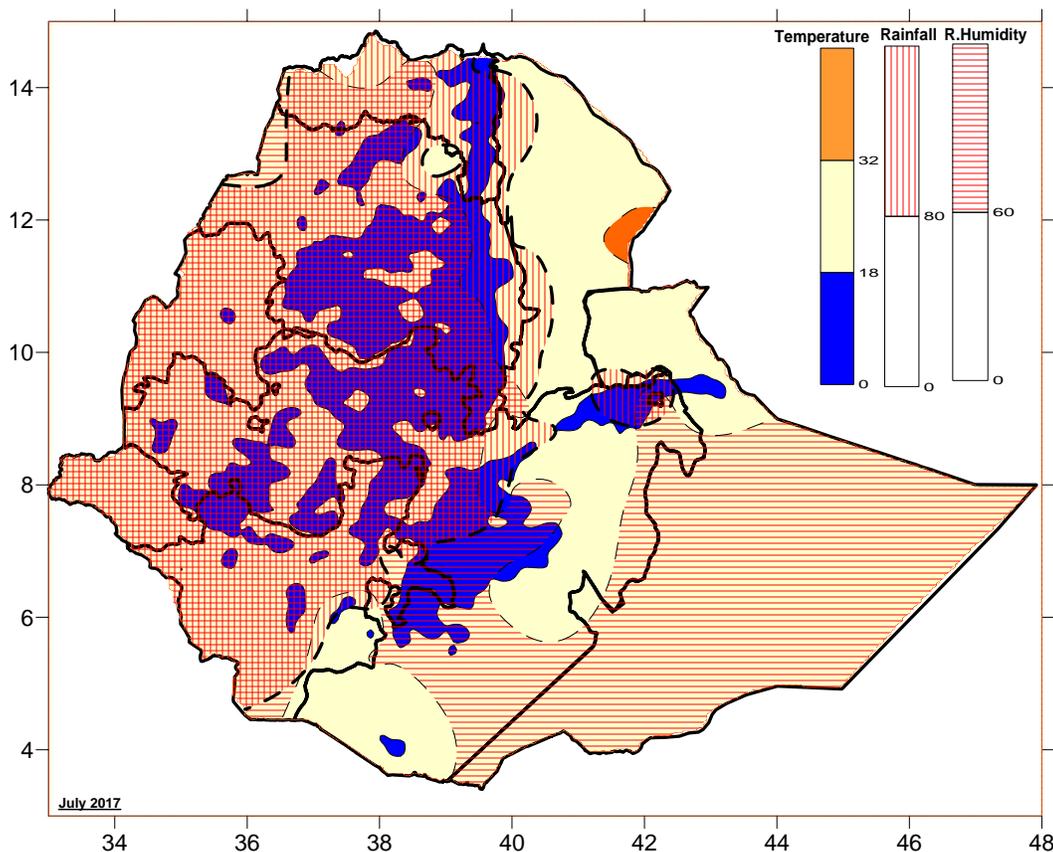# Malaria prone areas during the month of July 2017.

Fig 4:- Combined temperature, rainfall and relative humidity analysis for July 2017. Areas under square patterns with yellowish background color are assumed to satisfy favorable climatic conditions for malaria.

The above combined map was designed to demonstrate the effect of monthly Temperature, Rainfall and Relative Humidity on the distribution of malaria during the month of July 2017. Regarding to this, Areas under red squared patterns with light yellowish background colors are assumed to satisfy suitable climatological condition for the existence and distribution of malaria whereas areas whose monthly average temperature below 18^0C and lowland areas whose monthly average temperature greater than 32^0C are marked in deep blue and red color respectively and those portion of the country were not favorable for the distribution malaria.

According to the above explanations, areas whose average temperature between 18 and 32 degree Celsius, total rainfall 80 mm and above together with a monthly average relative humidity of 60% and above were observed over most western half lowland areas of the country. As a result climatic condition was favorable for the survival and distribution of malaria over most lowland parts of SNNPR, Gambela, western and eastern Oromiya, Benishangulgumz, western Amhara and Tigray regions during the month of July 2017.

In general the relation of rainfall, temperature and humidity (RTH) values with respect to malaria distribution; if the current monthly assessment of temperature, rainfall and humidity satisfy the above conditions, the climate condition over that specific area automatically considered to be favorable for the survival and distribution of malaria and that portion of the region will be marked in light yellowish background color superimposed with red square pattern.

2. *Temperature Humidity Index (THI) Conditions during July 2017.*

The Temperature Humidity Index (THI) approach, which was developed by the US weather Bureau in 1959, is applied to the temperature and humidity data over representative stations of the country to review the comfort and discomfort condition of July2017. According to this approach, 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 to heat stress.

According to the "THI" values of the above table, the level of human comfort with respect heat stress; uncomfortable condition was progressively increasing in both cases over the eastern and southern lowland areas of the country, as a result uncomfortable condition was recorded over Diredawa 27 out of 31 days and Metehara 20 out of 31 days during the month of July 2017. On the other hand high land areas like Debremarkos, Adisababa, Gore, Nekemte, Balerobe, Mekele and Gonder stayed comfortable for more than 90% of the observation days; moreover the rest parts of the country were remained moderate. In general, both comfortable and moderate conditions with respect to heat stress were dominating over most parts the country during July 2017 (table 1).

Frequency of temperature-humidity Index (THI) during the month of July 2017.

No	Stations / July_2017	Number of Days with THI Values of			Total number of Days
		< 21 (Comfortable)	21-26 (Moderate)	>26 (Uncomfortable)	
1	Debremarkos	31	0	0	31
2	Addisababa	31	0	0	31
3	Gore	30	1	0	31
4	Nekemte	28	3	0	31
5	Balerobe	28	3	0	31
6	Mekele	21	10	0	31
7	Gondar	17	14	0	31
8	Kombolcha	0	31	0	31
9	Bahirdar	2	29	0	31
10	Arbaminch	2	28	1	31
11	Debrezeit A.F		24	0	24
12	Jimma	9	22	0	31
13	Negele	13	18	0	31
14	Awassa	14	17	0	31
15	Diredawa	1	3	27	31
16	Metehara	0	11	20	31

Table 1:- Temperature Humidity Index (THI) values for some selected stations during the month of July 2017.

Reference: - Grover-Kopec et al. 2006 - Web-based climate information resources for malaria control in Africa, Malar J. 2006; 5: 38. Published online 2006 July11. doi: 10.1186/1475-2875-5