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Ministry of Water, Irrigation and Electricity

National Meteorological Agency

Applied Meteorological Services Case Team

Climate Information

For

The Health Sector

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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.

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

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1. Rainfall, Temperature and Humidity Conditions during Nov 2017

According to the national meteorological data of Nov 2017 report; total amount of monthly rainfall 80 mm and above, monthly mean relative humidity 60% and above were recorded over the South eastern of the country. Similarly the distribution of rainfall was not recorded highest to normal wholly except over some parts of the country; accordingly above average to highest in the record rainfall distribution was registered over most South-Western , South and South eastern part of the country; On the other hand; below normal rainfall distribution was observed over some parts of North western North and North eastern parts of the country.

Regarding rainfall, humidity and rainfall deciles outputs, normal and above rainfall amount was recorded over some parts of the country; as a result were a few parts of South-western ,South and South eastern portion of the country were favorable for the existence and distribution of malaria during the month of Nov 2017 (fig.1a), (fig. 1b)and (fig.2b).

As per Grover-Kopek et al. 2006, the favorable 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%. Accordingly the same method was applied on Temperature, Rainfall and Humidity using meteorological data of Nov 2017 collected from some representative meteorological stations of Ethiopia in order to demarcate all the possible malaria expected areas of the country (fig. 4).

On the basis of the above principle and other related output like the deciles map (fig. 1b), assessments of Nov 2017 rainfall, temperature and humidity with respect to the distribution of malaria, values of monthly mean temperature 18^0C to 32^oC was observed over most areas except the central Amhara and Oromia highland parts of the country and those areas of the country was shaded in deep blue color (fig. 2a). At the same time some parts of the country except northeastern and southeastern areas of the country recorded 80 mm and above of monthly total rainfall (fig. 1a). Additionally, 60% and above monthly mean relative humidity was recorded over few parts of the country except central, northern, northeastern and southeastern areas of the country (fig. 2b). Based on the above explained assessment, the monthly rainfall, humidity and temperature; Therefore climatic conditions were not favorable for the survival and distribution of malaria over most lowland areas of Benishangulgumz, North-western, North-eastern and eastern Oromia, and parts of area and a few lowland portion of western Amhara during Nov 2017 (fig.4).

For furthermore and detailed information with respect malaria, the monthly mean minimum and maximum temperatures summary maps of Nov 2017 were posted on page four, (figures 3 (a) and 3(b)).

In principle, areas of favorable climate conditions for the existence and distribution of malaria can be summarized as follows;

if there is an area which satisfies the above three stated conditions with respect to the current monthly rainfall, temperature and humidity data; that specific portion of the area will be clearly marked in light yellowish background which is superimposed with red square pattern (fig.4).

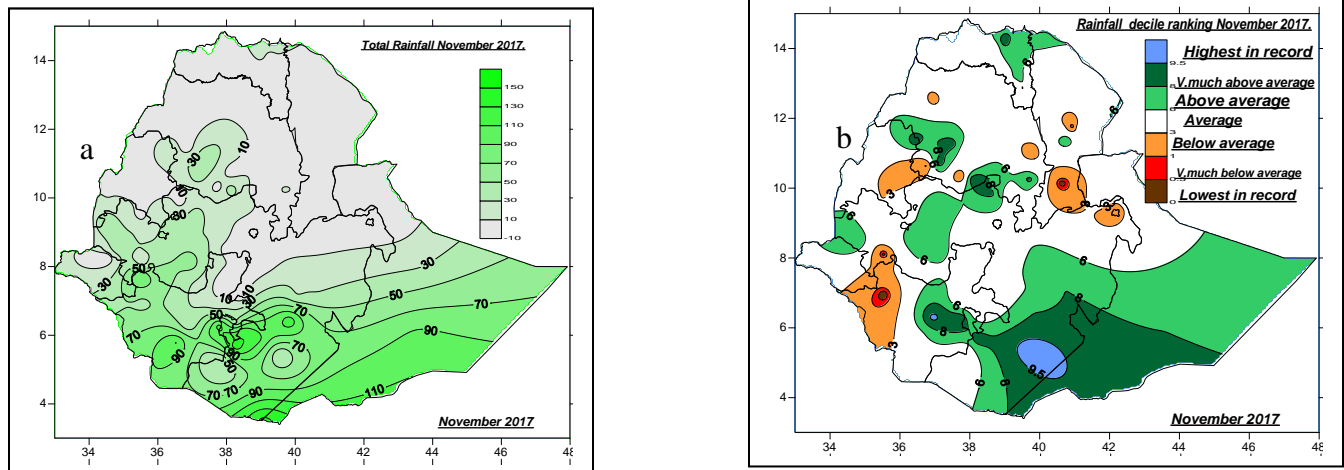**Rainfall, Temperature and Humidity Assessment during the month of Nov 2017**

Fig. 1:- Rainfall assessment of May2016.

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

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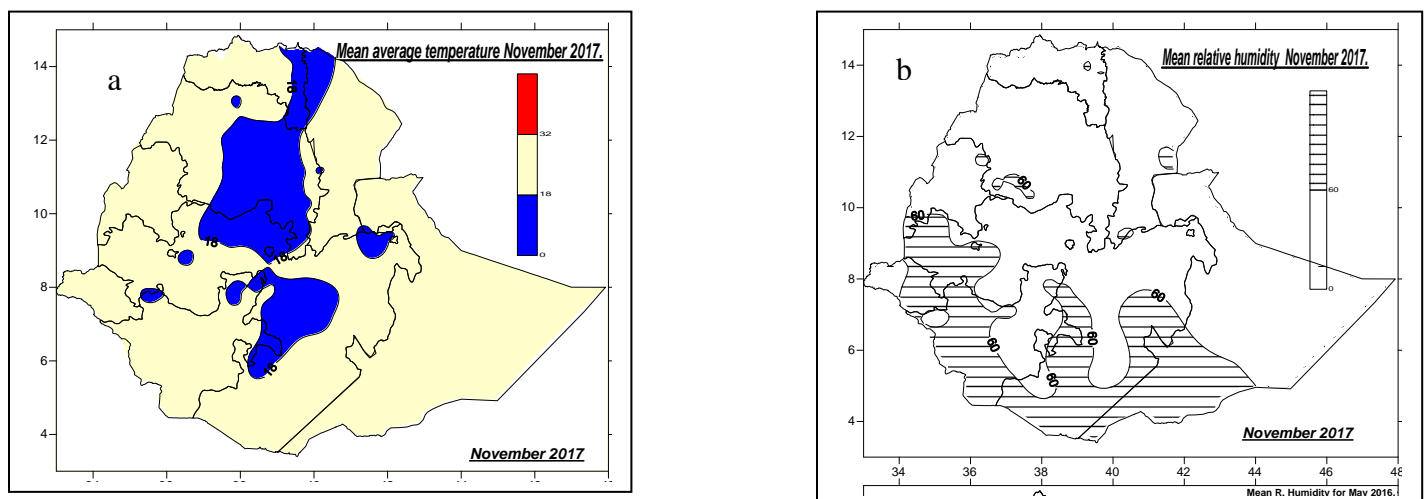

Fig. 2:- Temperature and relative humidity assessment of Nov 2017.

(a) Monthly mean temperature in degree centigrade of November 2017. Areas shaded in light yellowish color had monthly mean temperature of 18 to 32 $^{\circ}$C and areas with temperature greater than 32^{0}C shaded in red color while areas shaded in deep blue color had monthly mean temperature less than 18 ^{0}C

(b) Monthly average relative humidity in % of November 2017. Hatched areas had monthly average Relative humidity of 60% and above.

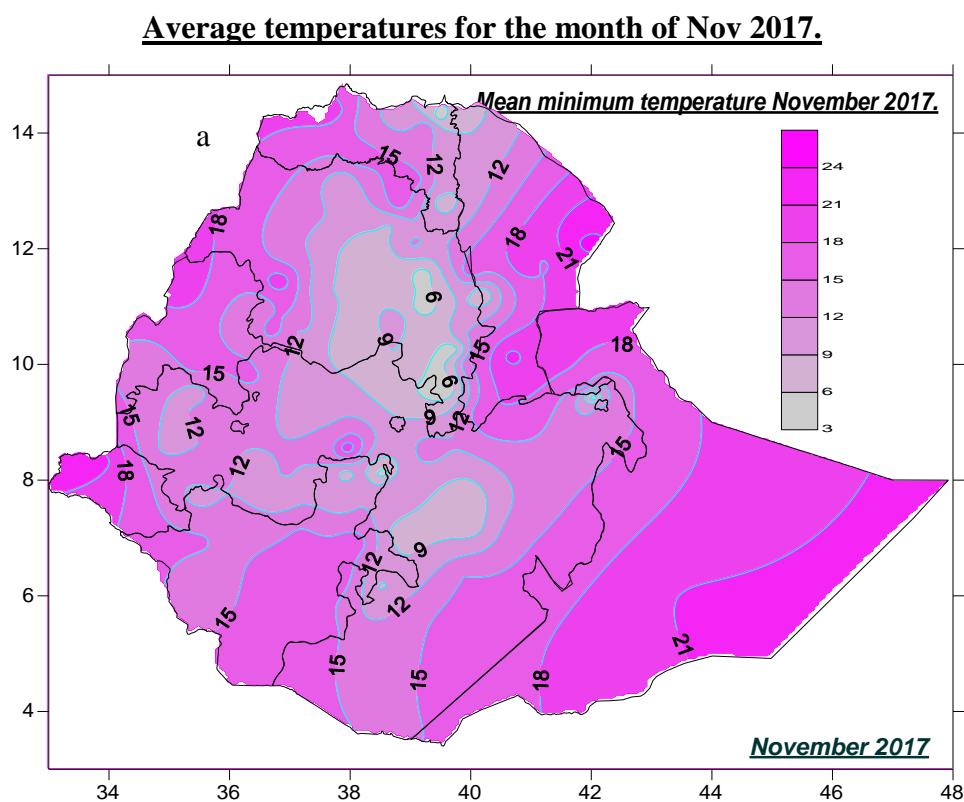**Average temperatures for the month of Nov 2017.**

Fig 3:- (a). Mean <u>minimum temperature in degree Celsius during Nov 2017</u>.
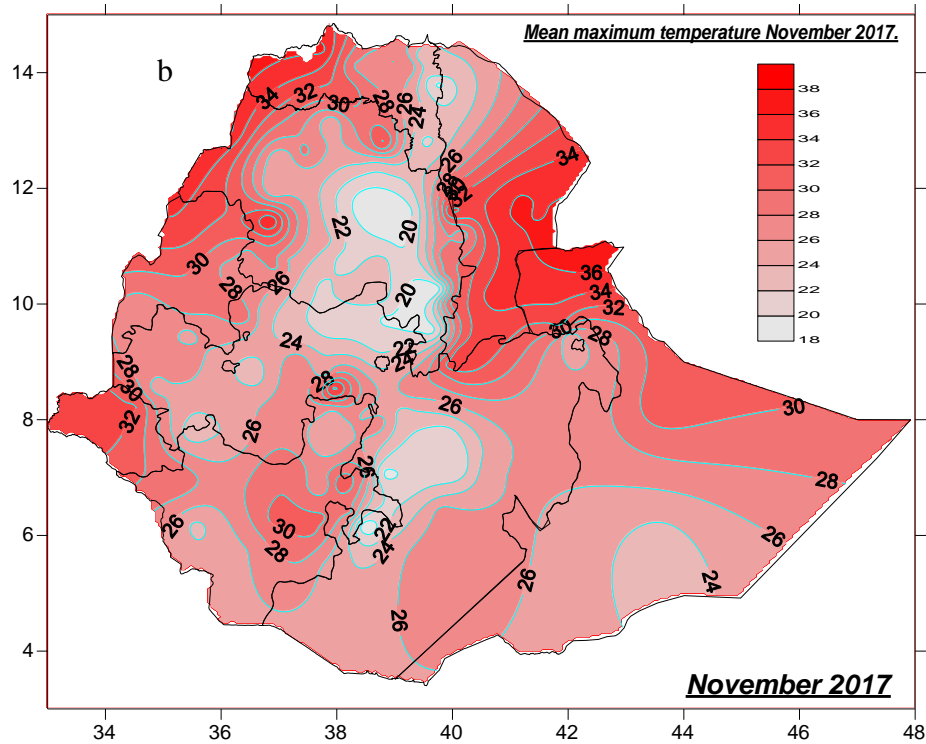
Fig 3:- (b). Mean maximum Temperature in degree Celsius for the month of Nov 2017

Malaria prone areas during the month of Nov 2017
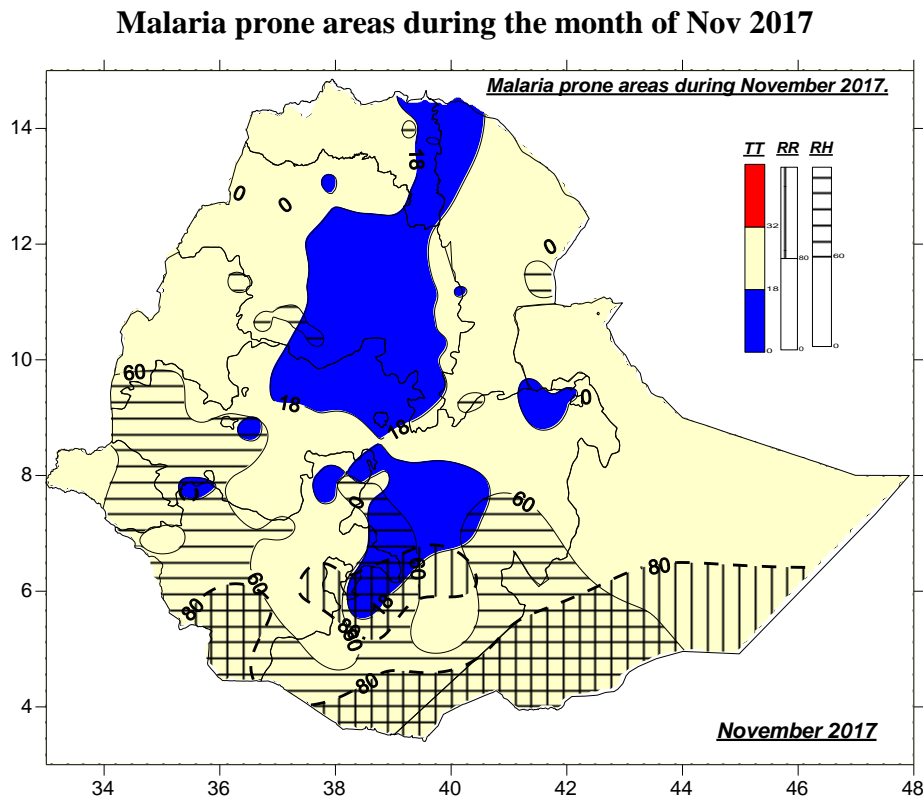

Fig 4:- Combined temperature, rainfall and relative humidity analysis for November 2017. Areas under square patterns with yellowish background color are assumed to satisfy favorable climatic conditions for malaria.

The above combined map was proposed to show the effect of monthly temperature, rainfall and relative humidity with respect to the survivable and distribution of malaria during the month of Nov 2017. Regarding to this issue; 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 of malaria.

According to the above principle; 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 the South-western , Western ,south-eastern lowland areas of the country; *Therefore climatic conditions were favorable for the survival and distribution of malaria over some lowland areas of Benishangulgumz ,South-western, southern and Southern Oromiya ,SNNPR, Southern eastern Somali parts of the country during Nov 2017* (fig. 4).

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

2. Temperature Humidity Index (THI) Conditions during Nov 2017.

With respect to Temperature-Humidity Index (THI), the climatic condition for human being was developed by the US weather Bureau in 1959; it is applied to the temperature and humidity datum over representative stations of the country in order to review the weather condition which was comfort, moderate and discomfort over all areas covered by indicated climate data sources during the month of May2016. 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.

Based on the "THI" values of the next table, the degree of human comfort with respect heat stress can be abridged as; uncomfortable was not registered over 30 days out of 31 days, ; yet comfortable and moderate conditions were dominating over rest most parts of the country during the month of Nov 2017 areas like Balerobe, Debremarkos, Addis ababa, Gore, Nekemte ,Mekele, Combolcha and Debrezeit were

stayed moderately comfortable for more than 81% of the observation days; moreover the. In most cases, both comfortable and moderate conditions with respect to heat stress were dominating over most parts of the country during the month of Nov 2017 (table 1).

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

No	Nov. 2017	<21(Comfortable)	21-26(Moderate)	>26(Uncomfortable)	TOTAL
1	*D/Markos*	31	0	0	31
2	*Robe*	29	0	0	29
3	*Mekele*	26	1	0	27
4	*Addisababa*	26	1	0	27
5	*Nekemte*	21	10	0	31
6	*Gore*	17	13	0	30
7	*Kombolcha*	16	15	0	31
8	*D/Zeit A.F*	14	13	1	28
13	*Jimma*	1	29	0	30
11	*B/Dar*	3	28	0	31
12	*D/Dawa*	3	28	0	31
10	*Gondar*	4	27	0	31
9	*Negele*	6	25	0	31
14	*Metehara*	0	20	10	30
15	*Awassa*	0	1	0	1
16	*Gode*	0	0	0	0
17	*Arbminch*	0	0	0	0

Reference: - Grover-Kopec et al. 2006 - Web-based climate information resources for malaria control Africa, Malar J. 2006; 5: 38.

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