

Federal Democratic Republic of Ethiopia

Ministry of Water Resources

National Meteorological Agency

Climatological Services 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 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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1. Rainfall, Temperature and Humidity Conditions

The total amount of rainfall for June 2010 was above 80mm over much of the western half of the country. As a result much of SNNPR, Gamblla, western and central Oromiya, Benishangulgumz and Amhara were included in this pattern (fig. 1a). Normal to very much above normal rainfall was prevailed over much of the Ethiopia except over northern and southern parts country. Furthermore very much above normal rainfall was recorded over the central the southern pocket areas of the country. On the other hand, below average rainfall was observed some northeastern and southern portion of Ethiopia (fig. 1b).

The monthly mean temperature values were 18⁰C to 32⁰C over most parts the country except the central and eastern chain of mountain ranges of Ethiopia shaded in deep blue color (fig. 2a). Most parts of the country recorded above 60% monthly average relative humidity except the northern, northeastern, southeastern and central parts of Ethiopia (fig. 2b). For further detailed information, refer to figures 3(a) and 3(b) for monthly mean minimum and monthly mean maximum temperature values respectively.

As per Grover-Kopec 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 18⁰C and 32⁰C and the monthly mean relative humidity is at least 60%.

The same approach is applied to the rainfall, temperature and relative humidity data of June 2010 of Ethiopia so as to produce (fig. 4).

As a result, climatic conditions were favorable for the spread of malaria over most parts of SNNPR, Gambella, Benishangugumz, western and central Oromiya, western Amhara and Tigray (fig. 4).

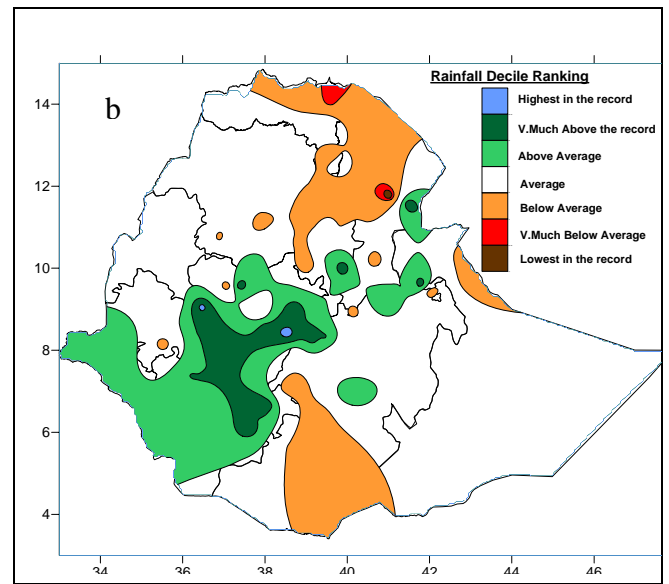
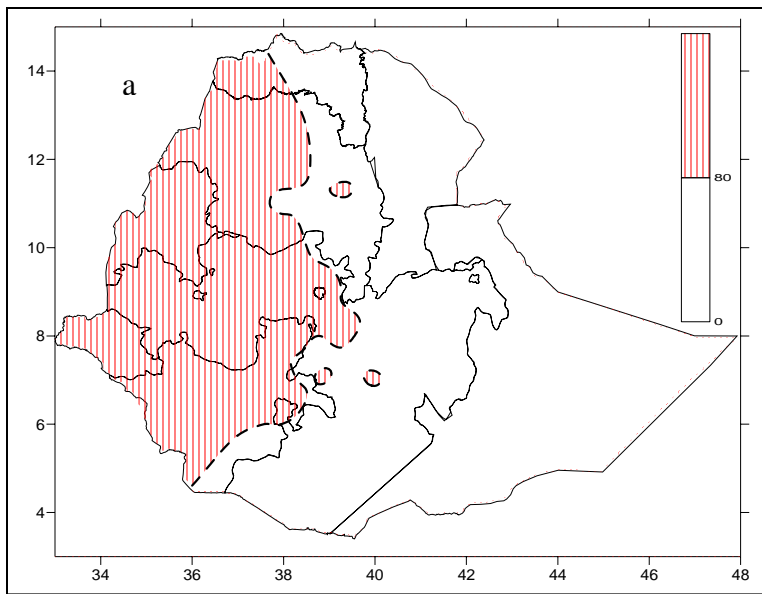


Figure 1. Rainfall assessment of June 2010. (a) Monthly total rainfall amount of June 2010 in mm. Hatched areas had monthly rainfall amount of 80mm and above (b) Rainfall deciles of June 2010. Areas shaded in green color indicate wetter than normal condition, while areas shaded in red color indicate rainfall deficiency

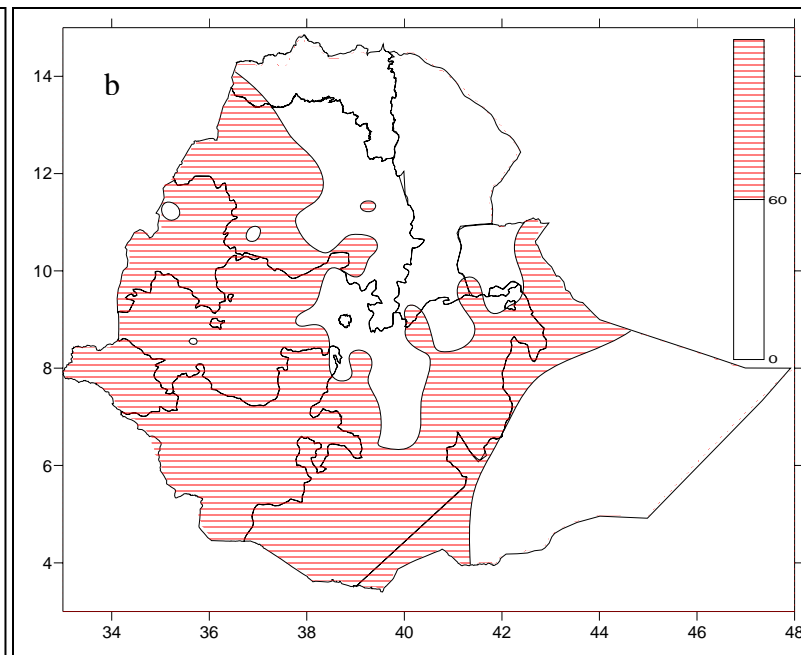
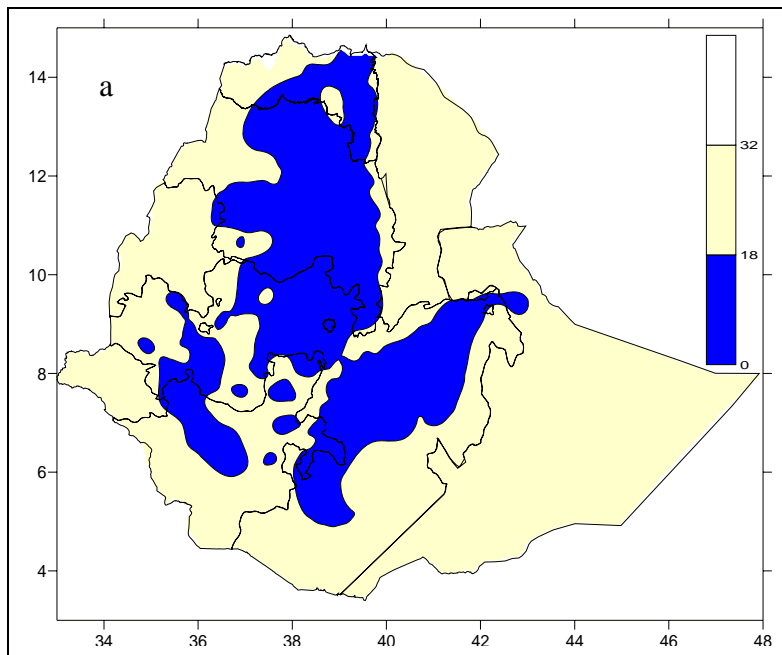


Figure 2. Temperature and relative humidity assessment of June 2010. (a) Daily mean temperature in °C of June 2010. Areas shaded in yellow color had monthly mean temperature of 18 to 32 °C while areas shaded in blue color had monthly mean temperature less than 18 °C (b) Monthly average relative humidity in % of June 2010. Hatched areas had monthly average relative humidity of 60% and above.

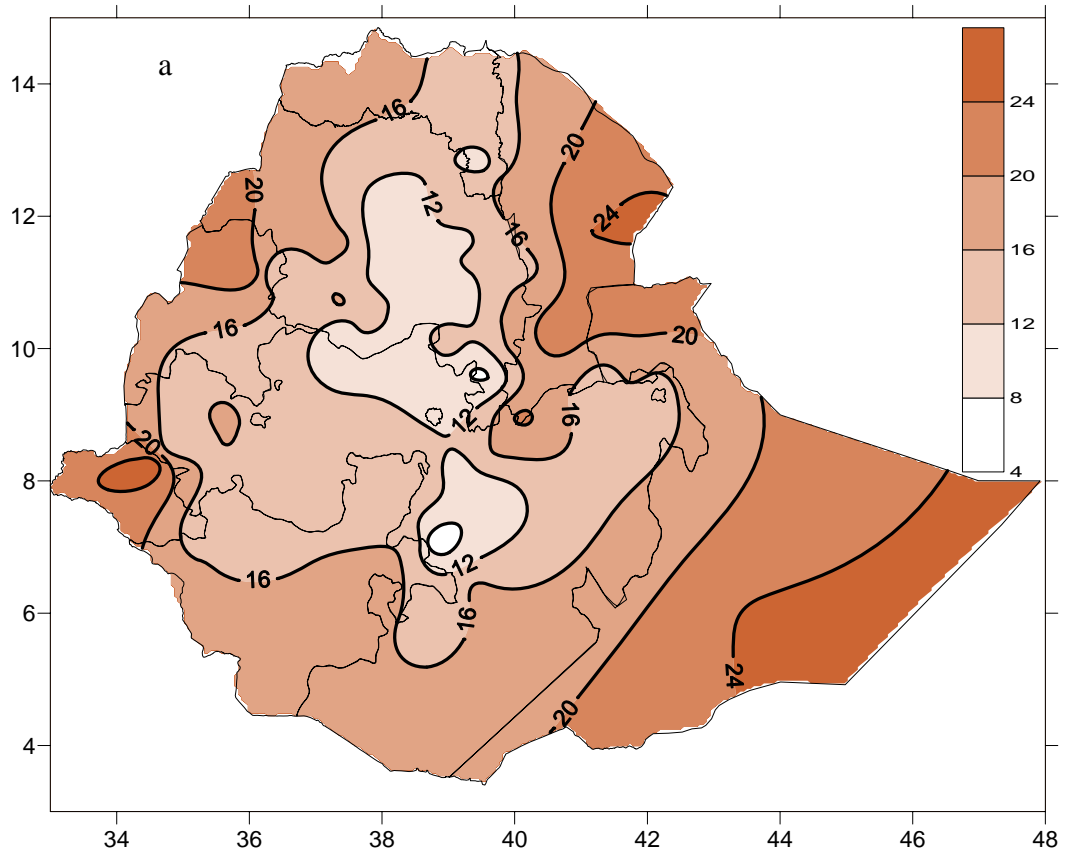


Figure 3 (a). Mean night-time minimum temperature in degree Celsius during June 2010.

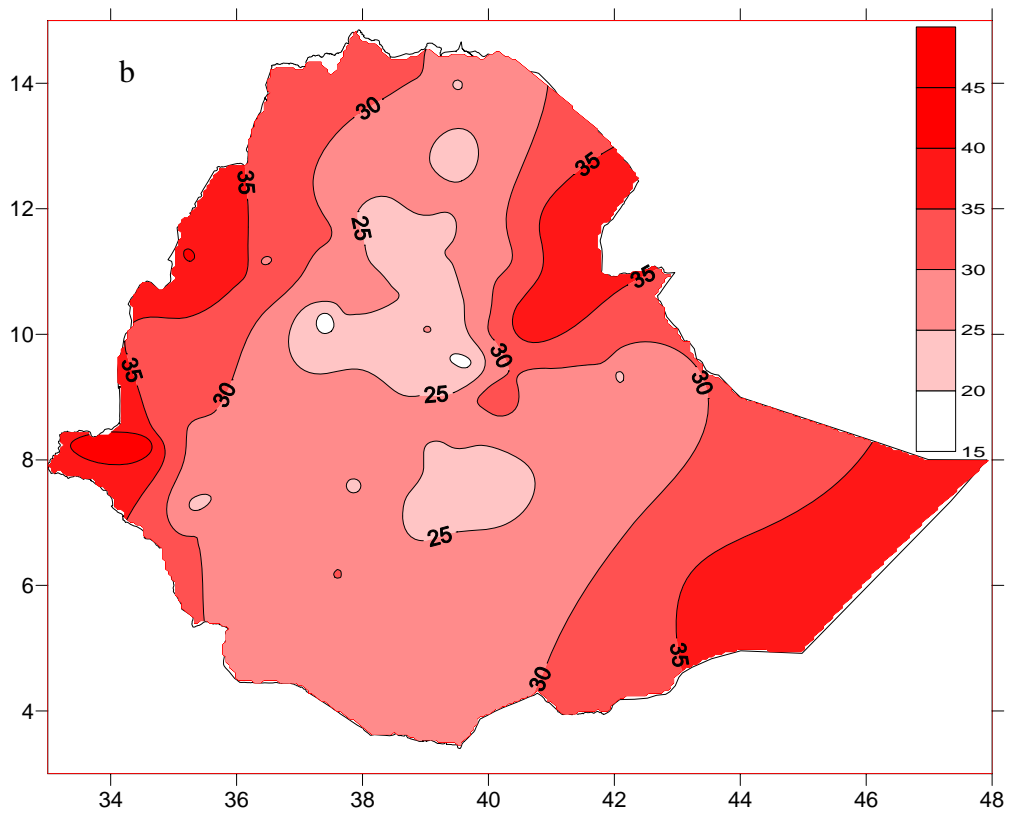


Figure 3 (b). Mean maximum Temperature in degree Celsius for the month of June 2010.

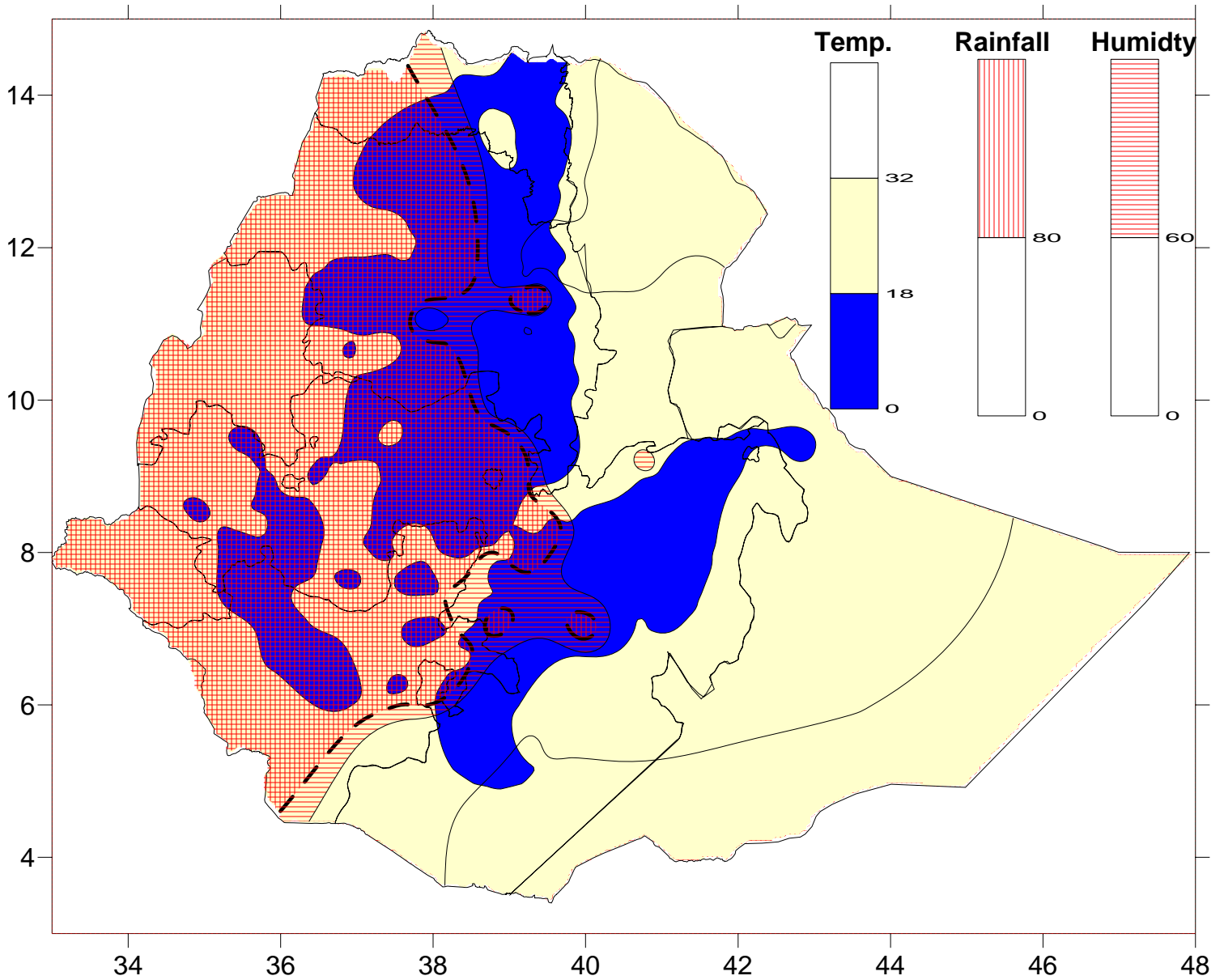


Figure 4. Combined temperature, rainfall and relative humidity analysis during June 2010. Areas under square patterns with yellowish background are assumed to satisfy favorable climatological conditions for spread of malaria.

2. Temperature Humidity Index (THI) Conditions.

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 selected stations of Ethiopia to assess the discomfort condition of June 2010. According to this approach, if the THI values exceed 26 almost all the population feel uncomfortable (here we refer to it as "uncomfortable"), for 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 table above, uncomfortable condition still persisted with increasing its strength than the previous few successive months over the eastern lowland parts of the Ethiopia; with respect to this, it was observed over D/Dawa 26 out of 28 days over and Gode for 24 out of 26 days. On the other hand, highland areas like Blalerohe, Debremarkos, Addis Ababa, Nekemte and Gore stayed comfortable for more than 73% of the observation days. In addition to this, moderate condition with respect to heat stress was dominated over the rest of country throughout June 2010 (table 1).

Table 1. Temperature Humidity Index (THI) frequency over selected stations in Ethiopia during June 2010

No	Stations	Number of Days with THI Values of			Total number of Days
		< 21 (Comfortable)	21-26 (Moderate)	>26 (Uncomfortable)	
1	Robe	30	0	0	30
2	D/Markos	28	0	0	28
3	Addis ababa	24	2	0	26
4	Nekemte	21	9	0	30
5	Gore	19	7	0	26
6	Arbminch	0	30	0	30
7	Kombolcha	2	28	0	30
8	B/Dar	3	27	0	30
9	D/Zeit A.F	3	27	0	30
10	Awassa	3	26	0	29
11	Jimma	8	22	0	30
12	Negele	10	20	0	30
13	Mekele	11	19	0	30
14	Gondar	12	15	0	27
15	D/Dawa	0	2	26	28
16	Gode	1	1	24	26

Reference: - **Grover-Kopec et al. 2006** - Web-based climate information resources for malaria control in Africa, Malar J. 2006; 5: 38. Published online 2006 June11. doi: 10.1186/1475-2875-5-