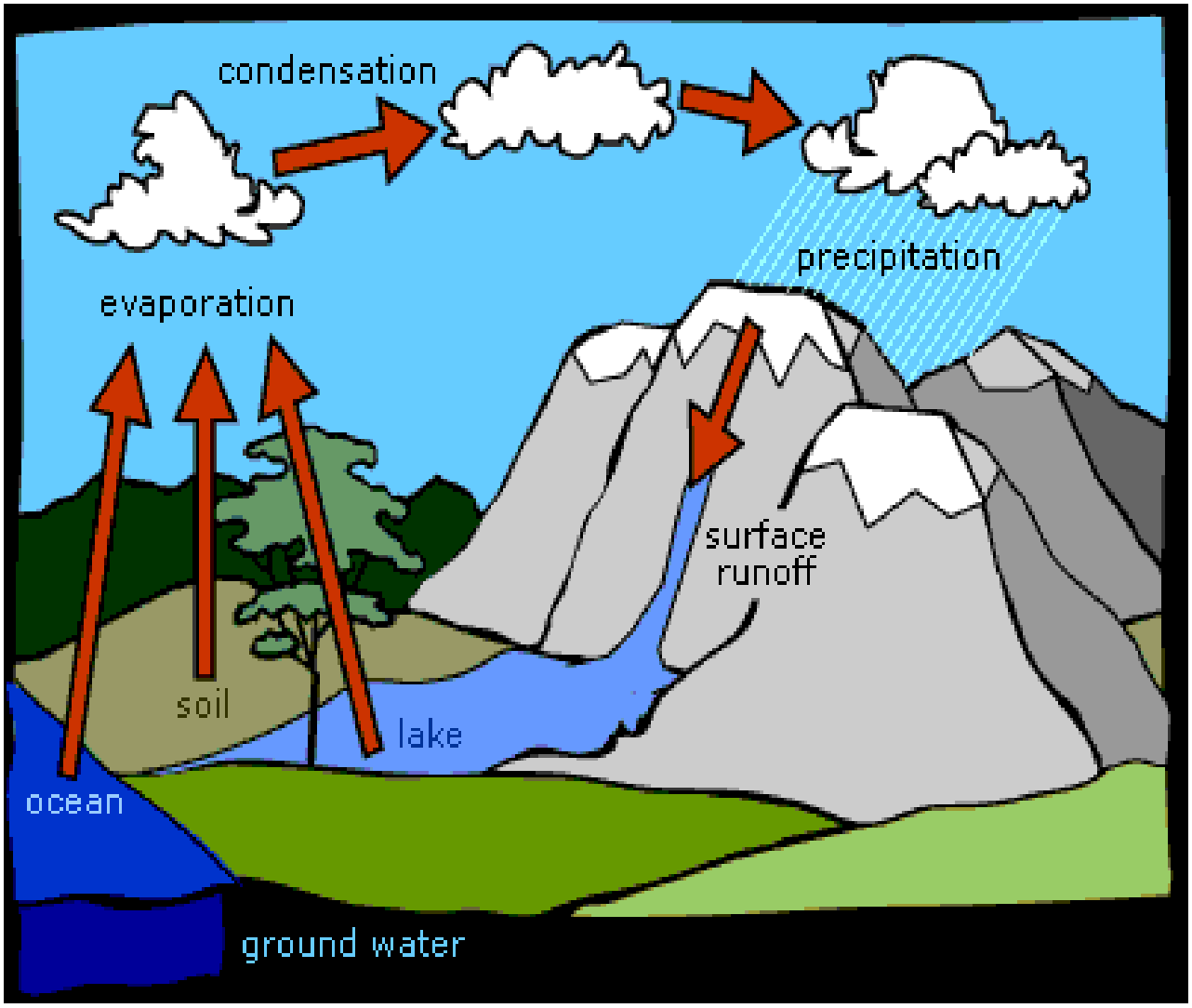
Ethiopia Meteorological Institute



Hydro Meteorological & flood monitoring Bulletin for, March, 2024

Foreword

This Monthly Hydro Meteorological Bulletin is prepared and disseminated by the Ethiopia Meteorological institute (EMI) of Ethiopia, for the purpose of providing hydro meteorological information to different sectors of the community involved in water related activities.

In general, Hydrometeorology is concerned with the study of the atmosphere and land phases of the hydrologic cycle, particularly, on the interrelationships involved. In this bulletin, more emphasis is given to presenting the results of analyses done on the extreme rainfall events as well as the moisture status prevailed over river catchments.

Accordingly, the data used in producing this bulletin are collected from selected indicative meteorological stations, which are believed to represent each of the main river catchments (hydrological regimes) of the country and the results of the hydro meteorological analyses are presented in maps format. Analysis presented in the forms of maps indicates comparisons of the total and extreme monthly rainfall events, monthly mean temperature and aridity index conditions for each basin.

Thus, the information contained in this bulletin is believed to be helpful in monitoring the performances of many hydraulic structures such as culverts, bridges, reservoir spillways, road embankments, dikes, flood prone areas as well as in planning and designing such new structures over the respective basins. It also gives the user an insight into the value as well as the contributions of the hydro-meteorological information towards the accomplishment of water resources assessment and management with respect to sustainable development of the country. Meanwhile, your comments and constructive suggestions are highly appreciated to make the objectives of this bulletin a success.

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I. Introduction

Ethiopia is located between latitudes of 3.8°N to 14.5°N and longitudes of 33°E to 48°E with an area of about 1.12 million km^2. The varied topography of the country shows extreme changes in altitude with its lowest point at about 120meters below sea level (Kobat Sink Afar depression) and its highest point about 4620 meters above sea level (Ras dashen.).These physographic variations create a large difference in meteorological and hydrological condition both by time and space.

From meteorological point of view, there are three seasons in Ethiopia; Belg, Kiremt and Bega.

Belg (February-May) is the small rainy season in Ethiopia. Much of the northeastern, central, southern, southwestern, eastern and southeastern parts of the country receive considerable amount of rainfall during this season.

Kiremt (June-September) is the main rainfall season for most parts of the country except for the lowlands of southern and southeastern Ethiopia.

Bega (October-January) is mostly a dry season for most parts of the country except for southwestern as well as the lowlands of south and southeast Ethiopia.

In general the mean annual rainfall amount ranges from 2400mm (over south western) to 500 and below over the northeastern and southeastern lowlands. Hydro meteorologically a rainy day is considered as the one with 2.5 mm of rain or more but in this publication a rainy day is one regardless of the amount.

In Ethiopia, water resources availability in terms of space shows a marked discrepancy when one goes from east to west. The eastern part of the region compromise 7 catchments with only 11 percent of the water resource and while the west compromise 5 catchments with 89 percent of water resources.

II. Catchments profile

Catchment	**Location**
Mereb – Gash Catchment: -	Northwestern tip of Tigray.
Atbara-Tekeze Catchment: -	The Tekeze River basin is situated in the northwest of Ethiopia between 11 ^{0}40` and 15 $^0$12` N, and 36 ^{0} 30` and 39$^0$ 50` E. It is bordered by the Mereb River basin and by Eritrea in the north, the Atbara River plains in Sudan in the west, the Abay River basin in the south and Danakil basin in the east.
Blue Nile/ Abbay Catchment: -	Roughly 13^0 N South of Gondar to 11^0 30'N, and west of 39^0 45'E of Wello, northwestern parts of Shoa; Gojam except the South Western and Western narrow area, Wellega and extreme Eastern tip of Illubabor together with a narrow northeastern strip of Keffa. It is the largest catchment that covers about 16 percent of the total area of Ethiopia. The Catchment that includes the Lake Tana, Upper Abbay(to Guder confluence),Middle Abbay (to didessa confluence), Didessa, Dabus ,Lower Abbay,Dinder and Rahad Sub-basin.
Baro –Akobo Catchment: -	The south western and western narrow strip of Wellega, except the eastern tip, the whole of Illubabor and southwestern tip of Keffa. The Catchment has upper and lower sub-basins along Baro River. The Catchment It is the wettest catchment because of the highest rainfall over the area.
Danikil – Afar Catchment: -	East of 40^0 E of Tigray, North of 11^{0}N of Wollo, narrow coastal strip south of 14^{0}30'N of Eritrea. The basin is the lowest region in the country where the kobar sink; with an elevation of about 120 meters b.s.l is found.
Awash Catchment: -	North of Garamuleta mountains, south of 11^0 40$^{'}$ N of Wollo, south of 9^0 N of Shoa, Northern tip of Bale and North part of Arsi. The catchment has upper, middle and lower sub-catchments. In general the catchment is narrow at the upper part marked by numerous volcanic mountains and wider at the lower part joining major tributaries from

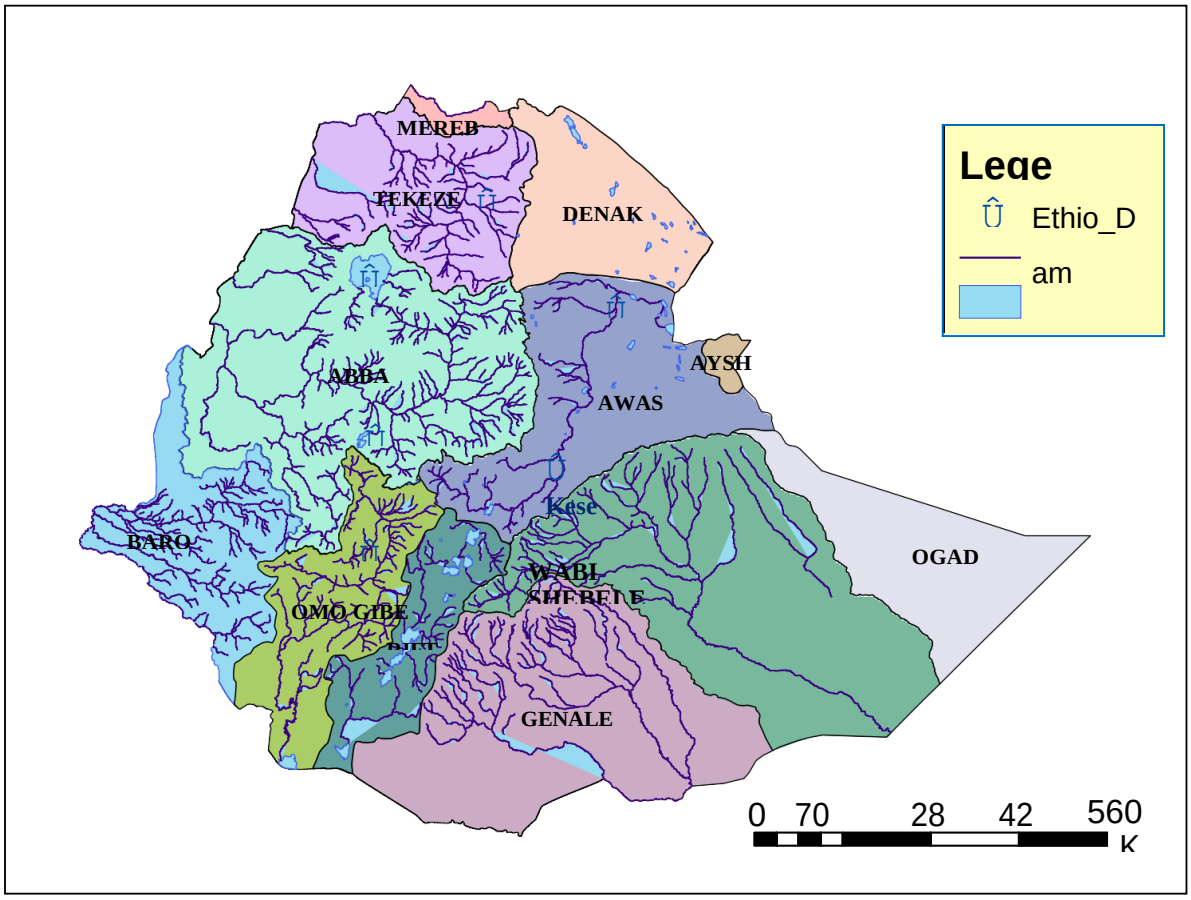
	northwestern highlands and a number of seasonal wadies from the southeast highlands.
Gulf of Aden – Aysha Catchment): -	Eastern narrow strip of Hararghe. It is a very dry Area with no stream flow representative Meteorological station. Thus, no assessment is done for this catchment in this publication.
Omo-Ghibe Catchment: -	Southwestern narrow strip of Shoa, the whole of Keffa except the southwestern tip, southwestern tip of Wellega, Western half of northern Omo and northwestern tip of Sidamo. The upper part of the catchment starts from the plateaus in north part of Ghibe and extends southward to the lower part of it (known as Omo River).
Central Lakes-Rift Valley Catchment: -	The whole of North and South Omo, west and southwestern narrow strip of Sidamo, southwestern portions of Shoa and western narrow tip of Bale and western part of Arsi. The catchment is found in the Great Rift Valley system and typically known by its lakes and streams. Lakes which adjoin the Awash catchment are found in its upper part, while Lake Awassa and Bilate in its central part and end to chamo bahr in its lower part**.**
Genale Dawa Catchment: -	The western half of Bale (South of Goba) and southeast, southwestern and northeastern parts of Sidamo. The catchment constitutes three river systems namely Dawa, Genalle and Wabi Gestaro that meet each other before they cross the Ethio-Somalia border.

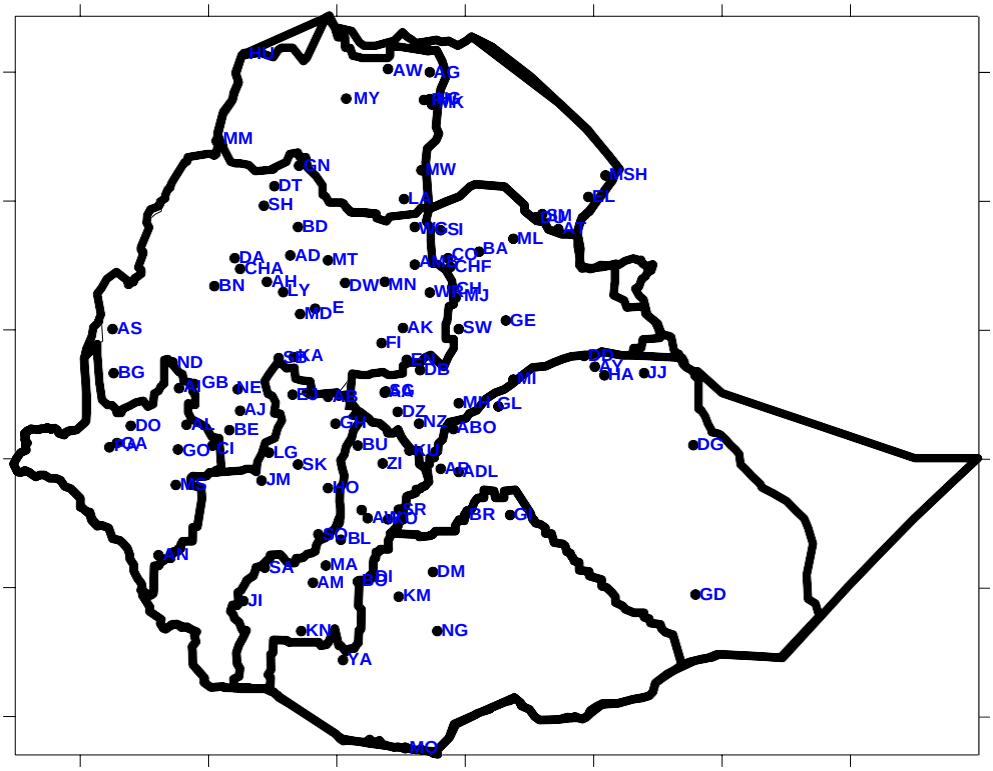
IV. Major River Catchments in Ethiopia, Location and Spatial Status

No.	Catchement Name	Area ($km^{2)}$	Length in Kilo meter			Volume of water bm^3/Annum	Altitude (meter)
			Within Eth.	Outside Eth.	*Total*		***Peaks*** **(Highest & Lowest)**
01	Mereb-Gash	5,700	440	160	600	0.15	North tip of Tigray
02	Tekaze – Atbar	90,001	608	560	1168	8.13	4620 Ras Dashen 125 Tikil -Dengay
03	Blue Nile(Abbay)	204,100	800	650	1450	52.62	4231 Guna 200 Horekelife
04	Baro - Akobo	75,912	227	280	557	23.55	3700 Masha 410 Jikawo
05	Afar (Denakil)	62,882	-	-	-	0.86	
06	Awash	112,696	1200	-	1200	4.6	4000 N.Shewa 4001 NW mt. 4002 of A.A 250 L.Abe
07	Aysha	2223				0.86	
08	Omo-Ghibe	78,213	760	-	760	17.96	4203Guge/Gurage Mt. 195 Chiri
09	Rift valley	54,900	-	-	-	5.63	
10	Genale - Dawa	171,042	480	570	1050	5.88	4310 Bale mt./Batu 500 Dolo Odo
11	Wabi - Shebele	205,697	1340	660	2000	3.16	3626 Mt.Gololcha 200 Somalia Desert
12	Ogaden	77,121	-	-	-	-	1500 Turkile 350 Gelad

V. Basin map of Ethiopia

And Meteorological Station distribution used for hydro meteorological Bulletin



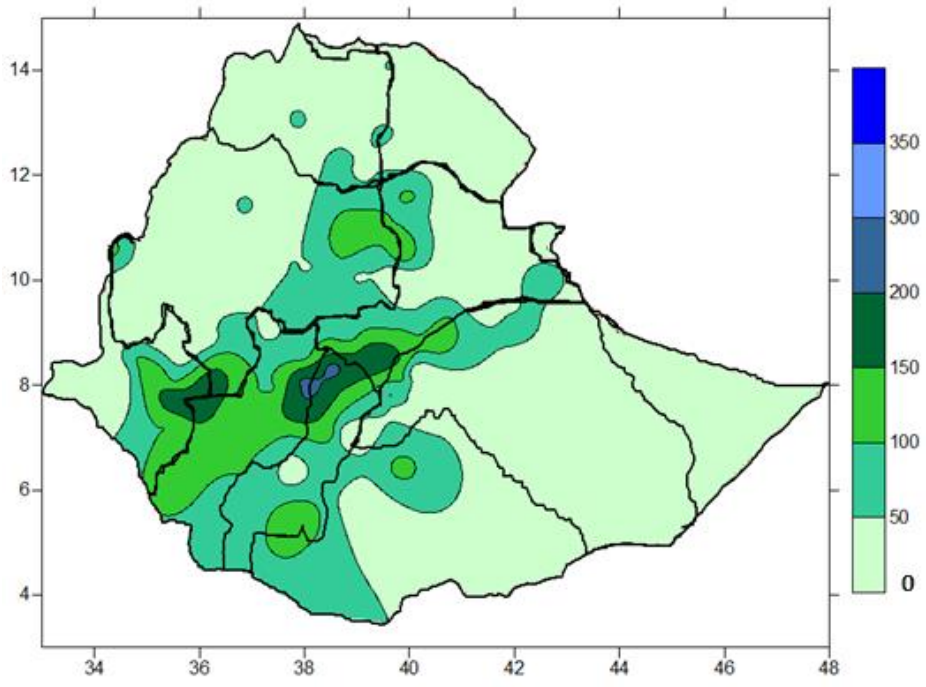


Belg season

Which occurs from February to May, plays a significant role in the country's annual rainfall patterns in northeastern, central, southwestern, southern, and southeastern Ethiopia. The Belg season is characterised by inter-annual and intra-seasonal variability. This means that from year to year and even within the same season, there can be fluctuations in the amount and timing of rainfall. Therefore, understanding the timing and variability of rainfall during the Belg season is crucial for effective water resource management, especially in river basins where rainfed agriculture is prevalent. High maximum temperatures are common during this season, and the peak rainfall was recorded from March to May.

Precipitation over MARCH

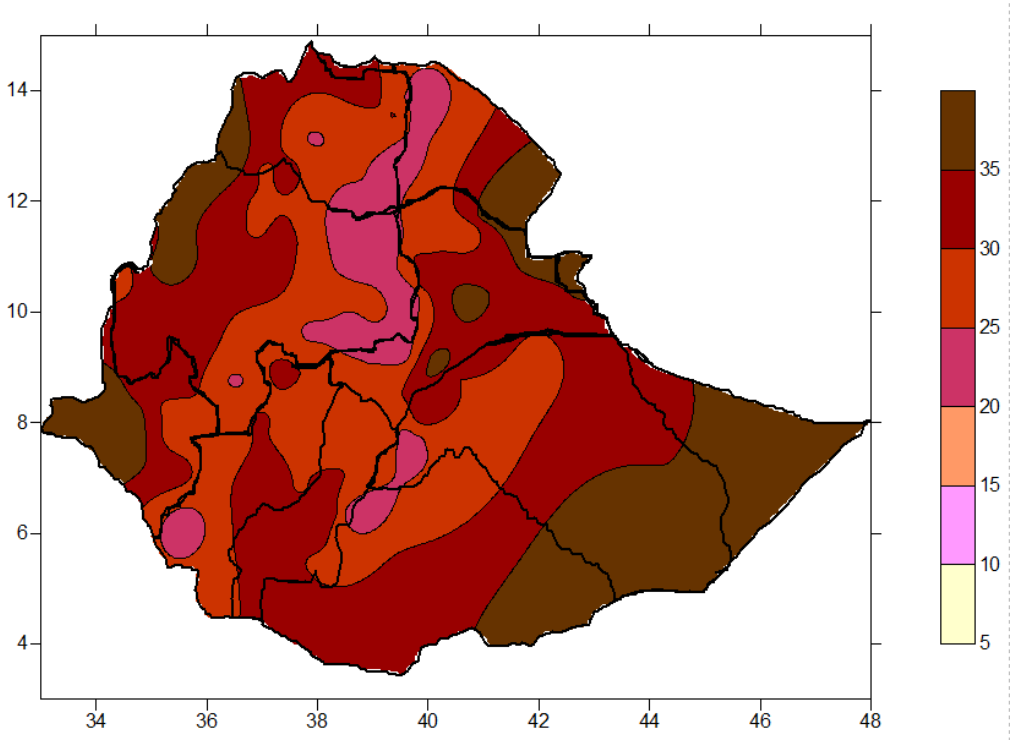
The rainfall distribution throughout the southwest, south, east, and central catchments was noted for this month. In this instance, the majority of Omo Gibe, Boro Akobo, Rift Valley, upper Wabishebele, and Genaledawa saw heavy rainfall, and the upper and middle Abay catchments saw rainfall ranging from 50 to 200 mm. Furthermore, a few locations in the Rift Valley Omo Gibe, Awash, and upper Baro Akobo saw rainfall totaling more than 200 mm. As can be seen in Figure 1 below, the remaining catchments saw less than 50 mm of rainfall.



(Fig.1) Monthly precipitation of March, 2024

Temperature

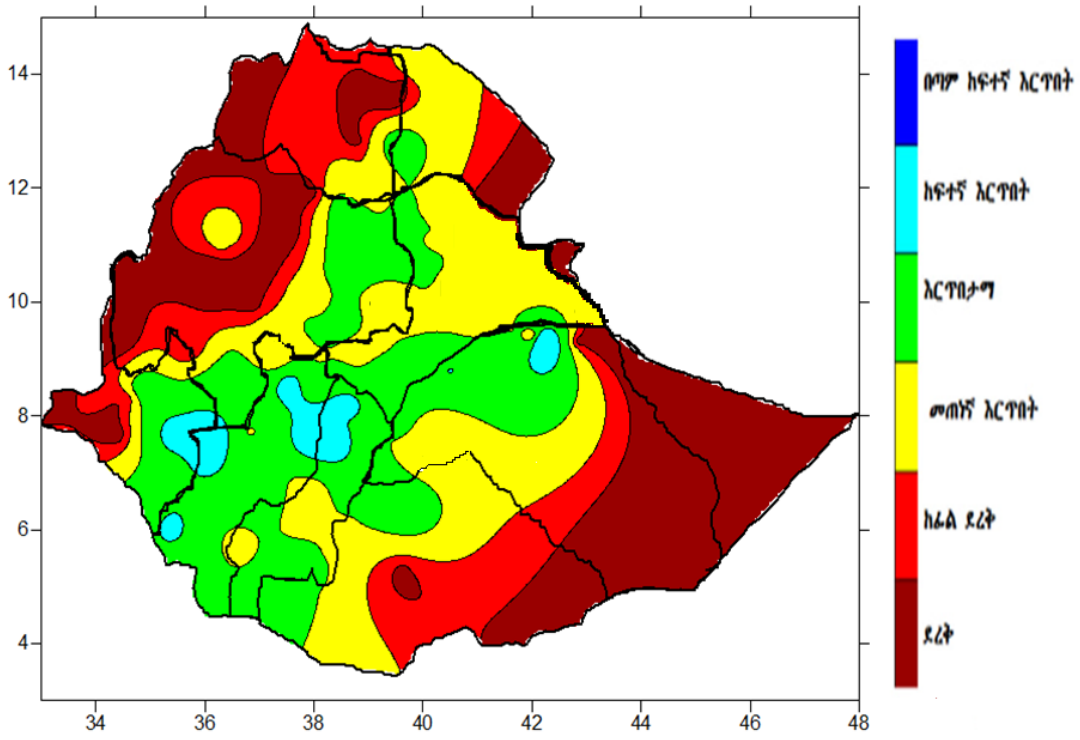
In March, the majority of the central catchments, lower OmoGibe, Upper Genaledawa, Wabishebele, and Upper Tekeze saw monthly average temperatures below 25ºC. as can be seen Figure (2) the monthly average temperatures that were reported in the remaining catchments of Ogaden, Wabishebele, Genaledawa, Awash, Afar Denakel, and BaroAkobo, which were all above 25 ºC.



(Fig. 2) **Mean monthly Temperature of March, 2024.**

Assessments of Aridity Index

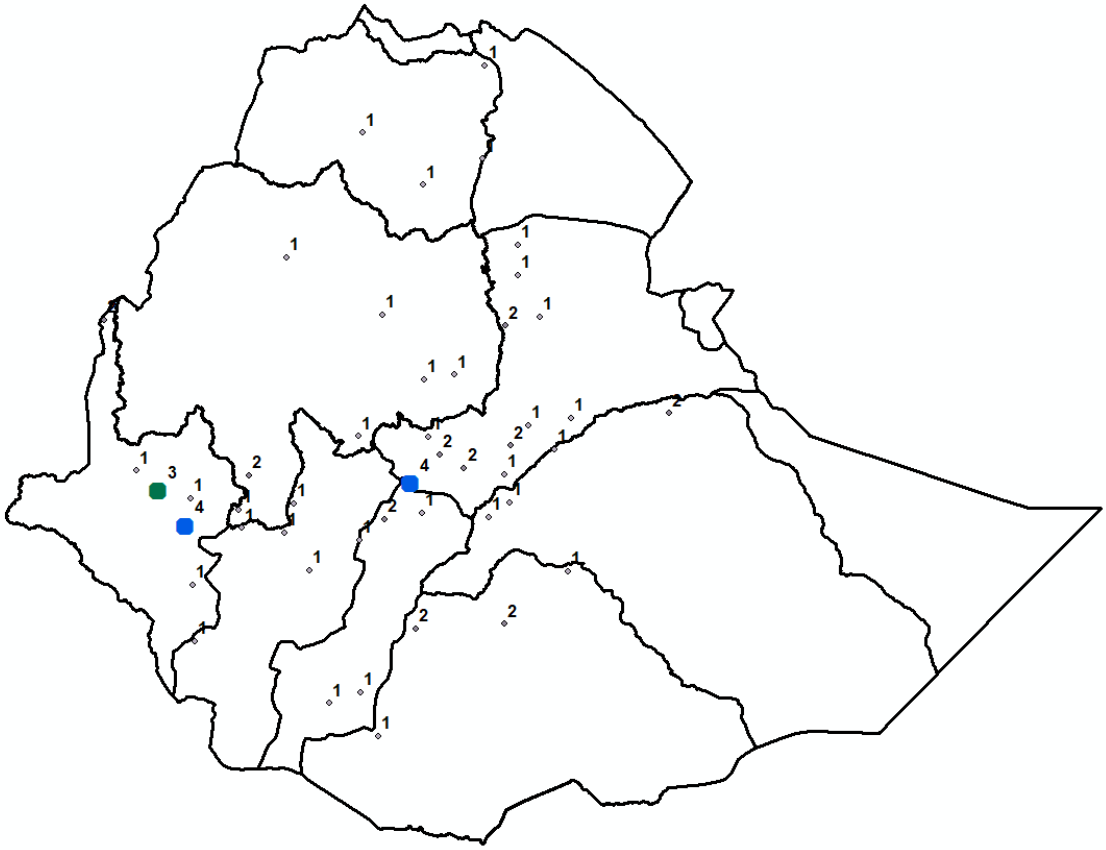
Over the previous month, the majority of the Omogibe, Awash, Rift Valley, Baro Akobo, Wabe Shebele, Genaledawa, and Afar Danakle watersheds have seen damp to high humidity levels. Furthermore, the Tekeze, and Abay basins, both upper and lower, had humid to semi-arid weather. When it comes to enhancing surface water resources and dam water capacity, this condition will be crucial.



(Fig.3) Aridity Index of February, 2024.

Distribution of heavy fall exceeding 30mm per day over different river basins

From one to four days in March, there were reports of high precipitation in the upper and lower Rift valley, OmoGibe, Genaledawa, Awash, upper BaroAkobo, Abye, Tekeza, and Genaledawa catchments. Additionally, the Upper Awash and BaroAkobo catchments saw the most rainfall.



(Fig.4) Distribution and frequency of heavy fall days in March, 2024

Expected weather impact on water resource during the coming Month of April, 2024

The Omogibe, Awash, Rift Valley, Baro Akobo, Wabe Shebele, Ngile Dawa, Ogaden, Afar Danakle, and Aisha basins will have humid to high humidity levels in the upcoming month. Moderate moisture is also anticipated in the upper and lower Tekeza and Abay basins. In order to improve surface water resources and dam water capacity, this scenario will be crucial. On the other hand, because high humidity occurs frequently in some basins, it is important to identify danger areas and take appropriate measures to prevent river filling.