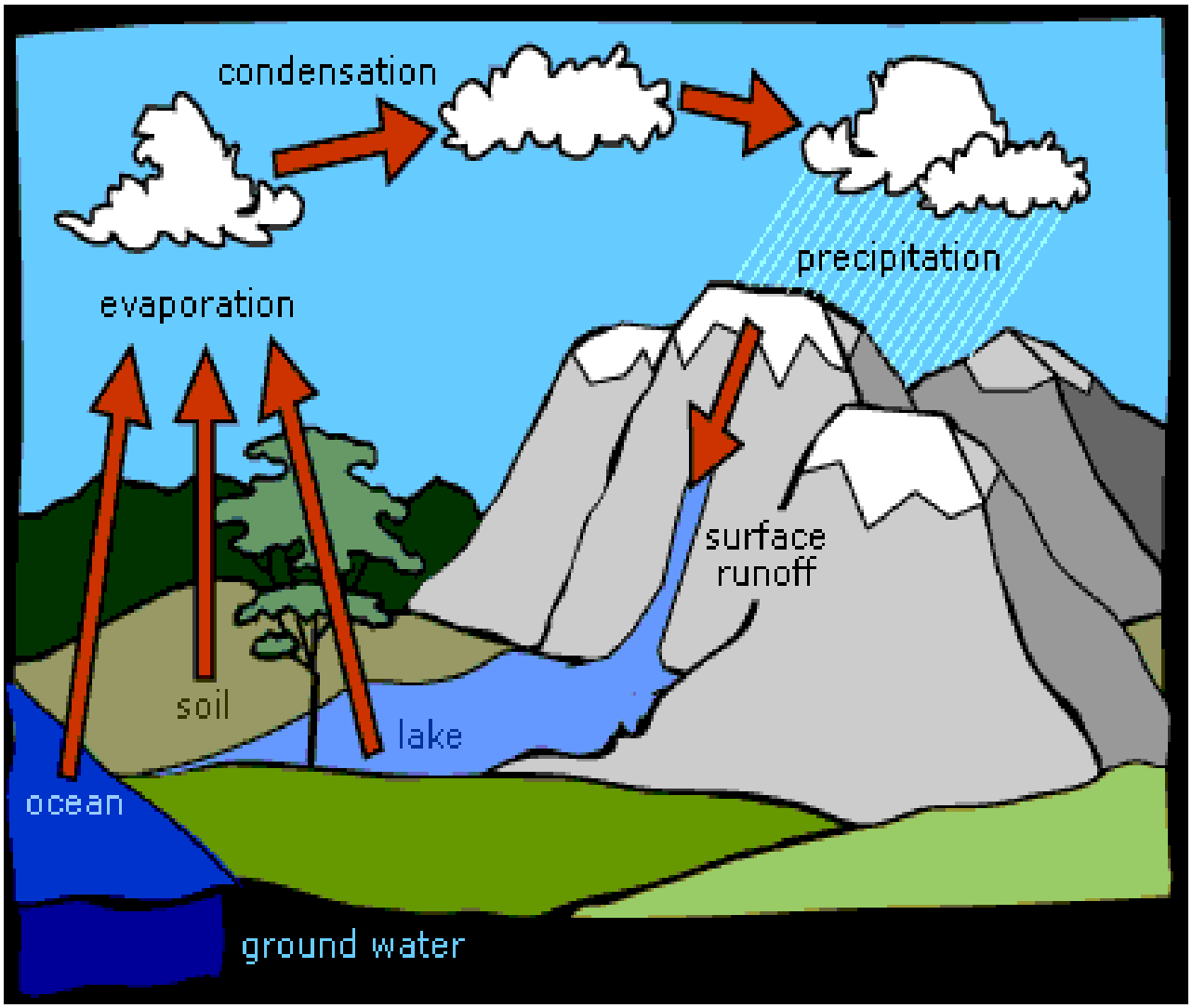
Ethiopia Meteorological Institute



Hydro Meteorological & flood monitoring Bulletin for, February, 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

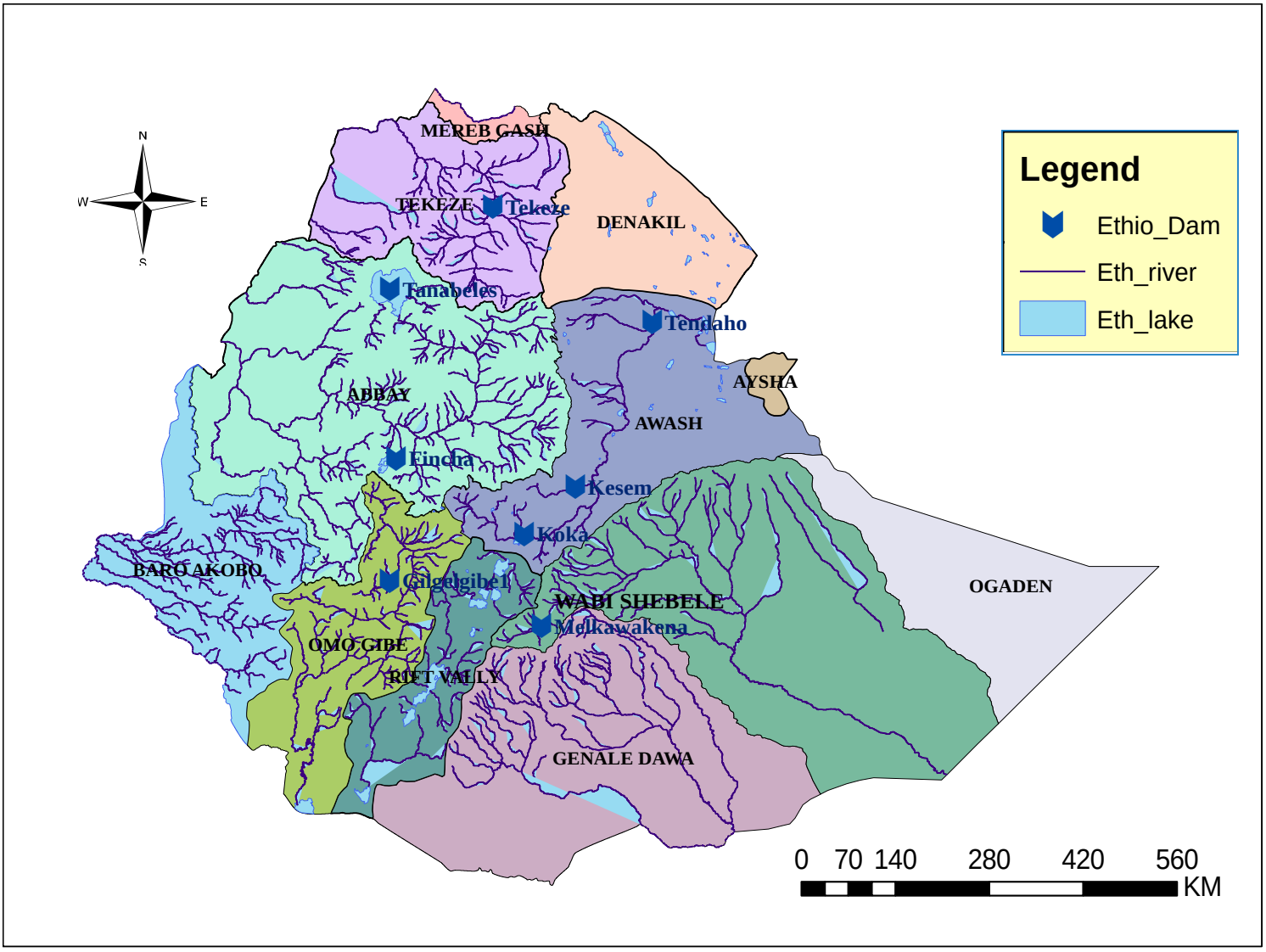
Catchment	Location
Mereb – Gash Catchment: -	Northwestern tip of Tigray.
Atbara-Tekeze Catchment: -	The Tekeze River basin is situated in the northwest of Ethiopia between 11 ^{0}40` and 15 $^0$12` N, and 36 ^{0} 30` and 39$^0$ 50` E. It is bordered by the Mereb River basin and by Eritrea in the north, 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.

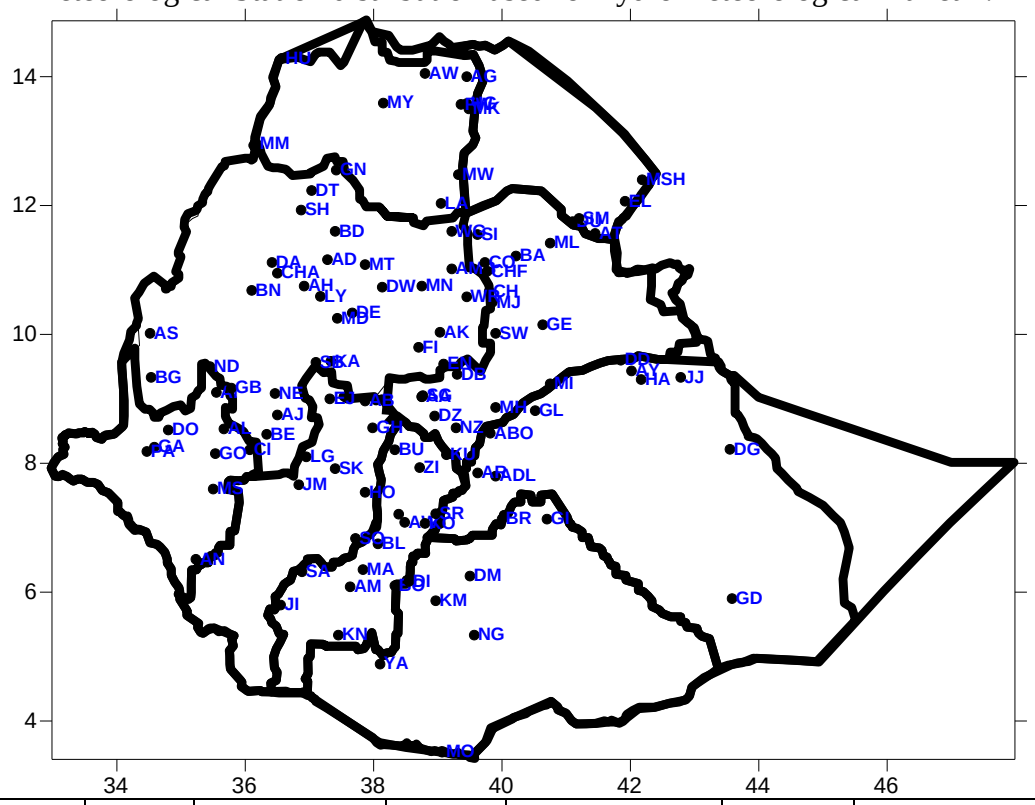
IV. Major River Catchments in Ethiopia, Location and Spatial Status

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



Meteorological Station distribution used for hydro meteorological Bulletin.



STATION	CODE	STATION	CODE	STATION	CODE	STATION	CODE
A.A (Bole)	AA	Cheffa	CHF	Gonder	GN	Mille	ML
Abomsa	ABO	Chercher	CH	Gore	GO	Mira Abaya	MR
Adet	AD	Chira	CI	Hageremariam	HG	Motta	MT
Adigrat	AG	Combolcha	CO	Harer	HA	Moyalle	MO
Adwa	AW	Dangla	DA	Hossana	HO	Mytsebery	MY
Aira	AI	Debrebrhan	DB	Humera	HU	Nazaret	NZ
Alem ketema	AK	Degehabur	DG	Jijiga	JJ	Nedjo	ND
Alemaya	AY	Debremarkose	DE	Jimma	JM	Negele	NG
Alge	AL	Debre Tabore	DT	Jinka	JI	Nekemt	NE
Ambamariam	AMB	Debre Zeit	DZ	Kachise	KA	Pawe	PA
Ambo	AB	DembiDolo	DO	Kibremengist	KM	Sawla	SA
Arbaminch	AM	Dilla	DI	Konso	KN	Sekoru	SK
Arjo	AJ	DireDawa	DD	Kulumsa	KU	Semera	SM
ArsiRobe	AR	Dolomena	DM	Koffele	KO	Freweyni	FW
Assaita	AT	Dubti	DU	Konso	KN	Shahura	SH
Assossa	AS	Ejaji	EJ	Kulumsa	KU	Shambu	SB
Awassa	AW	Elidar	EL	Lalibela	LA	ShewaRobit	SW
Ayehu	AH	Enewary	EN	Layber	LY	Shire	SR
Aman	AN	Elidar	EL	Limugenet	LG	SholaGebeya	SG
Bale Robe	BR	Enewary	EN	Maichew	MW	Sirinka	SI
BahiDar	BD	Fitche	FI	Mankush	MA	Sodo	SO
Bati	BA	Gambella	GA	Masha	MSH	WegelTena	WT
Beddele	BE	Gelemso	GL	Mehalmeda	MD	Wereillu	WR

Begi	BG	Gewane	GE	Mekaneselam	MN	Yabello	YB
Blate	BL	Ghion	GH	Mekele	MK	Ziway	ZY
Bui	BU	Gimbi	GB	Metehara	ME		
Bullen	BN	Ginir	GI	Meisso	MS		
Chagni	CG	Gode	GD	Metema	MM		

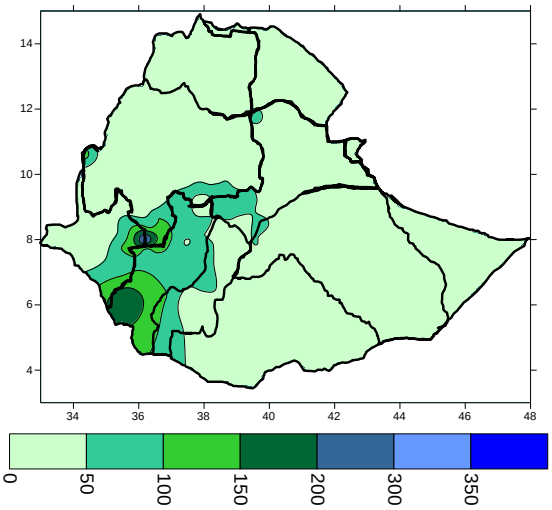
The above stations have five basic meteorological elements they send daily records for Addis Ababa main office of EMI. We use the meteorological elements which are the main factors for hydro meteorological impacts. These are rainfall, temperature, wind speed, evaporation and sunshine duration. This information is important to guide for different water resource activities.

Bega(October-January) :- it is mostly a dry season for most parts of Ethiopia river basins except those basins which receive considerable amount of rainfall for Baro Akobo, lower Rift Valley, lower OmoGibe and for those which receive second rainy season such as Ogaden, middle and lower Genale Dawa and middle and lower Wabi Shebele river basins of Ethiopia. The main rainy months with Bega season are October and November provides rainfall mainly for southern, south eastern and south western catchments. Sunny and windy condition dominated across many river basins thus it increase the loss of water by evaporation. Surface runoff not occurs during Bega hence, the flow of river water is low. In the meantime springs and ponds starting to dry up after mid Bega season. In this case the availability of water is also decrease across upstream of main river basins. In some years unseasonal rain slightly fevered for water availability.

1. Precipitation

We used Isohyetal approach which is lines of equal precipitation is drown taking to consideration over drainage basins from observation taken as a number of rain gauge stations.

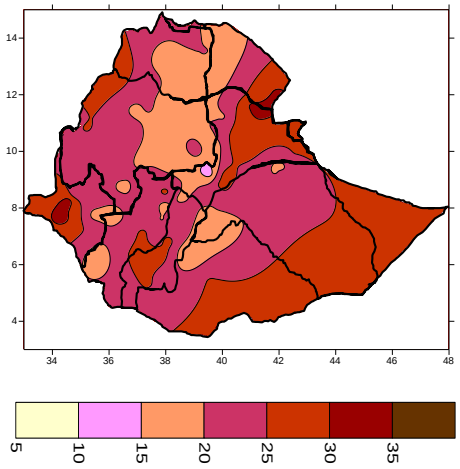
During February the spatial distribution and amount of rainfall was observed over south west, south and central catchments. In this case better rainfall distribution was observed over most part, Omo gibe, upper and middle of Abay, BoroAkobo, middle and lower Rift Valley catchments were received from 50 up to 150mm rainfall, in addition few place of upper BaroAkobo, lower OmoGibe were received above 150mm. The rest catchments were received below 50mm rainfall shown below in figure (1).



(Fig.1) Monthly precipitation of February, 2024

2. Temperature

The monthly average temperature of February recording below 25^{o}C average temperature was observed over most of the central catchments, most of Rift valley, OmoGibe Lower Abay, upper Genaledawa, Wabishebele, BaroAkobo and upper Awash and Lower Tekeze. The rest most of Ogaden, lower Wabishebele and Genaledawa, lower Awash, lower Afar Denakel and lower BaroAkobo catchments were recorded monthly average temperature above 25^{o}C shown below in figure (2).



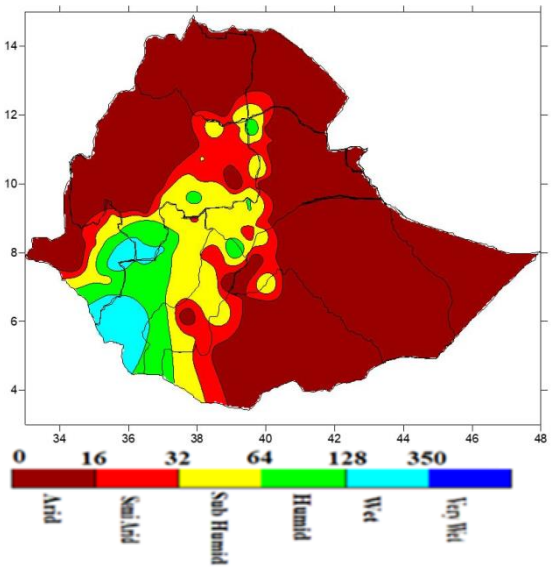
(Fig. 2) **Mean monthly Temperature of October, 2024.**

3. Assessments of Aridity Index

To compute the aridity index we use Thornthwait method, which is computed from the monthly values of rainfall and evaporation. The evaporation is computed empirically from mean monthly air temperature. In assessing the effectiveness of rainfall, in terms of water availability

relationships between the rainfall and air temperature has been worked out in terms of moisture indices. The aridity index values above 350 which shaded in blue were show Excessive wet, deep green wet condition. Light green to yellow value indicates humid to sub humid and pink to red values show semi-Arid to arid condition.

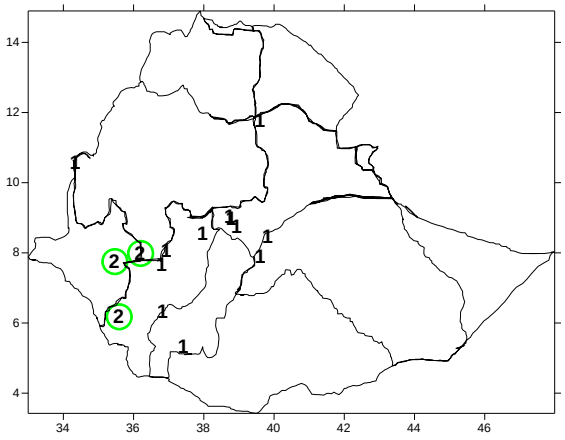
The moisture performance of February had shown better performance southern, southwestern and central catchments. In line with this most parts of Omogibe, upper and middle BaroAkobo, Middle and Lower Rift valley pocket places of upper and middle Abay, catchments were performed sub Humid to wet moisture condition. The rest most parts of Tekeze, Afar Denakel, Awash, Wabishebele, Ogaden and upper Rift valley catchments were dominated under Arid to semi-Arid condition below in figure (3).



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

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

The occurrence of heavy fall during February were observed over middle Rift valley, OmoGibe, and upper BaroAkobo catchments were received from one to Two days. The maximum frequency of heavy fall days was recorded middle Abay, upper BaroAkobo and lower Omo gibe, Gatra, Masha and Maji for 2 days respectively and maximum rainfall were recorded on Upper Awash at Addis Ababa Bole station was February 28th 56.2mm shown below in figure (4).



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

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

In the coming March the humid to wet condition will be dominated over southern, southwestern and south eastern river basin. In line with most of Genale Dawa, Middle and lower upper, Omo gibe, Rift valley, Abay, Upper and middle BaroAkobo, humid to wet condition, according to the forecast information. The occurrence of rain water across those catchments will be benefited to sustainable water utility and it has contribution to support the availability of water by using rain water harvesting.