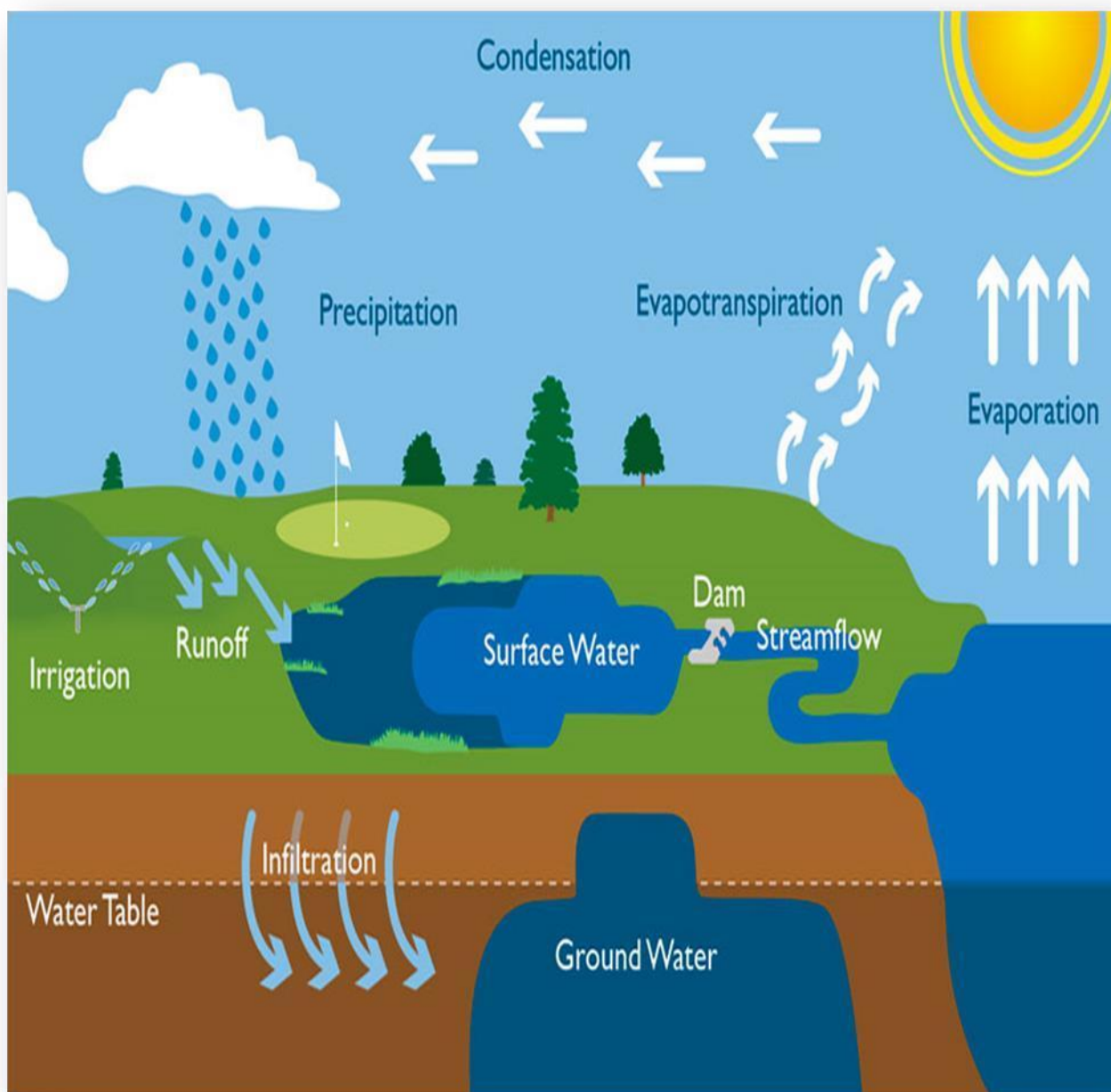


Ethiopia Meteorology Institute



Hydro Meteorological and flood monitoring Bulletin for Kiremt, 2025
impact assessment and Hydro meteorological impact outlook for Bega,
2025/26

Foreword

This seasonal hydro meteorological bulletin is prepared and disseminated by the Ethiopia Meteorological institution (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 km². 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° 04' N and 15° 02' N, and 36° 03' and 39° 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 130 N South of Gondar to 11° 30' N, and west of 39° 45' E of Wollo, 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.

Danakil – Afar Catchment: -

East of 40° E of Tigray, North of 11° N of Wollo, narrow coastal strip south of 14° 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° 40' N of Wollo, south of 9° 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.

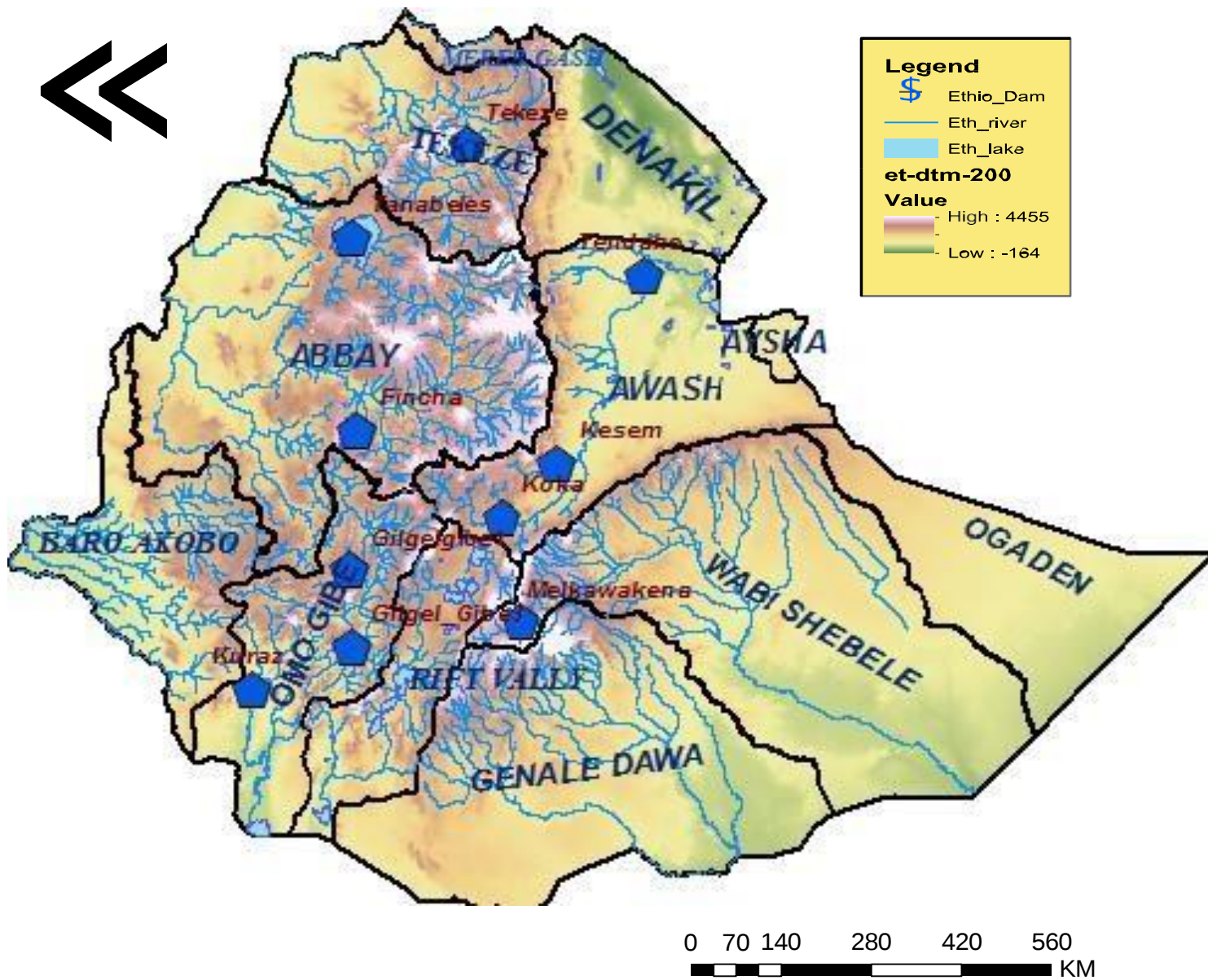
Genale Dawa Catchment: -

The western half of Bale (South of Goba) and southeast, southwestern and northeastern parts of Sidamo. The catchment constitute three river systems namely Dawa ,Genalle and Wabi Gestaro that meet each other before they cross the Ethio-Somalia border.

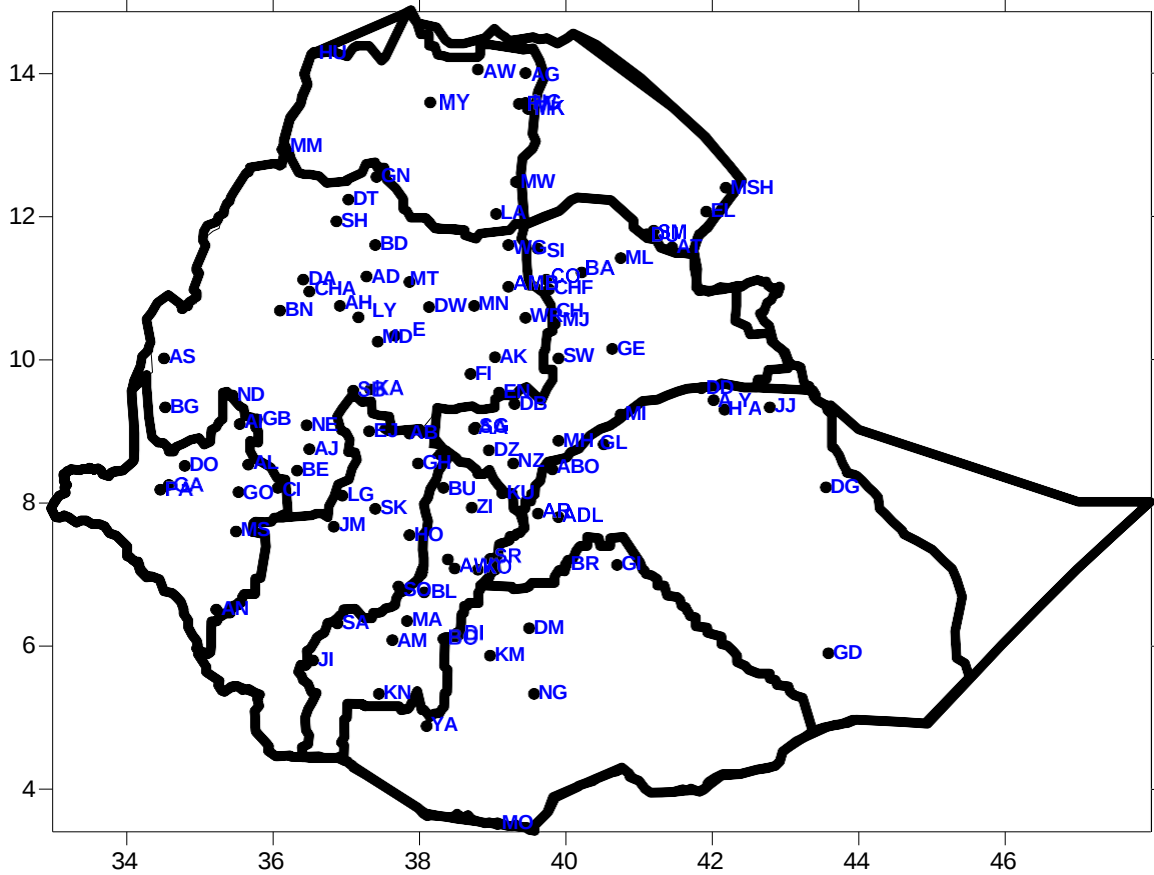
III. Major River Catchments in Ethiopia, Location and Spatial Status

No.	Catchement Name	Area (km ²)	Length in Kilo meter			Volume of water bm ³ /An num	Altitude (meter)
			Within Eth.	Outside Eth.	<i>Total</i>		<i>Peaks (Highest & Lowest)</i>
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

IV. Basin map of Ethiopia



V. 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	Moyalale	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 Tabor	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.

1. Kiremt season description

Kiremt from June to September is mostly wet to very wet season for most parts of the river basin except south and south eastern basins such as lower and middle Wabishebele, lower Rift valley, lower OmoGibe, middle and lower Genale Dawa catchments. It has significant important for water resource of the country. The main source of runoff is Kiremt seasonal rainfall, which occur high flow period and maximum availability of surface and ground water over those catchments. It is known that Kiremt season rainfall covers the water demand of all reservoir and river basin water storage. Dam, reservoir and ponds can capture the highest volume of water during this season. The occurrence of flood and land slide is widely known phenomenon over flood prone area and rugged surface of the country during Kiremt season respectively.

Methods

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 green very wet and 128 were show wet condition. Light green humid, yellow sub- humid and red values show dry condition.

Where RF= monthly rainfall in mm; T = monthly mean temperature in °C

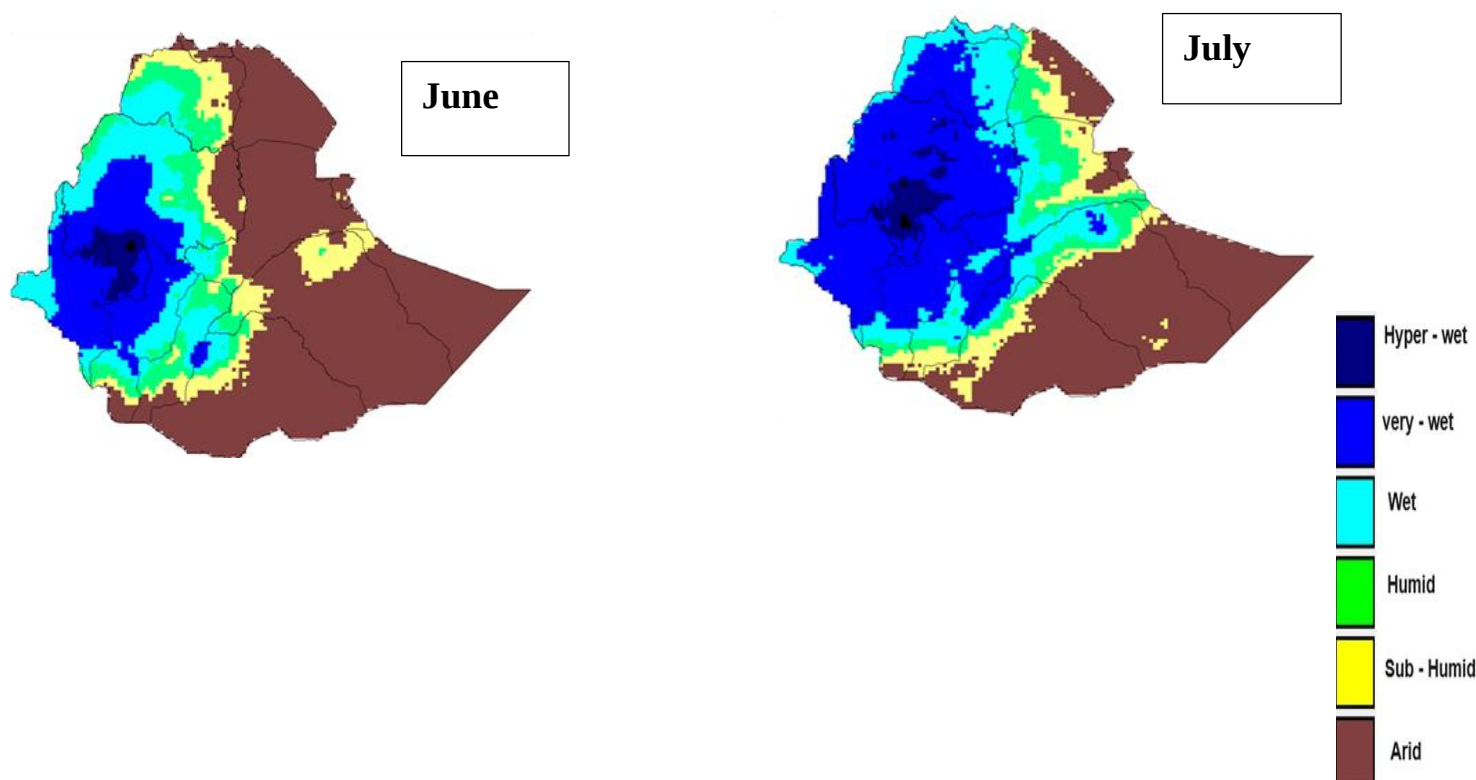
2. Aridity status for Kiremt 2025 at different river basins

June: During June first month of Kiremt season Moderate to high surface water flows were observed most part of Abay, BaroAkobo, middle and lower Tekeze, upper and middle Omo gibe, central rift valley, upper Awash and upper Genale Dawa River basins.

In **July**, better conditions expanded from the western region to the central, northern, and north-eastern catchments. This shift primarily benefited areas that rely on the Kiremt rains, including the Abay, Tekeze, upper Afar Danakil, upper and middle Awash, Omo-Gibe, Central Rift Valley, upper Wabe Shebele, and Genale Dawa basins, which experienced wet to hyper wet conditions.

August, during this month most of Abay, Tekeze, Afar Danakil, Awash, Omo Gibe, Central Rift Valley, upper and middle Genale Dawa, upper Wabe shebele and Ogaden basins experienced wet to very wet condition and additionally Abay, Tekeze, BaroAkobo, Omo Gibe and upper and middle Awash had experience Hyper wet conditions.

September, last month of Kiremt 2025, better moisture condition shift form east and north east to south west and western catchments inline to this most Abay, BaroAkobo, Omo Gibe, upper Wabe shebele, upper Genale Dawa, and few place of Afar Danakil had experienced humid to very wet moisture condition. Shown below in figure 1



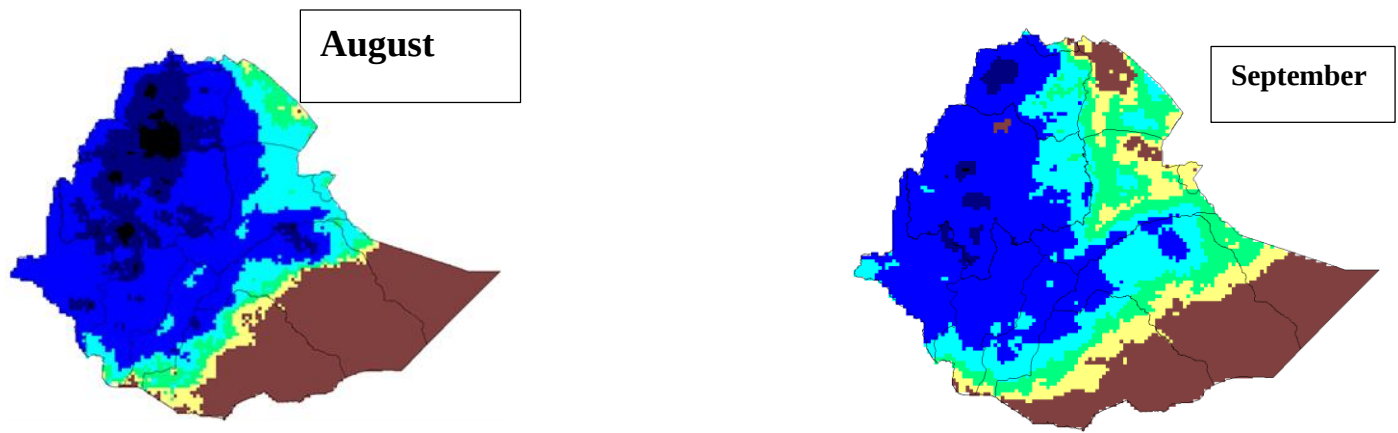


Figure 1 Aridity Index during Kiremt (June to September), 2025.

Distribution of heavy fall days exceeding 30mm during June to September 2025 over different river basins.

In June, heavy fall frequency was recorded over Abay, Baro-Akobo, Omo-Gibe, and Rift- Valley, Catchments. Maximum frequency of heavy fall days was observed over Abay catchment for 4 days.

July 1-9 day's heavy fall was observed over most of Abay station, BaroAkobo station, Tekeze station, upper and middle Awash, Omo Gibe, and few Afar Danakil stations. Maximum frequency of heavy fall observed over Abay for 9 Days

August: During this month heavy fall frequency observed over most of Abay, Baro Akobo, Tekeze, OmoGibe, and upper Central Rift Valley.

September: During this year Heavy fall frequency observed over most of Abay station, BaroAkobo station, upper and middle Tekeze station, OmoGibe stations, Maximum heavy fall frequency for 8 days over Middle Abay basin at Arjo station.

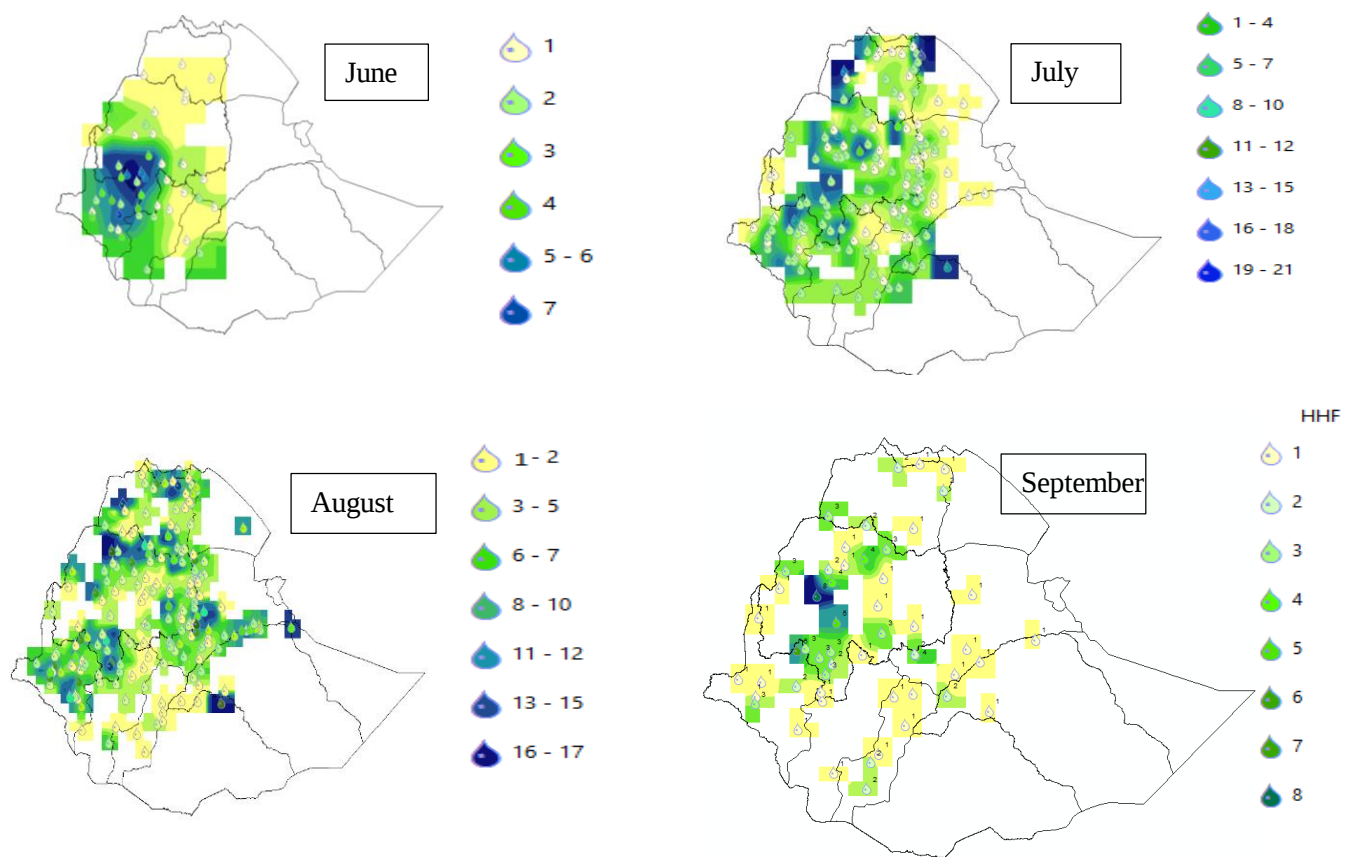


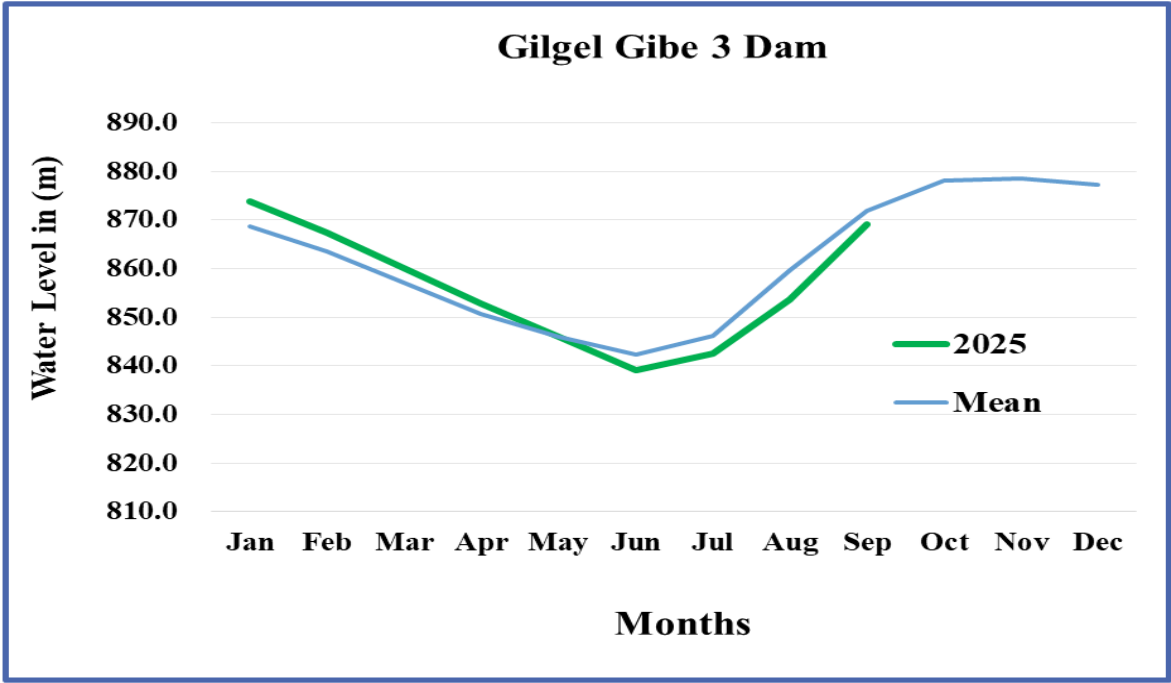
Figure 2 Distribution of Heavy fall from June to September, 2025.

Performance of Dams and Reservoirs water level in Kiremt 2025 season compared to long mean

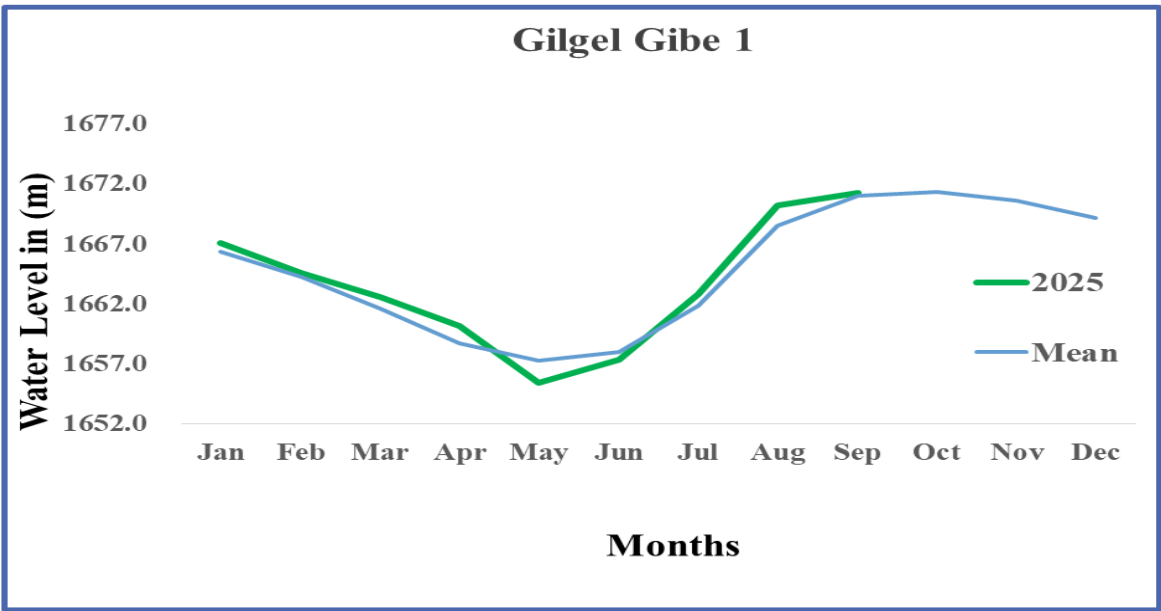
Rainfall is the primary source of runoff that feeds dams, reservoirs, and ponds. The Kiremt season provides the majority of this water, resulting in high river flow. In the current 2025 Kiremt season, rainfall was sufficient, leading to good performance for most man-made dams, natural rivers, and other water bodies. The exception was the Gilgel Gibe III dam, as shown in the figures below (4a-h).

Data source: EPA (NGCC)

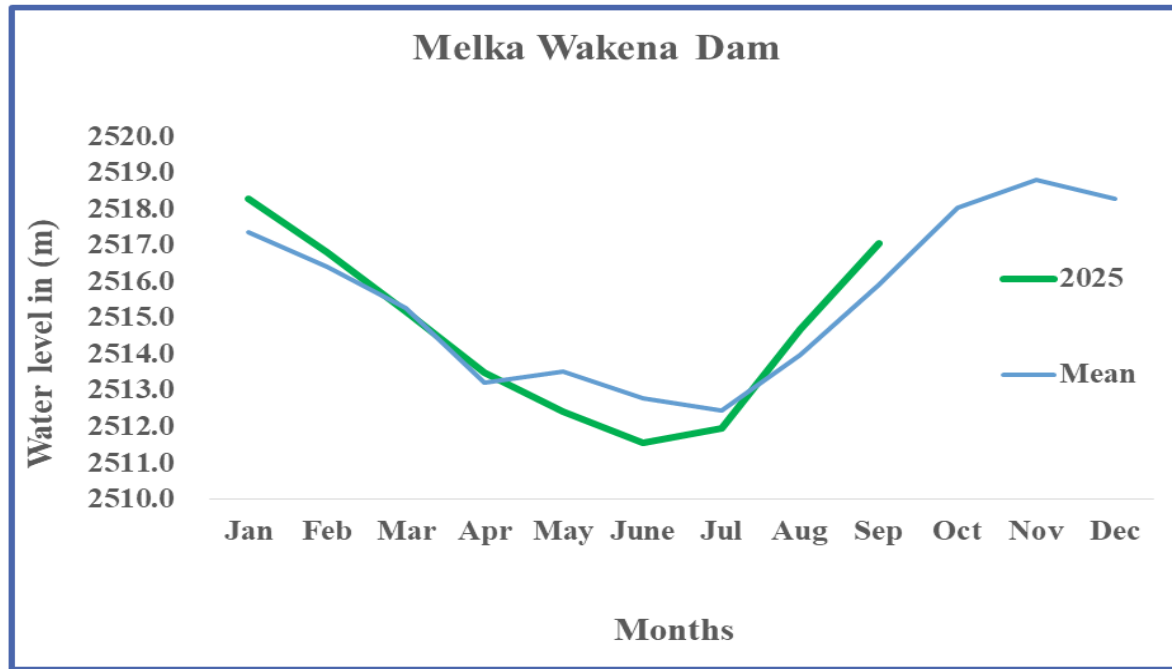
A,



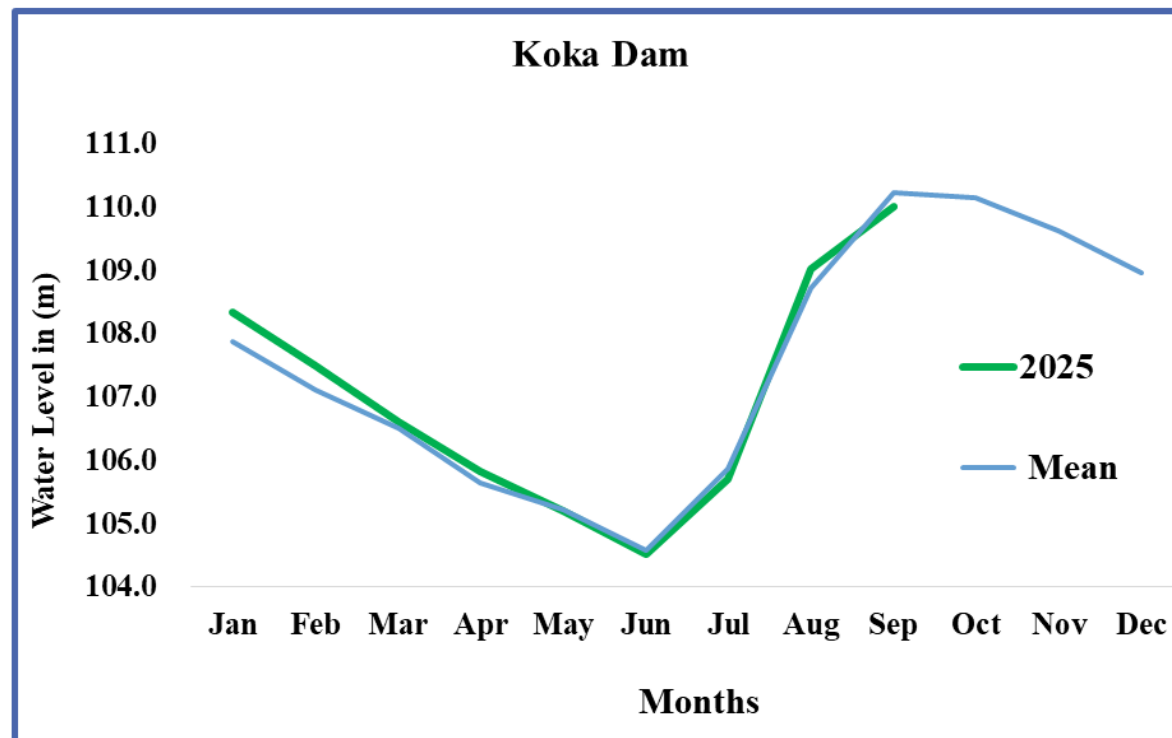
B,



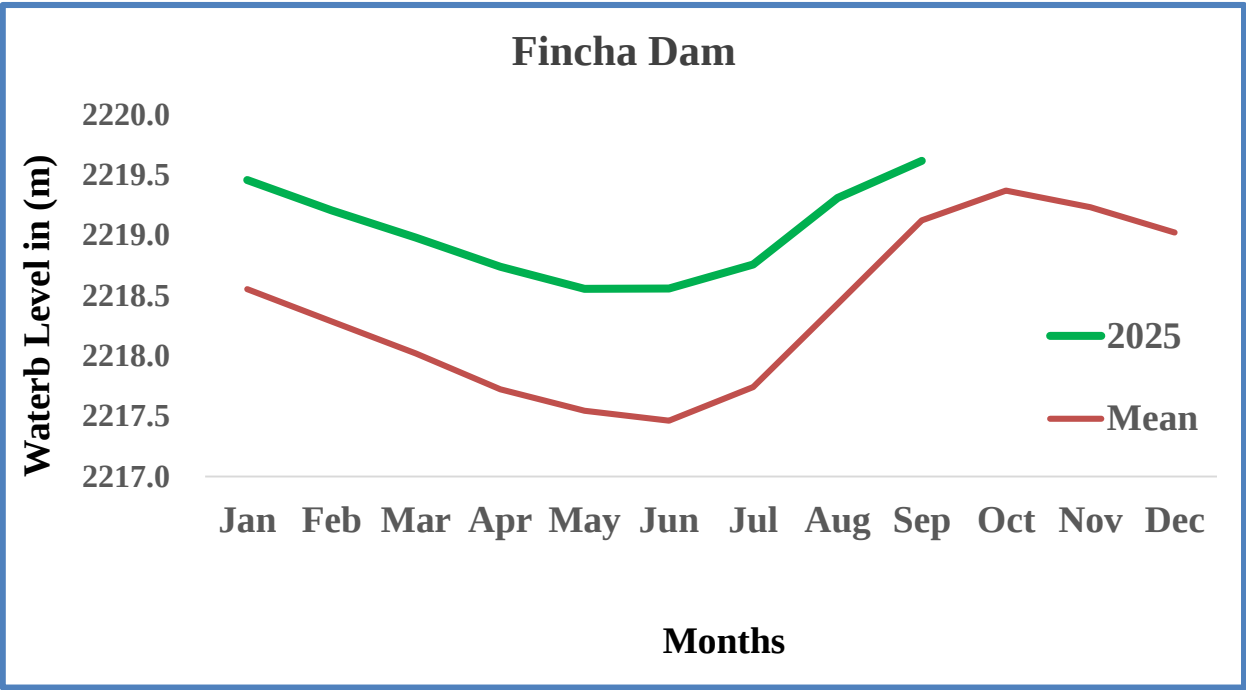
C,



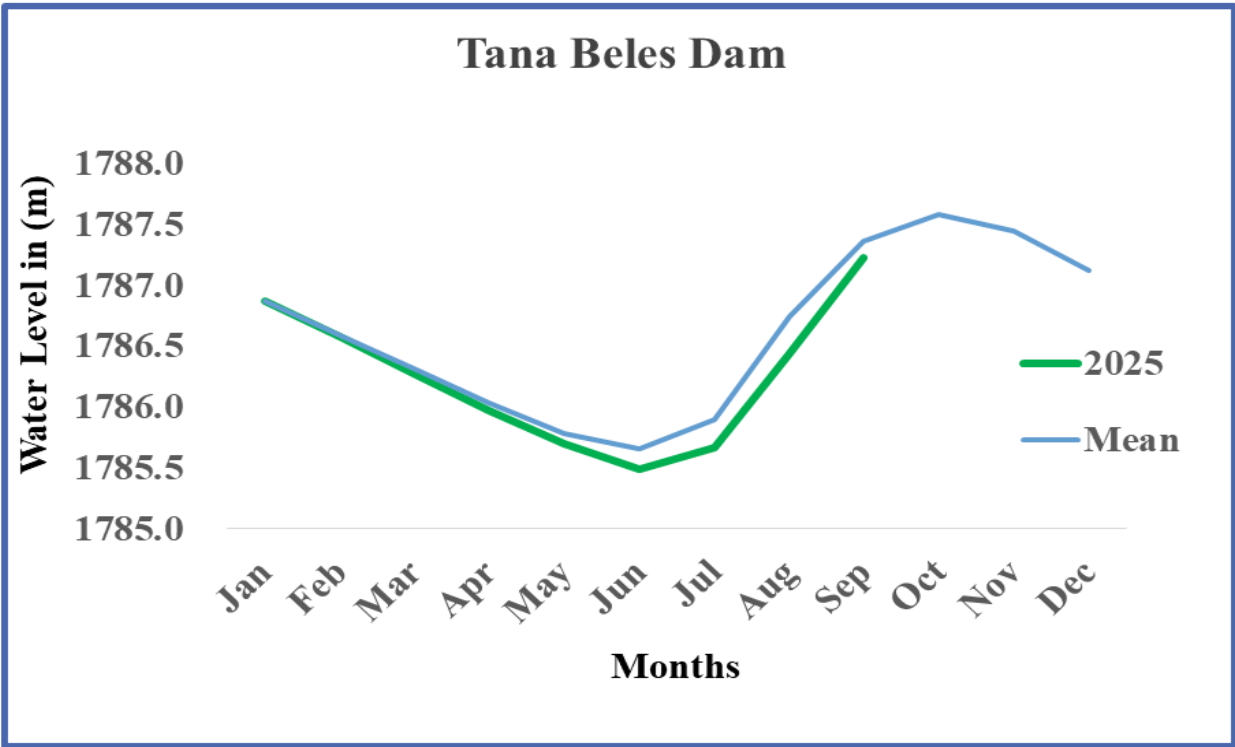
D,



E,



F,



G,

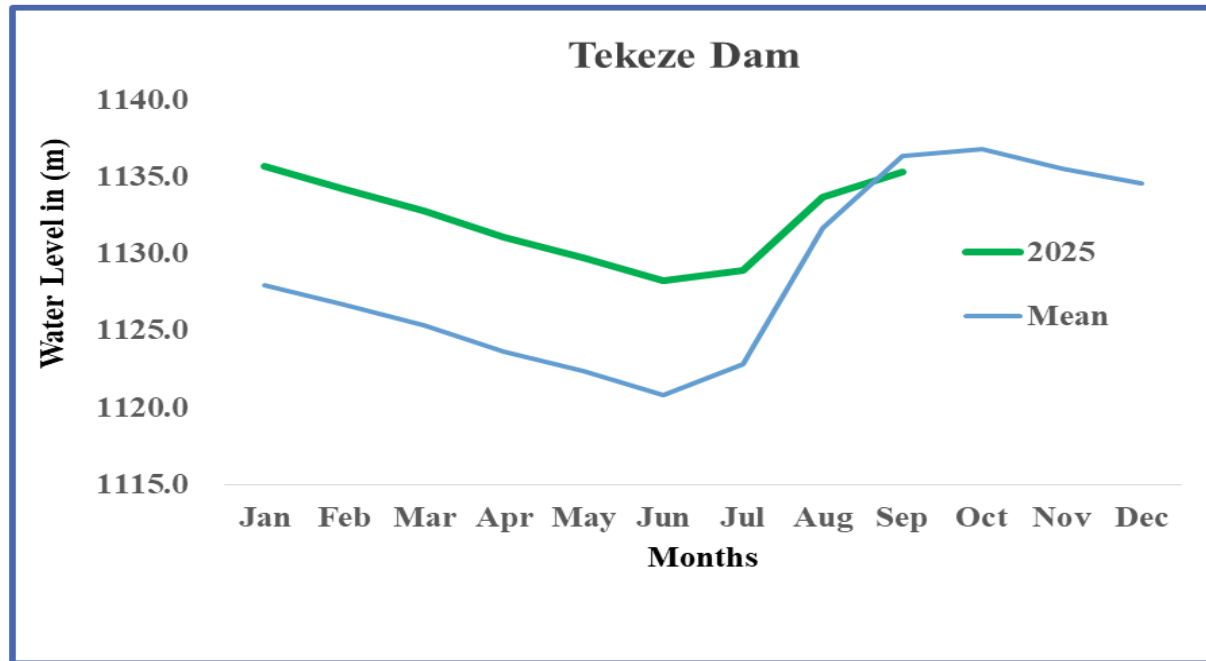


Figure 4a-h Water level of different dams.

3. Summary

From **June to September** most part of Abay, BaroAkobo, Tekeze, Omo Gibe, Upper and middle central Rift Valley, upper Wabi shebele, and Genale Dawa had experience moderate to high surface flows. During July and September maximum heavy fall frequency experienced July 19-21 days and September 16-17 days respectively. This condition has positive impact for water availability over Kiremt Benefiting catchments. Inline to this most dams of the country had good performance compared to current status in to Average long mean performance.

Conclusion

- The moisture performance of Kiremt 2025 was experienced under better moisture condition over most river basins, and after July some catchments had hyper moisture conditions
- Better moisture performance was observed in July and August over most catchments of south, south west, north eastern, Central and western catchments of the country.
- Reservoirs and dams water level performance have shown better status in comparison to the mean.
- Generally, Kiremt 2025 Season has good for Water availability and storage

Hydro-meteorological impact outlook for Bega 2025-26 over different river basins

1. Introduction

Bega from October to January is mostly an arid season for most part of the river basin except Ogaden, Lower and middle Wabeshebele, lower OmoGibe middle and lower Genale Dawa as well as lower central rift valley catchments. The main rainy month Bega season is October and November provides rainfall mainly for southern, south eastern and south western catchments. Sunny and windy condition dominated across many river basin thus it increase the loss of water by Evaporation. Availability of water is also decrease across upstream of main river basin. In some years' unseasonal rain slightly fevered for water availability.

2. Selected analogue Year

For the coming Bega season the selected analogue year **2017/18 and 2020/21** Were compared based on probabilistic seasonal forecast for **Bega 2025/26** and viewed out on catchments based map using geostatistical kriging method. Among those **2020/21** is the best analogue years that can inform the Aridity status in the coming Bega season.

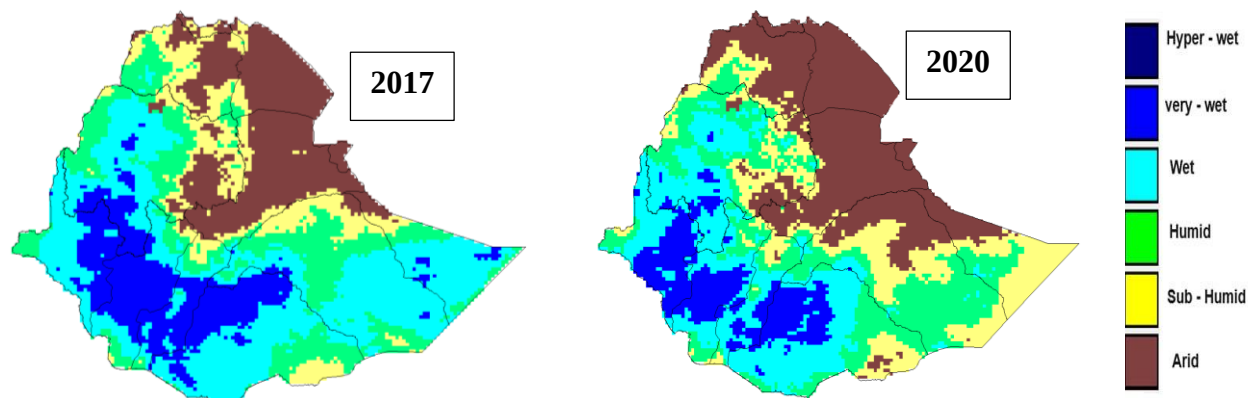
3. Methodology

Thornthwaite introduced the concept of the precipitation effectiveness index, 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.

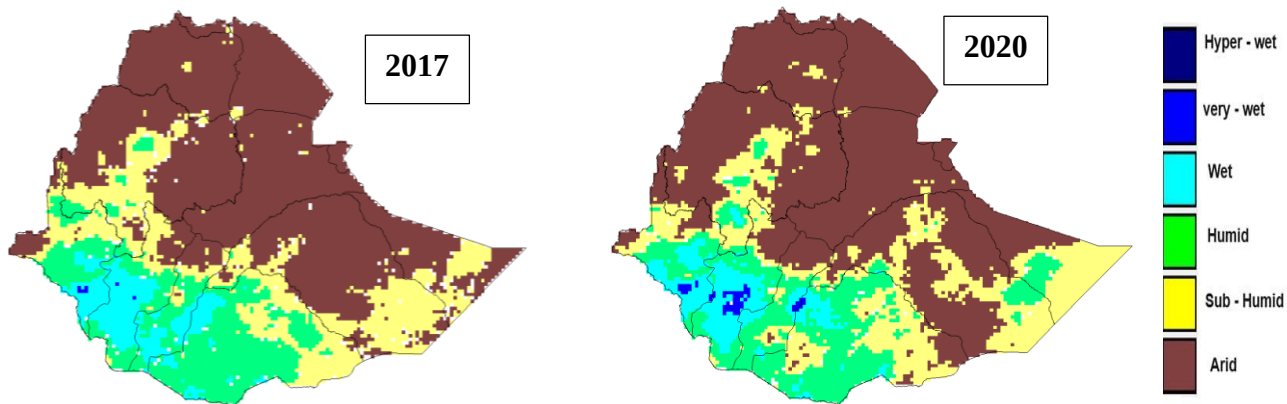
Where, R_f = monthly rainfall in mm;

T = mean monthly temperature in $^{\circ}\text{C}$

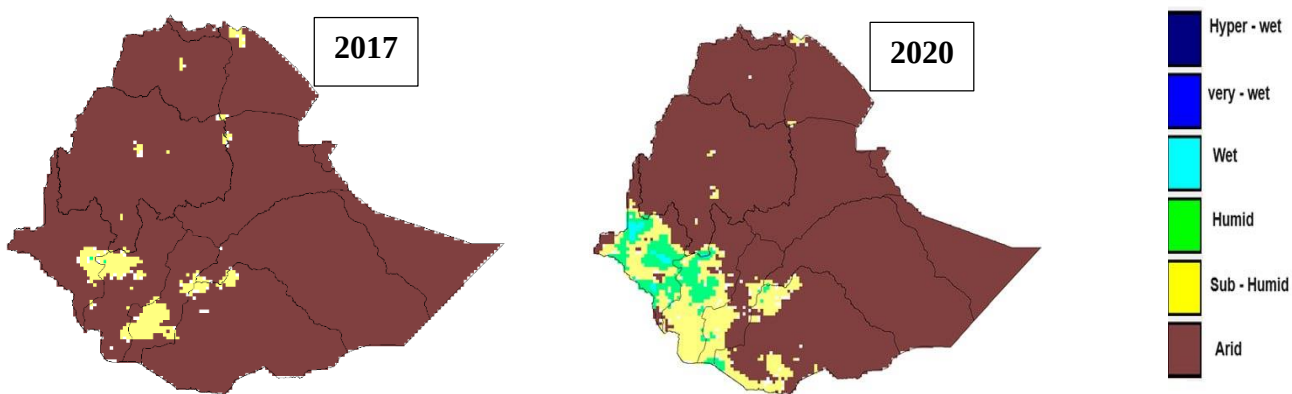
October: Based on the three analogue years, Bega moisture benefiting catchments start getting some amount of moisture over most basins, this Bega status the most of BaroAkobo, Wabeshebele, GenaleDawa, Ogaden, and lower Abay basin had performed sub-humid and wetmoisture condition.



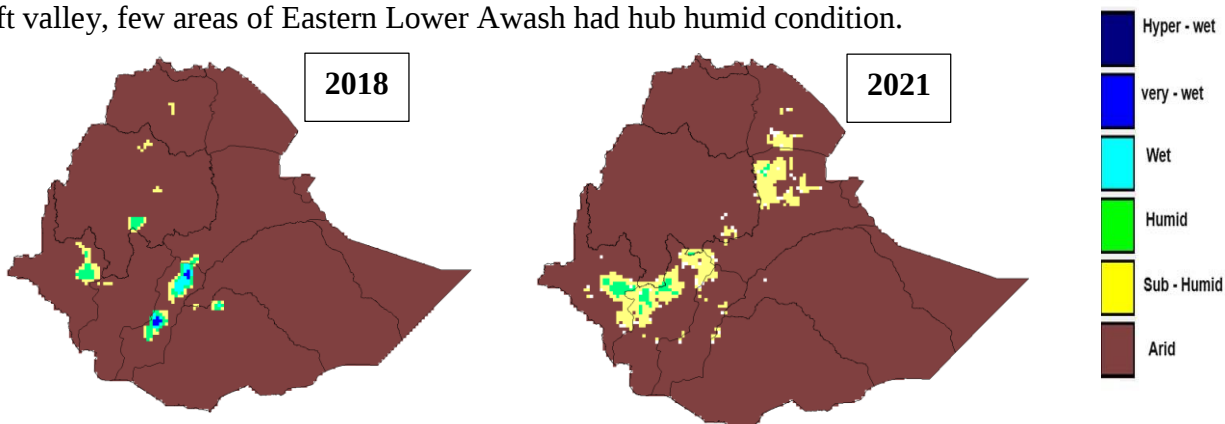
November: In this month, there would be starting spatial distribution moisture become decreasing compared to the previous month october. According to this, except middle and lower OmoGibe, upper and Middle BaroAkobo, GenaleDawa and lower Ogaden showed domination of arid moisture condition



December:-In this month dry moisture distribution performed across Bega benefiting catchments. Whereas: middle and lower Omo Gibe, Rift valley, GenaleDawa, upper and middle BaroAkobo, catchments were performed under sub humid to humid moisture condition. The rest most basins under arid moisture condition.



January: - During this month, dries month of the season of Bega therefore most River basins had dominated Arid moisture condition However, during 1996 analogue year most of OmoGibe and central rift valley, few areas of Eastern Lower Awash had hub humid condition.

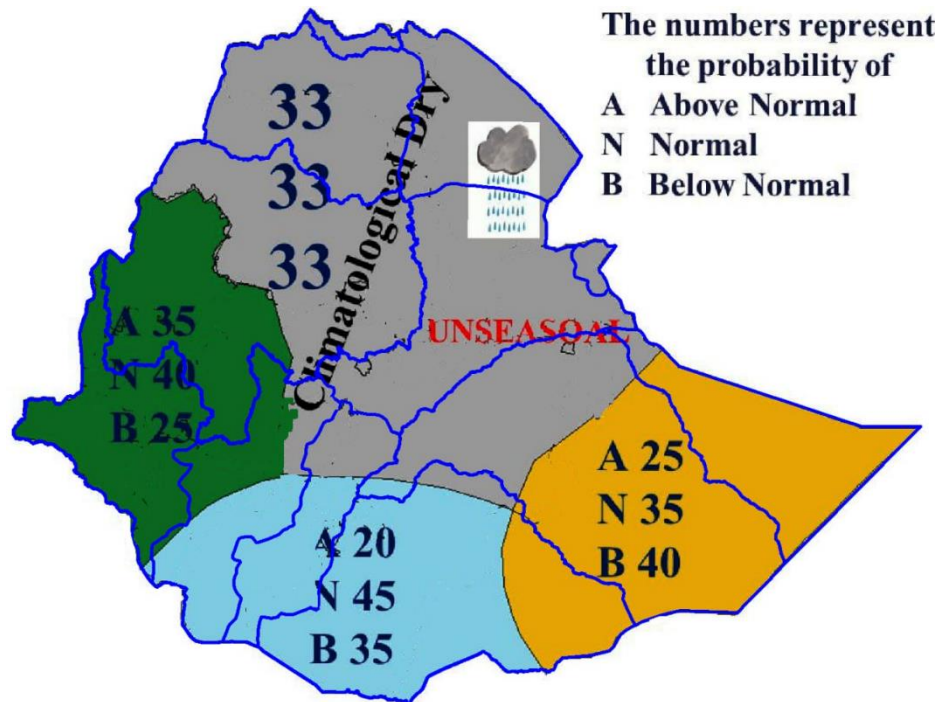


Hydro-Meteorological Summery and advisory for coming Bega (ONDJ), 2025-26

Summary

- ❖ During October, most major river basins in southern and south-western river basins experienced humid to wet conditions, positively impacting water management activities.

- ❖ In November, moist conditions decreased from western and northern areas toward the southern catchments, while humid conditions were experienced across most of Baro Akobo, Omo Gibe, Rift Valley and the southern part of Genale Dawa.
- ❖ December and January, most catchments experienced dry conditions, negatively impacting water availability; exceptions were the middle and lower Omo Gibe and Baro Akobo catchments, which maintained sub-humid to humid conditions.



Positive Impact

- Store water efficiently for use during the upcoming dry months
- Enhance reservoir capacity by ensuring proper storage in small dams and other water-harvesting structures
- Improve water availability through sustainable practices that secure adequate supply for communities, agriculture, and ecosystems.

Negative Impact

- Due to anticipated dry conditions in parts of the middle and lower Wabi Shebele, Ogaden, and Genale Dawa basins, water availability is expected to be significantly reduced.
- Due to increased daily maximum temperatures leading to higher evapotranspiration.

Advisory and Recommendation

- ❖ Below-normal rainfall is expected in South and south-eastern catchments. Implement strict water management strategies. Harvest and store rainwater effectively.
- ❖ Major reservoirs are at full capacity following good Kiremt rains. Manage water resources prudently for power, irrigation and other uses.
- ❖ Release water strategically from dams to support downstream ecosystems and agriculture during critical dry periods.
- ❖ Monitor official EMI forecasts and updates daily via the EMI website and accredited media channels. Visit: <https://www.ethiomet.gov.et/>