In brief

- The most significant event of the month was the tropical cyclone (BIPARJOY) formed over the southeast Arabian Sea. Biparjoy has been the longest duration cyclone over the North Indian Ocean (Arabian Sea, AS & Bay of Bengal, BoB) with a total life period of 12 days.
- National rainfall for the month of June 2023 was excessively above average (+160%) and stands 2nd wettest rainfall in June during past 63 years (the record is 88.10 mm in 2007).
- The wettest day of the month in the country was 26th June when Lahore (Punjab) recorded 226.0 mm rainfall, interestingly this exceptional rainfall also made Lahore the wettest place with monthly total rainfall of 392.5 mm.
- The national mean monthly temperature of June 2023 for Pakistan was 31.26 °C, being -0.72 °C cooler than average of 31.98 °C.
- Daytime (maximum) temperature at country-level was 37.85 °C, being -1.00 °C cooler than the country-average of 38.85 °C.
- Nighttime (minimum) temperature at country-level was 24.60 °C, being -0.07 °C cooler than the country-average of 24.68 °C.
- The hottest day of the month was at Turbat (Balochistan) when it recorded 49.5 °C temperature on 7th June 2023, whereas Nokkundi being the warmest place with 44.8 °C mean monthly maximum temperature.
- The coldest temperature (4.0°C) of the month was recorded at Kalam (KP) on 1st & 2nd June 2023, with the same station being the coldest place with 8.8 °C in mean monthly minimum temperature.
- The Indian Ocean Dipole (IOD) has remained in neutral phase during the month.
- The El Niño–Southern Oscillation (ENSO) shifted towards positive phase with sea surface temperatures (SSTs) in the Central and Eastern Pacific being +0.9 °C indicating the development of El Niño.

Table-1: National Weather Extremes during June 2023

Hottest day	49.5 °C	at Turbat (Balochistan) on the 7th
Coldest day	9.5 °C	at MalamJabba (KP) on the 1st
Coldest night	4.0 °C	at Kalam(KP) on the 1st & 2nd
Warmest night	35.0 °C	at Nokkundi (Balochistan) on the 24th
Wettest day	226.0 mm	at Lahore Airport (Punjab) on the 26th
Wettest month	392.5 mm	at Lahore Airport (Punjab)

Synoptic Summary

The most significant synoptic situation of the month was formation of tropical cyclone (BIPARJOY over the southeast Arabian Sea. A low-pressure area first formed on 5 June, which turned into a depression next morning and further strengthened into a Cyclonic Storm (CS) on 7th June. Moving North with mean overall direction towards North-East (sometimes towards

North-West) it intensified into a Severe Cyclonic Storm (SCS) on 8th June, into a Very Severe Cyclonic Storm (VSCS) on 11th June and further into an Extremely Severe Cyclone storm (ESCS) on 13th June with maximum sustained winds of 180km/hour. The Biparjoy kept meandering along north-northwest course until 14th June; thereafter it recurved towards northeast and weakened into VSCS on June 15. Moving further northeast ward, it made landfall at Indian Port, Jakhau, between Keti Bandar, Sindh and Gujarat (India) on evening of 16th June as a VSCS with maximum sustained winds of 120 Km/h and consequently converted into a SCS first and then into a CS (Fig. 1). Moving further northeastward as a CS it
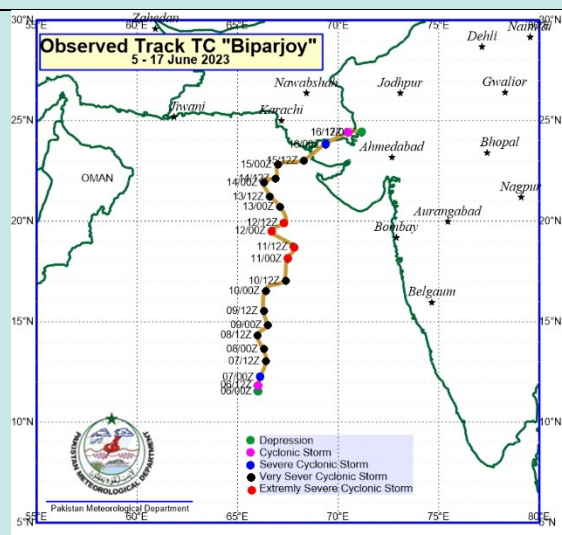

Fig1: Biparjoy Track

kept its strength intact and stationed over Nagarparker (Tharparker) and adjoining Indian Rann of Kutch for the whole day before changing into deep depression over west Rajasthan, India. It caused severe heatwave conditions over Karachi and other districts of lower Sindh for 4 days, 09-12 June, culminating into a dust-thunderstorms and widespread heavy rains in Southeast Sindh with light/moderate rainfall in Karachi during 13th to 17th June 2023.

Apart from this, westerly troughs continued to persist over Northern and central parts of the country, while Seasonal low prevailed over West/Northwest Balochistan with its trough extended southeast wards during the month. From 24th June the moist currents from the Arabian Sea started penetrating into eastern parts of the country that caused pre-monsoon rains in upper Khyber Pakhtunkhwa (KP), Gilgit-Baltistan (GB), Kashmir, Punjab, Northeast Balochistan and upper & eastern Sindh.

Table-2: Significant wind speeds recorded during the June-2023

Date	Station	Max Wind Knots	Date	Station	Max Wind Knots	Date	Station	Max Wind Knots	Date	Station	Max Wind Knots
01/2023	Bahawal Nagar	40	11/2023	Islamabad AP	41	30/2023	Lahore AP	30	26/2023	Peshawar City	30
11/2023	Bahawal Nagar	60	14/2023	Islamabad AP	32	11/2023	Lahore City	42	15/2023	Quetta Samungli	30
04/2023	Bahawalpur	42	24/2023	Islamabad AP	35	26/2023	Lahore City	55	16/2023	Quetta Samungli	34
11/2023	Bahawalpur	42	30/2023	Islamabad AP	34	27/2023	Larkana	34	25/2023	Quetta Samungli	30
01/2023	Bahawalpur AP	34	11/2023	Joharabad	50	11/2023	Layyah	40	10/2023	Rawalpindi	35
04/2023	Bahawalpur AP	46	26/2023	Kasur	45	19/2023	Mandi Bahauddin	30	14/2023	Rawalpindi	35
07/2023	Bahawalpur AP	36	01/2023	Khanewal	36	06/2023	Mangla	39	30/2023	Rawalpindi	30
11/2023	Bahawalpur AP	44	11/2023	Kot Addu	35	16/2023	Mithi	30	19/2023	Sialkot Ap	35
18/2023	Bannu	46	07/2023	Lahore AP	52	03/2023	Multan AP	38	15/2023	Thatta	32
27/2023	Chhor	40	10/2023	Lahore AP	40	06/2023	Multan AP	36	13/2023	Turbat	30
01/2023	D I Khan	30	11/2023	Lahore AP	60	07/2023	Multan AP	36	14/2023	Turbat	30
11/2023	D I Khan AP	20	15/2023	Lahore AP	55	26/2023	Narrowal	40	28/2023	Turbat	30
01/2023	DG Khan	54	19/2023	Lahore AP	60	03/2023	Padidan	30			
10/2023	Faisalabad	30	26/2023	Lahore AP	70	11/2023	Peshawar AP	35			

Table-3: New Weather (rain & temperature) Records Set in June 2023

S No	STATION	Weather Paramter	New Record Value	New Record date	Old Record Value	Old Record Date	No of years examined.
1	Chhor	Wettest month rain (mm)	124.3	2023	112.2	1978	86
3	Lasbella	Coldest night Temperature (°C)	18.0	11/2023	18.0	03/1935	63
4	Mithi	Coldest day Temperature (°C)	27.0	17/2023	29.8	27/2007	20
5	Mithi	Wettest month rain (mm)	209.0	2023	58.2	2007	20
6	Mithi	Heaviest one day Rainfall (mm)	165.0	17/2023	42.0	20/2021	20
7	Padidan	Heaviest one day Rainfall (mm)	65.0	28/2023	60.4	13/2013	83
8	Quetta Samungli	Hottest night temperature (°C)	26.0	(02)/2023	25.7	22/1986	63
9	Zhob	Hottest day temperature (°C)	43.0	25/2023	43.0	11/2021	69
10	Zhob	Wettest month rain (mm)	87.0	2023	77.0	2007	70
11	Zhob	Heaviest one day Rainfall (mm)	40.0	27/2023	37.0	27/2006	70
12	Bahawal Nagar	Coldest night Temperature (°C)	17.5	01/2023	18.3	12/1985	61
13	Bunji	Hottest day temperature (°C)	43.3	24/2023	43.3	30/2022	63
14	Bannu	Coldest day Temperature (°C)	26.0	02/2023	26.2	30/2007	25
15	Cherat	Coldest day Temperature (°C)	16.0	02/2023	16.7	09/1988	63
16	Dera Ismail Khan	Wettest month rain (mm)	113.0	2023	100.4	2013	143
17	Faisalabad	Coldest day Temperature (°C)	25.0	02/2023	27.5	30/2018	63
18	Garhi Dupatta	Coldest day Temperature (°C)	15.5	01/2023	19.5	22/2022	63
19	Gilgit	Hottest day temperature (°C)	43.5	24/2023	43.5	(03)/1990	63
20	Rawalpindi	Coldest day Temperature (°C)	22.5	02/2023	23.0	22/2022	63
21	Islamabad Zero Point	Coldest day Temperature (°C)	23.0	(02)/2023	23.0	22/2022	41
22	Jehlum	Coldest day Temperature (°C)	23.0	02/2023	25.4	22/2022	63
23	Jehlum	Wettest month rain (mm)	190.1	2023	184.8	2008	76
24	Kotli	Coldest day Temperature (°C)	20.6	01/2023	21.9	22/2022	63
25	Lahore Airport	Coldest day Temperature (°C)	24.3	01/2023	26.2	17/2006	63
26	Lahore Airport	Coldest night Temperature (°C)	17.5	26/2023	18.0	17/2011	70
27	Lahore Airport	Wettest month rain (mm)	392.5	2023	224.1	2011	70
28	Lahore Airport	Heaviest one day Rainfall (mm)	226.0	26/2023	98.0	29/2011	70
29	Lahore City	Coldest day Temperature (°C)	25.4	01/2023	25.8	15/2013	63
30	Lahore City	Wettest month rain (mm)	291.1	2023	208.6	1996	143
31	Lahore City	Heaviest one day Rainfall (mm)	161.8	26/2023	125.5	18/1894	143
32	Multan	Coldest night Temperature (°C)	19.5	01/2023	19.5	03/1998	70
33	Murree	Coldest day Temperature (°C)	11.7	01/2023	12.0	22/2022	63
34	Mizaffarabad	Coldest day Temperature (°C)	19.5	02/2023	20.0	22/2022	63
35	Peshawar	Coldest day Temperature (°C)	23.5	02/2023	23.5	05/2010	63
36	Sialkot	Coldest day Temperature (°C)	23.0	01/2023	24.0	22/2017	63

Rainfall: Largely above-average in the country as a whole

Climatologically, the June rainfall contribution to the annual national total and Pre-monsoon (AMJ) is 6.2% & 33.2% respectively. During June 2023, Pakistan experienced six moderate to heavy rainfall events. June 2023 rainfall was largely above average (160%) for Pakistan as a whole and stands 2nd wettest June on record (the record being 88.10 mm in 2007). The

Fig 2: Daily Area Weighted Rainfall

situation was more or less similar on regional scale too; largely above-average rainfall in Balochistan with 27.20 mm/+199% (record is 114.00 mm in 2007) and Sindh with 49.60
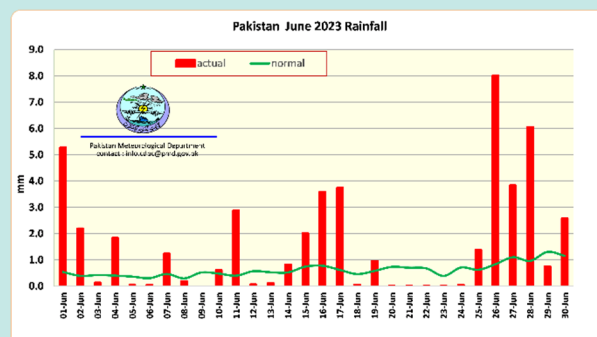
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mm/+385% (record is 51.60 mm in 1964) both standing 3rd wettest June during past 63 years. Punjab with 80.10 mm/+172% (record is 93.60 mm in 2007) ranked as the 4th wettest June during past 63 years, KP with 67.90 mm/+89% (record is 82.90 mm in 2008) ranked as the 7th wettest June during past 63 years, AJK with 93.50 mm/+48% (record is 172.40 mm in 1971) ranked as the 8th wettest June during past 63 years. The GB was the only region that witnessed nearly average rainfall with 11.70 mm/+9% (Table-4)
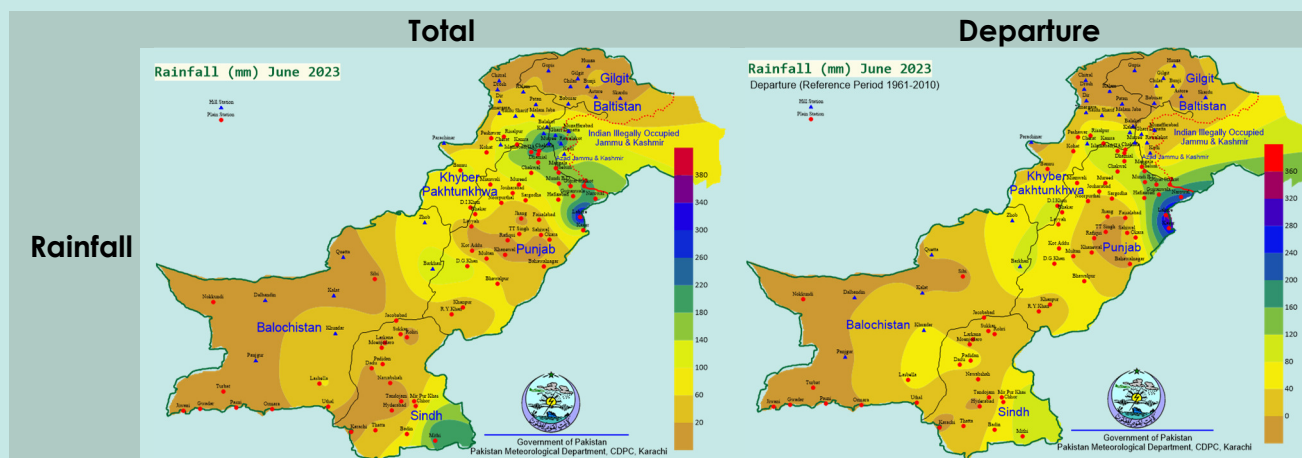
The wettest day of the month in the country was 26th June when Lahore (Punjab) recorded 226.0 mm rainfall, interestingly this exceptional rainfall also made Lahore the wettest place with monthly total rainfall of 392.5 mm (Table-1).

Table-4: June 2023 Area-Weighted Rainfall

Region	Rank (of 63y)	Normal (mm)	Average (mm)	Departure (percent)	Comment
Pakistan	62	18.60	48.40	160	2nd highest (record 88.10 mm in 2007)
Azad Jammu & Kashmir	56	63.00	93.50	48	8th highest (record 172.40 mm in 1971)
Balochistan	61	9.10	27.20	199	3rd highest (record 114.00 mm in 2007)
Gilgit Baltistan	40	10.80	11.70	9	-------
Khyber Pakhtunkhwa	57	36.00	67.90	89	7th highest (record 82.90 mm in 2008)
Punjab	60	29.40	80.10	172	4th highest (record 93.60 mm in 2007)
Sindh	61	10.20	49.60	385	3rd highest (record 51.60 mm in 1964)

[RANK RANGES FROM 1 (LOWEST) TO 63 (HIGHEST) IN TERMS OF YEARS FROM 1961]

June 2023 Rainfall maps

The other significant monthly-total rainfalls have been Lahore-City 291.1mm, Rawlakot 233.5mm, Murree 213.5mm, Mithi 209.0mm, Kakul 206.0mm, Islamabad-Airport 199.5mm,

Sialkot Cantt 199.1mm, Islamabad-Zeropoint 192.7mm, Sialkot Airport 192.6mm, Jhelum 190.1mm, Narowal 178.0mm, Rawalpindi 174.0mm, Garhi Dupatta 172.2mm, Mangla 158.4mm, Attock 150.5mm, Muzaffarabad-Airport 147.1mm, Muzaffarabad-City 143.8mm, Mandibahauddin 141.0mm, Risalpur 140.0mm, Gujranwala 139.2mm, Gujrat 138.0mm, Barkhan 136.0 mm, Cherat 128.0mm, Chakwal 126.7mm and Hafizabad 125.9mm. The stations Larkana, Dalbandin, Jiwani, Nokkundi and Panjgur, remained absolutely dry with no rain during the month. The stations Sibbi and Karachi-Masroor recorded traces of rainfall during the month.

Table 5: Temperatures: Cooler than average in the country Except GB.

Area Average Temperatures(°C) statistics in June 2023						
Regions	Maximum Temperature		Minimum Temperature		Mean Temperature	
	Actual	Anomaly	Actual	Anomaly	Actual	Anomaly
Pakistan	37.85	-1.00	24.60	-0.07	31.26	-0.72
Azad Jammu & Kashmir	32.07	-0.20	18.07	-0.18	25.09	-0.19
Balochistan	39.14	-0.06	25.16	0.45	32.21	-0.03
Gilgit-Baltistan	32.48	1.26	16.43	0.21	24.46	0.72
Khyber Pakhtunkhwa	35.33	-1.51	21.30	-1.06	28.31	-1.30
Punjab	38.32	-2.90	26.25	-0.76	32.32	-2.05
Sindh	39.01	-1.44	27.70	0.03	33.38	-0.86

June 2023 was -0.72 °C, cooler than average with national mean monthly temperature being 31.26 °C against the average of 31.98 °C. The situation was more or less similar on a regional scale too; KP with 28.31 °C (-1.30 °C), Sindh 33.38 °C (-0.86 °C), AJK 25.09 °C (-0.19 °C), Punjab 32.32 °C (-2.05 °C) and Balochistan with 32.21 °C (-0.03 °C) all recorded cooler than average temperatures. GB was the only region with 24.46 °C (+0.72 °C) that exhibited warmer than average temperature, (Table-5)

June 2023 mean maximum (daytime) temperature of 37.85 °C recorded at country-level was -1.00 °C cooler than average of 38.85 °C. Similarly, the country-level night (minimum) temperature of 24.60 °C was -0.07 °C slightly cooler than average of 24.68 °C (Table-5). The mean temperature anomalies ranged from ±3.4 °C while the mean maximum temperature anomalies were from -4.5 to +2.4 °C in the country, being considerably higher in northern parts of Pakistan and eastern Balochistan. The hottest day of the month was at Turbat (Balochistan) when it recorded 49.5 °C temperature on 7th June (Table-1), while Nokkundi (Balochistan) proved to be the warmest place with 44.8 °C average maximum temperature

during the month. Kalam (KP) recorded the month's coldest night temperature of 4.0 °C on 1st & 2nd June (Table-1) and incidentally has been the coolest place with 8.8 °C average minimum temperature.
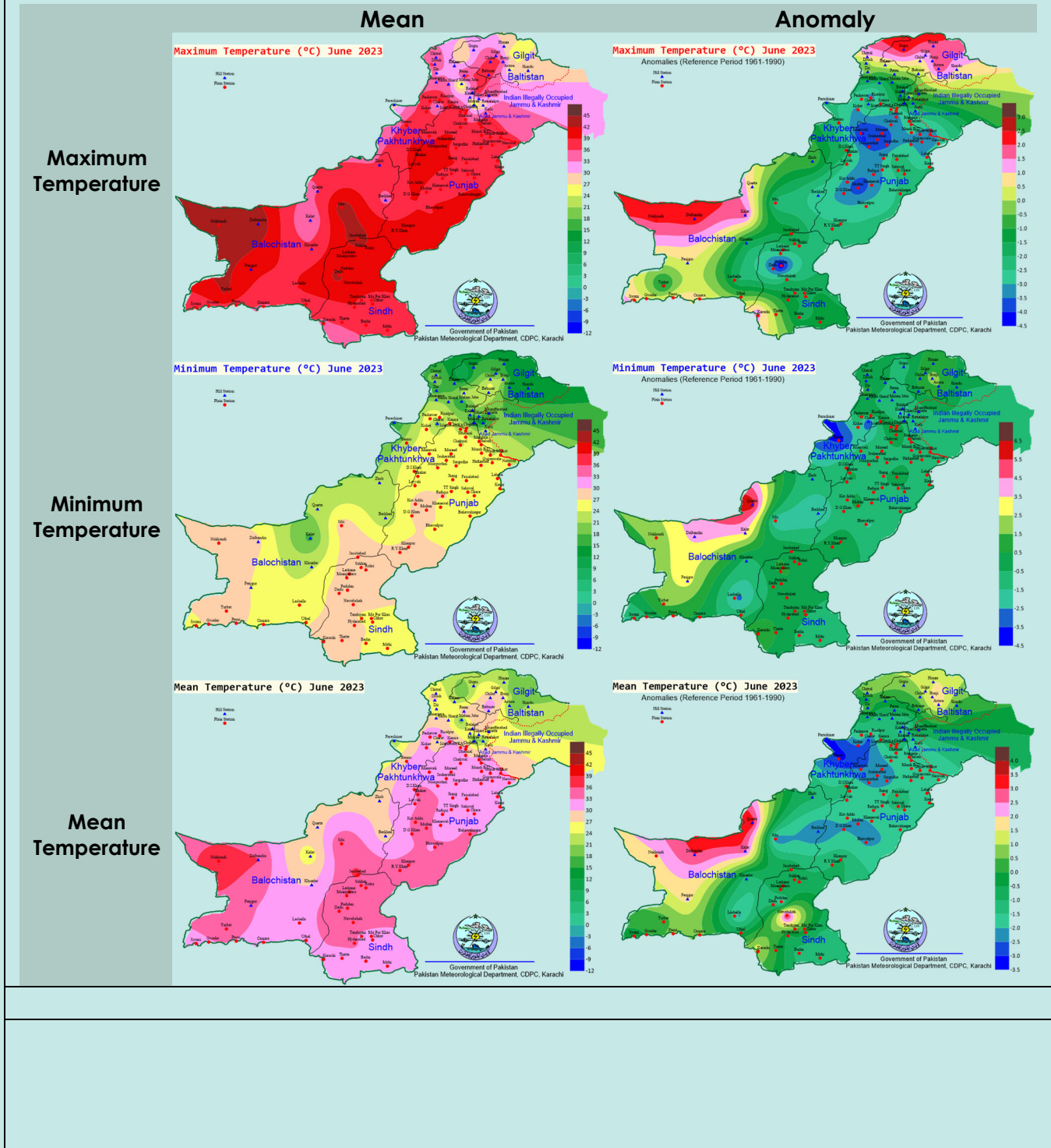
June 2023 Temperature maps

Table 6: June 2023 Monthly Averages & Normal

Station	Pressure (mb)		Temperature (°C)			Vapour (mb)	Precipitation	
	Station Level	Sea Level	Mean	Maximum	Minimum	Pressure	Total (mm)	Days
Drosh	846.1	1422.9	27.9	35.5	20.3	12.7	6.6	3
	846.7	1427.6	28.3	35.8	20.8	9.6	19.7	4.9
Peshawar	964.0	999.8	31.9	38.5	25.2	26.7	49.4	4
	956.5	995.4	33.0	40.2	25.4	20.0	12.1	4
Parachinar	825.5	1472.5	21.3	28.6	14.0	14.4	31.0	8
	821.8	1428.6	23.8	30.7	16.9	11.2	49.3	8.8
Rawalpindi	945.7	1000.8	30.1	35.7	24.4	21.0	174.0	9
	942.0	996.7	30.5	38.4	23.5	19.1	70.1	8.2
Sargodha	979.1	999.1	33.0	39.2	26.8	27.6	68.6	6
	977.0	995.7	34.2	41.6	26.8	22.9	33.4	6
Jhelum	973.6	999.3	31.5	37.9	25.0	27.9	190.1	9
	971.0	996.4	32.9	40.2	25.7	21.5	57.1	7.7
Sialkot	972.2	1000.3	30.5	36.5	24.4	27.2	199.1	9
	969.2	996.8	32.1	39.2	25.0	21.7	73.0	7.7
Zhob	852.3	1428.8	28.9	36.2	21.7	14.8	87.0	6
	850.0	1406.8	29.9	36.9	22.8	12.2	14.7	2.5
D.I.Khan	979.8	998.6	32.9	39.6	26.3	30.2	113.0	4
	976.9	995.7	33.7	41.1	26.3	23.6	22.2	3
Lahore	976.9	1000.4	31.9	37.3	26.5	26.7	291.1	10
	973.1	996.4	33.6	39.9	27.2	22.9	51.3	6.1
Quetta	836.4	1446.2	29.0	35.9	22.1	11.4	4.0	2
	834.3	1424.2	26.1	35.4	16.8	10.8	1.5	0.9
Multan	985.5	999.0	33.4	38.4	28.3	27.8	46.7	4
	982.5	995.8	35.4	42.2	28.6	23.7	15.1	2.4
Barkhan	883.1	1434.5	28.4	35.0	21.7	20.9	136.0	10
	881.4	1421.8	31.1	37.7	24.4	15.4	43.0	3.6
Nokkundi	922.3	993.8	37.0	44.8	29.1	6.1	0.0	0
	924.1	995.0	34.6	42.9	27.5	11.8	0.0	0
Dalbandin	907.4	1435.6	36.1	44.5	27.7	10.2	0.0	0
	907.0	1431.3	33.3	41.3	22.4	8.5	0.6	0.2
Jacobabad	992.6	998.7	36.5	43.1	29.8	30.1	22.0	1
	989.6	995.4	37.0	44.5	29.5	24.5	3.0	0.4
Khanpur	989.6	999.3	33.9	40.1	27.6	31.1	29.2	4
	986.2	995.9	34.8	42.7	27.0	24.9	3.4	0.8
Panjgur	894.6	1437.2	33.4	39.9	26.9	16.6	0.0	0
	896.5	1438.9	31.8	39.5	24.2	9.1	4.0	0.2
Khuzdar	870.0	1437.7	30.0	36.3	23.6	8.5	60.9	5
	866.5	1411.0	31.4	38.1	24.3	6.0	12.6	1.3
Sh. Benazirabad	995.5	998.8	34.7	41.3	28.1	31.8	12.0	3
	993.2	997.0	35.6	43.7	27.6	29.9	2.8	0.3
Jiwani	994.1	1000.4	30.4	35.3	25.4	33.0	0.0	0
	992.9	999.2	30.6	34.3	26.9	32.4	0.9	0.1
Pasni	999.9	1000.4	31.8	36.3	27.3	36.1	5.0	1
	998.3	999.0	30.0	35.2	26.8	32.1	0.4	0
Hyderabad	995.3	1000.1	33.5	38.9	28.1	29.7	8.6	2
	993.9	997.9	34.1	40.2	28.0	29.3	6.3	0.7
Chhor	999.6	1000.3	32.4	38.3	26.4	33.2	124.3	4
	997.3	997.9	33.6	40.3	26.9	29.1	18.4	1.2
Karachi	998.3	1000.9	32.6	36.0	29.3	33.6	4.0	1
	997.0	999.5	31.7	35.2	28.1	31.8	6.7	0.9

Note: The first row against each station contains the actual values while second row for normal values

Table 7: June 2023 extreme values

STATION	Mean Temperature (°C)				Temperature (°C)				Highest (mm & knots)			
	Highest	Date	Lowest	Date	Highest	Date	Lowest	Date	Rain	Date	Wind Speed	Date
Drosh	35.0	25	19.9	1	42.3	24	13.5	2	3.4	12	14	26*
Peshawar	37.7	23	20.8	1	44.0	22*	17.5	2	22.0	26	30	30
Parachinar	25.0	26*	16.7	2	33.0	26	9.0	2	13.0	1	8	3*
Rawalpindi	35.9	21	19.9	1	40.9	21	16.9	2	55.0	26	35	10*
Sargodha	38.3	23	21.3	1	44.5	22*	18.3	2	25.4	1	8	15*
Jhelum	36.9	22	21.7	1	42.5	18	16.0	2	67.0	26	12	28
Sialkot	34.7	23	23.7	1	41.1	10	17.6	2	47.0	26	14	10
Zhob	36.0	24	21.0	1	43.0	24	13.5	1	40.0	27	25	27
D.I.Khan	37.5	22	22.8	1	44.5	22	18.0	1	46.0	1	30	01
Lahore	37.5	23	24.7	1	41.6	24	19.4	2	161.8	26	55	26
Quetta	33.0	25	24.5	1	40.5	21*	17.5	1*	3.0	17	34	16
Multan	36.7	23	24.4	1	41.3	23	19.5	1	20.0	4	38	03
Barkhan	34.3	24	21.8	1	40.5	24	15.0	2*	45.0	16	6	27
Nokkundi	41.5	24	33.3	1	49.0	21	25.0	1	0.0	0	14	1*
Dalbandin	40.3	24	31.8	4	48.5	24	21.0	4	0.0	0	8	10*
Jacobabad	39.3	18*	29.3	1	46.0	19*	23.0	1	22.0	28	8	27
Khanpur	36.5	20	26.4	1	42.5	25*	20.2	1	11.2	4	20	3
Panjgur	35.0	9	30.8	1	42.0	8*	24.5	2	0.0	0	16	20
Khuzdar	30.8	13*	28.3	1	37.5	7*	21.5	1	20.3	26	8	19*
Sh.Benazirabad	36.3	9*	31.0	16	44.0	9	25.0	15	10.0	16	16	14*
Jiwani	33.0	7	29.3	18*	39.5	6	24.5	11*	0.0	0	16	22
Pasni	33.8	6	30.5	28	40.5	6	26.0	1	5.0	28	20	6
Hyderabad	35.4	12	28.3	16	42.2	3	25.5	16	4.6	16	28	20
Chhor	35.4	12	28.3	16	42.5	12	22.2	30	68.0	28	40	27
Karachi	35.3	12	31.4	15	40.5	12	27.5	16	4.0	16	20	13

* Means value occurred multiple times