Bangladesh Water Development Board

RAINFALL IN BANGLADESH
YEAR: 2017 & 2018.

December 2019

Surface Water Processing Branch
BWDB, 72 Green Road, Dhaka.

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SUMMARY OF RAINFALL IN BANGLADESH FOR THE YEAR 2017 & 2018.

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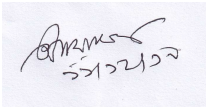

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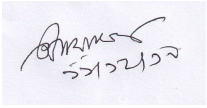
Preface

BWDB's Hydrology has now an operational network of Hydro-Geological Stations covering Surface Water, Ground water, River Morphology and Processing and Flood Forecasting Circle. All these activities are organized by three Circles and one Directorate under Chief Engineer, Hydrology, BWDB, Dhaka. Processing and Flood Forecasting Circle, BWDB, Dhaka is one of those three circles. This circle has five Divisions headed by four Executive Engineers & one Deputy Director.

Surface Water Processing Branch is one of the branch/Division under Processing and Flood Forecasting Circle which is receiving Surface water related data from different Hydrological field offices. After getting the hard copy of data, this branch is responsible for data entry & archiving the all soft data in the data base server.

Quality control of data, validation and archiving the data along with additional Secondary information for different user groups is vital responsibility of the Processing Branch of Hydrology. Simultaneously it has been felt to conduct research work to assess some trend analysis on the changes of the Surface Water Hydrology of Bangladesh. As such the Surface Water Processing Branch has taken initiative in this context which will continue in future.

This report "Summary of Rainfall in Bangladesh for the preiod 2017 & 2018" is an attempt to find out the Quantity of Rainfall in Bangladesh for last two year's rainfall.



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Executive Summary

The principal purpose of this report is to find out variation of rainfall volume in various districts in Bangladesh for the period of 2017 & 2018. It has been found that on maximum rainfall occurs during year 2017 at Sylhet district (7377.30mm) & Cox's Bazar district (5142.85mm) during year 2018. Lowest rainfall was observed during 2017 at Chapai Nawabganj district (1328.53mm) & Kustia District (911.45mm) during the year 2018.

The average annual rainfall varies from approximately1329mm to 7378mm in 2017 and 911mm to 5143mm in 2018. The average annual rainfall in 2017 is 2656mm and in 2018 it is 1796mm. Total rainfall volume is 409533.58 Mm^3 and 272274.64 Mm^3 in 2017 & 2018 respectively.

The seasonal variation of total rainfall varies from 64% to 66% in monsoon, in Post monsoon 5% to 11%, in Winter 1% to 2% and in summer 22% to 29% of the total annual rainfall.

Acronyms

BWDB	Bangladesh Water Development Board
GW	Ground Water
MAFt	Million Acre Feet
Mm^3	Million Meter Cube.
PFFC	Processing and Flood Forecasting Circle
PWD	Public Works Department
RMPB	River Morphology Processing Branch
SW	Surface Water
SWPB	Surface Water Processing Branch
TWL	Tidal Water Level
WARPO	Water Resource Planning Organization
mm	Millimetre.

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Introduction

1.1 Background

Surface Water Processing Branch do entry, process & send data to the data base server after receiving all data collected by field hydrological divisions. After receiving data from field offices check validation and published report is also a major activity of processing branch. Due to manpower shortage, there is a long gap to publish such type of report. In this study we analyzed rainfall data for the year 2017 & 2018 and findings are discussed in this report.

1.2 Required Data

Water occurs on the earth in all its three stages, viz, liquid, solid, & gaseous and in various degree of motion. Most of the water in our country comes through the cross boundary rivers and another major portion of water comes from rainfall. In this study Rainfall data for the year 2017 & 2018 are analysed.

1.3 Sources of Data

Field offices under Chief Engineer, Hydrology of Bangladesh Water Development Board (BWDB) collect, process and store the Hydrological Data of Bangladesh. BWDB maintains a strong hydrologic network throughout the country for the collection of different hydrological data. Details of these networks are shown in the flowing table:

SL	Database	Type Code	Data Type Name	Remarks
1	SW	NTWL	Non-Tidal SW Level	
2	SW	TDWL	Tidal SW Level	
3	SW	NTQ	Non Tidal Observed Discharge	
4	SW	TDQ	Tidal Observed Discharge	
5	SW	SWQ	Surface Water Quality	
6	SW	SA	Salinity	
7	RM	CS	River Cross Section	
8	RM	SED	Sediment	
9	CL	RF	Rainfall	
10	CL	CL	Climatology	
11	CL	EV	Evaporation	
12	GW	GT	Weekly GW Table	
13	GW	GT Daily	Daily GW Table	
14	GW	GQ	GW Quality	

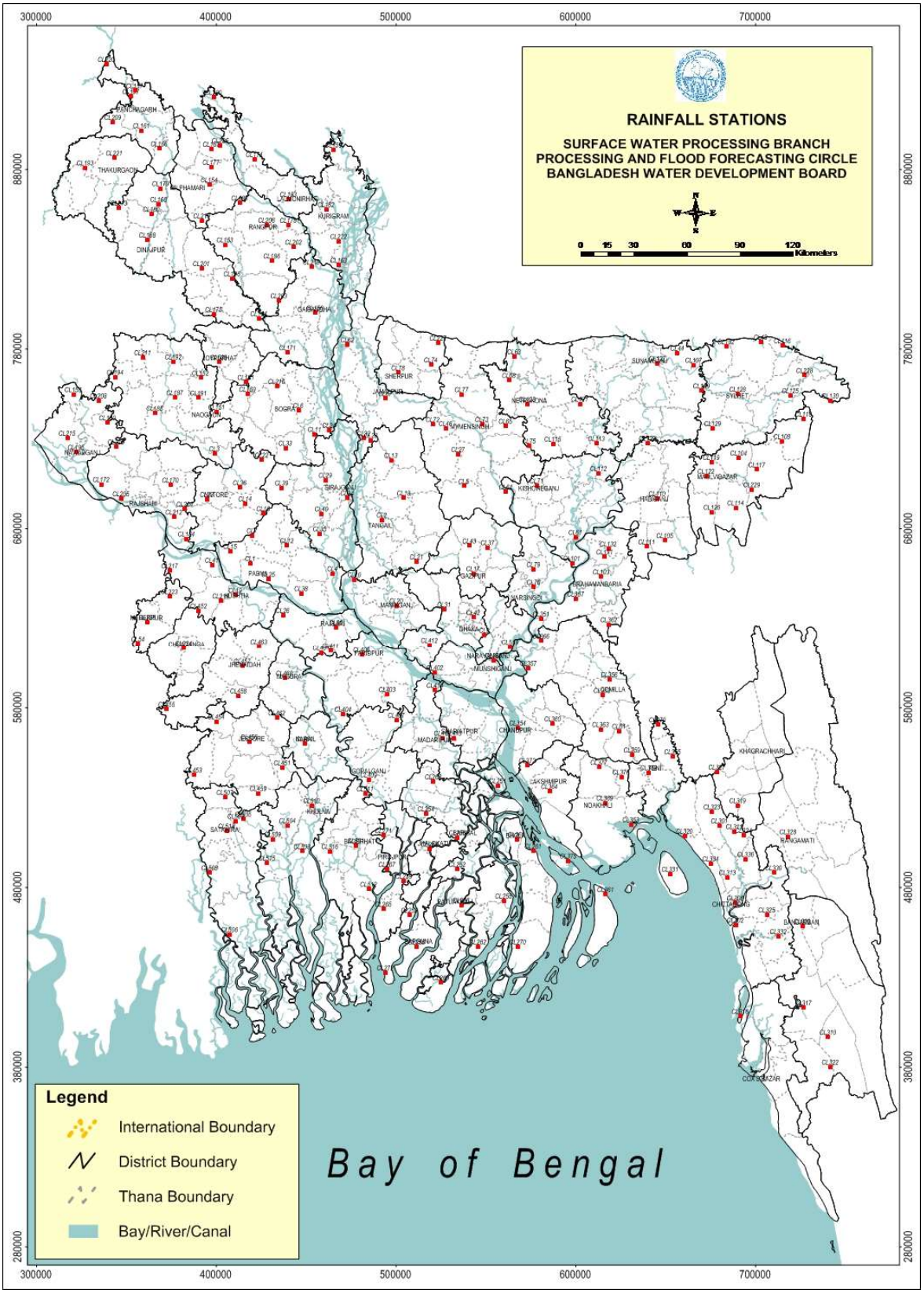
Source: BWDB Database

Table 1.1: Hydrological Network of BWDB

Rainfall and Evaporation data are collected on daily basis. Data collected from the fields are processed and stored in the database maintained by Processing Circle of BWDB. All the data used in this study are extracted from central database of BWDB.

1.4 Rainfall Stations

In this study there are total 243 rainfall stations situated in 64 districts of Bangladesh, which are shown in the flowing map (***Station name & ID shown in Appendix***):



Source : BWDB Database

Figure 1.1 : Map showing BWDB's Rainfall Stations.

Chapter 2
Estimation of Rainfall

2.1 Rainfall of Bangladesh

Bangladesh extends from N20°34' to N26°38' latitude and from E88°01' to E92°41' longitude which lies in the tropical monsoon region and the climate is characterised by high temperature, heavy rainfall, often excessive humidity, and fairly marked seasonal variations. Bangladesh enjoys generally a sub-tropical monsoon climate. While there are six seasons in a year, three namely, winter, summer and monsoon are prominent. Winter, which is quite pleasant, begins in November and ends in February. The summer starts from March and extended up to May. Monsoon starts in June and stays up to September.

In winter there is not usually much fluctuation in temperature which ranges from minimum of 5^0-12^0 Celsius to maximum of 22^0-31^0 Celsius. The maximum temperature recorded in summer season usually is 36^0 Celsius, However in some places this occasionally raises up to 41^0 Celsius or more. Monsoon period accounts for 80% of the total annual rainfall. The average annual rainfall varies from 2100 to 5100 millimetre. The maximum rainfall is recorded in the coastal areas of Chittagong and northern part of Sylhet district, while the minimum is observed in the western and northern parts of the country. Cyclonic storms with wind velocity of more than 120 km/hr occur with the advent of the monsoon season. These are particularly severe just before and after the monsoon, in May and October; winds of over 160 km/hr velocity, heavy downs pour and tidal surges of over 6 m above the normal level have brought devastation to life and property more than once in the recent past. Maximum evaporation in Bangladesh occurs during the summer (March-May), the highest evaporation generally occurs during April. The mean monthly evaporation varies from 51 mm in winter to 183 mm in summer. The rate of evaporation in the eastern part is generally lower than in the western and north-western parts. Humidity ranges between 60% in the dry season and 98% during the monsoon.

South-eastern zone (A): It comprises the Chittagong sub-region and a strip of land extending from southwest Sundarbans to the south of Comilla. The hills over 300m in height have south-eastern zone climate. The rest of the area has a small range of temperature, rarely goes over a mean of 32°C and below a mean of 13°C. Rainfall is heavy, usually over 2,540 mm. In winter dew fall is heavy.

North-eastern zone (B): This zone includes most of eastern and southern part of Sylhet division and a wedge shaped strip south of the Meghalaya Plateau.

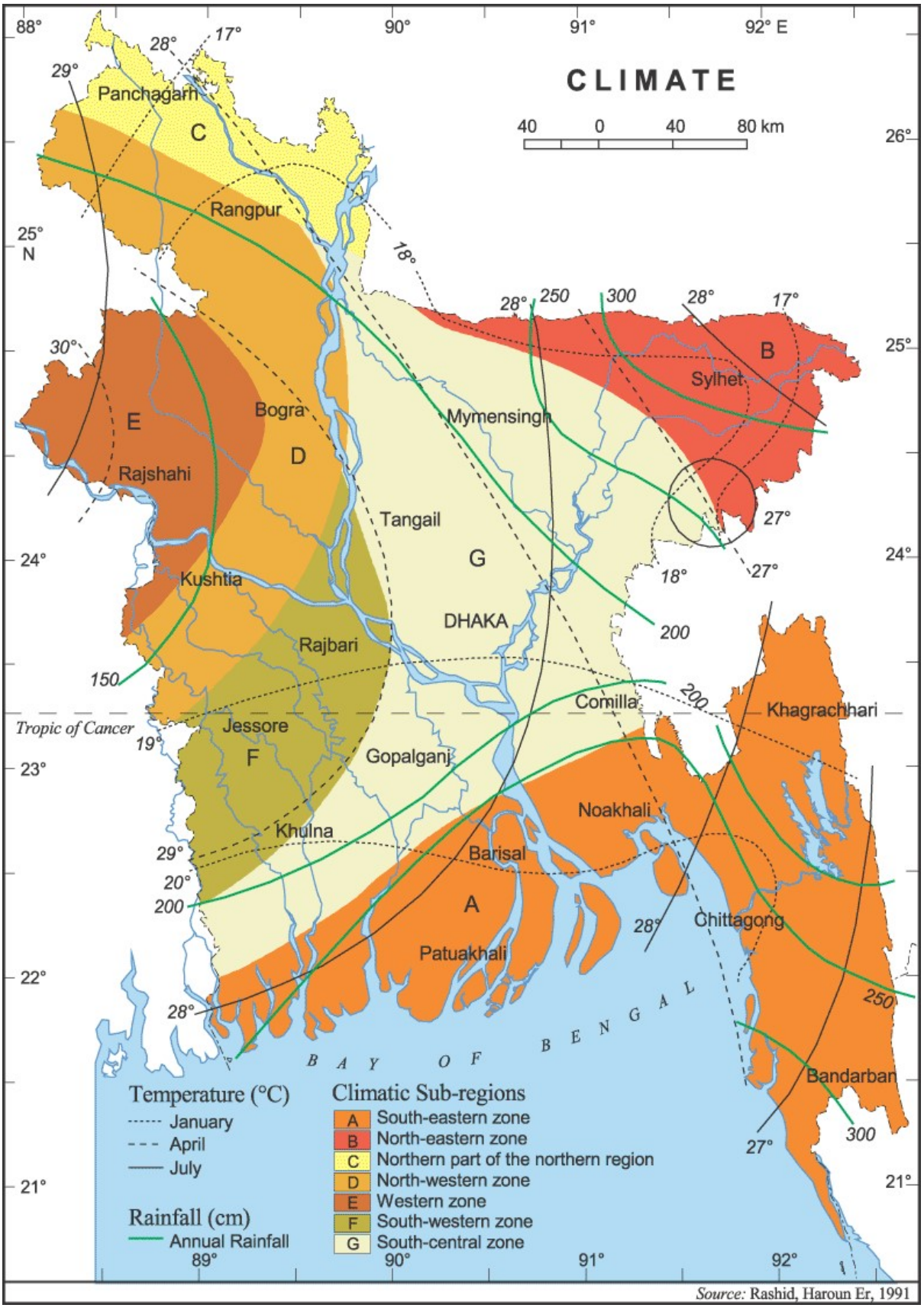


Figure 2.1: Average Climate of Bangladesh

Here, mean maximum temperature is rarely above 32°C but mean minimum is 10°C and below. Average humidity is even more than in south-eastern zone.

In this zone winter rain is appreciable. Fog is very common in winter. This is the cloudiest part of Bangladesh. The higher hills and mountains of the Chittagong sub-region can also be classified under this zone.

Northern part of the northern region (C): This is an area of extremes. In summer the mean maximum temperature is well above 32°C whereas in winter the mean minimum is below 10°C. The summer is dry, with a scorching westerly wind, but the rainy season is very wet, with 2000mm to 3000 mm of rainfall.

North-western (D): Except that the extremes are less and the rainfall is lower, this zone is similar to northern part of the northern region. The lower rainfall makes this area both atmospherically and ped logically drier.

Western zone (E): It comprises greater Rajshahi district and parts of adjacent districts. This is the driest area in Bangladesh with rainfall generally below 1,500 mm and summer humidity less than 50%. In summer, it is the hottest and driest of all climatic zones. Mean summer maximum temperature is over 35°C.

South-western zone (F): Here the extremes of the zones to the north are somewhat tempered. Rainfall is varies from 1,500 mm to 1,800 mm. Mean summer maximum temperature is below 35°C. Dew-fall is heavier than in Western zone.

South-central zone (G): In this zone rainfall is abundant, being above 1,900 mm. The range of temperature is, as can be expected, much less than to the west, but somewhat more than in South-eastern zone. This is a transitory zone between the South-eastern, North-western and South-western zones and most of the severe hail storms, nor'westers and tornadoes are recorded in this area.

2.2 Rainfall Volume and Statistics

Monthly Rainfall Volume has been estimated all the available rainfall data in BWDB for the year of 2017 & 2018. The rainfall volume has been calculated as the product of annual average rainfall and the district area, then presented it in Million m^3. It has been found that on average maximum rainfall occurs during the year 2017 at Sylhet & Cox's Bazar district and during the year 2018 at Cox's Bazar & Sunamganj District.

Lowest rainfall was observed during the year 2017 at Chapai Nawabganj & Kustia District and year 2018 at Kustia & Gaibandha District. Total rainfall volume during 2017 & 2018 has been presented in the flowing table.

Table 2.1: Rainfall Volume in 64 Districts of Bangladesh for the year 2017 & 2018.

Sl.	District	District Area (km^2)	Annual avg. RL'2017 (mm)	Annual avg. RL'2018 (mm)	Rainfall Volume'2017 (Million m^3)	Rainfall Volume'2018 (Million m^3)	Remarks
1	Bagerhat	3960	2369	1612	9380.94	6381.74	
2	Bandarban	4480	4322	2925	19360.69	13102.06	
3	Barguna	1832	3024	1935	5539.78	3544.00	
4	Barisal	2790	2174	1941	6066.65	5415.81	
5	Bhola	3403	3902	2192	13279.64	7458.92	
6	Bogra	2920	1884	1410	5500.62	4116.25	
7	Brahmanbaria	1927	2446	1650	4714.05	3178.84	
8	Chandpur	1704	2725	1810	4643.31	3084.15	
9	Chittagong	5285	3662	2731	19353.28	14434.27	
10	Chuadanga	1158	1672	1246	1936.48	1442.68	
11	Comilla	3084	3294	1918	10157.55	5916.39	
12	Cox's Bazar	2492	6378	5143	15893.37	12815.98	
13	Dhaka	1464	2489	1595	3643.97	2334.35	
14	Dinajpur	3439	1898	1338	6525.74	4602.46	
15	Faridpur	2072	1934	1263	4006.73	2616.68	
16	Feni	1125	3025	2055	3402.56	2311.35	
17	Gaibandha	2179	1910	1037	4162.91	2260.64	
18	Gazipur	1741	2317	1474	4034.13	2565.42	
19	Gopalganj	1490	2300	1545	3427.00	2301.31	
20	Habiganj	2636	2959	2135	7800.58	5628.45	
21	Jamalpur	2032	1817	1174	3691.20	2385.77	
22	Jessore	2567	2030	1530	5211.52	3927.90	
23	Jhalokathi	758	2838	1849	2151.20	1401.54	
24	Jhenaidah	1961	1986	1374	3894.31	2694.95	
25	Joypurhat	965	1762	1576	1700.72	1520.74	
26	Khagrachhari	2699	3202	2349	8641.48	6340.22	
27	Khulna	4317	2473	1423	10674.39	6141.36	
28	Kishoreganj	2689	2347	1289	6311.33	3467.04	
29	Kurigram	2296	2201	1425	5054.41	3272.26	
30	Kushtia	1620	1489	911	2412.34	1476.55	
31	Lakshmipur	1456	4004	2753	5829.19	4008.42	
32	Lalmonirhat	1242	1835	1476	2279.32	1833.65	
33	Madaripur	1145	2143	1659	2453.74	1899.21	
34	Magura	1049	1666	1301	1747.76	1364.33	
35	Manikganj	1378	2115	1558	2914.88	2146.58	
36	Meherpur	716	2421	1857	1733.34	1329.42	
37	Moulvi Bazar	2799	2779	1641	7778.42	4593.16	
38	Munshiganj	955	4239	2165	4048.25	2067.85	
39	Mymensingh	4362	2473	1592	10785.56	6945.92	
40	Naogaon	3640	1496	1132	5446.67	4121.12	

Sl.	District	District Area (km^2)	Annual avg. RL'2017 (mm)	Annual avg. RL'2018 (mm)	Rainfall Volume'2017 (Million m^3)	Rainfall Volume'2018 (Million m^3)	Remarks
41	Narail	917	1576	1123	1445.19	1029.79	
42	Narayanganj	759	2104	1846	1596.94	1401.11	
43	Narsingdi	1141	2411	1620	2750.51	1848.71	
44	Natore	1895	2180	1360	4131.67	2578.03	
45	Nawabganj	1702	1329	1158	2261.15	1970.70	
46	Netrokona	2810	3040	2588	8541.89	7271.94	
47	Nilphamari	1642	2467	1943	4051.42	3190.57	
48	Noakhali	3601	4107	2456	14788.33	8844.34	
49	Pabna	2371	2043	1112	4844.11	2637.47	
50	Panchagarh	1404	2433	2081	3416.61	2922.20	
51	Patuakhali	3205	2541	2025	8144.39	6488.76	
52	Pirojpur	1308	2053	1618	2684.93	2116.01	
53	Rajbari	1119	4837	2963	5412.49	3315.71	
54	Rajshahi	2407	1516	1211	3648.13	2915.72	
55	Rangamati	6116	1968	1328	12033.23	8118.99	
56	Rangpur	2308	2880	1593	6646.29	3676.44	
57	Satkhira	3858	1767	1255	6817.99	4839.86	
58	Shariatpur	1182	2586	2293	3056.65	2710.33	
59	Sherpur	1364	3030	1814	4132.87	2474.21	
60	Sirajganj	2498	2803	1063	7002.44	2654.72	
61	Sunamganj	3670	5413	3292	19864.24	12079.87	
62	Sylhet	3489	7377	3244	25739.40	11316.57	
63	Tangail	3414	1590	1290	5426.98	4403.63	
64	Thakurgaon	1809	1938	1669	3505.93	3019.22	
	Total =	**147816 (km^2)**			**409533.58 Million m^3**	**272274.64 Million m^3**	

2.3 Rainfall Volume for the year 2017 & 2018.

Annual average Rainfall in the country during the year 2017 is 2656 mm, which is equivalent to a depth of 2.77m. Annual average Rainfall in the country during the year 2018 is 1796 mm, which is equivalent to a depth of 1.84m.

Chapter 3
Seasonal Rainfall

Hydrological parameters show different values in different season. Specially rainfall volume changes abruptly in different seasons in Bangladesh. For calculating Seasonal variation of the year 2017 & 2018, we consider the Hydrological calendar of BWDB which are as bellows :

Summer - March, April and May

Monsoon - June, July, August and September.

Post-Monsoon - October and November.

Winter - December, January and February.

3.1 Seasonal Variation of rainfall

The calculated values of Seasonal & annual average rainfall (mm) distribution of 64 Districts and monthly & annual total rainfall (mm) in the year 2017 & 2018 are shown in the following Table : 3.1 & 3.2.

Table:3.1:Average Seasonal variation of Rainfall during 2017 (District wise)

SL	District	Summer (mm)	Monsoon (mm)	Post Monsoon (mm)	Winter (mm)	Annual Average (mm)
1	Bagerhat	418	1566	312	74	2370
2	Bandarban	846	3219	233	24	4322
3	Barguna	290	2210	476	48	3024
4	Barisal	382	1330	390	72	2174
5	Bhola	696	2780	373	53	3902
6	Bogra	457	1158	260	8	1883
7	Brahmanbar	524	1533	308	81	2446
8	Chandpur	655	1730	228	112	2725
9	Chittagong	641	2806	191	23	3661
10	Chuadanga	315	999	284	74	1672
11	Comilla	825	1966	381	121	3293
12	Cox's Bazar	879	5052	402	45	6378
13	Dhaka	515	1615	320	40	2490
14	Dinajpur	483	1274	135	5	1897
15	Faridpur	355	1233	320	26	1934
16	Feni	716	1854	351	104	3025
17	Gaibandha	541	1121	248	0	1910
18	Gazipur	364	1558	335	60	2317

SL	District	Summer (mm)	Monsoon (mm)	Post Monsoon (mm)	Winter (mm)	Annual Average (mm)
19	Gopalganj	381	1563	343	14	2301
20	Habiganj	1040	1517	298	104	2959
21	Jamalpur	558	1005	243	12	1818
22	Jessore	318	1327	335	51	2031
23	Jhalokathi	484	1858	400	96	2838
24	Jhenaidah	302	1366	277	41	1986
25	Joypurhat	447	1078	233	5	1763
26	Khagrachha	535	2482	152	34	3203
27	Khulna	536	1378	525	35	2474
28	Kishoreganj	600	1412	269	66	2347
29	Kurigram	792	1195	215	0	2202
30	Kushtia	285	994	201	10	1490
31	Lakshmipur	852	2676	380	96	4004
32	Lalmonirhat	542	1129	162	2	1835
33	Madaripur	474	1218	411	40	2143
34	Magura	254	1133	263	17	1667
35	Manikganj	442	1307	323	44	2116
36	Meherpur	453	1673	251	44	2421
37	Moulvi	977	1430	279	94	2780
38	Munshiganj	1562	2321	339	17	4239
39	Mymensing	586	1587	267	33	2473
40	Naogaon	339	950	198	9	1496
41	Narail	272	1088	189	27	1576
42	Narayanganj	525	1232	292	55	2104
43	Narsingdi	631	1486	272	21	2410
44	Natore	460	1430	261	29	2180
45	Nawabganj	206	952	158	13	1329
46	Netrokona	782	2037	201	20	3040
47	Nilphamari	471	1852	144	0	2467
48	Noakhali	858	2777	373	99	4107
49	Pabna	418	1285	300	39	2042
50	Panchagarh	473	1814	145	2	2434
51	Patuakhali	385	1657	442	57	2541
52	Pirojpur	303	1303	385	62	2053
53	Rajbari	1404	3057	375	0	4836
54	Rajshahi	276	1018	201	20	1515
55	Rangamati	339	1470	124	35	1968

SL	District	Summer (mm)	Monsoon (mm)	Post Monsoon (mm)	Winter (mm)	Annual Average (mm)
56	Rangpur	938	1688	212	42	2880
57	Satkhira	169	1249	312	38	1768
58	Shariatpur	613	1595	336	41	2585
59	Sherpur	885	1830	294	22	3031
60	Sirajganj	720	1748	323	12	2803
61	Sunamganj	1428	3604	326	55	5413
62	Sylhet	2282	4433	457	206	7378
63	Tangail	355	973	237	25	1590
64	Thakurgaon	207	1605	123	2	1937
Annual Average		**595**	**1731**	**287**	**43**	**2656**

Table:3.2:Average Seasonal variation of Rainfall during 2018 (District wise)

SL	District	Summer (mm)	Monsoon (mm)	Post Monsoon (mm)	Winter (mm)	Annual Average (mm)
1	Bagerhat	315	1203	93	1	1612
2	Bandarban	305	2299	307	14	2925
3	Barguna	358	1397	179	0	1935
4	Barisal	379	1437	122	3	1941
5	Bhola	416	1690	84	1	2192
6	Bogra	464	858	61	27	1410
7	Brahmanbar	709	845	64	31	1650
8	Chandpur	690	1035	79	7	1810
9	Chittagong	442	2039	238	11	2731
10	Chuadanga	304	820	82	40	1246
11	Comilla	787	1044	70	18	1918
12	Cox's Bazar	611	3722	788	21	5143
13	Dhaka	664	850	54	27	1595
14	Dinajpur	368	923	34	13	1338
15	Faridpur	468	715	70	10	1263
16	Feni	616	1348	87	3	2055
17	Gaibandha	351	672	12	2	1037
18	Gazipur	505	788	148	33	1474
19	Gopalganj	617	904	21	3	1545
20	Habiganj	931	1066	81	58	2135

SL	District	Summer (mm)	Monsoon (mm)	Post Monsoon (mm)	Winter (mm)	Annual Average (mm)
21	Jamalpur	529	583	42	20	1174
22	Jessore	361	1103	60	7	1530
23	Jhalokathi	495	1146	192	16	1849
24	Jhenaidah	360	918	67	29	1374
25	Joypurhat	485	1046	28	17	1576
26	Khagrachha	698	1565	82	4	2349
27	Khulna	297	1075	50	0	1423
28	Kishoreganj	606	589	71	23	1289
29	Kurigram	525	742	153	4	1425
30	Kushtia	105	596	177	34	911
31	Lakshmipur	643	1986	125	0	2753
32	Lalmonirhat	324	1142	6	5	1476
33	Madaripur	541	1056	56	7	1659
34	Magura	457	770	64	9	1301
35	Manikganj	623	867	55	13	1558
36	Meherpur	451	1261	122	23	1857
37	Moulvi	772	671	125	74	1641
38	Munshiganj	830	1218	112	5	2165
39	Mymensing	636	872	70	15	1592
40	Naogaon	357	714	35	27	1132
41	Narail	321	765	37	0	1123
42	Narayanganj	786	961	86	13	1846
43	Narsingdi	761	667	159	34	1620
44	Natore	479	754	72	55	1360
45	Nawabganj	290	770	69	29	1158
46	Netrokona	739	1708	125	15	2588
47	Nilphamari	369	1556	15	4	1943
48	Noakhali	586	1759	107	5	2456
49	Pabna	365	602	114	32	1112
50	Panchagarh	442	1629	7	3	2081
51	Patuakhali	361	1483	180	0	2025
52	Pirojpur	360	1130	128	1	1618
53	Rajbari	908	1764	215	76	2963
54	Rajshahi	337	751	95	30	1211
55	Rangamati	190	1053	85	0	1328
56	Rangpur	564	954	56	20	1593
57	Satkhira	250	909	93	4	1255

SL	District	Summer (mm)	Monsoon (mm)	Post Monsoon (mm)	Winter (mm)	Annual Average (mm)
58	Shariatpur	803	1295	165	31	2293
59	Sherpur	740	991	61	23	1814
60	Sirajganj	386	549	86	42	1063
61	Sunamganj	728	2457	93	14	3292
62	Sylhet	863	2158	179	45	3244
63	Tangail	594	606	49	42	1290
64	Thakurgaon	377	1267	16	9	1669
Annual Average		**515**	**1158**	**104**	**18**	**1796**

Table: 3.2: Average Seasonal variation of Rainfall during 2018 (District wise)

Chapter 4
Findings and Discussions

4.1 Summary of Rainfall Resources :

From the observed data of all 243 rainfall stations all over the Bangladesh it is found that minimum monthly rainfall occurred is 0 mm most of the days in January, February and a few days in month of November & December in 2017. Also minimum monthly rainfall occurred is 0 mm most of the days in January & February and a few days in month of March, November & December in 2018.

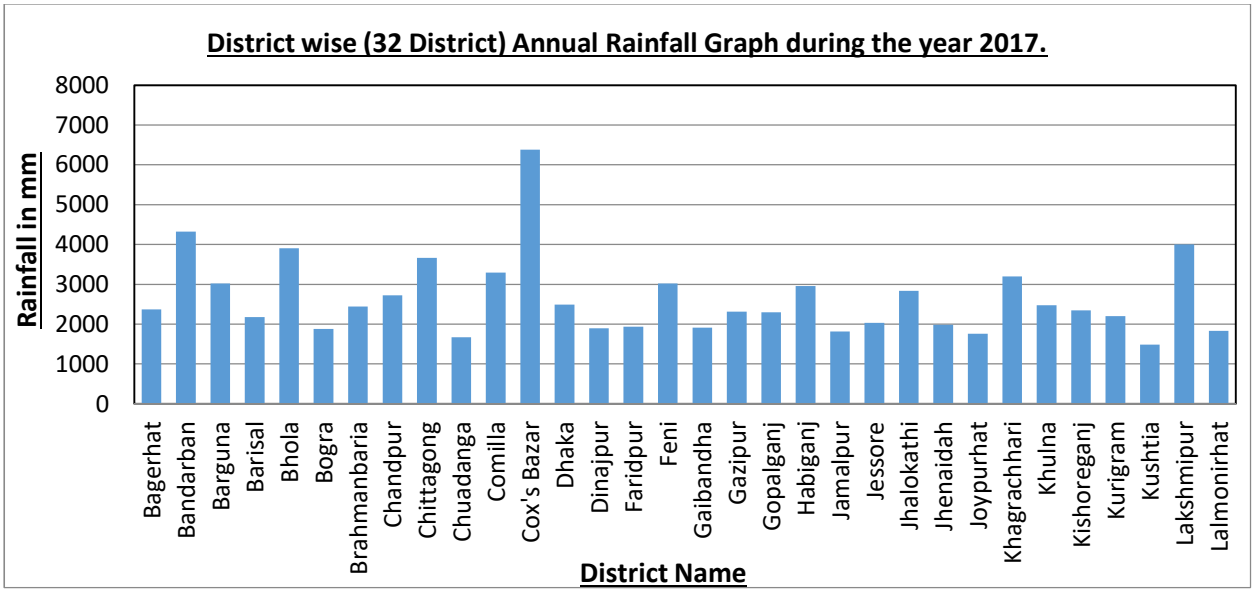


Figure 4.1a: District wise annual rainfall of 2017

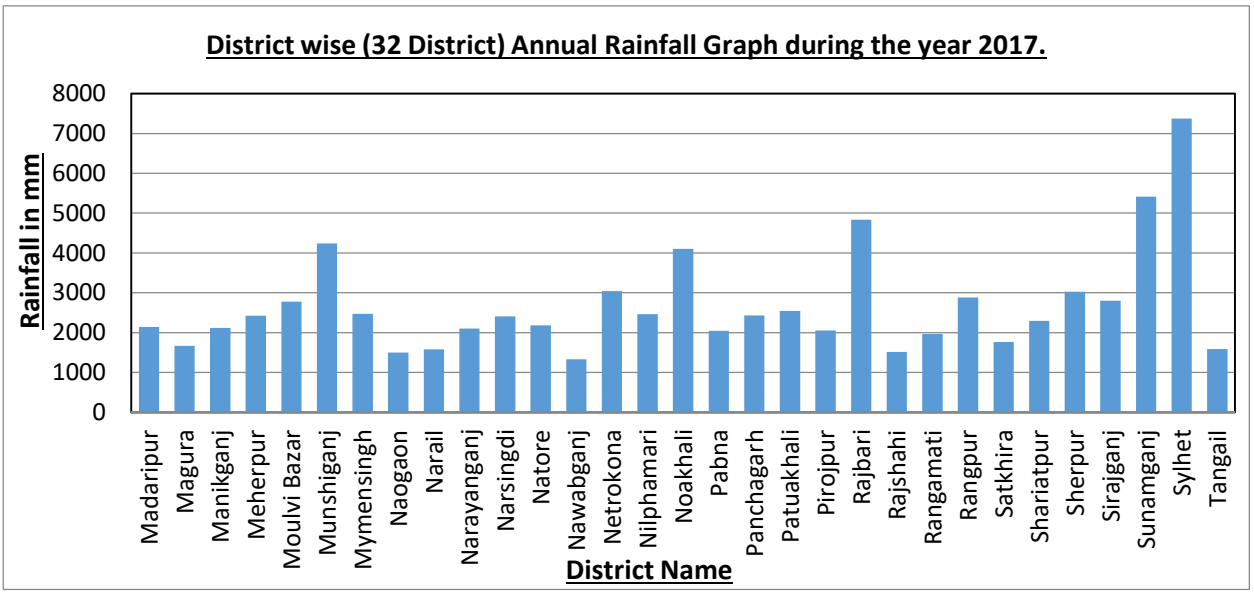


Figure 4.1b: District wise annual rainfall of 2017

The Maximum monthly rainfall occurred is 2683mm (Companygonj Bholagonj, Sylhet, CL102) in August,17 and 1743.3mm (Kutudia, Coxbazr, CL316) in Jun,18 respectively. The minimum yearly total rainfall is 442.40mm (Raigonj, Sirajgong, CL29) & 24.6 mm (Sujanagr, Pabna, CL38) in 2017& 2018 respectively. The Maximum yearly rainfall is 10696mm (Companygonj Bholagonj, Sylhet, CL102) & 5281.6mm (Kutudia, Coxbazr, CL316) in 2017& 2018 respectively.

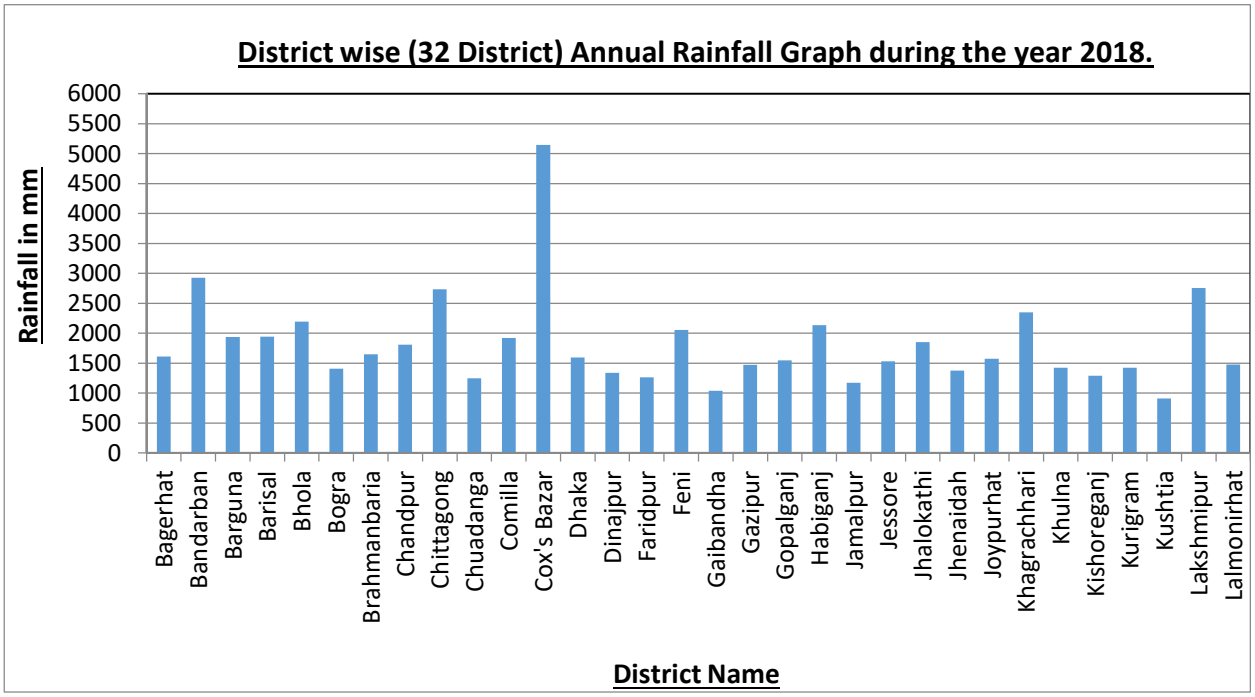


Figure 4.2a: District wise annual rainfall of 2018

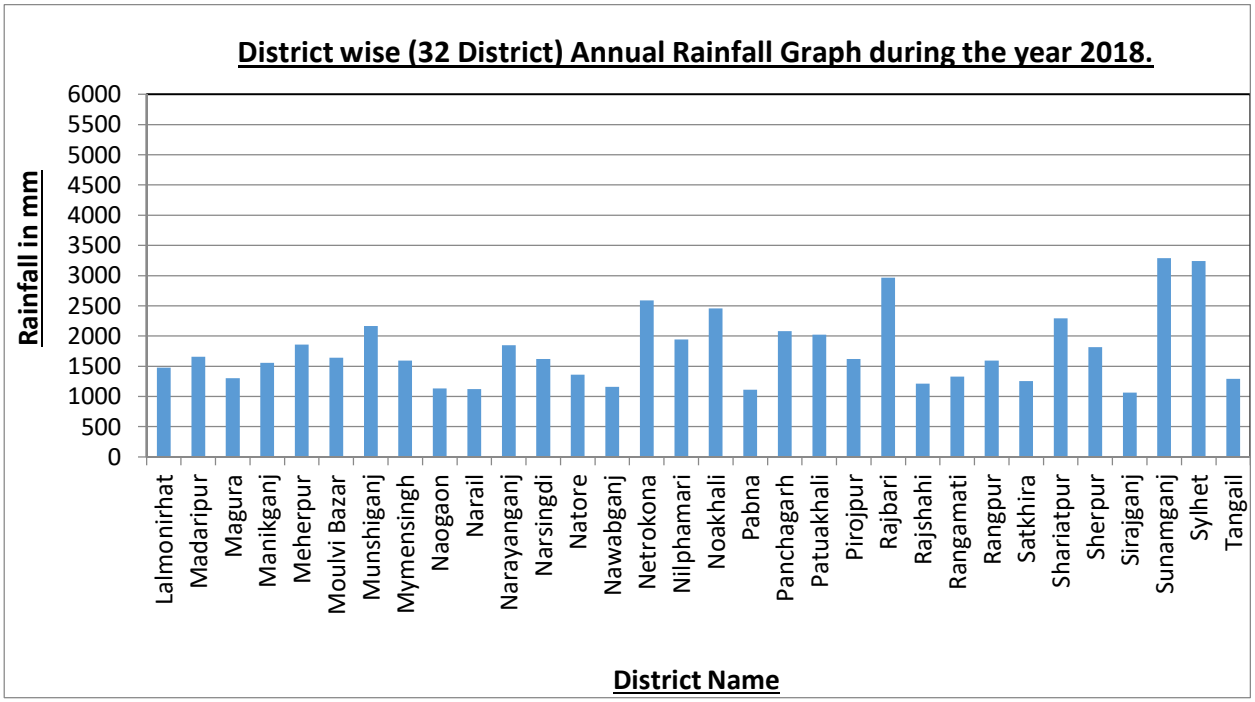


Figure 4.2b: District wise annual rainfall of 2018

After analysis of observed data it is found that Maximum yearly rainfall occurred is 7377.30mm (Sylhet district) and minimum yearly rainfall is 1328.53mm (Nawangonj district) in 2017. The Maximum yearly rainfall is 5142.85mm (Cox bazar district) and minimum yearly rainfall is 911.45mm (Kustia district) in 2018.

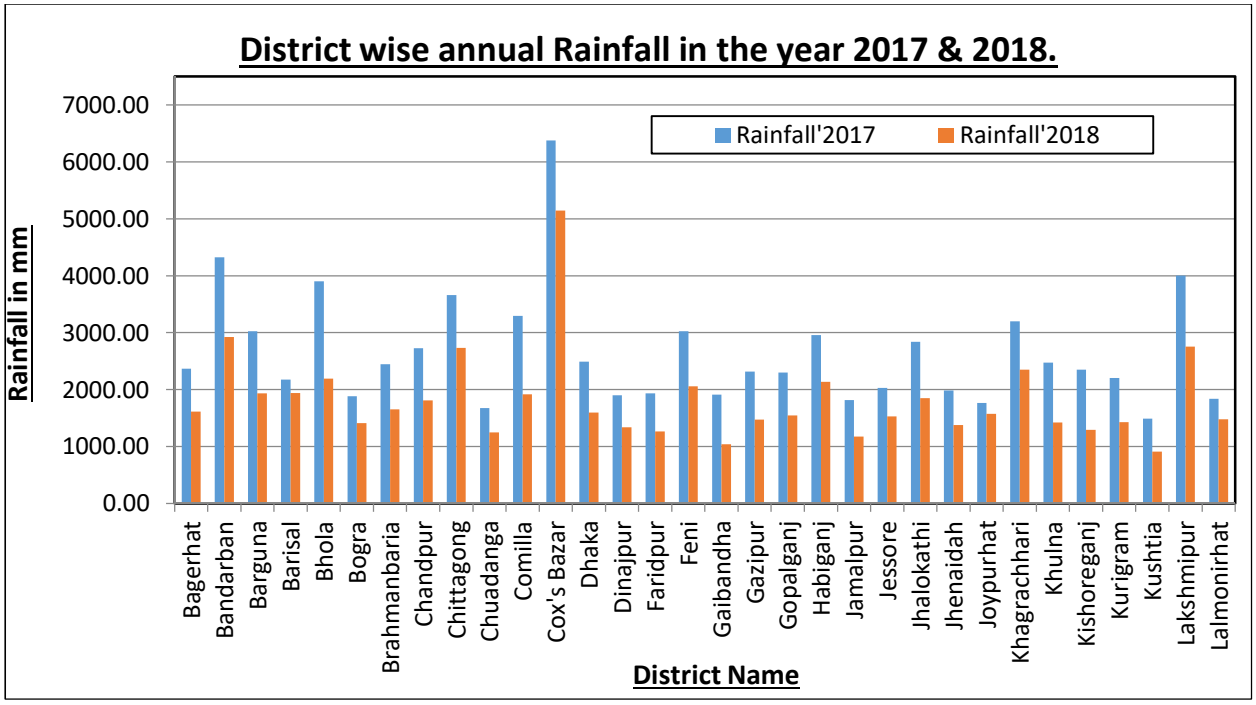


Figure 4.3a: District wise annual rainfall of 2017 and 2018

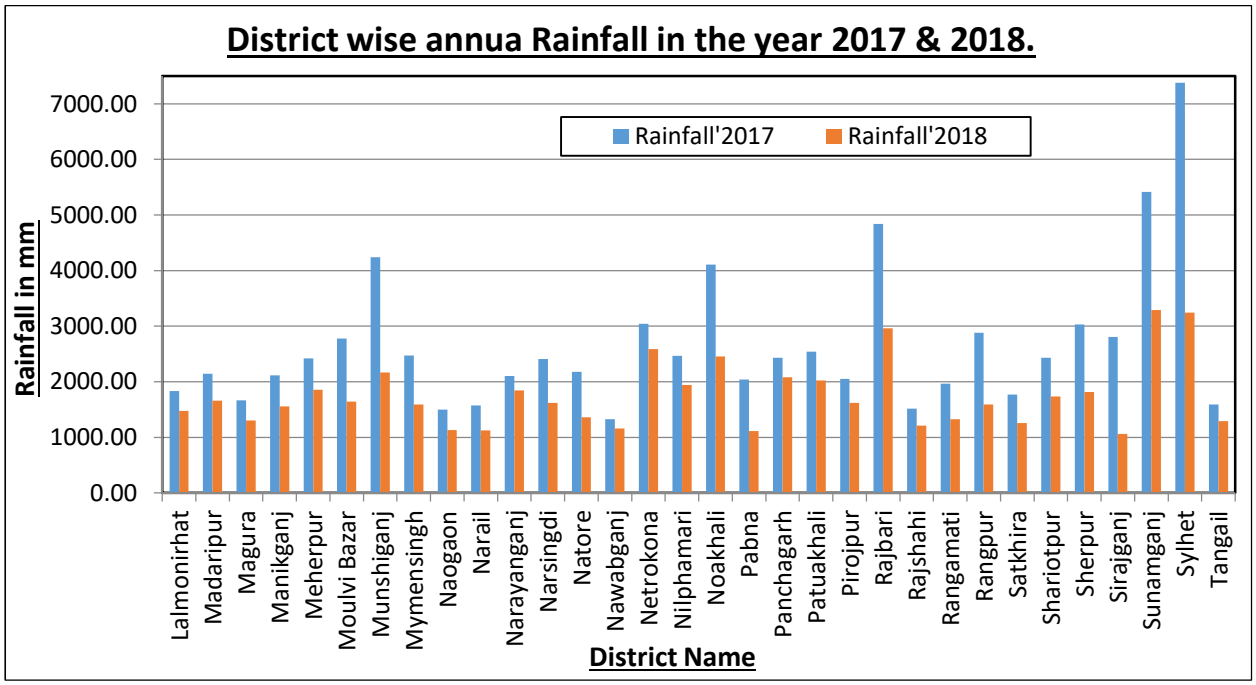


Figure 4.3b: District wise annual rainfall of 2017 and 2018

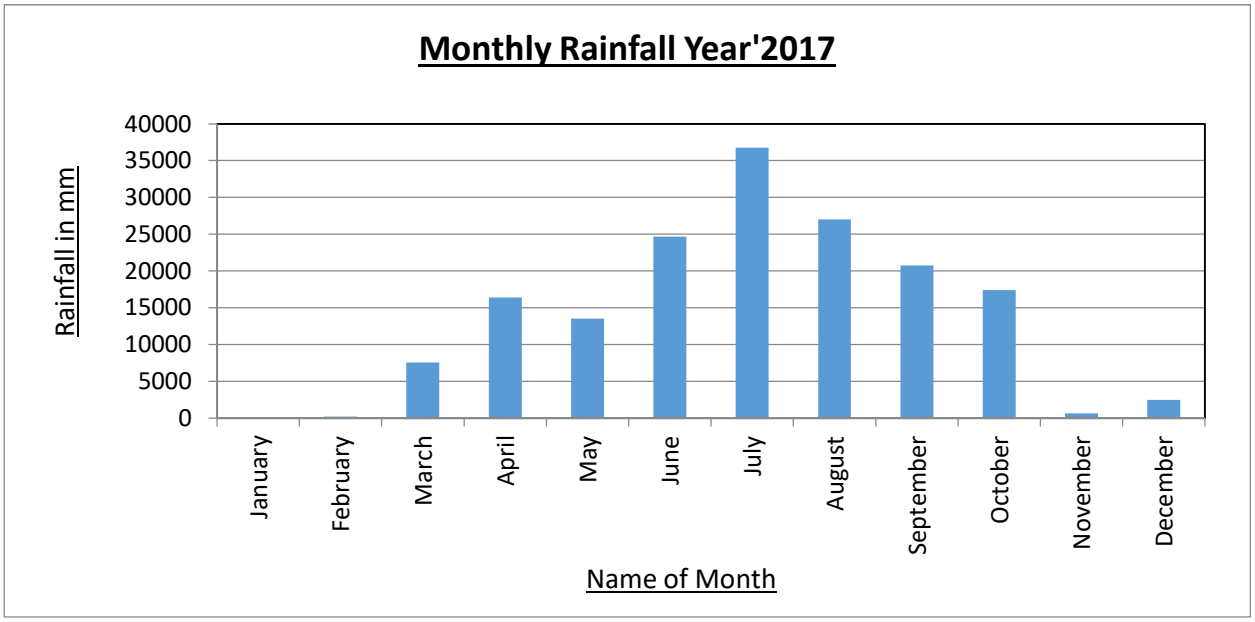


Figure 4.4: Monthly rainfall of 2017

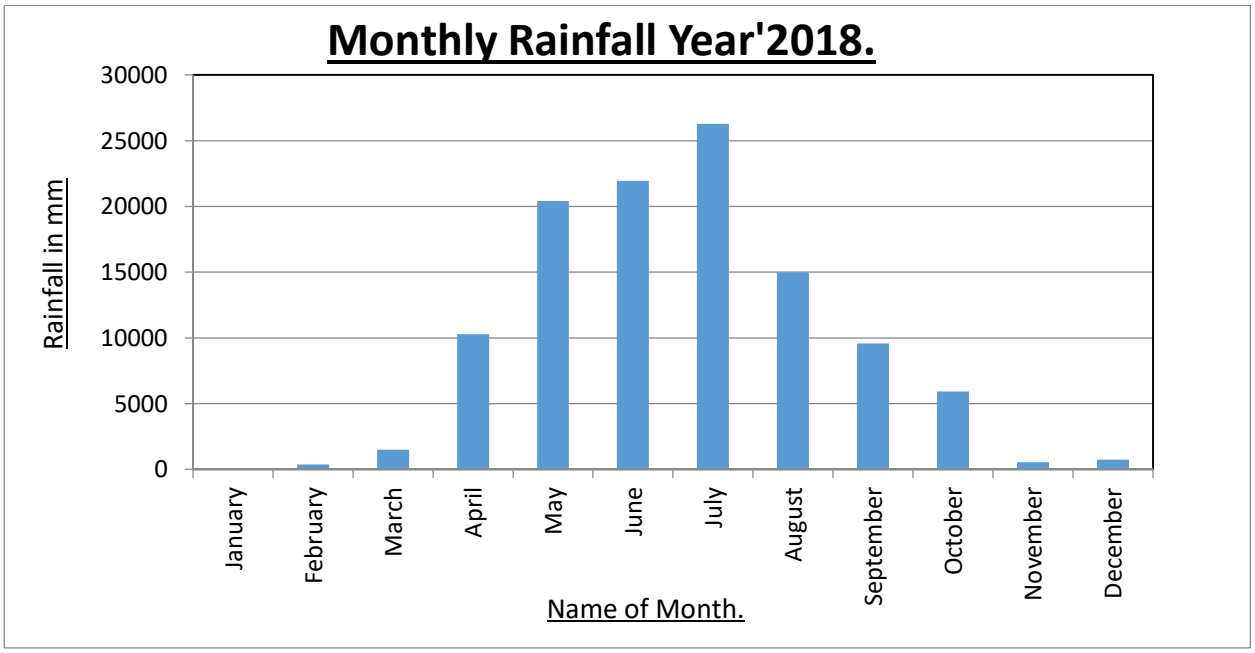


Figure 4.5: Monthly rainfall of 2018

The monthly total rainfall varies from 21mm to 37177mm, minimum rainfall occurred 21 mm in January and maximum rainfall is 36763mm in July for 2017. In 2018 it is varies from 41mm to 26274mm, minimum rainfall occurred 41 mm in January and maximum rainfall is 26747mm in July.

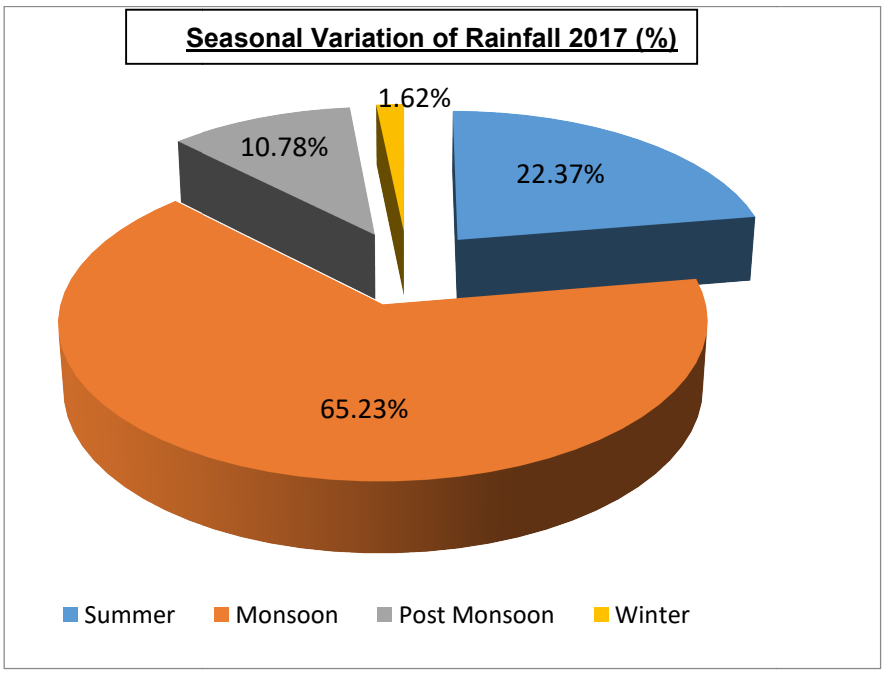


Figure4.6: Seasonal variation rainfall of 2017

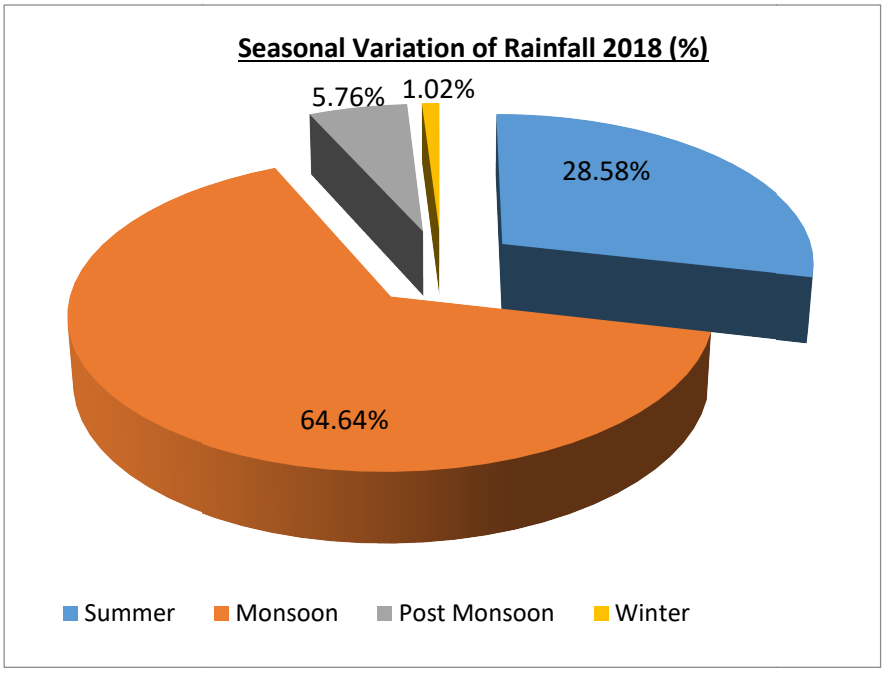


Figure4.7 : Seasonal variation rainfall of 2018

The average annual rainfall in 2017 is 2656mm 65.23% occurred in monsoon (June to September) and in 2018 it is 1796mm 64.64% occurred in monsoon.

4.2 Conclusion

The annual rainfall of 2017 & 2018 have been analysed from BWDB recorded data during this period whole over the country. The rainfall volume was calculated as the product of annual average rainfall in the district area and presented in Million m^3. It is found that rainfall varies from 1329mm to 7377mm in 2017 and average is 2656mm. During the year 2018 from it is varies from 911m to 5143mm and average is 1796m. The total volume of rainfall is 409533.58Mm^3 in 2017 and 272274.64Mm^3 in 2018. The total depth of rainfall is 2.77m and 1.84m in 2017 & 2018 respectively. In this study we also found that maximum 64% to 66% rainfall occurred during monsoon (June to September) and minimum 1% to 2% rainfall occurred during winter season (December, January and February).

References

BWDB Database.

Appendix: List of Rainfall Station Name and ID

Sl No	*District*	Station	Station ID	Remaks
1	Bagerhat	Morrelganj	CL512	
2	Bagerhat	Rampal	CL516	
3	Bagerhat	Mollahhat	CL511	
4	Bagerhat	Bagerhat	CL501	
5	Bandarban	Nakhyongochari	CL322	
6	Bandarban	Lama	CL317	
7	Bandarban	Bandarban	CL303	
8	Barguna	Patharghata	CL272	
9	Barguna	Barguna	CL256	
10	Barguna	Bamna	CL253	
11	Barisal	Gournadi	CL263	
12	Barisal	Barisal	CL258	
13	Barisal	Banaripara	CL254	
14	Barisal	Bakerganj	CL252	
15	Bhola	Daulatkhan	CL261	
16	Bhola	Borhanuddin	CL257	
17	Bhola	Bhola	CL260	
18	Bogra	Dhunot	CL11	
19	Bogra	Shibganj (Bogra)	CL216	
20	Bogra	Dubchanchia	CL169	
21	Bogra	Bogra	CL6	
22	Bogra	Khetlal	CL181	
23	Bogra	Nandigram	CL22	
24	Bogra	Nawkhila	CL24	
25	Bogra	Sherpur_Bogra	CL33	
26	Brahmanbaria	Kasba	CL362	
27	Brahmanbaria	Nabinagar	CL367	
28	Brahmanbaria	Bancharampur	CL351	
29	Brahmanbaria	Brahmanbaria	CL103	
30	Brahmanbaria	Nasirnagar	CL132	
31	Brahmanbaria	Sarail	CL131	
32	Chandpur	Chandpur	CL354	
33	Chandpur	Hajiganj	CL360	
34	Chittagong	Mirsarai	CL320	
35	Chittagong	Sandwip	CL331	
36	Chittagong	Sitakunda	CL334	
37	Chittagong	Nazirhat	CL324	
38	Chittagong	Amtali	CL301	
39	Chittagong	Narayanhat	CL323	
40	Chittagong	Patia	CL325	
41	Chittagong	Rangunia	CL330	
42	Chittagong	Satkania	CL332	
43	Chittagong	Chittagong	CL306	
44	Chittagong	Fatikchari	CL311	
45	Chittagong	Anowara	CL302	
46	Chittagong	Hathazari	CL313	
47	Chuadanga	Alamdanga	CL452	
48	Chuadanga	Amla	CL214	

Sl No	*District*	Station	Station ID	Remarks
49	Chuadanga	Chuadanga	CL224	
50	Comilla	Daudkandi	CL357	
51	Comilla	Barura	CL352	
52	Comilla	Chauddagram	CL51	
53	Comilla	Muradnagar	CL366	
54	Comilla	Laksam	CL363	
55	Comilla	Comilla	CL356	
56	Comilla	Gunabati	CL359	
57	Cox's Bazar	Kutubdia	CL316	
58	Cox's Bazar	Dulahazara	CL310	
59	Dhaka	Savar	CL31	
60	Dhaka	Dhaka_PBO	CL9	
61	Dhaka	Dhaka_Banani	CL42	
62	Dhaka	Nawabganj	CL412	
63	Dinajpur	Ghoraghat	CL164	
64	Dinajpur	Khansama	CL179	
65	Dinajpur	Nawabganj	CL196	
66	Dinajpur	Hilli (Hakimpur)	CL175	
67	Dinajpur	Setabganj	CL213	
68	Dinajpur	Kantanagar	CL180	
69	Dinajpur	Dinajpur	CL168	
70	Dinajpur	Phulbari	CL201	
71	Faridpur	Bhanga	CL403	
72	Faridpur	Faridpur	CL406	
73	Faridpur	Boalmari	CL404	
74	Faridpur	Modhukhali	CL411	
75	Feni	Feni	CL358	
76	Feni	Parshuram	CL370	
77	Feni	Chhagalnaya	CL355	
78	Gaibandha	Gobindaganj	CL171	
79	Gaibandha	Gaibandha(Bhawaniganj)	CL156	
80	Gaibandha	Sundarganj	CL218	
81	Gazipur	Sreepur	CL37	
82	Gazipur	Maona	CL43	
83	Gazipur	Joydebpur	CL17	
84	Gopalganj	Fatehpur	CL407	
85	Gopalganj	Haridaspur	CL409	
86	Habiganj	Habiganj	CL110	
87	Habiganj	Itakhola(Baikuntha)	CL111	
88	Habiganj	Chandpur Bagan	CL105	
89	Habiganj	Markuli	CL120	
90	Jamalpur	Jamalpur	CL67	
91	Jamalpur	Dewanganj	CL62	
92	Jamalpur	Sarishabari	CL32	
93	Jessore	Keshabpur	CL459	
94	Jessore	Rajghat	CL451	
95	Jessore	Jessore	CL456	
96	Jessore	Benapole	CL453	
97	Jessore	Chaugacha	CL454	

Sl No	District	Station	Station ID	Remarks
98	Jhalokathi	Jhalokati	CL264	
99	Jhenaidah	Dattanagar	CL455	
100	Jhenaidah	Sailkupa	CL463	
101	Jhenaidah	Jhenaidah	CL457	
102	Jhenaidah	Kaliganj (Jessore)	CL458	
103	Joypurhat	Joypurhat	CL520	
104	Khagrachhari	Manikchari	CL319	
105	Khagrachhari	Ramgarh	CL327	
106	Khagrachhari	Chandarkhil	CL305	
107	Khulna	Chalna	CL503	
108	Khulna	Paikgacha	CL515	
109	Khulna	Khulna	CL510	
110	Khulna	Dumuria	CL504	
111	Khulna	Kapilmuni	CL509	
112	Kishoreganj	Khaliajuri	CL113	
113	Kishoreganj	Bajitpur	CL61	
114	Kishoreganj	Bhairab Bazar	CL101	
115	Kishoreganj	Kishoreganj	CL71	
116	Kishoreganj	Itna	CL112	
117	Kurigram	Chilmari	CL163	
118	Kurigram	Bhurangamari	CL159	
119	Kurigram	Kurigram	CL182	
120	Kurigram	Ulipur	CL222	
121	Kushtia	Bheramara	CL41	
122	Kushtia	Kushtia	CL19	
123	Lakshmipur	Ramgati	CL375	
124	Lakshmipur	Lakshmipur	CL364	
125	Lakshmipur	Raipur (Noakhali)	CL372	
126	Lalmonirhat	Patgram	CL200	
127	Lalmonirhat	Hatibandha	CL174	
128	Lalmonirhat	Lalmanirhat	CL183	
129	Madaripur	Madaripur	CL410	
130	Madaripur	Shibchar	CL414	
131	Magura	Salikha	CL462	
132	Magura	Magura	CL460	
133	Manikganj	Manikganj	CL20	
134	Manikganj	Daulatpur	CL10	
135	Meherpur	Dattapara	CL54	
136	Meherpur	Meherpur	CL225	
137	Meherpur	Hogalbaria	CL223	
138	Moulvi Bazar	Srimangal	CL126	
139	Moulvi Bazar	Moulvi Bazar	CL122	
140	Munshiganj	Munshiganj	CL365	
141	Munshiganj	Bhagyakul	CL402	
142	Mymensingh	Ghosegaon	CL45	
143	Mymensingh	Phulbaria	CL27	
144	Mymensingh	Nandail	CL75	
145	Mymensingh	Bhaluka	CL5	
146	Mymensingh	Muktagacha	CL72	

Sl No	District	Station	Station ID	Remarks
147	Mymensingh	Gafargaon	CL64	
148	Mymensingh	Gauripur	CL65	
149	Mymensingh	Rasulpur	CL46	
150	Mymensingh	Phulpur	CL77	
151	Mymensingh	Mymensingh	CL73	
152	Naogaon	Naogaon	CL191	
153	Naogaon	Atrai Ahsanganj	CL3	
154	Naogaon	Nithpur	CL194	
155	Naogaon	Manda	CL185	
156	Naogaon	Mohadebpur	CL187	
157	Naogaon	Nazipur (Patnitala)	CL192	
158	Naogaon	Sapahar	CL211	
159	Naogaon	Badalgachi	CL152	
160	Narail	Narail	CL461	
161	Narayanganj	Shimrail	CL519	
162	Narsingdi	Narsindi	CL76	
163	Narsingdi	Shibpur	CL79	
164	Natore	Gurudaspur	CL14	
165	Natore	Singra	CL36	
166	Natore	Lalpur	CL184	
167	Natore	Joari	CL16	
168	Natore	Natore	CL23	
169	Nawabganj	Rohanpur	CL208	
170	Nawabganj	Bholahat	CL158	
171	Nawabganj	Chapai-Nawabganj	CL195	
172	Nawabganj	Nachole	CL190	
173	Netrokona	Durgapur	CL63	
174	Netrokona	Kendua	CL115	
175	Netrokona	Netrokona	CL123	
176	Netrokona	Jaria-jhanjail	CL68	
177	Netrokona	Mohanganj	CL121	
178	Nilphamari	Dalia	CL226	
179	Nilphamari	Dimla	CL167	
180	Nilphamari	Saidpur	CL210	
181	Noakhali	Noakhali	CL369	
182	Noakhali	Hatiya	CL361	
183	Noakhali	Sonaimuri	CL377	
184	Noakhali	Senbag	CL376	
185	Noakhali	Basurhat	CL353	
186	Pabna	Chatmohar	CL7	
187	Pabna	Atghoria	CL1	
188	Pabna	Pabna	CL25	
189	Pabna	Faridpur Banuaripara	CL12	
190	Pabna	Ishurdi	CL15	
191	Pabna	Bera	CL4	
192	Panchagarh	Tentulia	CL220	
193	Panchagarh	Boda	CL161	
194	Panchagarh	Panchagarh	CL197	
195	Panchagarh	Bhithargarh	CL157	

Sl No	District	Station	Station ID	Remarks
196	Panchagarh	Debiganj	CL166	
197	Patuakhali	Khepupara	CL269	
198	Patuakhali	Patuakhali	CL266	
199	Patuakhali	Galachipa	CL262	
200	Patuakhali	Bauphal	CL255	
201	Pirojpur	Mathbaria	CL265	
202	Pirojpur	Pirojpur	CL267	
203	Pirojpur	Nazirpur	CL271	
204	Pirojpur	Bhandaria	CL259	
205	Rajbari	Rajbari	CL30	
206	Rajshahi	Puthia	CL204	
207	Rajshahi	Sardah	CL212	
208	Rajshahi	Rajshahi	CL205	
209	Rajshahi	Shibganj(Rajshahi)	CL215	
210	Rajshahi	Tanore	CL219	
211	Rajshahi	Godagari	CL172	
212	Rangamati	Rangamati	CL328	
213	Rangpur	Latu	CL118	
214	Rangpur	Rangpur	CL206	
215	Rangpur	Badarganj	CL153	
216	Rangpur	Kaunia	CL178	
217	Satkhira	Kaikhali	CL506	
218	Satkhira	Kalaroa	CL507	
219	Satkhira	Satkhira	CL518	
220	Satkhira	Benarpota	CL502	
221	Satkhira	Kaliganj(Khulna)	CL508	
222	Satkhira	Islamkati	CL505	
223	Shariatpur	Polang	CL413	
224	Sherpur	Nakuagaon	CL227	
225	Sherpur	Nalitabari	CL74	
226	Sherpur	Sherpur Town	CL78	
227	Sirajganj	Taras	CL39	
228	Sirajganj	Shazadpur	CL35	
229	Sirajganj	Ullapara	CL40	
230	Sirajganj	Sirajganj	CL34	
231	Sirajganj	Raiganj	CL29	
232	Sunamganj	Chhatak	CL107	
233	Sunamganj	Sunamganj	CL127	
234	Sunamganj	Laurergarh	CL49	
235	Sunamganj	Moheshkhola	CL44	
236	Sylhet	Companyganj Bholaganj	CL102	
237	Sylhet	Sylhet	CL128	
238	Tangail	Mirzapur	CL21	
239	Tangail	Tangail_Atia	CL2	
240	Tangail	Gopalpur	CL13	
241	Tangail	Kalihati	CL18	
242	Thakurgaon	Thakurgaon	CL221	
243	Thakurgaon	Nekmard	CL193	