



Myanmar Climate Report

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Old Bagan, Myanmar. Photo: Sven Scheuermeier



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<p>Abstract</p> <p>Myanmar is situated in the tropical climate region, a region that is highly vulnerable to impacts from climate change. Therefore, information about climate change in Myanmar is in high demand. In this report, changing of various observed climate parameters were estimated and analyzed. New normal values for minimum and maximum temperature and rainfall, as well as for monsoon onset and withdrawal dates, were calculated for the period 1981-2010. Normal monthly mean temperature and rainfall values for the whole country of Myanmar were calculated for the new normal period and compared to values of the previous normal period 1961-1990. Frequency of days for different ranges of temperature and rainfall were computed, in addition to frequency of 10 years wind direction and wind speed. Trends of minimum and maximum temperature were also calculated and analyzed.</p> <p>From 1961-1990 to 1981-2010, the maximum temperature has increased at almost every station of Myanmar, whereas the minimum temperature has decreased at most of the stations. The average normal maximum temperature for the whole country of Myanmar has increased for all months, except February and December. The normal annual mean maximum temperature increased by 0.5 °C from 1961-1990 to 1981-2010. The average normal minimum temperature of Myanmar has decreased for the months January-May and September-December, while it has not changed significantly for the months June-August.</p> <p>The normal rainfall pattern has decreased for the months May-August, for the other months it has not changed significantly. In the pre-monsoon and mid-monsoon seasons, the amount of rainfall has decreased over the whole country, while it has been unchanged in the months of winter and post-monsoon seasons over Myanmar, from 1961-1990 to 1981-2010. In the new normal period, the onset date of the monsoon is later and the withdrawal date is earlier than in the old normal period, which means that the duration of the rainy season has decreased. The normal duration of the monsoon period was 144 days in the period 1961-1990 and 121 days in the period of 1981-2010. Compared to the new normal (1981 to 2010) duration of monsoon period, trend studies indicate however a possible increase in the duration of the rainy season in the recent years, and more studies of long-term rainfall trends are needed.</p>	
<p>Keywords Climate, Rainfall, Temperature, Monsoon, Normal values, Wind speed and direction.</p>	

Forward Message

Myanmar is located between 9° 32' N and 28° 31' N latitude and 92° 10' E and 101° 11' E longitude. It has composed of (14) States and Regions, while it can be classified as meteorologically aspects by Coastal Mountainous Area, Deltaic Area, Central Dry Zone, Shan Plateau and Northern Highland Area. These areas have the different Climatic characters on Annual Rainfall and Temperature based on Location, Altitude and nature of Geography. Some of the station shows Double Peak in Annual rainfall while others show single Mode in Rainfall and/or Thundery activity. Moreover, Myanmar is situated at the NE parts of the Bay of Bengal and North of Andaman Sea, so there are some of the weather disturbances such as Cyclone, very destructive power to the Coastal areas of Landfall points, passage of Western disturbances from the NE India and Easterly Waves from Thailand and activity of Typhoon Remnants from the China Sea towards Myanmar; accentuate the aspect of Local Climate. Likewise, Myanmar has also clear evident of the Abnormal Climatic conditions mostly after 1980s such as abnormal cyclone landfall, late Monsoon Onset, early Monsoon withdrawal, variation in Monsoon strength and Monsoon Rainfall, increase of summer Temperature, winter Temperature. Moreover, Myanmar also links with the Regional Climatic teleconnection with some atmospheric oscillation like El Nino and La Nina linkage with modulation of warm and cool sea surface temperature abnormalities. Severity and duration of this abnormal regional climatic pattern strongly influence the Climate of Myanmar.

Myanmar Department of Meteorology and Hydrology (DMH) under the supervision of Ministry of Transport and Communications, as a member of WMO since (1947) is mandated to observe, analyze, predict, and provide warning services for weather and climate related hazards including hazards of geologic and oceanic origins, to contribute to the safe and socio-economic benefit of welfare of communities through, among others, protection of lives and properties, reduction of the impacts of natural hazards, and sustainable resource management and development. Its main responsibility is to provide the timely, effective early warning of weather related hazards and other information to decision makers, Policy makers, Disaster Management related agencies and other various users by cooperation with the World Meteorological Organization. Forecast products comprise Bay of Bengal condition, Cyclone Frequency, Rainfall anomaly, Temperature anomaly, timing of Monsoon onset and withdrawal, rainy days

and foggy days according to season. Weather and climate services are expected to improve by using NWP model like WRF Model and Regional Climate Model and other advanced products from the WMO's Regional Climate Centers.

According to the MoU signed between Department of Meteorology and Hydrology (DMH) and Norwegian Meteorological Institute (MET Norway) in 2012, the Project entitled "Cooperation between DMH Myanmar and the Norwegian Meteorological Institute On Capacity Building" for enhancing the institutional and capacity building for the Hydro-meteorological services is being implemented with the funding support of Norwegian Ministry of Foreign Affairs (MFA) and in collaboration with Asian Disaster Preparedness Center (ADPC). Under this project, several "Working Groups" formulated and 'Climate Group' is one of them. Meteorological variables such as temperature, rainfall, wind speed and direction etc. were studied using statistical software 'R' and some other common software by Climate Group. The result is summarized in this report.

I hope that this report will be helpful for improved understanding the Climate of Myanmar.

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Abstract

Myanmar is situated in the tropical climate region, a region that is highly vulnerable to impacts from climate change. Therefore, information about climate change in Myanmar is in high demand. In this report, changing of various observed climate parameters were estimated and analyzed. New normal values for minimum and maximum temperature and rainfall, as well as for monsoon onset and withdrawal dates, were calculated for the period 1981-2010. Normal monthly mean temperature and rainfall values for the whole country of Myanmar were calculated for the new normal period and compared to values of the previous normal period 1961-1990. Frequency of days for different ranges of temperature and rainfall were computed, in addition to frequency of 10 years wind direction and wind speed. Trends of minimum and maximum temperature were also calculated and analyzed.

From 1961-1990 to 1981-2010, the maximum temperature has increased at almost every station of Myanmar, whereas the minimum temperature has decreased at most of the stations. The average normal maximum temperature for the whole country of Myanmar has increased for all months, except February and December. The normal annual mean maximum temperature increased by 0.5 °C from 1961-1990 to 1981-2010. The average normal minimum temperature of Myanmar has decreased for the months January-May and September-December, while it has not changed significantly for the months June-August.

The normal rainfall pattern has decreased for the months May-August, for the other months it has not changed significantly. In the pre-monsoon and mid-monsoon seasons, the amount of rainfall has decreased over the whole country, while it has been unchanged in the months of winter and post-monsoon seasons over Myanmar, from 1961-1990 to 1981-2010. In the new normal period, the onset date of the monsoon is later and the withdrawal date is earlier than in the old normal period, which means that the duration of the rainy season has decreased. The normal duration of the monsoon period was 144 days in the period 1961-1990 and 121 days in the period of 1981-2010. Compared to the new normal (1981 to 2010) duration of monsoon period, trend studies indicate however a possible increase in the duration of the rainy season in the recent years, and more studies of long-term rainfall trends are needed.

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1 Introduction

Myanmar is situated in the tropical climate region. However, a variation in climate is shown due to the long territory from South to North. Due to high impact of climate change in this region, information about climate change is in high demand. Meteorological variables such as minimum temperature, maximum temperature, pressure, rainfall etc. of major stations were selected and investigated. The monthly normal for maximum and minimum temperature, rainfall and 10 years mean wind were calculated for major stations of Myanmar during the period 1981-2010. Frequency of days for different ranges of temperature and rainfall were also calculated. Available information of the DMH meteorological stations were collected and documented. The quality check of weather elements such as temperature, rainfall and wind frequency were carried out by using the statistical software R, whereas RCLimDex was used for quality control of temperature and rainfall data. The softwares R and RCLimDex are useful for systematic climate data management and for generating quality climate products. This report is prepared with the guidance of the Norwegian Meteorological Institute.

2 Geography

Myanmar is roughly located between between 9° 32' N and 28° 31' N latitude and 92° 10' E and 101° 11' E longitude. It is bounded on the North by China, on the West by India and Bangladesh, on the East by Thailand and Laos PDR and in the South there is Bay of Bengal and Andaman Sea. There are about 60 rivers in Myanmar. Most of the rivers flow to the Bay of Bengal from North to South. The main rivers are Ayeyarwaddy, Chindwin, Sittaung and Thanlwin. The coastline of Myanmar is about 1470 km along the continental shelf which has a shallow bathymetry at the Deltaic. The entire area of Myanmar is about 676577 sq. km. The population is about 52 millions of which about 77% live in the rural areas.

3 Climate of Myanmar

The climate of Myanmar is determined mainly by its geographical position. It lies in the South of the great Asiatic continent and to the North of the Indian Ocean. Myanmar is separated from neighbouring countries by high mountain walls. In the extreme North lies the great Himalaya mountain and in the Northwest lies the jungle clad hills of the Pakistan, the Chin Hills and the Yomas with an average height or between 6000 ft to 12000 ft, separating Myanmar from India. Myanmar is one of the largest rice producing countries in the world. The country is composed of low-lying plain land, hilly area in the North, Northwest, West and East regions. The great Himalayan Range is to the North and the Indian Ocean and Bay of Bengal is to the South. Myanmar is one of the exemplifications of monsoon countries. Within Myanmar itself there are important features of relief which exert a dominant influence on its meteorology. The country is significantly made up of a great low land plain of Central Myanmar that formed by the valleys of the Ayeyarwaddy. The Rakhine Yoma runs from North to South parallel to the West coast of Myanmar and the BagoYoma runs along from North to South separating the Rakhine Yoma from the Central Myanmar valley area and Sittaung valley from the Shan plateau and Northern ranges of Tanintharyi mountains.

Due to the diversity of relief, there are many striking contrasts of meteorological conditions in different parts of the country. In the Central part of the country lies an area with an annual average rainfall of 30 inches (762 mm) and certain parts of the coastal region receives an annual average rainfall of 200 inches (5080 mm). The mean maximum temperature of about 100°F (37.8°C) is found in Central Myanmar area during the months of March and April and the mean minimum temperature of 40°F (4.4°C) to 50°F (10.0°C) is found to occur in the Northern part of Myanmar during January and February.

The country has experiences with meteorological, hydrological and seismic hazards. The Great Sittwe Cyclone of 1968, the Patheingyi Cyclone of 1975, the Gwa Cyclone 1982, the Maungdaw Cyclone of 1994, the Cyclone Mala of 2006, the Cyclone Nargis of

May 2008, the effect of the Cyclone Koman (crossed Bangladesh coast) and the historical flood of year 2004, 2010 and 2015 were all extreme meteorological and hydrological events.

3.1 Climate Seasons

Myanmar is situated in the tropical monsoon climate region. Based on the analysis of pressure, rainfall and temperature, the climate of this country can be described under the following four seasons:

3.1.1 Winter or Northeast monsoon season (November - February)

Almost like a tap turning off, November sees a sudden cessation of the monsoon rains in Myanmar. Clear weather generally set in over the country in November. The cold season begins over Myanmar in Mid November. In this season low temperatures prevail over the whole country. Clear sky, fine weather, low humidity and temperature and a large diurnal variation of temperatures are the usual features of the weather. From about the middle of December the serenity of the weather in Northern Myanmar is broken at intervals by a series of disturbances which travel Eastwards across Northern Myanmar. The number and character of these disturbances vary, but on the average four to six disturbances may be expected in each of the months of January and February. The precipitation associated with them is small in amount but very important for the winter crops of Northern Myanmar area. Some of the disturbances give rain over the whole of the Northern Myanmar while others confine their activities to the extreme North.

3.1.2 Summer or Hot weather season (March - Mid May)

This is a period of continuous and rapid rise of temperature. In March and April the highest day temperature of 100° F (37.8°C) and above occur in Central and Lower Myanmar areas. During this period of rising temperatures, the winds are variable with much less steadiness and persistence. The whole Bay of Bengal is almost calm and relax totally insignificant in storm formation. There is no storm in the past which cross the Myanmar coast during these months. By April, important changes take place in the surface air movements over Myanmar. Along the coastal region the air circulation is characterized by increasing land and sea winds. The temperatures dramatically increase all over the country starting from the Deltaic to the North up to the Central Area. The hottest area is in the rain shadow area of Central Myanmar during April when maximum temperature commonly ranges between (95°F) 35°C and (104°F) 40°C. Violent local storms form in the region during May. These storms are often accompanied by violent winds, hail and torrential rain. Cyclonic storms and depressions also form during May in South Bay of Bengal and these usually head towards Rakhine and the East Bangladesh coasts during the final stages of their journey.

3.1.3 Rainy or Southwest monsoon season (Mid May - October)

The Southwest Monsoon is divided into 4 parts, pre monsoon (Mid April to start onset date), early monsoon (June), mid or peak monsoon (July, August), late monsoon (September to withdrawal date) and post monsoon (October, November). Southwest monsoon makes its appearance in lower Myanmar about the third week of May. It gradually extends northwards and is usually established over the whole country by about the first week of June. It is the rain-bearing current for Myanmar. The mountain ranges over the West coast along Rakhine and Tanintharyi Regions give copious rain along the coastal area with an average annual rainfall of about 200 inches (5080 mm). The low land of Deltaic area receives somewhat less rain with an average annual rainfall of about 100 inches (2540 mm). However, the rain shadowing effect caused by the Yomas in Central Myanmar leaves the area with an annual amount of rainfalls as low as about 25 inches (635 mm). During the early monsoon period depressions form in succession confined in the North Bay of Bengal and cause widespread rains along the coastal area. In the mid monsoon period, the strength of the monsoon and the accompanying rainfall increases from June to August and rainfall decreases in late monsoon period, September in coastal areas. The Central Myanmar area has double maxima rainfall in May, September and October. The monsoon begins to retreat about the middle of September. The total rainfall of the monsoon season is about 200 inches (5080 mm) in the coastal area and decreases to about 25 inches (635mm) in Central Myanmar. The Southwest monsoon retreats from Myanmar about the end of September. During this season, the rainfall decreases appreciably in the whole country except the Central region where the rainfall is at its peak due to the passage of remnant of monsoon depressions from the Bay of Bengal after crossing the Rakhine and Bangladesh coasts. In the post monsoon period (October) and the early northeast monsoon season (November), the frequency of storms and depression is at a maximum during this season and these usually form in the South Bay and usually cross toward West or Northwest.

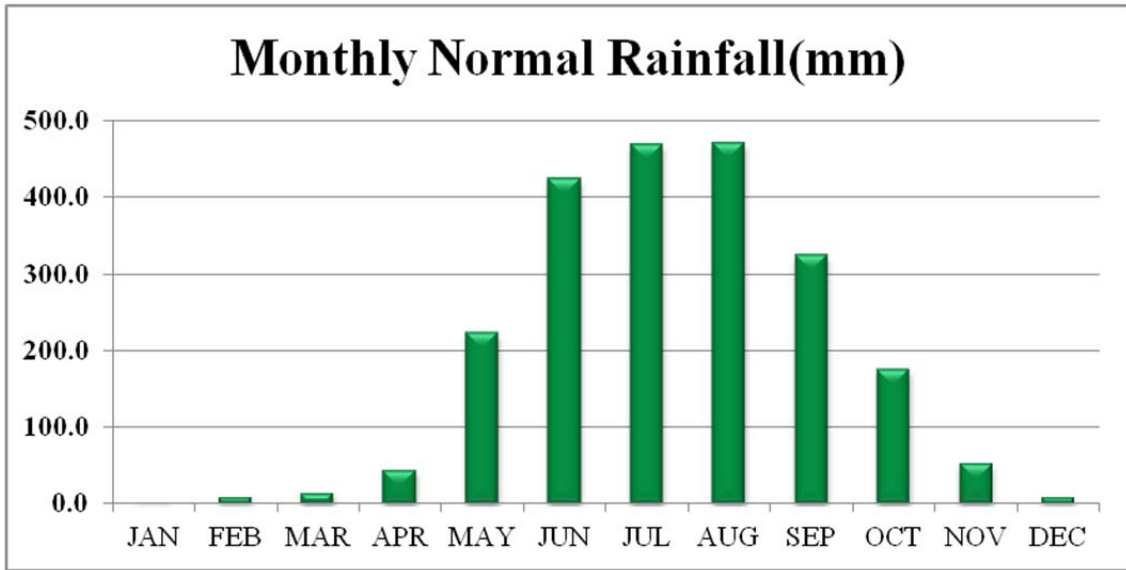


Figure 1: Monthly normal rainfall over Myanmar (1981-2010)

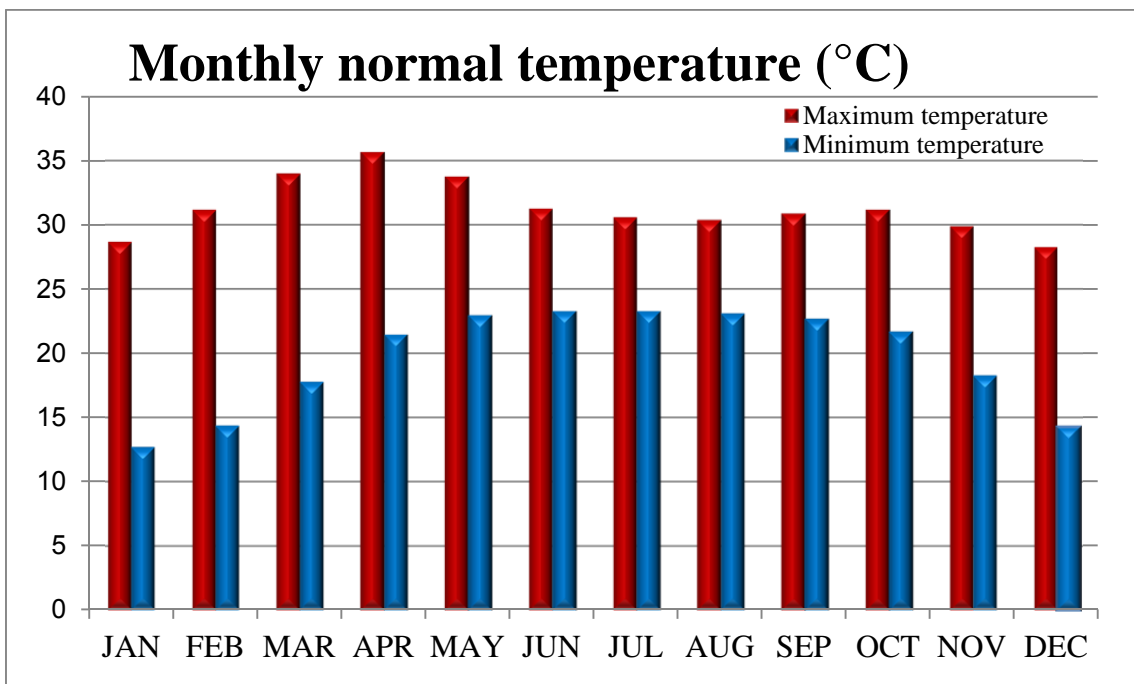


Figure 2: Monthly normal maximum and minimum temperature of Myanmar (1981-2010)

4 Weather Observations in Myanmar

4.1 Department of Meteorology and Hydrology (DMH)

The Department of Meteorology and Hydrology Myanmar (DMH) is a Government Organization under the administrative control of the Ministry of Transport and Communications. DMH was established at the 1st April 1937 in the Yangon Region first as the Burma Meteorological Department (BMD) and the 1st observatory was established at Kaba-Aye, Yangon. BMD was a member country of the World Meteorological Organization (WMO), when it organized 21st March 1951, and Director General of BMD was a Permanent Representative of Myanmar with WMO. At that time, the BMD served its duty with four officers and 22 staffs. After 1972, BMD reformed as the Department of Meteorology and Hydrology (DMH) and it supports the National project plan providing with meteorological, hydrological and seismological data. It also serves in the field of prevention on natural disaster, saving life and properties of public by issuing early warning.

DMH is responsible for all tasks related to meteorological, hydrological and seismological fields in Myanmar. Main works performed by DMH are routine observation and analysis of meteorological and hydrological phenomena and providing weather information to the general public. Those tasks and services are performed real time and continuously for 24 hours every day. DMH's main responsibility is to monitor and issue forecasts and warnings of all meteorological extreme events like tropical cyclones, severe thunderstorms/tornadoes, heavy rainfall events, droughts, cold and heat waves etc... along with daily routine forecasts round the clock. Therefore, more reliable and timely warnings are the main requirements of Myanmar. DMH held their diamond jubilee anniversary on the date of 23rd March 2012. Since 1992-1993, DMH cooperated and collaborated with Yangon and Dagon Universities for B. Sc. Meteorology and Hydrology (Honors) students in accordance with the supervision and advice of Secretary General of WMO. DMH has a milestone for establishing of mini studio and shooting for daily weather news.

4.2 Observational stations at DMH

4.2.1 Basic Observation Network

A total of 117 synoptic stations are in operation at DMH. There is 1 upper air (Radiosonde) station at Kaba-Aye, Yangon. According to the WMO guide line in 1947, there were 8 observatories for basic Meteorological data, also there were some part time observatories during that time. The number of observatories increased to 25 after 1960 and by gradual addition the total number of observatories was 77 in 1980. Later on, some observatories were established and at present the total number is 117. In this study, data of only 78 observatories were considered. The raw data were archived in CDs, DVDs and hard disks. The data before 1965 were not available at DMH. All observed data are received and gathered at the National Meteorological Communication Centre, Kaba-Aye and transmitted through GTS link to RSMC New Delhi (India), Bangkok (Thailand) and vice-versa. Some details of the DMH's observatories are given below:

Observatories established during 1947-1959:

Lashio, Mandalay, Myeikhtila, Taunggyi, Kengtung, Sittwe, Thandwe, Hinthada, Tharrawady, Hmawbi, Pathein, Maubin, Mingalardon, Mawlamyine, Dawei, Co Co Island, Myeik, Kawthong

Observatories established after 1964:

Putao, Hkamti, Myitkyina, Homalin, Pinlebu, Katha, Bhamo, Mawlaik, Kalay, Kalaywa, Falam, Shwebo, Gangaw, Monywa, Sagaing, Thipaw, Mindat, Pakokku, Myingyan, NyaungOo (Met), Loilem, Yamethin, Pinlaung, Mingsat, Kyaukpyu, Pyinmana, Loikaw, Pyay, Taunggu (Met), Shwegyin, Hpa-an, Bago, Kaba-Aye, Belin, Yay, Var, Taunggu(Air), Theinzayat, Minbu.

Observatories established after 1970:

Mohmyin, Tamu, Minkin, Kanbalu, Hakha, Yay Oo, Moekok, Pyinoolwin, Paletwa, Moekaung, Kyauktaw, Chauk, Heho, Namsam, Maungdaw, Sinphyugyun, Magway, Taungdwingyi, Ann, Aunglan, Gyobinkauk, Phyu, Gwa, Ngathaingyaung, Thaton, Phyarpon, Kawkayeik, Kyeikkheme, Machanbaw, Ranthalo, Tedim, Kyaukme, Naungcho, Moemeik, Kyemon, Myinmu, Chebuda, Taungkok, Hpa-an (Agro), Lunkyaw, Hlaingtat, NyaungOo (Air), Yazin, Tatkong, Tadaoo, Pauk, Laytatpyin, Zaungtu, Khamon, Nyaunglaypin, Tagontaing, Myaungmya, Hmawbi(Agro), Khayan, Mudon, Launglon, Zalun, Kyaukse, Naypyitaw, Laputta.

Global Transmission Stations:

Putao, Hkamti, Myitkyina, Homalin, Katha, Bhamo, Mawlaik, Kalaywa, Hakha, Falam, Shwebo, Moekok, Lashio, Monywa, Sagaing, Mandalay, Pyinoolwin, Mindat, NyaungOo, Meikhtila, Namsam, Taunggyi, Kengtung, Pyinmana, Kyauktaw, Chauk, Sittwe, Minbu, Magway, Kyaukpyu, Manaung, Loikaw, Pyay, Taunggu, Thandwe, Gwa, Hinthada, Hmawbi, Bago, Pathein, Maubin, Mingalardon, Kaba-Aye, Hpa-an, Phyarpon, Mawlamyine, Yay, Dawei, Co Co Island, Myeik, Kawthaung.

Table 1: Observatories of DMH which are in operation at present

Si. No.	Name of the observatory	Operational period	International Station Number	Latitude (North)	Longitude (East)	Elevation in meters
1.	FALAM	1964	48031	22.55	93.41	1372
2.	BAGO	1965	48093	17.20	96.30	15
3.	BELIN	1965	48100	17.13	97.14	61
4.	BHAMO	1966	48019	24.16	97.12	111
5.	CHAUK	1970	48052	20.54	94.50	82
6.	COCO ISLAND	1959	48109	14.07	93.22	2
7.	DAWEI	1946	48108	14.06	98.13	16
8.	GANGAW	1965	48036	22.10	94.08	214
9.	GWA	1982	48085	17.35	94.35	3
10.	HAKHA	1989	48030	22.39	93.37	1866
11.	HEHO	1979	48056	20.43	96.50	1159
12.	HINTHADA	1958	48087	17.40	95.25	26
13.	HKAMTI	1965	48004	26.00	95.42	146
14.	HMAWBI	1953	48092	17.06	96.04	27
15.	HOMALIN	1965	48010	24.52	94.55	130
16.	HPA-AN	1966	48099	16.45	97.40	9
17.	KABA-AYE	1968	48097	16.46	96.10	20
18.	KALAYMYO	1968	48024	23.12	94.04	152
19.	KALAYWA	1966	48025	23.12	94.18	109
20.	VARR	1966	-	22.50	94.40	285
21.	KENGTUNG	1951	48060	21.18	99.37	827
22.	KATHA	1966	48018	24.10	96.20	113
23.	KAWTHUNG	1947	48112	9.58	98.35	46
24.	PINLEBU	1964	48017	24.05	95.22	259
25.	LOILEM	1966	48058	20.55	97.33	1355
26.	KYAUKPYU	1964	48071	19.25	93.33	5
27.	MONGHSAT	1966	48070	20.33	99.16	572
28.	LASHIO	1952	48035	22.56	97.45	747

29.	LOIKAW	1966	48075	19.41	97.13	895
30.	MAUBIN	1953	48095	16.44	95.39	3
31.	MAGWAY	1973	48065	20.07	94.55	52
32.	MANDALAY	1947	48042	21.59	96.06	74
33.	THEINZAYAT	1965	-	17.32	96.54	11
34.	MAWLAMYINE	1952	48103	16.30	97.37	21
35.	MAWLAIK	1965	48020	23.38	94.25	115
36.	MEIKTHILA	1956	48053	20.50	95.50	214
37.	MINBU	1965	48064	20.10	94.53	51
38.	MINDAT	1965	48045	21.23	93.57	1395
39.	MINGALADON	1947	48096	16.54	96.11	28
40.	MOEKOK	1982	48034	22.55	96.30	1176
41.	MONYWA	1965	48037	22.06	95.08	81
42.	MYEIK	1947	48110	12.26	98.36	36
43.	MYINGYAN	1968	48047	21.28	95.23	60
44.	MYITKYINA	1966	48008	25.22	97.24	145
45.	SINPHYUGYUN	1973	48063	20.39	94.43	-
46.	NYAUNGOO	1965	48048	21.12	94.55	61
47.	PAKOKKU	1966	48046	21.2	95.05	57
48.	LUNKYAW	1973	-	21.30	96.30	-
49.	PATHEIN	1947	48094	16.46	94.46	9
50.	PINLAUNG	1967	48068	20.08	96.46	1463
51.	PUTAO	1967	48001	27.20	97.25	409
52.	HLAINGTAT	1973	-	20.48	96.11	152
53.	PYAY	1965	48077	18.48	95.13	58
54.	PYINMANA	1965	48074	19.43	96.13	101
55.	YAYOO	1973	48032	22.45	95.25	103
56.	KYEMON	1973	-	22.15	95.15	303
57.	SAGAING	1965	48039	21.54	96.35	64
58.	SHWEBO	1964	48033	22.35	95.43	106
59.	SHWEGYIN	1964	48089	17.55	96.52	12
60.	SITTWE	1947	48062	20.08	92.53	4
61.	MYAUNGMYA	1976	-	16.45	95.05	-

62.	TAUNGOO	1965	48078	18.55	96.28	47
63.	TAUNGGYI	1950	48057	20.47	97.03	1436
64.	THANDWE	1947	48080	18.28	94.21	9
65.	THARRAWADY	1953	48088	17.38	95.48	15
66.	THATON	1973	48098	16.55	97.22	17
67.	THIPAW	1966	48040	22.36	97.18	436
68.	YAMETHIN	1964	48067	20.25	96.09	199
69.	YAY	1964	48107	15.15	97.52	3
70.	MANAUNG	1973	-	18.50	93.45	9
71.	MINKIN	1972	48027	22.52	94.09	175
72.	TAMU	1979	48015	24.12	94.18	177
73.	KAWKAREIK	1978	48104	16.38	98.15	17
74.	MYAUKOO	1978	-	20.35	93.15	14
75.	YAYZIN	1983	-	19.50	96.00	-
76.	MYINMU	1983	-	16.14	97.43	68
77.	KYAUKME	1983	-	22.11	96.15	759
78.	NGATHAINGYAUNG	1989	48086	17.24	95.05	6

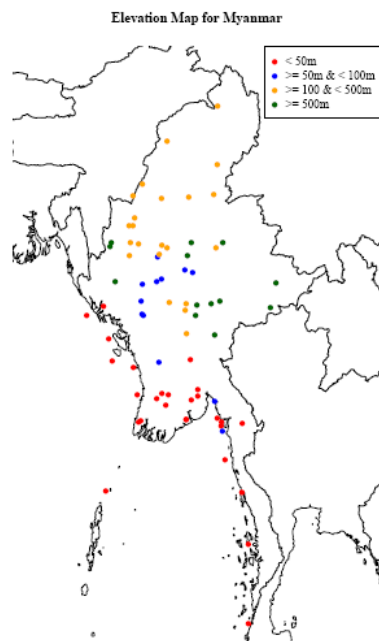


Figure 3: Station elevation map of DMH

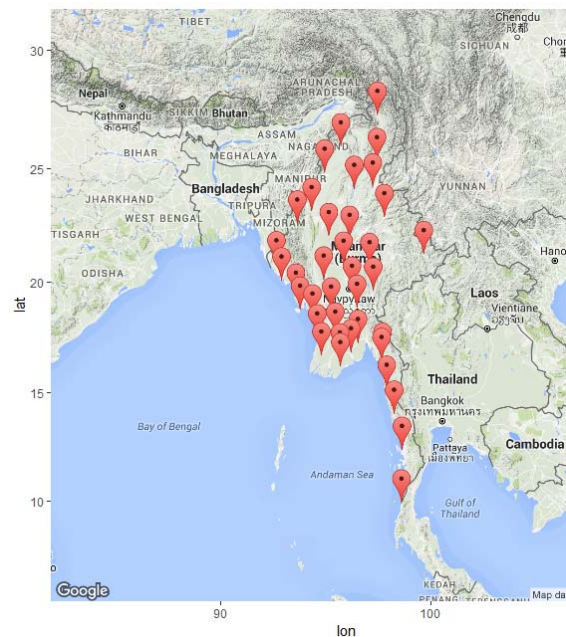


Figure 4: Station location map

Highest maximum and lowest minimum temperatures with date recorded at different observatories during the period (2001-2010) are given below:

Table 2: Highest maximum Temperature (°C) with date of occurrence; year 2001-2010

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Putao	26.5	29.5	34.5	38.5	37.0	37.5	37.0	36.5	35.0	35.5	30.5	26.5
Date	31/05	21/09	21/10	16/10	3/05	9/05	13/09	10/07	22/10	6/07	15/01	15/07
Myitkyina	30.0	33.5	38.0	39.0	40.7	40.5	37.5	38.0	37.2	37.0	33.3	30.0
Date	20/08	28/06	29/07	7/03	31/05	3/05	13/09	16/06	15/05	6/07	1/08	1/02
Bhamo	30.6	35.8	39.0	39.5	41.3	41.5	36.5	37.0	38.5	36.9	33.6	31.5
Date	29/09	28/06	28/04	19/05	31/05	4/05	14/09	22/03	13/09	1/09	7/09	19/05
Monghsat	32.1	34.6	37.1	39.1	39.5	36.9	35.5	35.1	34.5	35.2	33.8	31.3
Date	31/05	22/09	30/04	22/10	15/10	23/07	18/03	6/03	28/03	15/01	1/02	10/06
Hsipaw	33.4	35.0	42.3	41.0	42.0	38.0	37.0	36.2	38.0	36.0	33.0	32.0
Date	29/01	27/09	18/01	23/10	14/10	3/05	6/05	16/06	1/05	5/07	3/05	7/10
Lashio	38.9	33.5	36.5	38.0	38.1	37.0	34.6	36.0	35.6	34.4	32.4	30.5
Date	21/07	20/09	31/07	13/06	13/10	3/05	11/05	27/05	10/06	4/07	1/07	18/09
Taunggyi	27.8	30.0	33.0	34.3	34.6	29.6	28.5	28.8	28.7	30.2	30.0	29.2
Date	31/05	19/05	25/10	14/10	15/10	2/10	6/03	29/01	12/09	29/09	13/09	5/10
Kengtung	32.0	33.6	36.5	38.4	39.6	36.6	34.6	35.6	35.0	33.5	32.4	31.0
Date	4/05	20/09	31/07	22/10	15/10	24/07	1/04	6/03	24/08	18/02	12/09	20/07
Loilem	28.5	30.0	33.0	36.0	35.5	31.5	29.5	29.5	29.5	30.0	29.5	27.5
Date	31/01	25/09	26/04	26/10	15/10	4/10	6/03	24/01	1/03	12/03	14/09	20/07
Pinlaung	28.3	28.2	31.4	33.0	33.4	29.6	28.4	29.4	28.3	29.4	28.6	26.8
Date	30/05	18/09	10/10	25/07	17/10	24/07	15/10	10/10	5/05	4/07	17/09	3/05
Hakha	24.9	26.4	29.5	32.5	30.0	30.0	30.0	28.0	26.6	27.0	26.2	24.7
Date	6/06	15/09	21/10	27/03	17/10	1/03	7/02	7/03	2/02	1/02	19/08	3/05
Falam	28.6	30.5	30.7	32.6	32.6	32.2	29.0	29.0	29.5	30.8	29.5	27.0
Date	31/05	19/09	27/04	28/08	11/09	3/05	12/09	5/09	1/05	17/08	3/06	7/10
Mindat	26.7	32.2	34.9	35.7	37.0	33.6	31.0	29.9	29.7	28.8	28.1	26.5
Date	4/06	20/05	25/10	6/03	16/10	1/05	31/09	9/10	14/05	13/05	15/09	21/07
Hkamti	28.9	31.3	37.7	39.5	41.3	41.3	37.0	38.8	37.4	37.0	32.7	29.3
Date	31/06	27/04	31/07	26/09	6/07	9/05	13/09	10/06	12/09	6/07	4/03	13/03
Homalin	30.5	34.5	39.7	40.0	41.2	41.4	35.7	36.0	37.0	37.7	33.5	29.5
Date	31/05	28/06	28/04	26/09	31/05	2/05	13/09	8/10	12/09	2/09	4/07	1/04
Katha	32.5	36.6	40.2	40.6	41.9	42.1	36.5	37.5	38.2	38.8	34.9	31.7
Date	28/09	28/06	26/04	19/02	30/05	1/05	12/09	10/06	15/05	5/07	6/09	11/05
Pinlebu	29.0	35.0	39.0	41.0	41.0	42.0	35.5	36.5	36.5	35.0	33.0	28.5
Date	31/05	15/05	30/04	16/06	29/05	4/05	11/05	6/06	2/05	4/05	4/06	4/02
Mawlaik	30.0	37.8	41.7	42.7	42.2	42.0	37.6	36.8	37.0	36.0	33.7	39.8
Date	23/10	27/08	28/04	14/06	31/05	5/05	9/10	3/09	6/10	5/07	5/05	4/02

Kalewa	30.8	37.2	41.8	43.4	45.0	42.8	38.9	27.3	35.6	35.1	32.8	30.1
Date	28/09	27/06	25/10	11/10	15/10	1/05	9/10	8/10	1/05	5/05	5/05	1/03
Kalemyo	32.5	38.8	42.1	42.6	43.7	39.0	38.6	38.5	37.2	36.0	33.8	31.6
Date	28/09	21/03	23/10	14/06	15/10	9/10	9/10	8/10	11/02	3/10	1/03	2/02
Yeoo	33.0	39.2	42.0	43.2	43.0	41.5	40.0	39.2	38.7	37.0	36.2	33.5
Date	22/02	28/06	27/06	15/06	30/05	1/05	20/03	9/07	5/05	12/05	5/05	6/04
Shwebo	36.0	38.0	42.0	44.2	44.0	41.5	39.0	41.0	39.0	39.0	36.0	38.1
Date	29/09	27/09	26/10	20/08	12/10	1/05	13/10	9/07	29/08	12/08	17/09	16/07
Monywa	33.8	39.3	43.5	44.0	45.8	43.5	42.0	41.0	38.9	38.8	37.4	32.6
Date	28/09	28/09	26/10	6/10	13/10	1/05	17/10	6/09	13/09	11/08	15/09	6/09
Mandalay	34.5	39.2	42.5	44.0	45.0	42.0	40.0	39.0	38.0	39.2	39.0	33.4
Date	30/10	20/09	27/04	6/10	12/10	1/05	12/09	10/09	28/02	3/10	5/05	28/03

Table 3: Lowest minimum Temperature (°C) with date of occurrence; year 2001-2010

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Putao	2.0	2.5	6.0	10.5	13.5	19.0	20.0	17.5	21.9	11.6	5.0	1.5
Date	24/10	3/08	1/08	1/08	1/02	26/05, 8/10	30/10	14/04	24/01	27/07	24/04	28/10
Myitkyina	6.2	8.0	11.0	14.3	17.0	20.2	22.0	23.0	21.0	15.5	9.5	7.0
Date	23/03	3/08	10/03	3/06	3/11	3/01	11/04	20/01, 2/06	13/04	29/07	30/06	31/01
Bhamo	7.0	7.7	9.5	16.5	19.0	21.5	22.0	21.0	21.2	16.2	10.0	6.8
Date	20/03	5/04	9/03	4/06	2/02	13/07	30/01	9/01	21/07	28/07	30/06	30/09
Monghsat	3.8	4.3	7.3	12.4	16.7	20.7	20.5	20.4	17.3	11.9	7.5	4.7
Date	20/07	23/07	10/07	6/02	16/06	7/04	24/07	21/02	21/07	10/02	21/01	22/06
Hsipaw	4.0	5.0	7.0	13.8	16.9	21.0	21.0	21.0	18.0	13.3	10.7	5.0
Date	4/10	21/07	8/07	5/02	20/04	11/09	23/01	18/07	30/09	24/04	29/06	30/09
Lashio	-1.9	1.0	3.0	8.0	12.5	18.4	20.1	20.0	16.9	8.5	6.0	1.0
Date	11/01	7/10	8/07	5/02	14/05	11/09	21/07	9/01	30/09	9/02	30/01	30/09
Taunggyi	3.9	5.8	8.5	11.5	12.7	16.6	16.4	16.5	15.7	10.0	6.0	3.0
Date	11/01	5/04	1/07	4/04	18/06	2/08	27/04	23/03	27/08	9/02	30/06	25/10
Kengtung	4.5	5.0	7.6	10.2	13.4	16.0	18.0	17.0	14.8	7.8	4.3	4.8
Date	11/01	5/04	4/02	4/04	15/05	9/03	15/03	31/02	21/07	9/02	28/01	23/06
Loilem	-4.0	-2.0	1.0	5.0	8.0	10.0	10.0	10.0	9.0	4.5	-2.0	-4.0

Date	4/10	7/10	1/08	3/09	18/06	3/08	12/09	13/08	27/07	28/04	30/08	30/09
Pinlaung	-2.0	0.1	3.5	9.0	9.6	12.6	14.8	15.0	12.0	10.2	1.3	-1.3
Date	12/01	5/04	10/07	4/04	29/06	11/08	18/04	4/07	30/08	31/04	30/06	30/09
Hakha	-4.3	-5.0	-1.0	4.6	8.9	10.2	11.5	11.0	10.0	3.5	-3.8	-4.8
Date	6/08	15/08	8/07	5/01	10/08	2/08	12/08	9/03	28/10	17/08	23/08	30/09
Falam	4.0	4.0	7.0	9.8	11.5	12.3	15.0	15.0	13.5	11.6	7.6	5.0
Date	26/01	16/08	8/03	1/04	24/03	1/05	13/01	7/06	22/07	26/08	28/06	23/08
Mindat	2.4	4.9	7.5	9.6	10.7	12.2	11.8	12.2	10.7	8.0	5.1	3.2
Date	2/06	4/08	26/05	1/09	8/05	28/05	29/05	28/09	23/10	30/04	18/05	30/09
Hkamti	4.6	4.9	9.9	14.4	17.8	21.8	21.3	21.7	19.0	15.4	10.6	5.7
Date	17/03	10/04	1/08	1/06	7/04	5/04	7/08	31/02	22/07	31/04	30/05	29/04
Homalin	5.0	5.7	7.4	15.0	17.5	20.0	19.5	19.5	18.5	4.0	10.0	4.2
Date	17/03	5/01	8/03	1/02	5/05	28/10	30/10	20/02, 4/10	22/10	31/10	23/10	30/10
Katha	3.5	4.2	8.3	10.8	13.0	15.3	16.5	15.5	15.0	12.0	7.5	2.8
Date	4/10	3/08	1/08	1/10	16/06	8/10	7/10	22/10	17/10	30/10	30/06	29/09
Pinlebu	-1.0	0.5	4.0	9.5	11.8	15.0	15.0	16.0	14.0	11.5	2.6	1.0
Date	13/01	4/04	8/03	2/04	2/03	8/03	11/04	6/04, 17/04	18/04	25/04	1/03	2/04
Mawlaik	7.2	7.5	9.5	12.5	19.2	23.0	23.0	23.0	22.0	18.5	14.2	10.4
Date	27/02	6/10	8/03	26/06	2/02	12/04, 3/08	7/08	22/02	20/02	27/07	29/06	30/04
Kalewa	9.4	9.5	10.0	15.6	15.5	21.8	22.4	20.8	21.5	18.6	13.4	10.7
Date	28/02	5/04	8/03	29,30 /04	1/04	3/08	17/10	27/03	11/04	25/07	28/06	30/09
Kalemyo	6.0	6.7	8.6	14.7	18.8	22.0	23.0	22.6	20.5	17.7	11.5	9.1
Date	27/02	6/10	8/03	3/03	2/03	4/03	6/03	10/01	11/04	26/07	28/06	26/02
Yeoo	6.5	6.8	10.5	8.0	16.5	17.5	18.7	18.2	18.0	14.1	10.0	8.5
Date	30/08	16/08	1,3/08	1/03	14/07	21/08	25/07	31/07	18/05	30/07	30/06	9/07
Shwebo	3.0	7.0	10.0	11.6	14.0	15.0	16.0	15.0	15.0	13.0	8.0	3.0

Date	3/10	2,4/09	3,4/09	3/09	19/07	1/09	7/08	18/09	8/09	27/08	29/09	28/09
Monywa	10.0	11.0	14.2	18.0	20.0	20.2	23.1	21.0	20.4	17.6	12.0	8.3
Date	3/10	6/10	9/03	2/04	3/05	13/06	16/09	18/09	23/09	26/08	30/09	28/09
Mandalay	9.8	11.6	14.5	18.0	20.4	23.0	23.0	23.0	22.5	19.0	12.5	11.0
Date	11/01	5/04	9/03	2/04	20/04	11/03, 9/09	21/07	1/01	11/04	9/02	29/01	28/09

Table 4: List of some devastating cyclones that made landfall over the Myanmar coast

Cyclones	Maximum wind speed in mph	Surge height in meter	Deaths
17 May 1884 Sittwe Cyclone			100
26 April 1936 Kyaukpyu Cyclone			1000
10 May 1968 Sittwe Cyclone		4.25 m	1037
7 May 1975 Pathein Cyclone		3.00 m	304
4 May 1982 Gwa Cyclone		3.7 m	31
2 May 1994 Maungdaw Cyclone		3.66 m	10
19 May 2004 Sittwe Cyclone	100		-
29 April 2006 Mala Cyclone	120	4.57 m	1
2 May 2008 Severe Cyclonic storm Nargis	120	5.61 m	138373
10 th to 23 rd November 2010 Severe Cyclonic Storm Giri	120		27

5 Myanmar Climate Normals (1981-2010)

Monthly normals of rainfall and temperature were calculated for 78 weather stations of Myanmar Meteorological Department. But a few of the observatories, namely Gwa (Est.1982), Moekok (Est.1982), Yezin (Est.1983), Myinmu (Est.1983), Kyaukme (Est.1983), Hakha (Est.1989) and Ngathaingyaung (Est.1989), were established after 1981. So these stations have data ranges less than 30 years. The normals are based on the observed data which are archived at the climate division of DMH.

5.1 Temperature

5.1.1 Maximum Temperature

Monthly normals of maximum temperature were calculated for 78 observatories of DMH and are listed in Table 5.

Table 5: Monthly normal maximum temperature (°C) for different observatories of DMH

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Period
PUTAO	20.8	22.5	24.5	26.1	29.4	29.5	28.8	30.1	29.5	28.5	25.6	21.8	1981-2010
MYITKYINA	25.3	27.5	30.4	32.6	33.3	31.6	30.5	32.0	31.7	30.9	28.4	25.8	1981-2010
BHAMO	25.6	28.1	31.7	34.0	33.9	32.3	31.4	31.7	31.9	30.9	28.1	25.5	1981-2010
KALAYWA	25.6	29.2	33.9	36.5	35.7	32.9	32.5	31.9	31.5	30.9	27.9	25.0	1981-2010
KATHA	27.1	29.5	32.6	34.5	33.8	32.6	31.5	31.6	31.6	31.3	29.6	27.4	1981-2010
MONYWA	29.1	32.5	36.5	39.1	37.9	34.9	36.0	34.8	33.8	32.9	30.7	28.6	1981-2010

HKAMTI	24.8	27.1	30.2	32.2	32.7	30.8	29.7	30.9	31.3	30.9	28.4	25.3	1981-2010
HOMALIN	25.6	28.2	31.3	33.4	33.6	31.6	30.5	31.0	31.3	31.4	29.0	26.0	1981-2010
MAWLAIK	25.5	29.1	33.2	35.7	35.2	33.3	32.6	32.2	32.0	31.3	28.2	25.4	1981-2010
KALAYMYO	26.9	30.0	34.0	36.5	35.8	33.5	32.8	32.3	32.2	31.9	29.2	26.7	1981-2010
MINKIN	26.5	30.1	34.7	37.6	36.2	34.0	33.8	32.6	32.0	31.6	28.9	26.0	1981-2010
TAMU	26.0	28.8	32.9	34.7	34.3	32.5	31.5	32.0	31.8	31.3	29.3	26.3	1981-2010
KYEEMON	28.8	31.4	35.5	38.7	37.7	35.6	35.6	34.5	33.4	32.6	30.4	28.3	1981-2010
PINLEBU	24.9	28.5	32.9	35.5	34.6	32.7	32.1	31.6	31.6	30.8	27.6	24.9	1981-2010
YEEO	28.8	31.8	35.5	37.9	36.6	34.5	34.3	33.5	32.9	32.4	30.5	28.6	1981-2010
SHWEBO	28.9	31.7	35.4	38.1	36.6	34.4	34.2	33.5	33.1	32.4	30.5	28.6	1981-2010
SAGAING	28.8	31.9	36.0	38.2	35.7	33.7	33.0	32.5	32.5	32.3	30.4	28.3	1981-2010
MYINMU	30.1	33.2	37.3	40.0	38.2	36.2	35.7	34.9	34.3	33.4	31.4	29.5	1983-2010
TAUNGGYI	23.2	25.0	27.9	29.3	26.9	25.0	24.0	24.0	24.6	24.7	23.7	22.6	1981-2010
LASHIO	25.7	28.1	31.2	32.8	31.6	30.7	29.3	29.6	29.9	29.3	27.1	25.2	1981-2010
KYAUKME	24.7	27.7	31.0	32.9	31.0	29.8	29.0	29.1	29.3	28.5	25.9	23.8	1983-2010
KENGTUNG	27.2	29.5	32.0	33.7	31.9	30.7	29.5	29.6	29.6	28.8	27.3	25.6	1981-2010
HSIPAW	27.2	29.9	33.4	35.1	33.4	32.2	31.4	31.5	31.8	31.0	28.7	26.6	1981-2010
PINLAUNG	22.7	24.1	26.5	28.2	25.9	24.5	22.3	22.8	24.3	24.8	23.7	22.6	1981-2010
LOILEM	23.8	26.0	29.0	30.2	27.7	26.6	26.0	25.5	25.5	25.0	23.5	22.3	1981-2010
MONGHSAT	28.0	30.2	33.1	34.8	32.7	30.7	29.5	29.7	30.7	30.7	28.8	27.1	1981-2010
HEHO	24.8	26.8	29.7	31.4	29.2	27.4	26.6	26.7	27.2	27.2	25.5	24.2	1981-2010
HAKHA	18.7	20.3	22.9	25.1	24.0	23.0	22.3	21.9	21.9	21.5	19.6	18.1	1989-2010
FALAM	20.4	21.9	24.7	26.7	25.6	24.1	23.6	23.4	23.6	23.9	21.8	20.3	1981-2010
MINDAT	20.9	24.3	28.1	30.4	28.2	25.7	25.7	24.6	24.3	24.0	21.7	20.0	1981-2010
VARR	28.0	30.7	34.4	36.6	35.8	34.0	33.4	33.3	33.1	32.3	30.2	27.9	1981-2010
MANDALAY	29.6	32.7	36.6	38.9	36.9	35.2	35.1	34.3	34.0	33.4	31.1	29.1	1981-2010

MOEKOK	22.8	24.8	27.9	29.6	27.5	25.4	24.4	25.0	26.1	26.2	24.9	22.8	1982-2010
MEIKHTILA	29.9	33.0	36.5	38.4	36.0	33.0	32.7	32.3	32.7	32.5	29.6	28.8	1981-2010
MYINGYAN	29.2	32.9	37.3	40.0	38.3	36.3	36.0	34.9	34.1	33.3	31.1	28.7	1981-2010
LUNKYAW	29.5	32.6	36.2	38.2	36.3	34.6	34.4	33.7	33.6	33.2	30.7	29.0	1981-2010
NYAUNG OO	29.5	32.7	36.7	39.3	37.6	34.9	34.9	34.1	33.3	32.7	31.0	29.1	1981-2010
YAMETHIN	30.2	33.2	36.3	38.0	35.5	32.4	31.7	31.6	32.3	32.6	30.7	29.2	1981-2010
PYINMANA	31.5	34.4	37.2	38.7	36.0	32.4	31.4	31.3	32.5	33.2	31.8	30.5	1981-2010
HLAINGTAT	30.9	33.9	37.2	38.9	36.3	33.8	33.4	33.0	33.3	33.2	30.9	29.6	1981-2010
YEZIN	30.8	33.2	35.9	37.6	35.5	32.3	31.1	31.1	32.1	32.7	31.4	29.9	1983-2010
MAGWAY	30.7	34.5	38.6	40.9	38.3	34.2	33.4	33.1	33.7	33.7	31.5	29.8	1981-2010
MINBU	30.2	34.3	38.3	40.5	37.9	34.0	33.2	32.8	33.0	33.1	31.5	29.2	1981-2010
PAKOKKU	29.1	32.3	36.4	39.0	37.5	35.3	34.9	33.9	33.5	32.7	30.6	28.7	1981-2010
GANGAW	27.0	31.0	35.7	38.9	37.1	34.3	33.6	32.3	32.1	31.4	28.7	26.4	1981-2010
SINPHYU-GYAUNG	29.4	33.0	37.3	40.2	38.5	34.9	34.5	33.8	33.7	33.2	31.0	29.0	1981-2010
CHAUK	30.0	33.6	36.7	39.4	37.5	34.7	34.5	33.8	33.4	33.2	31.6	29.5	1981-2010
SITTWE	28.3	29.9	31.7	33.0	32.5	29.7	28.9	29.3	30.3	31.3	30.6	28.9	1981-2010
THANDWE	31.0	32.4	33.6	34.9	33.7	30.3	29.7	29.6	31.3	33.2	32.6	31.4	1981-2010
MYAUK U	30.4	32.7	35.2	36.0	34.7	31.0	30.0	30.4	31.9	33.1	32.1	30.3	1981-2010
MANAUNG	28.9	29.5	31.5	33.6	33.1	30.1	29.5	29.4	30.5	31.6	30.8	29.5	1981-2010
KYAUKPHYU	26.7	28.1	30.3	32.6	32.5	30.1	29.3	29.4	30.5	31.3	30.0	27.8	1981-2010
GWA	28.8	29.6	31.1	32.9	32.7	30.5	29.8	29.5	30.6	31.7	31.2	29.6	1982-2010
TAUNGOO	30.9	33.9	36.6	37.9	35.1	31.1	30.2	30.1	31.6	32.7	31.5	30.2	1981-2010
PYAY	32.2	35.1	37.6	38.7	36.0	31.9	31.0	31.0	32.3	33.5	32.7	31.5	1981-2010
BAGO	31.6	34.0	36.2	38.1	34.3	30.1	29.7	29.6	30.8	30.7	32.2	31.0	1981-2010
SHWEGYIN	32.6	34.6	37.1	38.2	34.7	30.7	29.8	29.7	31.4	33.2	33.3	32.1	1981-2010
THARRAWADDY	32.1	34.9	37.6	39.3	35.8	31.2	30.5	30.4	31.4	32.5	32.3	31.3	1981-2010

MINGALADON	32.6	34.9	36.6	37.5	34.1	30.6	30.2	29.9	30.7	32.1	32.5	31.8	1981-2010
KABA-AYE	33.2	35.2	36.7	37.5	34.2	30.8	30.3	30.0	30.9	32.2	33.1	32.5	1981-2010
HMAWBI	32.5	35.0	37.0	38.1	34.5	30.7	30.2	30.0	30.8	32.3	32.7	31.8	1981-2010
COCOISLAND	29.6	30.0	31.0	32.6	32.3	30.7	30.3	30.0	30.2	30.8	31.0	30.0	1981-2010
MAUBIN	30.8	33.4	35.4	36.7	34.0	30.7	30.2	29.8	30.7	31.8	31.4	30.2	1981-2010
PATHEIN	31.9	33.8	35.5	36.6	34.2	30.9	30.3	30.0	31.0	32.1	32.2	31.3	1981-2010
MYAUNGMYA	31.2	33.6	35.6	36.7	34.1	31.0	30.5	30.1	30.8	31.7	31.5	30.6	1981-2010
NGATHAING-GYAUNG	31.6	34.0	36.7	36.7	35.0	31.2	30.5	30.2	31.3	32.6	32.3	30.9	1989-2010
HINTHADA	31.2	34.2	37.1	38.7	35.6	31.3	30.6	30.4	31.5	32.5	31.6	30.3	1981-2010
LOIKAW	27.4	29.8	32.4	33.5	30.9	28.6	27.9	27.8	28.5	28.5	27.2	26.0	1981-2010
HPA-AN	33.8	35.7	37.1	37.7	33.7	29.8	29.1	28.8	30.9	33.6	33.9	33.0	1981-2010
KAWKAREIK	33.3	35.0	36.7	37.6	34.4	30.4	29.4	29.2	31.1	33.3	33.6	32.6	1981-2010
MAWLAMYINE	32.9	34.4	35.6	35.8	32.5	29.5	28.8	28.6	30.1	32.4	32.8	32.1	1981-2010
YAY	32.9	33.8	34.8	35.1	32.6	30.0	29.3	28.8	30.4	32.1	32.9	32.4	1981-2010
BILIN	32.1	34.1	35.5	36.1	32.8	29.3	28.6	28.6	30.2	32.6	32.6	31.4	1981-2010
THEINZAYAT	32.0	34.0	36.5	37.4	34.1	30.5	29.7	29.7	31.2	33.0	32.7	31.5	1981-2010
THATON	32.7	34.3	35.5	36.0	32.7	29.6	28.9	28.7	30.2	32.3	32.7	31.9	1981-2010
DAWEI	33.3	34.1	34.7	35.0	32.0	29.4	28.7	28.4	29.7	31.7	32.8	32.6	1981-2010
MYEIK	32.1	32.7	33.4	33.9	32.0	30.1	29.6	29.1	29.8	31.0	32.1	31.7	1981-2010
KAWTHUNG	31.7	32.9	33.6	33.7	31.6	30.3	29.9	29.6	29.5	29.9	30.5	30.6	1981-2010

5.1.2 Minimum Temperature

Monthly normals of minimum temperature were calculated for 78 observatories of DMH and are listed in Table 6.

Table 6: Monthly normal minimum temperature (°C) for different observatories of DMH

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Period
PUTAO	7.4	10.0	13.0	16.1	19.9	22.6	23.1	23.1	22.2	19.2	12.8	8.7	1981-2010
MYITKYINA	10.4	12.9	16.3	19.7	22.3	24.3	24.5	24.6	23.9	21.5	16.2	11.9	1981-2010
BHAMO	10.1	12.5	16.0	20.2	23.1	24.7	24.8	24.5	23.8	21.7	16.5	11.9	1981-2010
KALAYWA	13.3	14.4	17.9	22.1	24.2	25.0	25.0	24.8	24.1	22.9	19.1	14.9	1981-2010
KATHA	10.6	13.1	16.4	20.2	22.9	24.3	24.4	24.2	23.4	21.5	16.4	11.9	1981-2010
MONYWA	13.5	15.5	19.0	23.3	25.4	25.8	25.9	25.5	24.7	23.4	19.3	15.0	1981-2010
HKAMTI	10.3	12.9	16.4	20.0	22.6	24.1	24.2	24.4	23.8	21.6	16.5	11.7	1981-2010
HOMALIN	10.3	12.4	15.6	19.4	22.2	24.0	24.0	23.8	23.0	21.1	16.2	11.7	1981-2010
MAWLAIK	12.3	13.3	16.3	20.7	23.8	25.6	25.9	25.5	24.8	23.2	19.0	14.3	1981-2010
KALAYMYO	11.8	13.0	16.2	20.1	23.2	24.9	25.1	24.8	24.1	22.5	18.2	13.8	1981-2010
MINKIN	11.6	12.7	15.8	20.4	23.0	24.2	24.3	24.0	23.3	21.8	17.7	12.9	1981-2010
TAMU	7.6	9.9	14.1	18.1	20.4	22.1	22.1	21.8	21.3	18.7	14.3	9.1	1981-2010
KYEEMON	11.1	12.9	16.8	21.2	23.6	24.0	24.2	23.6	22.8	21.4	17.0	12.7	1981-2010
PINLEBU	9.2	11.2	14.1	18.1	20.9	22.4	22.4	22.5	21.3	19.4	14.7	9.9	1981-2010
YE OO	12.7	14.9	18.3	22.1	23.8	24.3	24.4	24.3	23.7	22.3	18.2	14.0	1981-2010
SHWEBO	12.8	15.0	19.3	23.6	25.0	25.0	25.0	24.8	24.4	23.1	18.7	14.4	1981-2010
SAGAING	14.3	16.4	20.6	24.8	25.7	26.2	26.2	26.0	25.6	24.7	20.4	15.9	1981-2010
MYINMU	13.0	15.3	19.6	24.5	26.4	26.6	26.5	26.1	25.6	24.4	19.7	15.1	1983-2010
KYAUKME	6.5	8.2	11.8	16.2	19.6	21.5	21.7	21.5	20.6	18.3	13.0	8.3	1983-2010
KENGTUNG	10.0	11.0	14.2	17.9	20.4	21.7	21.5	21.3	20.3	18.5	14.6	11.0	1981-2010
HSIPAW	9.3	9.5	12.8	18.1	21.5	23.5	23.6	23.4	22.5	20.5	16.2	12.0	1981-2010
TAUNGGYI	8.1	10.0	13.3	16.3	17.4	17.8	17.7	17.6	17.2	15.8	12.7	9.2	1981-2010
LASHIO	5.2	6.1	9.6	15.1	19.2	21.8	21.9	21.8	20.9	18.7	13.3	8.1	1981-2010

PINLAUNG	4.1	6.1	9.5	13.9	16.7	17.4	17.2	17.3	16.8	14.9	11.1	6.0	1981-2010
LOILEM	4.2	6.8	10.7	14.0	15.1	16.1	16.2	15.8	14.7	13.0	9.2	5.2	1981-2010
MONGHSAT	10.4	9.8	12.5	17.4	21.2	22.6	22.5	22.3	21.8	20.2	16.2	12.3	1981-2010
HEHO	3.9	5.8	10.0	14.9	18.0	19.2	19.1	19.0	18.2	16.3	11.7	6.2	1981-2010
HAKHA	2.2	4.7	8.2	11.1	13.7	15.7	16.1	15.8	15.0	12.6	7.1	2.3	1989-2010
FALAM	8.0	9.9	13.0	15.4	16.5	17.5	17.5	17.5	17.0	15.6	12.0	8.6	1981-2010
MINDAT	9.7	12.1	15.7	17.7	17.9	18.0	18.0	17.6	16.9	15.6	12.6	9.6	1981-2010
VARR	8.4	11.7	16.5	20.8	22.7	23.9	24.0	23.8	22.8	21.0	15.7	10.4	1981-2010
MANDALAY	13.7	16.0	20.4	24.7	25.9	26.1	26.2	25.8	25.4	24.0	19.9	15.4	1981-2010
MOEKOK	5.0	7.2	10.8	15.1	17.9	19.8	19.8	19.7	18.9	16.6	11.4	6.8	1982-2010
MEIKHTILA	14.6	16.7	21.1	25.0	25.2	24.6	24.4	24.3	24.2	23.4	20.0	16.0	1981-2010
MYINGYAN	12.3	14.8	19.5	25.5	26.8	26.8	26.8	26.3	25.7	24.3	19.7	14.2	1981-2010
LUNKYAW	12.5	15.1	19.1	23.7	24.9	25.1	25.5	24.7	24.3	22.9	18.9	14.5	1981-2010
NYAUNG OO	13.5	15.5	20.1	24.7	26.4	26.3	26.4	26.0	25.3	24.0	20.0	15.3	1981-2010
YAMETHIN	13.2	15.3	19.9	24.1	24.5	24.0	23.6	23.5	23.4	22.9	19.2	14.7	1981-2010
PYINMANA	14.6	16.4	20.4	24.3	24.9	24.3	24.0	23.9	23.9	23.3	20.2	16.0	1981-2010
HLAINGTAT	12.3	15.3	20.3	25.2	25.8	25.6	25.1	24.8	24.5	23.4	19.1	14.1	1981-2010
YEZIN	14.1	16.3	20.1	23.7	24.5	24.1	23.8	24.0	23.7	23.3	20.0	15.6	1983-2010
MAGWAY	11.4	13.7	18.0	22.4	24.0	23.2	23.1	23.0	22.7	21.9	18.3	13.8	1981-2010
MINBU	13.1	15.6	20.2	24.7	26.0	25.4	25.2	25.1	24.6	23.5	19.9	15.4	1981-2010
PAKOKKU	13.2	14.7	18.6	22.1	24.2	23.6	23.8	23.5	23.0	21.6	18.1	15.1	1981-2010
GANGAW	11.4	12.9	16.4	21.8	24.0	25.0	25.0	24.8	24.2	22.9	19.0	13.9	1981-2010
CHAUK	13.7	15.7	19.9	24.7	25.9	25.1	25.1	25.0	24.5	23.6	20.3	15.7	1981-2010
SINPHYU-GYAUNG	11.5	13.2	17.2	21.8	23.2	23.0	23.4	23.5	23.1	22.4	18.8	14.0	1981-2010
SITTWE	14.9	16.6	20.2	24.0	25.1	24.8	24.5	24.5	24.4	24.0	21.1	17.1	1981-2010
THANDWE	12.1	13.4	17.9	22.5	24.3	23.7	23.4	23.4	23.3	22.9	19.9	15.2	1981-2010

MYAUKOO	12.1	13.9	18.3	22.8	24.0	24.2	23.9	23.8	24.2	23.2	19.8	14.9	1981-2010
KYAUKPYU	17.1	18.6	21.5	24.8	25.8	25.0	24.8	24.6	24.9	25.0	23.4	19.4	1981-2010
MANAUNG	12.1	13.1	16.8	19.1	21.1	21.1	20.6	20.8	20.5	19.7	17.8	14.1	1981-2010
GWA	13.3	14.3	17.7	22.3	23.9	23.3	23.2	23.0	23.0	22.5	19.9	16.0	1982-2010
TAUNGOO	15.0	16.5	20.4	24.3	24.6	23.9	23.7	23.8	23.8	23.3	20.4	16.5	1981-2010
PYAY	16.2	17.8	21.2	24.7	25.6	24.8	24.8	24.7	24.6	24.2	21.7	18.1	1981-2010
BAGO	15.8	17.2	20.2	23.1	23.4	22.7	22.7	22.6	22.8	23.0	20.9	16.9	1981-2010
SHWEGYIN	15.7	17.5	20.8	24.4	24.9	24.1	23.8	23.8	23.8	23.4	20.8	16.8	1981-2010
THARRAWA-DDY	13.3	14.8	17.9	21.8	23.1	23.0	22.7	22.8	22.7	22.3	19.4	15.5	1981-2010
MINGALADON	17.5	18.8	21.2	23.7	24.6	24.2	24.1	23.9	23.9	23.9	22.1	18.7	1981-2010
KABA-AYE	16.7	18.4	21.0	23.8	24.3	23.6	23.2	23.2	23.2	23.1	21.3	17.8	1981-2010
HMAWBI	15.6	17.2	20.3	23.5	24.5	24.2	24.1	24.0	23.9	23.4	21.0	17.2	1981-2010
COCOISLAND	22.0	21.2	22.0	24.3	25.8	25.4	25.0	25.0	24.6	24.4	24.4	23.2	1981-2010
MAUBIN	15.5	16.7	19.1	22.1	23.7	23.8	23.7	23.6	23.5	23.4	21.3	17.5	1981-2010
PATHEIN	17.5	19.2	21.7	24.4	25.2	24.5	24.2	24.1	24.1	24.1	22.2	18.8	1981-2010
MYAUNGMYA	15.0	17.2	19.5	22.0	22.5	22.3	21.9	21.5	21.6	21.5	19.6	16.1	1981-2010
NGATHAING-GYAUNG	14.4	15.8	19.8	23.7	24.8	24.5	24.3	24.3	24.5	24.2	21.4	17.0	1989-2010
HINTHADA	14.4	15.2	18.8	22.5	24.2	23.9	23.8	23.9	23.8	23.4	20.9	16.9	1981-2010
LOIKAW	8.9	11.0	14.8	19.1	20.8	20.9	20.7	20.6	20.4	19.1	15.1	10.5	1981-2010
HPA-AN	17.9	19.3	22.0	24.6	24.5	23.8	23.5	23.5	23.8	23.9	22.0	18.6	1981-2010
KAWKAREIK	17.6	18.2	20.1	22.5	22.9	22.6	22.3	22.2	22.7	22.7	21.4	19.2	1981-2010
MAWLAMYINE	18.4	19.9	22.2	24.7	24.3	23.8	23.6	23.5	23.6	23.6	22.0	19.1	1981-2010
YAY	16.6	17.2	19.0	21.5	22.1	21.9	21.8	21.8	21.6	21.4	19.8	17.5	1981-2010
BILIN	16.5	17.5	20.6	23.4	23.4	23.0	22.7	22.7	22.9	22.9	20.9	17.8	1981-2010
THEINZAYAT	16.8	18.4	22.0	24.7	24.7	24.1	23.7	23.7	23.8	23.8	21.5	17.7	1981-2010
THATON	17.3	19.3	22.4	24.5	24.3	23.5	23.2	23.2	23.4	23.5	21.5	18.2	1981-2010

DAWEI	18.4	19.6	21.2	23.3	23.7	23.2	22.7	22.8	22.7	22.5	20.8	18.2	1981-2010
MYEIK	21.7	22.6	23.7	24.8	24.6	24.1	23.7	23.6	23.6	23.6	22.9	21.4	1981-2010
KAWTHUNG	22.4	23.0	23.8	24.6	24.1	23.6	23.2	23.1	22.7	22.6	22.7	22.2	1981-2010

5.2 Rainfall

Monthly normal rainfall was calculated for different months considering all 78 stations of DMH for the period 1981-2010. The stations which were established after the year 1981, had data ranges less than 30 years. In the winter season there is much less amount of rainfall over Myanmar, but the Northern and Southern parts of the country receive a considerably higher amount of rainfall than other parts of the country. During July and August, the Southern and coastal areas receive heavy to very heavy rainfall because of strong monsoon flow. The Central Myanmar areas receive double maxima rainfall due to onset and withdrawal phase of monsoon.

Table 7: Monthly normal rainfall

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Period
PUTAO	19.0	47.3	104.7	154.4	213.5	719.0	1082.5	943.7	681.4	179.3	24.4	14.0	1981-2010
MYITKYINA	9.9	21.0	24.0	54.0	218.5	549.2	543.0	398.3	294.7	170.6	25.1	11.7	1981-2010
BHAMO	5.4	14.6	15.0	52.6	177.1	344.6	406.0	411.8	217.1	129.0	38.7	7.3	1981-2010
KALEWA	2.9	4.0	17.3	37.6	182.0	272.1	245.6	303.3	346.3	187.5	38.7	4.0	1981-2010
KATHA	6.3	16.0	15.0	51.7	212.4	267.5	260.1	245.8	256.3	148.6	39.5	8.5	1981-2010
MONYWA	1.0	1.2	7.8	25.8	87.4	88.3	50.6	104.1	161.6	113.9	37.3	3.7	1981-2010
HKAMTI	7.6	16.3	20.4	45.8	275.1	865.1	1217.3	849.8	490.5	209.2	30.8	7.4	1981-2010
HOMALIN	6.8	15.1	24.2	45.9	187.1	436.0	521.8	421.2	349.4	181.1	32.3	11.9	1981-2010
MAWLAIK	4.1	7.0	20.3	40.0	156.6	287.2	285.1	320.6	362.6	213.3	41.3	7.0	1981-2010
KALEMYO	4.1	5.0	18.3	38.1	133.6	273.2	322.8	376.7	326.1	166.3	38.5	4.9	1981-2010
MINKIN	2.8	4.0	9.9	31.2	146.2	181.5	178.3	246.6	257.2	174.0	36.6	7.2	1981-2010
TAMU	5.0	14.5	34.3	65.7	189.9	403.1	461.2	411.8	368.0	202.8	38.6	10.2	1981-2010

KYEEMON	0.1	1.8	4.2	24.3	71.5	90.1	55.7	101.5	141.7	109.6	29.3	3.4	1981-2010
PINLEBU	2.0	9.7	15.5	45.9	181.7	275.0	241.9	235.2	275.8	186.8	23.9	6.4	1981-2010
YE OO	2.7	2.8	6.2	25.2	118.9	147.2	92.9	153.6	203.4	153.6	28.4	3.1	1981-2010
SHWEBO	1.2	3.2	7.7	22.5	101.3	130.4	93.1	149.4	158.9	128.6	28.5	3.9	1981-2010
SAGAING	1.0	4.6	5.0	39.4	142.6	99.0	69.8	126.1	153.0	124.3	32.0	6.0	1981-2010
MYINMU	0.9	4.3	4.4	22.9	111.8	90.1	67.7	116.2	160.6	116.9	25.7	3.0	1983-2010
KENGTUNG	3.2	4.7	7.1	41.9	168.4	163.6	158.1	253.2	293.4	184.0	60.6	8.1	1981-2010
HSIPAW	7.3	21.5	30.1	65.8	159.9	183.3	329.3	336.3	194.3	78.6	48.6	12.6	1981-2010
TAUNGGYI	1.0	5.3	9.6	47.3	154.7	116.2	113.1	174.8	185.4	133.9	61.6	7.1	1981-2010
LASHIO	2.7	5.9	9.6	57.1	171.9	178.3	213.0	290.9	280.7	175.6	75.5	10.0	1981-2010
KYAUKME	6.5	9.3	12.9	62.3	252.4	418.4	429.9	391.2	262.1	176.1	79.4	13.7	1983-2010
PINLAUNG	2.7	5.9	9.6	57.1	171.9	178.3	213.0	290.9	280.7	175.6	75.5	10.0	1981-2010
LOILEM	6.5	9.3	12.9	62.3	252.4	418.4	429.9	391.2	262.1	176.1	79.4	13.7	1981-2010
MONG-HSAT	3.2	4.7	7.1	41.9	168.4	163.6	158.1	253.2	293.4	184.0	60.6	8.1	1981-2010
HEHO	7.3	21.5	30.1	65.8	159.9	183.3	329.3	336.3	194.3	78.6	48.6	12.6	1981-2010
HAKHA	10.0	13.1	33.7	70.2	190.8	243.4	320.8	342.3	328.8	209.1	47.1	15.2	1989-2010
FALAM	8.4	11.5	33.0	78.9	161.0	229.7	255.2	261.8	224.3	139.1	53.1	11.2	1981-2010
MINDAT	3.0	6.3	13.0	33.9	169.7	188.8	180.6	287.4	318.8	202.6	57.3	9.6	1981-2010
VARR	5.7	7.6	27.8	58.3	108.5	116.6	145.8	130.6	129.5	89.2	32.8	7.1	1981-2010
MANDALAY	0.9	3.8	5.8	40.4	130.0	99.5	74.7	132.9	157.1	130.7	36.4	4.9	1981-2010
MOEKOK	6.8	11.8	22.0	77.4	362.7	493.3	511.3	479.6	337.3	286.1	85.8	17.0	1982-2010
MEIKHTILA	2.3	1.8	10.0	25.5	126.4	103.8	75.4	121.0	150.6	147.4	41.5	7.2	1981-2010
MYINGYAN	1.2	2.5	2.9	17.6	91.4	85.1	57.2	105.8	151.7	101.6	25.8	3.6	1981-2010
LUNKYAW	0.3	3.2	9.4	30.1	118.5	68.8	67.4	85.7	133.1	111.8	48.0	6.3	1981-2010

NYAUNGOO	1.1	2.2	5.1	22.7	94.7	83.8	34.7	85.9	134.0	114.5	36.5	3.7	1981-2010
YAMETHIN	1.7	2.6	8.8	25.1	136.0	104.8	96.8	117.1	152.4	140.2	48.8	9.3	1981-2010
PYINMANA	2.2	5.0	3.9	36.3	156.5	209.1	227.7	263.0	177.0	167.0	50.4	4.8	1981-2010
HLAINGTAT	1.9	2.6	6.2	33.1	142.5	85.2	82.2	124.3	161.9	144.6	62.9	9.6	1981-2010
YEZIN	2.1	5.8	4.2	29.6	147.6	184.7	213.2	256.5	174.9	123.7	39.6	6.9	1983-2010
MAGWAY	1.4	2.4	5.0	18.9	105.4	141.0	100.2	132.0	163.8	132.3	51.1	6.2	1981-2010
MINBU	1.0	1.6	4.7	16.0	95.6	121.0	90.0	126.0	145.4	118.4	42.9	4.5	1981-2010
PAKOKKU	0.9	0.3	3.9	11.1	88.2	89.7	38.2	90.6	117.8	132.0	29.6	4.0	1981-2010
GANGAW	2.0	4.7	10.7	31.1	136.5	183.6	153.2	230.2	215.1	173.4	42.5	6.9	1981-2010
CHAUK	0.4	2.0	2.9	17.8	84.1	138.0	55.6	127.8	167.5	158.2	53.9	5.2	1981-2010
SINPHYU-GYUNG	0.2	1.6	4.2	13.2	84.2	106.3	53.7	88.8	126.9	111.5	35.9	3.6	1981-2010
SITTWE	0.9	13.3	8.4	35.6	307.5	1168.1	1280.5	965.2	549.0	288.7	116.3	15.1	1981-2010
THANDWE	2.6	6.7	4.3	16.6	341.7	1277.6	1390.2	1374.7	675.5	204.6	74.0	11.2	1981-2010
MYAUKOO	4.6	8.1	14.2	52.3	286.1	867.4	1002.5	788.2	355.3	187.1	57.9	10.7	1981-2010
KYAUKPYU	1.1	6.4	20.8	24.5	347.0	1073.1	1248.4	1054.5	540.2	261.6	109.3	16.9	1981-2010
MANAUNG	1.4	4.1	2.9	20.7	313.4	1070.1	1300.0	1086.9	635.7	275.3	106.7	11.4	1981-2010
GWA	1.6	0.7	3.1	19.0	335.2	1016.5	1189.0	1162.5	587.8	197.3	49.4	6.8	1982-2010
TAUNGOO	2.6	4.0	7.3	32.6	204.3	355.9	417.7	451.7	282.5	149.9	48.0	2.6	1981-2010
PYAY	1.5	0.9	5.1	27.3	145.1	234.8	198.0	227.5	205.7	124.0	56.0	1.5	1981-2010
BAGO	1.3	2.7	13.5	44.1	333.9	654.0	716.9	653.4	436.3	183.7	48.7	1.3	1981-2010
SHWEGYIN	1.6	3.7	6.8	46.2	247.8	656.2	797.9	837.9	424.0	197.6	39.2	1.6	1981-2010
THARRAWA-DDY	0.9	3.0	3.5	24.2	212.8	485.5	516.1	448.2	318.2	154.0	60.6	0.9	1981-2010
MINGALADON	0.5	3.1	8.9	34.3	288.6	537.3	565.8	530.8	383.2	195.8	68.4	4.3	1981-2010
KABA-AYE	0.4	3.1	12.4	37.8	328.1	565.6	605.8	570.7	393.7	200.3	58.6	6.8	1981-2010

HMAWBI	2.2	3.5	7.2	28.2	281.3	526.4	540.7	534.8	349.4	164.3	57.8	5.4	1981-2010
COCO ISLAND	2.2	5.2	13.2	37.0	240.0	456.3	418.3	438.8	380.2	184.3	138.3	23.0	1981-2010
MAUBIN	1.3	3.6	8.9	38.2	280.3	494.5	535.9	514.2	338.2	186.3	68.5	7.8	1981-2010
PATHEIN	1.8	9.4	7.4	26.9	275.5	605.7	646.9	636.2	385.0	205.6	80.3	7.0	1981-2010
MYAUNG-MYA	0.3	2.6	5.7	26.7	277.0	577.1	617.7	650.9	396.8	197.6	88.1	8.9	1981-2010
NGATHAI-GYAUNG	1.3	2.3	4.8	25.6	232.5	517.2	607.2	572.8	328.7	161.8	22.0	4.5	1989-2010
HINTHADA	7.1	30.4	23.4	25.8	207.5	522.5	519.8	481.8	316.6	155.4	62.9	7.2	1981-2010
LOIKAW	5.1	3.1	10.0	37.7	139.6	135.7	146.5	210.5	194.2	109.4	46.2	7.9	1981-2010
HPA-AN	1.2	3.6	12.6	45.7	376.9	872.4	1047.2	1097.2	577.0	193.1	40.7	16.3	1981-2010
KAWKAREIK	3.5	9.6	22.6	73.8	407.5	833.2	1049.4	1105.7	616.6	234.2	33.7	7.1	1981-2010
MAWLAMYINE	2.2	6.0	17.4	117.2	517.7	988.9	1183.5	1227.0	632.6	214.9	46.1	16.3	1981-2010
YAY	3.2	16.8	24.0	84.9	528.9	1111.3	1171.6	1320.5	687.9	285.3	57.0	23.7	1981-2010
BILIN	1.1	9.1	16.4	63.8	478.3	1081.1	1270.2	1200.7	684.8	230.5	44.0	7.1	1981-2010
THEINZAYAT	3.1	6.6	8.4	43.2	351.2	716.2	878.4	871.6	485.7	204.8	31.5	6.3	1981-2010
THATON	1.4	4.1	18.4	80.5	555.8	1036.4	1213.8	1245.0	739.1	258.3	55.9	13.4	1981-2010
DAWEI	5.8	16.6	39.5	115.3	536.3	1099.4	1201.4	1310.4	707.3	355.8	44.5	7.6	1981-2010
MYEIK	26.3	41.7	55.4	106.0	444.3	748.4	713.7	894.9	514.6	313.3	65.5	19.1	1981-2010
KAWTHUNG	6.7	8.0	52.6	106.6	542.8	686.1	651.8	754.6	685.2	480.4	158.3	40.3	1981-2010

6 Frequency of common weather in Myanmar

6.1 Temperature

6.1.1 Minimum Temperature

The number of days of minimum temperature for several temperature ranges i.e. less than 6°C, 6-8°C, 8-10°C, 10-15°C, 15-20°C, 20-25°C and greater than 25°C were calculated and this operation was carried out for all the stations and all months for the period of 1981-2010. Table 8 to Table 16 show the results for different cities representing the states and regions of Myanmar, namely Myitkyina, Monywa, Patheingyi, Sittwe, Taunggyi, Hkamti, Magway, Mawlamyine and Hakha. The results for the rest of the weather stations of Myanmar are presented in the **Appendix**. During the study period 1981-2010, some of the stations have missing data.

The number of days of minimum temperature that range less than 6°C, i.e. severe cold days, were highest in the Northwestern, Eastern, Northern, Western and Central area of the country. This range of temperature mostly occur in the month of January and a very few days in February. The number of days in the range less than 6°C were Hakha (558 days), Taunggyi (131 days), Hkamti (25 days), Magway (9 days), and Myitkyina (1 day) in the month of January and Hakha (390 days), Taunggyi (26 days), Magway (5 days), and Hkamti (3 days) in the month of February.

In the month of January moderate cold days (6-8°C) had maximum frequency in the Northern, Northwestern, Western, Eastern, and Central area of the country and highest number of days occurred over Taunggyi (362 days), Loikaw (209 days), Hkamti (202 days) and Hakha (89 days), Myitkyina (85 days) and Magway (61 days).

Cold days had maximum frequency in the month of January, as it is the coldest month over Myanmar. The number of days in the minimum temperature range 8-10 °C was

highest over Myitkyina (376 days), Hkamti (300 days), Taunggyi (294 days) and Magway (204 days).

The frequency of days in the minimum temperature range 20°-25°C was higher for the months April and May to October. Most of the stations among 15 stations, which had high frequency of number of days for the minimum temperature range 20°- 25°C, observed it in the months February to November. Also the number of days for minimum temperature range (15°-20°C) was the second high frequency number of days in the month of January to December over the country.

Table 8: Number of minimum temperature days at Myitkyina, duration: 1981-2010

Minimum temp	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	1	-	-	-	-	-	-	-	-	-	-	1	2
6° - 8°	85	8	-	-	-	-	-	-	-	-	-	40	133
8° - 10°	376	75	1	-	-	-	-	-	-	-	1	170	623
10° - 15°	451	657	291	8	-	-	-	-	-	-	310	664	2381
15° - 20°	17	106	594	515	114	-	-	2	6	258	549	55	2216
20° - 25°	-	-	44	375	784	751	714	697	780	664	40	-	4849
Greater than 25°	-	-	-	2	32	149	216	231	99	8	-	-	737

Table 9: Number of minimum temperature days at Monywa, duration: 1981-2010

Minimum temp	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	-	-	-	-	-	-	-	-	-	-	-	-	0
6° - 8°	2	-	-	-	-	-	-	-	-	-	-	-	2
8° - 10°	22	-	-	-	-	-	-	-	-	-	-	32	54
10° - 15°	746	397	67	-	-	-	-	-	-	-	39	481	1730
15° - 20°	157	439	522	88	2	-	-	-	1	43	503	396	2151
20° - 25°	1	11	338	616	400	260	228	320	526	755	358	21	3834
Greater than 25°	-	-	3	192	520	639	701	610	373	132	-	-	3170

Table 10: Number of minimum temperature days at Patheingyi, duration: 1981-2010

Minimum temp	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	-	-	-	-	-	-	-	-	-	-	-	-	0
6° - 8°	-	-	-	-	-	-	-	-	-	-	-	-	0
8° - 10°	-	-	-	-	-	-	-	-	-	-	-	1	1
10° - 15°	124	32	1	-	-	-	-	-	-	-	1	42	200
15° - 20°	731	569	188	5	6	12	18	27	48	35	136	631	2406
20° - 25°	74	245	740	643	414	624	732	732	698	756	724	255	6637
Greater than 25°	1	1	1	252	510	264	180	171	154	139	9	1	1683

Table 11: Number of minimum temperature days at Sittwe, duration: 1981-2010

Minimum temp	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	-	-	-	-	-	-	-	-	-	-	-	-	0
6° - 8°	-	-	-	-	-	-	-	-	-	-	-	-	0
8° - 10°	5	3	-	-	-	-	-	-	-	-	-	1	9
10° - 15°	496	228	27	-	-	-	-	-	-	-	6	197	954
15° - 20°	395	540	417	35	6	1	-	-	1	13	308	604	2320
20° - 25°	3	48	480	616	405	577	705	700	665	767	574	97	5637
Greater than 25°	-	-	5	219	488	322	225	230	234	150	12	-	1885

Table 12: Number of minimum temperature days at Taunggyi, duration: 1981-2010

Minimum temp	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	131	26	-	-	-	-	-	-	-	-	4	79	240
6° - 8°	362	157	6	-	-	-	-	-	-	-	43	266	834
8° - 10°	294	261	70	-	-	-	-	-	-	2	96	246	969
10° - 15°	139	364	643	227	50	1	9	-	35	259	570	296	2593
15° - 20°	4	11	211	672	865	896	916	929	864	668	157	12	6205
20° - 25°	-	-	-	1	15	3	5	1	1	1	-	-	27
Greater than 25°	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 13: Number of minimum temperature days at Hkamti, duration: 1981-2010

Minimum temp	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	25	3	-	-	-	-	-	-	-	-	-	2	30
6° - 8°	202	27	-	-	-	-	-	-	-	2	-	82	313
8° - 10°	300	119	1	-	-	-	-	-	-	2	8	202	632
10° - 15°	308	507	302	20	-	-	-	-	-	2	290	451	1880
15° - 20°	64	160	534	458	78	-	-	-	3	184	449	91	2021
20° - 25°	-	3	61	375	754	762	788	725	767	661	92	9	4997
Greater than 25°	-	-	-	17	67	108	111	174	70	17	1	-	565

Table 14: Number of minimum temperature days at Magway, duration: 1981-2010

Minimum temp	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	9	5	-	-	-	-	-	-	-	-	-	-	14
6° - 8°	61	7	-	-	-	-	-	-	-	-	-	2	70
8° - 10°	204	72	1	-	-	-	-	-	-	-	-	100	377
10° - 15°	577	506	143	6	-	-	-	-	-	-	114	565	1911
15° - 20°	48	218	591	156	30	20	13	12	23	138	575	258	2082
20° - 25°	-	11	192	645	642	812	875	874	852	776	211	5	5895
Greater than 25°	-	-	3	93	258	68	42	44	25	16	-	-	549

Table 15: Number of minimum temperature days at Mawlamyine, duration: 1981-2010

Minimum temp	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	-	-	-	-	-	-	-	-	-	-	-	-	0
6° - 8°	-	-	-	-	-	-	-	-	-	-	-	-	0
8° - 10°	-	-	-	-	-	-	-	-	-	-	-	6	6
10° - 15°	77	25	12	-	1	-	-	-	-	1	5	49	170
15° - 20°	654	423	120	8	5	-	11	2	3	24	165	581	1996
20° - 25°	194	367	741	543	663	787	843	893	858	905	717	294	7805
Greater than 25°	3	13	57	349	261	97	72	35	39	-	13	-	939

Table 16: Number of minimum temperature days at Hakha, duration: 1989-2010

Minimum temp	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	558	390	158	10	-	-	-	-	-	7	250	568	1941
6° - 8°	89	117	178	68	1	1	-	-	-	26	131	68	679
8° - 10°	31	70	151	178	36	-	-	-	1	81	89	31	668
10° - 15°	4	44	183	374	462	208	152	172	307	483	156	14	2559
15° - 20°	-	-	12	30	183	450	529	478	322	54	4	-	2062
20° - 25°	-	-	-	-	-	-	1	1	-	-	-	-	2
Greater than 25°	-	-	-	-	-	-	-	-	-	-	-	-	0

6.1.2 Maximum Temperature

The same operation as for minimum temperature was carried out for maximum temperature and the temperature ranges are: Greater than 40°C, 38°- 40°C, 36° - 38°C, 30° -36°C, 25°- 30°C, 20° -25°C and less than 20°C for the whole year and for all stations. During the study period 1981-2010, some of the stations have missing data. Table 17 to Table 25 show the results for regions and state cities, the rest of the weather stations are presented in the **Appendix**.

It is seen that the number of moderate to severe hot days, i.e. maximum temperature range greater than 40°C, were higher in the months of April-May and for this reason April and May are the hottest months over Myanmar. That range of temperature occurred in the South-Eastern and Central part of the country. The number of severe hot days was highest at Magway (625 days in April, 340 days in May and 228 days in March), at Monywa (368 days in April, 275 days in May and 48 days in March) and at Mandalay (324 days in April, 171 days in May and 46 days in March).

Most of the stations among 15 stations had high frequency number of days for maximum temperature range 30-36°C was observed in the months February to November respectively. Also the number of days for maximum temperature range 25-30 °C was the second high frequency number of days in the month of January to December over the country except Monywa, Taunggyi, Hkamti, Lashio and Kengtung stations in the month of January to December over the country.

Table 17: Number of maximum temperature days at Myitkyina, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	-	-	2	2	-	-	-	-	-	-	4
38° - 40°	-	-	-	17	36	10	-	2	-	-	-	-	65
36° - 38°	-	-	9	120	140	17	4	25	15	6	-	-	336
30° - 36°	-	143	565	561	541	574	516	614	612	586	175	1	4888
25° - 30°	551	523	275	164	195	282	395	282	244	260	630	625	4426
20° - 25°	354	158	75	35	16	15	15	7	16	47	79	289	1106
Less than 20°	25	23	6	3	-	-	-	-	-	-	5	15	77

Table 18: Number of maximum temperature days at Monywa, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	48	368	275	46	21	-	-	-	-	-	758
38° - 40°	-	-	213	279	199	138	136	61	9	3	5	-	1043
36° - 38°	1	66	312	132	184	261	265	198	115	37	601	-	2172
30° - 36°	274	617	330	108	247	437	494	645	722	780	257	175	5086
25° - 30°	638	157	25	13	24	14	11	26	53	101	37	726	1825
20° - 25°	14	6	1	-	-	2	-	-	1	9	-	27	60
Less than 20°	2	-	1	-	-	-	-	-	-	-	-	1	4

Table 19: Number of maximum temperature days at Pathein, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	2	13	11	-	-	-	-	-	-	-	26
38° - 40°	-	2	50	127	53	-	-	-	-	-	-	-	232
36° - 38°	2	72	273	390	181	1	-	443	4	9	4	-	1379
30° - 36°	741	728	600	360	577	543	460	483	594	771	733	636	7226
25° - 30°	185	44	5	10	107	352	469	4	300	149	125	293	2043
20° - 25°	2	1	-	-	1	4	1	-	2	1	8	1	21
Less than 20°	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 20: Number of maximum temperature days at Sittwe, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	-	-	-	-	-	-	-	-	-	-	0
38° - 40°	-	-	-	-	-	-	-	-	-	-	-	-	0
36° - 38°	-	-	5	8	8	-	-	-	-	-	-	-	21
30° - 36°	71	354	783	841	776	383	229	267	512	757	594	163	5730
25° - 30°	805	447	136	20	114	512	676	659	388	172	294	720	4943
20° - 25°	23	18	6	1	1	5	25	4	-	1	12	16	112
Less than 20°	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 21: Number of maximum temperature days at Taunggyi, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	-	-	-	-	-	-	-	-	-	-	0
38° - 40°	-	-	-	-	-	-	-	-	-	-	-	-	0
36° - 38°	-	-	-	-	-	-	-	-	-	-	-	-	0
30° - 36°	-	4	137	364	81	3	-	-	-	1	-	-	590
25° - 30°	180	416	715	492	624	397	270	235	341	398	221	97	4386
20° - 25°	714	368	72	40	220	498	625	684	556	521	604	736	5638
Less than 20°	36	31	6	4	5	2	35	11	3	10	45	66	254

Table 22: Number of maximum temperature days at Hkamti, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	-	-	5	2	-	-	-	-	-	-	7
38° - 40°	-	-	-	8	53	13	1	4	1	-	-	-	80
36° - 38°	-	-	8	92	104	25	10	29	35	7	-	-	310
30° - 36°	6	83	499	549	494	419	319	453	501	584	202	9	4118
25° - 30°	386	532	292	147	181	378	529	377	266	232	574	436	4330
20° - 25°	454	152	61	44	29	2	8	5	18	43	60	370	1246
Less than 20°	27	23	8	-	2	1	-	-	-	2	4	22	89

Table 23: Number of maximum temperature days at Magway, duration: 1980-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	8	228	625	340	19	1	-	-	-	-	-	1221
38° - 40°	-	36	352	162	197	68	14	2	3	2	3	-	839
36° - 38°	-	153	243	71	140	117	75	59	95	109	13	-	1075
30° - 36°	543	575	98	38	201	610	787	787	732	716	659	388	6134
25° - 30°	353	37	7	4	49	86	53	82	69	100	193	516	1549
20° - 25°	3	10	2	-	3	-	-	-	1	3	32	24	78
Less than 20°	-	-	-	-	-	-	-	-	-	-	-	2	2

Table 24: Number of maximum temperature days at Mawlamyine, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	-	-	1	-	-	-	-	-	-	-	1
38° - 40°	-	-	40	63	17	-	-	-	-	-	-	-	120
36° - 38°	4	111	266	309	93	-	-	2	-	-	18	4	807
30° - 36°	861	701	615	518	609	333	205	193	450	825	795	787	6892
25° - 30°	64	27	9	10	209	565	718	719	441	101	84	137	3084
20° - 25°	1	8	-	-	1	2	7	16	9	4	3	2	53
Less than 20°	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 25: Number of maximum temperature days at Hakha, duration: 1989-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	-	-	-	-	-	-	-	-	-	-	0
38° - 40°	-	-	-	-	-	-	-	-	-	-	-	-	0
36° - 38°	-	-	-	-	-	-	-	-	-	-	-	-	0
30° - 36°	-	-	-	8	3	-	-	-	-	-	-	-	11
25° - 30°	-	20	114	340	241	102	21	28	26	19	2	-	913
20° - 25°	251	326	494	283	377	512	605	562	529	519	303	170	4931
Less than 20°	431	275	74	29	61	46	56	92	105	144	355	512	2180

6.2 Rainfall

For rainfall all 15 stations of DMH were considered. The number of rainy days for different rainfall ranges, i.e. light rain, moderate rain, moderately heavy rain, heavy rainfall etc, were calculated for all stations. Table 26 to Table 31 show the results for the weather stations representing the states and regions of Myanmar during the study period 1981-2010.

When the monsoon season is onset, rainfall increases for the rest of the season all over the country. During the months May to October the frequency of “moderately heavy” to “heavy” rainfall days are highest over the country. In the southwest monsoon season, heavy to very heavy rainfall days are the most frequent in the month of May and June in the coastal area of the country. “Extremely heavy rainy days” were recorded at Mawlamyine in July (481 mm rainfall on 16.6.2004, 344mm on 25.8.1994, 300mm on 23.5.2004) and at other stations, such as Kaba-Aye (344mm on 5.5.2007) and Sittwe (323 mm on 21.6.1994). One of the highest recorded rainfall amounts of 344 mm was observed at Yangon, Kaba-Aye on 5.5.2007 during a period of 39 years.

Table 26: Frequency of rainy days over Myitkyina for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	879	739	796	704	518	209	150	307	416	622	819	870	7029
Light rain 1-10	45	99	114	152	230	284	353	307	254	165	54	51	2108
Moderate rain 11-22	5	6	17	30	99	158	178	136	96	58	18	8	809
Moderate heavy 23-43	1	2	3	9	53	139	146	105	78	58	8	-	602
Heavy rain 44-88	-	1	-	5	21	82	84	64	47	22	1	1	328
Very heavy rain > 89	-	-	-	-	3	15	4	3	4	1	-	-	30
Very heavy rain 100-199	-	-	-	-	6	12	15	8	5	4	-	-	50
Very heavy rain 200-299	-	-	-	-	-	1	-	-	-	-	-	-	1
Very heavy rain > 300	-	-	-	-	-	-	-	-	-	-	-	-	0

*3rd June 2001 --- 233 mm rainfall

Table 27: Frequency of rainy days over Kaba-Aye for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	926	814	874	796	442	124	114	100	233	513	773	913	6622
Light rain 1-10	4	3	15	51	199	311	313	344	317	240	81	9	1887
Moderate rain 11-22	-	1	2	12	113	192	191	198	137	89	30	5	970
Moderate heavy 23-43	-	-	7	6	83	165	191	183	124	60	8	3	830
Heavy rain 44-88	-	1	1	1	57	94	109	96	51	25	5	-	440
Very heavy rain > 89	-	-	-	2	1	7	3	3	1	1	1	-	19
Very heavy rain 100-199	-	-	-	2	2	7	9	6	6	2	2	-	36
Very heavy rain 200-299	-	-	-	-	1	-	-	-	1	-	-	-	2
Very heavy rain > 300	-	-	-	-	1	-	-	-	-	-	-	-	1

*22nd September 2007--- 243mm, *3rd May 2008--- 244mm & *5 May 2007--- 344mm

Table 28: Frequency of rainy days over Mawlamyine for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	920	830	828	698	350	74	92	80	230	582	807	912	920
Light rain 1-10	8	12	34	93	228	206	186	186	262	191	55	6	8
Moderate rain 11-22	2	2	7	39	143	174	157	136	130	75	21	6	2
Moderate heavy 23-43	-	3	7	23	102	200	171	177	125	47	10	2	-
Heavy rain 44-88	-	-	1	9	76	177	197	216	118	23	5	3	-
Very heavy rain > 89	-	-	-	1	7	25	26	24	9	2	1	-	-
Very heavy rain 100-199	-	-	-	6	17	41	59	76	23	9	1	1	-
Very heavy rain 200-299	-	-	-	1	7	2	11	3	3	1	-	-	-
Very heavy rain > 300	-	-	-	-	-	1	-	1	-	-	-	-	-

*23rd May 2004 ----300 mm, * 16 June 2004 ---481 mm, * 25 August 1994 ---- 344 mm

Table 29: Frequency of rainy days over Sittwe for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	863	790	906	800	532	143	83	104	278	606	773	873	6751
Light rain 1-10	4	21	17	42	154	181	186	249	247	160	55	16	1332
Moderate rain 11-22	1	5	4	16	77	123	135	156	132	46	23	3	721
Moderate heavy 23-43	-	2	2	8	68	172	182	171	112	56	20	4	797
Heavy rain 44-88	-	2	1	3	52	165	223	182	98	43	20	2	791
Very heavy rain > 89	-	-	-	-	6	24	26	20	13	6	1	1	97
Very heavy rain 100-199	-	-	-	2	7	76	89	41	18	10	8	-	251
Very heavy rain 200-299	-	-	-	-	2	15	6	7	2	3	-	-	35
Very heavy rain > 300	-	-	-	-	-	1	-	-	-	-	-	-	1

**21st June 1994 --- 323 mm

Table 30: Frequency of rainy days over Taunggyi for different ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	918	821	883	732	472	303	254	196	280	505	689	866	6919
Light rain 1-10	9	21	41	115	294	424	477	458	357	258	112	24	2590
Moderate rain 11-22	3	3	4	38	101	110	124	164	143	102	37	6	835
Moderate heavy 23-43	-	1	2	12	45	53	60	79	80	46	21	2	401
Heavy rain 44-88	-	1	-	2	18	10	15	31	37	17	11	1	143
Very heavy rain > 89	-	-	-	-	-	-	-	1	-	1	-	-	2
Very heavy rain 100-199	-	-	-	-	-	-	-	1	2	1	-	-	4
Very heavy rain 200-299	-	-	-	-	-	-	-	-	-	-	-	-	0
Very heavy rain > 300	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 31: Frequency of rainy days over Mandalay for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	923	832	903	774	626	660	691	617	571	675	805	882	8959
Light rain 1-10	5	13	23	89	191	163	156	212	206	145	65	14	1282
Moderate rain 11-22	1	2	2	21	51	40	25	48	61	57	12	1	321
Moderate heavy 23-43	-	1	2	12	44	42	16	28	38	32	13	2	230
Heavy rain 44-88	-	-	-	4	18	11	8	21	20	17	5	-	104
Very heavy rain > 89	-	-	-	-	-	-	1	-	2	2	-	-	5
Very heavy rain 100-199	-	-	-	-	-	-	2	4	1	2	-	-	9
Very heavy rain 200-299	-	-	-	-	-	1	-	-	1	-	-	-	2
Very heavy rain > 300	-	-	-	-	-	-	-	-	-	-	-	-	0

** 14 June 2007 --- 259 mm &** 29 September 1997 --- 217 mm

7 Wind roses for different season in Myanmar

Wind roses from 15 stations of DMH were calculated for different seasons. Figure 5 to Figure 19 show the results for the wind direction and speed representing the states and regions of Myanmar during the study period 2001-2010. During the pre-monsoon months of onset date to June, the wind blew Southeast, South and Southwest direction over the country. In the Southwest monsoon months of July and August, the wind blew South and Southwest direction and in the post monsoon months of September to withdrawal date, the wind blew from North and Northeast direction over the country. For the wind speed, the coastal areas have stronger wind than the inland areas and also stronger wind prevailed monsoon season than the pre and post monsoon. Figures of wind roses for regions and state cities are given below and others figures are listed in the **Appendix**.

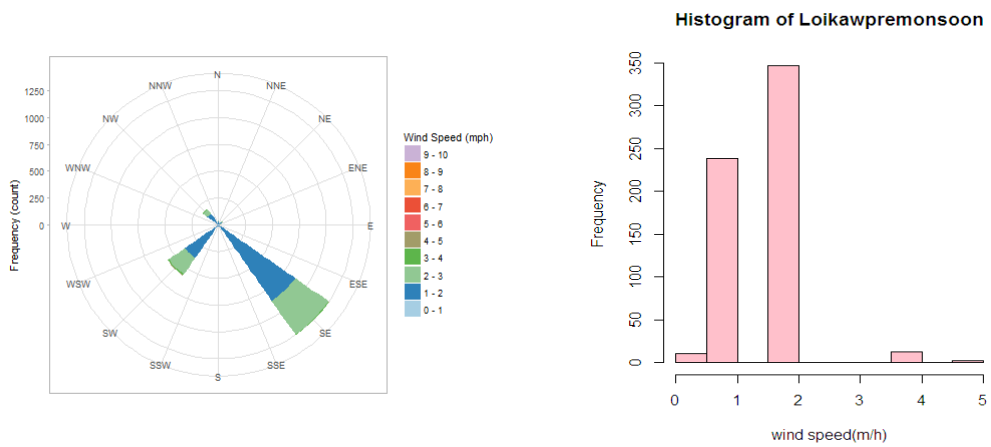


Figure 5: Loikaw: Wind rose and frequency of wind speed for pre-monsoon season

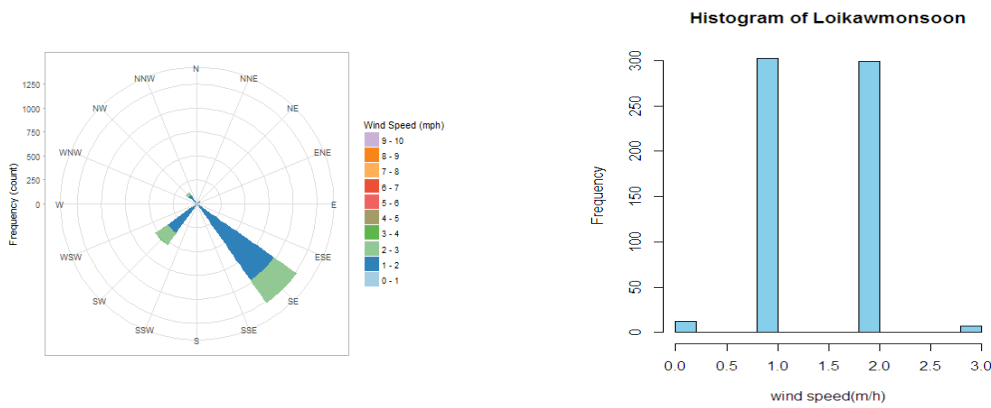


Figure 6: Loikaw: Wind rose and frequency of wind speed for monsoon season

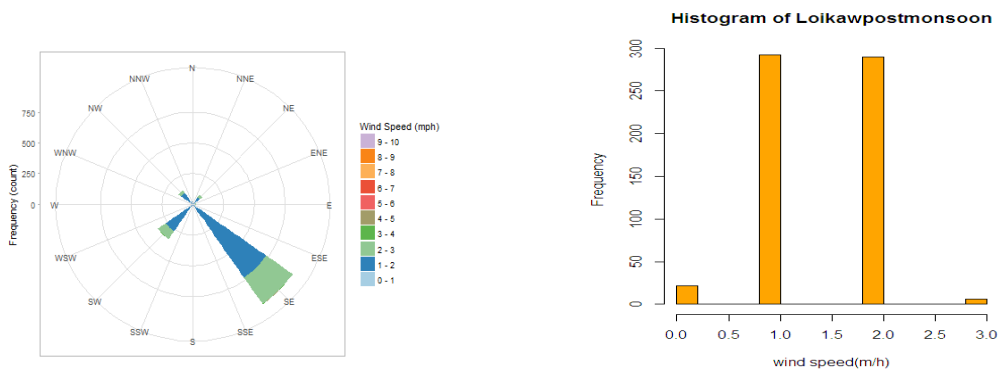


Figure 7: Loikaw: Wind rose and frequency of wind speed for post-monsoon season

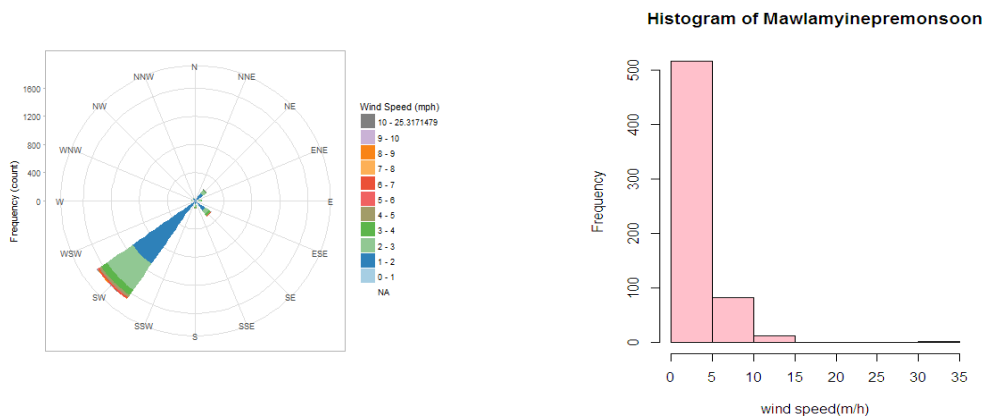


Figure 8: Mawlamyine: Wind rose and frequency of wind speed for pre-monsoon season

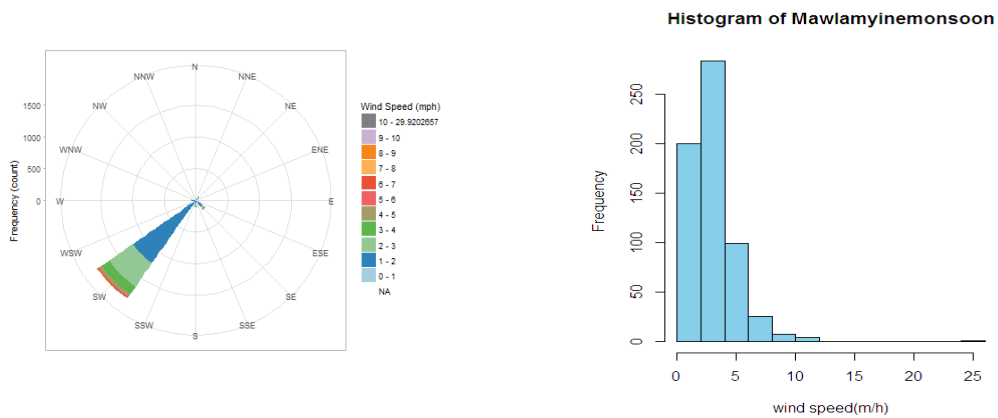


Figure 9: Mawlamyine: Wind rose and frequency of wind speed for monsoon season

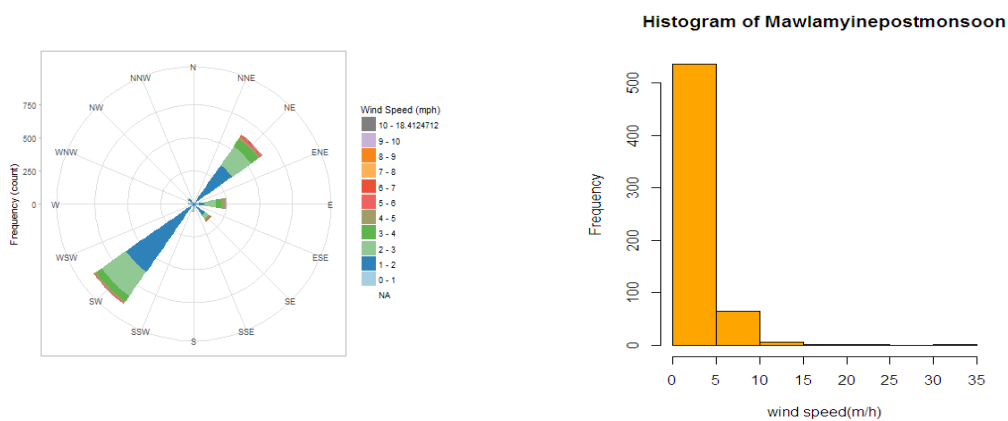


Figure 10: Mawlamyine: Wind rose and frequency of wind speed for post-monsoon season

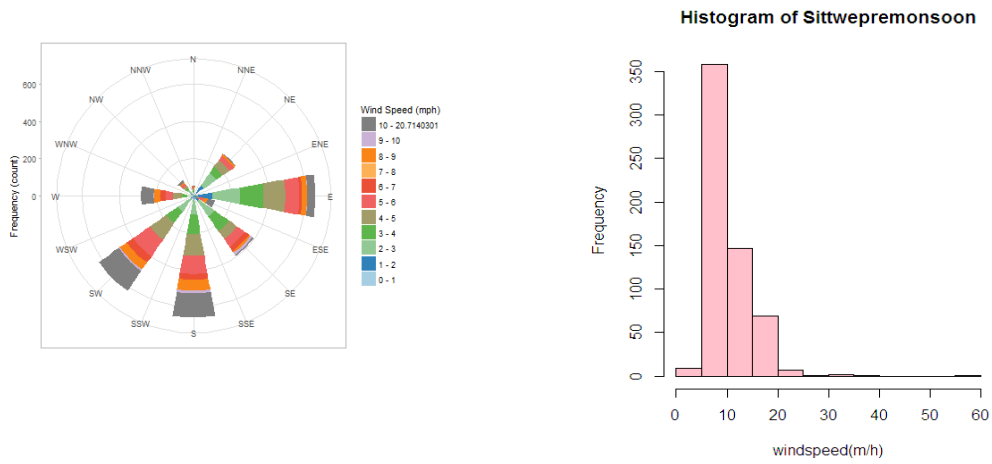


Figure 11: Sittwe: Wind rose and frequency of wind speed for pre-monsoon season

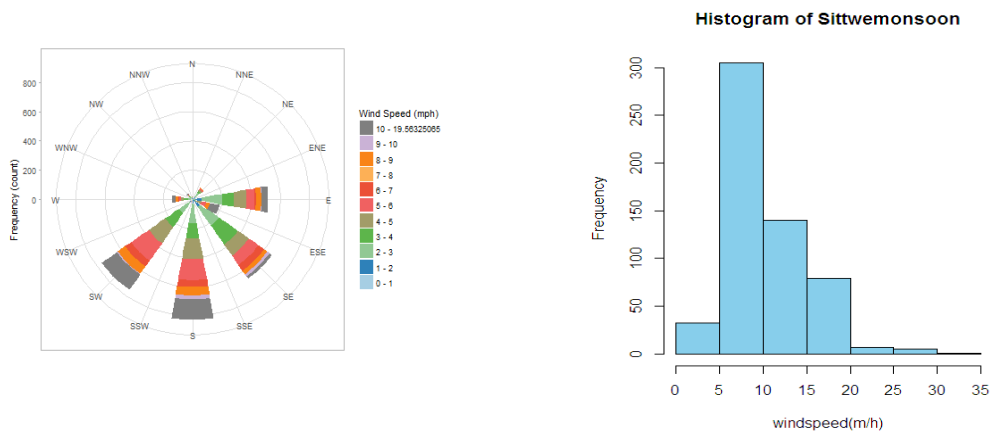


Figure 12: Sittwe: Wind rose and frequency of wind speed for monsoon season

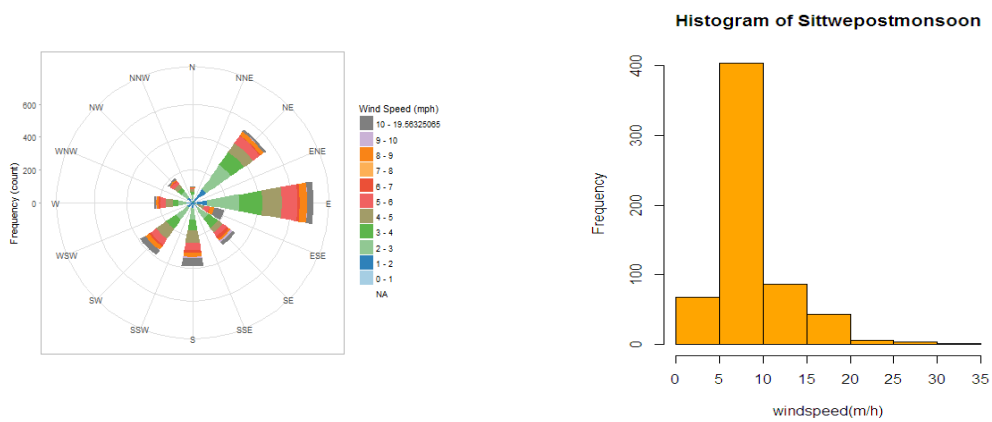


Figure 13: Sittwe: Wind rose and frequency of wind speed for post-monsoon season

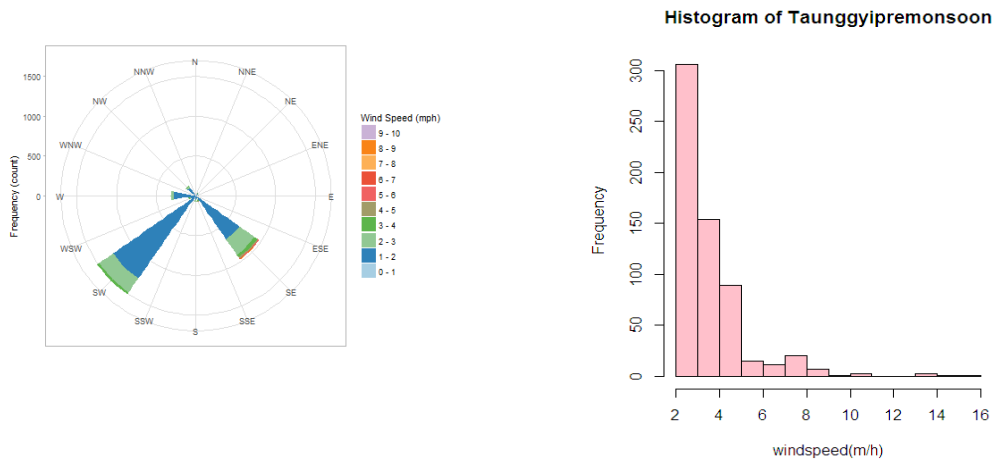


Figure 14: Taunggyi: Wind rose and frequency of wind speed for pre-monsoon season

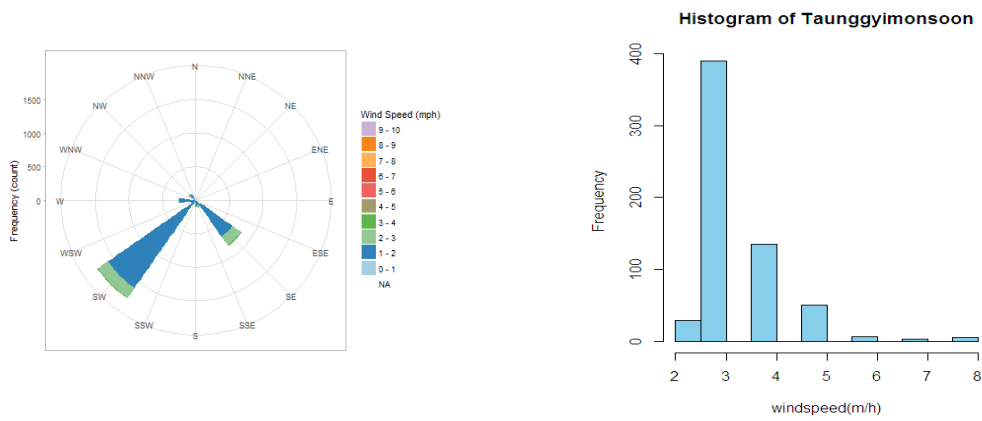


Figure 15: Taunggyi: Wind rose and frequency of wind speed for monsoon season

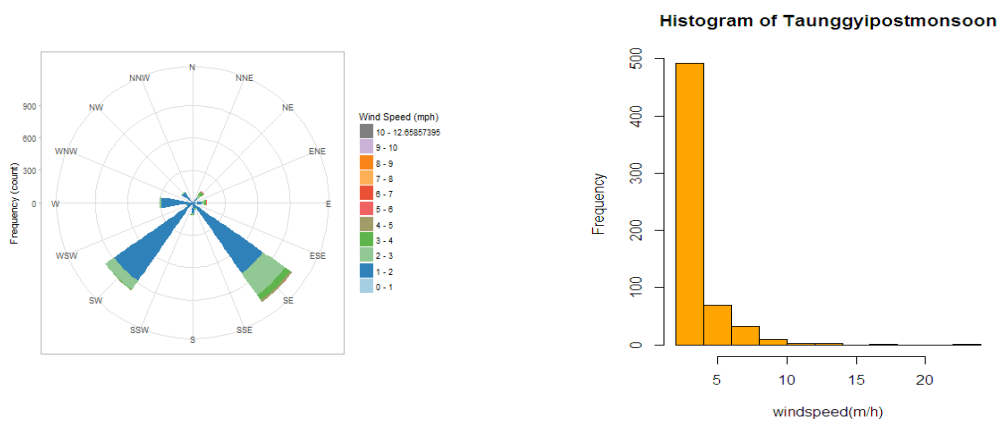


Figure 16: Taunggyi: Wind rose and frequency of wind speed for post-monsoon season

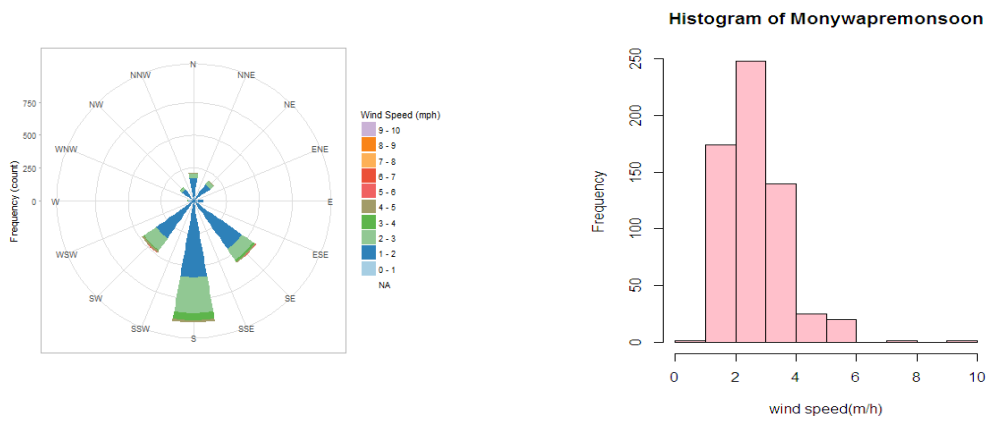


Figure 17: Monywa: Wind rose and frequency of wind speed for pre-monsoon season

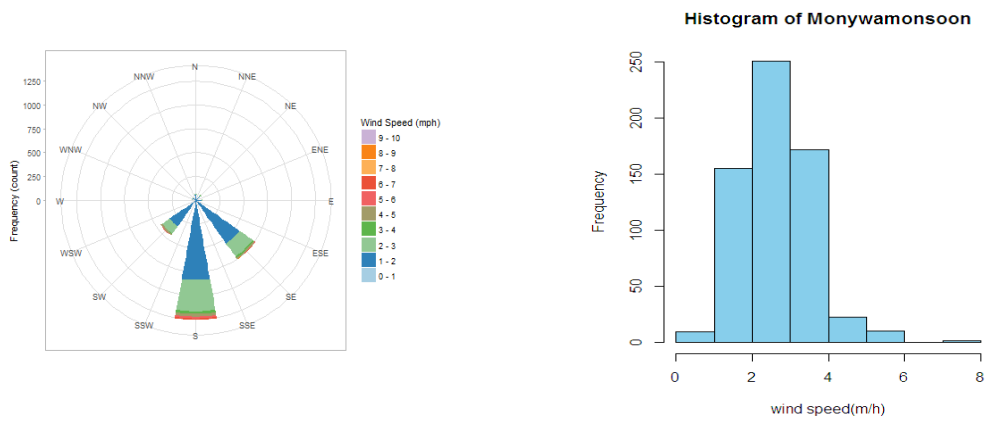


Figure 18: Monywa: Wind rose and frequency of wind speed for monsoon season

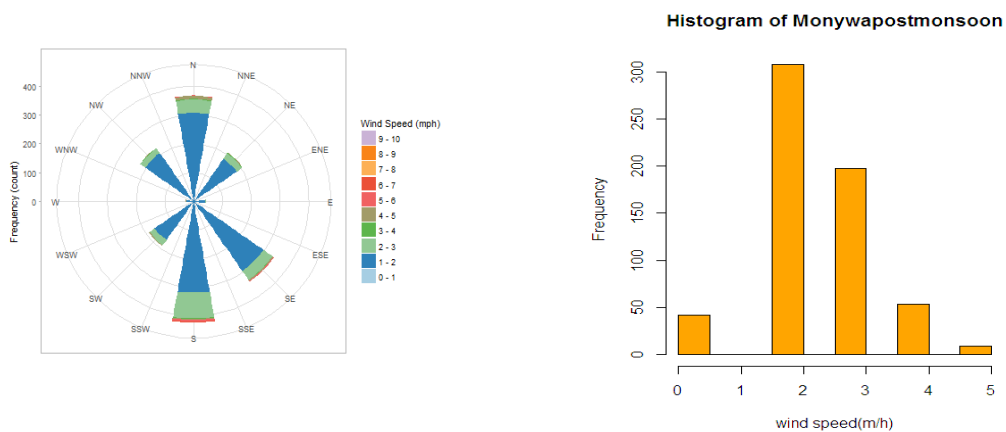


Figure 19: Monywa: Wind rose and frequency of wind speed for post monsoon season

8 Detected changes in Myanmar Climate

8.1 Temperature Trends

It was very clear from temperature trend analysis that the both maximum and minimum temperature showed increasing trends for 9 stations, the other 7 stations as Sittwe, Patheingyi, Kaba-Aye, Dawei, Hpa-an, Hkamti and Hakha showed increasing trend for maximum temperature and decreasing trend for minimum temperature over all parts of the country. The trends from some stations were not statistically significant. The highest rate of decreasing minimum temperature trends over 35 years was 2.6°C at Kaba-Aye and 2.3°C at Hkamti. The highest rate of increasing maximum temperature trends over 35 years was 1.6°C at Monywa.

The deviation for Tmax was calculated following the formula: $T_{max_n} - T_{max_{normal}}$, and the deviation for Tmin was calculated by $T_{min_n} - T_{min_{normal}}$, where “n” represents each year and “normal” is the Tmax or Tmin normals calculated for the period 1981-2010.

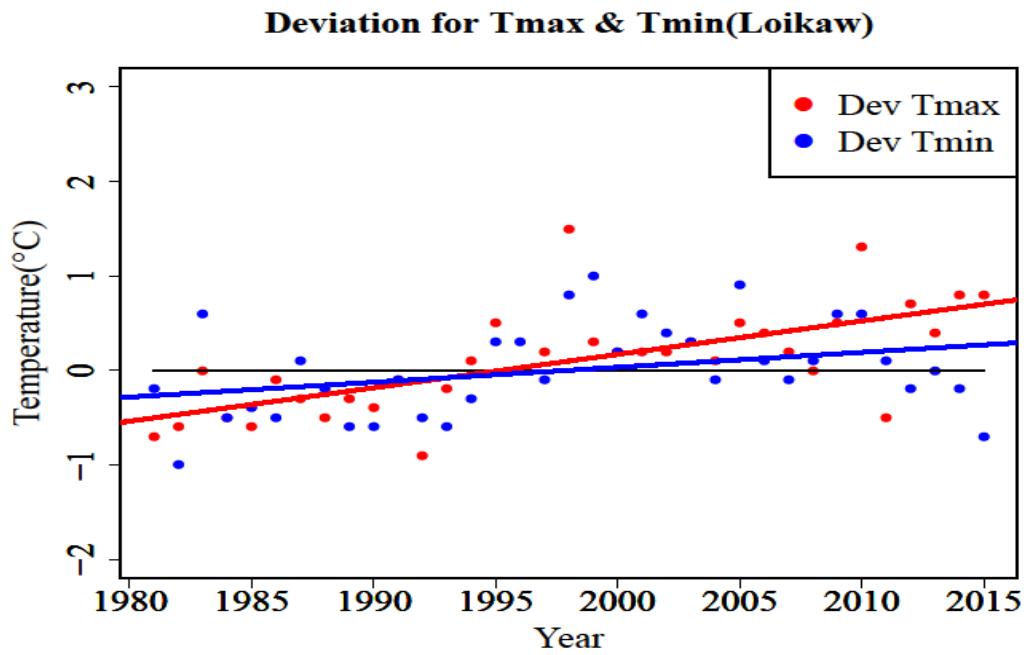


Figure 20: Maximum and Minimum temperature Deviation trend over Loikaw

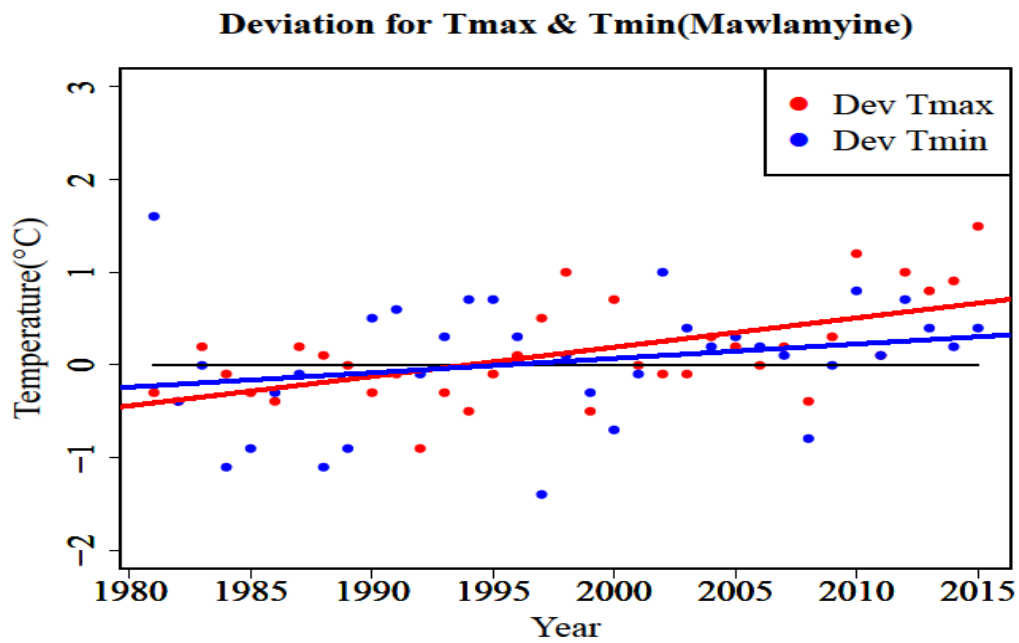


Figure 21: Maximum and Minimum temperature Deviation trend over Mawlamyine

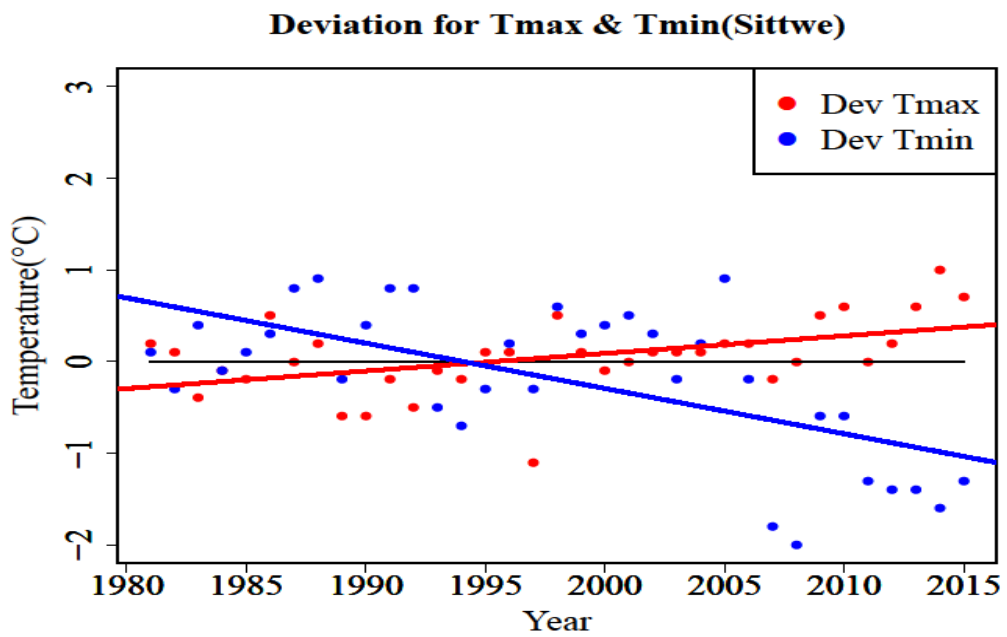


Figure 22: Maximum and Minimum temperature Deviation trend over Sittwe

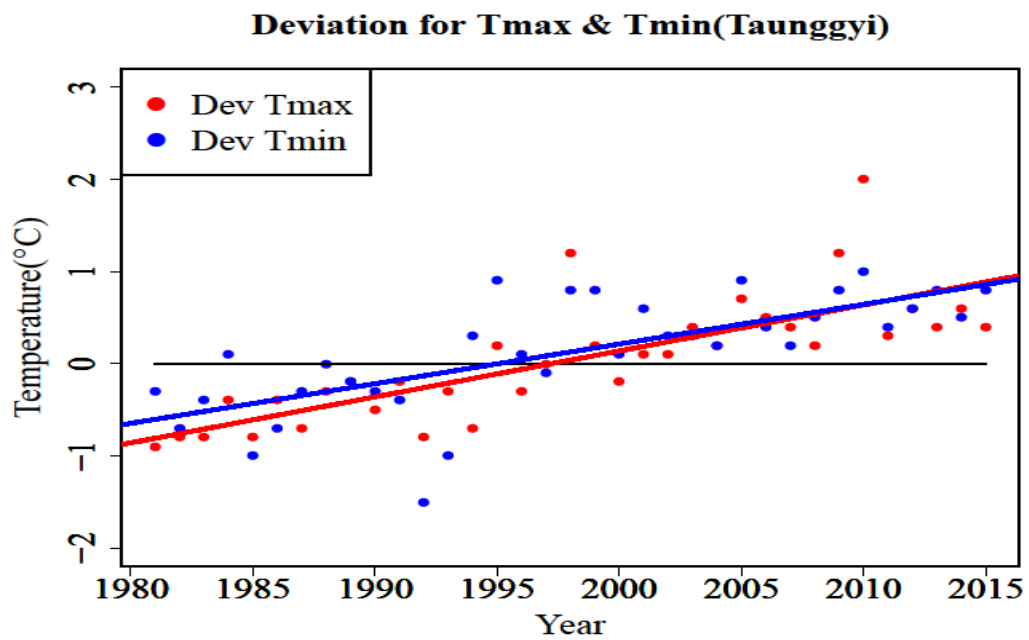


Figure 23: Maximum and Minimum temperature Deviation trend over Monywa

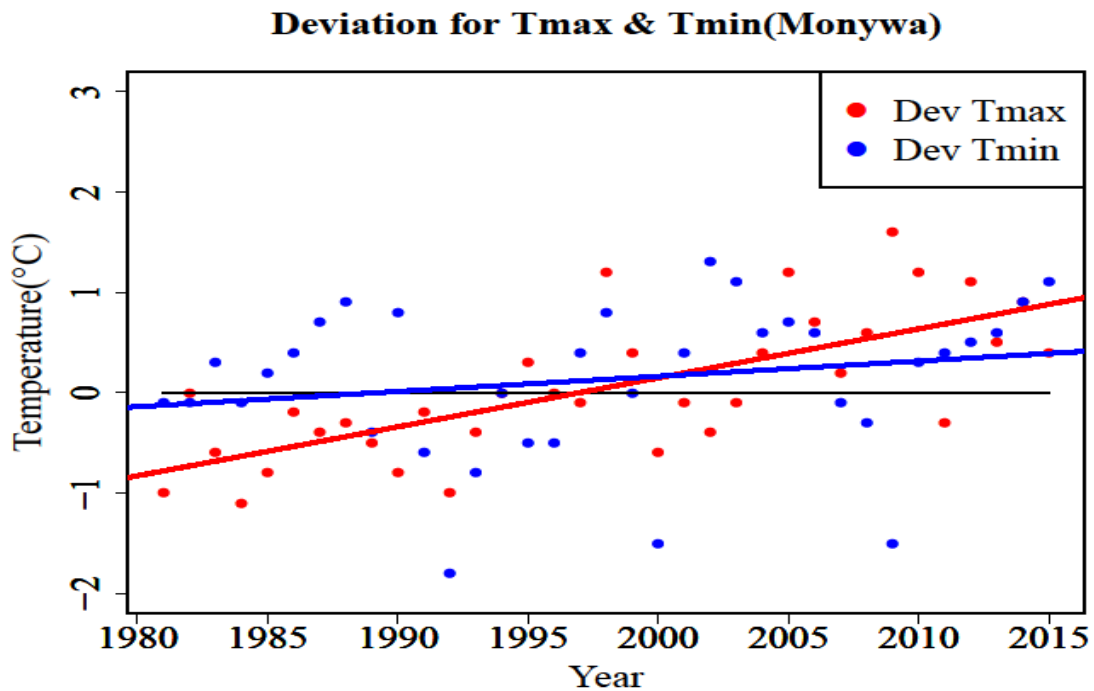


Figure 24: Maximum and Minimum temperature Deviation trend over Taunggyi

8.2 Seasonal change of Rainfall and Temperature

8.2.1 Rainfall

For calculation of seasonal change of rainfall, we used two data set, one existing normal (1961-1990) and new normal (1981-2010). The existing normal (1961-1990) was considered as the base period and the change was calculated. The 1981-2010 rainfall normal has decreased compared to the 1961-1990 normal for the months of May, June, July and August, while it is nearly unchanged for the other months (Figure 25). The decrease is largest in June (-59.2 mm), July (-42.6 mm) and August (-66.2 mm).

The normal annual rainfall sum of Myanmar has decreased by 185 mm, from 2406 mm to 2221 mm, in the period from 1961-1990 to 1981-2010. However, more long-term trend analyses are needed in order to conclude whether the annual rainfall is decreasing in Myanmar.

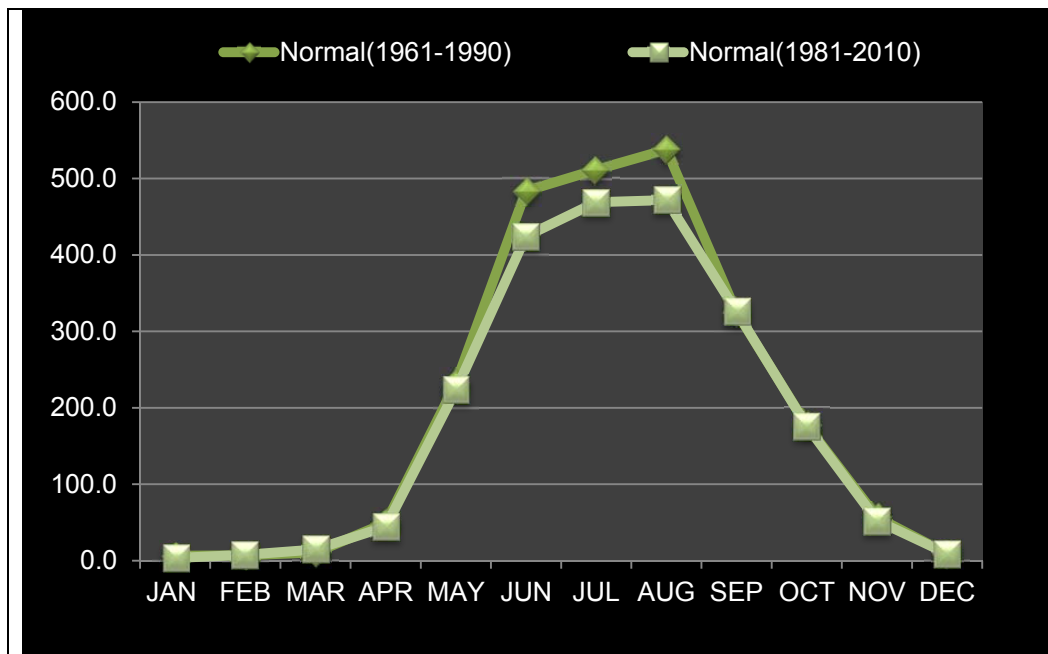


Figure 25: Country normal rainfall comparison over Myanmar

Table 32: Normal rainfalls data (mm) for periods (1961-1990) and (1981-2010) over Myanmar

Normal period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual sum
Normal (1961-1990)	6.4	6.9	10.7	49.2	232.1	483.6	511.6	537.8	324.5	177.4	56.7	8.9	2405.9
Normal (1981-2010)	3.5	7.7	14.6	44.3	223.2	424.4	469.0	471.6	325.6	176.1	52.2	9.1	2221.4

8.2.2 Temperature

Comparisons of normal minimum and maximum temperature were carried out using the new normal (1981-2010) with respect to the previous normal period (1961-1990).

The 1981-2010 normal minimum temperature is less than the 1961-1990 normal for the months from January to May and from September to December. It is nearly unchanged for the months of June, July and August (Figure 26). The normal annual mean minimum temperature has decreased from 1961-1990 to 1981-2010 by 0.4 degrees, from 20.1 °C to 19.7 °C (Table 33).

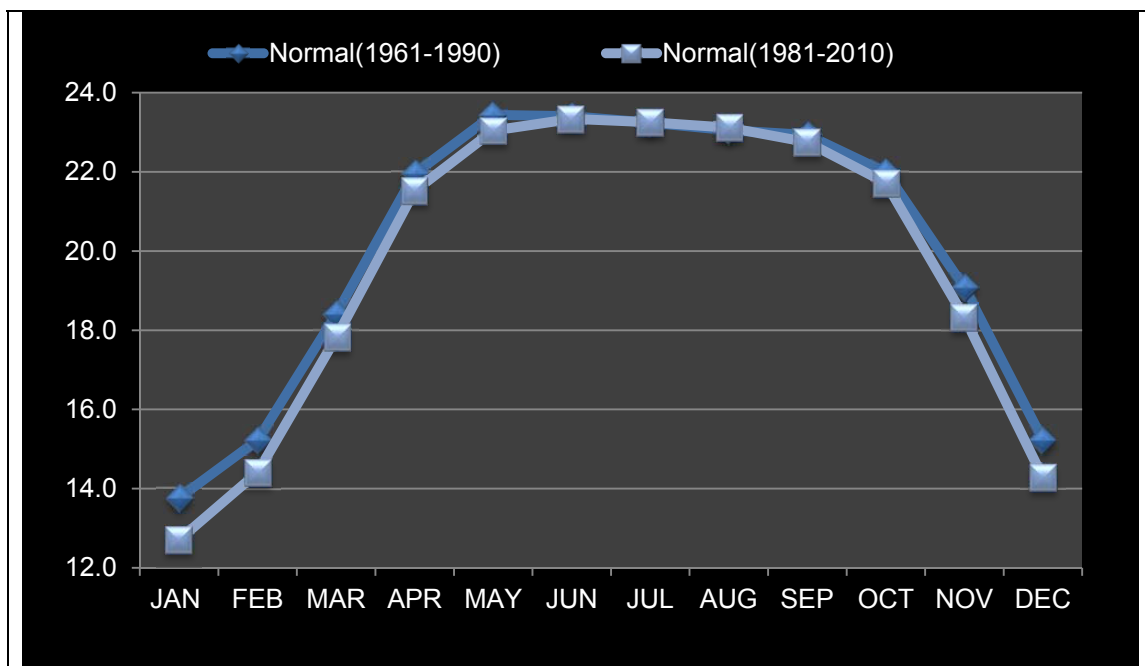


Figure 26: Country normal minimum temperature comparison over Myanmar

Normal period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual mean
Normal (1961-1990)	13.8	15.2	18.4	22.0	23.4	23.4	23.2	23.1	22.9	22.0	19.1	15.2	20.1
Normal (1981-2010)	12.7	14.4	17.8	21.5	23.0	23.3	23.3	23.1	22.7	21.7	18.3	14.3	19.7

Table 33: Normal minimum temperature data (°C) for the periods 1961-1991 and 1981-2010 over Myanmar

The country normal maximum temperature has increased from 1961-1990 to 1981-2010 in nearly all months except February and December (Figure 27). It is clear that the difference in maximum temperature between the two normal periods is higher in the months April to September compared to other months. The largest increase was found in June (+1.2 °C), July (+0.9 °C) and August (+0.9 °C). The normal annual mean maximum temperature has increased from 1961-1990 to 1981-2010 by 0.5 °C, from 30.8 °C to 31.3 °C (Table 34).

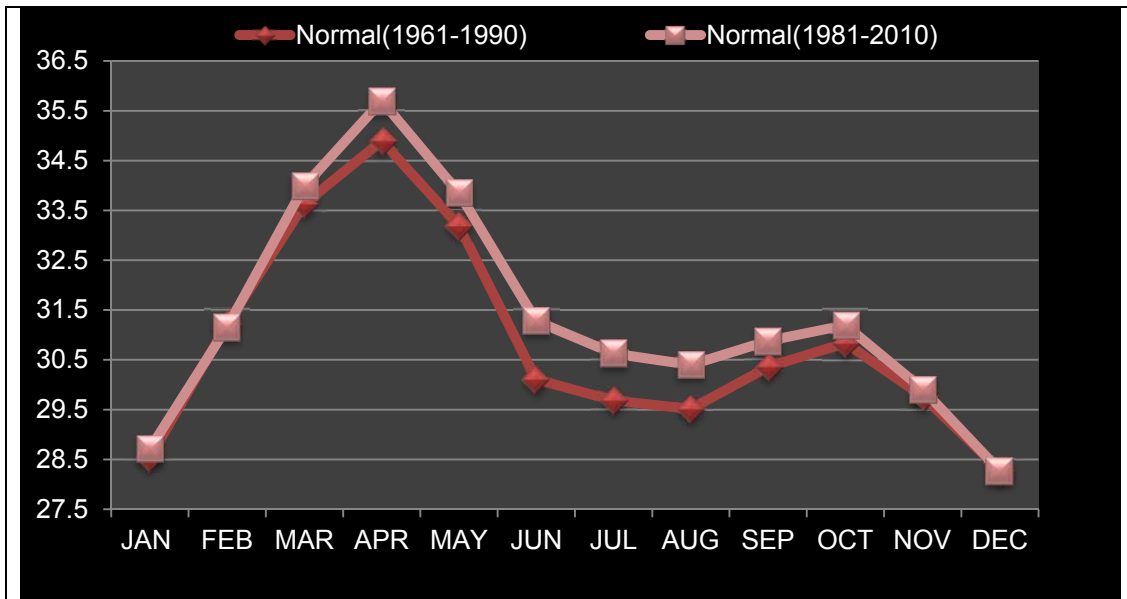


Figure 27: Country normal maximum temperature comparison over Myanmar

Normal period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual mean
Normal (1961-1990)	28.5	31.2	33.6	34.9	33.2	30.1	29.7	29.5	30.4	30.8	29.8	28.3	30.8
Normal (1981-2010)	28.7	31.2	34.0	35.7	33.8	31.3	30.6	30.4	30.9	31.2	29.9	28.3	31.3

Table 34: Normal maximum temperature data (°C) for the periods 1961-1991 and 1981-2010 over Myanmar

8.3 Monsoon

Comparisons of normal monsoon onset and withdrawal dates were calculated using the new normal (1981-2010) with respect to the existing normal period (1961-1990). The 1981-2010 normal onset date was thirteen days later than the previous normal for the Southern Myanmar areas and five days later than the previous normal for the Northern Myanmar areas (Figure 28). The 1981-2010 normal withdrawal date was seventeen days later than the previous normal for Northern Myanmar areas and eleven days later than the old normal for Southern Myanmar areas (Figure 29). The trend for monsoon onset is increasing, which means that the onset is coming later, and the trend for monsoon withdrawal is decreasing, which means that the withdrawal is coming earlier, in the period from the year 1955 to the year 2015 (Figure 30) and (Figure 31). The duration of rainy season may have increased compared to the new normal monsoon period (121 days) in the recent years.

Comparison between Old & New Normal Monsoon Onset Dates

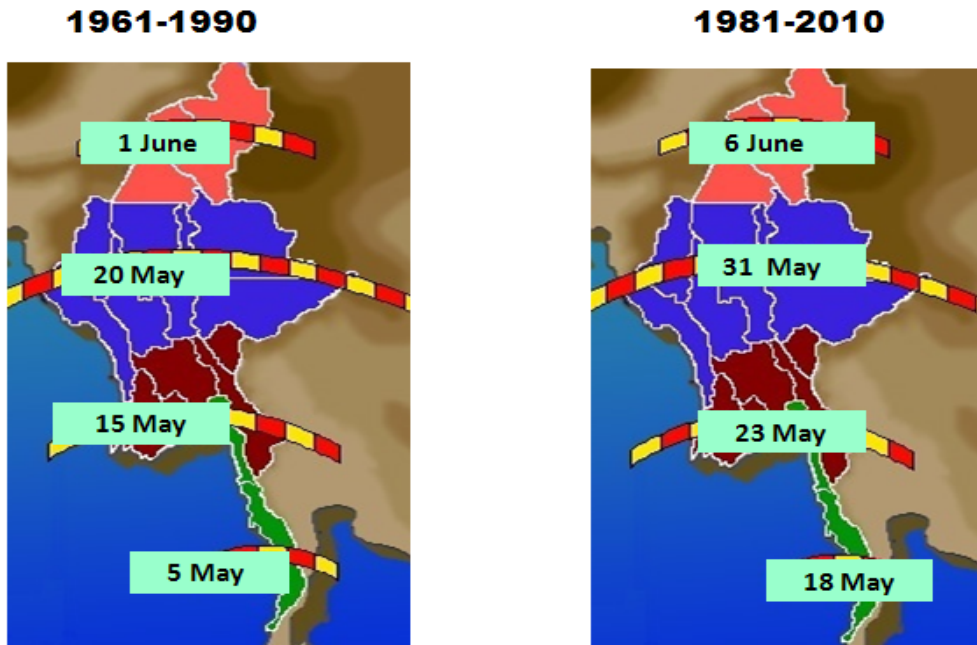


Figure 28: Comparison between old and new normal monsoon onset date over Myanmar

Comparison between Old & New Normal Monsoon Withdrawal Dates

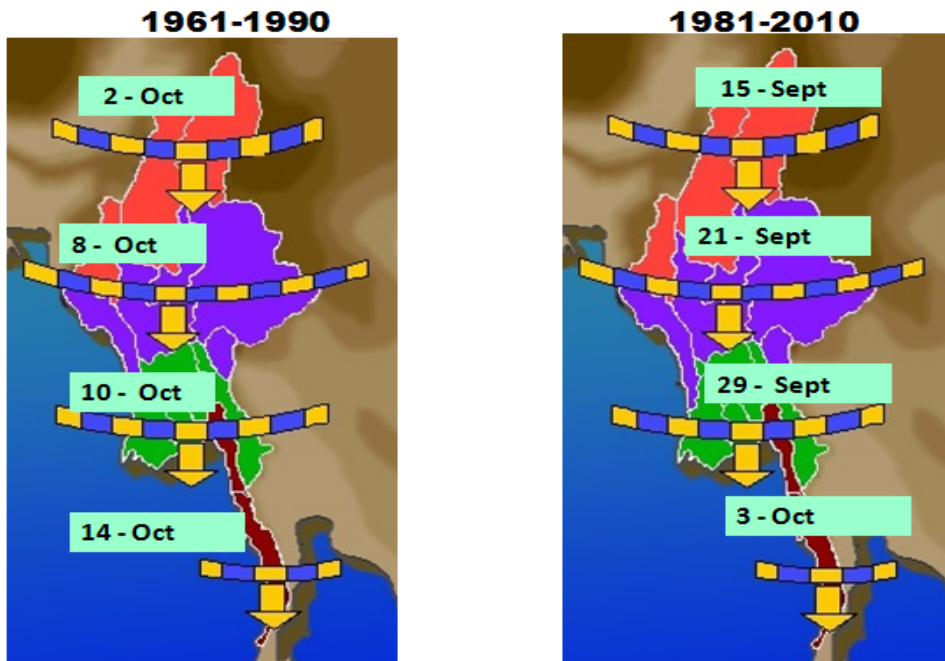


Figure 29: Comparison between old and new normal monsoon withdrawal date over Myanmar

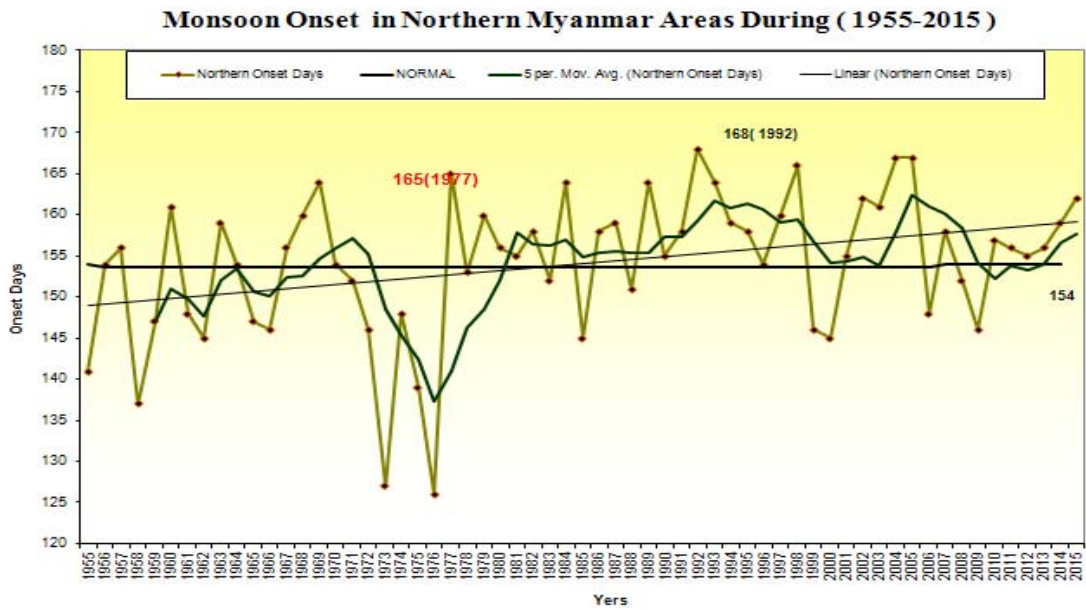


Figure 30: Monsoon onset in Northern Myanmar Areas during 1955-2015 over Myanmar

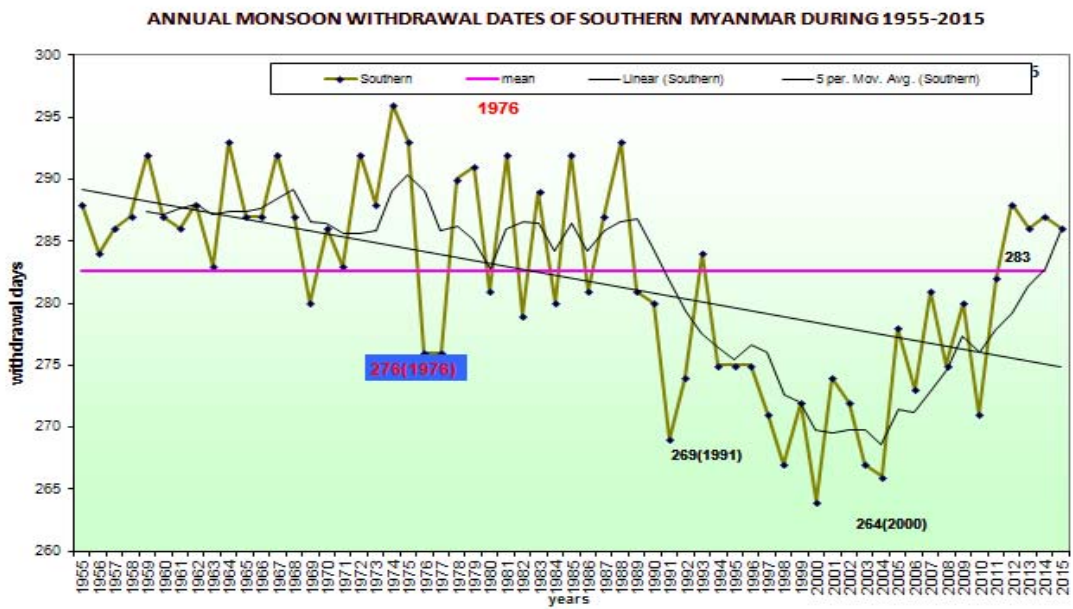


Figure 31: Monsoon withdrawal in Southern Myanmar Areas during 1955-2015 over Myanmar

9 Conclusions

Extreme weather events have increased after the 1980s. The occurrences of El Nino and La Nina events seen more frequent than 1972 over the world. During the period 1981-2010 there were several El Nino and La Nina events. For example, during 1997-1998 there was one of the strongest El Nino events recorded and it was followed directly by a La Nina event in 1998-1999. El Nino years are linked to higher global temperatures and may also cause long durations of high maximum temperatures in Myanmar. In the years of El Nino, extreme weather events such as high temperatures were recorded in Myanmar. 2010 was another El Nino year. Twenty stations in Myanmar registered new maximum temperature records during April and May 2010. The years 2015-2016 are also influenced by a very strong El Nino.

The continuous global warming causes the temperatures during El Nino to be especially high. Therefore, the extreme events are not only caused by phenomena like El Nino and La Nina, but basically by the increasing global warming and climate change over the globe. Due to global climate change, decreasing amounts of rainfall were observed during the monsoon period, the maximum temperature increased and the minimum temperature decreased in Myanmar during the period 1981-2010.

Changes in various climate parameters were observed and analyzed in this report. New normal values for minimum and maximum temperature, rainfall, and monsoon onset and withdrawal dates were calculated for the period 1981-2010. Normal values of temperature and rainfall for the whole country were calculated for all months and compared to values of the previous normal period 1961-1990. Trends of minimum and maximum temperature were also calculated.

For temperature, the maximum temperature has increased for almost every station; whereas the minimum temperature has decreased for most of the stations. The normal maximum temperature for the whole country of Myanmar has increased from 1961-1990 to 1981-2010 for all months, except February and December. The largest increase

was found in June, July and August. For the whole year, the normal annual mean maximum temperature increased by 0.5 °C from 1961-1990 to 1981-2010.

The normal minimum temperature has decreased from January to May and from September to December, and remained unchanged from June to August. Here it is also seen that the increasing rate of maximum temperature is higher than the increasing rate of minimum temperature.

The normal rainfall pattern has also shifted. It has decreased in the months from May to August and in the other months it has remained nearly unchanged. In the pre-monsoon and mid-monsoon seasons, rainfall has decreased over the whole country and it has been unchanged in the months of winter and post monsoon seasons over Myanmar. The decrease in rainfall was largest in June, July and August. For the whole year, the normal annual rainfall sum of Myanmar decreased by 185 mm in the period from 1961-1990 to 1981-2010. More studies are needed to conclude on the long-term rainfall trends in Myanmar.

The onset date of monsoon is later and the withdrawal date is earlier in the new normal period, which means a shorter duration of the rainy season. The normal duration of monsoon period was 144 days in the period (1961-1990) and 121 days in the period of (1981-2010). During the period from the year 1955 to the year 2015, the trend for monsoon onset has increased, and the trend for monsoon withdrawal has decreased. However, in the last 10-15 years of the period, the trend for monsoon withdrawal has again increased. This indicates a possible increase in the duration of the rainy season compared to the new normal monsoon period. When we compare with the old normal, rainy season is shorter in the recent years.

Acknowledgements

We express our sincere thanks to Director General Dr. Hrin Nei Thiam, M.E (Hydrology) in Roorkee, India, Ph.D (Physics), Yangon University, Head of Department of Meteorology and Norwegian Ministry of Foreign Affairs for the support of the capacity building project and special thanks to the Norwegian Meteorological Institute for “Instruments and Technical Support for Capacity Building in Weather forecasting and Climate Services”. DMH are greatly indebted to Mr. Tor Ivar Mathisen and Dr. Reidun Gangstø Skaland from the Norwegian Meteorological Institute for their valuable technical guidance and advice for preparation of this climate report of Myanmar. We would also like to thank ADPC for their support with data digitizing, data base and data portal. We would like to express sincerely thanks to Deputy Director General, Director and Deputy Director of Met. Division and also special thanks to junior/staffs at the climate, record and research section for their hardworking in computing and compilation of the data for this report.

Record Section

Appendix

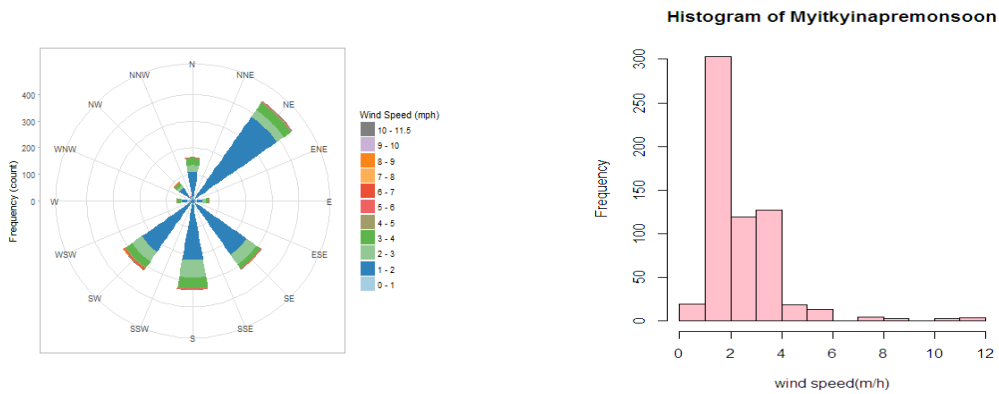


Figure 32: Myitkyina: Wind rose and frequency of wind speed for pre-monsoon season

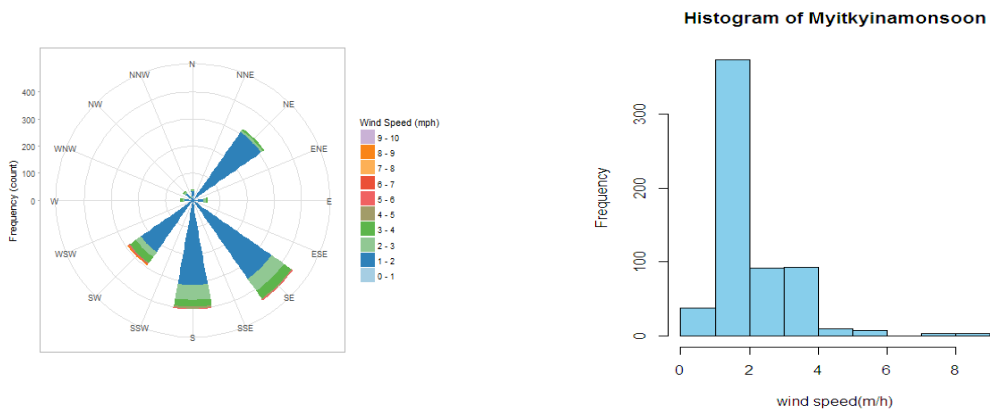


Figure 33: Myitkyina: Wind rose and frequency of wind speed for monsoon season

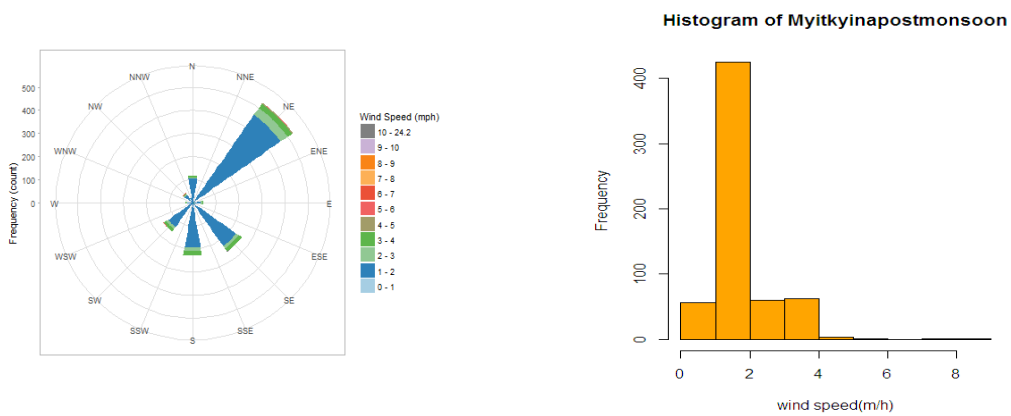


Figure 34: Myitkyina: Wind rose and frequency of wind speed for post-monsoon season

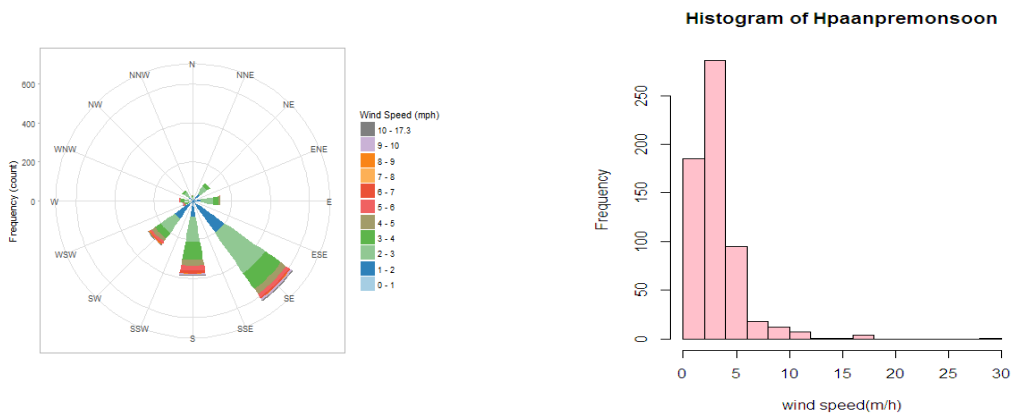


Figure 35: Hpa-an: Wind rose and frequency of wind speed for pre-monsoon season

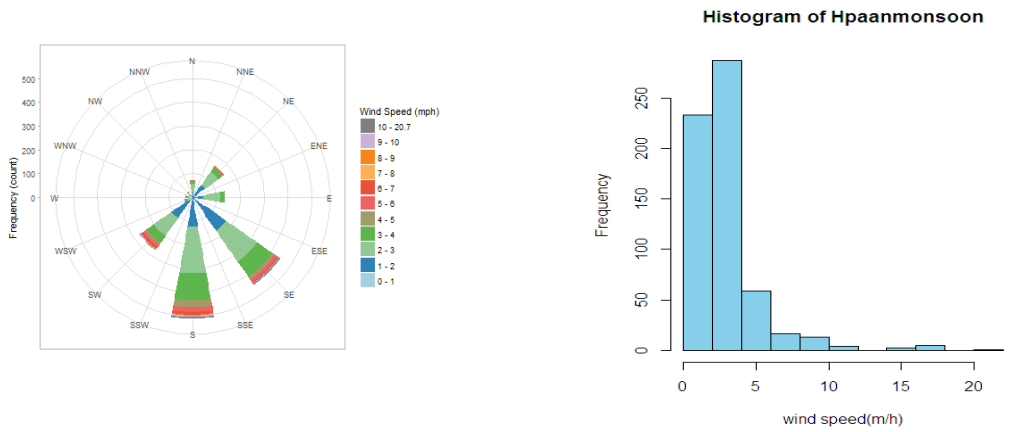


Figure 36: Hpa-an: Wind rose and frequency of wind speed for monsoon season

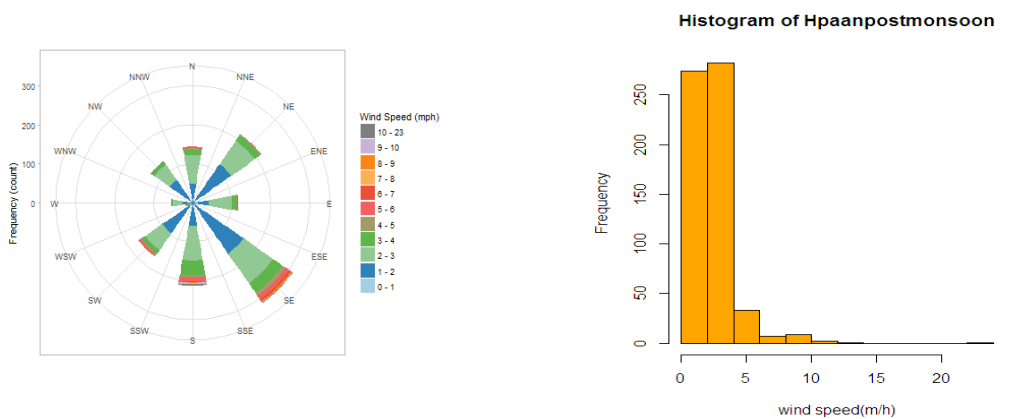


Figure 37: Hpa-an: Wind rose and frequency of wind speed for post monsoon season

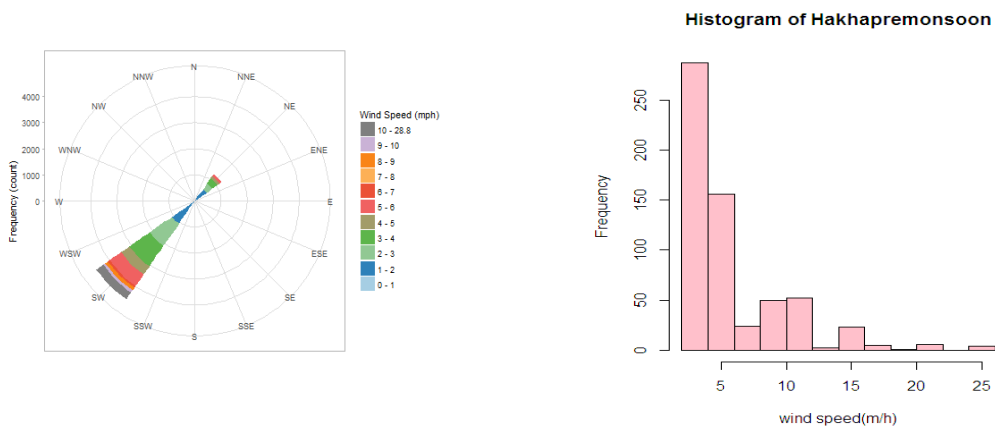


Figure 38: Hakha: Wind rose and frequency of wind speed for pre-monsoon season

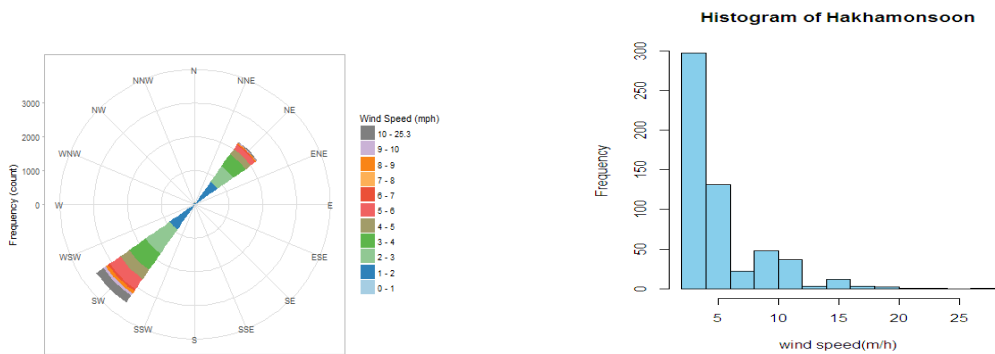


Figure 39: Hakha: Wind rose and frequency of wind speed for monsoon season

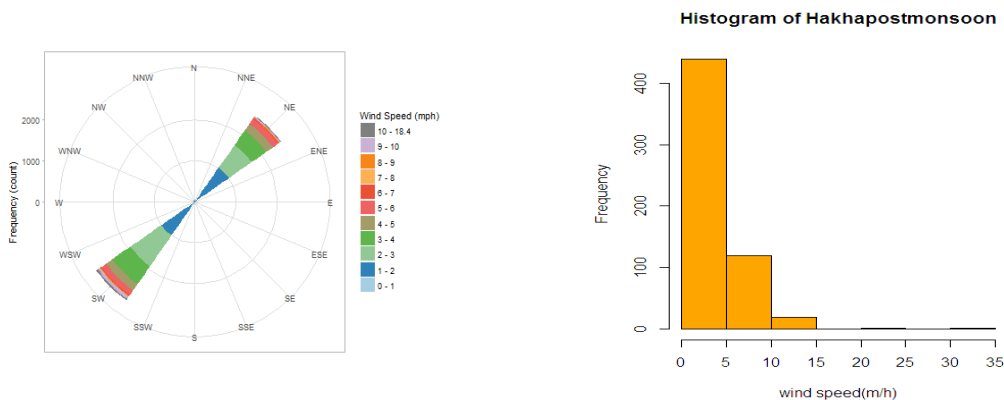


Figure 40: Hakha: Wind rose and frequency of wind speed for post monsoon season

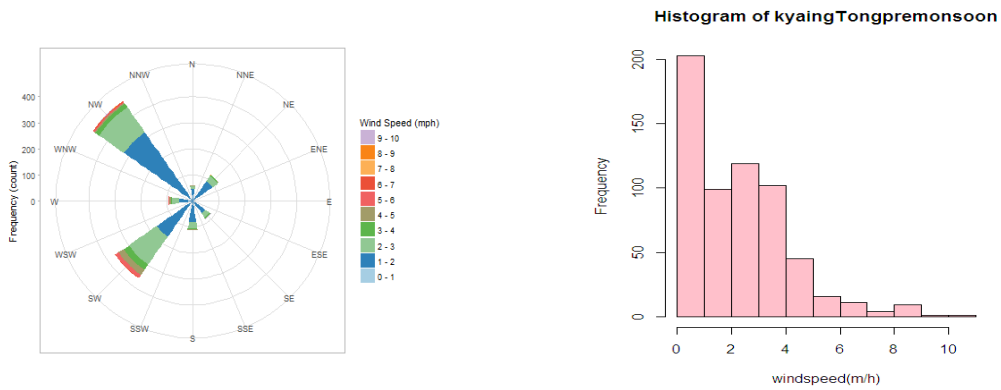


Figure 41: Kengtung: Wind rose and frequency of wind speed for pre-monsoon season

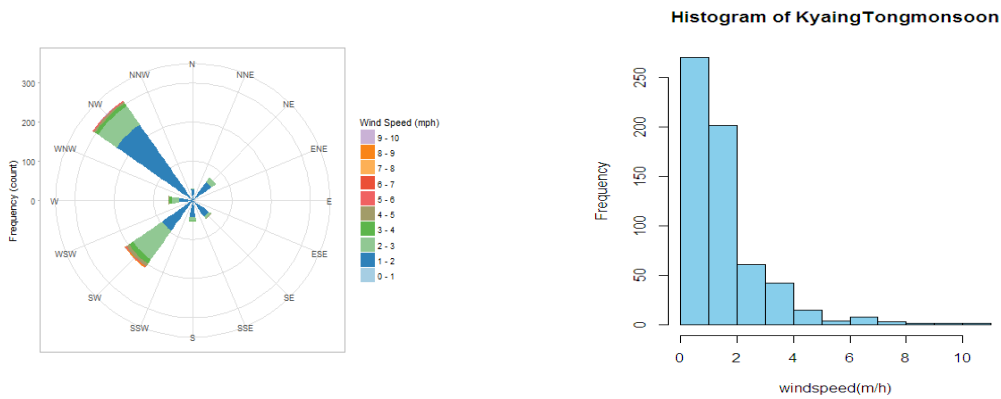


Figure 42: Kengtung: Wind rose and frequency of wind speed for monsoon season

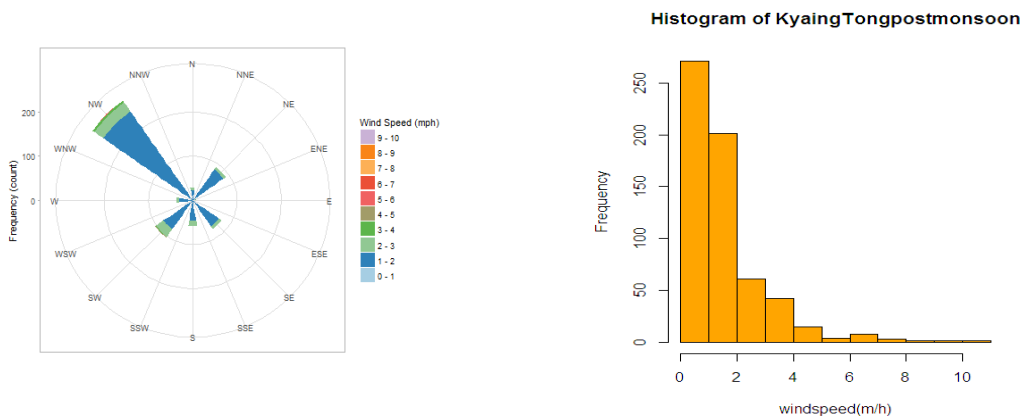


Figure 43: Kengtung: Wind rose and frequency of wind speed for post monsoon season

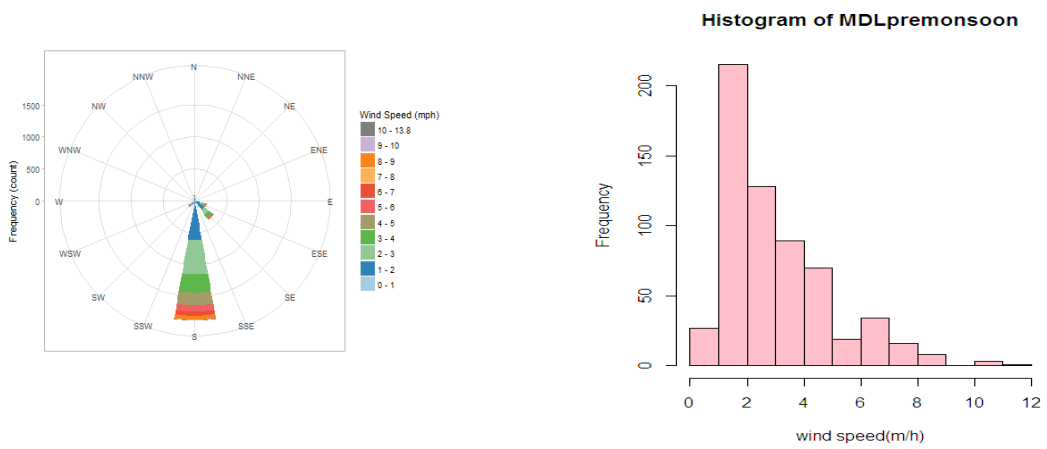


Figure 44: Mandalay: Wind rose and frequency of wind speed for pre-monsoon season

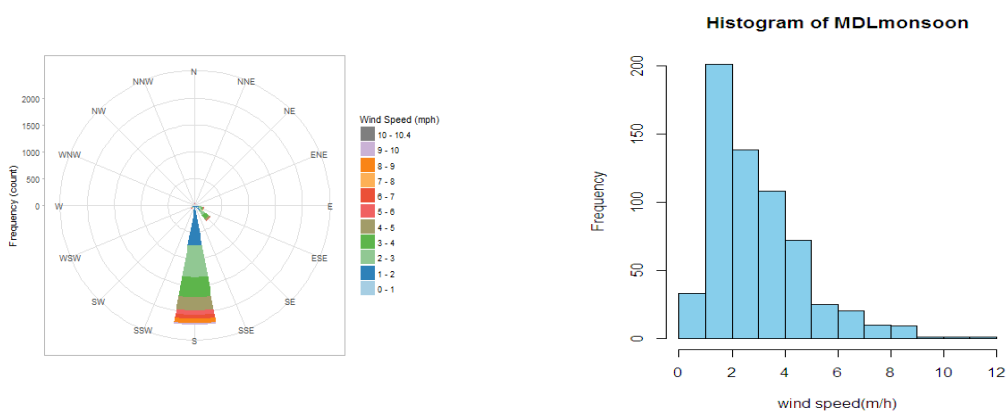


Figure 45: Mandalay: Wind rose and frequency of wind speed for monsoon season

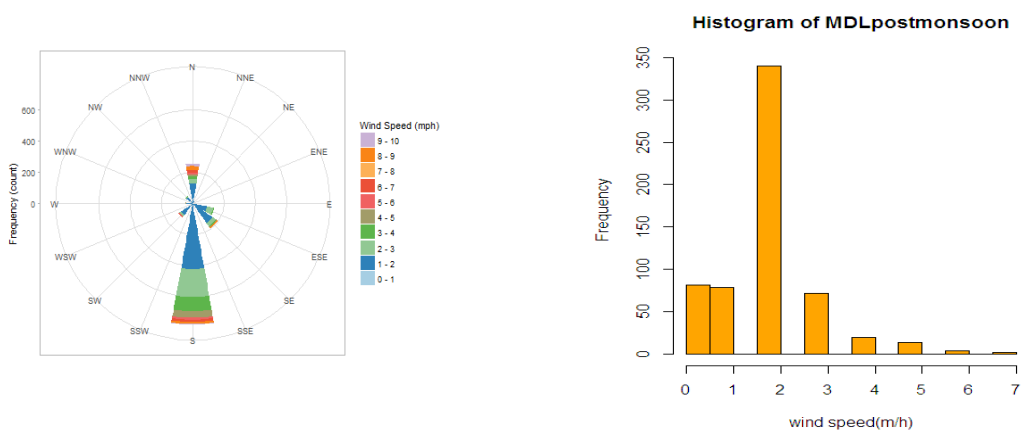


Figure 46: Mandalay: Wind rose and frequency of wind speed for post monsoon season

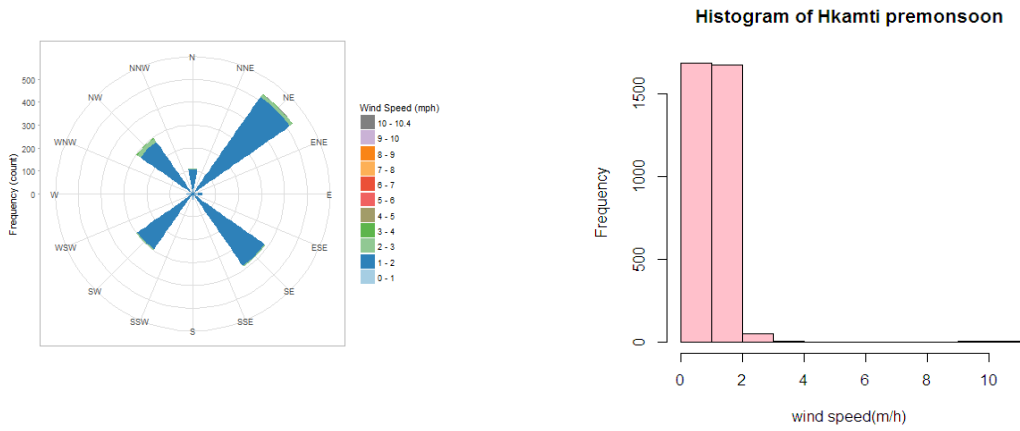


Figure 47: Hkanti: Wind rose and frequency of wind speed for pre-monsoon season

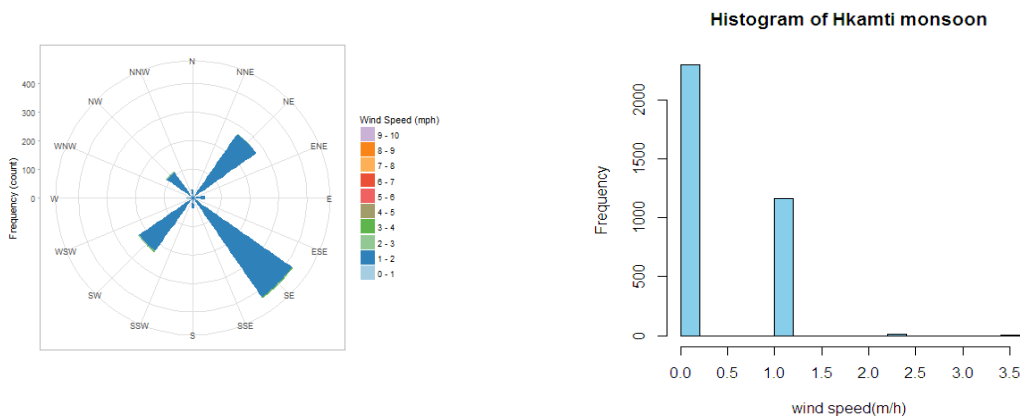


Figure 48: Hkanti: Wind rose and frequency of wind speed for monsoon season

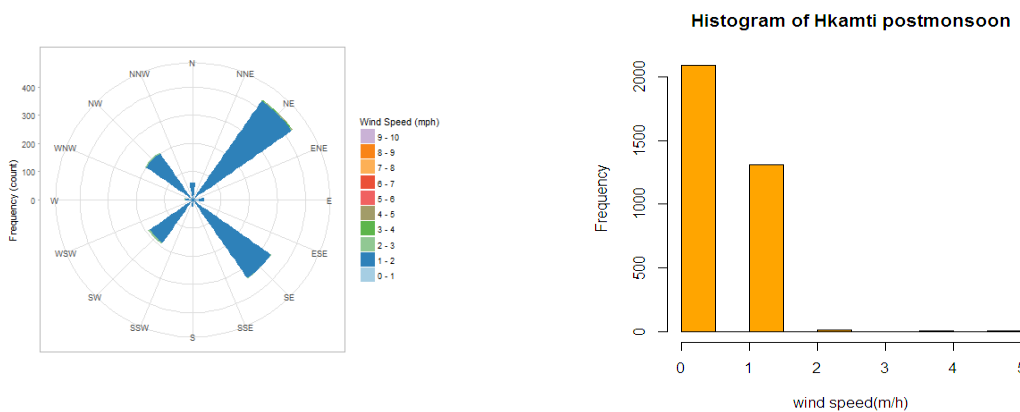


Figure 49: Hkanti: Wind rose and frequency of wind speed for post monsoon season

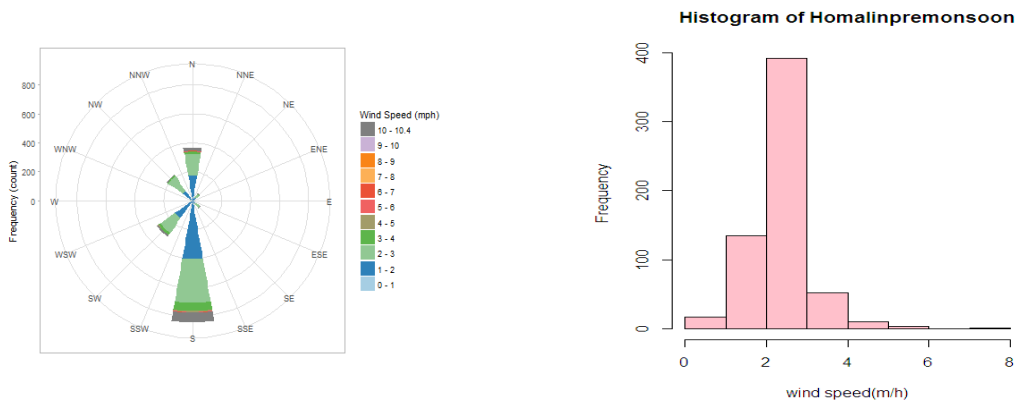


Figure 50: Homalin: Wind rose and frequency of wind speed for pre-monsoon season

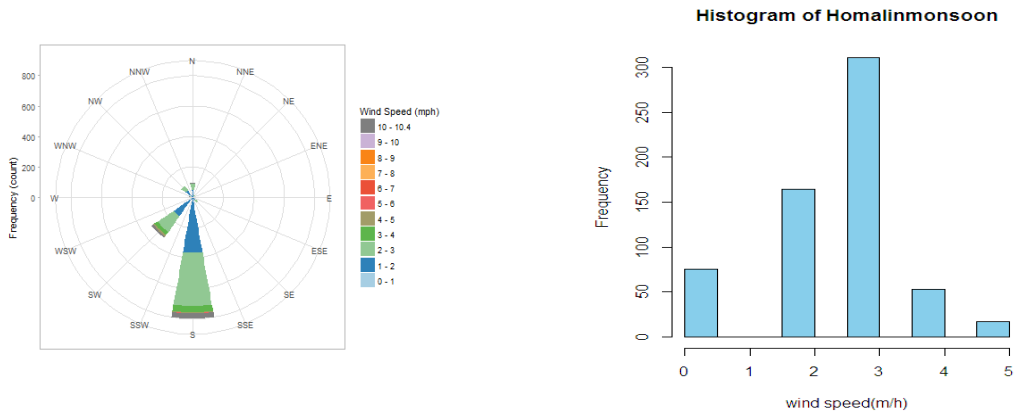


Figure 51: Homalin: Wind rose and frequency of wind speed for monsoon season

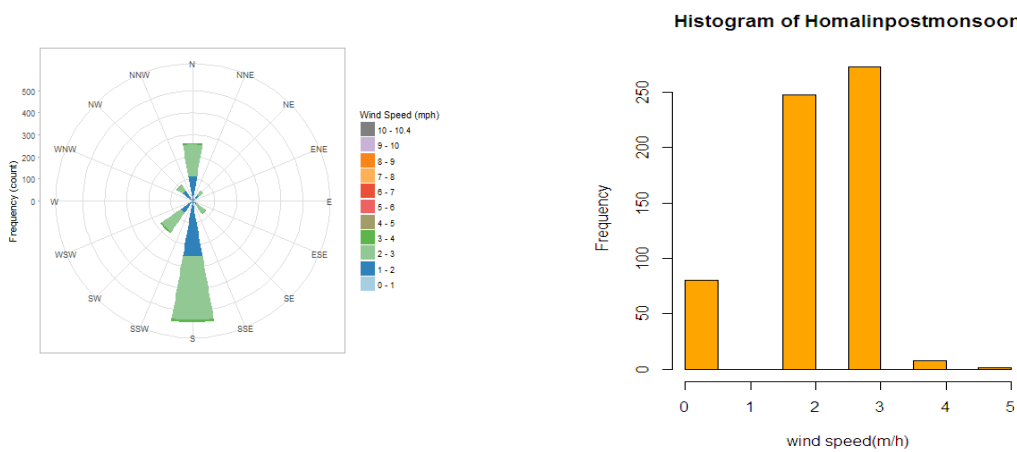


Figure 52: Homalin: Wind rose and frequency of wind speed for post monsoon season

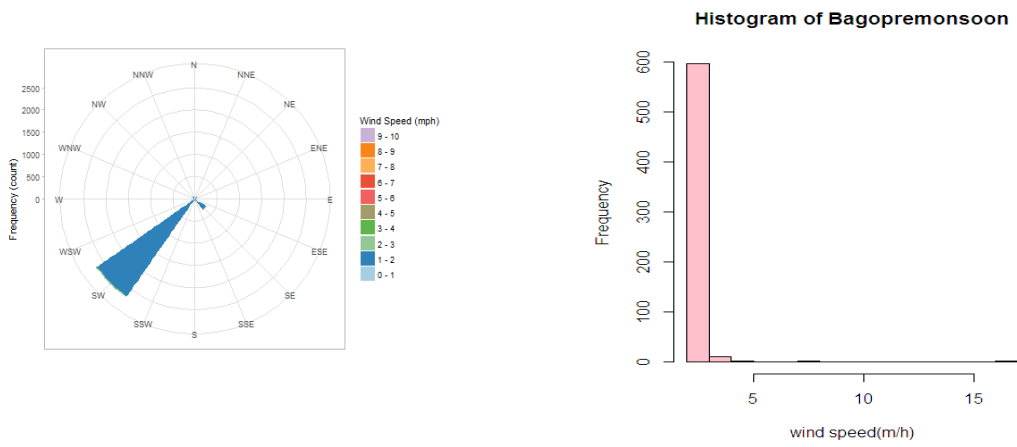


Figure 53: Bago: Wind rose and frequency of wind speed for pre-monsoon season

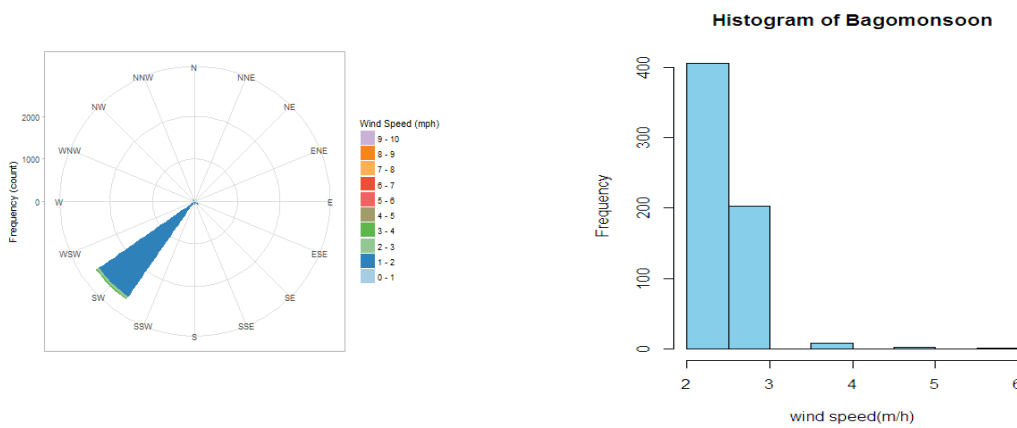


Figure 54: Bago: Wind rose and frequency of wind speed for monsoon season

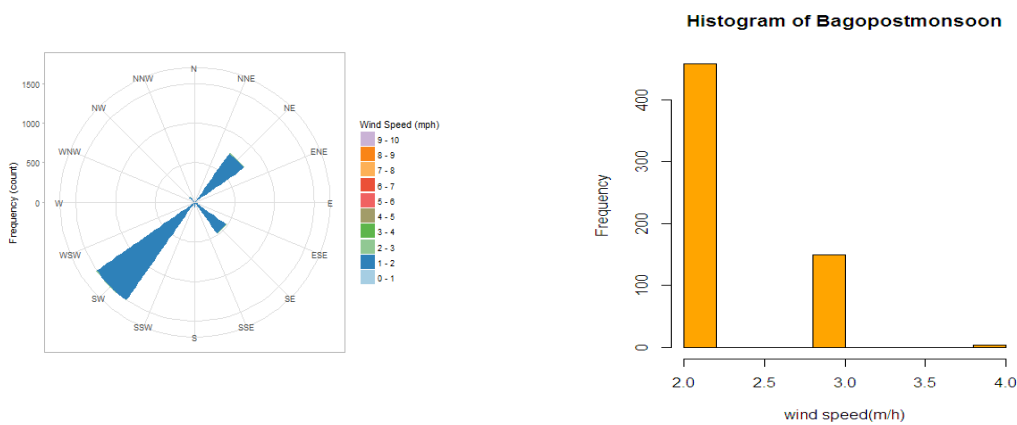


Figure 55: Bago: Wind rose and frequency of wind speed for post monsoon season

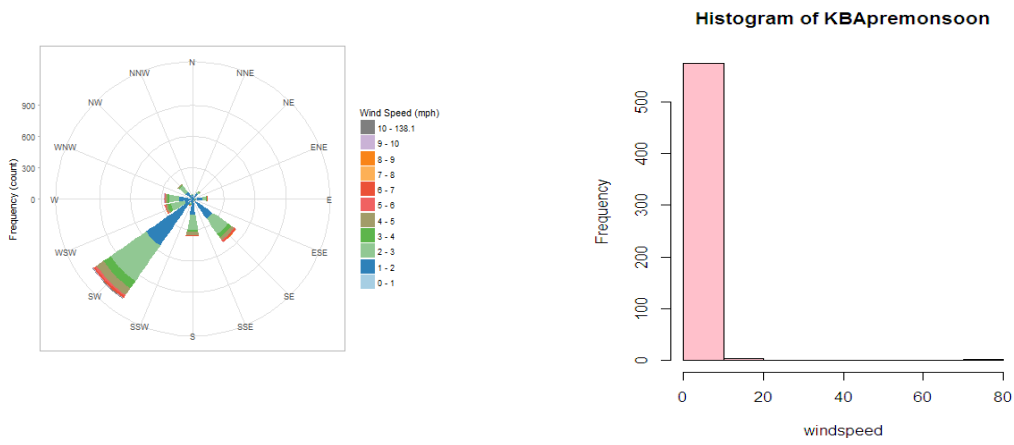


Figure 56: Kaba-Aye: Wind rose and frequency of wind speed for pre-monsoon season

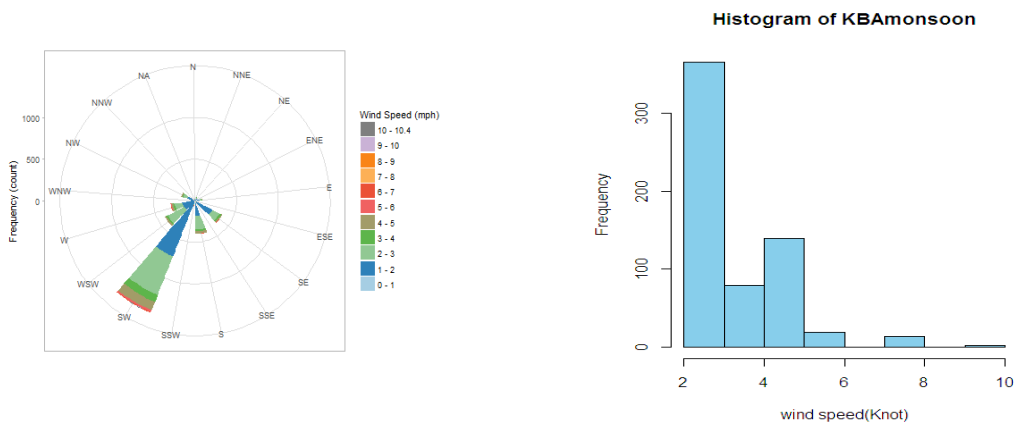


Figure 57: Kaba-Aye: Wind rose and frequency of wind speed for monsoon season

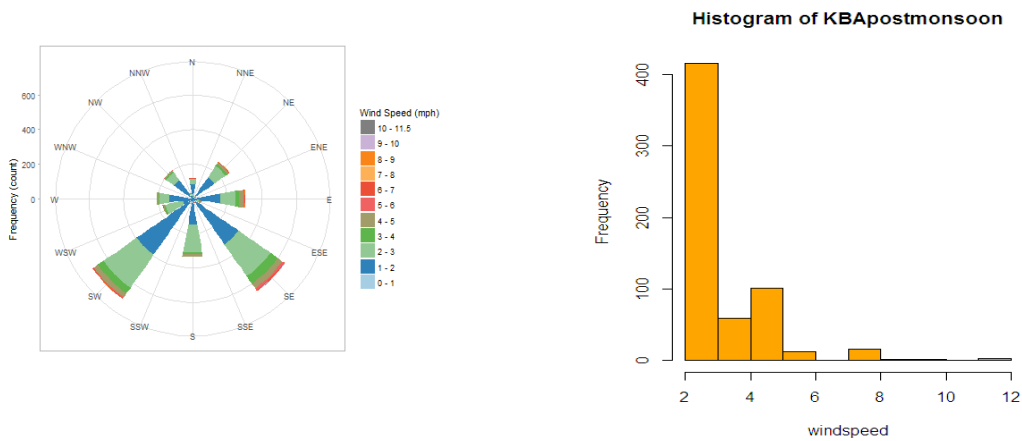


Figure 58: Kaba-Aye: Wind rose and frequency of wind speed for post monsoon season

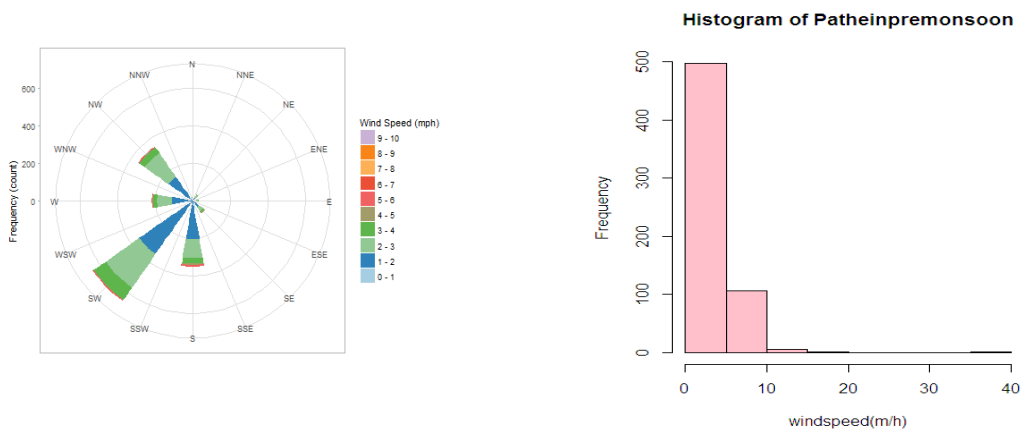


Figure 59: Pathein: Wind rose and frequency of wind speed for pre-monsoon season

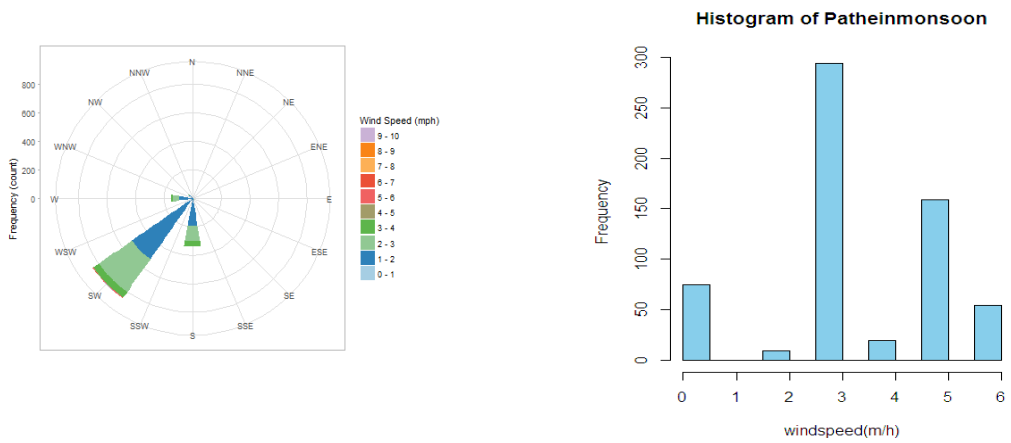


Figure 60: Pathein: Wind rose and frequency of wind speed for monsoon season

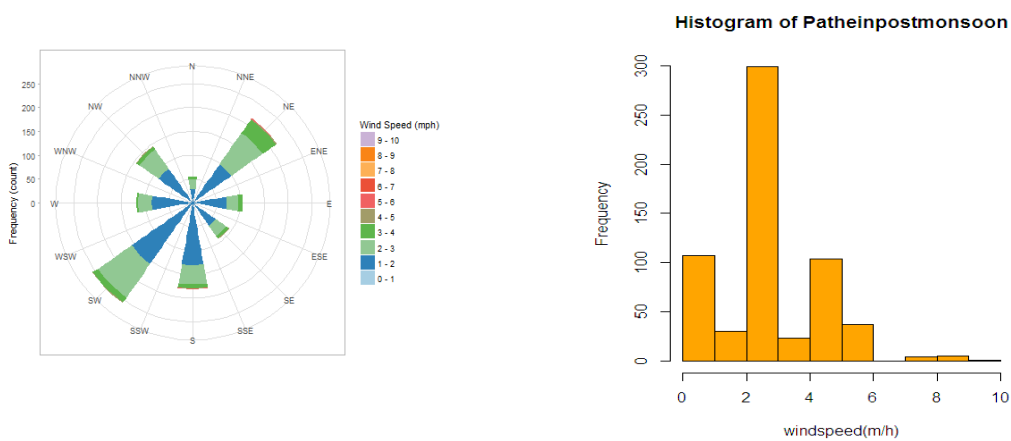


Figure 61: Pathein: Wind rose and frequency of wind speed for post monsoon season

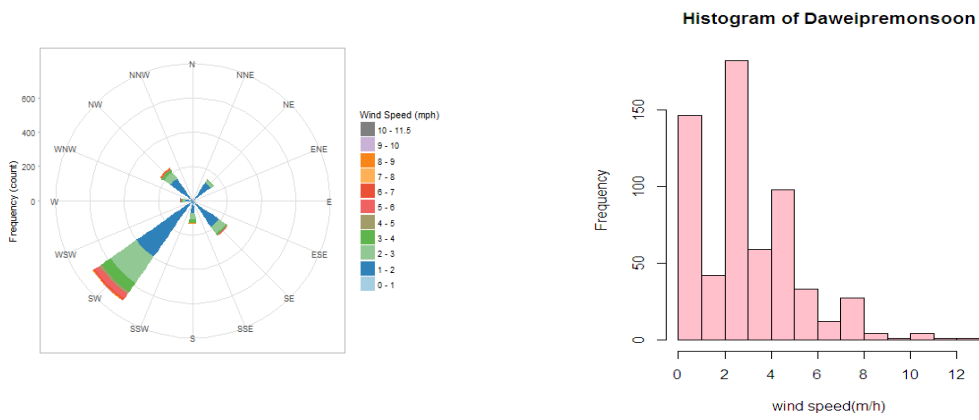


Figure 62: Dawei: Wind rose and frequency of wind speed for pre-monsoon season

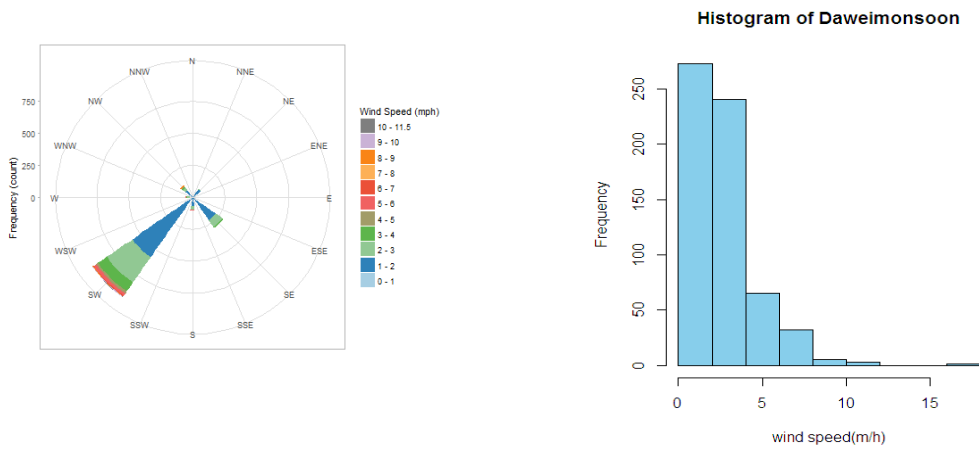


Figure 63: Dawei: Wind rose and frequency of wind speed for monsoon season

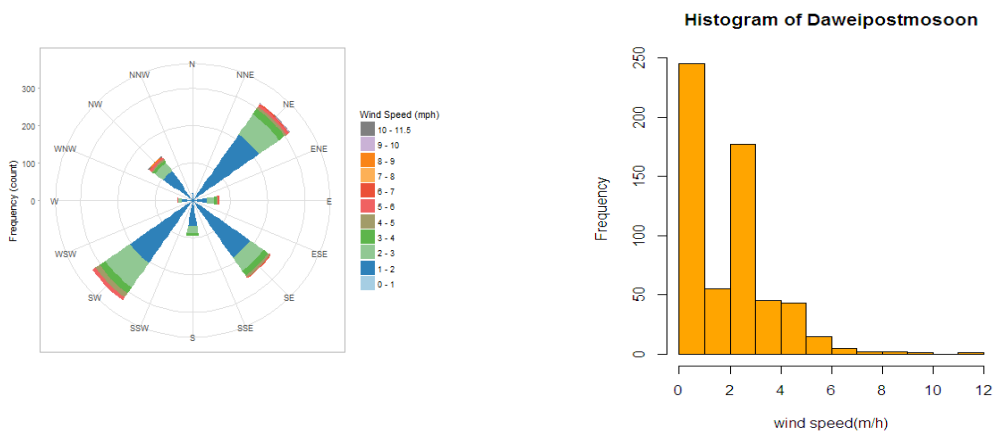


Figure 64: Dawei: Wind rose and frequency of wind speed for post monsoon season

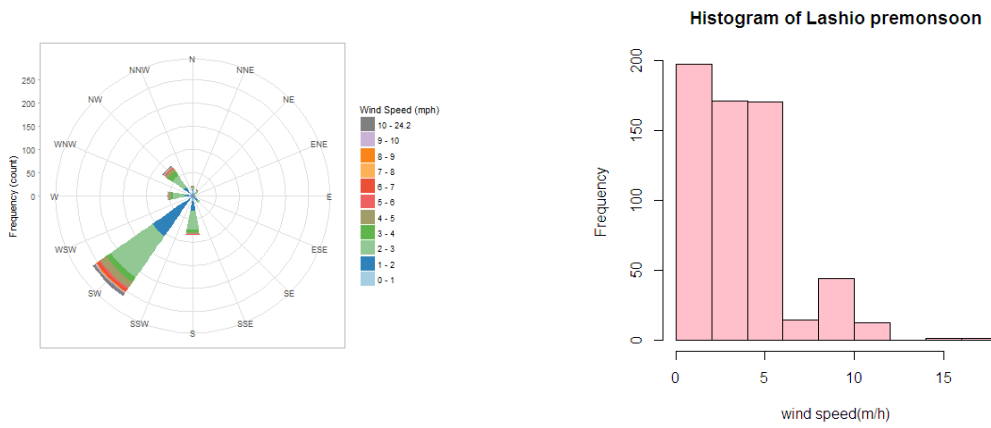


Figure 65: Lashio: Wind rose and frequency of wind speed for pre-monsoon season

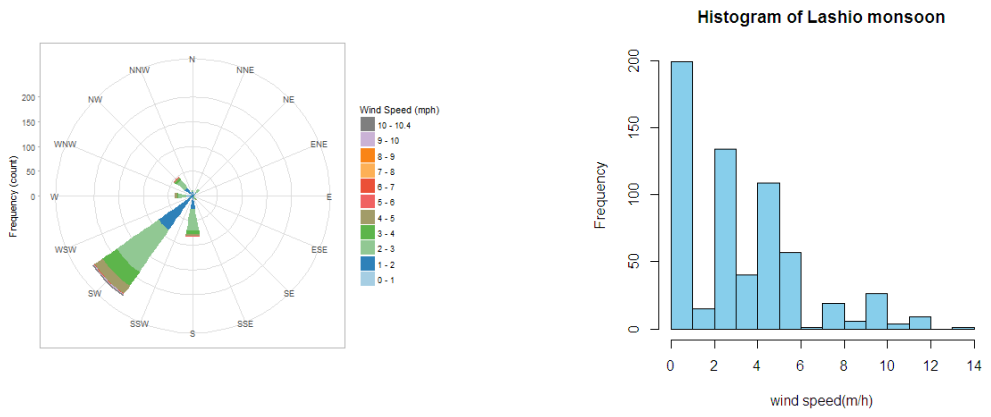


Figure 66: Lashio: Wind rose and frequency of wind speed for monsoon season

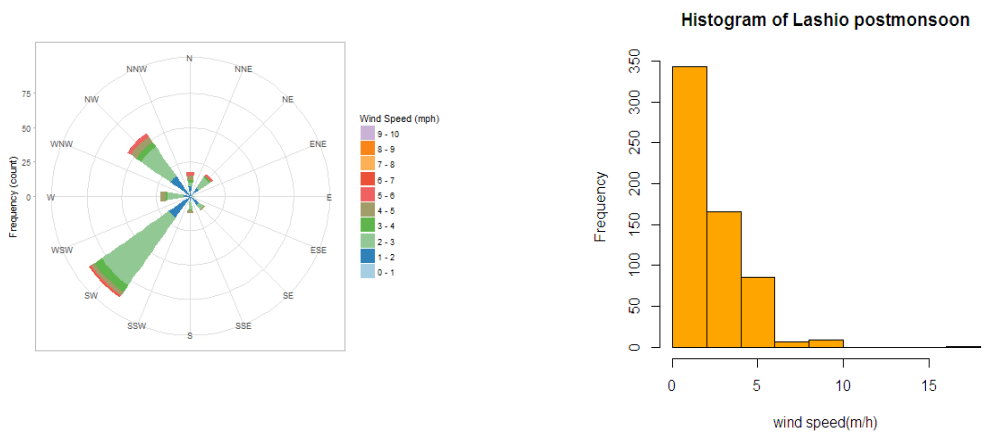


Figure 67: Lashio: Wind rose and frequency of wind speed for post monsoon season

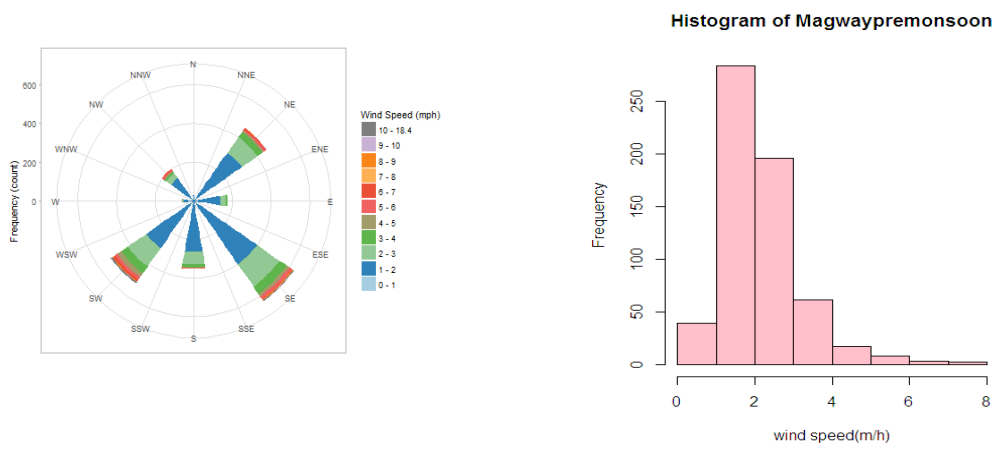


Figure 68: Magway: Wind rose and frequency of wind speed for pre-monsoon season

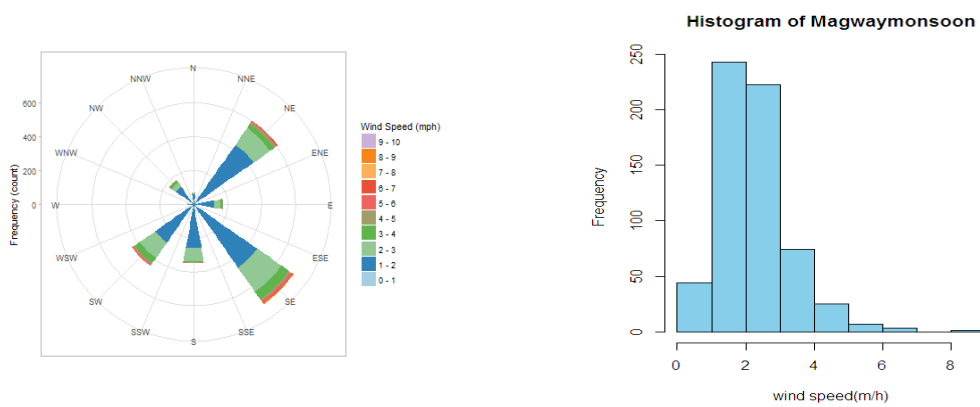


Figure 69: Magway: Wind rose and frequency of wind speed for monsoon season

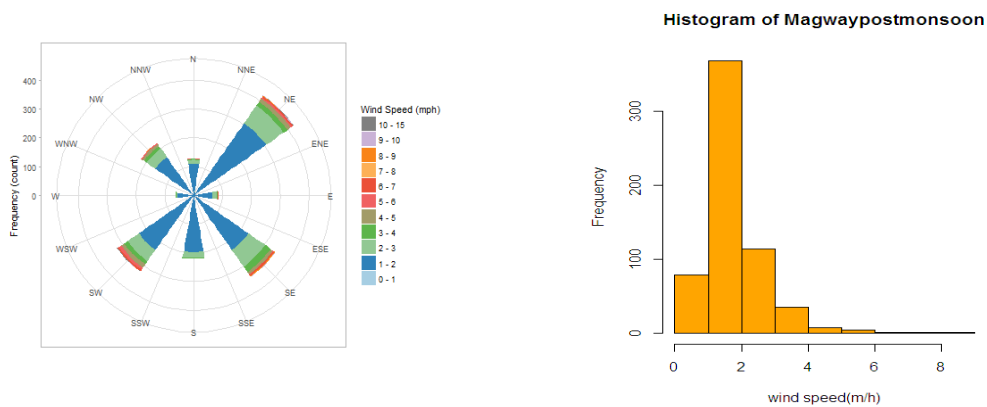


Figure 70: Magway: Wind rose and frequency of wind speed for post monsoon season

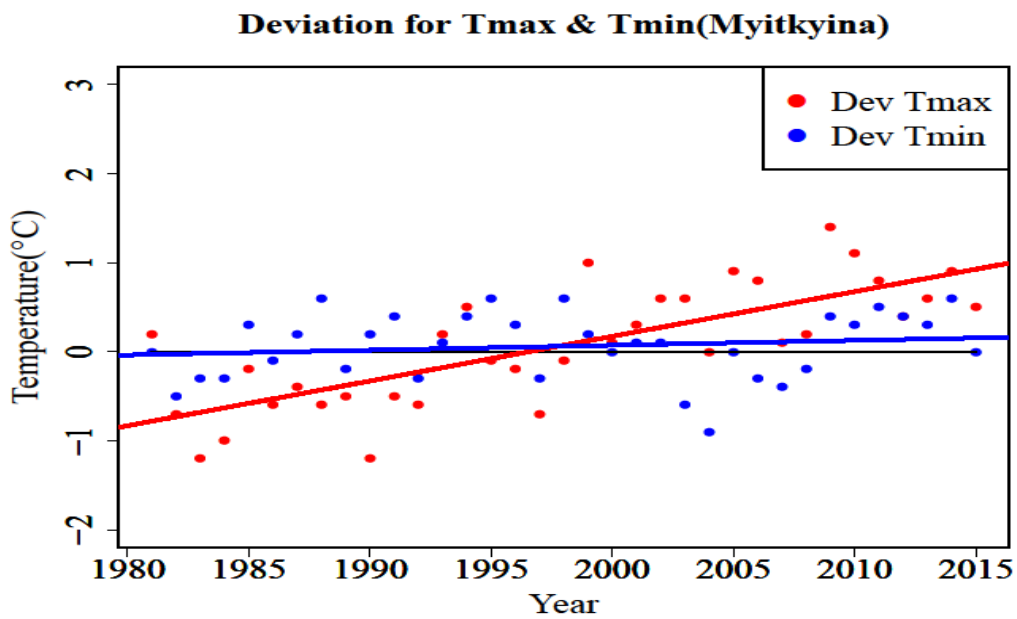


Figure 71 Maximum and minimum Temperature Deviation trend over Myitkyia

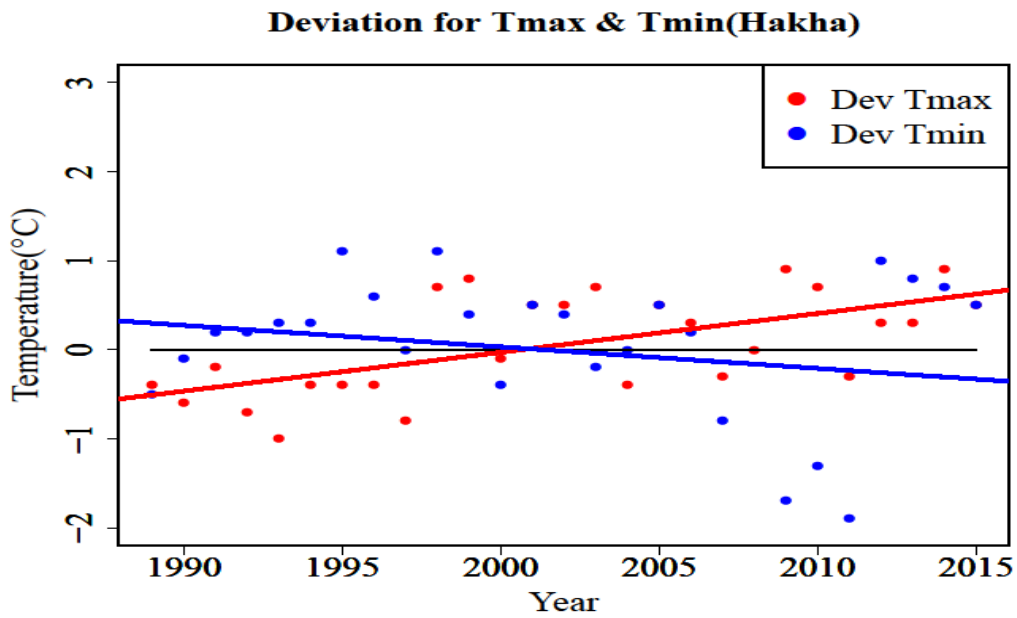


Figure 72 Maximum and minimum Temperature Deviation trend over Hakha

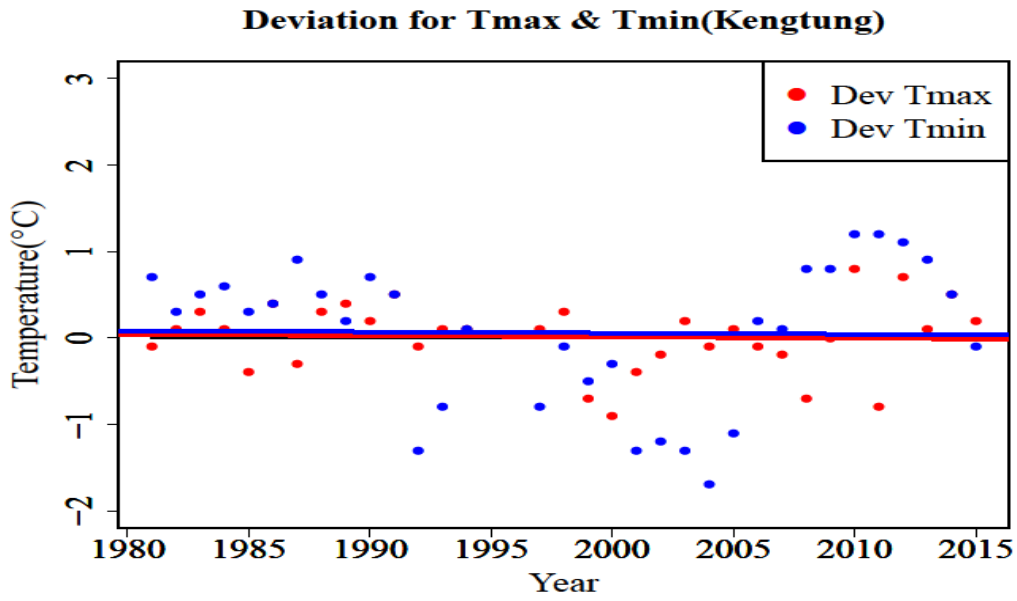


Figure 73 Maximum and minimum Temperature Deviation trend over Kengtung

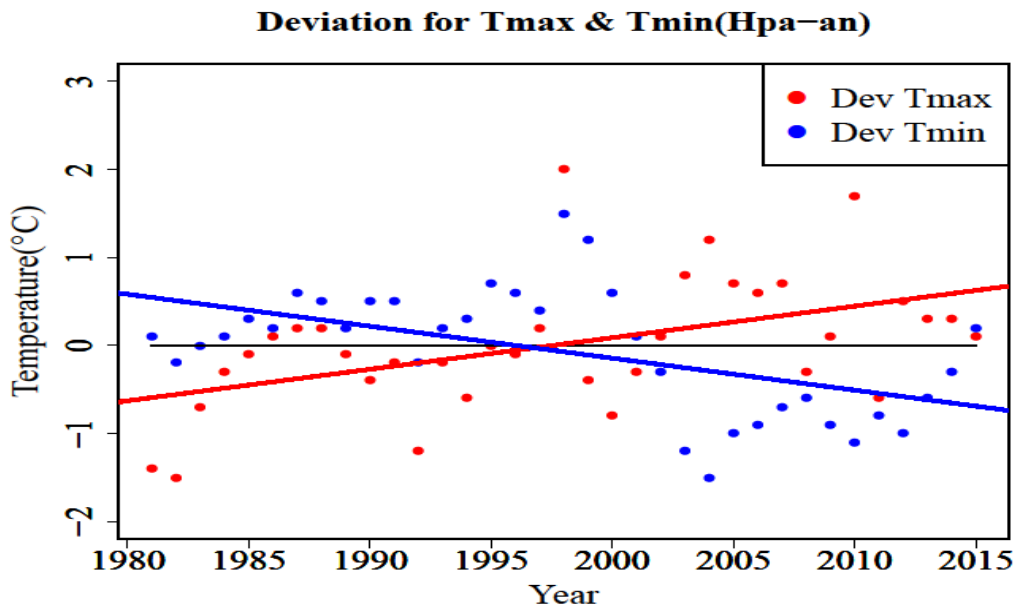


Figure 74 Maximum and minimum Temperature Deviation trend over Hpa-an

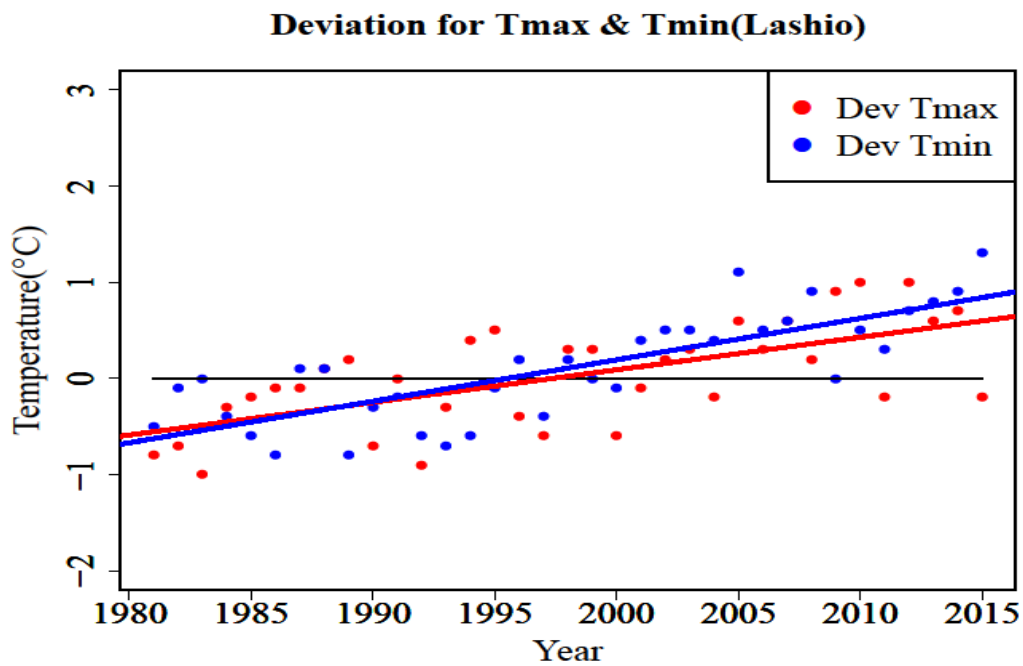


Figure 75 Maximum and minimum Temperature Deviation trend over Lashio

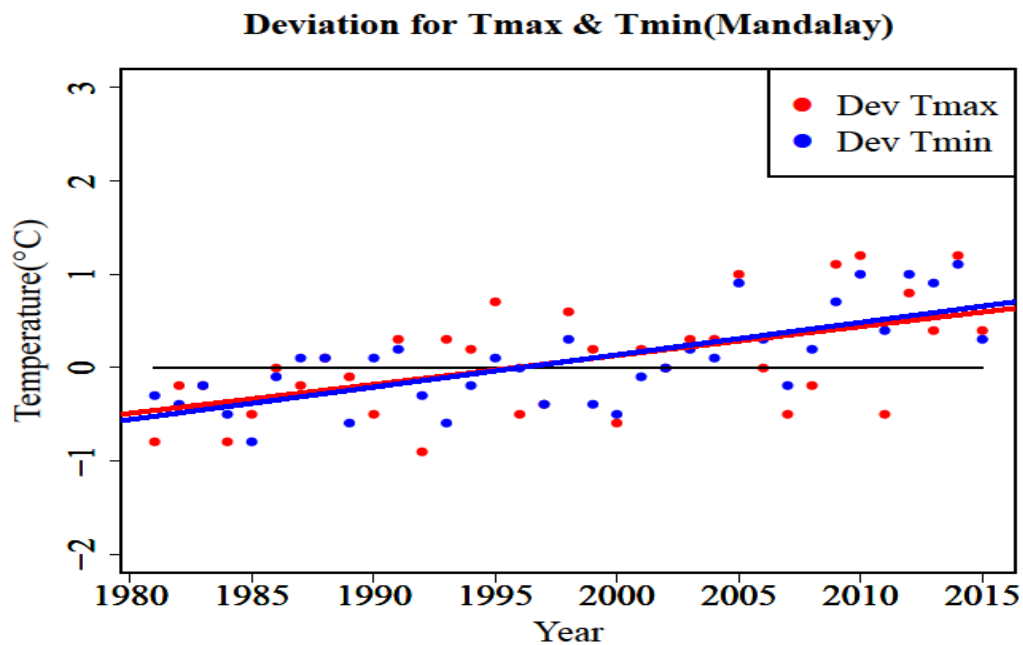


Figure 76: Maximum and minimum Temperature Deviation trend over Mandalay

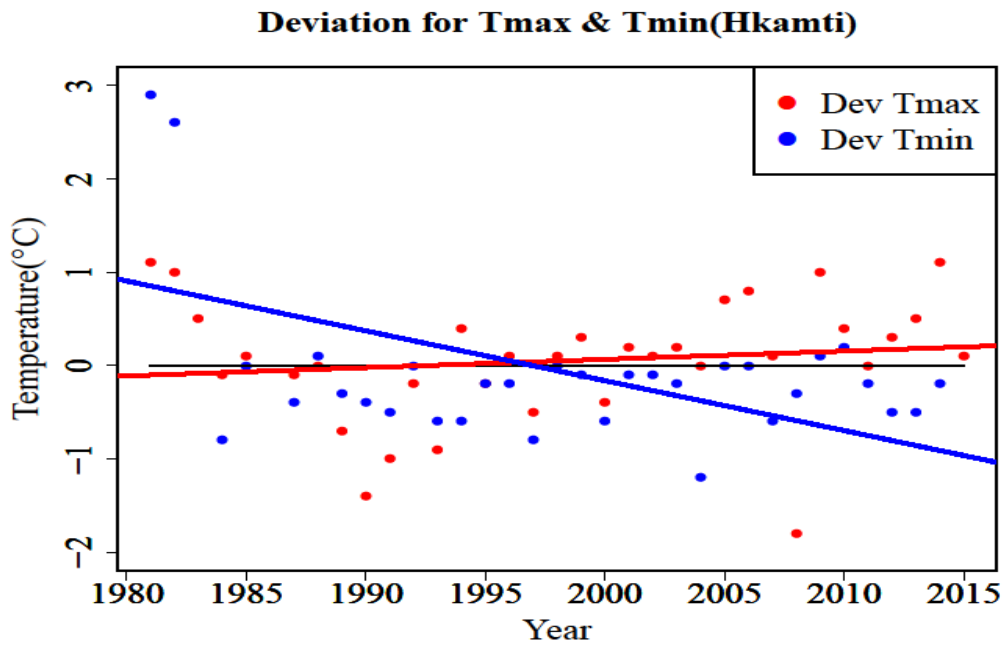


Figure 77: Maximum and minimum Temperature Deviation trend over Hkamti

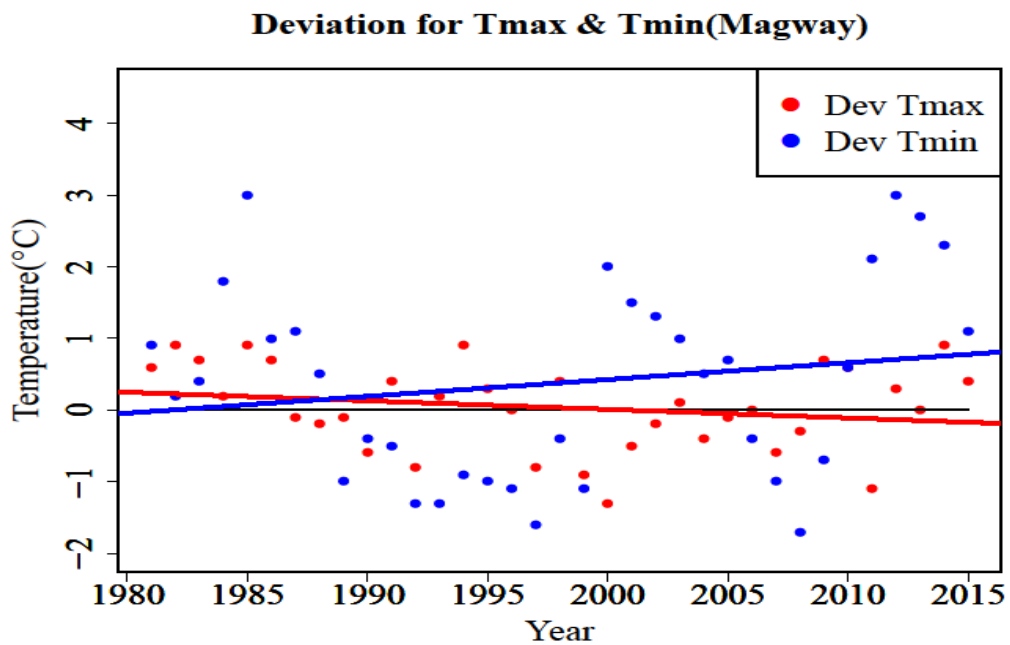


Figure 78: Maximum and minimum Temperature Deviation trend over Magway

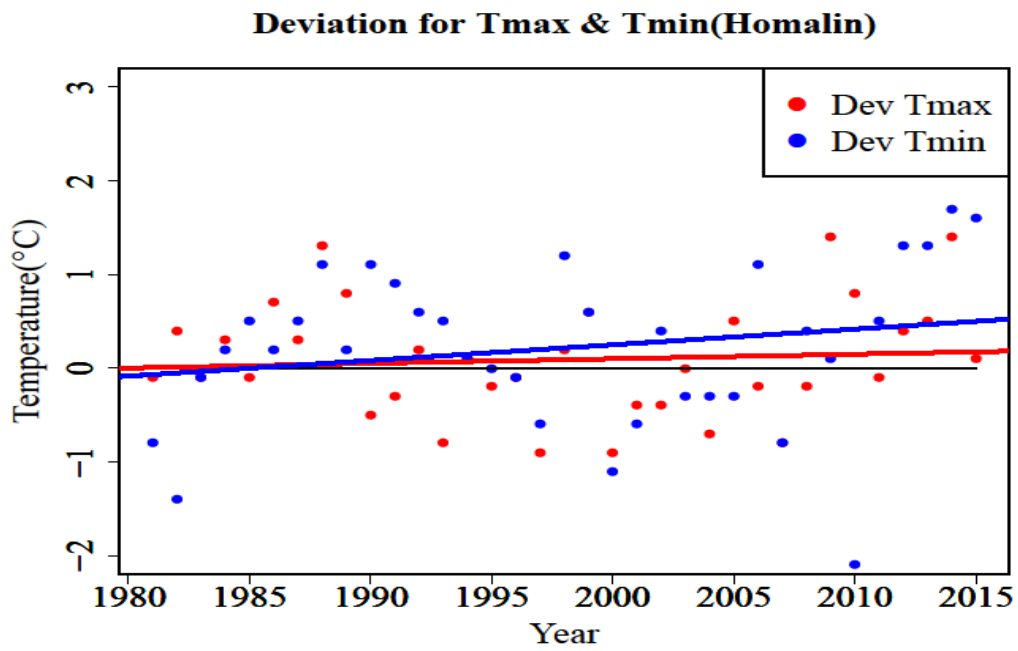


Figure 79: Maximum and minimum Temperature Deviation trend over Homalin

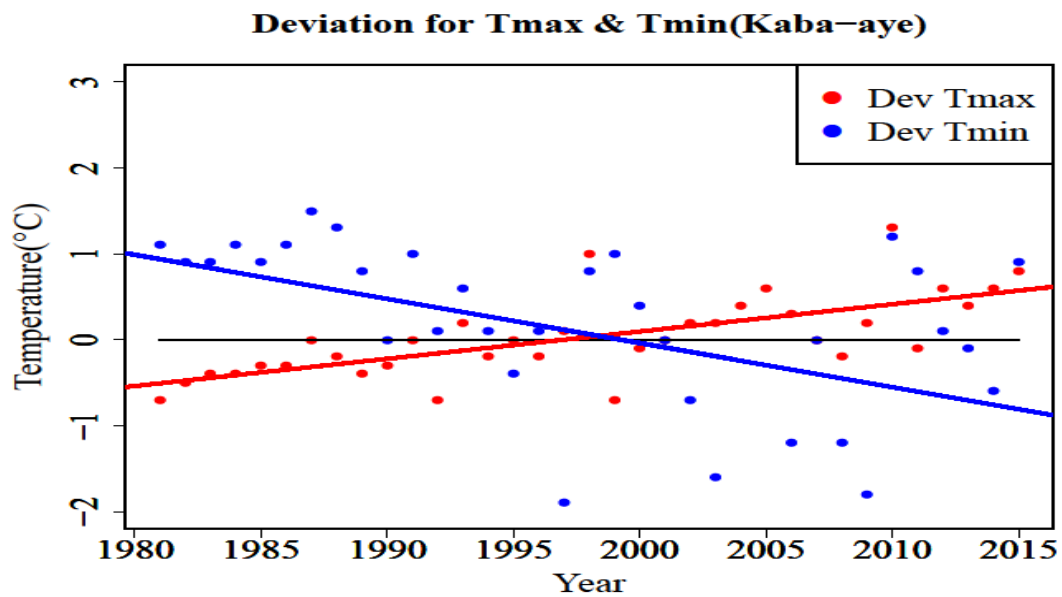


Figure 80: Maximum and minimum Temperature Deviation trend over Kaba-Aye

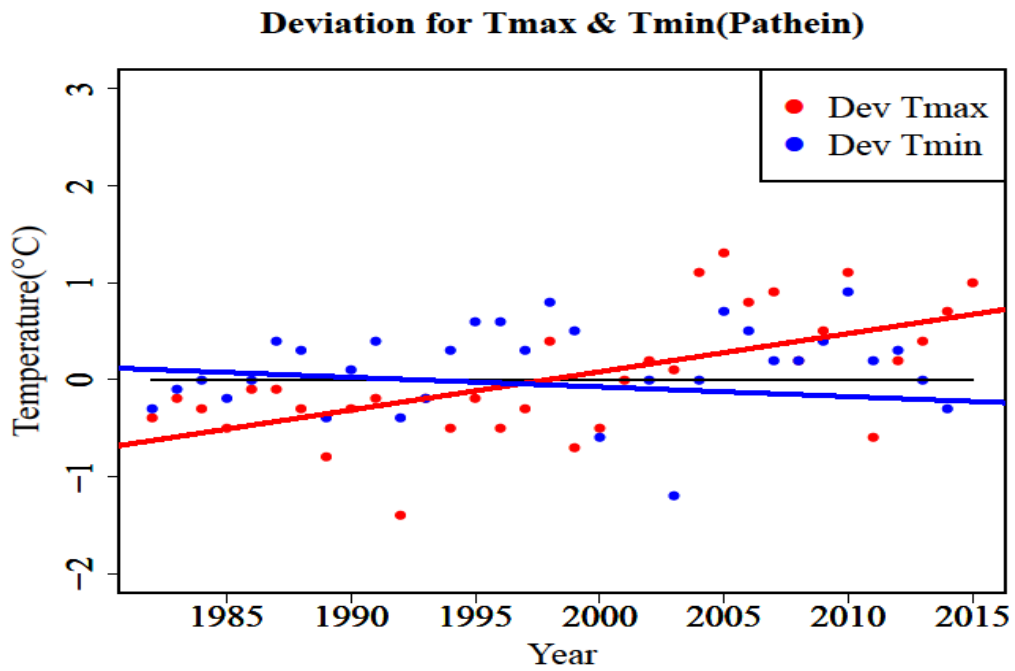


Figure 81: Maximum and minimum Temperature Deviation trend over Pathein

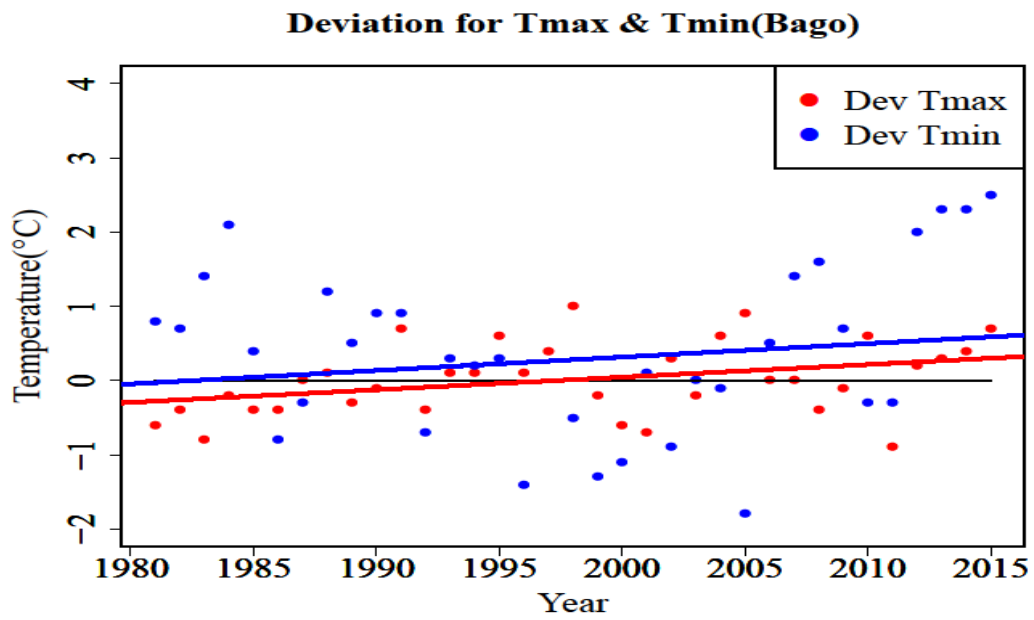


Figure 82: Maximum and minimum Temperature Deviation trend over Bago

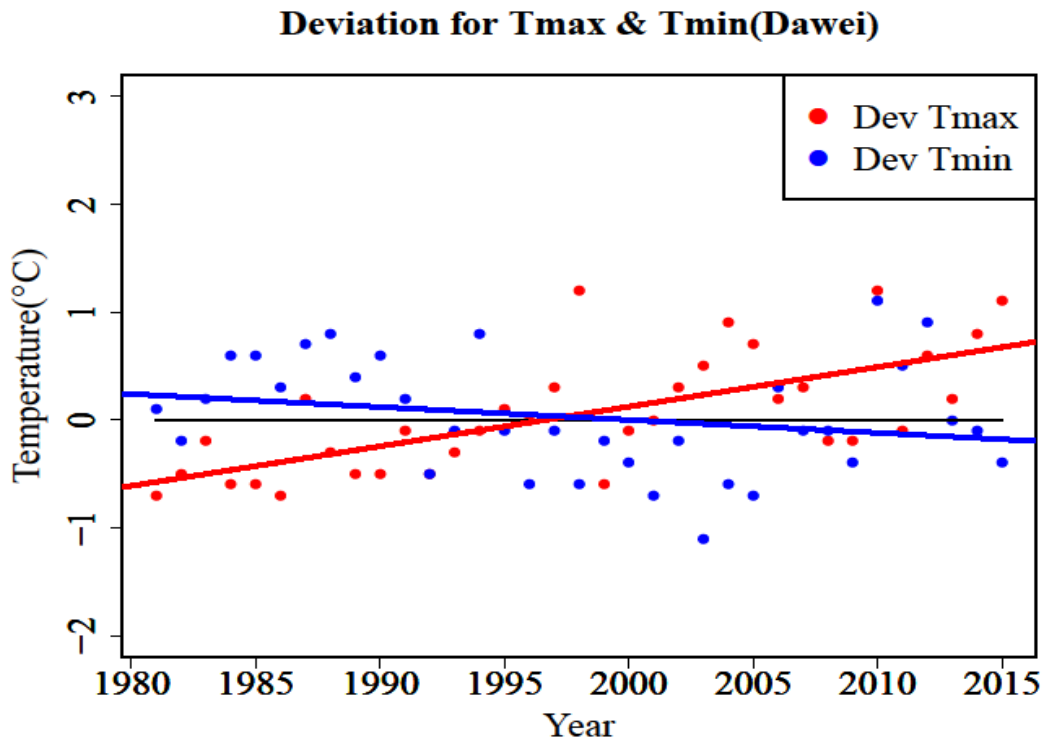


Figure 83: Maximum and minimum Temperature Deviation trend over Dawei

Table 35: Number of minimum temperature days at Loikaw, duration: 1981-2010

Minimum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	54	7	-	-	-	-	-	-	-	-	1	35	97
6° - 8°	306	107	1	1	-	-	-	-	-	-	13	197	625
8° - 10°	314	260	47	-	-	-	-	-	-	-	41	286	948
10° - 15°	214	424	477	33	-	-	-	-	-	36	406	331	1921
15° - 20°	11	43	396	626	290	223	321	324	416	709	421	81	3861
20° - 25°	-	6	9	240	639	677	609	606	484	185	18	-	3473
Greater than 25°	-	-	-	-	1	-	-	-	-	-	-	-	1

Table 36: Number of minimum temperature days at Lashio, duration: 1981-2010

Minimum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	577	439	112	4	-	-	-	-	-	-	13	267	1412
6° - 8°	229	234	204	11	-	-	-	-	-	-	69	253	1000
8° - 10°	76	91	226	32	-	-	-	-	-	6	122	182	735
10° - 15°	42	78	332	393	34	1	21	-	2	86	388	197	1574
15° - 20°	3	5	54	438	561	63	873	23	191	559	295	31	3096
20° - 25°	1	-	2	22	335	831	5	874	705	279	13	-	3067
Greater than 25°	-	-	-	-	-	5	-	2	2	-	-	-	9

Table 37: Number of minimum temperature days at Kengtung, duration: 1981-2010

Minimum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	24	10	1	-	-	-	-	-	-	-	8	34	77
6° - 8°	195	70	8	-	-	-	-	-	-	1	18	125	417
8° - 10°	291	246	26	-	-	-	-	-	-	3	37	202	805
10° - 15°	368	456	547	102	7	1	-	-	6	71	395	414	2367
15° - 20°	21	36	309	573	354	102	152	133	343	571	369	93	3056
20° - 25°	-	-	8	135	504	735	716	735	491	191	13	-	3528
Greater than 25°	-	-	-	-	3	2	-	-	-	-	-	-	5

Table 38: Number of minimum temperature days at Mandalay, duration: 1981-2010

Minimum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	-	-	-	-	-	-	-	-	-	-	-	-	0
6° - 8°	-	-	-	-	-	-	-	-	-	-	-	3	3
8° - 10°	21	2	-	-	-	-	-	-	-	-	-	5	28
10° - 15°	720	329	18	-	-	-	-	-	-	-	26	474	1567
15° - 20°	189	484	410	41	1	-	-	-	-	19	429	412	1985
20° - 25°	-	32	445	468	326	160	123	205	362	713	443	36	3313
Greater than 25°	-	-	57	391	603	740	807	725	538	198	2	-	4061

Table 39: Number of minimum temperature days at Homalin, duration: 1981-2010

Minimum temp(°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	10	2	-	-	-	-	-	-	-	-	-	7	19
6° - 8°	139	33	2	-	-	-	-	-	-	-	-	52	226
8° - 10°	313	140	10	-	-	-	-	-	-	-	2	183	648
10° - 15°	443	553	378	35	-	-	-	-	-	5	334	610	2358
15° - 20°	25	119	516	529	117	4	3	7	43	274	509	78	2224
20° - 25°	-	-	23	326	774	720	745	764	781	642	55	-	4830
Greater than 25°	-	-	1	10	39	176	182	159	76	9	-	-	652

Table 40: Number of minimum temperature days at Bago, duration: 1981-2010

Minimum temp(°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	-	-	-	-	-	-	-	-	-	-	-	-	0
6° - 8°	2	3	-	-	-	-	-	-	-	-	-	1	6
8° - 10°	12	4	-	-	-	-	-	-	-	-	-	6	22
10° - 15°	357	189	10	1	2	-	-	-	-	-	14	218	791
15° - 20°	535	543	439	75	76	113	111	122	96	64	304	614	3092
20° - 25°	24	106	479	714	652	736	788	760	776	825	580	91	6531
Greater than 25°	-	2	2	110	200	51	31	17	28	41	2	-	484

Table 41: Number of minimum temperature days at Kaba-Aye, duration: 1981-2010

Minimum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	-	-	-	-	-	-	-	-	-	-	-	-	0
6° - 8°	-	-	-	-	-	-	-	-	-	-	-	-	0
8° - 10°	1	1	-	-	-	-	-	-	-	-	-	-	2
10° - 15°	213	66	-	-	-	-	-	-	-	-	13	143	435
15° - 20°	658	599	299	23	19	26	70	61	61	52	228	626	2722
20° - 25°	58	181	623	706	572	730	754	786	739	820	647	161	6777
Greater than 25°	-	-	8	171	339	144	106	83	100	58	12	-	1021

Table 42: Number of minimum temperature days at Dawei, duration: 1981-2010

Minimum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Less than 6°	-	-	-	-	-	-	-	-	-	-	-	1	1
6° - 8°	-	-	-	-	-	-	-	-	-	-	-	2	2
8° - 10°	1	-	-	-	-	-	-	-	-	-	-	2	3
10° - 15°	141	57	9	-	1	-	-	-	-	2	28	153	391
15° - 20°	579	450	253	15	2	8	18	21	29	49	272	549	2245
20° - 25°	209	339	664	855	878	878	911	905	847	872	595	221	8174
Greater than 25°	-	1	4	30	49	14	1	4	4	7	5	2	121

Table 43: Number of maximum temperature days at Loikaw, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	-	-	-	-	-	-	-	-	-	-	0
38° - 40°	-	-	-	-	-	-	-	-	-	-	-	-	0
36° - 38°	-	-	2	64	19	-	-	-	-	-	-	-	85
30° - 36°	53	364	826	754	549	138	64	45	101	129	48	-	3071
25° - 30°	717	471	91	76	327	735	806	816	769	756	695	570	6829
20° - 25°	128	11	11	6	35	27	60	69	30	44	147	336	904
Less than 20°	1	1	-	-	-	-	-	-	-	1	10	8	21

Table 44: Number of maximum temperature days at Lashio, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	-	-	-	-	-	-	-	-	-	-	0
38° - 40°	-	-	-	3	1	-	-	-	-	-	-	-	4
36° - 38°	-	-	1	90	33	3	-	-	4	-	-	-	131
30° - 36°	2	174	711	653	645	543	388	420	487	426	57	2	4508
25° - 30°	600	559	185	137	215	341	442	440	375	425	697	482	4898
20° - 25°	320	95	26	16	33	12	69	38	32	74	128	427	1270
Less than 20°	8	19	7	1	3	1	-	-	2	5	18	19	83

Table 45: Number of maximum temperature days at Kengtung, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	-	-	-	-	-	-	-	-	-	-	0
38° - 40°	-	-	-	16	14	-	-	-	-	-	-	-	30
36° - 38°	-	-	6	139	91	11	-	-	-	-	-	-	247
30° - 36°	36	366	749	556	515	530	382	383	400	313	123	11	4364
25° - 30°	721	402	110	80	199	280	426	445	388	414	542	548	4555
20° - 25°	131	42	30	18	46	19	60	40	52	100	151	266	955
Less than 20°	11	8	4	1	3	-	-	-	-	10	24	43	104

Table 46: Number of maximum temperature days at Mandalay, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	46	324	171	12	2	3	-	-	-	-	558
38° - 40°	-	7	203	291	176	47	54	15	4	8	-	-	805
36° - 38°	-	54	333	164	204	234	231	152	86	30	6	1	1495
30° - 36°	367	654	326	107	341	593	624	727	765	823	657	253	6237
25° - 30°	547	117	20	14	36	14	19	32	45	66	200	639	1749
20° - 25°	15	13	2	-	2	-	-	1	-	3	37	32	105
Less than 20°	1	2	-	-	-	-	-	-	-	-	-	5	8

Table 47: Number of maximum temperature days at Homalin, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	-	9	20	17	-	-	-	-	-	-	46
38° - 40°	-	-	5	70	85	9	-	-	-	-	-	-	169
36° - 38°	-	-	39	155	151	21	1	7	15	14	-	-	403
30° - 36°	1	202	638	489	500	585	531	593	613	667	312	12	5143
25° - 30°	631	532	179	141	152	267	394	327	255	205	520	685	4288
20° - 25°	275	100	66	36	22	1	4	3	17	44	68	203	839
Less than 20°	23	13	3	-	-	-	-	-	-	-	-	30	69

Table 48: Number of maximum temperature days at Bago, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	-	76	54	-	-	-	-	-	-	-	130
38° - 40°	-	8	166	358	125	-	-	-	-	-	-	-	657
36° - 38°	-	84	344	326	143	1	-	-	-	2	6	-	906
30° - 36°	765	739	405	127	471	440	380	313	564	826	791	659	6480
25° - 30°	163	15	15	13	136	451	545	585	335	98	96	268	2720
20° - 25°	2	1	-	-	1	8	5	1	1	4	7	3	33
Less than 20°	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 49: Number of maximum temperature days at Kaba-Aye, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	1	2	32	24	-	-	-	-	-	-	-	59
38° - 40°	-	21	139	350	125	-	-	-	-	-	-	1	636
36° - 38°	9	233	500	380	138	-	-	-	1	11	29	6	1307
30° - 36°	885	586	284	128	509	568	500	455	605	779	797	850	6946
25° - 30°	35	6	5	10	134	332	429	475	292	136	65	73	1992
20° - 25°	1	-	-	-	-	-	-	-	2	4	9	-	16
Less than 20°	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 50: Number of maximum temperature days at Dawei, duration: 1981-2010

Maximum temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
40° and greater	-	-	-	-	-	-	-	-	-	-	-	-	0
38° - 40°	-	-	4	7	6	-	-	-	-	-	-	-	17
36° - 38°	5	31	125	207	53	-	-	-	1	1	13	3	439
30° - 36°	891	804	793	662	586	307	224	169	360	743	816	815	7170
25° - 30°	34	12	8	23	277	557	669	704	505	182	70	112	3153
20° - 25°	-	-	-	1	8	36	37	57	14	4	1	-	158
Less than 20°	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 51: Frequency of rainy days over Loikaw for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	918	834	896	758	516	355	367	317	390	594	759	901	7605
Light rain 1-10	5	10	25	107	286	427	430	425	321	243	95	21	2395
Moderate rain 11-22	5	3	5	25	80	79	86	104	110	54	34	6	591
Moderate heavy 23-43	2	-	4	8	37	35	41	66	61	32	8	2	296
Heavy rain 44-88	-	-	-	2	11	4	6	18	18	6	5	-	70
Very heavy rain > 89	-	-	-	-	-	-	-	-	-	-	-	-	0
Very heavy rain 100-199	-	-	-	-	-	-	-	-	-	1	-	-	1
Very heavy rain 200-299	-	-	-	-	-	-	-	-	-	-	-	-	0
Very heavy rain > 300	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 52: Frequency of rainy days over Hakha for different rainfall ranges during the period 1989-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	635	546	607	520	382	222	171	157	186	330	548	655	4959
Light rain 1-10	13	37	52	96	187	269	281	280	256	212	76	17	1776
Moderate rain 11-22	2	9	15	26	60	92	115	137	117	79	29	5	686
Moderate heavy 23-43	-	-	6	15	33	57	90	79	74	39	4	4	401
Heavy rain 44-88	-	-	1	2	17	19	25	29	22	21	3	1	140
Very heavy rain > 89	-	-	1	-	-	-	-	-	1	-	-	-	2
Very heavy rain 100-199	-	-	-	1	3	-	-	-	4	1	-	-	9
Very heavy rain 200-299	-	-	-	-	-	-	-	-	-	-	-	-	0
Very heavy rain > 300	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 53: Frequency of rainy days over Lashio for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	908	808	861	666	524	420	329	329	453	610	763	891	7562
Light rain 1-10	20	32	62	184	268	308	366	358	270	195	80	31	2174
Moderate rain 11-22	1	5	3	35	81	100	121	117	97	73	36	4	673
Moderate heavy 23-43	1	2	4	15	48	53	66	73	61	33	12	3	371
Heavy rain 44-88	-	-	-	-	9	14	16	20	19	19	8	-	105
Very heavy rain > 89	-	-	-	-	1	-	-	-	-	-	-	-	1
Very heavy rain 100-199	-	-	-	-	3	1	1	-	-	-	-	-	5
Very heavy rain 200-299	-	-	-	-	-	-	-	-	-	-	-	-	0
Very heavy rain > 300	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 54: Frequency of rainy days over Kengtung for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	852	771	817	644	451	324	262	275	403	523	671	780	6773
Light rain 1-10	35	41	62	112	293	388	390	394	286	210	99	43	2353
Moderate rain 11-22	10	4	18	40	70	82	143	133	95	73	33	9	710
Moderate heavy 23-43	1	1	2	11	43	36	60	52	43	25	26	5	305
Heavy rain 44-88	1	1	-	3	11	10	12	12	13	6	10	-	79
Very heavy rain > 89	-	-	-	-	-	-	1	-	-	-	1	-	2
Very heavy rain 100-199	-	-	-	-	-	-	-	1	-	-	-	-	1
Very heavy rain 200-299	-	-	-	-	-	-	-	-	-	-	-	-	0
Very heavy rain > 300	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 55: Frequency of rainy days over Magway for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	892	808	914	852	691	493	549	488	527	653	795	908	8570
Light rain 1-10	6	10	12	32	154	288	297	315	224	162	66	16	1582
Moderate rain 11-22	-	-	3	7	44	74	55	78	76	64	19	4	424
Moderate heavy 23-43	1	1	-	6	30	32	23	41	53	29	12	2	230
Heavy rain 44-88	-	-	1	2	9	12	6	6	19	19	7	-	81
Very heavy rain > 89	-	-	-	1	-	-	-	1	2	2	-	-	6
Very heavy rain 100-199	-	-	-	-	2	1	-	-	1	1	1	-	6
Very heavy rain 200-299	-	-	-	-	-	-	-	-	-	-	-	-	0
Very heavy rain > 300	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 56: Frequency of rainy days over Monywa for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	925	834	891	807	686	704	768	674	598	691	829	911	9318
Light rain 1-10	2	12	33	71	171	120	124	162	163	138	44	15	1055
Moderate rain 11-22	2	1	5	15	38	42	19	45	67	48	8	4	294
Moderate heavy rain 23-43	-	-	-	5	24	24	12	39	43	41	12	-	200
Heavy rain 44-88	-	-	1	2	8	8	7	9	27	12	6	-	80
Very heavy rain > 89	-	-	-	-	1	-	-	-	1	-	-	-	2
Very heavy rain 100-199	-	-	-	-	1	2	-	1	1	-	1	-	6
Very heavy rain 200-299	-	-	-	-	-	-	-	-	-	-	-	-	0
Very heavy rain > 300	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 57: Frequency of rainy days over Hkamti for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	887	767	831	705	557	190	104	203	322	631	816	867	6880
Light rain 1-10	35	64	85	153	179	228	217	261	239	155	60	28	1704
Moderate rain 11-22	7	12	10	28	79	135	155	129	132	57	11	2	757
Moderate heavy rain 23-43	1	2	3	10	58	148	155	132	85	43	10	1	648
Heavy rain 44-88	-	1	1	3	45	131	180	132	96	30	1	1	621
Very heavy rain > 89	-	-	-	-	2	16	22	19	11	6	-	-	76
Very heavy rain 100-199	-	-	-	-	7	45	83	48	11	8	1	-	203
Very heavy rain 200-299	-	-	-	-	3	5	10	6	4	-	-	-	28
Very heavy rain > 300	-	-	-	-	-	2	4	-	-	-	-	-	6

Table 58: Frequency of rainy days over Homalin for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	896	772	802	696	579	317	281	330	401	636	808	889	7407
Light rain 1-10	24	63	109	168	200	258	280	291	241	152	65	26	1877
Moderate rain 11-22	9	10	13	24	77	130	150	123	113	65	17	10	741
Moderate heavy 23-43	-	2	5	11	43	96	108	96	74	44	6	4	489
Heavy rain 44-88	-	-	-	1	22	82	83	73	51	24	4	-	340
Very heavy rain > 89	-	-	-	-	1	8	6	7	7	2	-	-	31
Very heavy rain 100-199	-	-	-	-	6	8	18	9	12	6	-	-	59
Very heavy rain 200-299	-	-	-	-	-	1	2	-	-	-	-	-	3
Very heavy rain > 300	-	-	-	-	-	-	1	-	-	-	-	-	1

Table 59: Frequency of rainy days over Bago for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	919	839	901	823	445	125	113	159	255	569	795	913	6856
Light rain 1-10	11	5	16	40	234	241	264	232	288	200	65	9	1605
Moderate rain 11-22	-	2	5	16	87	177	194	190	154	84	18	4	931
Moderate heavy 23-43	-	1	4	14	103	186	198	232	124	54	16	2	934
Heavy rain 44-88	-	-	2	6	52	126	134	97	66	19	5	2	509
Very heavy rain > 89	-	-	-	1	2	6	11	10	5	1	-	-	36
Very heavy rain 100-199	-	-	-	-	6	9	16	10	8	3	1	-	53
Very heavy rain 200-299	-	-	-	-	1	-	-	-	-	-	-	-	1
Very heavy rain > 300	-	-	-	-	-	-	-	-	-	-	-	-	0

Table 60: Frequency of rainy days over Pathein for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	1	3	12	25	185	276	269	303	314	219	58	3	1668
Light rain 1-10	-	4	2	14	79	164	154	174	128	113	26	2	860
Moderate rain 11-22	1	2	2	6	63	166	184	150	124	51	17	1	767
Moderate heavy rain 23-43	-	1	1	6	43	90	110	105	49	21	8	-	434
Heavy rain 44-88	-	-	-	-	5	5	8	9	4	1	-	-	32
Very heavy rain > 89	-	1	-	-	4	17	16	19	4	3	4	1	69
Very heavy rain 100-199	-	-	-	-	1	1	-	-	-	-	-	-	2
Very heavy rain 200-299	-	-	-	-	-	-	-	-	-	-	-	-	0
Very heavy rain > 300	1	3	12	25	185	276	269	303	314	219	58	3	1668

Table 61: Frequency of rainy days over Dawei for different rainfall ranges during the period 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Dry days	907	809	841	726	313	89	86	72	162	418	776	905	6104
Light rain 1-10	17	26	54	91	253	198	208	201	272	279	85	18	1702
Moderate rain 11-22	4	4	18	34	119	154	153	140	151	97	19	5	898
Moderate heavy rain 23-43	2	5	12	31	126	171	204	184	135	65	16	1	952
Heavy rain 44-88	-	3	4	13	85	201	177	203	109	55	2	1	853
Very heavy rain > 89	-	-	-	2	14	18	21	24	12	2	1	-	94
Very heavy rain 100-199	-	-	1	2	20	62	66	97	34	12	-	-	294
Very heavy rain 200-299	-	-	-	-	-	6	12	7	4	1	-	-	30
Very heavy rain > 300	-	-	-	1	-	1	3	2	1	1	-	-	9

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