

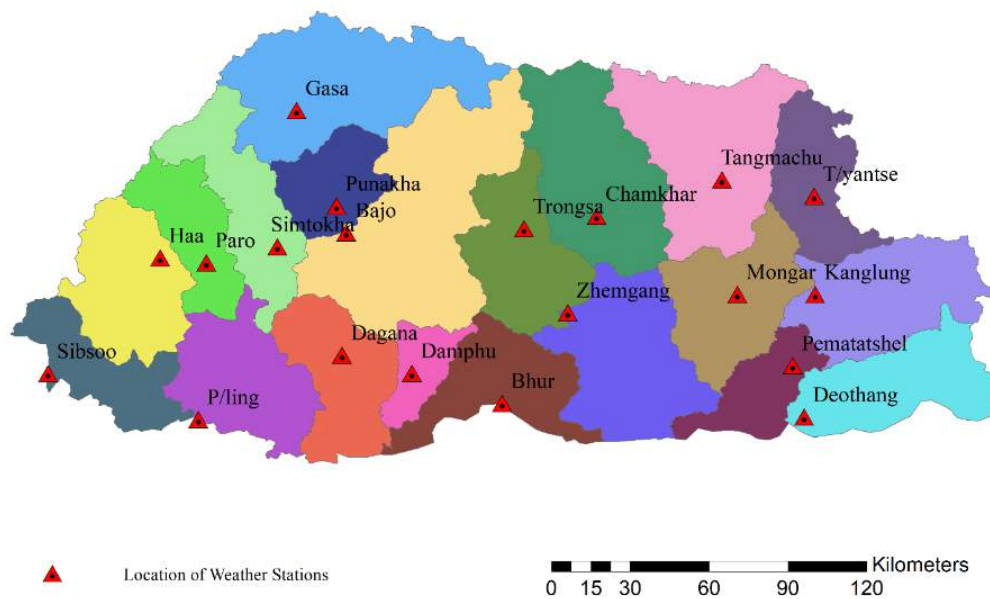
**WEATHER AND CLIMATE SERVICES DIVISION
NATIONAL CENTER FOR HYDROLOGY & METEOROLOGY
ROYAL GOVERNMENT OF BHUTAN**



**RECORDS OF
EXTREME WEATHER EVENTS
IN BHUTAN
2022**

About this Report

The Extreme Weather Events records is an annual report that provides a summary of observations of the country's extreme weather. The report includes lists of extreme meteorological events in the country from July 2016 to July 2022. Due to the scarcity of historical weather impact datas and records relating to extreme weather and flooding in NCHM, extreme event records are retrieved from Kuensel and BBS. This report aims to provide information about historical extreme meteorological occurrences in Bhutan, including their locations, causes, and impacts. Computations contained in this report are based on Class A (Agro meteorological) stations owned and operated by the National Center for Hydrology and Meteorology, Royal Government of Bhutan.



Location of Agro-meteorological Stations

Contents

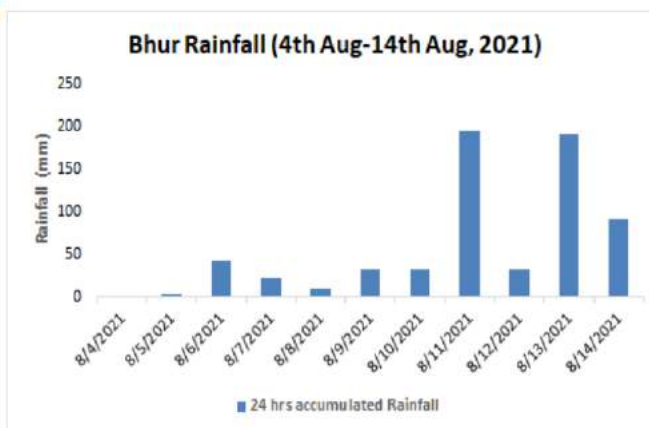
Extreme Weather Events [July, 2021 - July, 2022]	1
1. Flash Floods	1
2. Landslides	3
3) Snowfall	4
4) Pre and Post Monsoon disturbances	7
Past Extreme Weather Records [July, 2016 - July, 2021]	11
1. Flash Flood	11
2. Landslide	13
3. Snowfall	14
4. Windstrom	16
5. Impact of Tropical cyclone ‘AMPHAN’	18

Extreme Weather Events [July, 2021 - July, 2022]

1. Flash Floods

a. 12 August 2021

A flash flood triggered by incessant rainfall (from 5th August to 12th august) damaged a temporary bailey bridge near the domestic airport in Gelephu at around 5 am in the morning of 12th august. Gelephu recorded extremely heavy rainfall of 194.5 mm on 11th August, 2021. The flood also damaged the protection wall. The estimated cost of damage is reported around Nu 600,000.



b. 25 August 2021

Gasa tshachu nestled on the left bank of Mochhu was washed away on the early morning of 26th August. Gasa received heavy rainfall of 31.2 mm on 25th of August (rainfall recorded from 9 AM of 25th till 9 AM of 26th August). Similarly, the flood on 25th August in Gelephu destroyed the water treatment plant in gelephu. Gelephu received extremely heavy rainfall of more than 200 mm on both 24th and 25th August.



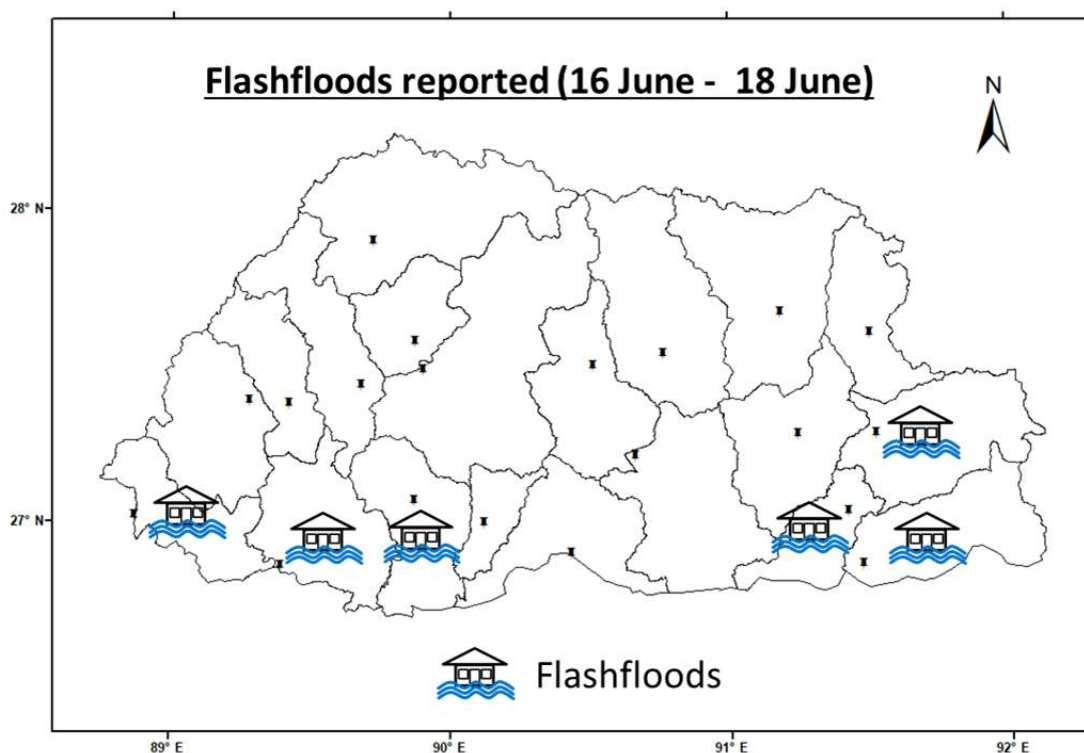
c. 19 October 2021

The swollen Amochhu due to the incessant rainfall washed away 26 cattle in Bangaley village under Denchukha Gewog in Samtse on 19th October night.



d. 16-18 June 2022

Bhutan experienced heavy to very rainfall during 16 June and 18 June over some places in the southern and eastern parts of the country causing several flash floods and landslides damaging infrastructures and resulting in casualties.





2. Landslides

a. 26 August 2021

On August 26, 2021, a landslide killed three people in PemaGatshel. The landslide washed away the hut they were living in. Pemagatshel received heavy rainfall on 24th August and very heavy rainfall of 81.8mm on 25th August (rainfall recorded from 9 AM of 25th till 9 AM of 26th August). Similarly, a shop in Tsalabi village under Kengkhhar gewog, Mongar was damaged by a falling boulder on 26th August, 2021.



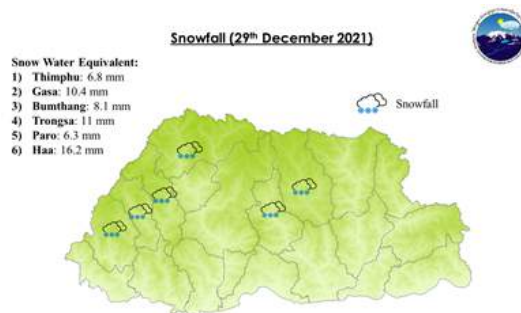
b. 18th June 2022

Heavy rain on 17th night caused several landslides in the southern parts of the country which resulted in 3 casualties.



3) Snowfall

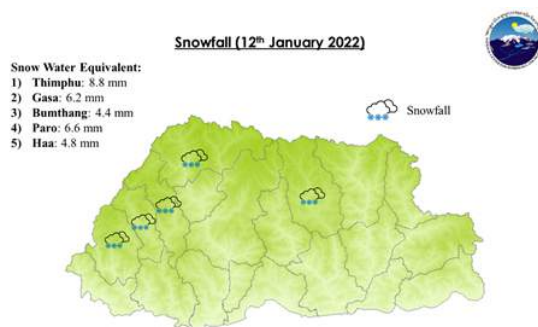
a) 29th December 2021



SI no.	Class A station	Snow water equivalent
1	Thimphu	6.8 mm
2	Gasa	10.4 mm
3	Bumthang	8.1 mm

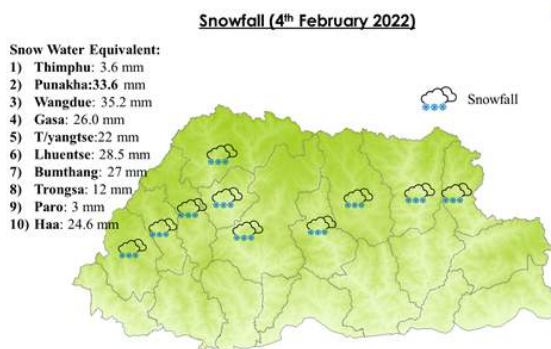
4	Trongsa	11 mm
5	Paro	6.3 mm
6	Haa	16.2 mm

b) 12 January 2022



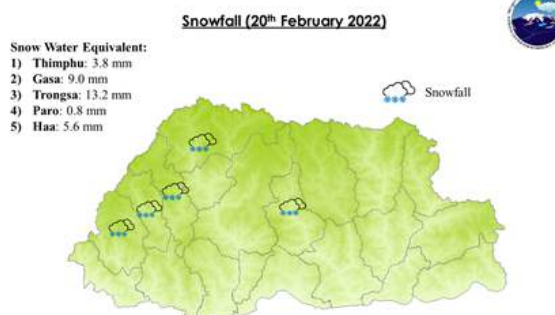
SI no.	Class A station	Snow water equivalent
1	Thimphu	8.8 mm
2	Gasa	6.2 mm
3	Bumthang	4.4 mm
5	Paro	6.6 mm
6	Haa	4.8 mm

c) 4-5 february 2022



SI no.	Class A station	Snow water equivalent (4 th February)	Snow water equivalent (5 th February)
1	Thimphu	6.6 mm	4.2 mm
2	Gasa	26 mm	N/A
3	Bumthang	27 mm	2 mm
4	Trongsa	12 mm	0 mm
5	Paro	3 mm	1 mm
6	Haa	24.6 mm	1.4 mm
7	Wangdue	35.2 mm	
8	Punakha	33.6 mm	
9	Trashiyangtse	22 mm	
10	Lhuentse	28.5 mm	

d) 20 February 2022



SI no.	Class A station	Snow water equivalent
1	Thimphu	3.8 mm
2	Gasa	9 mm
4	Trongsa	13.2 mm
5	Paro	0.8 mm
6	Haa	5.6 mm

4) Pre and Post Monsoon disturbances

a) 17-20th October 2021

The continuous rainfall from 17 till 20th October damaged harvested paddies and ripe standing paddy crops in many parts of the country. The incessant rain ruined paddies in the western, eastern and central dzongkhags as farmers started harvesting their paddies.

Kuensel
19 October at 12:01 · 🌐

A farmer in Lobesa, Punakha, tries to save her paddy from the rain. The rain since last night has drenched harvested paddy in many places. The NHCM forecast light to moderate rainfall over the country until October 20.

Photo: Singye Dorji, Cluster Lead Teacher, Gaselo HSS, Wangdue



BBS
19 October at 12:30 · 🌐

Incessant rain affects paddy growers

With incessant rain for almost three days and NCHM predicting rainfall for another few days, farmers in Trongsa are worried that it will affect the paddy yield this time.

Farmers have managed to temporarily cover with plastics for now..... See more



Kuensel
20 October at 12:22 · 🌐

Incessant rain damages paddy crops across the country

Phurpa Lhamo, Phub Dem and Choki Wangmo

Heavy rain since October 17 has damaged harvested paddies and ripe standing paddy crops in many parts of the country. The incessant rain ruined paddies in the western, eastern and central dzongkhags as farmers started harvesting their paddies. In the south, farmers have not yet harvested the crop, but the rain has damaged it. <https://kuenselonline.com/incessant-rain-damages-paddy-cro...> See more



BBS
19 October at 19:30 · 🌐

Incessant rain affects paddy growers

Paddy growers are facing a tough time as continuous rain lashed in most parts of the country's western and central regions causing damage to the matured crop ready for harvest. The continuous rain in the last two days has dashed the hopes of farmers. <http://www.bbs.bt/news/?p=159348>

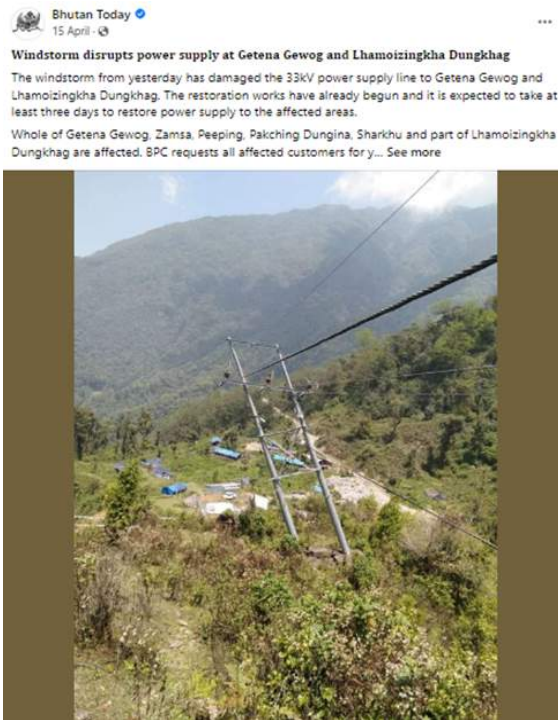


b) 20 February 2022

Hailstorm and strong winds damaged cardamom and vegetables of four villages under Pemaling Gewog in Samtse on 20th February.

c) 14 April 2022

The windstorm on 14th April damaged the 33kV power supply line to Getena Gewog and Lhamoizingkha Dungkhag.



d) 15 April 2022

Windstorm and heavy rain damaged about 127 acres of maize fields in Dagana on 15th April. The calamity also blew off the roofing of 16 houses and a poultry farm. The roofing of three houses was reported to be severely damaged. The storm also collapsed a mega greenhouse to the ground and damaged 250 bags of cement meant for the ongoing BHU construction in the gewog.



e) 22 April 2022

The heavy storm on 22nd April damaged the Jamthog and roofs of the main Lhakhang of Pekar Choeling Dratshang. Few incidents of fallen tree branches and flash flood hitting the houses and supply lines reported in other areas of the town.



f) 8 May 2022

The heavy rainfall and gusty wind on the 8th May, 2022 damaged the 33kV Jomotshangkha Line causing black out under Jomotshangkha Dungkhag, Langchenphu Dungkhag, Lauri Gewog and Serthi Gewog.



g) 18 May 2022

Heavy rain and strong winds damaged roofs in Phuentsholing on 18th May 2022.



Past Extreme Weather Records [July, 2016 - July, 2021]

In the last six years, some of the most common hazards observed in Bhutan are landslides, flash floods, windstorms, and snowfall.

1. Flash Flood

a. 15th to 26th July, 2016

There was continuous heavy rain from 15th to 26th July 2016 over most parts of the country. Southern parts of the country received heavy to very heavy rainfall during these periods. Due to consistent heavy rain there were several flash floods and landslides reported from different parts of the country damaging infrastructures in nine dzongkhags.

The major affected dzongkhags were Samtse, Chukha and Sarpang. The impact due to the swollen river was over Sarpang town. More than 40 shopkeepers of Sarpang had to move to higher ground after the Sarpang River broke its banks and flooded the town.

b. 29th April, 2019

On 29th April 2019, most of the stations over the country reported rainfall. Heavy rainfall was received mainly over the eastern parts of Bhutan. Deothang met station received the heaviest rainfall of 267 mm followed by Mongar with 37.4 mm and Lhuentse 35.2 mm (daily accumulation). There are reports of small flash floods in Lhuentse.



Figure 3: Flash flood on Lekpagang chhu in Lhuntse.

c. 7th August, 2019

Continuous rainfall caused flash floods on 7th August, 2019 morning at Kamichu area, Wangdue Phodrang. The flood led to swelling of Punatsangchhu and submerging of roads. The swollen Phangruchhu stream in Jaroggang totally damaged a two-storied traditional house and washed away a concrete bridge connecting Athang Gewog Centre. The flash flood has also damaged the irrigation water channel of twenty households, drinking water supply of four households and about twenty acres of paddy field under Jaroggang-Dzawo chiwog in Athang Gewog.



Figure 4: Aftermath of the flash flood in Wangdue Phodrang.

d. 1st October, 2020

The incessant rainfall near the source of the stream, Chamdey Gangchhu joining Mangdechhu, triggered the flash flood on October 1, 2020, causing six families residing at Bjizam homeless and also damaging the bridge linking Bjizam village. An artificial landslide dam was formed on Mangdechhu in Bjizam as a result of debris flow from the flash flood, posing a threat to residents living along the river valley. Locals claim that this was the first time in the area that such a severe flood occurred.

e. 4th October, 2020

A Flash flood in Ruecheykha village, Ruebisa gewog, on October 4 around midnight ruined more than three acres of ripe paddy belonging to 11 people. The same flood also damaged farm roads in Jala village, broke electricity lines in Ruecheykha village, damaged water sources and kitchen gardens, and destroyed roughly 30 litchi trees and other fruits.

f. 15th June, 2021

A flash flood occurred around 4:00 PM on June 15, 2021 at Chendebji, Trongsa as a result of continuous rainfall, causing minor damage to a bridge, houses, cow sheds, and timber logs in the river's vicinity. However, there were no reports of casualties.

2. Landslide

a. 25th July, 2019

Due to the continuous rainfall in July, a landslide led to the Artificial Lake Formation on 25th July, 2019 at Jigmecholingarea, Sarpang.

b. 11th July, 2020

On July 11th, due to continuous heavy rainfall over the southern parts of the country, there was a massive landslide which buried the two-storied traditional gewog office in Gomdar gewog, Samdrup Jongkhar. The continuous heavy rainfall has also caused several roadblockages along the highways in the southern parts of the country.

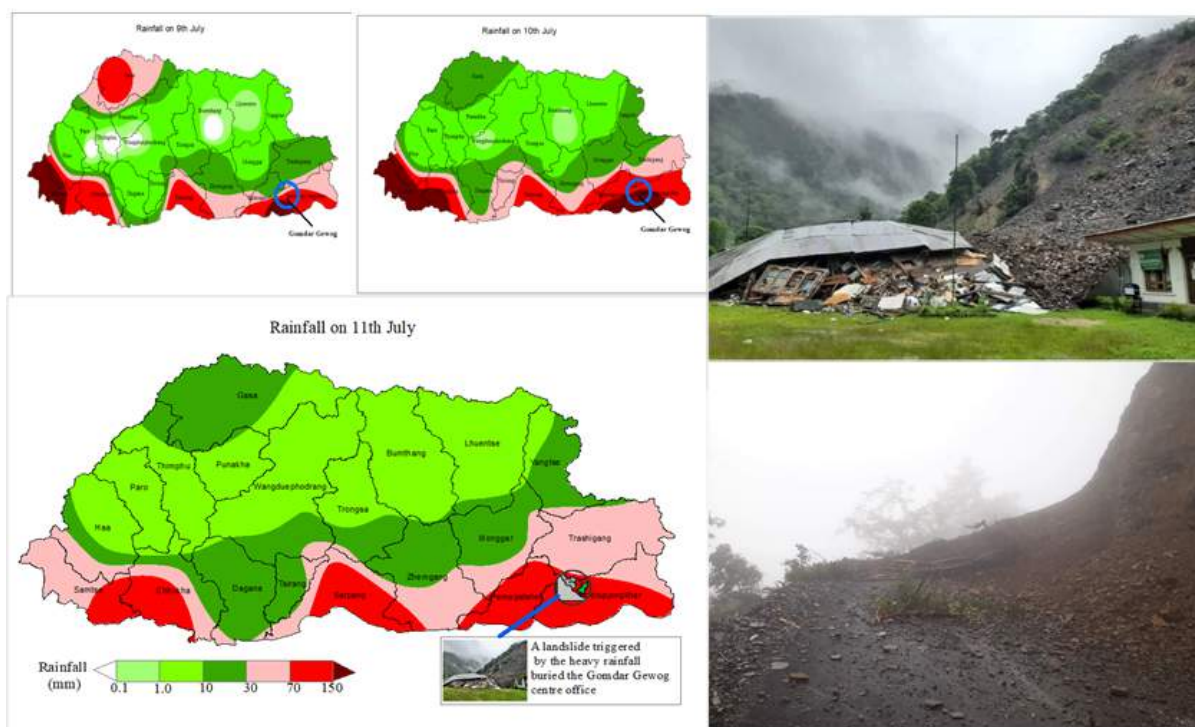


Figure 12 : 24 hour accumulated rainfall in 3 days (Left) and landslide caused by the heavy rainfall (Right) source: BBS

c. 22nd July 2020

A landslide triggered by the heavy rainfall damaged a shop and a kitchen belonging to a family in Dubpi under Patshaling Gewog in Tsirang. Although there was no report of causality, all belongings and necessities of the family were buried by the landslide.

d. 26th July 2020

A landslide occurred on the right bank of the Nyera Ama river at Peydung village and blocked the river channel on 26th July at around 5:30 PM. There is observation made from the field on formation of artificial landslide dams. However, there were no major damages reported.

e. 12th April 2021

A landslide on 12th April midnight swept away a temporary store of the Dobji Dzong in Paro along with a retention wall adjacent to its main tower. According to sources, the recent earthquake and incessant rainfall caused the landslide.

f. 17th June 2021

Due to moderate and continuous rainfall over the Laya, there was a massive landslide which killed 10 highlanders from Laya after the tents they were living in were swept away by a landslide near Tshari-Jathang, Ri-Druzhi in Laya at 1 am of 17th June. Moderate rainfall of 23 mm was recorded on June 14, a day prior to the accident.

g. 30th June 2021

On June 29th, the southern region received heavy rain, with the highest amount being 283.8 mm in Samtse Dzongkhag. A 39-year-old lady and her seven-month-old kid were killed when their home in Naudhokay village, Sampheling (Pasakha) Gewog, was washed away by a landslide caused by heavy rain on 30st June 2021.

3. Snowfall

a. 11th March, 2017

The heavy snowfall occurred over the western, northern, central parts of the country while the southern part and eastern parts of the country received heavy rainfall on 11 March, 2017. The event occurred due to the strong western disturbance with moisture incursion from the Arabian Sea.

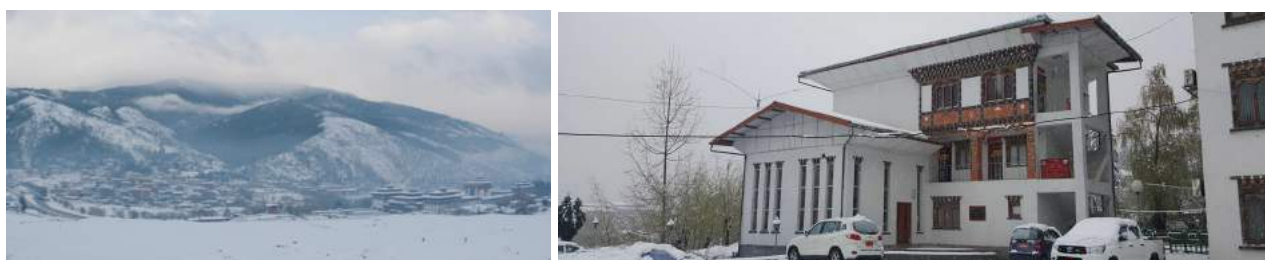


Figure 7: Thimphu valley covered in the blanket of snow (Source: www.bbs.bt) (left).
National Weather and Flood Forecasting Centre, Thimphu(right)

b. 18th December, 2018.

Towards the end of the year, the western, northern and central parts of the country with elevation above 2000 meters received snowfall. The snowfall occurred on 18 December, 2018 due to the peripheral effect from the cyclonic storm named “PHETHAI” that developed

over the Bay of Bengal. There was good moisture incursion from Bay of Bengal that caused heavy snowfall over northern, western and central Bhutan.

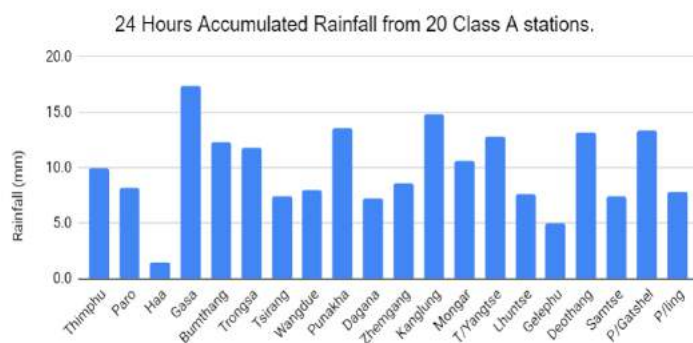


Figure 9 : Daily observation observed on 18th December, 2018(left). Thimphu Residents visiting Kuensel Phodrang (Source: Kuensel)(right)

The above graph (Figure 6) shows accumulated precipitation (24 hours) of 20 mm and above over the country. Snowfall of maximum depth of 12.9 cm was observed in Gasa meteorological station. Moderate rainfall was observed over the country.

c. January and February, 2019

Bhutan received several snowfall this year which was light snow/rain over the country. Most of these weather events occurred in the higher altitude of the country. First snow this winter was on 18 December, 2018. The snowfall occurred due to the peripheral effect from the cyclonic storm named “PHETHAI” developed over the Bay of Bengal. Following this event, western, central and northern parts of the country received light snowfall in the first two months of the year, 2019. This event occurred due to the western disturbance.

The following table shows records of snowfall in the country.

Table 1: Records of Snowfall in the country

Date	Location	Quantity
18 Dec, 2018	Thimphu	2.00 cm (Depth)
	Paro	1.27cm (Depth)
	Haa	12.00 cm
	Gasa	12.90 cm (Depth)
	Bumthang	6.80 cm (Depth)
9 Jan, 2019	Haa	0.20 mm (SWE Rainfall)
	Gasa	4.00 cm (Depth)
	Bumthang	0.20 mm (Depth)
8 Feb, 2019	Haa	3.70 cm (Depth)
9 Feb, 2019	Haa	2.80 cm (Depth)
25 Feb, 2019	Gasa	11.20 mm (SWE Rainfall)
26 Feb, 2019	Gasa	10.00 mm (SWE Rainfall)
27 Feb, 2019	Gasa	10.40 mm (SWE Rainfall)
28 Feb, 2019	Gasa	1.50 mm (SWE Rainfall)

4. Windstrom

a. 4th December, 2019

On 4th December, 2019, a strong windstorm was reported in parts of Thimphu and Gasa dzongkhag caused primarily by the westerly winds. The windstorm ripped off roofs of six houses and public structures in Naro and Lunana gewog.

There were no casualties due to the windstorm, but a one-storey house in Naro gewog collapsed completely when a tree fell on it rendering the inhabitants homeless. Similarly, in Lunana gewog it blew off the roof of Mandrel Thang extended classroom. The windstorm was also experienced in other highland communities such as Soe and lingzhi gewogs, but no damage was reported.

b. Windstorm events from July 2020 - July 2021

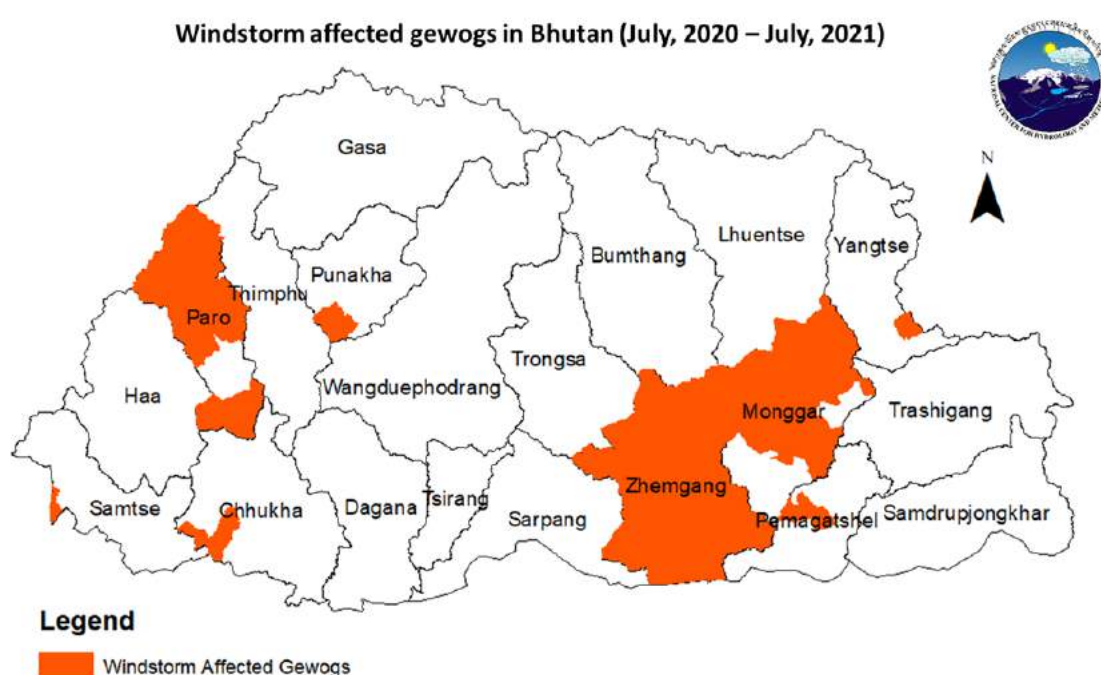


Figure 14 : Windstorm affected gewogs in Bhutan from July,2020 till July,2021

Table2: records of winstorm events in July 2020 to July 2021

SI. No	Date and time	Gewog	Damages reported
a)	20 th September, 2020	Toedpaisa Gewog, Punakha.	Damaged 30 acres of paddy belonging to 18 households in Punakha.

		Durungri in Dungmaed gewog, Pemagatshel.	The windstorm destroyed more than four acres of maize belonging to 19 households in Pemagatshel.
b)	4 th October, 2020 evening	Toedtsho gewog in Trashiyangtse.	A windstorm on the evening of October 4 damaged maize and paddy in four villages of Toedtsho gewog in Trashiyangtse.
c)	22 nd and 23 rd November, 2020	soe gewog, Paro	The strong windstorm partially damaged many houses, particularly the roof tops.
d)	24 th December, 2020 afternoon	Doteng, Naja, Lamgong & Tsento gewog	Damaged 11 houses in paro (8 houses in Doteng gewog and 1 house from each Naja, Lamgong, and Tsento gewog)
e)	5 th January, 2021	Dokar gewog, Paro	Roofs of two houses were completely blown off.
f)	10 th March, 2021, evening	Phuentsholing	Windstorm blew away CGI sheets of three temporary settlement huts at Toorsa settlement.
g)	4 th April, 2021 evening	Nangkor, Bardo and Phangkhag gewogs in Zhemgang	Damaged more than 50 structures
h)	6 th April, 2021, evening	(Balam, Dramitse, Thanggrong, Kengkhar, Sherimuhung and Ngatshang gewog) Mongar	Blew off roofs of 11 houses

i)	22 nd April, 2021	Sipsu	Damaged hundreds of betel nut trees of many households. Rooftops of many cowsheds and some houses were blown away.
		Thang-rong, Chaling, Drepoong, Saling and Shermuhoong Gewog, Mongar	Blew off the roofings of 16 houses
		Nangkhor gewog	Roofings of five houses were blown away.
j)	28 th April, 2021	Bardo, Bjokha, Goshing, Nangkor, Ngangla, Phangkhar, Trong and Shingkahr, Zhemgang	Windstorm rips apart 60 structures in Zhemgang
K)	30 th April, 2021	Drepoong, Chhaling, Tsamang, Mongar and Tsakaling gewog.	Roofings of 43 houses in seven gewogs of Mongar.
		Tsenkher gewog, Lhuentse	Partially blown off the roof of a house in Lhuentse

5. Impact of Tropical cyclone ‘AMPHAN’

The Cyclonic Storm ‘AMPHAN’ (pronounced as UM-PUN) in Bay of Bengal which made landfall at 7:00 BST of 20th May 2020 across West Bengal – Bangladesh coasts between Digha (West Bengal) and Hatiya Islands (Bangladesh) caused moderate to heavy rain over southern and eastern parts of the country on 21-22 May, 2020. Rest of the places received light to moderate rain in the same period. The rainfall affected the transportation and agriculture in the country.

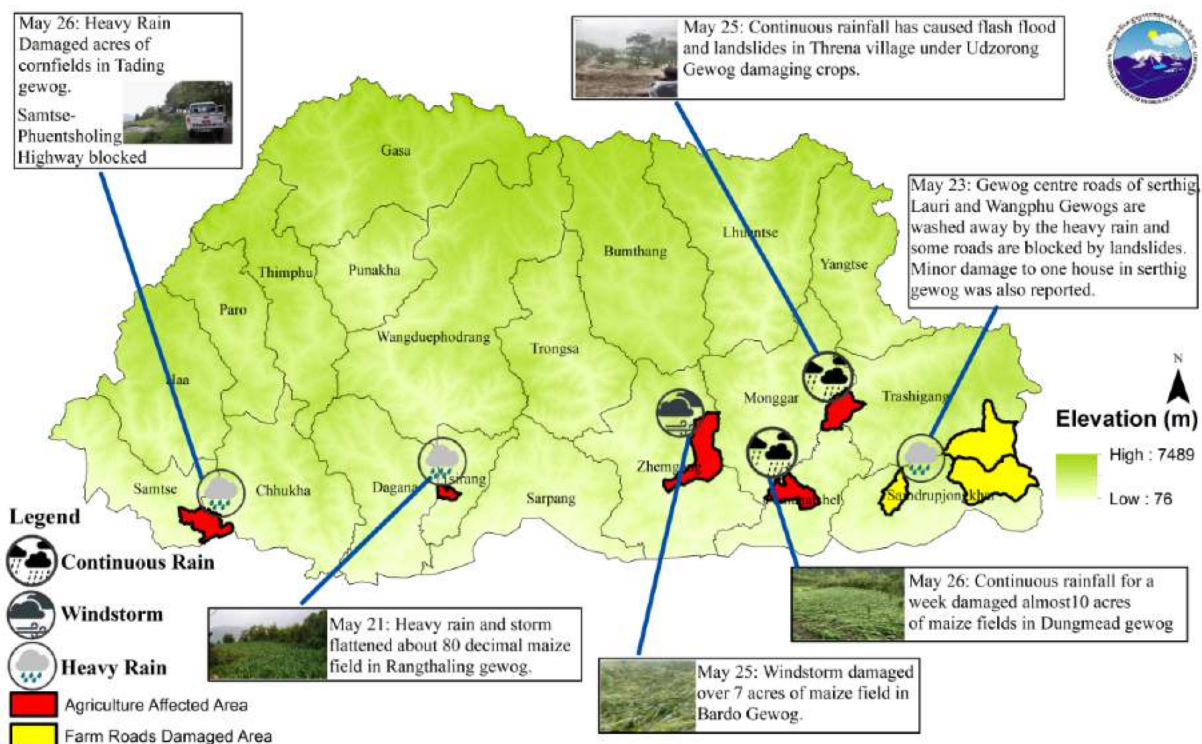


Figure 11 : Effect of cyclone “AMPHAN”

Informations retrieved from:

- BBS news, Bhutan <http://www.bbs.bt/>
- Kuensel Online <http://www.kuenselonline.com/>
- Bhutan Times <http://bhutantimes.bt>
- Bhutan Today <http://www.bhutantoday.br/>