Atmospheric Pollution & Climate Change (APCC)

Environmental Information System (ENVIS)

Resource Partner

(Sponsored by Ministry of Environment, Forest & Climate Change, Govt. of India)

Compendium of Extreme Weather & Air Pollution Events

Global & National

2018-19

INDIAN INSTITUTE OF TROPICAL METEOROLOGY
PUNE - 411 008

Contributed by

Dr. Gufran Beig

Dr. Suvarna Tikle

Mr. Samir Dhapare

Mr. Gaurav Shinde

Ms. Darshana Jadhav

Environmental Information system's centre on Atmospheric Pollution & Climate Change (APCC) at Indian Institute of Tropical Meteorology (IITM, Pune) is taking a step further to record the Extreme Events, which occurred in the year 2018, in weather and air pollution categories. This book has short descriptions of such events and its effect on the environment and on mankind. We have tried to cover the major episodes of such events from around the world and classify into categories which are simple to understand and easy to relate to in future or if it's part of any such cycle in its occurrence.

CONTENTS

1.HEAT WAVE

Heat Wave Duration Index is that a heat wave occurs when the daily maximum temperature of more than five consecutive days exceeds the average maximum temperature by 5 °C (9 °F). A heat wave is a prolonged period of excessively hot weather, which may be accompanied by high humidity, especially in oceanic climate countries. While definitions vary, a heat wave is measured relative to the usual weather in the area and relative to normal temperatures for the season. Temperatures that people from a hotter climate consider normal can be termed a heat wave in a cooler area if they are outside the normal climate pattern for that area. The term is applied both to hot weather variations and extraordinary spells of hot which may occur only once a century. Severe heat waves have caused catastrophic crop failures, thousands of deaths from hyperthermia, and widespread power outages due to increased use of air conditioning. A heat wave is considered extreme weather and a danger because heat and sunlight may overheat the human body warms up to 102°F (39°C).

Health Impacts of Heat Waves

The health impacts of Heat Waves typically involve dehydration, heat cramps, heat exhaustion and/or heat stroke. The signs and symptoms are as follows:

- Heat Cramps: Edema (swelling) and Syncope (Fainting) generally accompanied by fever below39°C i.e.102°F.
- Heat Exhaustion: Fatigue, weakness, dizziness, headache, nausea, vomiting, muscle cramps and sweating.
- Heat Stoke: Body temperatures of 40°C i.e. 104°F or more along with delirium, seizures or coma. This is a potential fatal condition

Urban atmosphere during heat wave

Zoo animals given ice cube to cool them during heat wave

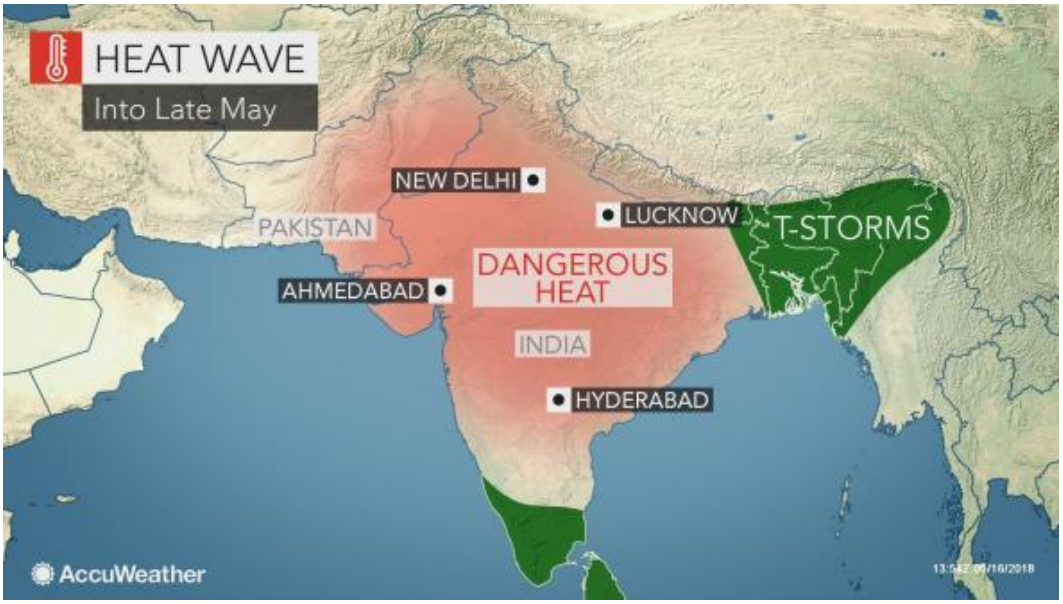
1.1 Heat wave grips India

Source: indiatoday.in, May 22, 2018

The Indian Meteorological Department (IMD) had issued a warning about an impending heat wave that will sweep Maharashtra, Rajasthan, Punjab, Haryana, Delhi, and Uttar Pradesh. The temperature may rise up to 48 degrees Celsius in some places.

According to the IMD, a heat wave is considered if maximum temperature of a station reaches at least 40°C or more for plains, 37°C or more for coastal stations and at least 30°C or more for hilly regions. This resurgence of heat will once again put millions of residents at risk for illnesses such as heat stroke and heat exhaustion.

The maximum temperature on Monday remained 1.6 to 3 degrees above normal in many parts of Delhi and Chandigarh, Haryana, Punjab, west Uttar Pradesh, Rajasthan, east Madhya Pradesh, Gujarat, Konkan and Goa, Marathwada and Telangana.



The country is set to face a heat wave in the next 5 days. (Photo: AccuWeather)

IMD experts said it will get hotter this week as pre-monsoon activities of thunderstorms and light rains take a break for the next few days. Day temperatures were also expected to raise three to five degrees Celsius in the next few days. Dry and hot weather is expected to prevail over all the States of northwestern plains till May 28 or May 29 (the date of onset of southwest monsoon in Kerala), officials said.

The heat wave comes after a series of dangerous thunderstorms across northern Indian which claimed over 100 lives, injured many more and caused heavy damages to property.

DELHI

The mercury is soaring in the capital with Tuesday recording a temperature of 44 degrees

Celsius. "Temperatures are likely to increase over next two day... In Delhi we have not declared heat wave yet," an IMD official told news agency IANS.

PUNJAB
Punjab also faced high temperatures with Amritsar city recording a high of 41.5 degrees. Ludhiana and Patiala recorded highs of 40.8 and 42 degrees respectively. Met department officials said heat wave conditions would prevail over the region in the coming days and the weather would remain dry.

HARYANA
Most parts of Haryana reeled under heat wave conditions on Monday with temperatures soaring past the 41 degrees Celsius mark at most places. The sweltering heat forced people to remain indoors at most places, particularly between noon and 4 pm.

Hisar town in Haryana sizzled at 43.4 degrees while Narnaul town hit a high of 43.2 degrees. Bhiwani (42 degrees), Karnal (42) and Ambala (41.6) also experienced the heat wave.

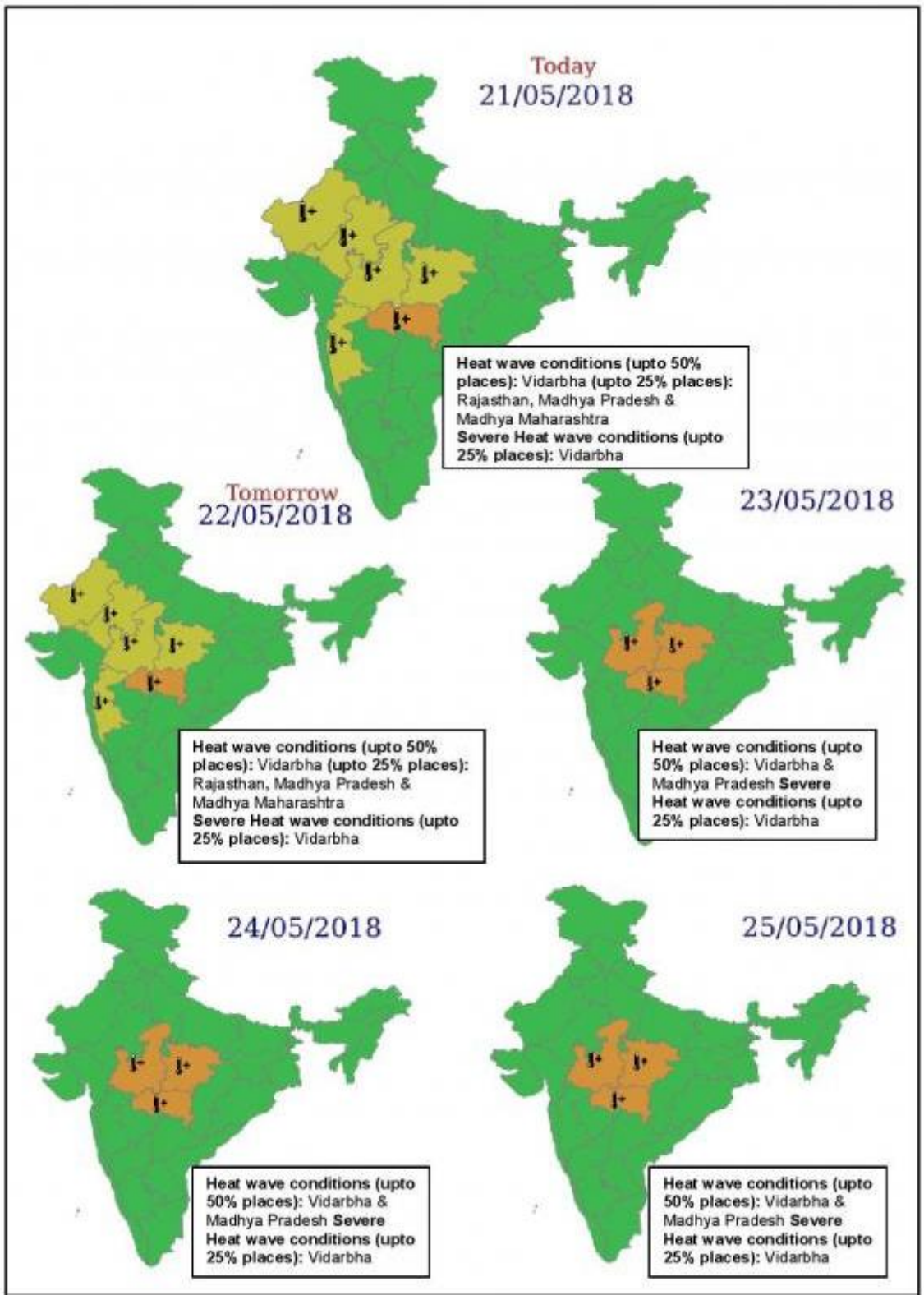
Chandigarh recorded a high of 41.7 degrees.

GUJARAT
Gujarat had been among the hardest hit by the heat wave with Bramhapuri in Vidarbha recording the highest maximum temperature of 47.5°C on Sunday. Although isolated pre-monsoon active may occur over east Vidarbha during next 24-48 hours but will not have any significant effect over the temperatures, IMD officials have said.

The Rajkot Municipal Corporation had issued a red alert in the city. The city had prepared a heat action plan in order to help the residents deal with the high temperatures.

UTTAR PRADESH
With the country witnessing a rise in mercury across all states, the people of Uttar Pradesh's Kanpur and Varanasi are having a tough time beating the heat. The temperature had gone beyond 40 degree Celsius in most parts of the two regions.

TELANGANA
According to the Met officials, the Nizamabad and Adilabad district could record a maximum temperature of 45 degrees and several other places in the state are likely to witness a fierce heat wave.



The advisory issued by the IMD predicts temperature patterns over the next 5 days in the country. (Source: India Meteorological Department)

2. Heavy Precipitation Causing Floods and Landslides

When heavy precipitation takes place and the natural watercourses do not have the capacity to pass excess water that's when flooding occurs. Also floods can result from other phenomena, particularly in coastal areas where inundation can be caused by a storm surge associated with a tropical cyclone, a tsunami or a high tide coinciding with higher than normal river levels.

Other factors which may contribute to flooding include: volume, spatial distribution, intensity and duration of rainfall over a catchment ;the capacity of the watercourse or stream network to convey runoff; catchment and weather conditions prior to a rainfall event; ground cover; topography; and tidal influences.

Landslide was mass movement of rock, debris, and soil or earth material down the slope. The factors which influence whether a landslide will occur typically include slope angle, climate, weathering, water content, vegetation, and overloading, geology, and slope stability. Natural causes include: elevation of pore water pressure by saturation of slope material from both intense or prolonged rainfall and seepage, vibrations caused by earthquakes, undercutting of cliffs and banks by waves or river erosion, volcanic eruptions. Both the natural disaster will result in

- Loss of life
- Economic loss
- Destruction of Infrastructure
- Impact on River ecosystem

Below are the extreme flooding events & landslides which occurred in the year 2018

Flood in Kerla

Landslide

2.1 India – Floods in Tripura Leave 15 Dead, Thousands Displaced

Source: floodlist.com 23 May, 2018 by Richard Davies

Fifteen people had lost their lives and thousands had been forced to evacuate their homes after flooding in the north-east Indian state of Tripura.

Rain had affected parts of the state since early May and state disaster management officials said that a total of 15 people had died in floods and landslides, with 24 injured and 11,704 displaced. Local media said that the overflowing Haora (Howrah) and Gumti (Gomati) rivers had forced many to evacuate their homes.

A storm on 06 to 07 May caused widespread damage in parts of West Tripura. However, most of the fatalities and evacuations across the state occurred from 17 May, 2018 after monsoon rain intensified.

The worst hit area was the district of West Tripura, where 6 people had died and around 4,500 people had evacuated their homes. Wide areas of the state capital, Agartala, had been flooded.

As of 21 May, 1,236 houses had been completely destroyed, with 620 those in West Tripura and 343 in Unakoti. A total of 4,222 houses had been severely damaged since 01 May, 1784 of them in West Tripura, 722 in Dhalai, 638 in Unakoti and 510 in Khowai.

District officials said the National Disaster Response Force (NDRF), police, fire service, civil defense and volunteers were working to provide assistance to those affected. The state's Chief Minister, Biplab Kumar Deb, and the Education Minister, Ratan Lal Nath, had both visited affected areas.

Flood rescues in Tripura, India, May 2018. Photo: Tripura Police

Flood Summary

Type: Flash flood, River flood- A storm on 06 to 07 May 2018 caused some flooding in West Tripura. However, monsoon rainfall from 17 May caused the worst of the flooding, affecting almost all districts of the state.

Locations

West Tripura, Dhalai, the districts of South Tripura, Unakoti North Tripura, Gomati, Khowai, Sipahijala, South Tripura, Unakoti, **North Tripura**

Magnitude

Rainfall level: 61 mm in 24 hours; Agartala - May 20 to May 21, 2018

Rainfall level: 50 mm in 24 hours; Agartala - May 21 to May 22, 2018

River level: Overflowing Haora River, West Tripura - May 17, 2018 according to local media

River level: Overflowing Gumti (Gomati) river, Gomati district - May 18, 2018 according to local media

Damages

Fatalities: 15 people May 1 to May 23, 2018

Evacuated: 11,704; May 17 to May 23, 2018

Buildings destroyed: 1,236; May 17 to May 23, 2018

2.2 India – 3 Dead, Hundreds Rescued After Record Rainfall in Karnataka

Source: floodlist.com, 30 May, 2018 by Richard Davies

Record rainfall in the Indian state of Karnataka had caused flooding in the city of Mangaluru as well as areas of Dakshina Kannada and Udupi districts. Local observers said that Panambur in Mangaluru recorded 334 mm of rain to early 30 May, 2018, breaking the previous high of 330.8 mm set in 1982. Mangaluru Airport recorded 284 mm during the same period, also breaking a previous high. Normal rainfall in the month of May for Mangaluru is 168.6 mm.

Roads around the city of Mangaluru were inundated, bringing traffic to a standstill and damaging homes and businesses. Many people were left trapped in their homes or vehicles. Emergency teams from Mangaluru fire service said they rescued over 500 people from the flooding in Mangaluru. State Disaster Response Force (SDRF), National Disaster Response Force (NDRF), Civil Defence and other teams were also drafted in to provide rescue services in affected areas.

Local media reported that at least 3 people had died in the severe weather. One person died in Karkala, Udupi district, after being struck by lightning, and another died after a wall collapsed in the flooding in Mangaluru. The third victim was swept away by flood water near Padubidri.

Flooding in Mangaluru (Mangalore), India, 29 May 2018. Photo: City of Mangalore

Flood Summary
Event: Karnataka, India, May 2018

Date: May 29, 2018

Type: Flash flood

Cause: Extreme rainfall

Locations
Mangaluru (Mangalore)
Dakshina Kannada
Udupi

Magnitude
Rainfall level: 334 mm in 24 hours
Panambur, Mangaluru - May 29 to May 30, 2018

Figures from State Emergency Operation Centre, Revenue Department (Disaster Management), Govt. of Karnataka. Normal rainfall in the month of May for Mangaluru is 168.6 mm

Rainfall level: 284 mm in 24 hours
Mangaluru Airport - May 29 to May 30, 2018

Damages
Fatalities: 3 people
Karnataka - May 29 to May 30, 2018

Rescued: 545 people
Mangaluru - May 29 to May 30, 2018

2.3 Landslides, floods in Mizoram

Source: indiatoday.in , June 12, 2018

Landslide in Mizoram (Photo courtesy: Lal Hmingwamia)

The northeastern state continues to face floods 5 years in a row.

HIGHLIGHTS

- Incessant rainfall had triggered landslides and rainfall in Mizoram
- The area around NH54 had become unstable
- Flooding had led to building collapses

Incessant rainfall had triggered landslides and floods in various parts of Mizoram. The northeastern state had seen floods every year in past five years and this year seems to be no different. The land was then unstable around the hilly areas cuts across National Highway 54.

It was the area located near Hunthar, Aizawl and it's the road to the airport too. Even areas just outside the Aizawl city located near the Tlawng River had been badly affected. Flooding had affected the lives of the people and even houses had collapsed.

2.4 Floods, rain and landslides in northeast India

Source: indianexpress.com, June 16, 2018

Torrential rains had affected lakhs of lives across the north-eastern states with multiple instances of landslides and flash floods reported from the states of Mizoram, Manipur, Meghalaya, Tripura, Nagaland and Assam. The flood situation had deteriorated in Assam with four more deaths reported Saturday, taking the death toll to 17. Thousands of people had suffered the loss of livelihoods and a total of seven deaths had been reported in Manipur alone on Saturday.

Multiple landslides had blocked vital transport routes, hindering the relief work in the affected states. Security forces comprising of paramilitary troops, as well as the Army, had been deployed in carrying out the relief operations and required medical support in the states of Tripura, Assam and Manipur. Official reports stated that the flash floods had destructed crops and plantations, and scores of livestock had swept away causing major loss of livelihoods for local population. The Indian Meteorological Department (IMD) had attributed the heavy rainfall in northeast India to an upper air cyclonic circulation over south Assam and Meghalaya and neighboring areas.

Assam

Close to four lakh people were estimated to be stranded due to floods in Assam, IANS reported. The Assam State Disaster Management Authority (ASDMA) stated a total of 3,86,570 people had been affected in the seven flash flood-hit districts.

Partially submerged houses were seen at a flood-affected village in Hojai district, in the northeastern state of Assam. (Photo: Reuters)

"The flood waters had fully damaged 325 houses besides state and National Highways at different places," an ASDMA official informed IANS, furthering that rainfall had also triggered landslides at Mahur, Harangajao, Maibang and Dima Hasao. Nearly 350 people had been evacuated to safer places during the last 24 hours by the State Disaster Relief Force (SDRF) and NDRF personnel from Karimganj, Hailakandi and Cacahar. Landslides had been reported at three locations in Guwahati city. Brahmaputra at Nimatighat in Jorhat, Barak at AP Ghat in Cachar and Badarpurghat in Karimganj were flowing above the danger marks in the state.
The landslides in Dima Hasao and on the Lumding-Badarpur hill section had also disrupted railway services to Assam's Barak Valley and Tripura.

Imphal: Repair works underway National Highway No. 37 after a landslide triggered by heavy rainfall near Imphal on Thursday, June 14, 2018. (PTI Photo)

Manipur
Around 1.8 lakh people had been estimated to be affected by the flash floods in Manipur. The situation were disrupted in the valley districts of Thoubal, Imphal West and Bishnupur, official sources informed PTI. The state government report mentioned 22,624 houses as damaged by the flood waters and landslides. It was also stated that 48 new relief camps were set up across the state to suffice the efforts to rehabilitate and provide medical assistance to the victims.

Meghalaya
The recurrent rains had caused landslides in different parts of the state. East Khasi Hills district in Meghalaya had witnessed landslide that had left commuters stranded on the roads, disrupting the transport facilities. Local media reports stated that farmers bringing agricultural products to the markets had been unable to reach 'mandis' due to the blocked roads owing to landslides.

Mizoram

Although no casualty had been reported from the southernmost state in the northeast, landslides had caused a serious paralysis of transport facilities in Mizoram and had left Lunglei district virtually cut off from the state capital Aizawl.

"Hundreds of families were evacuated from the flood-hit areas. Many inhabited areas, houses, paddy fields, roads and low-lying areas were inundated. Normal life was badly affected in Aizawl and various other parts of Mizoram due to torrential rains. Many electric poles and trees were uprooted affecting supply of electricity," the statement read.

At least 1,066 families had so far been evacuated to safer places due to floods, state disaster management and rehabilitation department officials informed PTI Friday.

Tripura

The flood situation in Tripura had improved at large. However, close to 40,000 people remain marooned in 189 relief camps across the state, official sources informed. State CM Biplab Kumar Deb, who paid a visit to the worst-hit district of Unakoti, had summoned a meeting of heads of departments such as PWD, Water Resources, Health and Family Welfare, Sankar Chakraborty, the deputy secretary of Revenue Department informed PTI.

Tripura: Unikuti District Collector and Superintendent of Police visit the flood-affected area at a village, in Kailashahar on Thursday, June 14, 2018. (PTI Photo)

2.5 India – At Least 3 Dead After Days of Rain in Jammu and Kashmir

Source: floodlist.com, 1 July, 2018 by Richard Davies

At least 3 people had lost their lives in Jammu and Kashmir, northern India, after days of heavy rainfall.

The fatalities occurred in Akhnoor, Poonch and Kishtwar, according to local media. The Jammu-Srinagar highway had been closed due to the flood threat. Authorities suspended the famous Amarnath Yatra pilgrimage due to threat of floods and landslides along the route. Schools in the region had also been closed.

Flooding was also reported in the city of Srinagar, where homes had been damaged and police and emergency teams carried out water rescues. Local official Syed Abid Rasheed Shah said that "relief camps are being established in District Srinagar, should there be a need for evacuation in view of the rising levels. They were equipping them with footstock, blankets, medical and sanitation facilities."

Flood Warnings and River Levels

Flood rescue in Srinagar, India, June 2018, Photo; Srinagar Police

The Irrigation and Flood Control Department (IFC) in Kashmir issued flood warnings on 29 and 30 June, saying that levels of the Jhelum River and its tributaries had increased after heavy rain since 27 June. IFC asked residents living along river embankments in those in low-lying areas in South and Central Kashmir to remain vigilant.

According to IFC figures, Kulgam recorded 62.2 mm of rain in 24 hours to 30 June, after 58.4 mm had fallen in the area the previous day.

The rising river levels triggered fears of a rerun of the 2014 flood disaster in the state, where over 300 people died.

On 30 June the Jhelum River at Sangam stood at 23.69 feet (7.22 meters), above "flood declaration level" of 21 feet (6.40 meters) according to IFC. Just days earlier IFC had raised concern about the consequences of a recent dry period on crops and farming in the region. As of 19 June, the Jhelum River at Sangam stood at 3.26 feet (1 meter).

Flood Summary

Event: Jammu and Kashmir, India, June 2018
Date: June 27 to July 2, 2018
Type: Flash flood, Landslide

Cause: Extreme rainfall, Long-term rainfall
Locations: Akhnoor, Poonch, Kishtwar, and Srinagar

Magnitude

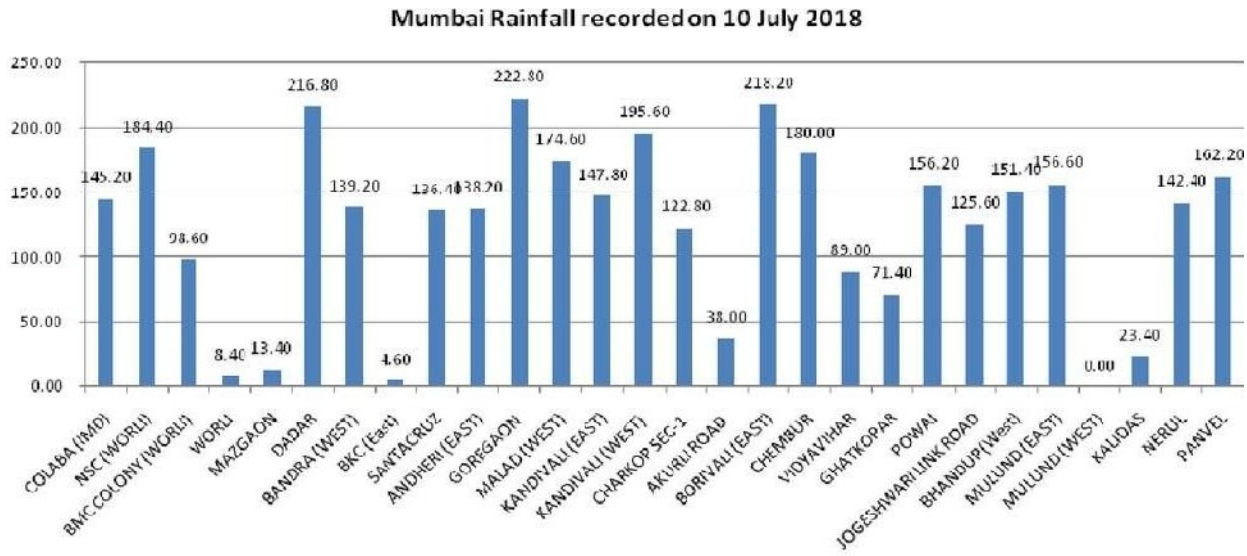
Rainfall level: 58.4 mm in 24 hours; Kulgam - June 28 to June 29, 2018
Rainfall level: 62.2 mm in 24 hours; Kulgam - June 29 to June 30, 2018
River level: 7.22 metres; Jhelum river at Sangam - June 30 to June 30, 2018
"flood declaration level" is 21 feet (6.40 meters) according to Irrigation and Flood Control Department, J&K.
Damages: **Fatalities**: 3 people; June 27 to July 1, 2018 fatalities occurred in Akhnoor, Poonch and Kishtwar

2.6 India – Hundreds Rescued from Floods in Maharashtra

Source: floodlist.com, 11 July, 2018 by Richard Davies

Authorities have rescued hundreds of people stranded in the state of Maharashtra after heavy rainfall and flooding. India's National Disaster Response Force (NDRF) said that 1,500 passengers were evacuated from stranded train at Nala Sopara station, about 40 km north of central Mumbai. The train became stranded after tracks around Nala Sopara were flooded on 10 July. Meanwhile other NDRF teams rescued over 200 people who were stranded after severe flooding in the village of Manikpur in the district of Palghar, also on 10 July.

Elsewhere, some minor surface flooding was reported in parts of the state capital, Mumbai, on 10 July. At least 19 locations around Greater Mumbai recorded more than 100 mm of rain in 24 hours on 10 July, and 3 locations – Dadar, Goregaon and Borivali East – more than 200 mm.



Rainfall in Mumbai, India, 10 July 2018. Image: Disaster Management Mumbai

A few days earlier, torrential rainfall caused major flooding in the city of Nagpur, Maharashtra, which was situated around 680 km east of Mumbai. The Office of the Chief Minister of Maharashtra said that Nagpur received 282mm of rainfall in 24 hours on 06 July 2018, of which 263.5mm fell in just 6 hours. Local media said that one person drowned and one person was missing in the flooding. As many as 735 people needed to be rescued in the city.
Last month 16 people died as a result of flooding and severe weather in Maharashtra.

NDRF and police teams rescue train stranded passengers in Nala Sopara north of Mumbai, 10 July 2018. Photo; Western Railway India

Flood Summary

Event: Maharashtra, India, July 2018
Date: July 6 to July 11, 2018
Type: Urban flood, Flash flood

Cause:
Extreme rainfall, Long-term rainfall

Locations:
Nala Sopara, District of Palghar, Nagpur

Magnitude

Rainfall level: 282 mm in 24hr; Nagpur - July 5 to July 6, 2018
Rainfall level: 216.80 mm in 24 hours; Dadar - July 9 to July 10, 2018
Rainfall level: 222.80 mm in 24 hours; Goregaon - July 9 to July 10, 2018
Rainfall level: 218.20 mm in 24 hours; Borivali East - July 9 to July 10, 2018

Damages

Rescued: 1500 people
Nala Sopara - July 10 to July 10, 2018

Rescued: 200 people; District of Palghar - July 10 to July 10, 2018
Fatalities: 1 person; Nagpur - July 6 to July 6, 2018

Rescued: 800 people
Nagpur - July 6 to July 7, 2018

2.7 India – Floods Leave 12 Dead and Over 34,000 Displaced in Kerala

Source: floodlist.com, 18 July, 2018 by Richard Davies

A second spell of heavy monsoon rainfall had caused severe flooding in parts of the state of Kerala in southern India. Heavy rain that began around 09 July, 2018, had caused flooding in 13 districts. At least 12 people had died and 6 reported missing during the period 09 to 17 July. As of 17 July, 34,693 people had moved to 265 relief camps after flood water inundated low-lying areas. Thirty-six houses had been completely destroyed while 1,214 suffered partial damage.

According to reports from India's National Disaster Management Authority (NDMA), the districts was affected include Kollam, Kasaragod, Alappuzha, Thrissur, Kozhikode, Palakad, Malappuram, Pathanamthitta, Ernakulam, Kottyam, Idukki, Thiruvanthapuram and Wayanad.Kerala's State Disaster Management Authority warned of possible further flooding and and slides.

Rainfall and Rivers in Kerala

Between 01 June and 17 July, Idukki (1567.8 mm), Kottyam (1435.3 mm) and Palakkad (1182.6 mm) had recorded rainfall levels more than 40% higher than normal according to the India Meteorological Department. In a 24 hour period to 17 July, 2018, Idukki recorded 64.2 mm of rain and Ernakulam 56.9 mm. India's Central Water Commission said via that "due to very heavy rainfall to isolated extremely heavy rainfall in Ernakulam, Alapuzzah and Idukki districts of Kerala, most of the rivers in around Ernakulam were rising."

Monsoon in India 2018

This year's monsoon rain first hit parts of Kerala in early June, causing deadly flooding and affecting 14 districts. Rain, flooding and landslides had continued in the state since then and NDMA says that 81 people had died and over 8,000 homes have been damaged or destroyed since the start of the monsoon this year. At least 11 other states have been severely affected by the monsoon rain so far this year, including Manipur, Tripura, Assam, Maharashtra, Mizoram, Karnataka, Jammu and Kashmir and Gujarat.

According to the statistics from NDMA, a total of 511 people had lost their lives and 176 people had been injured as a result of the monsoon. Around 55,000 houses had been damaged and livelihoods severely affected, in particular agriculture where thousands of livestock had been destroyed and 81,147 hectares of farm land and crops damaged.

Flood Summary

Event: Kerala, India, July to August 2018
Date: July 9 to August 30, 2018
Type: Urban flood, Flash flood, Landslide, River flood
Cause: Reservoir release, Extreme rainfall, Long-term rainfall

Locations: Kollam, Kasaragod, Alappuzha, Thrissur, Kozhikode, Palakad, Malappuram, Pathanamthitta, Ernakulam, Kottyam, Idukki, Thiruvanthapuram, Wayanad

Magnitude:
Rainfall level: 64.2 mm in 24 hours; Idukki - July 16 to July 17, 2018
IMD figures
Rainfall level: 56.9 mm in 24 hours; Ernakulam - July 16 to July 17, 2018
IMD figures
Rainfall level: 78.7 mm in 24 hours; Cohin - July 17 to July 18, 2018
WMO figures
Rainfall level: 112 mm in 24 hours; Kozhikode - July 17 to July 18, 2018
WMO figures

Dam level: 731.18 meters; Idukki Reservoir - August 15 to August 15, 2018
Figures from Kerala Disaster Management (KSDMA) Idukki Reservoir level (given in feet) was 2,398.90 feet (731.18 m), where FRL was 2,403 feet (732.43 meter).
Dam level: 169.20 meters; Idamalayar dam - August 15 to August 15, 2018
Full reservoir level (FRL) was 169 meters
River level: Overflowing River Valapatnam at Perumannu in Kannur District - August 15 to August 15, 2018

India's Central Water Commission Flood Forecast unit said that the River Valapatnam at Perumannu in Kannur District was flowing in "**Extreme Flood Situation."**

Rainfall level: 79.1 mm in 24 hours; Idukki - August 13 to August 14, 2018
India Meteorological Department (IMD) figures
Rainfall level: 75.2 mm in 24 hours; Kasargod - August 13 to August 14, 2018
Rainfall level: 83.4 mm in 24 hours; Kozikod - August 13 to August 14, 2018
Rainfall level: 75.5 mm in 24 hours; Malappuram - August 13 to August 14, 2018
Rainfall level: 73.3 mm in 24 hours; Wayanad - August 13 to August 14, 2018
Rainfall level: 214 mm in 24 hours; Palakkad - August 8 to August 9, 2018
Local meteorological observers Chennai Rains said via Social Media that Palakkad recorded 214 mm of rainfall in 24 hours to early 09 August, adding "that's just about 20 mm short of highest recorded 24 hour rainfall in the city, 236 mm way back in May 1957."

Rainfall level: 167.2 mm in 24 hours; Idukki - August 8 to August 9, 2018
India Meteorological Department (IMD) figures
Rainfall level: 83.2 mm in 24 hours; Malappuram - August 8 to August 9, 2018
Rainfall level: 170.9 mm in 24 hours; Wayanad - August 8 to August 9, 2018

River level: 712 meters
River Kabini at Muthankera, Wynadu District - August 9 to August 9, 2018
India's Central Water Commission Flood Forecast unit figures - this was a **record high**

Damages

Evacuated: 1,452,425 ; Kerala - July 9 to August 28, 2018
According to NERC figures over 1 million people have been displaced by floods and accommodated in 5,645 relief camps. As of 28 August there remained 696 camps.
Buildings destroyed: 1822 buildings; Kerala - July 9 to August 28, 2018
21,695 suffered partial damage
Rescued: 535 people; August 9 to August 21, 2018
According to NERC, India's From 9 August, 2018 to 21 August, 2018, and National Disaster Response Force had rescued 535 people and evacuated 25,225. Medical assistance was provided to 5562.

2.8 India – Deadly Floods Hit Gujarat

Source: floodlist.com, 18 July, 2018 by Richard Davies

At least 2 people had died and 3,500 displaced after flooding and heavy rain in parts of the Indian state of Gujarat. The latest deaths bring the total number of fatalities in Gujarat for this year's monsoon to 29, according to India's National Disaster Management Authority (NDMA). Heavy rain over the last two days had caused flooding the districts of Gir Somnath, Surat, Amreli, Junagadh and Valsad. In a 24 hour period to 17 July, Dangs recorded 95.3 mm of rain, Navsari 92.5 mm and Valsad 139.4 mm. Local observers said that levels of the Auranga River were extremely high.

Seventeen teams from India's National Disaster Response Force (NDRF) had been deployed: one team each in Surat, Valsad, Panchmahal, Banaskatha, Mahisagar, Vavsari, Aravali, Jaitpur (Rajkot), Amreli, Bhavnagar and Tapi. Two teams were in Gandhinagar and four in Gir Somnath. Further teams were on standby at an NDRF base in Vododara.

Flooding in Gujarat, India, July 2018. Photo credit: Office of the Chief Minister of Gujarat, India

Monsoon in India 2018

At least 11 other states had been severely affected by the monsoon rain so far this year, including Manipur, Tripura, Assam, Maharashtra, Mizoram, Karnataka, Jammu and Kashmir and Kerala.

According to the statistics from NDMA, a total of 511 people had lost their lives and 176 people had been injured as a result of the monsoon. Around 55,000 houses had been damaged and livelihoods severely affected, in particular agriculture where thousands of livestock had been destroyed and 81,147 hectares of farm land and crops damaged.

India's National Disaster Response Force (NDRF) said that so far it had saved 29 lives and evacuated more than 15,600 people across the country during this year's monsoon season.

Flood Summary

Event: Gujarat, India, July 2018

Type: Flash flood, River flood
Cause: Extreme rainfall, Long-term rainfall
Locations: Gir Somnath, Surat, Amreli, Junagadh, Valsad,

Magnitude

Rainfall level
95.3 mm in 24 hours; Dangs - July 16 to July 17, 2018

Rainfall level
92.5 mm in 24 hours; Navsari - July 16 to July 17, 2018

Rainfall level
139.4 mm in 24 hours; Valsad - July 16 to July 17, 2018

River level
Overflowing; Auranga river, Gujarat - July 16 to July 18, 2018
According to local observers. India's CWC figures could not confirm.

Damages

Fatalities: 2 people; Gujarat - July 15 to July 18, 2018

Evacuated: 3,500; Gujarat - July 15 to July 18, 2018

2.9 India – Overflowing Yamuna River Causes Flooding in Delhi

Source: floodlist.com, 1 August, 2018 by Richard Davies

Levels of the Yamuna River in India reached a 5 year high on 31 July, 2018, flooding areas along the river in National Capital Territory (NCT) of Delhi and neighboring parts of the state of Haryana.

Local media report that at least 2 people had died and 1 was injured. The fatalities occurred in Usmanpur and near the Raj Ghat power plant situated along the Yamuna River in Delhi.

Around 10,000 people had evacuated their homes, mostly from settlements close to the river in Delhi. Kailash Gahlot, Cabinet Minister of the NCT Delhi government, visited affected communities on Monday 30 July in order to arrange relief centres and distribute food.

According to figures from India's Central Water Commission, the Yamuna River at Delhi Railway Bridge in North district stood at 206.05 meters as of 18:00 on 31 July, well above danger level of 204.83 metres. The highest level reached at this location is 207.48 meters, a record set in September 1978.

Water released from Hathnikund barrage on 29 July inundated villages in Yamunanagar, Karnal, Panipat and Sonipat districts of Haryana, local media reported.

The swollen Yamuna River at the ITO Bridge in Delhi, India, July 2018. Photo: CWC India

Flood Summary

Date: July 28 to August 2, 2018
Cause: Reservoir release, Extreme rainfall
Levels of the Yamuna River in India reached a 5 year high on 31 July, 2018, flooding areas along the river in National Capital Territory (NCT) of Delhi and neighboring parts of the state of Haryana. Water released from Hathnikund barrage on 29 July inundated villages in Yamunanagar, Karnal, Panipat and Sonipat districts of Haryana, local media reported.

Locations: Usmanpur, Raj Ghat power plant, Yamunanagar, Karnal, Panipat, Sonipa,

Magnitude: River level: 206.05 meter
Yamuna River at Delhi Railway Bridge in North district, Delhi - July 31 to August 31, 2018
Danger level of 204.83 meters, record level is 207.48 meters set in September 1978

Damages

Fatalities: 2 people Delhi - July 26 to August 2, 2018
The fatalities occurred in Usmanpur and near the Raj Ghat power plant situated along the Yamuna river in Delhi
Evacuated: 10,000; Delhi - July 26 to August 2, 2018

2.10 India – Fresh Wave of Floods in Assam Leaves 3 Dead and 25,000 Displaced

Source: floodlist.com, 1 August, 2018 by Richard Davies

A fresh wave of flooding in the north east Indian state of Assam began on 02 August, 2018. This follows an earlier wave of flooding that began in June which left over 30 people dead and 200,000 displaced. Around 90,000 people had been affected in 9 districts from 02 August, with 3 people dead and around 25,000 displaced. The Dhansiri river in Golaghat district had exceeded its previous highest ever flood level by almost 30 cm. Flooding was reported in Golaghat, Sivasagar, Barpeta, Lakhimpur, Dhemaji, Darrang and Charaideo till 03rd of August,. Flooding affected Biswanath and Udalguri districts on 02 August. By far the worst hit district is Golaghat, where flooding had affected 67,724 people in 99 villages. Four hundred homes had been damaged or destroyed by flooding in the district.

According to the Assam State Disaster Management Authority (ASDMA), fatalities were reported on 02 August in Dhemaji, Udalguri and Golaghat districts. Forty-one people have now died in flooding in Assam since the start of this year's monsoon.

Rescues

India's National Disaster Response Force (NDRF) rescued around 400 people in Golaghat after flooding from the overflowing Dhansiri River. On 03 August NDRF said that further evacuation operations are still in progress. Around 100 people were also rescued in Shivsagar district.

Assam flood rescues after fresh wave of flooding began on 02 August, 2018. Photo: NDRF India

Rivers:

ASDMA said Brahmaputra at Nematighat in Jorhat district, Dikhow River in Sivsagar, Dhansiri River at Numaligarh in Golaghat and the Jia Bharali River in Sonitpur were flowing above danger level, as of 03 August.

India's Central Water Commission said that, as of 03 August, the Dhansiri river at Numaligarh in Golaghat district was flowing at 80.14 meters, which is 0.27 meters above its previous 'Highest Flood Level' of 79.87 meters.

Rainfall:

According to India Meteorological Department (IMD) in a 24 hour period to 02 August, Goalpara recorded 130.7mm of rain, Jorhat 53.2mm, Kokrajhar 69.2mm and Lakhimpur 60.8mm.

Flood Summary

Date: August 2 to August 7, 2018
Cause: Extreme rainfall, Long-term rainfall
Locations: Biswanath, Udalguri, Golaghat, Sivasagar / Charaideo (Charaideo is a newly formed district), Barpeta, Lakhimpur, Dhemaji, Darrang

Magnitude:

Rainfall level: 130.7 mm in 24 hours
Goalpara - August 2 to August 3, 2018
According to India Meteorological Department (IMD) figures

Rainfall level: 53.2 mm in 24 hours
Jorhat - August 2 to August 3, 2018

Rainfall level: 69.2 mm in 24 hours
Kokrajhar - August 2 to August 3, 2018

Rainfall level: 60.8 mm in 24 hours
Lakhimpur - August 2 to August 3, 2018

River level: 80.14 meters
Dhansiri River at Numaligarh in Golaghat - August 3 to August 3, 2018
Record high - previous 'Highest Flood Level' was 79.87 meters.

Damages

Fatalities: 3 people, August 2 to August 7, 2018

Evacuated: 25,000; Assam - August 2 to August 7, 2018
As of 03 August almost 24,000 people in 99 relief camps in Golaghat. Nine relief camps also in Sivasagar district to accommodate over 200 evacuees.

Rescued: 400 people
Golaghat - August 2 to August 7, 2018

2.11 India – 19 Dead After Torrential Rain in Himachal Pradesh

Source: floodlist.com, 14 August, 2018 by Richard Davies

At least 19 people had died in floods and landslides in the state of Himachal Pradesh in northern India over the past few days.

According to the Press Trust of India, the highest number casualties were in Solan district (eight), followed by Mandi district (four), three in Kangra district, two in Hamirpur district and one each in Bilaspur and Una districts. According to India Meteorological Department (IMD) figures, in a 24 hour period to 13 August, Hamirpur recorded 172.3 mm of rain, Kangra 165.6 mm, Mandi 122.2 mm and Solan 154.4 mm.

Water from the overflowing Beas River had flooded parts of Nadaun in Hamirpur district, according to ANI news agency. The heavy rain in had increased levels of the Giri River, a tributary of Yamuna, in Sirmaur District, according to India's Central Water Commission

Official Flood Forecast. Hundreds of roads had been blocked across the state and houses had been damaged or destroyed as a result of the heavy rain. All schools in the state had been closed. Relief supplies were being distributed by the district administrations to the affected families.

Heavy rain had also affected neighboring Indian state of Jammu and Kashmir, where landslides in Ramban district had blocked parts of the Jammu-Srinagar National Highway.

Floods in Himachal Pradesh, Mandi District.PTI

Flood Summary

Event: Himachal Pradesh, India, August 2018
Date: August 12 to August 15, 2018
Locations: Solan, Mandi, Kangra, Hamirpur, Bilaspur, Una

Magnitude

Rainfall level: 172.3 mm in 24 hours; Hamirpur - August 12 to August 13, 2018
India Meteorological Department (IMD) figures
Rainfall level: 165.6 mm in 24 hours; Kangra - August 12 to August 13, 2018
Rainfall level: 122.2 mm in 24 hours; Mandi - August 12 to August 13, 2018
Rainfall level: 154.4 mm in 24 hours; Solan - August 12 to August 13, 2018

River level:
Overflowing; Beas River, Nadaun in Hamirpur district - August 12 to August 14, 2018

Damages

Fatalities: 19 people, August 12 to August 15, 2018
Solan district (eight), followed by Mandi district (four), three in Kangra district, two in Hamirpur district and one each in Bilaspur and Una districts.

2.12 India – Deadly Flash Floods in Jammu and Kashmir

Source: floodlist.com, 15 August, 2018 by Richard Davies

Heavy rain had continued to fall in northern India, this time causing flash floods and landslides in the Jammu and Kashmir. According to Press Trust of India, at least 4 people had died and three others injured in the state since Monday 13 August. The deaths occurred in Udhampur (2), Jammu and Poonch districts. PTI added that "As per reports two dozen houses and structures suffered damaged due to rains, flash floods and landslides in Jammu, Kathua, Poonch, Rajouri, Udhampur and Reasi districts and scores of vehicles had been damaged in Jammu city."

Local media had previously reported that heavy rain landslides in Ramban district had blocked parts of the Jammu-Srinagar National Highway. According to India Meteorological Department (IMD) figures, in a 24 hour period to 13 August, Jammu recorded 105.7 mm of rain, Kathua 77.1 mm, Riasi 118.8 mm, Samba 124 mm and Udhampur 80.6 mm. During the following 24 hours Kathua recorded 111.6 mm of rain.

The deaths in Jammu and Kashmir come after at least 19 people died in the neighboring state of Himachal Pradesh.

Flood Summary
Date: August 13 to August 15, 2018
Locations:- Udhampur, Jammu, Poonch, Kathua, Reasi, Rajouri, Magnitude

Rainfall level: 105.7 mm in 24 hours; Jammu - August 13 to August 14, 2018
According to India Meteorological Department (IMD) figures.

Rainfall level: 77.1 mm in 24 hours; Kathua - August 13 to August 14, 2018

Rainfall level: 118.8 mm in 24 hours; Riasi - August 13 to August 14, 2018

Rainfall level: 124 mm in 24 hours; Samba - August 13 to August 14, 2018

Rainfall level: 80.6 mm in 24 hours; Udhampur - August 13 to August 14, 2018

Rainfall level: 111.6 mm in 24 hours; Kathua - August 14 to August 15, 2018

Damages:
Fatalities: 4 people; Jammu and Kashmir - August 13 to August 15, 2018
The deaths occurred in Udhampur (2), Jammu and Poonch districts.

Buildings destroyed: 25 buildings
Jammu and Kashmir - August 13 to August 15, 2018

2.13 India – 12 Dead, Homes and Roads Destroyed After Weeks of Flooding in Nagaland

Source: floodlist.com, 5 September, 2018 by Richard Davies

Flooding and landslides affected the state of Nagaland in India since late July, 2018. By early September 48,821 families in 538 villages of 11 districts had been affected. At least 11 people had died. Nagaland is a mountainous state in northeast India, bordering Myanmar which had also been badly affected by flooding this monsoon.

Local media said that thousands of people in hundreds of villages had been cut-off for weeks after roads were blocked or destroyed by floods and landslides. Relief items are either being air dropped or shipped on smaller vehicles to as far as possible.Neiphiu Rio, Chief Minister of Nagaland state in India said on 03 September that roads had been damaged at 557 locations. Four bridges had also been destroyed, as well as crops and farmland, including 300 hectares of paddy fields.

The affected districts include Phek, Longleng, Tuensang,Peren, Dimapur, Wokha,Zunheboto, Kiphire, Mokokchung, Mon and Kohima. India's Disaster Management Division said that 410 houses had been destroyed. Ten relief camps had been set up for those displaced. A team from India's National Disaster Response Force (NDRF) consisting of 38 rescuers and 2 boats was deployed to assist flood victims in Dimapur in mid-August.

Flood Summary

Type: Flash flood, Landslide

Flooding and landslides affected the state of Nagaland in India since late July, 2018. By early September 48,821 families in 538 villages of 11 districts had been affected. Hundreds of homes and roads were damaged, as well as 4 bridges and 2 schools.

Locations: Phek, Longleng, Tuensang, Peren, Dimapur, Wokha, Zunheboto, Kiphire, Mokokchung, Mon, Kohima

Damages : **Fatalities**: 11 people; July 26 to September 4, 2018
According to Disaster Management Division report of 19 August.

Roads damaged: 557 roads; July 26 to September 4, 2018
Road damage left thousands of people cut off. 4 bridges were also destroyed.

Buildings destroyed: 412 buildings; July 26 to September 4, 2018

2.14 India – 19 Dead in Uttar Pradesh Floods as Rivers Rise

Source: floodlist.com, 5 September, 2018 by Richard Davies

At least 19 people had died in flood-related incidents in Uttar Pradesh, India, since 01 September, 2018.According to India's Disaster Management Division; nearly 300 villages in 12 districts had been affected. The affected districts were: Faizabad, Gonda, Barabanki, Lakhimpur Kheri, Mau, Kushinagar, Basti, Ambedkarnagar, Badaun, Santkabirnagar, Ballia and Moradabad. Many of the deaths were a result of collapsing buildings or lightning strikes. Over 220 houses had been damaged or destroyed in the heavy rain and flooding over the last 4 days. There were 59 relief camps to house those displaced. Nine teams from India's National Disaster Response Force (NDRF), consisting of 221 rescuers with 21 boats had been deployed to affected areas.

Rivers

As on 04 September, India's Central Water Commission Flood Forecasting Network reported that the Ganges and Ghagra rivers in Uttar Pradesh are at "Orange" warning level (indicating the river is in a "severe flood situation") in several locations.

Monsoon 2018

The recent flooding brings the number of rain-related deaths in Uttar Pradesh to 256 since the start of this year's monsoon. Fourteen people are still missing. Almost 350,000 people have been affected and 4,864 houses have been damaged or destroyed.

Flood Summary

Type: Flash flood, River flood
Cause: Extreme rainfall, Long-term rainfall
Locations: Basti, Gonda, Kushinagar, Mirzapur, Bijnor, Unnao

Magnitude

River level: 124 meters; Ganga at Kanpu - September 5 to September 5, 2018
Highest Flood Level (HFL): 124.49 in September 2010
River level: 137.63 meters; Ganga at Farrukhabad - September 5 to September 5, 2018
Highest Flood Level (HFL): 138.14 in September 2010
River level: 162.24 meters; Ganga at Budaun - September 5 to September 5, 2018
Highest Flood Level (HFL): 162.79 in September 2010
River level: 106.6 meters; Ghagra at Bara Banki - September 5 to September 5, 2018
Highest Flood Level (HFL): 107.616 in August 2014
River level: 93.2 meters; Ghagra at Faizabad - September 5 to September 5, 2018
Highest Flood Level (HFL): 94.01 in October 2009

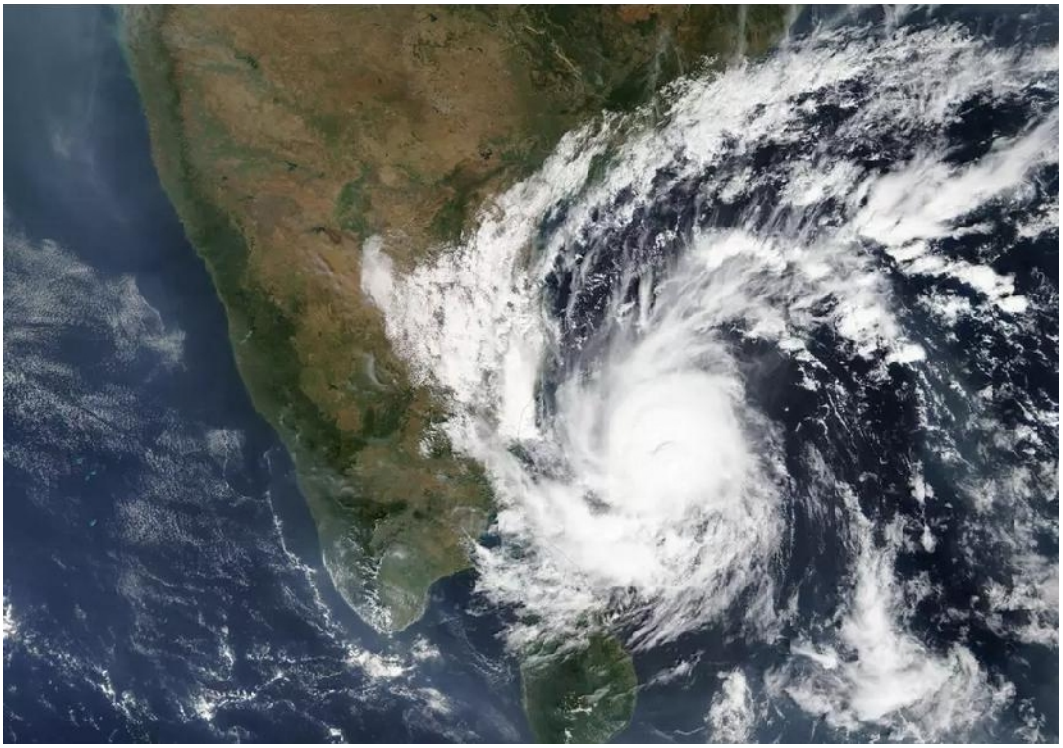
Damages: Fatalities: 19 people; September 1 to September 5, 2018

Buildings destroyed: 226 buildings; September 1 to September 5, 2018

3. CYCLONES

Cyclone, any large system of winds that circulates about a centre of low atmospheric pressure in a counterclockwise direction north of the Equator and in a clockwise direction to the south. Cyclonic winds move across nearly all regions of the Earth except the equatorial belt and are generally associated with rain or snow. Also occurring in much the same areas are anticyclones, wind systems that rotate about a high-pressure centre. Anticyclones are so called because they have a flow opposite to that of cyclones—i.e., an outward-spiralling motion, with the winds rotating clockwise in the Northern Hemisphere and counterclockwise in the Southern. These winds are usually not as strong as the cyclonic variety and commonly produce no precipitation. A brief treatment of cyclones follows. For full treatment, *see* climate: Cyclones and anticyclones.

Cyclones occur chiefly in the middle and high latitude belts of both hemispheres. In the Southern Hemisphere, where most of the terrestrial surface is covered by the oceans, cyclones are distributed in a relatively uniform manner through various longitudes. Characteristically, they form in latitudes 30° to 40° S and move in a generally southeasterly direction, reaching maturity in latitudes around 60°. The situation is quite different in the Northern Hemisphere. There, continental landmasses extend from the Equator to the Arctic, and large mountain belts interfere with the midlatitude air currents, giving rise to significant variations in the occurrence of cyclones (and anticyclones). Certain tracks are favoured by the wind systems. The principal cyclone tracks lie over the oceans, regularly traversing to the east of both mountain barriers and continental coastlines.



Cyclone Gaja approaching southern India

3.1 Cyclone Sagar forms in Arabian Sea, first of the season

Source: skymetweather.com, 17 May 2018 07:23 PM

Cyclone Sagar forms in Arabian Sea, first of the season. The first cyclonic storm of the season, Cyclone Sagar had formed far west of the Arabian Sea. The cyclone was centered at the Gulf of Aden about 400 km away East-Northeast of Aden in Yemen.

Cyclone Sagar was anticipated to intensify further in the next 12 hours. Thereafter, as the system moves closer to the coast, the system started weakening gradually.

Initially, the cyclone moved westward and later west southwest wards. In wake of this, torrential rains along with high velocity winds were lashed North Somalia, parts of Ethiopia and Yemen.

However, this cyclonic storm had no bearing on the weather over India.

3.2 Cyclone 'Titli' caused landfall in Gopalpur, Odisha

Source: indiatoday.in, Oct 12, 2018

Road communication and telephonic connect got completely sacked in Odisha and Andhra Pradesh, due to cyclone Titli.

The cyclone 'titli' hit the eastern coast of India

Cyclone Titli hit near Gopalpur in Odisha with a wind speed of 126kmph on October 11, 2017, reported PTI. The cyclone had resulted in killing eight people in Andhra Pradesh and one in Odisha. The storm has caused major damaging of houses, uprooting trees, and power lines in the two states. Early Thursday it had even caused landfall in the Gopalpur district of Odisha between 4:30 am and 5:30 am.

The uprooting of trees also blocked some sections of the roads of Chennai-Kolkata highway.

Many South Central and East Coast railways had been cancelled and were terminated midway.

According to the reports, the storm was heading northeast towards Gangetic West Bengal and got settles down gradually.

The communication had disrupted as no telephone links and road communication were available.

Chief minister Naveen Patnaik reviewed the scenario and had ordered the officials to start the restoration programs as soon as the situation gets improved.

3.3 Cyclones buffet Odisha as temperatures rise

Source: indiaclimatedialogue.net , by Basudev Mahapatra | Oct 17, 2018

The rise in temperatures due to climate change had increased the vulnerability of Odisha on the east coast of India to intense cyclonic storms

An aerial view of cyclone-hit coastal Odisha (Photo by Odisha Government)

The southern coast of Odisha, with the small port town of Gopalpur at its centre, seems to have become a favored destination for tropical cyclones occurring in the months of October-November in the Bay of Bengal. This year, coastal districts of Odisha and neighbouring Andhra Pradesh on the east coast around Gopalpur faced two intense tropical cyclones — **Daye** in September and **Titli** in October.

Gopalpur had been facing a constant threat of post-monsoon tropical cyclones since at least 1999 when it was badly hit by a devastating tropical cyclone 10 days before the super cyclone of 1999. That super cyclone hit near Odisha's port town of Paradeep in the early hours of October 29 and ravaged large parts of coastal areas, leading to at least 10,000 deaths.Narrating the impacts of the pre-super cyclone that hit Gopalpur on October 18, 1999, climate campaigner Oras Tynkkynen said in his report Orissa Cyclone, "With wind speeds of around 200 km per hour and large tidal waves, it killed around 500 and affected two million people."

The subsequent super cyclone of October 29-30, 1999, had a wind speed of up to 260-270 km per hour in the core area to produce a huge storm surge that led to sea-level elevation of more than 20 feet, according to India Meteorological Department. "Both the cyclones affected approximately 15 million people and damaged three million homes," Tynkkynen said in his report.

Recurrent hits

Fourteen years after the super cyclone, the severe cyclonic storm **Phailin** hit Gopalpur on the southern coasts of Odisha on October 12, 2013. With a wind speed of 200 km per hour, this very severe cyclonic storm (VSCS) affected about 13.2 million people, took a toll of over 40 lives and caused losses amounting to INR 42.4 billion (USD 688 million), while damaging crops over 500,000 hectares of farmland.

The hiatus of 14 years between the super cyclone of 1999 and Phailin of 2013 did not last for the next storm to hit Odisha. Gopalpur was under the threat of being hit by another VSCS Hudhud the very next year, 2014. Somehow, the small port town escaped the major wrath of Hudhud as it changed direction and made its landfall near the city of Vishakhapatnam of Andhra Pradesh on October 12, 2014. The whole of southern Odisha, however, was severely affected by the storm because of strong wind and heavy rainfall during the landfall and its aftermath.

Resulting in loss of more than 30 human lives, **Titli** severely affected Gajapati, Kandhamal and all coastal districts of Odisha along with Srikakulum and Vizianagaram districts of the neighbouring state by causing widespread damage and heavy rain leading to flood situation in its aftermath.

The UN General Secretary in a statement had extended solidarity with the government of India as "Millions of people had been affected in Odisha mainly in the worst-hit districts of Ganjam, Gajapati, and Rayagada, and thousands of houses were damaged in Andhra

Pradesh. Cyclone Titli also disrupted road and telecommunications networks and power supplies."

"Increasing frequency of cyclonic storms with higher intensity hitting Gopalpur and adjacent coastal areas during the month of October over last five years had created panic among people living in coastal villages and threatened their livelihood as most of them depend on fishing," said Mangaraj Panda of Ganjam-based United Artists' Association that work for the welfare of marine fisher communities living in coastal villages.

Temperature rise

"These were all cyclonic storms originated in the Bay of Bengal which was very much cyclone-prone like North Atlantic Ocean, the eastern and western parts of the northern Pacific Ocean, and the south-western Pacific Ocean. The months of October and November were the usual cyclone season for the Bay of Bengal because the conditions were favorable for cyclones to form," H.R. Biswas, Director of Regional Meteorological Centre, Bhubaneswar, told indiaclimatedialogue.net.

According to the weather channel, tropical cyclones were intense water-rotating systems formed by strong winds (of speeds at least 62 km per hour) around low-pressure areas. They had a spiral, anticlockwise movement. Additional weather conditions like high sea surface temperature, vertical changes in wind speed inside the spiral, and high relative humidity help cyclones form and intensify.

Cyclone Titli, which made landfall last week, caused extensive damage in coastal areas (Photo by Basudev Mahapatra)

"Since sea surface temperatures and humidity both directly correlate with chances of cyclone formation, the Bay of Bengal was a more likely target because it gets higher rainfall, and because the sluggish winds around it keep temperatures relatively high: about 28 degrees around the year. Warm air currents enhance this surface temperature and aid the formation of cyclones," it said.

Sea Surface Temperature (SST) was a fuel to tropical cyclones for their genesis and intensification. Global warming heats both the sea surface and the deep water, thus creating ideal conditions for a cyclone to survive and thrive in its long journey from tropical depression to Category Four or Five super storms. SST was increasing fast in the equatorial Indian Ocean compared with other oceans. It had increased 0.6 degree Celsius the northern Indian Ocean since 1960, the largest warming among the tropical oceans. Recent increase in severity of tropical cyclones in Bay of Bengal region was being attributed to the increase in SST, Ashutosh Mishra, a geographer, wrote in a paper.

According to researchers at Pacific Northwest National Laboratory and the National Oceanic and Atmospheric Administration, Bay of Bengal's cyclone environment were caused by decades-long changes in the El Niño Southern Oscillation, or ENSO, a regular pattern variation of winds and sea surface temperatures affecting the tropics and sub-tropics. The ENSO triggers an atmospheric wave that helps instigate the May-June monsoon circulation over the Bay of Bengal, which then becomes responsible for initiating tropical cyclone activity.

"Because of global warming, sea surface temperature remains higher in the Bay of Bengal leading to generation and intensification of cyclonic systems. The southern coasts of Odisha experience cyclonic storms more frequently since Phailin cyclone of 2013," Sarat Chandra Sahu, Director of the Center for Environment and Climate at SOA University, told indiaclimatedialogue.net.

"Through transaction between land and sea, land surface temperature was also being transferred to the sea surface, making it warmer. When sea surface temperature reaches 26.5 degrees, it can help formation of a cyclonic storm. More temperature would add further strength to it for intensification. During formation of Titli, surface temperature in the coastal sea was 30 degree Celsius," Sahu said. Asked about the reason of frequent landfall of cyclonic storms around Gopalpur, Sahu said that rapid urbanisation, deforestation and developmental activities could be the reason, although no specific study on this had yet been done.

Stating that cyclones occur due to depressions in the ocean, and certain areas like the coast Odisha and the Nagapattinam area of Tamil Nadu visited by cyclones more frequently, eminent scientist and father of India's Green Revolution M.S. Swaminathan told indiaclimatedialogue.net, "In fact, there was no clear reason why such extreme weather events take place more frequently in some areas. We can, however, use this information to take anticipatory action on cyclone management."

3.4 Cyclone Gaja leaves at least 45 dead in southern India

Source: qz.com, by Maria Thomas, November 19, 2018

Cyclone Gaja had left a trail of destruction in the southern Indian states of Tamil Nadu, Kerala, and Puducherry, claiming the lives of at least 45 people.

Around 250,000 people had been evacuated in Tamil Nadu and Puducherry, where wind speeds reached 120kmph when the storm made landfall on Nov. 16. Last week, the India Meteorological Department (IMD) had issued a red warning, the highest category, for the eastern coastal states, telling locals to watch out for heavy rains and strong winds. Fishermen were also asked not to go out to sea.

Tamil Nadu

The state government had estimated that the cyclone uprooted over 170,000 trees and damaged about 117,000 houses. Farmers had seen acres of their coconut farms and banana plantations ruined, according to the 'The News Minute'. The impact of the cyclone also damaged electricity transformers and power lines, cutting off electricity in several districts. In a number of affected areas, including the Thanjavur, Tiruvarur, and Nagapattinam districts, schools remain closed today (Nov. 19).

Puducherry

Huts collapsed in the district of Karaikal in Puducherry following the impact of Cyclone Gaja, which chief minister V Narayanasamy said had affected fishermen the most, destroying around 150 of their vessels. Strong winds and heavy rains also uprooted trees and damaged electricity lines and transformers, leaving some coastal hamlets without power.

The winds reportedly dragged a dredger anchored in the port for 60km. It eventually ran aground, but the three crew members on board at the time managed to survive. The carcasses of several animals from the Point Calimere Wildlife Sanctuary in nearby Tamil Nadu were also found washed up on the coast of Karaikal on Nov. 17.

Kerala

Just a few months after severe flooding brought life in the southern-most state to a standstill, several districts in Kerala faced heavy rains and landslides once again. Parts of the Idukki district, including the popular tourist destination Munnar, were flooded and witnessed damage to bridges and crops. In the Alappuzha district, 160 houses were destroyed, school buildings damaged, and electricity disrupted in the wake of the storm.

3.5 Cyclone Phethai makes landfall in Andhra Pradesh, one killed

Source: indiatoday.in , 17 December, 2018

Cyclonic storm Phethai had made a landfall at Katrenikona in Andhra Pradesh's East Godavari district. Cyclone Phethai made the landfall at 35 km east-southeast of Narsapur and 75 km south-southwest of Kakinada at 12.30 pm. Heavy rains and winds were being experienced in many areas in the district. The entire Konaseema region had received heavy rainfall. The state government had alerted people to be careful. One person was killed in a landslide caused by heavy rains in Vijayawada city but no other casualties had been reported from elsewhere so far, according to sources in the State Disaster Management Authority.

The process of crossing the coast was expected to end in the next two-three hours. Cyclone Phethai was expected to weaken to a deep depression by evening, to depression by mid/late night and low-pressure storm by tomorrow morning. The cyclone was moving towards Visakhapatnam. In Andhra Pradesh, 22 passenger trains had been cancelled, one train rescheduled and another partially cancelled in view of the rain due to Cyclone Phethai. Phethai was the third cyclone that Andhra Pradesh had witnessed in a span of three months. Earlier Cyclone **Titli** and **Gaja** had also affected the coastal state. The Andhra Pradesh government claimed it was successful in minimising damage as precautionary measures were taken by the authorities according to the instructions given by Chief Minister N Chandrababu Naidu. He had been monitoring the situation via telephone.

The CEO of Andhra Pradesh's Real Time Governance Centre, R Babu, said that over 25,000 people were shifted to relief camps. He said the RTG was monitoring the cyclone with the help of ISRO satellites and other global weather forecast systems."RTG played a key role in alerting fishermen who ventured into the sea. In addition, people were alerted through IVRS and messages," he said.

Here are some steps taken to minimize the impact of Cyclone Phethai:

- A cyclone warning (Orange message) had been issued for Andhra Pradesh and Yanam (Puducherry) coasts. The cyclonic storm was located over the Bay of Bengal.
- Heavy rainfall (more than 60 mm) had been reported at Injaram, Uppalaguptam, Aryavatam, Ninnimamidivalasa and Velagaleru stations in Andhra Pradesh.
- Cyclone Phethai was likely to trigger heavy rainfall in several parts of Odisha. Heavy rain was likely over one or two places in the West Bengal districts of Howrah, East and West Midnapore, Purulia, Bankura, West Burdwan, Jhargram, and Hooghly.
- Control rooms had been established by the Andhra Pradesh government at Machilipatnam (08672-252486), Guidwada (08674-243697), Nuzvid (08656-232717) and Vijayawada (0866-2574454).
- The Indian Railways had made elaborate arrangements to ensure that rail services are handled with utmost safety and convenience of rail passengers in view of the cyclone.

Railway helpline control had been put into operation at Visakhapatnam railway station with helpline numbers 9121271340, 9121271447, 0866-2576924 and 1072.

- Indian Navy was on standby. The Eastern Naval Command (ENC) had deployed aircraft and ships to offer assistance to those stranded as well as warn fishermen to stay away from the sea. The ENC was also in close contact with state disaster management authorities to oversee the relief process.
- Andhra Pradesh Chief Minister N Chandrababu Naidu on Sunday directed state officials to take precautionary measures for the cyclone. He asked officials to ensure availability of water and food for people living on the coast.
- Damage to thatched huts, minor damage to power and communication lines due to the breaking of branches expected once Cyclone Phethai makes landfall. Major damage to kuccha roads was also expected. The cyclone was also likely to result in uprooting of small trees and damage to paddy crops, banana, papaya trees and orchards. There may also be sea water inundation in low lying areas after the erosion of kuccha embankments.
- Farmers in the cyclone-affected region had been asked to harvest their paddy crops in advance to prevent damage. They had also been asked to collect the paddy stacks kept in the field for drying to a safe place and cover the paddy stacks. Andhra CM Chandrababu Naidu had directed paddy purchasing centres to function 24 hours to help the farmers in the hour of crisis.
- A total suspension of fishing operations along and off the Andhra Pradesh coast on December 17 had been announced. Fishermen are advised not to venture along and off south Odisha coast. Those, who are out in deep sea areas had been advised to return to the coasts.
- Air traffic to the port city of Visakhapatnam had been hampered due to turbulent weather conditions, following which some flights were diverted to Hyderabad.
- A holiday had been declared for educational institutions in the coastal districts of the state as a precautionary measure.

4. SMOG & URBAN AIR POLLUTION

It is a combination of various gases with water vapor, dust and it generally made up of particulates, which are formed by a complex reaction between various oxides of nitrogen and a wide range of hydrocarbons, which is triggered by sunlight. It is a kind of air pollution that reduces visibility, especially in urban areas. The term was first used in 1905 by Dr. H. A. Des Voeux to describe the conditions of fog that had soot or smoke in it. The most harmful components of smog are ground level ozone and fine air pollutants (PM) collectively known as aerosol. The characteristic symptoms of the smog are the brown haze in the atmosphere, reduced visibility, eye irritation, respiratory distress and plant damage. Major smog occurrences are often linked to heavy motor vehicular traffic, high temperature, sunshine and calm winds. Weather and geography affect the location and severity of smog. Because temperature regulates the length of time it takes for smog to form, smog can occur more quickly and be more severe on a hot, sunny day.

Types of Smog:

- Photochemical Smog: This smog is the end product of photochemical reactions consisting of air contaminants such as ozone, PAN, aldehydes, ketones, CO, VOC etc. It is restricted to highly motorized areas. Ex: Los Angeles smog.
- Coal Induced Smog: This smog consists of smoke, sulphur compounds & ash. Burning of coal in winter and coal fired power stations lead to the formation of this smog. This is generally formed during night time and when the temperature is below 100C. Ex: London Smog.

Health Effects : Short term decrease in breathing ability, eye & nose irritation, inflammation of lung tissue, damage to respiratory cells, increased hospital admissions and increased emergency room visits due to short-term exposure to ozone, as well as possible permanent lung damage and reduced quality of life. Increase in chest pains and a lack of oxygen in the bloodstream of those with heart disease due to carbon monoxide and increased susceptibility to infections among children, and increased asthma attacks, due to nitrogen dioxide**.**

4.1 Bellandur Lake catches fire again in Bengaluru; 5,000 army jawans douse blaze in the middle of wetlands

Source: firstpost.com, Jan 20, 2018 12:01:50 IST

Bengaluru: A huge fire emanated from the highly polluted Bellandur Lake, the biggest water body of the city, giving anxious moments to hundreds of residents living nearby.

The locals noticed huge clouds of smoke billowing from the lake replete with sewage, chemical effluents and construction debris.

The fire was in the middle of the wetlands, fire brigade officials said.

Soon pictures and videos of the smoke and fire went viral even as various government agencies and defense personnel doused the blaze, which also raised concerns about the apathy of civic agencies towards a recurring problem in the lake.

Smoke billows from a fire in the middle of the wetlands of the severely-polluted Bellandur Lake, in Bengaluru. PTI

According to defense officials, a strong contingent of 5,000 army jawans of the ASC centre led by Major General NS Rajpurohit doused the fire in the lake.

Spread over 1,000 acres near the infotech hub, the lake is highly contaminated receiving 60 percent of the sewage generated in the city.

The lake was in bad shape despite the National Green Tribunal pulling up the government and its various agencies for failing to prevent pollution and not doing enough to restore the lake to its pristine glory.

Bengaluru Mayor R Sampath Raj said the fire seems to be an outcome of the accumulation of chemicals.

The water samples were collected and tested to find the reason behind the fire, he said.

Raj said government agencies and Bangalore Development Authority and Bruhat Bengaluru Mahanagara Palike (BBMP) would seek the assistance of the Indian Institute of Science to find the reason and chalk out steps to prevent any recurrence.

Following the incident, a blame game erupted between the Karnataka State Pollution Control Board and the Defence Department.

KSPCB chairman Lakshman alleged that the fire started from the land held by the defence department and spread to the lake area.

"Actual cause of the fire was not known. It started from the Defense area. We had taken the samples of the water and will send it to the lab for ascertaining the reasons behind the fire," Lakshman said.

The defense department maintained that the fire was in the lake area and not anywhere near the land held by it.

Rajya Sabha member Rajeev Chandrasekhar, whose organization Namma Bengaluru Foundation had petitioned the National Green Tribunal to save the lake, flayed the government for its "inability" to protect the lake.

"I think it is evident that the Siddaramaiah government is not serious about protecting the lakes and abiding by the NGT's directions on maintaining the sanctity of its buffer zone," he said.

The state government is going to spend Rs 80,000 crore in the next 75 days on various projects but not a single penny will be spent on the improvement of any of the lakes in Bengaluru, Chandrasekhar alleged.

The Bellandur lake had caught fire in May 2015 and August 2016, also.

In 2015, the lake had turned into a frothy, foam-filled water body due to the high concentration of pollutants in the water. Foam from the lake had spilt onto the roads and other areas surrounding the lake.

The Varthur Lake also had caught fire in May, 2017 when some garbage was set ablaze.

4.2 Mumbai Pollution "Severe", Smog Will Persist Till Friday, Says Met Office

Source: All India | ndtv.com | Edited by Debjani Chatterjee | Updated: February 08, 2018 14:14 IST

Mumbai:

Mumbai pollution reaches "severe" levels, people complain of breathing trouble

The Mumbai skyline was wrapped in a haze. The city woke up to a smoggy day with citizens on their way to work complaining of burning eyes and difficulty in breathing. People tweeted about a dull sky behind thick smog.

Pollution levels at Bandra were the worst with Particulate Matter (PM)10 at 405 at 10:30 am, which is "severe" as per the Air Quality Index (AQI) data.

PM10 levels over 400 affects healthy people while seriously impacting those with existing respiratory illnesses.

The meteorological department had said stagnant winds, cloud cover and high humidity were the reasons for the spike in pollution levels for the last 48 hours but it was expected to improve tomorrow evening onward.

Officials from System of Air Quality Weather Forecasting and Research (SAFAR), the body which measures AQI or pollution levels said, "There was a western disturbance which was pulling in a lot of moisture, but as the sun comes up, heat would reduce moisture and pollution levels, thereby improving air quality."

Critical pollution levels were no longer just Delhi's issue, the Supreme Court on January 25, while hearing petitions on combating pollution, had asked the Centre to look into the problem of air pollution on a nationwide basis and not confine it to Delhi-NCR only; the court cited reports suggesting that cities in Uttar Pradesh, Raipur and Patna were more polluted. The top court had asked the Ministry of Environment, Forest and Climate Change) what it proposed to do on the air pollution issue for the rest of the country.

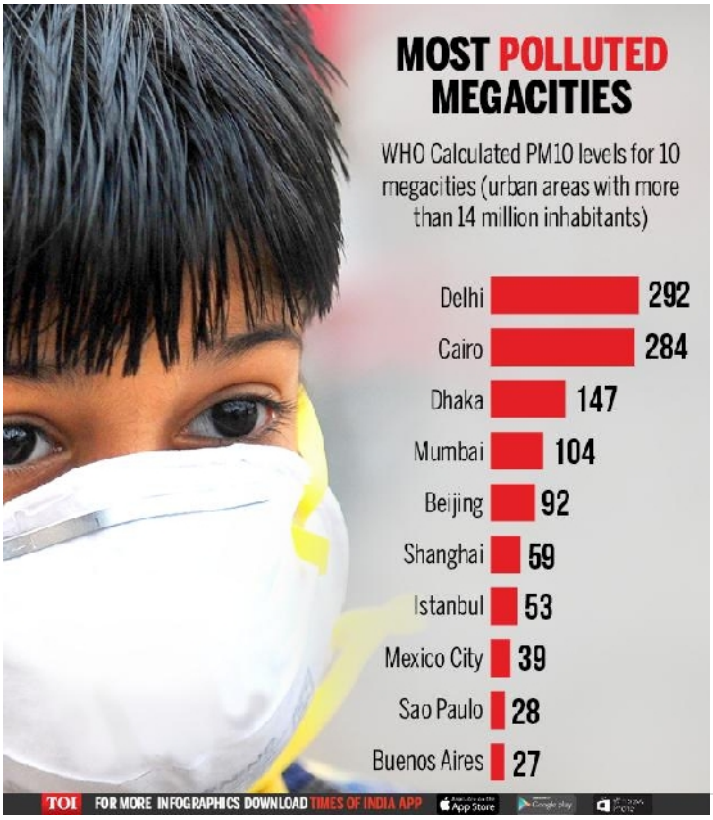
Mumbai last saw pollution levels like today's after Diwali last year, when the AQI levels touched 400. Pollution levels between 51-100 is considered satisfactory, 101-200 is moderate, 201-300 is poor, 301-400 is very poor and over 400 is severe.

4.3 India tops world in bad air quality: Kanpur, Delhi among 15 worst cities, Mumbai 4th most polluted megacity - Times of India

Source: timesofindia.indiatimes.com | Updated: May 02, 2018 20:10 IST

NEW DELHI: According to the World Health Organization (WHO) global air pollution database released in Geneva, India has 14 out of the 15 most polluted cities in the world in terms of PM 2.5 concentrations -- the worst being Kanpur with a PM 2.5 concentration of 173 micrograms per cubic meter, followed by Faridabad, Varanasi and Gaya.

Other Indian cities that registered very high levels of PM2.5 pollutants were Delhi, Patna, Agra, Muzaffarpur, Srinagar, Gurgaon, Jaipur, Patiala and Jodhpur, followed by Ali Subah Al-Salem in Kuwait and a few cities in China and Mongolia.



India's financial capital Mumbai was the world's fourth most polluted megacity. The study considered PM2.5 (particulate matter of diameter less than 2.5 micro meters) and PM10. PM2.5 is more dangerous than PM10. The period considered for the study was 2010 to 2016.

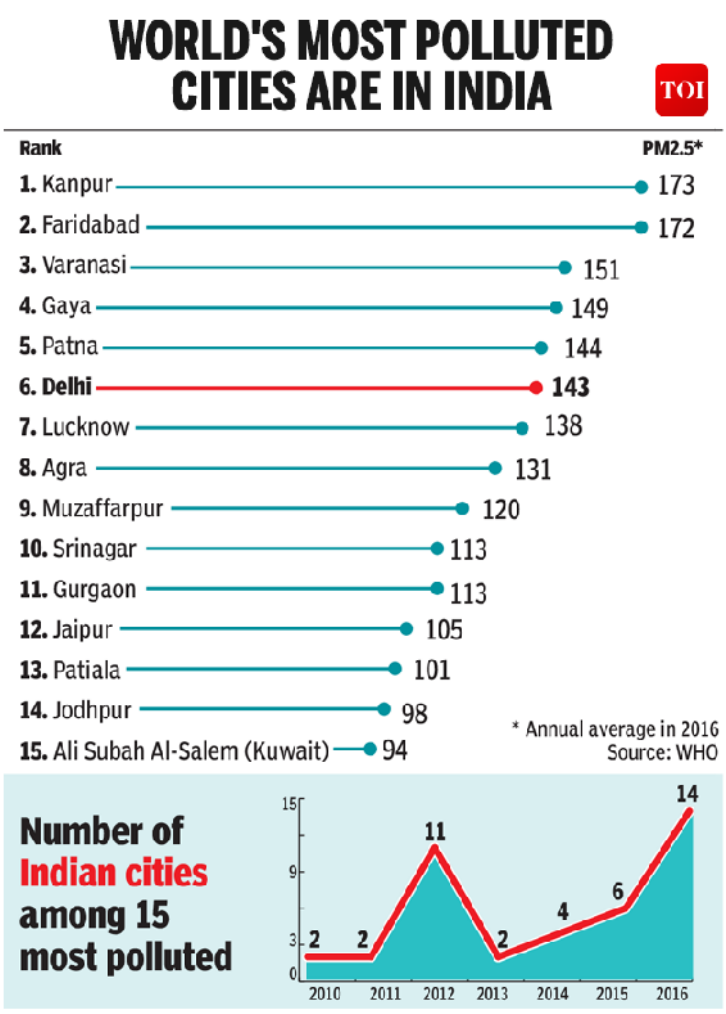
What the WHO report said?

The report states that 9 in 10 people in the world breathe polluted air. In a statement, it said 7 million people die every year because of outdoor and household air pollution. "Ambient air pollution alone caused some 4.2 million deaths in 2016, while household air pollution from cooking with polluting fuels and technologies

caused an estimated 3.8 million deaths in the same period," it said. More than 90% of air pollution-related deaths occur in low- and middle-income countries, mainly in Asia and Africa, followed by low- and middle-income countries in the eastern Mediterranean region, Europe and the Americas.

"Air pollution threatens us all, but the poorest and most marginalized people bear the brunt of the burden," WHO chief Tedros Adhanom Ghebreyesus said in a statement.

WHO highlighted that air pollution is mainly responsible for non-communicable diseases (NCDs), causing an estimated one-quarter (24%) of all adult deaths from heart disease, 25% from stroke, 43% from chronic obstructive pulmonary disease and 29% from lung cancer.



The organization stressed that although its report provides air quality data from more than 4,300 cities and towns in 108 countries, there was unevenness in the information received, with a dire lack of data from Africa and parts of the Western Pacific region.

Only eight of the 47 countries in Africa provided air quality information about one or more of their cities. And while the database listed information on 181 Indian cities, it provided data for only nine Chinese cities.

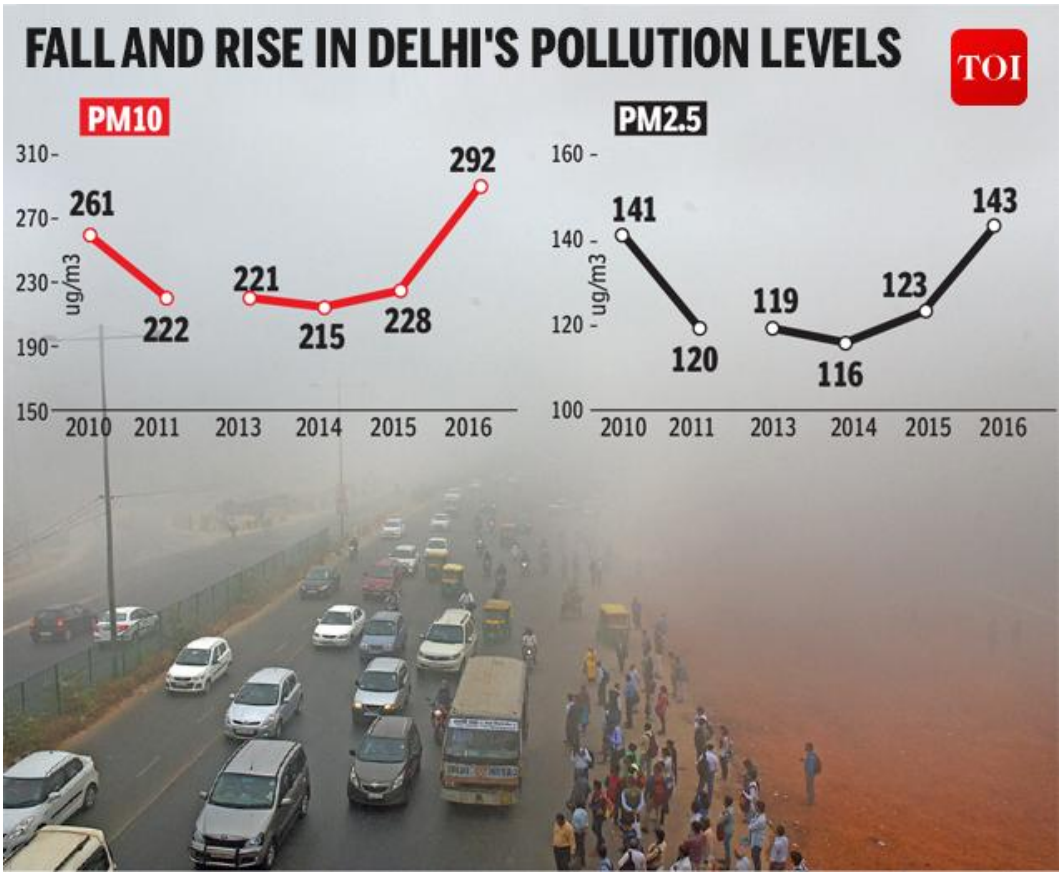
The WHO's collected annual mean concentrations of fine particulate matter (PM10 and PM2.5) includes pollutants, such as sulphate, nitrates and black carbon, which pose the greatest risks to human health.

Major sources of air pollution from particulate matter include the inefficient use of energy by households, industry, the agriculture and transport sectors, and coal-fired power plants. In some regions, sand and desert dust, waste burning and deforestation are additional sources of air pollution.

DELHI HAS NO REASON TO CHEER

While Delhi is not the most polluted city in the world; it's hardly reason to cheer. Despite public outcry over severe air pollution, and both Centre and Delhi government taking up the issue, the report shows that Delhi's pollution levels improved only marginally between 2010 and 2014 but started deteriorating again in 2015.

In 2016, the latest year in WHO's database, Delhi was in sixth spot, having recorded its highest pollution levels in six years. The city's PM 2.5 annual average was 143 micrograms per cubic meter, more than three times the national safe standard, while the PM 10 average was 292 micrograms per cubic meter, more than 4.5 times the national standard.



The data source for Delhi is mainly from the Central Pollution Control Board (CPCB) (about 10 stations), although for the years 2015 and 2016 WHO also considered data from ministry of earth sciences (MoES) and US Environment Protection Agency's (EPA) Air Now. This may have also influenced the air pollution concentrations for 2015 and 2016, experts said.

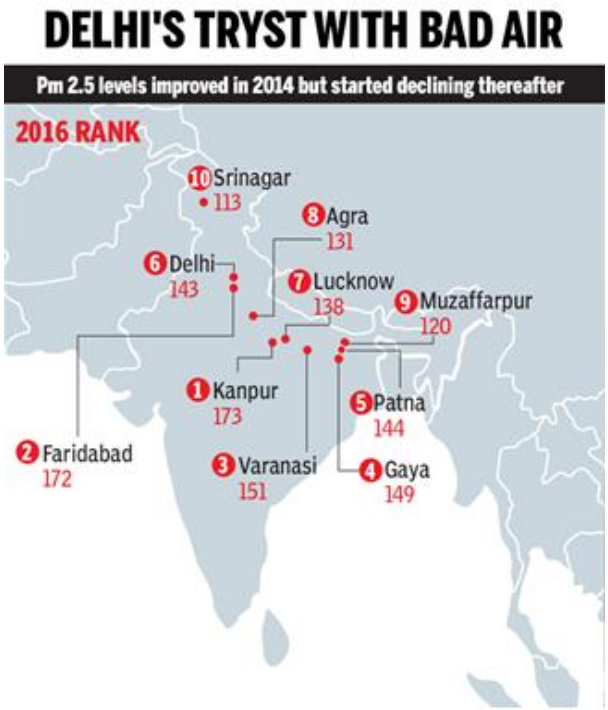
Ironically, as India's air pollution monitoring network improved in the past few years with more cities being monitored, the number of Indian cities in the top polluters' list zoomed.

"With improved air quality monitoring, we are beginning to understand the depth and spread of the air pollution problem in India. While Delhi is at the crossroads and is expected to bend the curve post 2016, other pollution hot spots are proliferating across the country," said Anumita Roy Chowdhury, executive director, Centre for Science and Environment (CSE).

"This is a national public health crisis and the newly proposed national clean air action plan has to ensure stringent action in all cities to comply with clean air standards," Chowdhury said.

In 2010, Delhi was the worst polluted city globally followed by Peshawar and Rawalpindi. Agra was the only other Indian city in the top 10 polluted (PM 2.5) cities, in 2011 too Delhi and Agra were the only two Indian cities and Ulaanbaatar was the worst.

But this started changing 2012 onward when 14 out of top 20 most polluted were in India. In 2013, 2014 and 2015 too, four to seven Indian cities were in top 20. But in the 2016 data released on Wednesday, 14 out of 15 most polluted are in India.



Rank	2015	PM2.5
1	Muzaffarpur	197
2	Pasakha	150
3	Novi Sad	142
4	**Delhi**	123
5	Greater Cairo	117
6	Agra	115
7	Varanasi	114
8	Kanpur	108
9	Lucknow	108
10	Baoding	107

Collated by CSE

Rank	2014	PM2.5
1	Varanasi	180
2	Al Jubail	152
3	Xingtai	131
4	Baoding	129
5	Shijiazhuang	126
6	Pasakha	117
7	**Delhi**	116
8	Handan	116
9	Greater Cairo	116
10	Hengshui	108

LEVELS SEE IMPROVEMENT IN 2017

The CPCB had recently claimed that Delhi's air pollution levels improved in 2017 as compared to 2016. The board, however, hasn't released the annual average PM 2.5 concentration for 2017 yet.

A number of policies came into effect towards the end of 2016 - the graded response action plan (GRAP) in October, doubling of the environment compensation charge (ECC) on trucks in December 2015 and better coordination among NCR states on pollution control.

The WHO report, however, doesn't reflect this because it considers annual PM 10 and PM 2.5 averages between 2010 and 2016.

DELHI UNABLE TO KEEP PACE WITH BEIJING

Experts are not sure what may have led to a sudden spike in Delhi's pollution levels in 2015 and 2016. "In 2015 and 2016, there were northwesterly winds in the crop burning season which brought particulate pollution from neighbouring states. These meteorological factors may have also accentuated air pollution in Delhi," said Dipankar Saha, former CPCB air lab head.

In contrast, many Chinese cities are improving. In 2016 only four Chinese cities —Baoding, Hengshui, Xingtai and Anyang — were in top 20 compared to 14 Chinese cities, including Beijing, in 2013's top 20.

Delhi and Beijing are often compared due to their high air pollution levels and policies like the odd-even road rationing measure or air pollution emergency action plan. However, WHO's recent data shows that Beijing's air pollution levels have been consistently reducing 2013 onwards.

In 2016, Beijing's PM 2.5 concentration was 73 micrograms per cubic meter compared to Delhi's 143. "There are cities that have seen a decrease in PM2.5 level, Beijing and Mexico, if you look at the data. China has put a number of measures since 2013, from a National Action Plan of Air pollution Control, enforcement of environmental standards etc," WHO said, responding to TOI's questionnaire.

MUMBAI IS WORLD'S 4TH MOST POLLUTED CITY

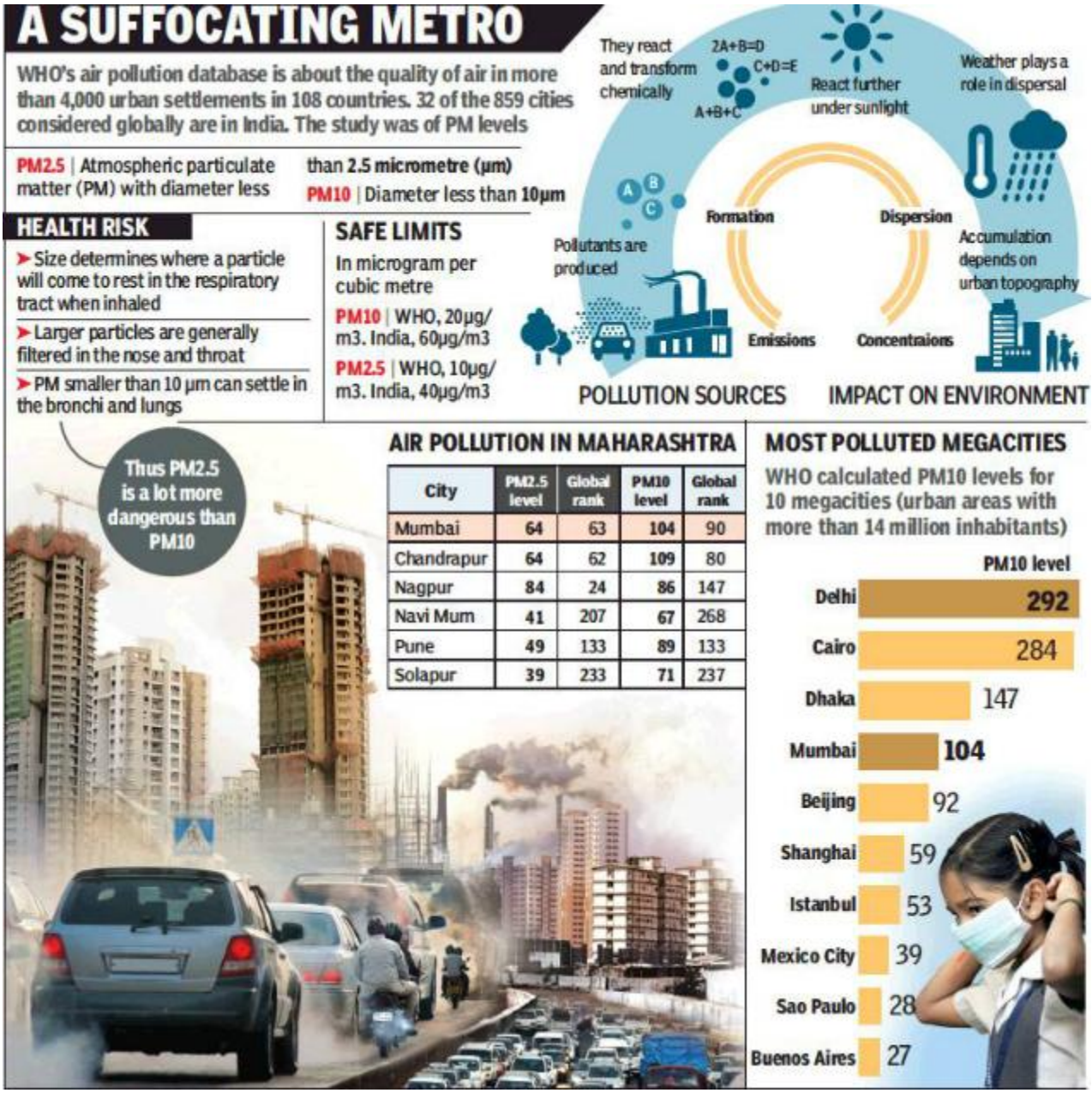
In an alarming reflection of the city's air pollution levels, WHO ranked Mumbai as the fourth most polluted megacity in the world, up from last year's fifth place, also being ranked the 63rd most polluted city among 859 considered by the WHO around the world.

Among 10 global megacities (habitation of above 14 million), Mumbai, with an average PM10 level of 104ìg/m3 (microgram per cubic meter), came after Delhi (which topped the list), Cairo and Dhaka. Shockingly, it was found to be more polluted than Beijing, which is always in news for its terrible smog-laden days, accompanied with pictures of people moving around in masks.

Mumbai's air pollution is nearly as bad as Beijing's, but the city is not paying the required attention to this problem and that is alarming. It is time Mumbai woke up to the situation and took responsibility and react with the sort of urgency Bejing has reacted and how even Delhi is preparing to respond to its growing pollution," said Sunil Dahiya, senior campaigner, Greenpeace.

Quite a few factors contribute to Mumbai's high air pollution levels. "Construction activity accounts for about 30% of dust particles, followed by vehicular emissions. In addition, open burning of garbage occurs in the city, adding to pollution," said Rakesh Kumar, director, National Environmental Engineering and Research Institute (NEERI).

"Nevertheless, the Indian subcontinent cannot be directly compared with other regions of the world. Being in a tropical country, Indian cities have a lot of background pollutants like natural dust. This is why Indian cities have recorded higher level of pollutants (on the WHO list)."



In Maharashtra, polluted cities include Pune, Navi Mumbai and Nagpur (not in that order). For Mumbai, WHO used data provided by the Maharashtra Pollution Control Board from its monitoring stations in Sion and Bandra and monitoring stations by System of Air Quality Weather Forecasting and Research (SAFAR).

JAIPUR IS RAJASTHAN'S MOST POLLUTED CITY

The Pink City too is not in the pink of health, according to the WHO report which said Jaipur is the most polluted city in the desert state, followed by Jodhpur, Kota, Alwar and Udaipur. The samples were collected in different years in different districts.

City	Year	PM10	PM2.5
Jaipur	2016	193	105
Jodhpur	2016	180	98
Kota	2012	156	83
Alwar	2012	152	81
Udaipur	2016	98	41

Jaipur recorded the highest level of PM10 (Particles smaller than 10 microns) in the state. The international standards of air pollution says that index value of 0-50 (micrograms per cubic meter air) is excellent, 51-100 is good; 101-150 is lightly polluted.

“If the PM10 is more than 150, then it is alarming. If PM 10 is up to 100, then it is satisfactory,” said Dr Ajit Singh, respiratory allergy specialist, department of medicine, Sawai Man Singh (SMS) Hospital.

He said, “The example of PM10 is dust particles, moulds and pollens. These particles easily reach up to the lungs to cause various diseases related to lungs and respiration.” According to the health experts, PM10 particles can penetrate into the lungs and may enter the bloodstream. It can cause heart disease, lung cancer, asthma and acute lower respiratory infection.

4.4 Dust storms kill more than 100 in India

Source: bbc.com , 03 May, 2018

The storms destroyed homes and uprooted trees

At least 109 people had been killed and scores more injured in fierce dust storms that hit the northern Indian states of Uttar Pradesh and Rajasthan.

The storms on Wednesday disrupted electricity, uprooted trees, destroyed houses and killed livestock. Many of the dead were sleeping when their houses collapsed after being struck by intense bursts of lightning. Dust storms are common in this part of India during summer but loss of life on this scale is unusual.

At least 73 people died in Uttar Pradesh - more than half of them of them in Agra district, which is home to the Taj Mahal monument. Officials say the death toll could increase further. Falling trees and walls killed many people in the state.

Local journalist Laxmikant Pachouri told the BBC that 21 people had died in the village of Kheragarh, about 50km (30 miles) south-west of Agra.

Image copyright Laxmikant Pachouri

More than 20 people were left dead in Kheragarh village

"People are in shock and can't believe that such destruction happened in their village. I met a family which lost four children last night - it was so disturbing. The family couldn't believe it. They told me that their children were playing in the house when a wall collapsed on them," Pachouri said.

Prime Minister Narendra Modi said he was saddened by the loss of life. Uttar Pradesh Chief Minister Yogi Adityanath had directed officials to personally monitor relief operations.

Storm risk continues for parts of India

The storms also affected three districts in neighboring Rajasthan state - Alwar, Bharatpur and Dholpur - where at least 36 people were killed. Officials say Alwar was worst affected. Schools in the district were closed.

Image copyright AFP

Alwar hotel owner Shivam Lohia said he abandoned his car after it was almost blown off the road.

The Uttar Pradesh government has also announced that families of the dead will receive 400,000 rupees ($6,000; £4,400) as compensation.

The southern state of Andhra Pradesh, meanwhile, was hit by more than 41,000 lightning strikes on Wednesday, reported news agency AFP - saying there had also been deaths in that state.

Officials said they had been taken aback by the ferocity of the storms.

"I've been in office for 20 years and this is the worst I've seen," Hemant Gera, secretary for disaster management and relief in Rajasthan, told the BBC.

This man in Agra was one of many carried from the debris of homes

Image copyright AFP

"We had a high intensity dust storm on 11 April - 19 people died then - but this time it struck during the night so many people sleeping and couldn't get out of their houses when mud walls collapsed."

Mr Gera said teams were trying to restore electricity to homes after 200 to 300 electricity poles were felled in the storm.

The dust storm also hit the capital Delhi, more than 100km (62 miles) away, late on Wednesday evening. The city was also belted by heavy rain.

India's Meteorological Department said more storms were likely across a wider area before the weekend.

Image copyright EPA

The dust storm also hit the capital Delhi

4.5 Delhi Air Pollution Highlights: Thick Smog Grapples Delhi After Diwali

Source: All India |ndtv.com|Written by Aditi Ghosh | Updated: November 08, 2018 15:37 IST

Pollution in Delhi: People burst crackers outside the two hour time period stipulated by the top court

New Delhi:
As Delhi continues to grapple with rising air pollution, the air quality dropped and Delhi pollution level slipped to "very poor" category and on Diwali night on Wednesday.

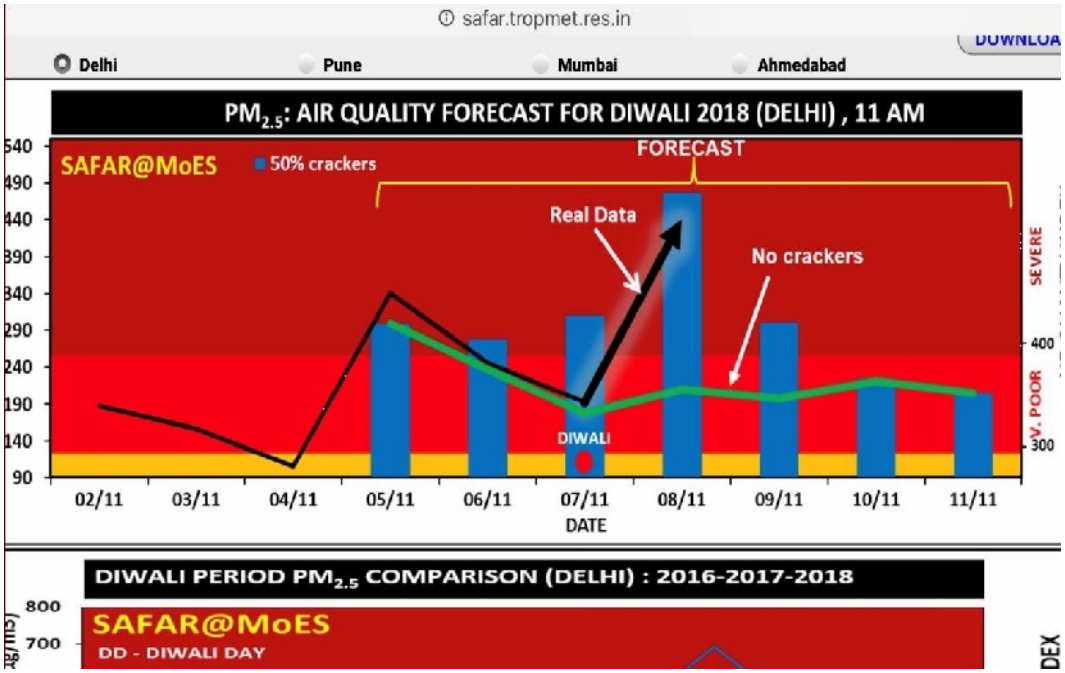
A thick haze engulfed the city as people in the city continued to burst firecrackers long after the deadline set by the Supreme Court. The overall Air Quality Index (AQI) was recorded at 302 at 11 pm, which fell in the very poor category, according to the Central Pollution Control Board.

The Supreme Court had allowed bursting of firecrackers from 8 pm to 10 pm only on Diwali and other festivals. It had also allowed manufacture and sale of only "green crackers", which have low light and sound emission and less harmful chemicals.

The situation was similar, if not worse, in the neighboring areas of Delhi such as Gurugram, Noida and Ghaziabad, where crackers were burst as usual, raising question marks on the efficacy of the administration in enforcing the top court's ban.

Here are the highlights of the air pollution in Delhi after Diwali:

SAFAR said that surface winds have continued to play a major role, it said, as it was calm (2.1 kmph) on Thursday afternoon, so pollution levels were expected to build-up rapidly due to the stagnation. "The contribution of stubble fire appears to be marginal so far," it added. The overall air quality index jumped to 574 which fall in the "severe-plus emergency" category, according to data by the Centre-run SAFAR (System of Air Quality and Weather Forecasting And Research).



Delhi's air quality typically worsens in winter, due to pollution from the burning of rice stubble, diesel engines, coal-fired power plants and industrial emissions.

Delhi Records Worst Air Quality Of Year After Diwali. An AQI between 0 and 50 is considered "good", 51 and 100 satisfactory", 101 and 200 "moderate", 201 and 300 "poor", 301 and 400 "very poor", and 401 and 500 "severe". Above 500 is "severe-plus emergency" category.

The Delhi Air Quality Index is around 574 at present. Air Quality Index entered in severe category at 2 AM after midnight on Thursday and will continue to remain in severe category until evening, a senior official said.

Workers of Public Works Department (PWD) sprinkle water in Anand Vihar area to settle the dust as a pollution control measure.

In October, Supreme Court allowed the use of "green" firecrackers for Diwali but only if they were let off between 8-10 pm. However, there were no "green" fireworks available for sale and many fireworks were let off before and after the designated two-hour period.

Authorities have been reluctant to enforce an outright ban on the use of fireworks to avoid offending millions of Hindus across the country, for whom Diwali is one of the biggest festivals.

The burning of cracker has lead to the thick smog in the national capital.

Smog at Rajpath

As many as 209 calls were received by the Delhi Fire Services on Diwali, including one related to a huge fire in a factory at Bawana, officials said.

Of these, 89 calls were related to fire incidents at garbage and dumpyards, while the rest were related to fire incidents involving electric wires, at factories and residential areas, a senior Delhi Fire Services officer said.

The officials said the number of calls related to firecrackers was comparatively low, but there was no decline in the number of calls related to fire incidents.

Health Hazards

A "very poor" AQI essentially means that people may suffer from respiratory illnesses on a prolonged exposure to such air. If the air quality dips further, the AQI will turn "severe", which may trouble even those with sound health conditions and seriously affect those with ailments.

The apparent lack of concern about the toxic air - whether through ignorance or apathy - gives politicians the cover they need for failing to address the problem, say environmental activists and others. Tiny particulate matter can cause major health problems.

In recent weeks, Delhi doctors have reported an increase in patients with respiratory problems.

The SAFAR forecast "bad" air quality Thursday even though partially toxic crackers were burst as compared to 2017. It also said the pollution levels would peak between 11 am and 3 am Wednesday and Thursday.

Each year, smoke from festival firecrackers significantly adds to pollution levels in Delhi and its satellite cities, resulting a haze that can linger for days as wind speeds drop in the cooler weather.

The Supreme Court order to burst crackers from 8 pm to 10 pm only on Diwali and other festivals were not followed properly. Several areas showed a spike in the air pollution. Areas like Anand Vihar, ITO and Jahangirpuri recorded very high pollution levels. Violations of the Supreme Court order were reported from Mayur Vihar Extension, Lajpat Nagar, Lutyens Delhi, IP extension, Dwarka, Noida Sector 78 among other places.

The air quality started deteriorating rapidly from 7 pm. The AQI was 281 at 7 pm. It rose to 291 at 8 pm and further deteriorated to 294 at 9 pm and 296 at 10 pm, according to the CPCB.

4.6 Toxic Smog Covered 41 Indian Cities, The Day After Diwali

Source: bloombergquint.com, November 10 2018, 12:58 PM, Bhasker Tripathi, IndiaSpend

About 41 cities, mostly in north and central India, experienced "poor" to "severe" air quality on Nov. 8, 2018, a day after Diwali, according to Government data.

Seven cities, including Noida, Faridabad, Patna and Lucknow, recorded worse air than Delhi, according to the Air Quality Index (AQI) bulletin, which records a 24-hour average and was released every day at 4 pm by the Central Pollution Control Board (CPCB). AQI was a number used by governments to communicate to the public how polluted the air was. AQI of 100 was considered acceptable in India.

The plunging air quality after Diwali also took on religious overtones, with some arguing that a Hindu festival was being unfairly criticized and smoke from firecrackers was not the reason for Delhi's increased air pollution, and there was no evidence that the smoke had any long-term effects.

However, studies suggest that exposure to even brief spikes in pollution could increase mortality.

Short-term exposure to air pollution was seen to cause premature deaths among the elderly, India Spend reported on January 19, 2018. For each 10 μg/m^3 daily increase in PM 2.5, the daily mortality rate increased by 1.05%, according to this December 2017 study by the Harvard TH Chan School of Public Health at Harvard University.

Delhi, currently regarded the world's most polluted city, recorded "very poor" air with an AQI of 390, as per the CPCB bulletin.

Wazirpur in central Delhi was the most polluted area in the city with particulate matter (PM) 2.5 readings crossing 4,000 μg/m3 at 2.05 AM on November 8--66 times the national safe air standard of 60 μg/m3. PM 2.5 were air-borne particles 30 times finer than a human hair and can sicken or kill people by entering human lungs.

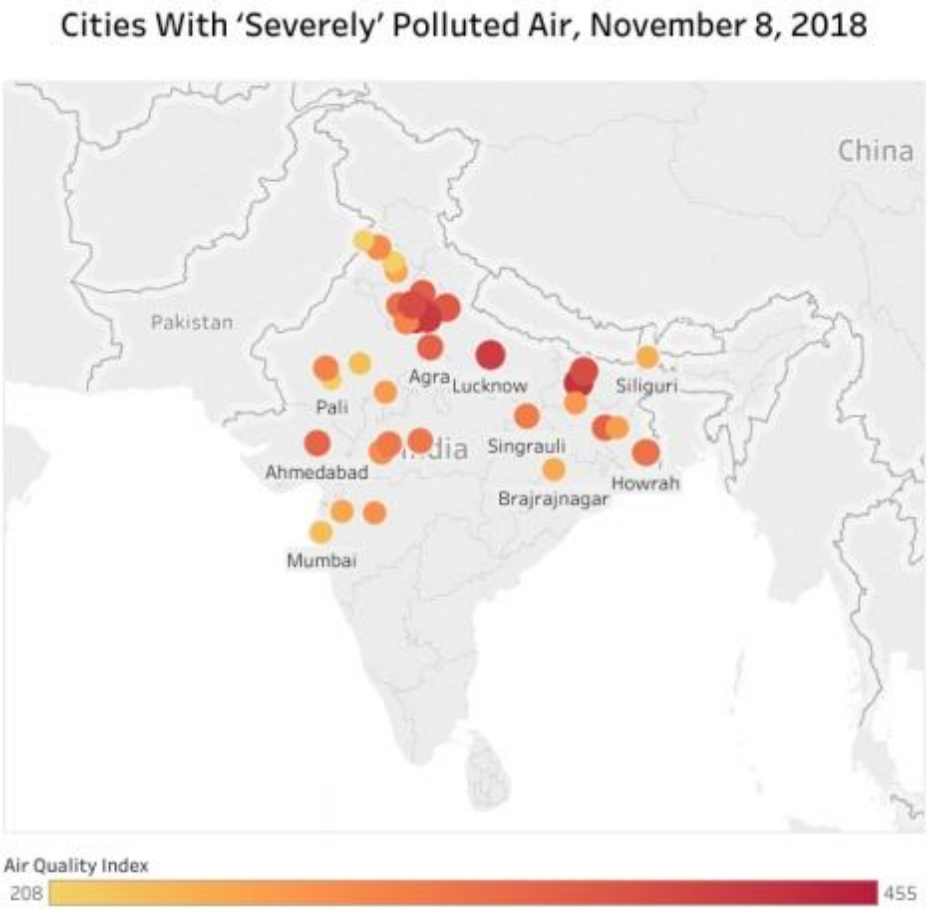
Firecrackers Worsen Already Toxic Air

Firecrackers on Diwali evening added to already deteriorating pollution levels across Delhi. In many areas of India's capital, monitors showed pollution levels peaking between 8-10 pm, during which time the Supreme Court allowed firecrackers.

About 5 million kg of firecrackers were estimated to had been burnt in Delhi this Diwali, despite a Supreme Court ban. The city had not seen a single day of safe air for more than a month, as per IndiaSpend's analysis of air quality data of Delhi's 37 automatic air quality monitoring stations between October 1-November 6, 2018.

In terms of 24-hour averages, about 41 cities in India recorded poor-to-severe level AQIs.

Faridabad recorded the worst air with the 24-hour average AQI reaching 455, followed by Noida with an AQI of 432. Lucknow, Patna and Ghaziabad recorded "severe" air with the AQI at 412, 427 and 422, respectively. An AQI of 100 is considered acceptable.



Source: Central Pollution Control Board

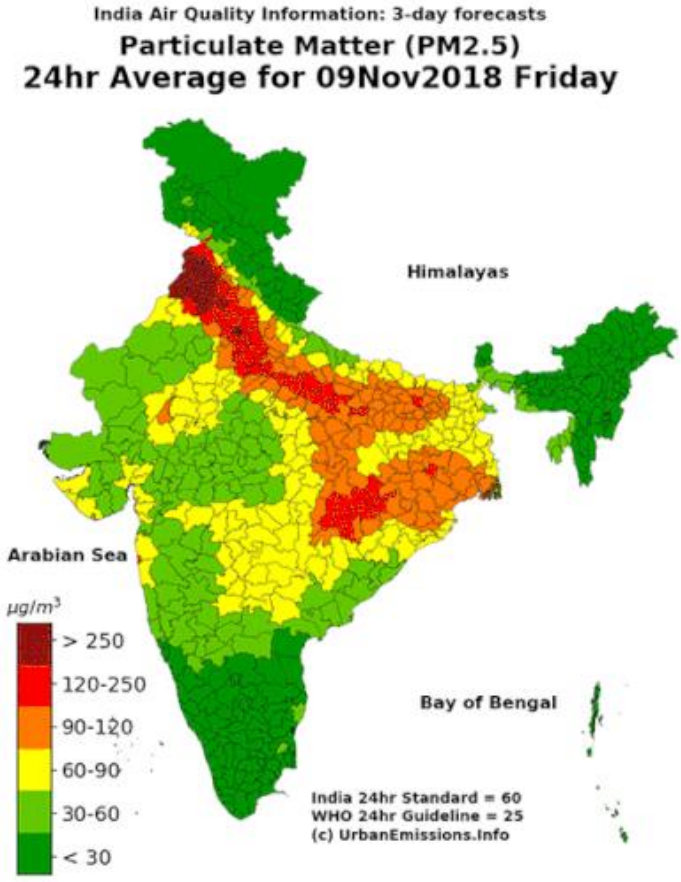
Air Quality Index And Health Impacts

Good	Minimal Impact
Satisfactory	Minor breathing discomfort to sensitive people
Moderate	Breathing discomfort to the people with lungs, asthma and heart diseases
Poor	Breathing discomfort to most people on prolonged exposure
Very Poor	Respiratory illness on prolonged exposure
Severe	Affects healthy people and seriously impacts those with existing diseases

Northern Cities Will Continue To Have Poor Air Quality

Most of the North Indian cities we mentioned were not likely to breathe safer air over three days to November 11, according to an-all India forecast of PM 2.5 levels by Urban

Emissions, a non-profit research group. The air will clear up only after November 10, 2018, according to the forecast.



5. WILDFIRES

Uncontrolled blazes fueled by weather, wind, and dry underbrush, wildfires can burn acres of land—and consume everything in their paths—in mere minutes. On average, more than 100,000 wildfires, also called wild land fires or forest fires. A wildfire moves at speeds of up to 14 miles an hour (23 kilometers an hour), consuming everything—trees, brush, homes, even humans—in its path.

How They Are Formed

There are three conditions that need to be present in order for a wildfire to burn, which firefighters refer to as the fire triangle: fuel, oxygen, and a heat source. Fuel is any flammable material surrounding a fire, including trees, grasses, brush, even homes. The greater an areas fuel load, the more intense the fire. Air supplies the oxygen a fire needs to burn. Heat sources help spark the wildfire and bring fuel to temperatures hot enough to ignite. Lightning, burning campfires or cigarettes, hot winds, and even the sun can all provide sufficient heat to spark a wildfire.

Although four out of five wildfires are started by people, nature is usually more than happy to help fan the flames. Dry weather and drought convert green vegetation into bone-dry, flammable fuel; strong winds spread fire quickly over land; and warm temperatures encourage combustion. When these factors come together all that's needed is a spark—in the form of lightning, arson, a downed power line, or a burning campfire or cigarette—to ignite a blaze that could last for weeks and consume tens of thousands of acres.

Forest fire in Himachal Pradesh forests

5.1 Scattered forest fires engulf parts of Sanjay Gandhi National Park

Source: dnaindia.com, March 14, 2018, 06:40 AM IST

Forest Fire ***The fire has gutted parts of SGNP and Aarey Colony***

A major series of forest fire engulfed area of the Sanjay Gandhi National Park (SGNP) on Tuesday. Chief Conservator of Forest (CCF) and Director of SGNP, Anwar Ahmed said that there were several fires reported on Tuesday from Yeoor and Tulsi regions and included parts behind Wagle Estate and even portions in Mira Road.

"A majority of our staff were sent to control the situation and several fires were extinguished or restricted from spreading further by around 9pm. Forest fires are common in the summer," said Ahmed.

The locals from Mulund west claimed that they had not witnessed such intense forest fire in recent times and the smell of burning wood could be felt till LBS road. Several wildlife activists and residents complained that the forest department and SGNP Control Room numbers were non-functional for a long time. "We began seeing the forest fire around 3 pm in scattered portions behind Johnson & Johnson factory. We called the forest department but they were incommunicado," said Karan Shah, a resident of Mulund.

Pawan Sharma, Wildlife Warden for Thane affirmed that the fire was surely one of the worst as it seemed to have taken over large parts of the forest in Tulsi lake range. "The actual intensity of fire was only understood after sunset as large patches of forest could be seen burning in flames, the extent of damage in terms of area of forest cover lost will only be clear in the morning." Meanwhile fire was also reported from Aarey Milk Colony.

5.2 Fire in Trikuta-hills leads to suspension of Vaishno Devi Yatra

Source: dailyhunt.in , May 24, 2018 11:11am

Fire in Trikuta-hills leads to suspension of Vaishno Devi Yatra

After a raging forest fire took over Trikuta Hills, about 50 kms from Jammu, the Vaishno Devi Yatra was suspended on Wednesday.

The shrine witnesses a footfall of 35,000 pilgrims a day from around the country and it peaks during the summer season.

Following suspension, 10,000 pilgrims were left stranded at the Katra base camp, and another 3,000 moved to a safer place near Himkoti Marg.

Yatra suspended to avoid rush amid devastating fire

Deputy Commissioner Reasi P Ramaswamy G said the fire broke out at new battery car track. The pilgrims were allowed to take the traditional route to the cave shrine, but battery car track was suspended.

However, the registration counter was closed to avoid a rush on the road. By Wednesday afternoon, 20,000 devotees had registered themselves for the journey.

IAF helicopters deployed to douse fire

To douse the massive fire, two MI-17 helicopters of Indian Air Force and a high-utility helicopter were sent. The helicopters used under-slung bambi buckets to contain the fire. "It is being controlled by over 200 ground staff deployed by CRPF and the Shrine Board," an official of the shrine board said. He added there were no adverse reports and all pilgrims were safe.

A devotee said raging fire caused concern

"Though we didn't panic, there was a cause of concern when it was raging. At that time we were at Himkoti. The authorities have suspended the Yatra for our safety and we have to abide by their decision," a devotee told Hindustan Times.

5.3. Massive forest fire in Uttarakhand causes damages worth lakhs

Source: dailyhunt.in , May 28, 2018 & June 22, 2018 hindustantimes.com

Uttarakhand Chief Minister Trivendra Singh Rawat when inquired about the incidents said, "The government was trying to control the fire incidents and to some extent we had been successful too."

Fire in Uttarakand forests

On Wednesday, at least 295 new incidents of forest fires were reported from different parts of Uttarakhand. According to the forest department of Uttarakhand, 3399 hectares forest cover had been gutted in 1451 forest fire incidents in the state this year. Loss of Rs 63.40 lakh had been calculated. The forests of Garhwal and Shivalik had been affected the most.

A total of 2321 hectares of forest land of Garhwal and Shivalik region had been affected in 976 fire incidents this year and this had resulted in economic loss of around Rs 43.94 lakh. The Kumaon region has recorded a loss of Rs 17.11 lakh where 846.13 hectares of forest land had been gutted.

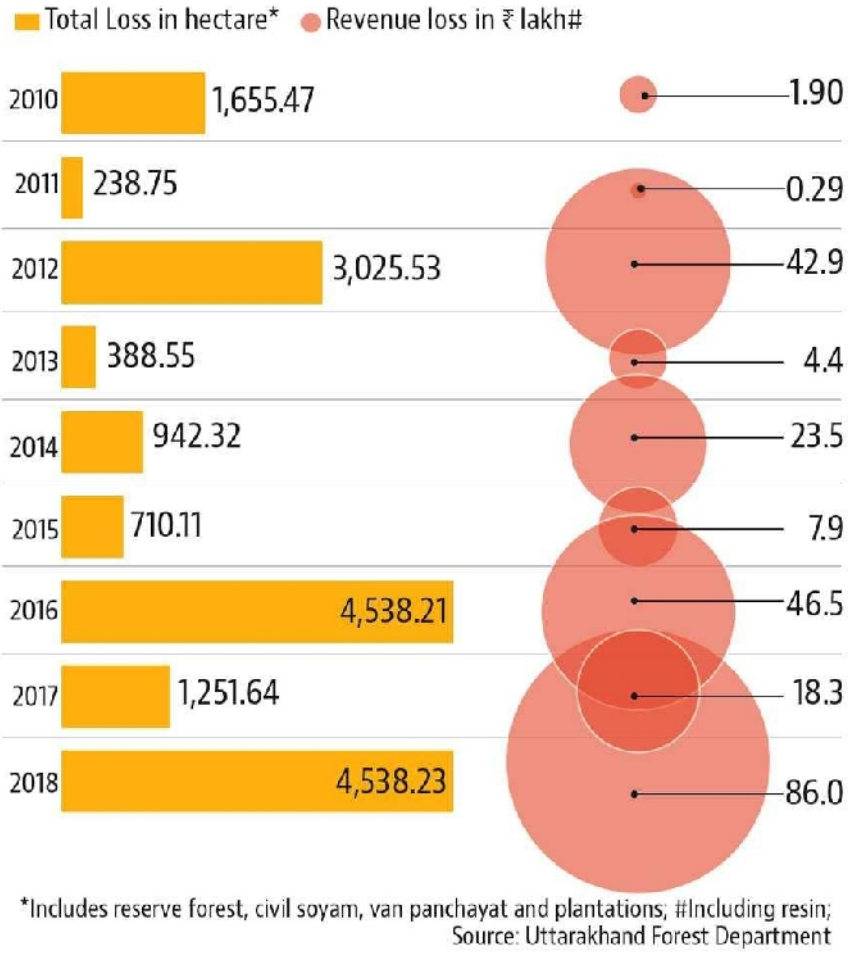
Wildlife sanctuaries had been burnt too. 125.13 hectares of reserved forest had been burnt leading to a loss of Rs 23000 lakh. A majority of fire was reported from Pauri Garhwal (579) Almora (186) Uttarkashi (163).

To combat these losses the forest department has released Rs 12.5 crore from the state budget and Rs 1.75 crore from CAMPA. Uttarakhand Chief Minister Trivendra Singh Rawat when inquired about the incidents said, "The government is trying to control the fire incidents and to some extent we had been successful too."

However, minutes after saying this, fire increased in two more districts.

The fire must be prevented as soon as possible. The more delay, the more loss of life and property. Out of 13 districts in the state, 10 are burning.

The affected districts in Garhwal region were - Haridwar, Uttarkashi, Tehri Garhwal, Pauri Garhwal, Rudraprayag, Chamoli ; Kumaun region - Nainital, Bageshwar, Champawat, Almora.



5.4 Forest fires highest in five years in Himalayan foothills

Source: economictimes.indiatimes.com, By Jayashree Nandi, Jun 01, 2018, 10.24 AM IST

Wildfires burn through a forest near Shimla

NEW DELHI: In May 2018, number and extent of forest fires were possibly the highest in the Himalayan foothills of Uttarakhand and Himachal Pradesh in the past five years, satellite data shows. An analysis of forest fires in the two states by NASA scientists reflects there were more than 13,000 fires this May compared to only 2927 last year. Meteorologists had linked it to a relatively long dry spell April onward and extreme heat even in the hills. In 2012, there were more than 14,000 fires in May.

Hiren Jethva, research scientist, Universities Space Research Association (USRA) at Nasa Goddard Space Flight Center analyzed the total number of fire spots detected by the VIIRS sensor on-board Suomi-NPP platform of NOAA-NASA. "I think drier atmosphere coupled with rising mercury levels might have triggered these forest fires," he told TOI. An analysis of forest fires detected by another satellite Aqua, between 2002 and 2016, also reflects similar trends with 2012 being an anomaly recording more than 2000 fires compared to less than 100 in all other years. While there had been no specific reports of how wildlife has been affected in these areas, Forest Survey of India (FSI) scientists and forest department officials confirmed that there may had been extensive damage to biodiversity on the forest floor, in some cases even canopies have caught fire. The Indian Meteorological Department (IMD) linked this to the fact that there was no impact of western disturbance or wet spell in May. "Trees were dry which was leading to the spread of fire. A western disturbance was there but it affected only Jammu and Kashmir. This coupled with intense heating and

vertical sunrays may have caused the fires to spread. There were heat waves in Himachal Pradesh and parts of J&K too," explained Kuldeep Shrivastava, scientist at the Regional Meteorological Centre of IMD.

Forest officials said 2016 was another year with a massive number of forest fires but the peak was in April end instead of May. "None of the fires were natural. They have been set by people. They had noticed that people set fire to the dry chir pine needles every year. This year, people couldn't set fire in April because of the thunderstorms so they are making use of the dry spell now. The weather conditions were leading to fires spreading to large areas. People had to set fire to ensure there was growth of grass," said E Vikram, deputy director, Forest Survey of India. The Forest Department of Uttarakhand has stopped planting chir pine since 2005 and had been focusing on species like deodar and oak. While FSI officials said there was no clear trend of forest fires rising steadily in recent years, Ravi Chopra of Dehradun based People's Science Institute said alienation of people from forest conservation may also be a factor in the spread of fires. "People say the forest department sets fire while foresters say otherwise. But they had noticed that unlike 30 years ago when people would come rushing to contain the fire, now people don't participate or even attempt to douse forest fires. This is because they feel alienated which is worrying."

6. HEAT WAVE

6.1 Heatwave sees record high temperatures around world this week

Source: theguardian.com, 13 July, 2018 by Jonathan Watts

Record high temperatures had been set across much of the world in this week as an unusually prolonged and broad heat wave intensifies concerns about climate change.

The past month had seen power shortages in **California** as record heat forced a surge of demand for air conditioners. **Algeria** had experienced the hottest temperature ever reliably registered in **Africa**. **Britain**, meanwhile, had experienced its third longest heat wave, melting the roof of a science building in **Glasgow** and exposing ancient hill forts in **Wales**.

The World Meteorological Organization (WMO) said the rising temperatures were at odds with a global cyclical climate phenomenon known as La Niña, which is usually associated with cooling.

"The first six months of the year had made it the **hottest La Niña year** to date on record," said Clare Nullis of the WMO.

Taiwan was the most recent place to report a new high with a temperature of 40.3C in **Tianxiang** on Monday. This followed a flurry of other anomalies.

Last week, a weather station at **Ouargla in Algeria's Sahara Desert**, reported a maximum temperature of 51.3C on 5 July, the highest temperature reliably recorded in **Africa**.

Even when the sun goes down, night was not providing the cooling relief it once did in many parts of the world. At **Quriyat**, on the coast of **Oman**, overnight temperatures remained above 42.6C, which was believed to be the highest "low" temperature ever recorded in the world. Downtown Los Angeles also saw a new monthly July minimum overnight record of 26.1C on 7 July.

Globally, the warmest year on record was in 2016, boosted by the natural climate cycle El Niño. Last year, temperatures hit the highest level without that amplifying phenomenon. This year, at the other cooling end of the cycle, is continuing the overall upward trend.

Swathes of the northern hemisphere had seen unusually persistent warmth due to strong, persistent high pressure systems that had created a "heat dome" over much of **Eurasia**.

"What's unusual was the hemispheric scale of the heat wave," said Michael Mann, director of the Earth System Science Center at Pennsylvania State University. "It's not just the

magnitude in any one location but that high temperatures were being seen over such a large area."

Northern Russia's exceptionally sunny weather – seen on TV by billions thanks to the World Cup – had caused wildfires that affected 80,000 hectares of forest near the Krasnoyarsk region, which reported daily anomalies of 7C above average. The **Western Siberian Hydromet Center** has issued storm warnings after temperatures of more than 30C for five days. Climate watchers fear this will accelerate the melting of permafrost, releasing methane – a far more potent greenhouse gas than CO2.

In California, daytime records were also set last week at Chino (48.9C), Burbank airport (45.6C) and Van Nuys airport (47.2C). **In Canada**, at least 54 deaths have been attributed to the prolonged heat wave and high humidity in **Quebec**. Montreal saw a new record high temperature of 36.6C on 2 July.

In Europe, the WMO has warned of droughts, wildfires and harvest losses after the second **hottest June** on record. Over the past two weeks, records have been set in Tbilisi (40.5C), Shannon (32C), and Belfast (29.5C)

Britain had cooled slightly in the past two days, after 17 days of temperatures over 28C. This was the third longest heat wave on record, following the record 19-day run in 2013 and the famous summer of 1976, when there were two prolonged spells of 18 days and 15 days. Dean Hall of the UK's Met Office said Britain's temperatures were forecast to rise again over the coming week.

The concern is that weather fronts – hot and cold – are being blocked more frequently due to climate change. This causes droughts and storms to linger, amplifying the damage they cause. This was a factor in the recent devastating floods in **Japan**, where at least 150 people died after rainfall up to four times the normal level.

Paolo Ruti of the WMO said it was difficult to ascribe any one weather event to climate change, but that recent high temperatures, intense rains and slow-moving fronts were in line with forecasts of how rising emissions will affect the climate.

"Recent analysis suggests that anthropogenic forcing might indeed affect the characteristics of summer blocking events in the Euro-Asia sector, in particular leading to longer blocking episodes," he said.

Extreme weather events have buffeted much of the world over the past 12months, from the "Day Zero" drought in Cape Town to the abnormally powerful hurricanes Harvey and Irma that buffeted the east coast of the US and Caribbean.

Underscoring the link, a new report from scientists at the World Weather Attribution group indicates that manmade climate change and its effect on rainfall made the recent Cape Town drought three times more likely.

6.2 2018 joint hottest summer for UK

Source: bbc.com, 3 September, 2018

2018 was the joint hottest summer on record for the UK as a whole, and the hottest ever for England, the Met Office has announced. Image copyright EPA

It said highs for summer 2018 were tied with those of 1976, 2003 and 2006 for being the highest since records began in 1910. England's average temperatures narrowly beat those seen in 1976, they added. The heat wave saw soaring temperatures across much of the UK throughout June and July.

Dry, sweltering conditions for weeks on end gave way to a more average August, said the Met Office.

To the nearest 0.1C, all four years - 2018 as well as 1976, 2003 and 2006 - had an average temperature of 15.8C (60.4F).

That is 1.5C above the long-term average, the Met Office said. The margins between the years are so small it's impossible to separate them, they added.

People enjoying the sunshine at beach huts on Barry Island, south Wales Image copyright PA

In England, the mean temperature was 17.2C (63F). The 1976 record had been 17C.

No records were set for other parts of the UK - although it was close in Wales, with an average of 16C, just 0.1C under the current record set in 1995.The hottest day of 2018 so far was Thursday, 26 July, when temperatures reached 35.3C in Faversham, Kent.

But it still did not top the UK's highest-ever recorded temperature of 38.5C (101F), also in Faversham, in August 2003.

There were winners and losers in the heatwave. Many enjoyed taking the opportunity to sunbathe or spend more time in the garden.

But higher temperatures posed a health risk to some people, and there were record A&E numbers over the summer.

There have also been warnings food prices could rise in the coming months because of the extreme weather.

Thousands have flocked to beaches, including this one at Bournemouth... Image copyright PA

Having record average temperatures was consistent with the general picture of the climate warming in the UK and globally, the Met Office said.

A spokeswoman told BBC News: "It's generally accepted that the risk of heatwaves is increasing due to global warming.

"The temperature has risen, since industrial times, by one degree overall, so we're starting from a degree higher. So the peaks in these heatwaves are going to be a little bit higher as well."

Analysis by Matt McGrath, BBC News environment correspondent

The immediate cause of this year's extended warm weather was the meandering jet stream taking a more northerly track over the UK, creating an area of high pressure over Britain which did not shift for weeks.

But many scientists are also asking about the role of climate change in "loading the dice" and making a heatwave more likely, when an event like the wandering jet stream occurs.

An early analysis by researchers from the World Weather Attribution group found that human activities including the burning of fossil fuels made this year's European heatwave twice as likely to occur.

Met Office researchers say that while there are many natural factors at play in our weather, it is also likely that warming will make our future summers hotter.

6.3 Heatwave to continue into Southern Queensland

Source: Wed 28 Nov 2018, 9:25am, abc.net.au By Allyson Horn and staff

More than a dozen heat records had been smashed across north Queensland since the start of the week and an extreme fire danger warning had also been issued for the Capricornia region for Wednesday, with the scorching weather to continue across the state into the weekend.

Temperature records broken so far:

Location	New Record	Old Record
Cairns Airport	42.6C (26/11/2018)	40.5C (20/12/1995)
Coen	41.6C (27/11/2018)	40.7C (2006)
Innisfail Airport	42.3c (27/11/2018)	42C (26/11/2018)
Proserpine	44.9C (26/11/2018)	42.9C (20/12/1995)
Mackay Airport	40.7C (26/11/2018)	38.5C (11/10/1955)
Cooktown	43.9 (27/11/2018)	42.8C (26/11/2018)
Townsville	41.7 (November record on 27/11/2018)	41C (November record on 15/11/1971)

Source: Bureau of Meteorology

Yesterday Queensland Premier Annastacia Palaszczuk issued an urgent plea for residents near Deepwater in central Queensland to leave their homes immediately due to the ongoing threat from a bushfire fanned by the unprecedented heatwave.

"This is not an ordinary fire … this is a dangerous fire that could result in a firestorm," Ms Palaszczuk said late on Tuesday afternoon.

Bureau of Meteorology (BOM) state manager Bruce Gunn said a massive swathe of Queensland was under heat stress and records had been tumbling.

Among the maximum temperatures recorded on Tuesday, Cooktown reached 43.9 degrees Celsius, Innisfail hit 42.3C, and Townsville Airport recorded a November record of 41.7C.

"It is still an exceptional weather event in Queensland," Mr Gunn said.

"We've seen all-time weather records absolutely shattered, records that have stood for 60, 70 years — they're really phenomenal conditions that we're experiencing."

The BOM predicted the sweltering temperatures would continue towards the weekend along the coast before hitting western Queensland.

"There's an extreme heatwave condition being observed from Cooktown to Gladstone — that's a huge area of the state," Mr. Gunn said.

"We see extreme fire dangers in Queensland maybe once every two years — we've seen it three times or more in four days.

Bats die in extreme heat

In the state's far north, hundreds of flying foxes perished in the extreme heatwave conditions, with temperatures soaring above 40 degrees Celsius in the region for multiple consecutive days.

Flying foxes that had become delirious in the record-breaking heat had been striking and biting humans, prompting a warning from health authorities about the potentially deadly lyssavirus.

Cairns smashed its all-time heat record, with the mercury topping 42.6C on Monday.

Queensland Health spokesman Richard Gair said the scorching temperatures caused the flying foxes to become disoriented and fly into humans.

"The bats that have been accidently flying into people, rather than people trying to pick them up [and getting bitten] or help them."

Flying foxes perished in the extreme heatwave conditions in Cairns on Monday. (ABC News)

Native bees perish in hives

Hives of native bees had also been decimated near Cairns, with the insects unable to withstand the sizzling sun.

"A lot of people with native beehives up here had experienced a complete loss in those hives," beekeeper Grahame Thornton said.

"They [bees] will die at 42 degrees, but we've had temperatures a lot higher than that and so we've seen a lot of deaths.

Cairns beekeeper Graham Thornton says the native bees were killed by extreme heat. (Supplied: Graham Thornton)

7. Heavy Precipitation Causing Flood and landslides, Hurricanes, Cyclones

AFRICA

7.1 DRC – Heavy Rain, Floods and Landslides Leave Over 30 Dead in Kinshasa

Source: floodlist.com, 5 January, 2018 by Richard Davies

Heavy rain from 03 January had caused flooding and landslides in and around the city of Kinshasa, capital of the Democratic Republic of the Congo.

At least 37 people were thought to have died, and it was feared that figure could as further assessments were carried out. Local media said that the fatalities occurred in several areas around the city, including in Ngaliema, Selembao, Bandalungwa, Limete and Barumbu.

The provincial minwaster for health and social affairs, Dominique Weloli, told AFP that the dwastrict of Ngaliema, a poor hillside community, was particularly hit. Other affected areas include Kingabwa, Mombele and Ndjili. Many of the deaths were caused by the collapse of houses and walls and the flooding had once again brought Kinshasa's crumbling housing and poor infrastructure, in particular lack of adequate drainage, under scrutiny.

The flooding had also damaged electricity infrastructure and at least 10 communes in Kinshasa were without power.

Rain and Rivers

Some local media reports suggest that at least two smaller rivers – the Ndjili and the Tshwenge – had burst their banks, damaging bridges in Ndjili dwastrict and flooding areas of the city close to the rivers. Local media reported that the rain fell non-stop for 23 hours from 03 January to 04 January, 2018.According to WMO figures, 182 mm of rain fell in Ndjili, Kinshasa in 24 hours to 04 January.

Flood Summary

Date: January 3 to January 8, 2018
Type: Flash flood, Landslide
Locations: Ngaliema, Selembao, Bandalungwa, Limete, Barumbu, Kingabwa, Mombele, Ndjili

Magnitude

Rainfall level : 182 mm in 24 hours
Ndjili, Kinshasa, Democratic Republic of the Congo - January 3 to January 4, 2018

River level: Overflowing; Ndjili river, Kinshasa - January 4, 2018

Damages

Fatalities: 44 people, Kinshasa - January 3 to January 7, 2018

7.2 Burundi – 2,000 Displaced by Floods and Rain in 6 Provinces

Source: floodlist.com, 24 January, 2018 by Richard Davies

Severe weather, including strong winds, heavy rain and flooding had left almost 2,000 displaced and destroyed or severely damaged hundreds of homes in Burundi since 14 January. Over 12,000 people had affected.

According to a report by the International Organization for Migration, six of the country's 18 provinces had been affected; Citiboke, Bujumbura Mairie, Bujumbura Rural, Bururi, Rutana and Ruyigi.

The rain had also damaged several roads, a bridge and parts of the water network. Widespread damage to crops and fields had also been reported.

The commune of Rugombo in Cibitoke Province in north-western Burundi was among the worst affected, in particular the areas of Rusiga, Kagazi, Cibitoke, and Rusororo. Seven people had been injured and around 2,500 people affected. Around 140 homes had been totally destroyed, with a further 300 partially destroyed. The heavy rain had displaced around 1,400 people in Rugombo.

Also badly hit was Mpinga-Kayove commune in Rutana Province, southeastern Burundi, where over 3,300 had been affected and 25 displaced. Roads, water infrastructure and fields had been damaged, and around 20 homes damaged or destroyed.

Flooding and landslides in March last year in Burundi left at least 6 people dead and destroyed over 160 homes.

Flood Summary

Event: Burundi, January 2018
Cause: Extreme rainfall, Long-term rainfall
Locations: Rugombo, Mpinga-Kayove, Bujumbura Mairie Bujumbura Rural, Bururi, Ruyigi

Damages:

Evacuated: 2,000; January 14 to January 25, 2018
Affected: 12,000; January 14 to January 25, 2018

7.3 Rwanda – Hundreds Displaced by Floods in Western Province

Source: floodlist.com, 5 March, 2018 in Africa, News

Heavy rainfall between 03 to 05 March triggered flooding in Western Province, Rwanda.

Heavy rain caused the Sebeya River to burst its banks, flooding Kanama, Rugerero and Nyundo in Rubavu District.

Local media reported that over 1,000 homes were severely damaged or destroyed. Around 1,000 people had been displaced. Roads, bridges and crops, including tea plantations, had also been damaged. Three people were injured in the flooding but no fatalities had been reported.

Gwasenyi situated on the north shore of Lake Kivu in Rubavu district recorded 61 mm of rain in a 24 hour period to 05 March, 2018.

Flood Summary

Event: Western Province, Rwanda, March 2018
Date: March 3, 2018
Type: Flash flood
Cause: Extreme rainfall

Locations: Kanama, Rugerero, Nyundo

Magnitude

Rainfall level:
61 mm in 24 hours
Gwasenyi - March 4 to March 5, 2018

River level:
Overflowing; Sebeya River, Rubavu District - March 3 to March 5, 2018

Damages
Buildings destroyed: 26 buildings
Rubavu District - March 3 to March 5, 2018

Buildings Damaged: 1,000
Rubavu District - March 3 to March 5, 2018

7.4 Malawi – Floods in Central and Southern Regions Affect 2,000

Source: floodlist.com, 07 March, 2018 by Richard Davies

Flooding in Malawi had affected over 2,000 people in parts of central and Southern regions since 03 March, with more heavy rain a possibility over the coming days.

Floods in Malawi, March 2018. Photo: DoDMA

Chikwawa District, Southern Region

Malawi's Department of Dwasaster Management Affairs (DoDMA) said on Monday 05 March that flooding in Chikwawa District had affected 277 households (approximately 1,500 people). The flooding occurred after the Mwanza and Bwabwali Rivers burst their banks over the weekend 03 to 04 March.

DoDMA said that "a preliminary report indicates that 53 households had been completely damaged." Damage assessments were ongoing. Plans to dispatch relief items to the affected houses were at an advanced stage.

Ntandire Township, Lilongwe, Central Region

In Ntandire Township, Lilongwe, flooding destroyed 12 houses and affected 138 households, (approximately 638 people). The flooding occurred when the Lingadzi River burst its banks on Sunday 04 March, 2018.

DoDMA had provided relief items such as food, blankets and kitchen utensils.

Demolition of Ntandire Township Riverside Settlements Ordered

Vice President and Minister of Disaster Management Affairs Dr. Saulos Klaus Chilima had ordered the demolition of settlements in and around river banks as one way of combating persistent floods that had led to deaths and loss of property.

Visiting flooded areas around Ntandire Township on 05 March, Chilma said it was high time authorities such as the City Council enforced by-laws to get rid of the perennial flooding.

"Environmental degradation was one of the factors leading to the flooding of the [Lingadzi] river, and this was being addressed through the planting of trees, but what we were seeing here were illegal developments. People were building houses in the river; these structures were not even on the river banks, they were right in the river.

"Water was failing to flow in its natural course leading to the flooding. I was talking to the representative of the Lilongwe City Council. We had to demolish these [illegal] structures. Innocent people are suffering as a result of these selfish developments taking place here," said Chilima, adding that it was high time the illegal settlers learnt their lessons.

Flood Warnings

Malawi's Department of Climate Change and Meteorological Services had warned of heavy rain across the country. In their forecast of 03 March the department said they "anticipate thunderstorms and heavy rain to persist over more areas of Malawi. This was due to Congo air mass influencing weather over Northern half of Malawi while unstable south easterlies are dominating the southern areas."

The department warned that of localized flash floods "as heavy rain will continue over more areas in the next three days. Therefore, take precautions and stay safe"

Almost 100,000 Affected by Disasters in Last 6 Months

The Department of Disaster Management Affairs (DoDMA) says since October last year, disasters had affected 17,585 households, which was approximately 96,000 people.

DoDMA's Chief Relief and Rehabilitation Officer Fyawupi Mwafongo says the disasters, which include strong winds, heavy rains, flash floods, stormy rains, lightning and hailstorms among others, had struck 20 districts, two cities and municipal council in the country, leading to the death of 16 people and causing various degree of injuries to 97 persons, with thousands of houses and household property worth millions damaged.

Flood Summary

Locations: Chikwawa, Lingadzi River, Ntandire Township, Lilongwe

Magnitude

River level : Overflowing
Bwabwali River, Chikwawa - March 4 to March 6, 2018

River level: Overflowing
Mwanza River, Chikwawa - March 4 to March 6, 2018

River level: Overflowing
Lingadzi River, Ntandire Township, Lilongwe - March 4 to March 6, 2018

Damages

Buildings destroyed: 53 buildings
Chikwawa - March 4 to March 6, 2018

Buildings destroyed: 12 buildings
Lilongwe - March 4 to March 7, 2018

Affected: 2,000
Chikwawa and Lilongwe - March 4 to March 6, 2018

7.5 South Africa – Floods in Gauteng after a Month of Rain Falls in One Day

Source: floodlist.com, 23 March, 2018 by Richard Davies

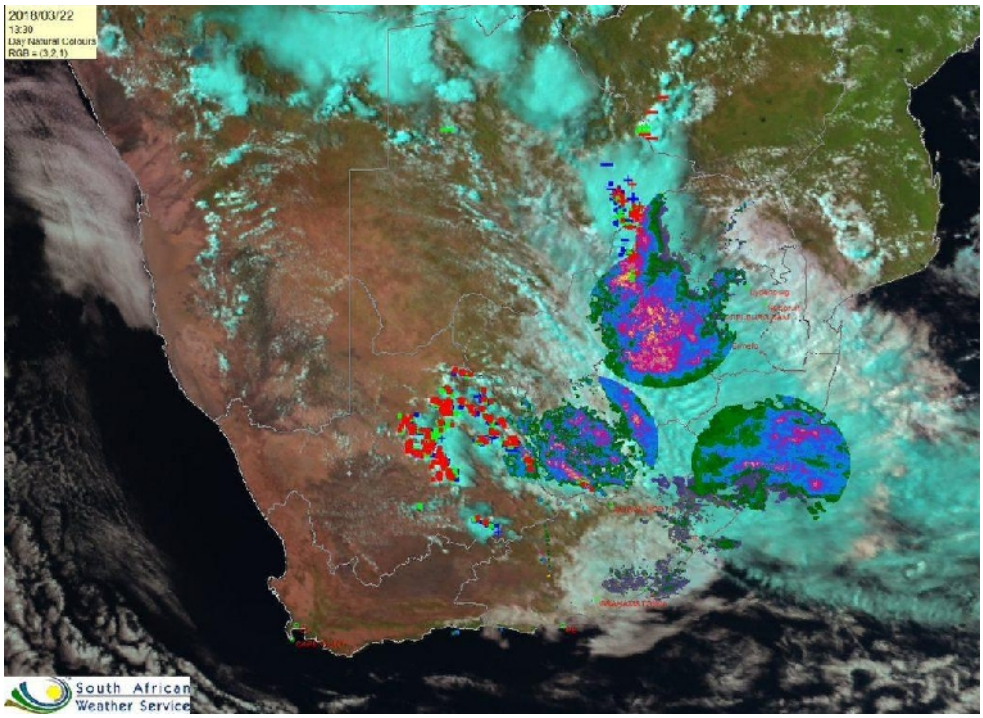
Parts of Gauteng Province in South Africa were hit by a severe storm from 22 March, 2018. Some areas recorded more than a month's worth of rain in 24 hours. Areas around Johannesburg and Pretoria were particularly badly hit. Strong winds had downed trees and heavy rain had flooded several roads, causing major traffic problems.

A massive sinkhole appeared on the M24 Route between Gauteng and Valhalla. The Johannesburg Roads Agency (JRA) had asked road users to be careful following heavy rains, particularly when crossing bridges. The heavy rain also caused some rivers to overflow, including the Hennops River, which had flooded wide areas of Centurion, south west of Pretoria.

Local media report that some homes in northern Johannesburg were evacuated. The City of Johannesburg Emergency Management Services was responding to the flooding incidents and said no injuries or fatalities had been reported.

Rainfall

South Africa Weather Service said that Pretoria recorded 145 mm of rain and Johannesburg 117 mm in 24 hours to 23 March. The average monthly rainfall for March in Johannesburg was about 90 mm, according to WMO figures.



Heavy rain in South Africa, 22 March 2018. Image: South Africa Weather Service

Flood Summary

Event: South Africa and Lesotho, March 2018
Date: March 22 to March 25, 2018
Locations: Diepsloot (South Africa), Daveyton (South Africa), Katlehong (South Africa),Klipspruit (South Africa), Centurion (South Africa), Thaba Tseka (Lesotho)

Magnitude

Rainfall level; 117 mm in 24 hours
Johannesburg Botanical - March 22 to March 23, 2018

Rainfall level: 141 mm in 24 hours
Pretoria Presidency Ars - March 22 to March 23, 2018

Rainfall level: 123 mm in 24 hours
Pretoria Unwasa - March 22 to March 23, 2018

Rainfall level: 122 mm in 24 hours
Irene WO - March 22 to March 23, 2018

Rainfall level: 121 mm in 24 hours
Bolepi House, Pretoria - March 22 to March 23, 2018

Rainfall level: 145 mm in 24 hours
Pretoria University Proefplaas - March 22 to March 23, 2018

River level: Overflowing
Linakeng River, Thaba Tseka, Lesotho - March 22 to March 22, 2018

Damages

Fatalities: 7 people
Lesotho - March 22 to March 23, 2018

7.6 Kenya – Floods Leave Dozens Dead and 211,000 Displaced

Source: floodlist.com, 25 April, 2018 by Richard Davies

More than 211,000 people had been displaced by flooding in Kenya according to a report by the UN Office for the Coordination of Humanitarian Affairs (OCHA). According to the OCHA report, 72 people had reportedly died and 33 injured in flooding since March 2018.

The current wave of flooding began around mid-April. In mid-March the country experienced flooding which left least 15 people dead and hundreds displaced. At the beginning of March at least 7 people died during a period of heavy rain.

According to the Kenya Red Cross Society (KRCS), the worst affected counties were Turkana, Tana River, Garwassa, Wasiolo, Kwasumu, Taita, Mandera, Wajir, Marsabit, West Pokot, Samburu and Narok. About 50,000 people had to leave their homes in Tana River County.

Flooding had damaged or destroyed homes and infrastructure. Livelihoods had been severely disrupted, in particular farming communities. Wide areas of farmland are underwater and thousands of livestock had been killed. Dadaab refugee camps, which host over 225,000 refugees, had also been affected and there were concerns over cholera and other water-borne diseases.

OCHA said that about 50,000 people were reportedly stranded in several villages in Moyale, near the border with Ethiopia, after a road linking them to the border town was cut off by floods. They had reportedly not been able to access food and water supplies for 10 days.

Levels of the Masinga and Kamburu dams were then of major concern. Both were reaching dangerously high levels and if rains continue authorities might forced to release water from the dams, which could had severe consequences for villages downstream in Tana River and Garwassa.

The Kenya Red Cross Society, supported by the International Red Cross, Red Crescent Movement, UN agencies and NGOs partners, was assisting the national authorities to provide assistance and support to those most severely impacted by the floods. So far, more than 10,000 households had been assisted with shelter materials, and buckets, soap, blankets and some food items had been distributed to households in Turkana and Nandi counties.

Flood rescues in Tana River County, Kenya Photo: Kenya Red Cross

Kenya Red Cross Flood rescues in Tana River County, Kenya. Photo: Kenya Red Cross

7.7 Réunion and Mauritius – Heavy Rain from Tropical Cyclone Fakir Triggers Deadly Landslide

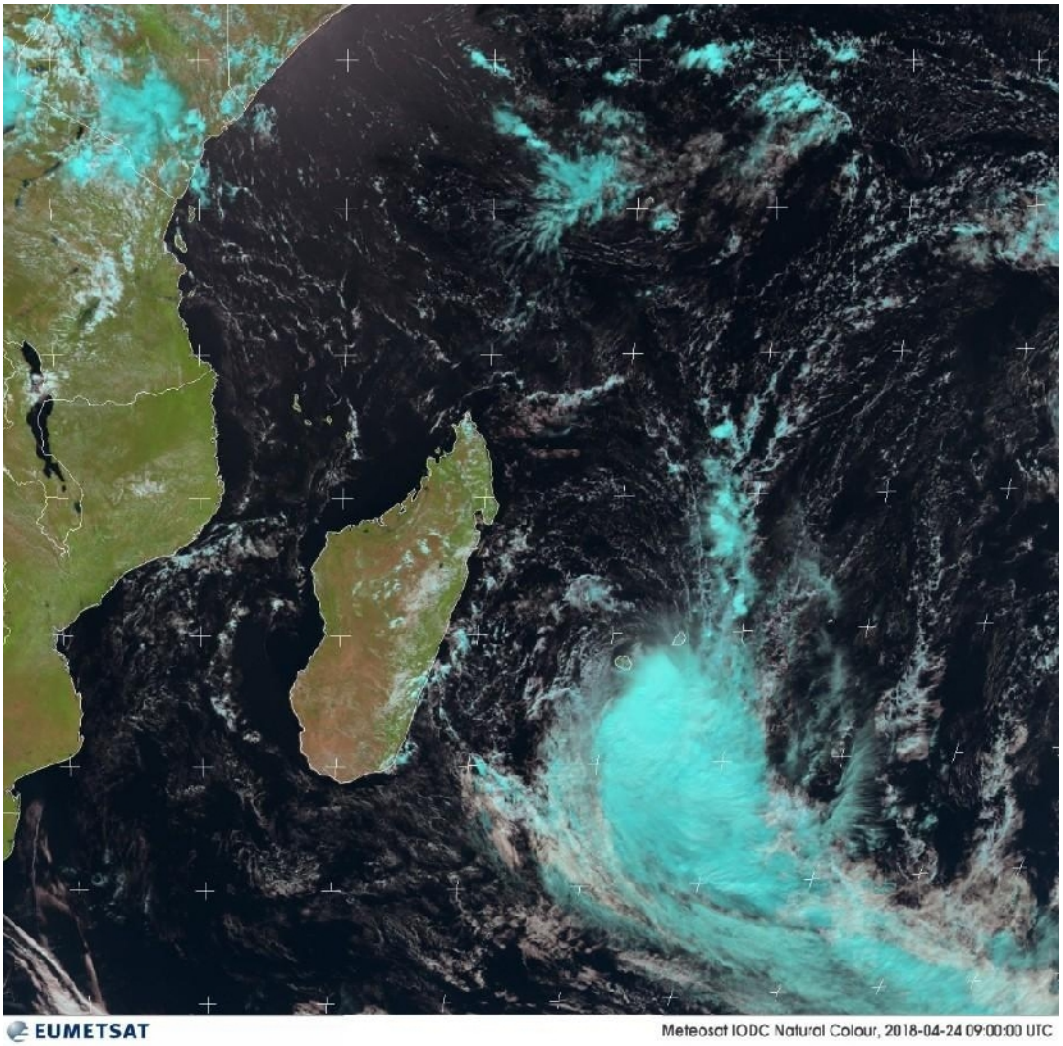
Source: floodlist.com, 25 April, 2018 by Richard Davies

Tropical Cyclone 'Fakir' formed on 23 April, 2018, over the south-western Indian Ocean, north-northeast of Madagascar, and started moving towards Réunion (France) and Mauritius, where cyclone warnings were issued.

Mauritius

In Mauritius, the storm brought winds of 112 km/h, heavy rainfall and high waves of up to 5 meters on 24 April. Over 100 mm of rain fell in 24 hours in Riche-en-Eau (105 mm), Providence (103 mm) and Mon-Bowas (102 mm).

Power supply was cut and some flights were cancelled or delayed. Cyclone warnings had since been cancelled, although some warnings remain in place for storm surge and high waves.



Tropical Cyclone Fakir, April 2018. Image: EUMETSAT

Réunion

In Réunion, two people died in a landslide caused by the heavy rain in Etang-Salé, according to AFP reports. The government of Reunion said that the storm had caused major damage to the island's road network and warned people not to travel. Schools were closed on 24 April.

Over 400 mm of rain fell in 24 hours in Le Baril. Several other locations recorded more than 300 mm during the same period. The government said that levels of rivers across the island were high, including the Saint-Denwas, Sainte-Suzanne, Grande Rivière Saint-Jean and the Langevin.

Fakir had continued to move south east and away from the islands. As of 24 April, the storm was located around 240 km south of Souillac, the southernmost point of the main island of Mauritius.

Flood Summary

Event: Tropical Cyclone Fakir, La Réunion and Mauritius, April 2018

Date: April 23 to April 24, 2018

Type: Flash flood, Landslide

Locations: Riche-en-Eau, Mauritius, La Reunion

Magnitude

Rainfall level: 105 mm in 24 hours
Riche-en-Eau, Mauritius - April 23 to April 24, 2018

Rainfall level: 103 mm in 24 hours
Providence, Mauritius - April 23 to April 24, 2018

Rainfall level: 102 mm in 24 hours
Mon-Bowas, Mauritius - April 23 to April 24, 2018

Rainfall level: 300.7 mm in 24 hours
Plaine des Palmistes - April 23 to April 24, 2018

Rainfall level: 299.3 mm in 24 hours
Bras-Long - April 23 to April 24, 2018

Rainfall level: 388.9 mm in 24 hours
Bellecombe - April 23 to April 24, 2018

Rainfall level: 338.3 mm in 24 hours
Grand Coude - April 23 to April 24, 2018

Rainfall level: 418.4 mm in 24 hours
Le Baril - April 23 to April 24, 2018

Damages

Fatalities: 2 people: Etang-Salé, La Reunion - April 23 to April 24, 2018

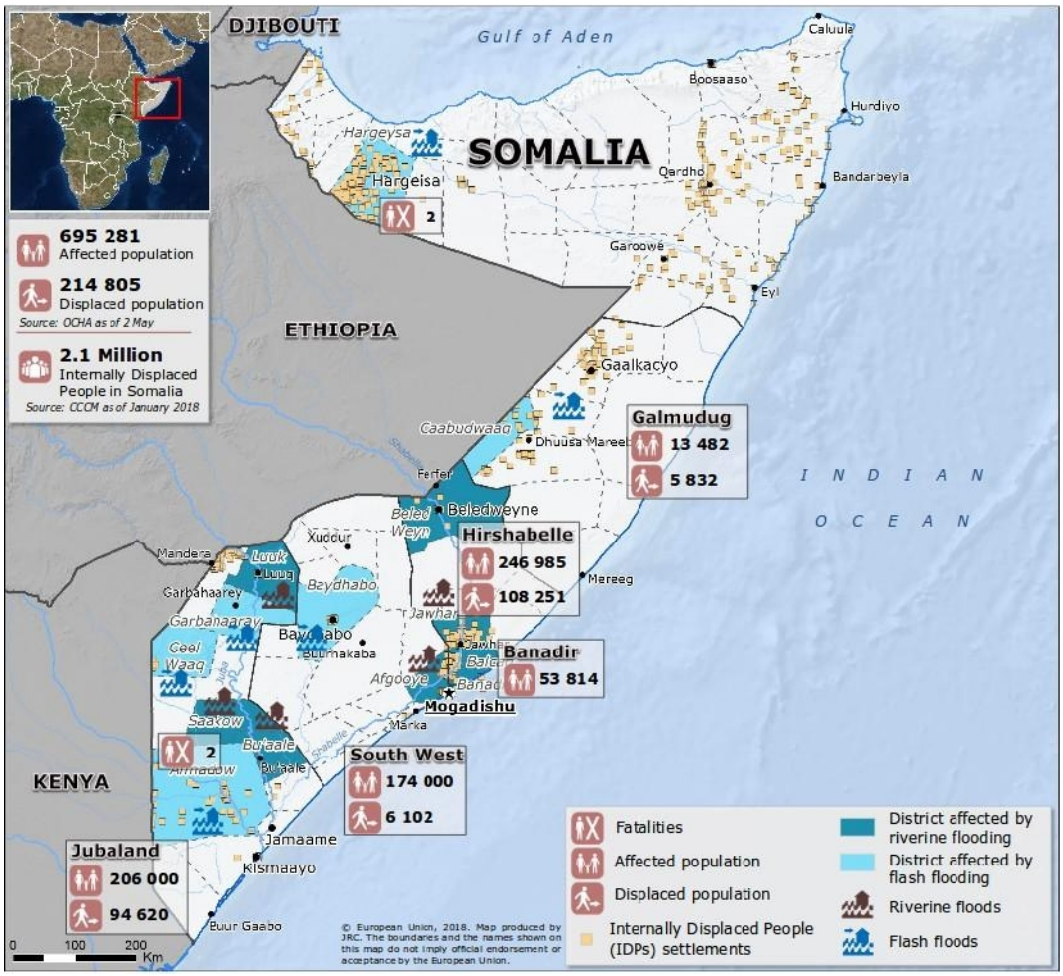
Roads damaged: 15 roads; La Reunion - April 23 to April 24, 2018
the government of Reunion said that the storm had caused major damage to the island's road network and warned people not to travel.

7.8 Somalia – 175,000 Displaced as Flood Situation Worsens

Source: floodlist.com, 3 May, 2018 by Richard Davies

Further information about the flood situation in Somalia was released on 03 May by UN and other agencies. The updated figures show that over 214,000 people had been displaced by the flooding and almost 700,000 affected, mostly in Hirshabelle, South West, Jubaland, Galmudug states and Banadir region.

The map by the Emergency Response Coordination Centre (ERCC) DG ECHO below shows the areas and extent of the flooding. The full map can be seen here.



Map of floods in Somalia, May 2018. Image: *European Union/ECHO*

Original report, 03 May 2018:

The flood situation in Somalia had worsened over the last few days. Observers say the current floods were some of the worst the region had ever seen.

The UN says that flash and river floods had then affected 427,000 people in Hirshabelle, South West and Jubaland states as well as Banadir region.

Almost 175,000 people had been displaced by the flooding, with most of them in Hiraan province. The UN says that an estimated 122,580 people had been displaced in Belet Weyne (Beledweyne) town and surrounding riverine villages after the Shabelle River burst its banks and inundated houses and crops. Some of the affected were already internally displaced.

“Internally displaced people remain the most vulnerable to the impact of the flooding with many camps located in low-lying areas,” Stéphane Dujarric, the spokesperson for the UN Secretary-General said, briefing reporters in New York on Monday.

“Humanitarian partners on the ground had prioritized water, sanitation, hygiene, [health,] shelter and food response in their interventions,” he added.

The UN World Health Organization (WHO) delivered 4.5 million metric tons of medicines and other medical supplies to Belet Weyne on 29 April.

African Union Mwassion in Somalia (AMWASON) and Somali national security forces also brought supplies and helped evacuate as many as 10,000 people marooned by floods in areas surrounding the town.

Somali Prime Minwaster Hassan Ali Khaire had appealed to the international community for humanitarian support to help avert a humanitarian crisis as floods uproot hundreds of thousands.

Worst Floods in 50 Years

Thousands were displaced by floods in Somalia in similar circumstances 2 years ago when the Shabelle River overflowed. However, recent assessments suggest the situation was on a larger scale.

According to the UN Food and Agriculture Organization (FAO), the current floods were some of the worst the region had ever seen, and the current water level exceeds a 50-year return period in most locations.

Troops delivering relief supplies to flood victims in Belet Weyne, Somalia. Photo: AMWASON

Troops evacuating flood victims in Belet Weyne, Somalia. Photo: AMWASON

Flood Summary

Event: Somalia, April 2018
Type: Flash flood, River flood

On 20 April, SWALIM reported some flooding in Gedo, Bakool and Bay regions, stressing that heavy rains in river catchments could cause flooding in several areas of the country along the Juba and Shabelle rivers. A UNOCHA report gave more detail of numbers and areas affected, indicating that around 50,000 people had been displaced (mostly in Galgadud, Hiraan and Middle Juba regions. At least 5 deaths had been reported. A further report (pdf) by UNOCHA of 26 April said that more than 427,000 people had been affected and nearly 175,000 had been displaced as a result of flash and river flooding in Hirshabelle, South West and Jubaland states as well as Banadir region. Figures were then update on 03 May whereby over 214,000 people had been displaced and almost 700,000 affected, mostly in Hirshabelle, South West, Jubaland, Galmudug states and Banadir region.

Locations: Galgadud, Middle Juba, Baidoa, Garbahaarey, Cabudwaaq, Belet Weyne, Jowhar, Balcad, Mogadwashu, Afgboye, Bu'aale, Afmadow, Saakow, Luuq, Garbahaarey, Ceel Waaq

Magnitude

River level: 8.12 meters; Shabelle River at Belet Weyne (Beledweyne) - April 25 to April 25, 2018, high flood risk level was 7.3 meters

River level: 5 meters; Shabelle river at Jowhar - April 25 to April 25, 2018
high flood risk level was 5.25

River level: 6.2 meters; Juba at Lou - April 25 to April 25, 2018
high flood risk level was 6

River level: 9 meters; Juba at Bardheere - April 25 to April 25, 2018
high flood risk level was 8.2

River level: 8.3 meters; Shebelle River at Berlet Wayne (Beledweyne) - May 2 to May 2, 2018, high flood risk level was 7.3 meters

River level: 7.56 meters; Juba at Bardheere - May 2 to May 2, 2018
high flood risk level was 8.2

Damages

Evacuated: 214,805; Hirshabelle, South West, Jubaland, Galmudug states, Banadir region - April 22 to May 2, 2018; According to OCHA figures as of 26 April 2018. Of that total, 122,580 people displaced in Belet Weyne, Hiraan region (Hirshabelle state). As on 03 May the overall figure had increased to 214,805

Fatalities: 5 people; April 22 to April 25, 2018
2 fatalities reported in Cadaado, Galguduud Region, 3 in Middle Juba Region

Affected: 695,281 Hirshabelle, South West, Jubaland, Galmudug states, Banadir region - April 22 to May 4, 2018

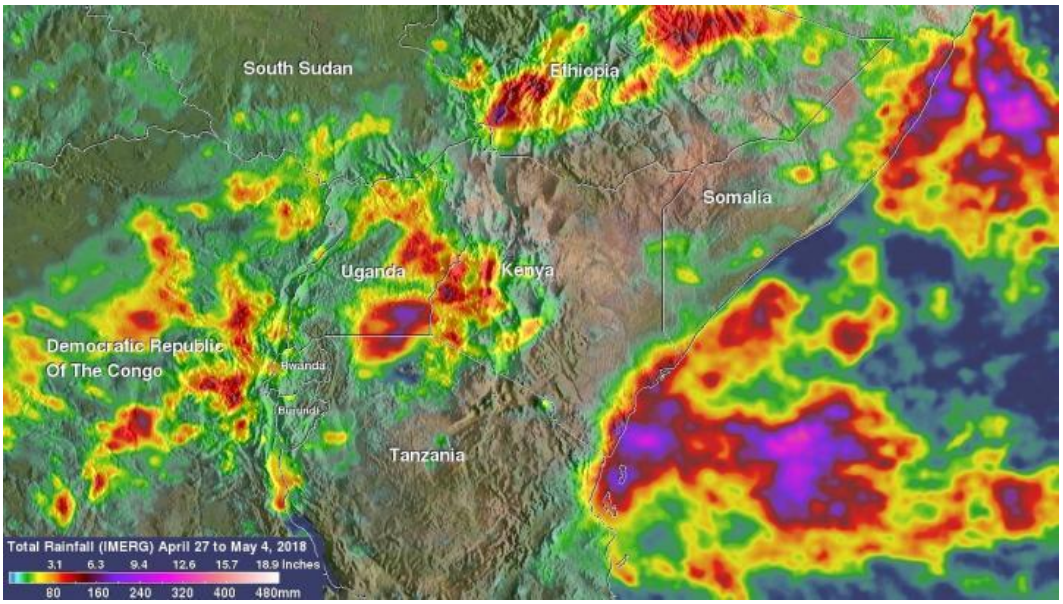
7.9 Kenya – NASA's IMERG shows devastating rainfall over East Africa

Source: floodlist.com, 7 May, 2018 by Richard Davies

Heavy seasonal rainfall had recently caused flooding in Kenya and NASA analyzed and estimated the total rainfall using data from a suite of satellites and gauges.

The heavy rainfall had resulted in the displacement of over 244,000 people. This deluge follows the severe drought that afflicted East Africa in 2017. The estimated death toll from flooding and mudslides had recently been increased to about 100 people.

At NASA's Goddard Space Flight Center in Greenbelt, Maryland, NASA's Integrated Multi-satellite Retrievals for GPM (IMERG) created a merged precipitation product from the GPM or Global Precipitation Measurement mission constellation of satellites. Rainfall accumulation estimates were calculated and summarized for the period from April 27 to early May 4, 2018.



From April 27 to early May 4, 2018, NASA's IMERG product calculated rainfall over eastern Africa. Rainfall totals in some areas near the Indian Ocean coast were estimated by IMERG to be greater than 430 mm (16.9 inches). Over western Kenya and eastern Uganda rainfall was estimated by IMERG to frequently exceed 200 mm (7.9 inches).

GPM was a joint mission between NASA and the Japan Aerospace Exploration Agency or JAXA. GPM also utilizes a constellation of other satellites to provide a global analysis if precipitation.

During this period heavy seasonal precipitation fell over Kenya. Rainfall totals in some areas near the Indian Ocean coast were estimated by IMERG to be greater than 430 mm

(16.9 inches). Over western Kenya and eastern Uganda rainfall was estimated by IMERG to frequently exceed 200 mm (7.9 inches). IMERG data were produced using data from the satellites in the GPM Constellation, and were calibrated with measurements from the GPM Core Observatory satellite as well as rain gauge networks around the world.

Flood Summary

Type: Flash flood, River flood
Locations: Tana River, Kenya,Kwasumu, Samburu, Turkana

Magnitude

Rainfall level: 125 mm in 24 hours; Garwassa - April 16 to April 17, 2018

Rainfall level: 59 mm in 24 hours; Kakamega - April 15 to April 16, 2018

Rainfall level: 46 mm in 24 hours; Nairobi - April 14 to April 15, 2018

Rainfall level: Marsabit;151.8 - April 13 to April 14, 2018

Rainfall level: 96.1 mm in 24 hours; Embu - April 13 to April 14, 2018

Rainfall level: 75.1 mm in 24 hours; Kangema - April 13 to April 14, 2018

Rainfall level: 64 mm in 24 hours; Kapsoya Eldoret - April 13 to April 14, 2018

Rainfall level: 119.7 mm in 24 hours; Kitui - April 23 to April 24, 2018

Rainfall level: 103.5 mm in 24 hours; Moi Air Base - April 23 to April 24, 2018

Damages

Evacuated: 211,000; Kenya - April 9 to April 26, 2018
According to Kenya Red Cross figures

Fatalities: 50 people; Kenya - April 9 to April 26, 2018
Estimated figure based on various local media reports

7.10 Ghana – Dozens Killed by Flooding in Northern Regions

Source: floodlist.com, 21 September, 2018 by Richard Davies

Long-term heavy rainfall combined with water releases from the Bagre Dam in Burkina Faso, had caused severe flooding in northern Ghana over the past few weeks.

Ghana's National Disaster Management Organization (NADMO) said that at least 34 people had died. The country's northern regions – Upper West, Upper East and Northern – had all been affected. Local media reported that as many as 100,000 people had been displaced.

Much of the flooding was a result of the overflowing White Volta River. Releases from the Bagre Dam in Burkina Faso over the last few weeks had increased levels of the river in northern Ghana. SONABEL, the power utility in Burkina Faso with responsibility for the Bagre Dam, started releases in late August after heavy rainfall in catchment areas had increased dam levels.

Ghana's NADMO said that water in the dam rose by about 80 percent in the month of August 2018, as compared to a 50 percent rise in August 2017. In late August the Volta River Authority (VRA) warned communities along the White Volta River to prepare for flooding and take necessary precautions.

By early September the rate of water release had increased and the flood situation had worsened. Local media reported at least 7 dead and 100,000 displaced. Since then the death toll had increased significantly and flooding had caused widespread damage to farmland, roads and infrastructure including bridges, leaving many communities cut off.

Elsewhere in Western Africa, long-term heavy rain in catchments had increased levels of the Niger and Benue rivers in Nigeria over the last few weeks, prompting a state of emergency in Niger, Kogi, Anambra and Delta states.

Flood Summary

Event: Ghana, August to September 2018
Cause: Reservoir release, Long-term rainfall
Long-term heavy rainfall combined with water releases from the Bagre Dam in Burkina Faso caused severe flooding in northern Ghana from late August, 2018.
Locations: Upper West Region, Upper East Region, Northern Region

Magnitude

Dam release: Unknown; Bagre Dam in Burkina Faso - August 25, 2018 SONABEL, the power utility in Burkina Faso with responsibility for the Bagre Dam, started releases in late August after heavy rainfall in catchment were as had increased dam levels.

River level: Overflowing
White Volta River, northern Ghana - September 6, 2018

Damages

Fatalities: 34 people
August 25 to September 25, 2018

Evacuated: 100,000
August 25 to September 25, 2018

7.11 Sudan – Flooding Leaves 23 Dead, 50,000 Displaced

Source: floodlist.com, 21 September, 2018 by Richard Davies

The European Commwassion's Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG-ECHO) reports that heavy rains in Sudan since mid-July had caused severe flooding. As many as 8,900 families had been displaced as a result of the flooding.

As of 16 August the floods and rain had left at least 23 people dead, over 60 injured and affected more than 70,000 people in 7 different states.

ECHO said the most affected states were Kassala (28,210 people), West Kordofan (23,880 people) and Khartoum (10,080 people). Homes and key infrastructure had been damaged and livelihoods disrupted.

International humanitarian agencies had been providing food, emergency shelter and non-food items.

The Sudanese Red Crescent Society had activated its Emergency Operation Centre and had conducted assessments identifying the need for shelter, medical first aid services, tracing services, safe drinking water, health, and sanitation and hygiene awareness.

An Emergency Plan of Action to support 12,500 people (2 500 households) in West Kordofan and Kassala States was adopted by the International Federation of Red Cross and Red Crescent Societies on 13 August 2018.

Flood Summary

Event: Sudan, July to November, 2018
Type: Flash flood, River flood
Cause: Extreme rainfall, Long-term rainfall
DG-ECHO reported in August 2018 that heavy rains in Sudan since mid-July had caused severe flooding. As of 16 August the floods and rain had left at least 23 people dead, over 60

injured and affected more than 70,000 people. The worst affected states were Kassala (28,210 people affected), West Kordofan (23,880 people) and Khartoum (10,080 people.

In November 2018, UNOCHA reported that over 200,000 people in 15 of Sudan's 18 states had been affected by heavy rains and flash floods between June and early November, according to the Government's Humanitarian Aid Commwassion (HAC). This was almost double the 122,500 people affected by floods the same time last year. The worst affected states were Kassala (47,480 people affected) Sennar (33,830) West Kordofan (33,175) Gedaref (23,975), Red Sea (19,100), Northern (16,450), Central Darfur (14,200), and White Nile (13,645). Over 19,640 homes were destroyed, according to the Government of Sudan and partners.

Locations: Kassala, Sennar, West Kordofan, Gedaref , Red Sea, Northern State, Central Darfur, White Nile

Damages

Fatalities: 23 people; July 15 to August 16, 2018

Evacuated: 50,000; July 15 to August 16, 2018 estimated figure. Official figures report 8,900 families displaced

Affected: 200,000; Sudan - June 1 to November 27, 2018
According to a report by UNOCHA for flooding between June and November 2018.

Buildings destroyed: 19,640; Sudan - June 1 to November 27, 2018
According to the UNOCHA report

America

7.12 USA – Deadly Flooding and Mudslides in California (Updated)

Source: floodlist.com, 10 January, 2018 by Richard Davies

A powerful storm on 09 January caused flash flooding and massive debris flow from burn areas in California, USA.

The worst hit areas were in Santa Barbara County, in particular Montecito. Some parts of Los Angeles and Ventura counties were also affected.

Santa Barbara County Sheriff's Office said that at least 13 people had died and over 20 were injured in what the office described as "an absolutely tragic day for Santa Barbara County." The Sheriff's Office added:

"The death toll was expected to rise as there were residents who were missing and unaccounted for. Our hearts were broken for the family members and friends who lost loved ones.

"The search and rescue effort continues tonight. The hope was to find people who may still be alive and reunite them with their families and to help others who were trapped and need help evacuating."

Some reports said at least 6 homes were swept off their foundations and completely destroyed.

Streets were covered in mud up to 1.5 meters deep and littered with boulders and debris. Rescue teams had been using helicopters to lift people to safety after dozens of major roads were blocked.

Santa Barbara County Sheriff had declared a "Public Safety Exclusion Zone" in Montecito and the surrounding areas in order to facilitate the ongoing rescue and recovery operation.

Montecito, California, flood and mudslides damage, January 2018. Credit: Santa Barbara County Fire Department

Montecito, California, flood and mudslides damage, January 2018. Credit: Santa Barbara

County Fire Department : Montecito, California, flood and mudslides rescue operations, January 2018. Credit: Mike Eliason/Santa Barbara County Fire Department/Handout

Montecito, California, flood and mudslides, January 2018.
Photo; Ventura County Air Unit / Twitter

Rainfall

Rain from the storm fell on hillsides and mountains stripped of trees and vegetation by the wild fires that swept through parts of California from October last year. The weather station at Sandberg in Los Angeles County recorded 57 mm of rain in 24 hours to 10 January. NWS Los Angeles said via Social Media that 0.54″ of rain had fallen in 5 minutes at Montecito. Other figures include 0.73″ in 10-minutes at KTYD Radio Towers, 0.86″ in 15-minutes at Carpinteria, 1.11″ in 30-minutes at Carpinteria and 1.45″ in 1 hour at Matilija Canyon. Further up the coast, San Francisco recorded 85.9 mm in 24 hours to 10 January.

Warnings and Evacuations

The storm was expected and warnings had been issued in advance. Evacuations orders – some of them mandatory – were issued for areas below the Thomas, Whittier, Sherpa and Rey Fire Burn Areas on Monday, 08 January, 2018 due to the approaching storm. The evacuation area was widened to include other areas as the storm drew closer.

Santa Barbara County Sheriff's Office said "Do not delay in taking action to protect you, your family, your animals and your property. If you fail to take action and decide to stay in these areas, you could be stranded with no way for rescuers to reach you if you need help."

Flood Summary

Event: California, USA, January 2018

Date : January 9 to January 11, 2018

Type: Flash flood, Landslide

Locations: Montecito, Ojai, Carpinteria

Magnitude:

Rainfall level: 57 mm in 24 hours; Sandberg, Los Angeles County, California - January 9 to January 10, 2018; WMO figures

Damages

Fatalities: 20 people; Santa Barbara County, California - January 9 to January 11, 2018

Buildings destroyed: 127 buildings; Santa Barbara County, California - January 9 to January 11, 2018

Injured: 28 people; Santa Barbara County, California - January 9 to January 10, 2018

Buildings damaged: 320 buildings; Santa Barbara County, California - January 9 to January 11, 2018

7.13 Colombia – Deadly Landslide in Nariño

Source: floodlist.com, 24 January, 2018 by Richard Davies

At least 13 people had died in a landslide in the municipality of Mallama, near the town of Túquerres in Nariño Department, Colombia.

The landslide occurred on 21 January, 2018 after a period of heavy rain. A huge section of a hillside along the Tumaco-Pasto highway fell onto the road, pushing a bus carrying at least 15 passengers into a ravine.

The victims were thought to include the driver and a young child. As of 22 January, 2 people were still missing. Police, firefighters, Red Cross, civil defense officials and a team of volunteers were still searching the area for survivors.

(on left) Scene of the landslide near Mallama, Narino, Colombia, January 2018. Photo: Dirección Nacional de Bomberos de Colombia del Ministerio del Interior.

(Above) Scene of the landslide near Mallama, Narino, Colombia, January 2018. Photo: Dirección Nacional de Bomberos de Colombia del Ministerio del Interior.

Bomberos Colombia reported that a further landslide had damaged a road near Yanancha and Guaitarilla. No casualties were reported.

Orange level alerts for landslides in several areas of the country, including Tumaco, Ricaurte, Barbacoas and Mallama in Nariño Department.

Flood Summary

Event: Nariño Department, Colombia, January 2018

Date: January 21 to January 22, 2018

Locations: Mallama, Túquerres

Damages

Fatalities: 13 people; Mallama, Narino - January 21 to January 22, 2018

7.14 Brazil – 4 Dead in Rio After Storm Dumps 123mm of Rain in 1 Hour

Source: floodlist.com, 16 February, 2018 by Richard Davies

A storm that hit Rio de Janeiro, Brazil, between 14 and 15 February 2018 caused severe wind damage and flooding across the city.

At least 4 storm-related deaths had been confirmed by Rio authorities. Trees and power lines were downed and some areas of the city were left without electricity.

Some areas recorded more rain in 1 hour than would normally be seen for the whole of February. Rivers overflowed and streets were flooded, causing traffic chaos.

Rio de Janeiro – Floods in Jardim Maravilha. Photo: Vladimir Platonow/Agência Brasil)

In a statement of 15 February, the government of Rio de Janeiro city said:

"We were expecting heavy rain, but we had a historic rain. The last historic record happened 17 years ago, in Campo Grande, with 116 mm of rain in one hour. This year, in Barra da Tijuca, we had more than 123 mm. Thwas rain was accompanied by strong winds, causing flooding and fallen trees across the city."

Four deaths had been confirmed. Two people died when a house collapsed in Quintino, and another when a house collapsed in Cascadura. A military police officer was killed in Realengo when a tree fell on the victim's car.

Civil defense say that over 50 properties had suffered severe flood damage in Complexo do Alemão and Cascadura.

Centro de Operações Rio said they were responding to over 100 incidents across the city, including downed trees, rockfalls, and landslides and flooding.

Agência Brasil (ABR) the national public news agency, reports that Jardim Maravilha in Guaratiba in the western zone of Rio, was one of the worst affected by the rain. The Cabuçu River burst its banks flooding houses and streets around the town.

The rain was particularly intense during the early hours of 15 February. According to figures from Sistema Alerta Rio, more than 50 mm fell in the space of an hour in 15 different locations across the city. Some areas recorded 36.2 mm in the space of just 15 minutes and Barra da Tijuca / Riocentro recorded 123.2 mm in 1 hour. The mean total rainfall for Rio in February was 105.3 mm according to WMO.

Flood Summary

Event: Rio De Janeiro, Brazil, February 2018
Date: February 14 to February 16, 2018
Locations: Quintino, Cascadura, Complexo do Alemão, Guaratiba, Barra da Tijuca,

Magnitude

Rainfall level : 123.3 mm in 24 hours; Barra da Tijuca, Rio de Janeiro - February 15 to February 15, 2018
This total fell in 1 hour early on 15 February

Damages:

Fatalities: 4 people; Rio de Janeiro - February 14 to February 15, 2018

Buildings destroyed: 2 buildings; Rio de Janeiro - February 14 to February 16, 2018
At least 50 other buildings suffered flood damage.

7.15 USA – Winter Storm Riley Causes Coastal Flooding

Source: floodlist.com, 3 March, 2018 by Richard Davies

Much of Northeast and northern Mid-Atlantic USA was slammed with heavy snow, heavy rain and high winds from a powerful storm system named "Winter Storm Riley" on 02 March 2018.

At least 6 people were killed, mostly as a result of falling debris from strong winds. Over 3,000 flights were cancelled and almost 2 million people were left without power. Some coastal areas had seen flooding caused by storm surge, waves, high tides and strong winds.

Associated Press said that Winter Storm Riley dropped more than a foot (30.5cm) of snow in the western and northern parts of New York State, as heavy rain lashed coastal areas.

The Washington Post reported that at least six people were killed when fierce winds brought trees crashing down on roads, homes and other buildings.

Strong winds had affected areas up and down the Eastern seaboard in Massachusetts, New York, New Jersey, Rhode Island, Pennsylvania, Connecticut, Delaware, Washington D.C., Maryland, Virginia and North Carolina. NWS DC/Baltimore said late last night that Dulles Airport had reported gusts over 50 mph for over 12 hours straight.

"This was a rare occurrence," they added. NWS Boston recorded 93 mph gusts in Barnstable, Massachusetts on 02 March.

Nearly two million people had been left without electricity after winds and falling trees downed power lines. More than 3,000 domestic and international flights were cancelled on Friday and more than 2,400 others were delayed, according to the website Flight Aware.

Coastal Floods

The combination of high tides, waves and strong winds brought some coastal flooding along the eastern coastline for the second time this year.

Just a few weeks ago Boston Harbor reached record highs during a winter storm in early January. Towns and cities on the New England coast were inundated with icy water from the high tide.

In Massachusetts, National Guard, police and fire departments were called on to help evacuate residents from flooded homes and rescue stranded drivers.

Rescuers evacuate a resident and a dog from his home in Quincy, Massachusetts during a winter storm that hit the region on 02 March, 2018. Local authorities called on members of the Massachusetts National Guard to transport flood victims for safety using medium and light tactical vehicles that could cross the high water. (Photo by Spc. Samuel Keenan)

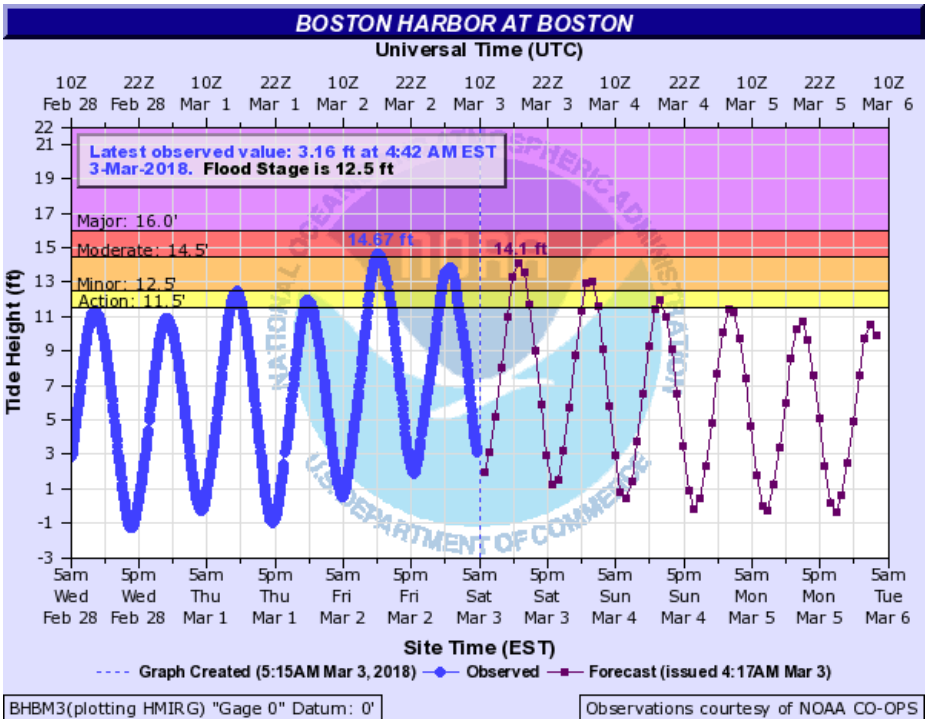
During Storm Riley yesterday, NWS Boston said their greatest concern was coastal flooding and erosion.

Strong winds, high waves and storm surge, along with multiple high tide cycles, some of them potentially record breaking means that coastal location was likely to suffer damage and could be cutoff for long periods.

On 03 March NWS Boston listed as in their jurisdiction affected by flooding, as reported by local observers. Areas included: Quincy, Essex, Marshfield, Plymouth, Winthrop, Sandwich, Orleans, Saugus, and South Boston. Coastal roads had been flooded and some cars left stranded.

The Nantucket tide gauge peaked at 6.69 feet at high tide just before 01:00 hours, 03 March, with a storm surge of 3.3 feet. The high tide at Boston Harbor peaked at 13.83 feet just before midnight, with a storm surge of 2.9 feet. The earlier tide at around 11:00 on 02 March brought levels to 14.67 feet.

Floods in Quincy, MA during winter storm Riley March 2018. Photo: Quincy Police Dept



Boston Harbor levels during winter storm Riley, March 2018. Image: NWS

River Flooding

Away from the coast, snowmelt and rain caused some increase in river levels in New Jersey. The Millstone River at Griggs town, New Jersey, reached moderate flood stage and stood at

12.63 feet as of early 03 March. The Millstone River at Blackwells Mills was 9.07 feet and rising. Flood stage was 9.0 feet.

Coastal Flood Warnings

Coastal flood warnings remain in place for areas of Monmouth County and Middlesex County in New Jersey, with storm surge of about 2.0 to 2.5 feet and waves of up to 14 feet expected until Sunday.

Coastal flood warnings were also in place for Eastern Massachusetts coast from Salisbury to Plymouth, including Boston, and in particular for Cape Cod, Nantucket and Martha's Vineyard, where a storm surge of around 3.5 feet was expected during the high tide on the afternoon of 03 March, 2018.

NWS Boston said "Widespread inundation of coastal roads and basements with life-threatening inundation depths of 4 feet likely in some spots. Some neighborhoods will be cut off for an extended time. This remains a very dangerous storm."

Flood Summary

Event: Winter Storm Riley, Eastern USA, March 2018

Type: Coastal flood, Storm surge

Locations: Quincy, Absecon, Griggs town, Nantucket, Scituate

Magnitude

Additional statistics: 4.47 meters; Boston Harbor - March 2 to March 2, 2018

Damages

Rescued: 100 people; Quincy - March 2 to March 3, 2018

7.16 Uruguay – Evacuations After Floods in South

Source: floodlist.com, 23 March, 2018 by Richard Davies

Strong winds, heavy rain and floods affected several departments in southern Uruguay between 17 and 19 March, 2018, causing around 70 people to be evacuated. Carrasco, near Montevideo, recorded 173 mm of rain in 24 hours to 19 March.

Uruguay's Sistema Nacional de Emergencias (SINAE) said that at least 20 people were evacuated in the department of Canelones, where flooding affected the towns of Paso Carrasco, Barros Blancos and La Floresta. Emergency service received 345 requests for help due to flooding. All those displaced have since returned to their homes.

The intense rains were accompanied by lightning strikes, strong winds of 60 km/h and hail in some parts of the country,

In Montevideo department there were 300 calls for emergency assistance calls, including around 80 for flooding. Around 15 people were evacuated from their homes in the department.

In the department of San José, 6 people evacuated in Playa Pascual. Eight were evacuated after flooding in Colonia department. In Maldonado, over 20 evacuations were carried out in the city of Maldonado and Piriápolis.

Flood Summary

Event: Uruguay, March 2018
Date: March 18 to March 20, 2018
Locations: Carrasco, Canelones Colonia, Rocha, Paso Carrasco, Barros Blancos, La Floresta

Magnitude

Rainfall level: 86.3 mm in 24 hours
Rocha, Rocha Department - March 18 to March 19, 2018

Rainfall level: 173 mm in 24 hours
Carrasco near Montevideo - March 18 to March 19, 2018

Rainfall level: 124 mm in 24 hours
Laguna Del Sauce, Maldonado Department - March 18 to March 19, 2018

Damages

Evacuated: 57 people; March 17 to March 20, 2018
20 people evacuated in Canelones Department, 15 in Montevideo dept, 6 in San José, 8 in Colonia and 8 in Maldonado

7.17 Argentina – Floods in Santa Cruz Province After Record Rain

Source: floodlist.com, 6 April, 2018 by Richard Davies

Storms and heavy rain between 03 to 05 April, 2018 had caused severe flooding in Santa Cruz province, Argentina and Magallanes Region in Chile.

Evacuations had been carried out and schools and roads closed. The Santa Cruz provincial government said the flooding had "paralyzed the city of Río Gallegos."

Argentina

Over 50 people were evacuated and dozens of streets closed after flooding in Río Gallegos, Santa Cruz province, Argentina.

The floods came after a period of heavy rain between 03 to 05 April, 2018. Local media reported that the city received 3 times the amount of rain it would normally see for the whole of April.

Public offices and schools were closed and over 50 people evacuated their homes. Some had since been able to return home.

Civil Protection, police, fire service and military personnel had been deployed to alleviate the flooding.

Record Rainfall

Argentina's National Meteorological Service (SMN) said that in a 24 hour period 04 to 05 April, Río Gallegos recorded 59 mm of rain, the highest daily amount on record for the city. The previous daily high was 41.8 mm recorded in January, 1957.

SMN added that Río Gallegos had had its wettest April on record, with 69 mm of rain falling thwas month (to 05 April). The previous high was 64.1 mm, set in April 2002.

A warning for strong winds and rain will remain in place for the region over the next few days.

Chile

Storms and flooding also affected Punta Arenas in Magallanes Region, Chile, around 200km to the south west of Río Gallegos.

Local media reported that several houses and a bridge were damaged in the flooding. The storm also interrupted power supplies. Authorities were prompted to close schools on 04 April, 2018.

The city recorded 33.4 mm of rain in 24 hours to 04 April 2018.. According to WMO figures, Punta Arenas would normally see around 44.7 mm of rain for the whole of April.

Flood Summary

Event: Southern Argentina and Chile, April 2018

Date: April 3 to April 6, 2018

Locations: Río Gallegos (Argentina), Punta Arenas (Chile)

Magnitude

Rainfall level: 33.4 mm in 24 hours
Punta Arenas, Chile - April 3 to April 4, 2018

Rainfall level: 59 mm in 24 hours
Río Gallegos, Argentina - April 4 to April 5, 2018

Damages

Evacuated: 50 people
Río Gallegos, Argentina - April 3 to April 6, 2018

Buildings damaged: 10
Punta Arenas, Chile - April 3 to April 6, 2018
Local media also reported damage to a bridge.

7.18 Canada – Evacuations in Alberta After Snowmelt Flooding

Source: floodlist.com, 26 April, 2018 by FloodList News in Americas, News

Snowmelt in the province of Alberta, Canada, had caused overland flooding and increased river levels over the last few days. Evacuations had been carried out in areas near Drumheller.

The government of Alberta said on 25 April, 2018, that as many as 17 municipalities and First Nations across the province had recently issued overland flooding alerts.

The community of Wayne in Drumheller is on a mandatory evacuation notice as a result of high levels of the Rosebud River.

A number of provincial and municipal roads had been affected across the province as a result of flooding.

Flood watches (mid-level warnings) were in effect for Kneehills, Lasthill and Threehills creeks, as well as the Rosebud, Little Red Deer and Medicine rivers.

A 17 km long ice jam prompted authorities to issue a warning (top level) for the Peace River east of Manning, in the vicinity of Sunny Valley and Kulyna Flats. Flooding had affected some low-lying lands and authorities had warned that river levels could change quickly and dramatically.

The Government of Alberta said it was supporting their response efforts through community liaisons and by providing provincially held resources, such as pumps and piping, when requested.

Areas that had issued flood alerts:

As of 25 April there were 17 municipalities, First Nations and communities that had issued alerts via the Alberta Emergency Alerts system:

Red Deer County
MD of Taber
Town of Beiseker
Wheatland County
Village of Rycroft
Saddle Lake County
Town of Drumheller
Birch Hills County
MD of Smoky River
Kneehill County

MD of Greenview
Forty Mile County
Siksika Nation
MD of Fairview
Village of Stirling
Rocky View County
Vulcan County

Flood Summary

Event: Alberta, Canada, April 2018
Locations: Drumheller, Manning

Magnitude

River level: 2.772 meters
Red Deer River at Red Deer - April 25 to April 25, 2018

River level: 375.794 meters
Peace River at Sunny Valley - April 25 to April 25, 2018

River level: 4.364 meters
Kneehills Creek near Drumheller - April 25 to April 25, 2018

River level: 3.578 meters
Rosebud River at Redland - April 25 to April 25, 2018

River level: 2.305 meters
Little Red Deer River (near the mouth, west of Innisfail) - April 25 to April 25, 2018

Damages

Evacuated: 30 people; Wayne, Drumheller - April 23 to April 25, 2018
Estimated figure

7.19 Ecuador – Floods and Landslides Hit Imbabura and El Oro Provinces

Source: floodlist.com, 6 May, 2018 by Richard Davies

Heavy rain in Ecuador over the last few days had caused flooding in Imbabura Province and floods and landslides in parts of El Oro Province.

According to the country's risk management agency (Secretaría de Gestión de Riesgos – SGR) at least 160 people were affected by flooding in Antonio Ante Canton, Imbabura Province after heavy rain that began around 04 May, 2018.

Initial assessments by SGR suggest that 38 houses had been damaged or destroyed. Streets were left covered in mud and flood debris. Farm land and crops, in particular alfalfa and potatoes, also suffered damaged.

SGR said that many of the houses affected were in high risk areas and were built without adequate urban planning and drainage channels.

In El Oro Province, SGR said that heavy rain had triggered landslides in parts of Atahualpa Canton on 07 May, 2018, damaging homes and roads. No fatalities or injuries were reported.

Landslide in Atahualpa Canton, El Oro Province, Ecuador, May 2018. Photo: Secretaría de Gestión de Riesgos

Landslide in Atahualpa Canton, El Oro Province, Ecuador, May 2018. Photo: Secretaría de Gestión de Riesgos

Flood Summary

Date: May 4 to May 10, 2018

Type: Flash flood, Landslide

Locations: Antonio Ante Canton, Imbabura Province, Atahualpa Canton, El Oro

Magnitude

Rainfall level: 70 mm in 24 hours; Machala, El Oro Province - May 8 to May 9, 2018 Ogimet

Damages

Buildings damaged: 38 buildings; Antonio Ante Canton, Imbabura Province - May 4 to May 10, 2018

Buildings damaged: 20 buildings; Atahualpa Canton, El Oro - May 8 to May 10, 2018 estimated figure

7.20 Mexico – Flash Floods in Jalisco State as Hurricane Bud Intensifies

Source: floodlist.com, 11 June, 2018 by Richard Davies

Mexico's weather service warned yesterday of storms, heavy rain and strong winds in the states of Michoacán, Jalisco, Colima and Guerrero as Tropical Storm Bud intensified into a hurricane late on Sunday, 10 June. Coastal areas in Colima, Michoacán and Guerrero were also warned of storm surge of up to 3 meters.

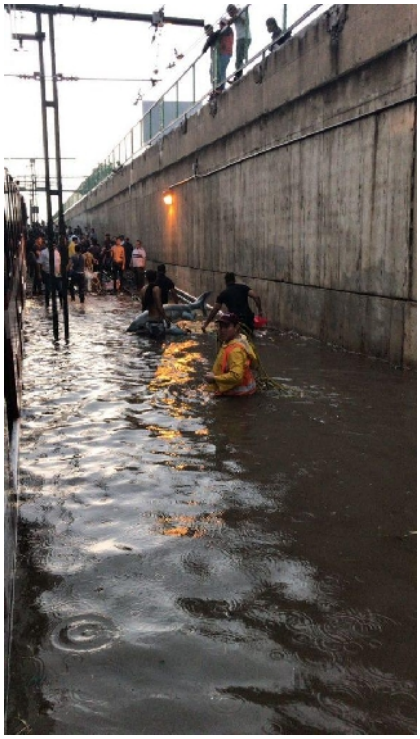
Severe weather affected parts of Jalisco state in Mexcio during the afternoon of Sunday 10 June. Areas around the city of Guadalajara were the worst affected.

Around 65 mm of rain fell in Guadalajara in just a few hours on Sunday afternoon. Elsewhere, heavy rain was recorded in the state of Guerrero, where 97 mm of rain fell in 24 hours to early 10 June.

Guadalajara

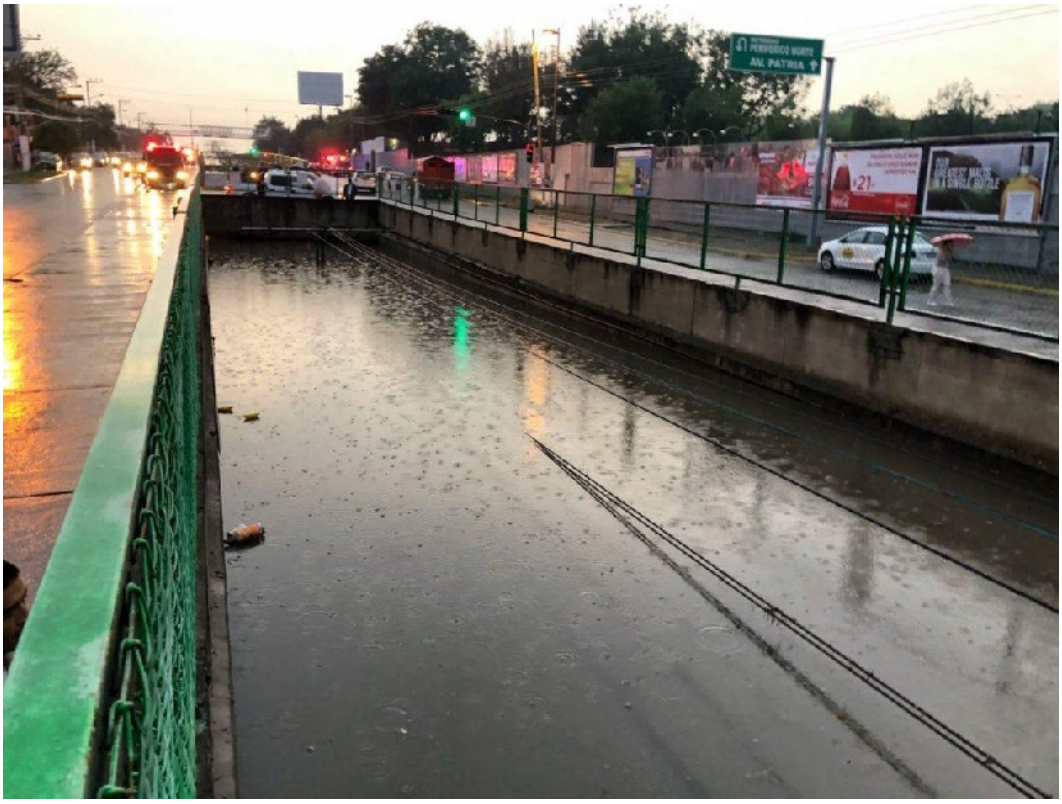
In Guadalajara, streets, businesses and homes were flooded and cars were dragged along flooded streets and drainage channels. The Avenida Patria canal to the north of Guadalajara overflowed, according to local media.

Emergency services were called into action after a tunnel of the city's light railway system was flooded. Social media showed images of passengers escaping a train trapped in flood waters around 3 to 4 metres deep in places.

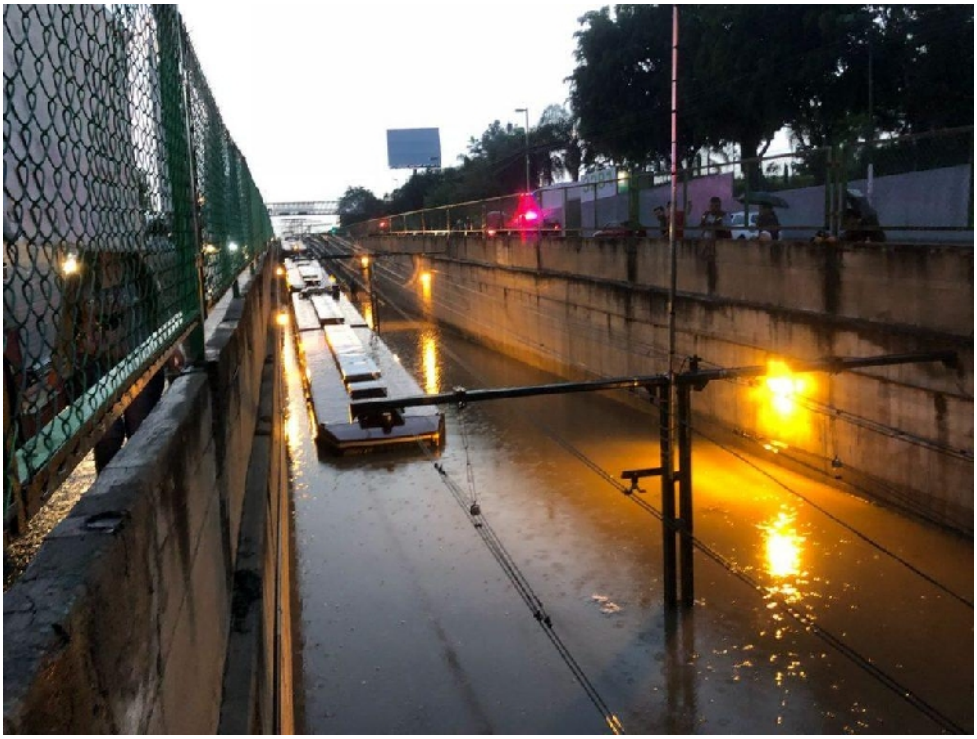


Aristóteles Sandoval, Governor of Jalisco state, said that no injuries were reported during the severe weather.

Flooded railway in Guadalajara, Jalisco, Mexico, 10 June 2018. Photo: Protection Civil Jalisco



Flooded railway in Guadalajara, Jalisco, Mexico, 10 June 2018. Photo: Protection Civil Jalisco

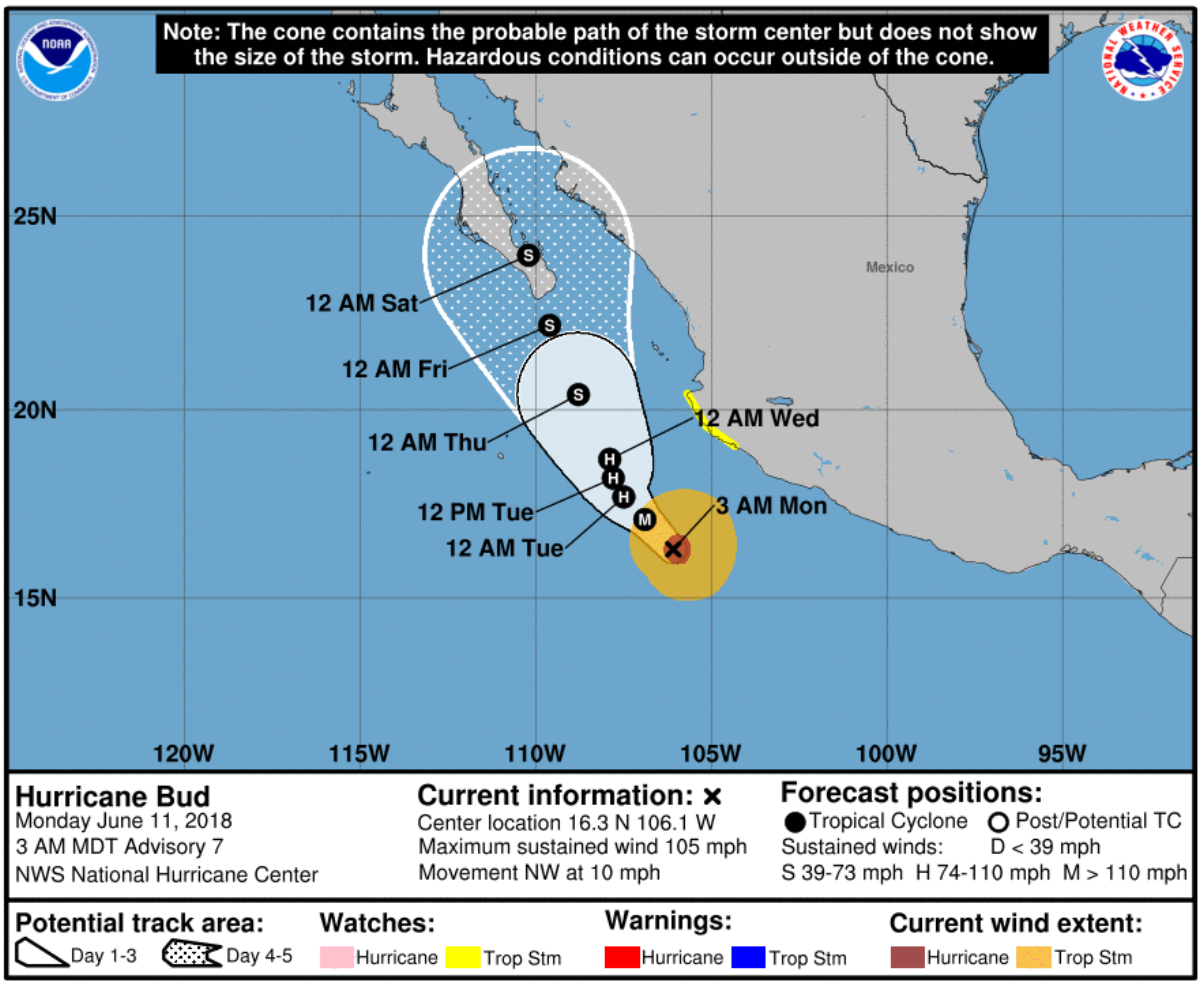


Flooded railway in Guadalajara, Jalisco, Mexico, 10 June 2018. Photo: Protection Civil Jalisco

Hurricane Bud

On 11 June, Hurricane Bud had intensified further to a Category 2 hurricane. As of 11 June at 06:00 UTC, its centre was located approximately 340 km south-southwest of Manzanillo city (Colima State) and approximately 465 km south of Cabo Corriente city (Jalisco State) with maximum sustained winds of 165 km/h.

Hurricane Bud was the second of the 2018 Pacific hurricane season after Tropical Storm Aletta, which was moving slowly west, well away from land.



Predicted trajectory of Hurricane Bud, Mexico, June 2018 Image: National Hurricane Center

Flood Summary

Event: Jalisco State, Mexcio, June 2018

Date: June 9 to June 12, 2018

Locations: Guadalajara, Avenida Patria, Zapopan

Magnitude

Rainfall level: 65 mm in 24 hours; Guadalajara - June 10 to June 10, 2018

Most of the rain fell in just a few hours

Damages

Rescued: 60 people; Zapopan, Guadalajara - June 10 to June 10, 2018

Emergency services were called into action after a tunnel of the city's light railway system was flooded in the Zapopan area of the city

Buildings damaged: 100 buildings; Guadalajara - June 10 to June 11, 2018

Estimated: streets, businesses and homes were flooded and cars were dragged along flooded streets and drainage channels

7.21 USA – Emergencies Declared After Floods in New York, New Jersey and Pennsylvania

Source: floodlist.com, 15 August, 2018 by Richard Davies

Torrential rain and flooding had affected parts of eastern USA over the last few days prompting high-water rescues and evacuations.

New Jersey Governor Phil Murphy declared a state of emergency in five counties on Tuesday, 14 August after some areas recorded more than a month's worth of rain between 11 and 12 August.

Meanwhile heavy rain had caused flooding in parts of New York state and Pennsylvania, where people were rescued from flooded cars and homes.

New Jersey

New Jersey Governor Phil Murphy declared a state of emergency in Bergen, Essex, Monmouth, Ocean and Passaic counties.

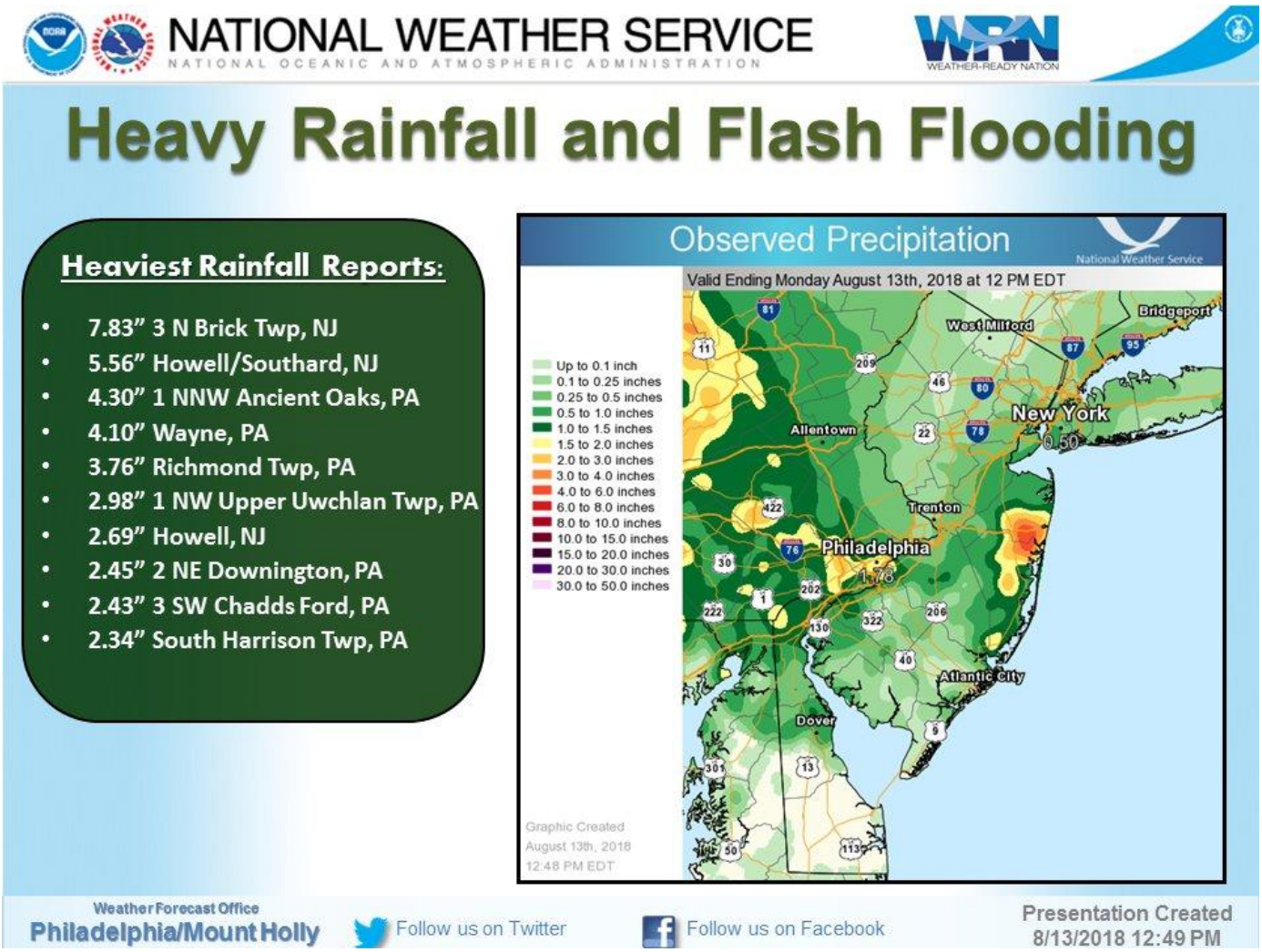
"There is no doubt that parts of our state have received nothing less than historic amounts of rain, and some communities received an entire month's worth in just a few hours," said Governor Murphy.

Flood damage in New Jersey. Photo: Governor's Office New Jersey

The governor's statement said that several communities received between five and eight inches of rain between 11 and 12 August, exceeding what should be the expected rainfall for the entire month.

As a result, numerous neighborhoods experienced significant localized flooding, driving residents from their homes and shuttering businesses. Municipalities along waterways were also dealing with cleanup of downed trees, mud, and other storm-related debris. The National Weather Service had indicated that more storms may hit New Jersey, further complicating cleanup in affected communities.

National Weather Service Mount Holly said that Brick Township had recorded 7.83 inches of rain to 13 August and Howell 5.56 inches.



Rainfall in New Jersey and Pennsylvania to 13 August 2018. Image: National Weather Service Mount Holly

New York

In New York, Governor Andrew M. Cuomo declared a State of Emergency was declared for Broome, Chemung, Chenango, Cortland, Delaware, Monroe, Onondaga, Ontario, Schulyer, Seneca, Steuben, Tioga, Wayne, Yates, and contiguous counties

Swift water rescue teams were called to the Lodi State Park area in Seneca County where they evacuated approximately 50 to 60 people from various flooded camps and homes. Governor Cuomo later visited Broome and Seneca counties where he said flash floods and heavy rain have damaged homes and property.

Flood damage in New York, 13 August 2018. Photo: Governor's Office New York

Pennsylvania

Pennsylvania Governor Tom Wolf said in a statement of 14 August that 7 counties had declared disaster declarations – Susquehanna, Bradford, Wyoming, Sullivan, Columbia, Schuylkill, and Lackawanna.

Emergency and transport officials had visited affected areas. Flooding has buckled roads and damaged homes.

Many residences in Bradford County and a non-profit library were swept from their foundations by flood waters. The Pennsylvania Helicopter Aquatic Rescue Team (PA-HART) deployed to Bradford County and rescued individuals who had been swept from their homes. The helicopter team remains in the area for further search and rescue and additional teams had been deployed to Susquehanna County for water and water-based search and rescue.

Many of those affected were recovering from considerable flooding that washed out a number of communities only a few weeks ago.

Governor Wolf said "These rains arrived on the heels of heavy rain in late July, not giving areas in central and north central Pennsylvania time to fully recover."

Wet summer in the East

Much of the recent rainfall fell on ground already saturated after what had been a very wet summer for eastern areas.

NWS New York said via Social Media that "Since August 1, Central Park has had 5.77″ of rain! That is 3.79″ over the normal amount of rain for the first two weeks of August!"

Figures from NWS Eastern revealed that some locations had recorded almost double the amount of rainfall expected for this period.

Rainfall Totals – June 1 to August 13, 2018

	Rainfall June 1 to Aug 13 2018	Normal Rainfall 6/1 to 8/13
Wilmington NC	28.69″	15.84″
Cape Hatteras NC	26.38″	11.71″
Baltimore MD – BWI	23.13″	8.97″
Elizabeth City NC	21.67″	12.96″
Williamsport PA	21.35″	9.94″
Beaufort NC	21.31″	14.05″
Mount Pocono PA	20.68″	11.05″
Richmond VA	20.05″	10.46″
Reading PA	19.83″	9.80″
Harrisburg PA	19.43″	9.61″
N. Myrtle Beach SC	19.19″	13.23″
New Bern NC	18.59″	13.67″
Norfolk VA	18.49″	11.86″
Charlottesville VA	18.44″	9.83″
Wakefield VA	17.75″	10.96″
Elkins WV	17.58″	11.49″
Washington DC–DCA	17.31″	8.82″
Allentown PA	17.16″	10.97″
Washington DC–IAD	17.03″	9.22″
Concord NH	16.57″	8.87"
NYC– Central Park	16.33″	10.99″
Hartford CT – BDL	16.17″	10.38″
Charleston SC	15.90″	14.99″
Martinsburg WV	15.87″	8.79″
Poughkeepsie NY	15.86″	11.00″
Ashville NC	15.52″	10.81″
Florence SC	15.40″	12.15″
Charleston WV	15.35″	10.93″
Wilkes-Barre/ Scranton PA	14.84″	9.33″
Hagerstown MD	14.47″	8.57″
Altoona PA	14.47″	7.96″
Manchester NH	14.12″	9.25″

	Rainfall June 1 to Aug 13 2018	Normal Rainfall 6/1 to 8/13
Lumberton NC	14.11″	12.22″
Columbus OH	14.06″	10.20″
Greensboro NC	13.86″	9.84″
NYC – LaGuardia	13.78″	10.28″
Danville VA	13.77″	10.02″
Lynchburg VA	13.69″	9.38″
Fayetteville NC	13.42″	12.70″
Binghamton NY	13.35″	9.46″
Anderson SC	13.31″	8.92″
Cleveland OH	13.26″	8.40″
Trenton NJ	13.23″	11.20″
Wilmington DE	13.15″	9.92″
Johnstown PA	12.72″	9.55″
NYC – J F Kennedy	12.71″	9.60″
Bennington VT	12.62″	10.30″
Orangeburg SC	11.27″	12.75″
Huntington WV	12.20″	10.07″
Worcester MA	12.19″	10.12″
Augusta GA	12.18″	10.83″
Zanesville OH	12.01″	9.16″
Wallops Island VA	11.86″	9.33″
Pittsburgh PA	11.83″	9.66″
Newark NJ	11.99″	10.56″
Islip NY	11.74″	9.37″
Boston MA	11.02″	8.64″
Greenville-Spartanburg SC	10.99″	10.57″
Pittsfield MA	10.96″	10.44″
Glens Falls NY	10.71″	9.32″
Albany NY	10.50″	9.50″
Roanoke VA	10.46″	9.36″
Bridgeport CT	10.32″	8.79″
Charlotte NC	10.21″	9.21″
Clarksburg WV	10.05″	11.80″

	Rainfall June 1 to Aug 13 2018	Normal Rainfall 6/1 to 8/13
Beckley WV	10.02″	10.75″
Salisbury MD	9.89″	10.14″
Raleigh NC	9.88″	10.01″
Millinocket ME	9.82″	9.49″
Savannah GA	9.79″	14.35″
Atlantic City NJ	9.46″	8.65″
Columbia SC	9.41″	12.53″
Portland ME	9.24″	8.76″
Georgetown DE	9.16″	10.14″
Bangor ME	9.06″	8.58″
Syracuse NY	9.03″	8.57″
Philadelphia PA	8.92″	9.31″
Morgantown WV	8.87″	10.27″
Massena NY	8.77″	8.65″
Mansfield OH	8.62″	10.96″
Cincinnati OH	8.48″	9.26″
Youngstown OH	8.48″	9.57″
New Philadelphia OH	8.16″	9.05″
Providence RI	7.90″	8.46″
Dayton OH	7.86″	9.49″
Caribou ME	7.80″	9.21″
Bradford PA	7.69″	10.83″
Burlington VT	7.50″	9.61″
Watertown NY	7.49″	6.82″
Toledo OH	7.46″	8.17″
Augusta ME	7.35″	8.45″
Montpelier VT	7.06″	9.68″
Bluefield WV	6.82″	9.80″
Erie PA	6.75″	8.80″
Buffalo NY	6.58″	8.30″
Blacksburg VA	6.53″	9.84″
Rochester NY	6.30″	8.20″
Akron-Canton OH	6.19″	9.45″
Parkersburg WV	6.11″	9.79″

USA rainfall totals summer 2018. Image: NWS Eastern

Flood Summary

Event: New York, New Jersey and Pennsylvania, USA, August 2018

Date: August 11 to August 14, 2018

Type: Urban flood, Flash flood

New Jersey declared a state of emergency in Bergen, Essex, Monmouth, Ocean and Passaic counties. New York declared a State of Emergency was declared for Broome, Chemung, Chenango, Cortland, Delaware, Monroe, Onondaga, Ontario, Schulyer, Seneca, Steuben, Tioga, Wayne, Yates, and contiguous counties. Pennsylvania declared disasters for Susquehanna, Bradford, Wyoming, Sullivan, Columbia, Schuylkill, and Lackawanna counties.

Locations: Brick, NJ, Broome, Lodi, Seneca, NY, Bradford County, PA, Susquehanna

Magnitude

Rainfall level: 198.88 mm in 24 hours; Brick Township - August 12 to August 13, 2018
National Weather Service Mount Holly figures

Rainfall level: 141.22 mm in 24 hours; Howell - August 12 to August 13, 2018
National Weather Service Mount Holly figures

Damages

Evacuated : 60 people; Lodi, NY - August 12 to August 13, 2018

Rescued: 20 people
Bradford County, PA - August 12 to August 14, 2018

ASIA

7.22 Russia – Over 1,000 Evacuated from Floods in Altai Krai Region

Source: floodlist.com , 23 March,2018 by Richard Davies

Russia's Ministry of Emergency Situations EMERCOM reports that melting snow and ice jams had caused flooding in Altai Krai Region. As of 27 March, flooding had affected 55 rural settlements, in particular in Krasnoschekovsky, Tretyakovsky, Charyshsky districts.

EMERCOM said that 1,146 homes were flooded and 1,029 people evacuated. The two small settlements of Ust-Kozluha and Maralaha in Krasnoschekovsky district had been almost completely evacuated as a precaution when the Reka Maralikha River threatened to flood the villages.

Around 1,500 EMERCOM personnel and 440 units of equipment had been deployed to alleviate flooding issues. Teams were working on pumping water, as well as delivering basic food products and providing assistance to the affected communities.

The flooding was caused by melting snow and ice jams in rivers, along with some rain. EMERCOM said the situation had been worsened by the fact that the ground was frozen and unable to absorb the melting snow and rain.

Snow melt and ice jam floods in Altai Krai, Russia, March, 2018. Photo: EMERCOM

Snow melt and ice jam floods in Altai Krai, Russia, March, 2018. Photo: EMERCOM

Flood Summary

Event: Altai Krai Region, Russia, March 2018
Type: Inland flood, River flood
Locations: Krasnoshchyokovsky, Tretyakovsky, Charyshsky

Magnitude

River level: Overflowing; Reka Maralikha river, Krasnoschekovsky district - March 26 to March 28, 2018

Damages

Evacuated:1,029; Altai Krai Region - March 26 to March 28, 2018

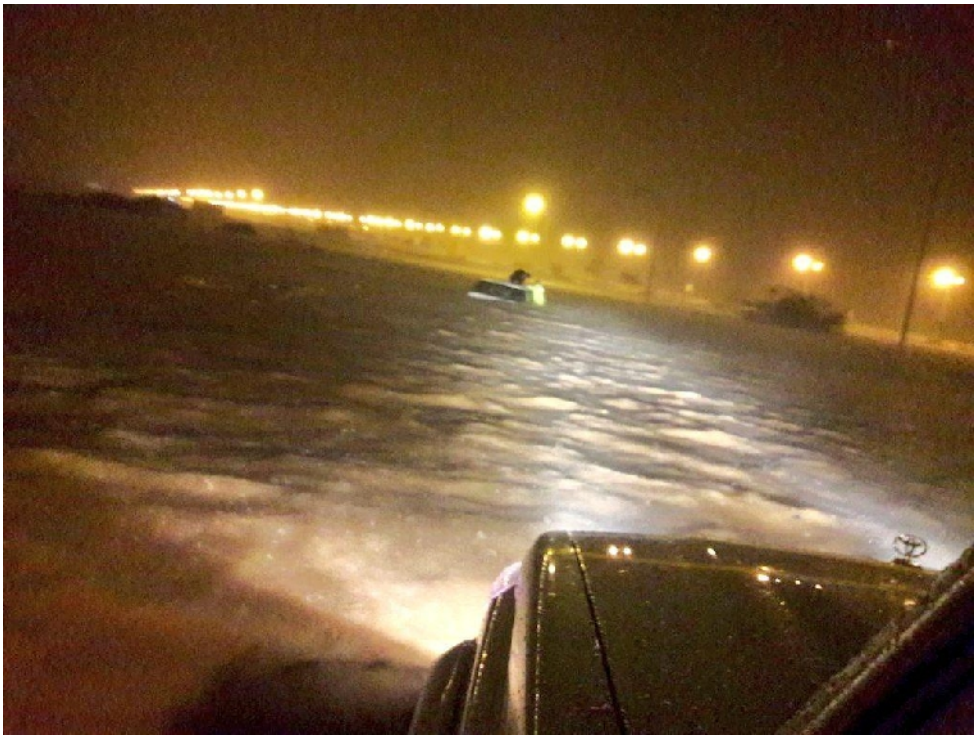
Buildings damaged: 1,146; Altai Krai Region - March 26 to March 28, 2018

Fatalities: 2 people, Altai Krai Region - March 26 to March 28, 2018
According to media reports

7.23 Oman – 2 Dead as Cyclone Mekunu Dumps 278.2mm of Rain in 24 Hours

Source: floodlist.com , 26 May, 2018 by Richard Davies

After sweeping through the Yemen island of Socotra, Cyclone Mekunu made landfall in southern Oman as a Category 2 storm late on 25 May, 2018, battering the area with strong winds, storm surge and torrential rain. Almost 3 years' worth of rain fell in 24 hours in the city of Salalah, with more rain expected.



Flood rescues in Oman during Cyclone Mekunu, May 2018. Photo: PACDA Oman

The storm made landfall in Dhofar province, between the towns of Rasyut and Rakhyut, just west of Salalah.

Over 10,000 people had been evacuated, mainly in Salalah. Authorities urged residents to remain indoors. Oman civil defense (Public Authority for Civil Defense and Ambulance – PACDA) said they carried out dozens of flood rescues. Salalah airport was closed.

Oman police said a young girl was killed as a result of wind damage and a man died when his car was swept away. Three other people had been reported injured.

High waves and torrential rain caused wide areas of flooding in Dhofar and Al Wusta governorates. Social media images showed torrents of flood water racing along the streets

of Salalah. By early 26 May, Salalah had recorded 278.2 mm of rain. According to WMO figures, the city would normally see around 95 mm of rain in a whole year.

Oman Meteorology (PACA) said risk of flash flooding will remain as they warned of further heavy rain of between 200 and 400 mm in Dhofar and Al Wusta governorates over the next 36 hours. High waves and storm surge will continue to be a risk in Dhofar and al-Wusta coastal areas, with wave heights of 5 and 8 meters expected.

PACA said the cyclone has been downgraded to Category 1 since making landfall and predicted Mekunu to weaken further into a tropical storm.

It is likely that parts of mainland Yemen close to the border with Oman had also been affected by Mekunu. The storm had already caused devastation on the Yemen island of Socotra. As of early 26 May however, no information was available about Mekunu in mainland areas of the war-torn country.

Flood Summary

Event: Cyclone Mekunu, Yemen and Oman, May 2018
Date: May 23 to May 28, 2018
Type: Urban flood, Flash flood, Storm surge
Cause: Storm surge, Extreme rainfall
Locations: Socotra (Yemen), al-Mahra province, Yemen (Yemen),Dhofar Governorate, Oman (Oman), Al Wusta (Oman)

Magnitude

Rainfall level: 278.2 mm in 24 hours; Salalah, Oman - May 25 to May 26, 2018
Oman Met figures

Rainfall level: 156.6 mm in 24 hours; Dalkot, Oman - May 25 to May 26, 2018

Rainfall level: 188.9 mm in 24 hours; Sidh, Oman - May 25 to May 26, 2018

Rainfall level: 96.2 mm in 24 hours; Marbat, Oman - May 25 to May 26, 2018

Damages : **Fatalities**: 13 people; Yemen and Oman - May 23 to May 29, 2018
Many fatalities a result of sailing accidents or wind damage. It is unclear how many people died as a result of flooding.

Missing people: 38 people; Yemen and Oman - May 23 to May 29, 2018

Evacuated: 10,000; Dhofar Governorate, Oman - May 25 to May 28, 2018

Evacuated: 3,000; Socotra, yemen - May 23 to May 28, 2018

7.24 Japan – Floods and Landslides Leave 80 Dead, 28 Missing

Source: floodlist.com. 9 July, 2018 by Richard Davies

Floods and landslides in Japan had killed at least 80 people and left 28 people missing, according to the country's Fire and Disaster Management Agency (FDMA).

Torrential rain in the wake of Typhoon Prapiroon prompted authorities to issue an initial 160,000 evacuation notices on 06 July, 2018.

Since then the torrential rainfall had triggered floods and landslides that had affected 2 million people, with 1.5 million people on evacuation notice. Fatalities had been reported in 11 prefectures.

Rivers overflowed after unprecedented rainfall, causing widespread flooding. Military boats and helicopters were used to rescue people trapped in their homes and on rooftops.

Prime Minister Shinzo Abe said in a statement that around 54,000 members of the Self-Defense Forces, police, firefighters, and the Japan Coast Guard had been working around the clock to conduct urgent rescue operations. The Prime Minister said that "more than 20,000 people were spending an uneasy time in shelters."

"The climate continues to be unstable, with the designated heavy rain emergency warnings issued for Gifu Prefecture, Ehime Prefecture, and Kochi Prefecture. I ask that the public continue to pay close attention to evacuation and weather information released by each municipality and meteorological station and take measures to ensure safety, including early evacuations," the Prime Minister added.

According to FDMA figures of 09 July, 40 deaths occurred in Hiroshima Prefecture, 21 in Ehime, 5 in Okayama and 3 each in Yamaguchi and Fukuoka. Other fatalities were in Gifu (1), Shiga (1), Kyoto (1), Hyōgo (2), Kochi (1) and Kagoshima (2). At least 28 people are still missing, including 16 in Hiroshima. Over 100 people had been injured, 24 of them seriously.

At least 40 homes had been completely destroyed and further 8,000 homes damaged. Around 2,500 of that figure are in Fukuoka, over 1,000 in Ehime, and around 1,500 in Hiroshima.

Meanwhile further severe weather was threatening the country as Tropical Cyclone Maria moves northwest over the Philippine Sea. Maria was expected to head toward the Okinawa islands in Japan, possibly reaching Miyako Island on 10 July.

Maria was also likely to affect parts of Taiwan and Fujian and Zhejiang provinces in eastern China over the coming days.

Flood and landslide rescues in Hiroshima, Japan, July 2018. Photo: Fire and Disaster Management Agency

Flood and landslide rescues in Hiroshima, Japan, July 2018. Photo: Fire and Disaster Management Agency

Floods in Ehime, Japan, July 2018. Photo: Fire and Disaster Management Agency

Floods in Japan, July 2018. Photo: Fire and Disaster Management Agency

Floods in Hiroshima, Japan, July 2018. Photo: Fire and Disaster Management Agency

Flood Summary

Type: Flash flood, Landslide
Locations: Hiroshima, Yamaguchi, Fukuoka, Gifu, Shiga, Kyoto, Hyōgo, Kochi, Kagoshima

Magnitude

Rainfall level: 384 mm in 24 hours; Sukumo - July 7 to July 8, 2018
All rainfall figures via Ogimet

Rainfall level: 153 mm in 24 hours; Akune - July 7 to July 8, 2018

Rainfall level: 132 mm in 24 hours; Hitoyoshi - July 7 to July 8, 2018

Rainfall level: 274 mm in 24 hours; Kure - July 6 to July 7, 2018

Rainfall level: 242 mm in 24 hours; Maizuru - July 6 to July 7, 2018

Rainfall level: 226 mm in 24 hours; Tsuyama - July 6 to July 7, 2018

Rainfall level: 225 mm in 24 hours; Akune - July 6 to July 7, 2018

Rainfall level: 218 mm in 24 hours; Hiroshima - July 6 to July 7, 2018

Rainfall level: 218 mm in 24 hours; Hita - July 6 to July 7, 2018

Rainfall level: 210 mm in 24 hours; Toyooka - July 6 to July 7, 2018

Rainfall level: 208 mm in 24 hours; Fukuyama - July 6 to July 7, 2018

Rainfall level: 335 mm in 24 hours; Wakayama - July 5 to July 6, 2018

Rainfall level: 314 mm in 24 hours; Iizuka - July 5 to July 6, 2018

Rainfall level: 270 mm in 24 hours; Sasebo - July 5 to July 6, 2018

Rainfall level: 261 mm in 24 hours; Fukuoka - July 5 to July 6, 2018

Rainfall level: 221 mm in 24 hours; Kobe - July 5 to July 6, 2018

Rainfall level: 205 mm in 24 hours; Unzendake - July 5 to July 6, 2018

Damages

Fatalities: 128 people; July 6 to July 9, 2018
According to FDMA figures of 09 July there were 80 fatalities: 40 deaths in Hiroshima Prefecture, 21 in Ehime, 5 in Okayama and 3 each in Yamaguchi and Fukuoka. Other fatalities were in Gifu (1), Shiga (1), Kyoto (1), Hyōgo (2), Kochi (1) and Kagoshima (2). By 10 July this figures had increased to 128.

Buildings destroyed: 347 buildings; July 6 to July 10, 2018; Also 9,868 homes damaged

7.25 Afghanistan – Deadly Flash Floods Hit Kunar Province

Source: floodlist.com, 27 August, 2018, by FloodList News

Local media in Afghanistan were reporting that at least 11 people had died in flash floods in the eastern province of Kunar, along the border with Pakistan.

Heavy rain fell in Ghaziabad district from Friday, 24 August, 2018. Eight of the victims were from the same family. The flooding also damaged farmland, livestock and crops, as well as telecommunications, water supply and irrigation channels.

At least 10 people died after a landslide broke the banks of a natural dam in Panjshir province, eastern Afghanistan in mid-July, 2018.

The region of eastern Afghanistan was particularly affected by seasonal flooding and other natural disasters. A flood mitigation project by the International Organization for Migration (IOM) had attempted to provide protection for some communities in the province.

IOM completes flood protection walls in Afghanistan's Nangarhar, Kunar provinces. Photo: IOM

Flood Summary

Event: Kunar Province, Afghanistan

Date: August 24 to August 28, 2018

Type: Flash flood, Landslide

Damages

Fatalities: 11 people; Ghaziabad district - August 24 to August 28, 2018

7.26 North Korea – Floods Leave 76 Dead and 75 Missing

Source: floodlist.com, 5 September, 2018, by Richard Davies in Asia, News

Severe floods had been affecting North and South Hwanghae provinces in North Korea since late August, 2018, according to the UN. Kangwon province had also been affected according to other reports·

"In both (North and South Hwanghae) provinces there were 76 reported deaths, and 75 people missing. Over 9,000 people were displaced and nearly 1,800 residential buildings destroyed or damaged," UN Office for the Coordination of Humanitarian Affairs (OCHA) said in a report (pdf) of 03 September.

Several parts of the country recorded heavy rain from around 28 August, 2018. Kaesong recorded 298 mm of rain in 24 hours to 29 August, 2018. Nampo recorded 191 mm, Sariwon 121 mm, Ryongyon 135 mm and Pyonggang 189 mm during the same period.

NK News reports that the overflowing Ryesong River had caused major flood damage in areas near Kaesong, a city in North Hwanghae Province.

Elsewhere in the country, as many as 10,000 houses had been damaged and 35 000 displaced in Kangwon Province, according to the Red Cross.

Tropical Storm Soulik

Days before the recent heavy rain, Tropical Storm Soulik caused extremely heavy rainfall, resulting in heavy flooding in Kangwon and South Hamgyong provinces from 24 August.

UN OCHA says that Munchon city was worst affected with 10 reported deaths, 60 people missing. Over 58,000 people displaced from both Munchon city and Kowon city. Many schools and health facilities were destroyed or damaged. The water supply system of Munchon city was destroyed leaving tens of thousands of people without access to safe drinking water.

Flood Summary

Event: North Korea, August to September 2018

Type: Flash flood, River flood

Locations: Kangwon, North Hwanghae, South Hwanghae

Magnitude

River level: Overflowing; Ryesong River, Near Kaesong, North Hwanghae province - August 29 to September 5, 2018

Rainfall level: 298 mm in 24 hours; Kaesong, North Hwanghae province - August 28 to August 29, 2018
Ogimet figures

Rainfall level: 191 mm in 24 hours Nampo - August 28 to August 29, 2018

Rainfall level: 121 mm in 24 hours; Sariwon - August 28 to August 29, 2018

Rainfall level: 135 mm in 24 hours; Ryongyon - August 28 to August 29, 2018

Rainfall level: 189 mm in 24 hours; Pyonggang - August 28 to August 29, 2018

Damages

Fatalities :76 people; North and South Hwanghae provinces - August 28 to September 5, 2018
According to OCHA

Buildings destroyed: 1800 buildings: North and South Hwanghae provinces - August 28 to September 5, 2018
According to OCHA

Evacuated: 9000 people: August 28, 2018 - August 28 to September 5, 2018
According to OCHA

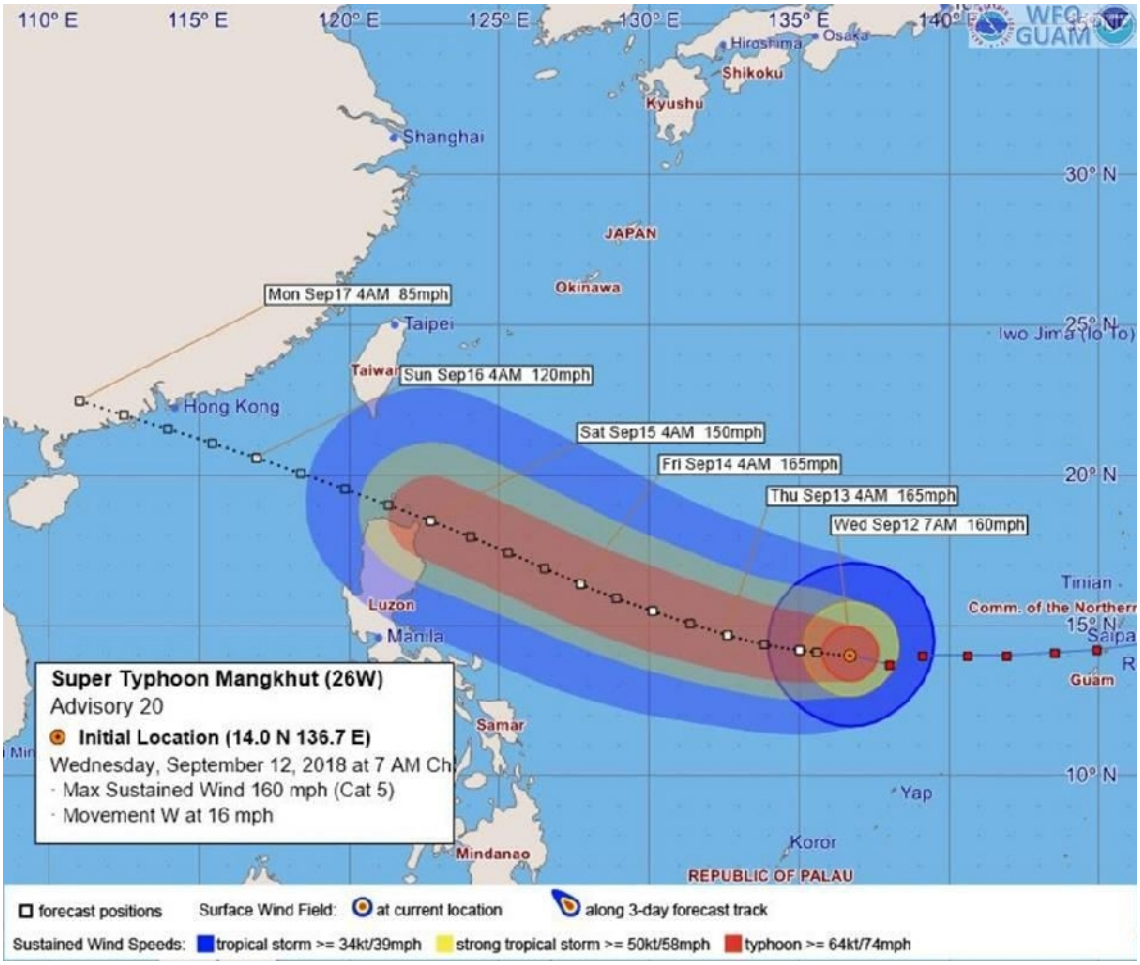
Evacuated: 5,000: Kangwon Province - August 28 to September 5, 2018
According to the Red Cross

7.27 Guam – Typhoon Mangkhut Damages Homes and Power Supply

Source: floodlist.com 12 September,2018 by Richard Davies

Tropical Cyclone 'Mangkhut' formed over the North West Pacific Island on 07 September, 2018, and moved toward Guam and the Northern Mariana Islands, causing wind damage and some flooding from heavy rain.

Since then Mangkhut had strengthened and is moving towards the Philippines as a Super Typhoon. It was forecasted to continue west-north-west and reach northern Luzon and the Babuyan Islands (Philippines) on 14-15 September. Heavy rain, storm surge and strong winds were likely to affect the northern Philippines, southern Taiwan and possibly Hong Kong and parts of southern China.



Track of Typhoon Mangkhut as of 12 September 2018. Image: NWS Guam / NOAA

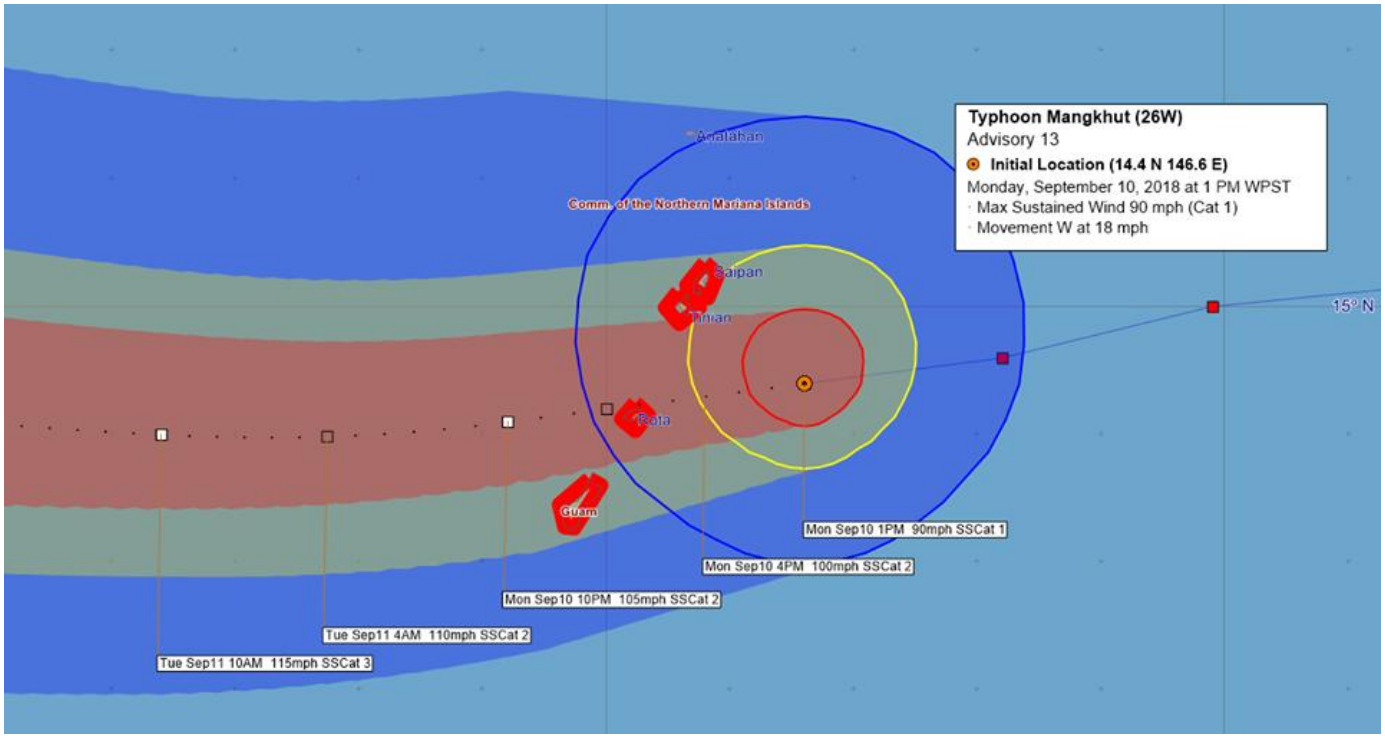
Guam and Northern Mariana Islands

As of 10 September, around 2,100 people had evacuated their homes and were staying in emergency shelters in Guam. Others in vulnerable locations, including tourists in hotels, were warned to stay indoors during the storm. Schools, offices, shops and the airport were all closed temporarily.

According to local media, Typhoon Mangkhut damaged homes, caused widespread power outages, knocked down power poles, flooded some areas and uprooted large trees. Dededo and Yigo were among the worst hit areas.

Most of the damage was caused by strong winds, although some flooding was reported in Yigo. As much as 145.3 mm of rain was recorded in 24 hours to 11 September in Agana.

.



Typhoon Mangkhut approaches Rota, Northern Mariana Islands, 10 September 2018. Image: NWS Guam / NOAA

Philippines

Typhoon Mangkhut was expected to enter the Philippine Area of Responsibility (PAR) Wednesday afternoon. Known locally as 'Ompong' the storm was last observed 1,390 km east of southern Luzon, with maximum sustained winds of 220 km/h per hour near the

centre. Moderate to heavy rain was expected across Luzon and other parts of the country from Wednesday 12 September.

Flood Summary

Event: Typhoon Mangkhut, Guam, Northern Mariana Islands, Philippines and China

Date: September 10 to September 19, 2018

Type: Coastal flood, Flash flood, Landslide

Cause: Storm surge, Extreme rainfall

Locations: Yigo (Guam), Dededo (Guam), Rota, Northern Mariana Islands (Northern Mariana Islands), Itogon (Philippines), Calabarzon (Philippines), Central Luzon (Philippines), Ilocos Region (Philippines), Guangdong Province (China)

Magnitude

Rainfall level: 145.3 mm in 24 hours; Agana, Guam - September 10 to September 11, 2018 WMO figures. Agana is also known as Hagåtña

Rainfall level: 223.2 mm in 24 hours; Laoag, Philippines - September 14 to September 15, 2018
All rainfall figures for China and Philippines via Ogimet

Rainfall level: 268.2 mm in 24 hours; Tuguegarao, Philippines - September 14 to September 15, 2018

Rainfall level: 347.8 mm in 24 hours; Iba, Philippines - September 14 to September 15, 2018

Rainfall level: 543 mm in 24 hours; Baguio, Philippines - September 14 to September 15, 2018

Rainfall level: 289.6 mm in 24 hours; Baguio, Philippines - September 15 to September 16, 2018

Rainfall level: 117.6 mm in 24 hours; Laoag, Philippines - September 15 to September 16, 2018

Rainfall level: 123 mm in 24 hours; Shenzhen, China - September 15 to September 16, 2018

Rainfall level:284 mm in 24 hours; Yangjiang, China - September 16 to September 17, 2018

Rainfall level: 158.5 mm in 24 hours; Shangchuan Dao, China - September 16 to September 17, 2018

Rainfall level:118 mm in 24 hours; Haikou, China - September 16 to September 17, 2018

Rainfall level: 83.1 mm in 24 hours; Hechi, Guangxi Zhuang Autonomous Region, China - September 17 to September 18, 2018

Damages

Evacuated: 2,100; Guam - September 9 to September 11, 2018
Airport was closed, power outages reported

Fatalities: 70 people; Philippines - September 12 to September 19, 2018
Local media (quoted by DG-ECHO) reported over 70 fatalities, with 50 missing (including from the landslides in Itogon Municipality. Alternatively, as of 19 September NDRRMC reported 8 deaths from storm Mangkhut.

Fatalities; 4 people; Guangdong Province, China - September 16 to September 18, 2018

Evacuated: 245,775; Philippines - September 12 to September 18, 2018

Evacuated: 2,500,000; Guangdong Province, China - September 14 to September 18, 2018

Buildings destroyed: 130 buildings: Philippines - September 12 to September 18, 2018

7.28 Middle East – Deadly Flash Floods in Jordan and Kuwait

Source: floodlist.com, 11 November, 2018 by Richard Davies

Further heavy rain in parts of the Middle East had caused flash flooding in Kuwait and Jordan, where at least 12 people had lost their lives.

Severe weather including record rainfall and flooding had affected parts of the Middle East since late October, 2018.

Jordan

Heavy rains and subsequent flash flooding on 9 November left at least 12 people dead in central and southern areas of Jordan.

On 10 November, Minister of State for Media Affairs Jumana Ghunaimat said in a statement that the death toll of the flash floods had risen to 12 (seven in Madaba; 4 in the Dhab'a area of the Desert Highway (Jizah District, Amman Govenorate) and one in the southern governorate of Ma'an).

A total of 29 people were injured in the flash floods, including 8 Civil Defense and Public Security departments' personnel. Emergency teams are are still searching for 14 missing people in Al-Jafr in Ma'an Governorate.

The floods also forced the evacuation of nearly 4,000 tourists from the ancient city of Petra, Ma'an Governorate, where floodwaters in some areas rose up to 4 metres according to state TV. Flash flooding also triggered a state of emergency in the port city of Aqaba.

The floods come just 2 weeks after 21 people died in flash floods in the Dead Sea region of the country.

Kuwait

At least one person died in flash floods Kuwait after heavy rain that began on Friday 09 November, 2018. The equivalent of around 3 months' of rain fell in one day.

Flooding also left several people injured and caused damage to roads, bridges and homes. Schools had been closed by the Education Ministry and the Health Ministry called a state of emergency. Images on Social Media showed cars dragged away by flood water racing through city streets.

Kuwait's meteorological department said via Social Media that Kuwait Airport recorded 49.20mm of rain on 09 November. This was around the same amount normally seen for October, November and December combined.

Around 20 mm of rain fell in 2 hours during the late evening, which was the equivalent of around 1 month of rain. According to WMO, Kuwait Airport's mean total rainfall for November is 18.90mm.

Kuwait, along with parts of Iran and Iraq, were affected by flooding last week after a period of heavy rain from 04 November.

Further warnings for heavy rain and thunder had been issued by Kuwait's meteorological department.

Flood Summary

Event: Iran, Iraq, Kuwait, Jordan, Qatar, Saudi Arabia, November 2018

Date: November 4 to November 20, 2018

Heavy rain in parts of the Middle east caused flooding in Iran, Iraq and Kuwait. Full damage assessments were not available. Local media in Iraq said that wide areas of Diyala Governorate were cut off and some rescues carried out. Over 80 people were displaced in Iran where flooding affected over 1,000 in 8 provinces. Flash flooding was also reported in Kuwait, causing major traffic problems. Local media said some flood rescues were carried out. The government in Kuwait announced a holiday on 06 November for all ministries, public and private schools and universities in response to the heavy rains and flooding. Further heavy rain from around 09 November caused flash flooding in Jordan, where 12 fatalities were reported. Flash floods once again affected Kuwait, where one person died, and Qatar.

Locations:

Kuwait City (Kuwait)
West Azerbaijan (Iran)
Ilam (Iran)
Chaharmahal and Bakhtiari (Iran)
Bushehr (Iran)
Khuzestan (Iran)
Mazandaran (Iran)
Fars (Iran)
Gilan (Iran)
Diyala Governorate (Iraq)
Madaba (Jordan)
Ma'an (Jordan)
Jizah District (Dhab`A), Jordan (Jordan)
Bassel Al-Assad International Airport, Jableh, Syria - Rainfall level 101 mm in 24 hours
Baiji, Iraq - Rainfall level 70 mm in 24 hours
Kanaqin, Iraq - Rainfall level 58 mm in 24 hours
Karbalaa, Iraq - Rainfall level 98 mm in 24 hours
Masjed Soleyman, Khuzestan Province, Iran - Rainfall level 67 mm in 24 hours
Bandar Anzali, Gilan Province, Iran - Rainfall level 62 mm in 24 hours Yasuj, Kohgiluyeh and Boyer-Ahmad Province, Iran - Rainfall level 56 mm in 24 hours
Gachsaran, Kohgiluyeh and Boyer-Ahmad Province, Iran - Rainfall level 61 mm in 24 hours
Ramsar, Mazandaran Province, Iran - Rainfall level 55.2 mm in 24 hours
Bandar Anzali, Gilan Province, Iran - Rainfall level 83.1 mm in 24 hours
Rasht, Gilan Province, Iran - Rainfall level 52 mm in 24 hours Bushehr, Bushehr Province, Iran - Rainfall level 67 mm in 24 hours
Noshahr, Mazandaran Province, Iran - Rainfall level 53.2 mm in 24 hours
Ramsar, Mazandaran Province, Iran - Rainfall level 63 mm in 24 hours
Kuwait Airport - Rainfall level 49.2 mm in 24 hours
Al Shehaimiya, near Al Nu`man, Qatar - Rainfall level 30.9 mm in 24 hours
Lankaran, Azerbaijan - Rainfall level 182 mm in 24 hours
Yasuj, Kohgiluyeh and Boyer-Ahmad Province, Iran - Rainfall level 76 mm in 24 hours
Ilam, Ilam Province, Iran - Rainfall level 90 mm in 24 hours
Al Qaisumah Saudi Arabia - Rainfall level 79 mm in 24 hours

Magnitude

Place	Rainfall level (WMO figures)	Date
Bassel Al-Assad International Airport, Jableh, Syria	101 mm in 24 hours	November 4 to November 5, 2018
Baiji, Iraq	70 mm in 24 hours	November 4 to November 5, 2018
Kanaqin, Iraq	58 mm in 24 hours	November 4 to November 5, 2018
Karbalaa, Iraq	98 mm in 24 hours	November 4 to November 5, 2018
Masjed Soleyman, Khuzestan Province, Iran	67 mm in 24 hours	November 5 to November 6, 2018
Bandar Anzali, Gilan Province, Iran	62 mm in 24 hours	November 5 to November 6, 2018
Yasuj, Kohgiluyeh and Boyer-Ahmad Province, Iran	56 mm in 24 hours	November 5 to November 6, 2018
Gachsaran, Kohgiluyeh and Boyer-Ahmad Province, Iran	61 mm in 24 hours	November 5 to November 6, 2018
Ramsar, Mazandaran Province, Iran	55.2 mm in 24 hours	November 6 to November 7, 2018
Bandar Anzali, Gilan Province, Iran	83.1 mm in 24 hours	November 6 to November 7, 2018
Rasht, Gilan Province, Iran	52 mm in 24 hours	November 6 to November 7, 2018
Bushehr, Bushehr Province, Iran	67 mm in 24 hours	November 6 to November 7, 2018
Noshahr, Mazandaran Province, Iran	53.2 mm in 24 hours	November 6 to November 7, 2018
Ramsar, Mazandaran Province, Iran	63 mm in 24 hours	November 6 to November 7, 2018
Kuwait Airport	49.2 mm in 24 hours (Kuwait's meteorological department figures)	November 9 to November 9, 2018
Lankaran, Azerbaijan	182 mm in 24 hours	November 12 to November 13, 2018
Yasuj, Kohgiluyeh and Boyer-Ahmad Province, Iran	76 mm in 24 hours	November 15 to November 16, 2018
Ilam, Ilam Province, Iran	90 mm in 24 hours	November 15 to November 16, 2018
Al Qaisumah Saudi Arabia	79 mm in 24 hours	November 14 to November 15, 2018

Damages

Affected : 1,117; Iran - November 5 to November 8, 2018
According to Iranian Red Crescent, people were affected in the provinces of West Azerbaijan, Ilam, Chaharmahal and Bakhtiari, Bushehr, Khuzestan, Mazandaran, Fars, and Gilan

Evacuated: 83 people; Iran - November 5 to November 8, 2018

Buildings destroyed or damaged : 18 buildings
Iran - November 5 to November 8, 2018

Affected: 50,000;
Diyala Governorate, Iraq - November 5 to November 8, 2018
Estimated figures. National Iraqi News Agency (NINA) said at areas around Baquba were cut off, as were Mandali and Qazani.

Rescued: 8 people;
Diyala Governorate, Iraq - November 5 to November 8, 2018
National Iraqi News Agency (NINA) said people in the village of Hanoun were rescued from floods by military teams.

Fatalities: 12 people
Jordan - November 9 to November 11, 2018
7 in Madaba; 4 in the Dhaba' area on the Desert Highway and one in the southern governorate of Ma'an

EUROPE

7.29 Greece – Evacuations After Floods in Thessaly

Source: floodlist.com, 2 March, 2018 by Richard Davies

The regional government of Thessaly in central Greece declared a state of emergency last week after intense rainfall caused rivers to overflow. The government said the severe weather was unprecedented, and brought unusually intense high rainfall over a short period of time.

A weather station near the village of Zagora in Magnesia regional unit recorded 676 mm of rain between 21 and 26 February, including 208.8 mm in 24 hours to 26 February.Heavy rainfall elsewhere in the region caused the Pinios River and its tributaries to overflow in Trikala regional unit. Farmland was inundated and areas around several villages flooded, including Valtino, Farkadona, Exalofos, Eleftherochori, Matsoukiotika and Dendrochori.

Local media also reported flooding and evacuations in the municipality of Pyli along the Portaikos River in Trikala regional unit. On 26 February the Greek Directorate for Emergency Planning and Response requested Copernicus Emergency Mapping Service to produce delineation maps showing the extent of flooding. Copernicus is the EU programme for satellite Earth observation. See all the maps here.

Map of the floods in Trikala, Greece, February to March 2018. Image: Copernicus EMS

As of 02 March, heavy rain fall was also reported in Zakynthos, Ionian Islands. Flooding in November last year caused major devastation in West Attica, Greece. At least 23 people died and around 1,000 buildings were damaged.

Flood Summary

Event: Central Greece, February 2018
Type: Flash flood, River flood
Cause: Extreme rainfall, Long-term rainfall
Locations:
Valtino, Farkadona, Exalofos, Eleftherochori, Trikala, Matsoukiotika, Dendrochori, Zagora

Magnitude

Rainfall level: 208.8 mm in 24 hours; Zagora - February 25 to February 26, 2018

Rainfall level: 32.2 mm in 24 hours; Larissa - February 25 to February 26, 2018

Rainfall level: 30.6 mm in 24 hours; Trikala - February 25 to February 26, 2018

Rainfall level: 63 mm in 24 hours; Elati - February 24 to February 25, 2018

Rainfall level: 48 mm in 24 hours; Karditsa - February 25 to February 26, 2018

Rainfall level: 134.6 mm in 24 hours; Zagora - February 20 to February 21, 2018
Rainfall level: 36.8 mm in 24 hours; Zagora - February 21 to February 22, 2018

Rainfall level: 120.6 mm in 24 hours; Zagora - February 22 to February 23, 2018

Rainfall level: 80.6 mm in 24 hours; Zagora - February 23 to February 24, 2018

Rainfall level: 94.6 mm in 24 hours; Zagora - February 24 to February 25, 2018

River level: Overflowing
Pinios River, Trikala regional unit - February 26, 2018

River level: Overflowing
Portaikos river, Pyli, Trikala regional unit - February 26, 2018

Rainfall level: 130 mm in 24 hours; Zakynthos, Ionian Islands - March 2 to March 3, 2018

Damages

Evacuated: 30 people; Pyli - February 25 to March 2, 2018 Estimated figure

Roads closed: 15 roads; Pelion - February 25 to March 2, 2018

7.30 Italy – Evacuations after Major Floods in Trentino Province

Source: floodlist.com, 4 July, 2018, by Richard Davies

As much as 130 mm of rain fell in under 4 hours on 03 July in the town of Moena and surrounding areas in the province of Trentino, northern Italy.

The torrential rain caused rivers to overflow and sent mud and flood water raging through Moena's streets. Authorities pre-emotively evacuated around 50 people from their homes in Moena and areas near San Pellegerino. Safe accommodation was provided in a local school. Roads were closed in 4 locations around Soraga, Moena and San Pellegerino.

Trentino Civil Defense said that radar images showed that an area of 6 km radius around the town of Moena received about 130 mm of rain between 14:00 and 18:00 on 03 July, 2018. Other areas of the province also saw severe weather, including thunderstorms, lightning strikes and strong winds.

Floods in Moena, Trentino, Italy, 03 July 2018. Photo: Government of Trentino

Floods in Moena, Trentino, Italy, 03 July 2018. Photo: Government of Trentino

Flood Summary

Event: Trentino Province, Italy, July 2018
Date: July 3 to July 4, 2018
Locations: Moena, Soraga, San Pellegerino

Magnitude

Rainfall level: 130 mm in 24 hours; Moena - July 3 to July 3, 2018
Trentino Civil Defense said that radar images showed that an area of 6 km radius around the town of Moena received about 130 mm of rain between 14:00 and 18:00 on 03 July, 2018

Damages

Evacuated: 50 people; Trentino - July 3 to July 4, 2018
Authorities pre-emptively evacuated around 50 people from their homes in Moena and areas near San Pellegerino

7.31 France -Deadly Floods in South West After 244mm of Rain in 6 Hours

Source: floodlist.com, 15 October, 2018 by Richard Davies

At least 6 people had died in floods affecting parts of southern France after extremely heavy rainfall over night, 14 to 15 October, 2018.

The heaviest of the rain fell in Aude department. Meteo France said that in a 12 period to early 15 October, 295 mm of rain fell was recorded Trèbes, which was the equivalent of 4 months of rain. Furthermore, 244 mm of that total fell in just a 6 hour period.

Elsewhere, 211 mm of rain was recorded in Arquettes-en-Val, 178 mm in Mouthoumet, 172 mm in Les Martys and 138 mm in Carcassonne.

A red warning (highest level) for flooding Aude Department was in place. An orange level for flooding was in place for Pyrénées-Orientales department and orange level warnings for heavy rain had been issued for Tarn, Herault and Aveyron departments.

Vigicrues, the flood information service provided by France's Environment Ministry, reports that rivers are at red alert level (level 4 of 4) in areas of the Vallée Centrale in Aude Department. Orange and yellow warnings had been issued for other rivers in the south west of France.

Levels of the Aude River at Trèbes jumped 7 metre overnight, reaching levels not seen since the floods of October 1891. As of 07:30 on 15 October the river stood at 7.68 meters. In 1891 the river reached 7.95 meters.

In a statement of 15 October, France Prime Minister Edouard Philippe said flooding was affecting the municipalities of Carcassonne, Conques sur Orbiel, Aragon, Berriac, Trèbes, Floure, Villegailhenc, Villemoustaussou and Villalier.

Firefighters had carried out over 250 interventions since last night in Carcassonne. Edouard Philippe said that 350 firefighters, supported by 160 gendarmes, had been deployed and several helicopters had been mobilized.

French News Agency AFP reported 6 deaths as of early 15 October, including 1 in Villardonnel, 4 in Villegailhenc, near Carcassonne and 1 in Trèbes.

Floods in Var Department, Corsica and Sardinia

Two people died in flooding in Var department, France, last week, after their vehicle was swept into the sea by flood waters near Saint-Maxime. Firefighters made more than 275 interventions, and 26 people were rescued. The flooding came after torrential rain fell in

the area overnight, causing the Garonnette River to burst its banks. Over 170 mm of rain was recorded in 24 hours to 11 October in Les Arcs, Var Department.

Heavy rain also fell in the Mediterranean islands of Corsica (France) and Sardinia (Italy) where one person died after her vehicle was swept away by flood water near the town of Assemini.

Flood Summary

Event: Southern France, October 2018

Extremely heavy rainfall caused flooding in south west France overnight 14 to 15 October, 2018. Local observers said the rain was produced by remnants of Hurricane "Leslie" which made landfall in Portugal on 13 October as Category 1 hurricane, with heavy rain and maximum sustained winds of 120 km/h.

In Portugal Hurricane "Leslie" left 325,000 people without electricity, 27 people suffered minor injuries. Civil Protection registered almost 1,900 incidents during the night of Saturday and early Sunday (13 to 14 October), most of it a result of wind damage, although some surface flooding was reported in the Lisbon area.

Further heavy rain and some flooding were reported in Corsica 16 to 17 October.

Locations:

Carcassonne
Conques sur Orbiel
Aragon
Berriac
Trèbes
Floure
Villegailhenc
Villemoustaussou
Villalier

Magnitude

Rainfall level: 295 mm in 24 hours; Trèbes - October 14 to October 15, 2018
Figures from Meteo France for a 12 to 13 hour period. 244 mm of that total fell in just a 6 hour period

Rainfall level: 211 mm in 24 hours; Arquettes-en-Val - October 14 to October 15, 2018

Rainfall level: 178 mm in 24 hours; Mouthoumet - October 14 to October 15, 2018

Rainfall level: 172 mm in 24 hours; Les Martys - October 14 to October 15, 2018

Rainfall level; 138 mm in 24 hours; Carcassonne - October 14 to October 15, 2018

River level; 7.68 meters; Aude River at Trèbes - October 15 to October 15, 2018
Highest level since 1891 when the river reached 7.95 meters.

Rainfall level: 90 mm in 24 hours; Bastia corsica - October 16 to October 17, 2018
WMO figures

Damages
Fatalities: 14 people; Aude Department - October 14 to October 15, 2018

Evacuated: 1,000; October 15 to October 15, 2018
Pezens, Trèbes, Villemoustaussou, Villegailhenc

Injured: 74 people; Aude Department - October 15 to October 16, 2018

Flood Summary
Event: France and Italy, October 2018

Date: October 9 to October 13, 2018

Locations:

Saint-Maxime (France)
Roquebrune (France)
Saint-Tropez (France)
Assemini (Italy)

Magnitude
Rainfall level: 104 mm in 24 hours; Lézignan-Corbières (Aude) - October 8 to October 9, 2018
All figures for France via Météo-France

Rainfall level: 255 mm in 24 hours; Mont Aigoual (Gard) - October 10 to October 11, 2018

Rainfall level: 187 mm in 24 hours; Castanet-le-Haut (Hérault) - October 10 to October 11, 2018

Rainfall level: 175 mm in 24 hours
Mandelieu la Napoule (Maritime Alps) - October 10 to October 11, 2018
61 mm in 1 hour

Rainfall level: 173 mm in 24 hours; Les Arcs (Var) - October 10 to October 11, 2018
equivalent to 4 to 7 weeks of precipitation

Rainfall level: 158 mm in 24 hours; Draguignan (Var) - October 10 to October 11, 2018

Rainfall level: 95 mm in 24 hours; Lugo-di-Nazza (Corsica) - October 10 to October 11, 2018
40 mm in 1 hour

Rainfall level: 67 mm in 24 hours; Conca (Corsica) - October 10 to October 11, 2018

River level: Overflowing
Garonnette at Sainte-Maxime, Var, France - October 10 to October 11, 2018

River level: 5.5 metres
Argens aval, Roquebrune, Var - October 11 to October 11, 2018

Rainfall level: 154 mm in 24 hours
Cagliari / Elmas - October 10 to October 11, 2018
Ogimet figures

Rainfall level: 84 mm in 24 hours
Decimomannu - October 10 to October 11, 2018

Damages

Fatalities: 2 people
Var Department, France - October 10 to October 11, 2018

Rescued: 26 people
Var Department, France - October 10 to October 11, 2018

Evacuated: 100 people
France - October 11 to October 12, 2018
80 in Var, 20 in Corsica

Fatalities: 1 person
Assemini, Sardinia, Italy - October 10 to October 11, 2018

OCEANIA

7.32 Australia – Record Rain, Floods and Evacuations in North

Source: floodlist.com, 31 January,2018 by Richard Davies

Days of heavy rain in northern Australia caused flooding in parts of Kimberley in the state of Western Australia (WA) and the town of Daly River, Northern Territory (NT) state, where over 300 people had been evacuated.

Some areas had recorded over 700 mm of rain in the last few days. During January, Broome in WA recorded its highest monthly rainfall on record with 942.2 mm.

Australia's Bureau of Meteorology (BoM) said that the heavy rains were as a result of an active phase of the monsoon and a tropical low.

The highest weekly rainfall totals were observed in the Northern Territory, where many locations had falls in excess of 500 mm. Humpty Doo, a town in rural Darwin, and West Roebuck both received more than 700 mm during the last seven days. Broome and West Roebuck observed rainfall in excess of 400 mm on 30 January.

BOM added that "during the last few days, a tropical low had focused the heaviest rainfall on the western Top End of the Northern Territory and the western Kimberley region."

"The low is forecast to track inland over coming days, moving further away from the open waters that provided its energy. As it does so, increasing amounts of dry air will infiltrate the system and it will steadily weaken," BoM added.

Western Australia

The Kimberley town of Broome recorded 412.2 mm in 24 hours between 29 and 30 January, its second wettest day on record behind the 476.6 mm set in 1997.

The tropical low also brought string winds of 100 kph, with gusts of up to 125kph. Home and businesses had been flooded and more than 450 residents lost power, according to local media.

The Bureau of Meteorology said via Social Media, "Broome has recorded 697.2mm in the past 5 days which is the highest 5-day total on record going back to 1889. The previous highest 5-day total was 667.4mm in 1978. Broome also received their highest monthly rainfall on record with 942.2mm!"

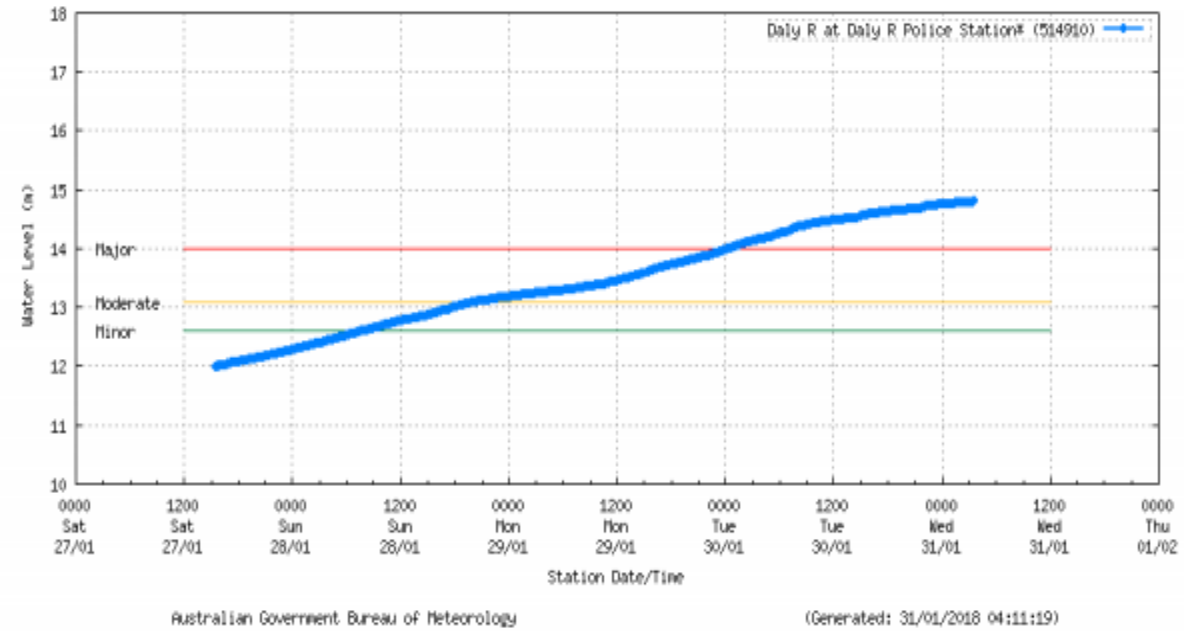
Emergency WA has warned residents in several areas of Kimberley, including Sandy Desert, West Kimberly and Fitzroy River catchments of possible flooding over the coming days.

Northern Territory

In Northern Territory, the Daly River overflowed affecting parts of the town of the same name.

The area recorded 252 mm of rain in 24 hours to 30 January, and about 500mm of rain over three days. As of early 31 January local time, the Daly River stood at 17.52 metres, over 3.5 metres above major flood stage

.



Levels of Daly River, January 2018. Image BoM

"The current advice from the Bureau of Meteorology was that the Daly River has reached major flood levels and will remain above major for some time" Northern Region Emergency Controller, Assistant Commissioner Matthew Hollamby said on 30 January.

Schools had been closed and there was a boil alert for those residents remaining in the area.

Daly River floods, January 2018. Photo: Northern Territory Police, Fire and Emergency Services

Flood Summary

Event: Northern Territory and Western Australia, January 2018
Type: Flash flood, River flood
Locations: Broome, Daly River

Magnitude

Rainfall level: 412 mm in 24 hours; Broome, WA - January 29 to January 30, 2018

Rainfall level: 448.8 mm in 24 hours; West Roebuck, WA - January 29 to January 30, 2018

Rainfall level: 252 mm in 24 hours; Daly River Police Station, NT - January 29 to January 30, 2018

River level: 17.523 metre; Daly River at Daly River, NT - January 31 to January 31, 2018
Flood levels: Minor: 12.60 Moderate: 13.10 Major: 14.00

Damages

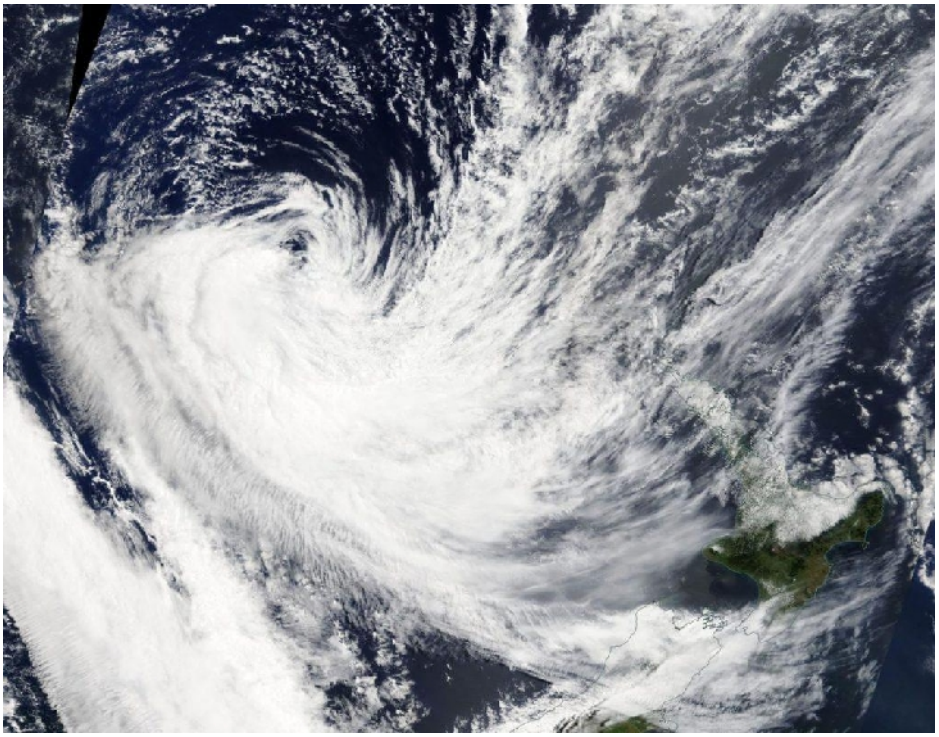
Evacuated: 380 people; Daly River - January 28 to January 30, 2018

7.33 New Zealand – Ex Cyclone Fehi Causes Major Flooding

Source: floodlist.com, 1 February, 2018 by Richard Davies

After causing severe flooding in New Caledonia, the remnants of Tropical Cyclone Fehi brought severe weather including thunderstorms, heavy rain and strong winds to parts of the South Island of New Zealand from 31 January 2018.

Thousands of homes had been left without power. Local states of emergency had been declared in Buller and Dunedin.



NASA's Terra satellite captured this visible image of extra-tropical cyclone Fehi northwest of New Zealand on Jan. 31. Bands of thunderstorms extending far southeast of center were brushing northwestern New Zealand. Credit: NASA

Buller, West Coast Region

Buller District Council said that there had been evacuations in many low lying areas such as Snodgrass, Carters Beach and Derby Street and many houses had experienced flooding.

The Emergency Operation Centre had been on standby since yesterday and was now in full swing as a coordination point for welfare, planning, communications and the general emergency operations

The main issue had been the high tide which was at 12.20 hrs. The water was then starting to recede in some areas however continues to rise in areas north of Westport. Evacuated residents should not return home until notified it is safe to return

Dunedin, Otago Region

Dunedin City Council said that more than 108mm of rain had fallen in Dunedin. Rain and winds had eased off and river levels were dropping, but there were still areas with surface flooding.

Dunedin Civil Defense Controller Leanne Mash says the state of emergency declared at around 14:00 (local time) on 01 February, 2018 will remain in place overnight and be re-assessed in the morning.

The council said up to 800 properties was vulnerable to flooding, mainly in South Dunedin. A few people evacuated their homes but centers in South Dunedin and Mosgiel set up to house those displaced had since closed due to lack of demand.

At this stage it was not clear how many houses have been affected by floodwaters. A number of roads around the city will remain closed.

More Rain Forecast

Meteorological Service of New Zealand said the storm will weaken overnight, although its associated front will move east across the North Island.

"This storm and front should bring further periods of heavy rain to the northwest of the South Island and the central areas of the North Island till Friday morning (02 February, 2018).

"The heaviest rain was expected in Westland, Buller, the ranges of northwest Nelson and Canterbury High Country, also Waikato, Waitomo,Taumarunui, Taupo and Taihape including Tongariro National Park, Bay of Plenty and the ranges of Gisborne. A heavy rain warning was still in force for these areas.

"Heavy rain had eased in Fiordland, Southland, Otago, Marlborough and eastern Nelson, and the heavy rain Warning for these areas is now lifted."

Flood Summary

Event: Tropical Cyclone Fehi, New Caledonia and New Zealand, January to February2018
Date: January 29 to February 4, 2018

Tropical Cyclone Fehi caused severe flooding in New Caledonia from 29 January, 2018. Remnants of the cyclone Fehi brought severe weather to parts of the South Island of New Zealand from 31 January 2018, then later to areas west of Auckland, North Island.

Locations

- Kouaoua (New Caledonia)
- Houaïlou (New Caledonia)
- Ponérihouen (New Caledonia)
- Canala (New Caledonia)
- Poindimié (New Caledonia)
- Nouméa (New Caledonia)
- Dunedin (New Zealand)
- Buller (New Zealand)
- Waitakere Ranges (New Zealand)

Magnitude

Rainfall level: 32 mm in 24 hours; Nouméa, New Caledonia - January 28 to January 29, 2018

Rainfall level: 278 mm in 24 hours; Canala, New Caledonia - January 28 to January 29, 2018

River level: Overflowing; Nimbaye River, Ponérihouen, New Caledonia - January 29 to January 30, 2018

Rainfall level: 108 mm in 24 hours; Dunedin, New Zealand - January 31 to February 1, 2018

Rainfall level: 165 mm in 24 hours; Secretary Islands, New Zealand - January 31 to February 1, 2018

Damages

Additional: New Caledonia - January 29 to January 30, 2018
roads blocked and at least 2 bridges damaged according to media reports.

Evacuated: 100 people; Buller, New Zealand - January 31 to February 1, 2018
Estimated figure

Evacuated: 100 people; Piha, New Zealand - February 2 to February 3, 2018

Fatalities:2 people; Waitakere Ranges - February 3 to February 3, 2018
According to local media, 2 people died attempting to cross a swollen river beneath the Cascades Falls, Waitakere Ranges.

7.34 Samoa – Tropical Cyclone Gita Causes Landslides and Flooding

Source: floodlist.com 12 February, 2018 by Richard Davies

Days of heavy rainfall brought by Tropical Cyclone Gita had caused flooding and landslides in Samoa. The storm dumped massive amounts of rain from 07 to 11 February. Some areas recorded over 600 mm in a 24 hour period.

Strong winds from the storm also caused wind and coastal damage. In a statement of 10 February, the government of Samoa said that no injuries or deaths were reported. Around 250 people evacuated their homes and stayed in shelters during the storm.

Electricity, communications and water supply had been cut in some areas, mostly as a result of wind damage.

Samoa's Land Transport Authority reported landslides had blocked roads in Solosolo and Saleapaga. Flood water blocked roads in several areas, including Matautu, Faatoia Apia, Savai'i and Afega, according to Land Transport Authority.

Floods in Samoa after Tropical Cyclone Gita in February 2018.
Photo: Land Transport Authority

American Samoa

In neighboring American Samoa, the storm also caused extensive damage to power, water and telecommunications. Homes had been damaged and schools and businesses shut down. No fatalities had been reported. A state of emergency had been declared.

Tonga and Fiji

The EU's Directorate-General for European Civil Protection and Humanitarian Aid Operations (ECHO) said that "GITA is forecast to pass near or over the islands of Eua (4,900 people) and Tongatapu (74,600 people, the most populous island of Tonga) on 12 February as an intense Tropical Cyclone with maximum sustained winds of 210-220 km/h. It was then forecast to pass south of Ona-I Lau Island (Fiji) on 13 February. Very strong winds heavy rains and storm surge could affect these islands as well as Ha'apai and Vava'u group of Islands (Tonga)."

Global Disasters Alerts and Coordination System (GDACS) had issued a red alert for GITA in Tonga, as the cyclone can have a high humanitarian impact based on strong winds, affected population and their vulnerability.

The government of Tonga had declared a state of emergency. Evacuation centres had been set up in Tongatapu, Vava'u, Ha'apai and 'Eua.

Flood Summary

Event: Tropical Cyclone Gita, Samoa, American Samoa, Tonga, Fiji and New Zealand
Type: Flash flood, Landslide

Locations:

Matautu, Faatoia, Savaii, Afega and Malie (Samoa)
Faatoia (Samoa)
Savaii (Samoa)
Afega (Samoa)
Saleapaga (Samoa)
Solosolo (Samoa)
Pago Pago (American Samoa)
Tongatapu (Tonga)
'Eua (Tonga)
Ha'apai (Tonga)
Riwaka (New Zealand)
Tasman (New Zealand)
New Plymouth (New Zealand)
Takaka (New Zealand)

Magnitude

River level: Overflowing
Vaisigano River, Apia, Samoa - February 9 to February 11, 2018

Rainfall level: 105 mm in 24 hours; Apia / Upolu Island, Samoa - February 10 to February 11, 2018
Ogimet figures

Rainfall level: 204 mm in 24 hours; Le Piu Tai, Samoa - February 9 to February 10, 2018

Rainfall level: 200.5 mm in 24 hours; Maota Int Airport, Samoa - February 9 to February 10, 2018

Rainfall level: 402 mm in 24 hours: Mt Talu, Samoa - February 9 to February 10, 2018

Rainfall level: 264 mm in 24 hours; Apia / Upolu Island, Samoa - February 9 to February 10, 2018

Rainfall level: 212.5 mm in 24 hours; Le Piu Tai, Samoa - February 8 to February 9, 2018

Rainfall level: 314 mm in 24 hours Mt Talu, Samoa - February 8 to February 9, 2018

Rainfall level: 647.5 mm in 24 hours; Le Piu Tai, Samoa - February 7 to February 8, 2018

Rainfall level: 262.5 mm in 24 hours; Maota Int Airport, Samoa - February 7 to February 8, 2018

Rainfall level: 627.5 mm in 24 hours; Maota Int Airport, Samoa - February 7 to February 8, 2018

Rainfall level: 109 mm in 24 hours; Pago Pago, American Samoa - February 8 to February 9, 2018

Rainfall level: 68.6 mm in 24 hours; Niuafo‘ou, Tonga - February 10 to February 11, 2018

Rainfall level: 80.6 mm in 24 hours; Wellington, New Zealand - February 20 to February 21, 2018
Note; Figure for New Zealand from MetService NZ for the duration of the storm, therefore possibly longer period than 24 hours.

Rainfall level: 80.6 mm in 24 hours; Kelburn, New Zealand - February 20 to February 21, 2018

Rainfall level: 69.2 mm in 24 hours; Christchurch Airport, New Zealand - February 20 to February 21, 2018

Rainfall level: 96.6 mm in 24 hours; Le Bons Bay, New Zealand - February 20 to February 21, 2018

Rainfall level: 60.2 mm in 24 hours; Dunedin Airport, New Zealand - February 20 to February 21, 2018

Rainfall level: 296.5 mm in 24 hours; Hundalee ranges south of Kaikoura, New Zealand - February 20 to February 21, 2018

Damages

Evacuated: 244 people ; Samoa - February 9 to February 12, 2018

Roads damaged: 30 roads; Samoa - February 9 to February 12, 2018
Estimated figure. Numerous roads suffered flood and landslide damage, according to Samoa Land Transport Authority

Fatalities: 1 person; Tonga - February 11 to February 13, 2018

Evacuated: 3,900; Tonga - February 11 to February 13, 2018

Buildings destroyed: 95 buildings; Tonga - February 11 to February 13, 2018
much of the damage was a result of strong winds

Evacuated: 200 people; Nelson-Tasman Region, New Zealand - February 20 to February 21, 2018

7.35 Fiji – PM Warns of Constant Threat of Extreme Weather Events as Storm Josie Death Toll Rises

Source: floodlist.com, 4 April, 2018 by Richard Davies

After the death and destruction caused by Tropical Cyclone Josie, the Prime Minister of Fiji warned of the constant threat of extreme weather events facing Fiji as a result of climate change.

Meanwhile, Fiji's National Disaster Management Office said that the number of deaths from the storm had increased to six.

Almost 2,300 people were still displaced, staying in 40 evacuation centers. Food and relief supplies were being distributed and clean-up operations had begun. Many roads had been re-opened and water and electricity supply restored. Government ministries had started to carry out initial damage assessments.

Meanwhile Fiji Meteorological Service had warned of further heavy rain and potential flooding, particularly in the north.

Constant Threat of Extreme Weather Events

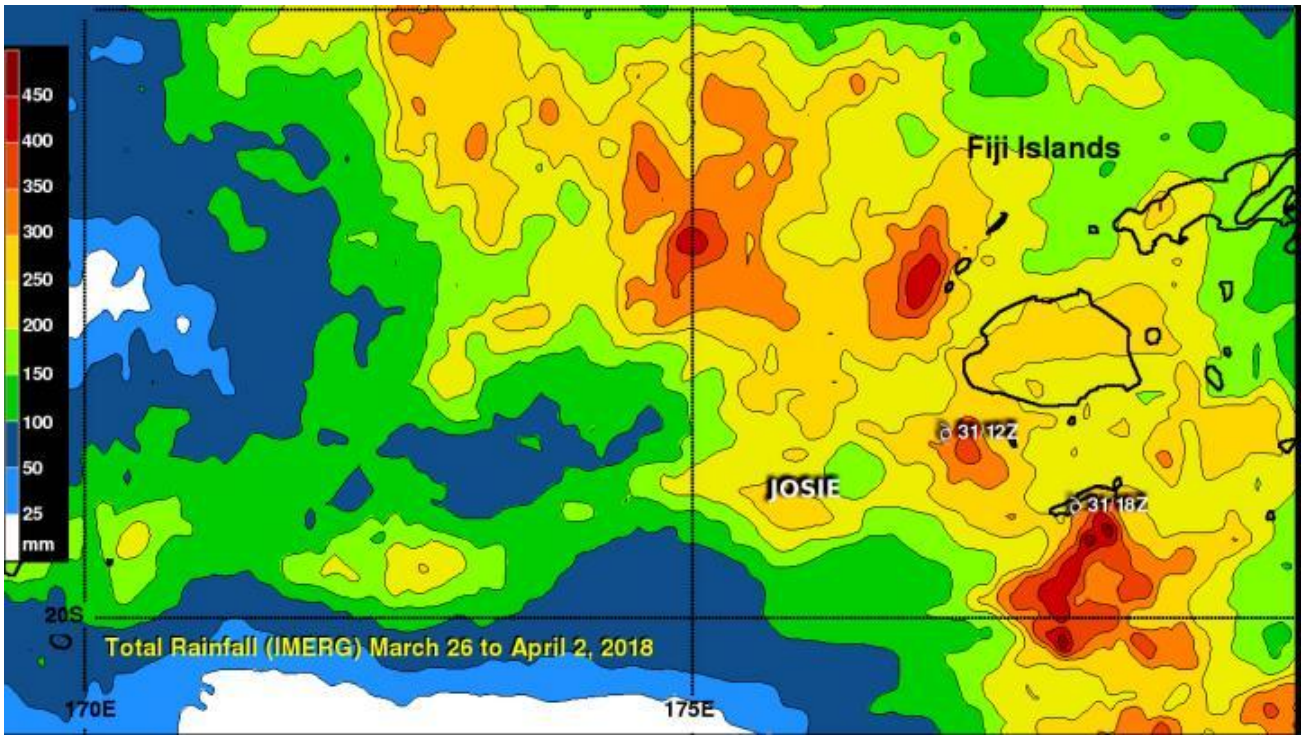
Speaking at an event to launch a climate change virtual reality project in Suva, Prime Minister Voreqe Bainimarama said "we are now at an almost constant level of threat from these extreme weather events that are becoming more frequent and more severe because of climate change.

"And while as a nation, we are striving to build our resilience and adapt to the frightening new era that is upon us, Fiji is also doing what it can to address the root cause of these events through our leadership of the global climate negotiations, COP23."

NASA Examines Rainfall from Cyclone Josie

NASA calculated the rainfall that Josie left in its wake as it moved south of Fiji and began weakening. At NASA's Goddard Space Flight Center in Greenbelt, Maryland a rainfall accumulation analysis was created using Integrated Multi-satellitE Retrievals for GPM (IMERG) data.

The IMERG analysis showed the locations of rainfall during the period from March 26 to April 2, 2018. During this period tropical cyclone Josie formed and passed by close to the southwest of Fiji and then to the southeast. IMERG data indicated that rainfall totals of greater than 250 mm (9.8 inches) occurred over large parts of Fiji. IMERG also indicated that tropical cyclone Josie produced extreme rainfall totals greater than 450 mm (17.7 inches) in some areas along the storm's track.



This rainfall analysis covers March 26-April 2, 2018. During this period tropical cyclone Josie formed and passed by close to the southwest of Fiji and then to the southeast. IMERG data indicated that rainfall totals of greater than 250 mm (9.8 inches) occurred over large parts of Fiji and extreme rainfall totals greater than 450 mm (17.7 inches) in some areas along the storm's track. Credits: NASA/JAXA, Hal Pierce

More Flooding Possible

Fiji's met office warned that a trough of low pressure continues to affect the Fiji islands, and the Northern Division with nearby islands had been issued a heavy rain warning. A Flood Alert had also been issued to major rivers of Vanua Levu and Taveuni.

Photos of Damage Caused by Tropical Cyclone Josie

Below is a selection of photos showing some of the damage caused by Tropical Cyclone Josie in Fiji, as a part of a visit made by the Prime Minister to affected areas in Western Division.

Damage caused by Tropical Cyclone Josie in Fiji, April 2018. Photo: Government of Fiji

The Prime Minister assess the damage caused by Tropical Cyclone Josie in Fiji, April 2018. Photo: Government of Fiji

Damage caused by Tropical Cyclone Josie in Fiji, April 2018. Photo: Government of Fiji

The Prime Minister assesses the damage caused by Tropical Cyclone Josie in Fiji, April 2018. Photo: Government of Fiji

The Prime Minister assesses the damage caused by Tropical Cyclone Josie in Fiji, April 2018. Photo: Government of Fiji

Flood Summary

Event: Tropical Cyclone Josie, Fiji, March and April 2018

Date: March 31 to April 4, 2018

Locations: Nadi, Ba,Lautoka, Sabeto

Magnitude

Rainfall level: 60.7 mm in 24 hours; Nausori - April 1 to April 2, 2018

Rainfall level: 121.7 mm in 24 hours; Vunisea - April 1 to April 2, 2018

Rainfall level: 83 mm in 24 hours; Yasawa-I-Rara - March 31 to April 1, 2018

Rainfall level: 77 mm in 24 hours; Rakiraki Aws - March 31 to April 1, 2018

Rainfall level: 106 mm in 24 hours; Viwa Island - March 31 to April 1, 2018

Rainfall level: 163.6 mm in 24 hours; Nandi - March 31 to April 1, 2018

Rainfall level: 100 mm in 24 hours; Sigatoka - March 31 to April 1, 2018

Rainfall level: 81.1 mm in 24 hours; Nausori - March 31 to April 1, 2018

Rainfall level: 99.2 mm in 24 hours; Vunisea - March 31 to April 1, 2018

Damages

Fatalities: 6 people; Vanua Levu Island, Fiji - March 31 to April 4, 2018

Evacuated: 2,300; Vanua Levu Island, Fiji - April 1 to April 4, 2018

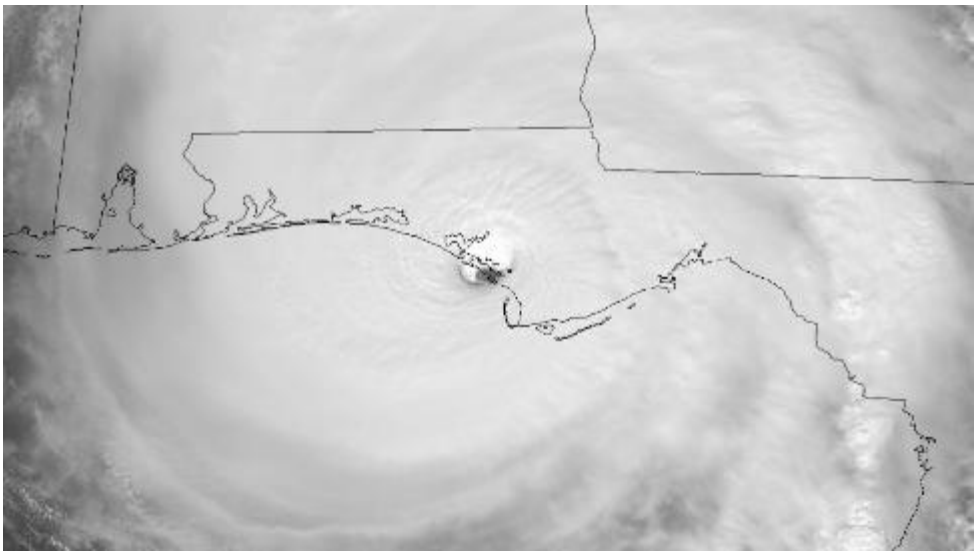
7.36 Hurricane Michael Likely To Be the 12th Billion-Dollar U.S. Weather Disaster of 2018

Source: weather.com, 10 October, 2018

- Through September, the United States had been hit by 11 billion-dollar weather disasters so far in 2018.
- Hurricane Michael is likely to be added to the list.

Hurricane Michael was become the 12th billion-dollar weather disaster to affect the United States in 2018.

Through September, the nation had seen 11 weather disasters that cost a billion dollars or more. The first was a winter storm just after the New Year and the most recent was Hurricane Florence, according to NOAA's report released Tuesday.



Visible satellite view of Michael at landfall on Wednesday afternoon. (NOAA)

Michael made landfall Wednesday afternoon as a strong Category 4 with 155 mph winds near Mexico Beach, Florida.

Last year had 16 billion-dollar weather disasters, tying 2011 for the most in a year dating to 1980. After Michael was likely included, 2018 would had 12 billion-dollar weather disasters, ranking as fourth most on record for a single year.

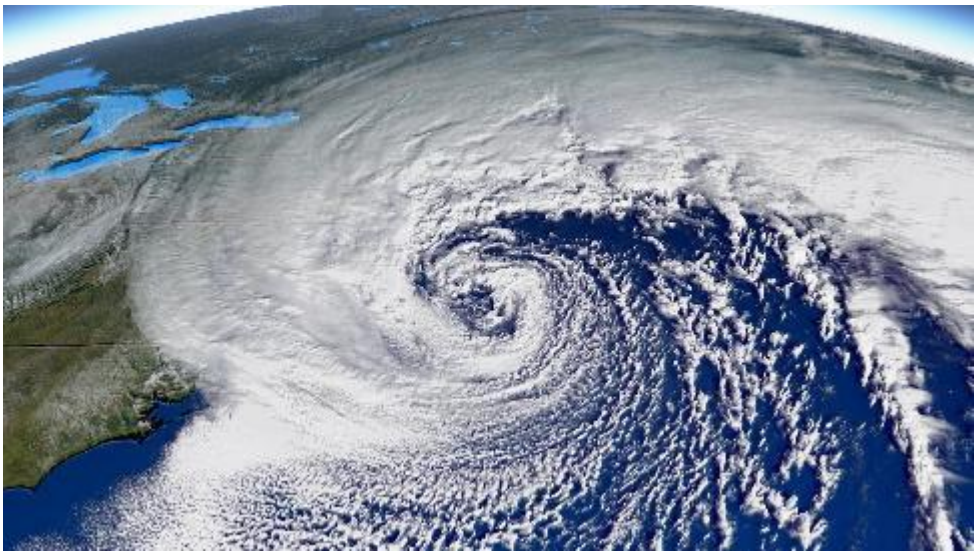
Below are the 11 billion-dollar U.S. weather disasters that occurred before Michael struck, according to NOAA.

1. Eastern Winter Storm, Jan. 3-5

Winter Storm Grayson swept through the eastern states just after the New Year, leaving a swath of snow, sleet and freezing rain from northern Florida to Maine.

Blizzard conditions, heavy snow and major coastal flooding walloped the Northeast as Grayson's area of low pressure underwent bombogenesis.

NOAA says the winter storm caused $1.1 billion in damage and killed 22 people.



Satellite image of Winter Storm Grayson off the East Coast on Jan. 4, 2018.

2. Northeast Winter Storm, March 1-3

March came in like a lion in the Northeast as Winter Storm Riley pummeled the region with heavy snow, high winds and major coastal flooding.

The high-impact Nor'easter caused widespread damage in the Northeast, according to NOAA. At the height of the storm, more than 2 million lost power.

Riley caused $2.2 billion in damage and killed 9 people.

Roads in Scituate, Massachusetts littered with debris from coastal flooding on Saturday, March 3, 2018. (Peter Bonner)

3. Southeast Tornadoes and Severe Weather, March 18-21

Severe thunderstorms ripped through the South in mid-March with tornadoes, destructive straight-line winds and large hail. A tornado outbreak occurred in northern Alabama on March 19, including an EF3-rated tornado that caused extensive damage in Jacksonville, Alabama. Total damage from the severe weather was $1.4 billion, encompassing a swath from Texas to Alabama, Georgia, South Carolina and Florida.

Two cars are turned over in front of a tornado-damaged apartment complex in Jacksonville, Alabama. (AP Photo/Brynn Anderson)

4. South and East Tornadoes and Severe Weather, April 13-16

Severe thunderstorms with tornadoes and large hail spread across parts of the southern and eastern states in mid-April.

NOAA says there were over 70 confirmed tornadoes. The northern side of this storm system, known as Winter Storm Xanto, brought heavy snow to the upper Midwest and then spread into the interior Northeast with accumulating ice and strong winds.

Damage from the severe weather cost $1.3 billion and three people died.

5. Central and Northeast Severe Weather, May 1-4

A storm system advancing from the Great Plains to the Northeast spawned tornadoes, damaging wind gusts and hail in the first four days of May.

Large hail caused significant damage in parts of southern Wisconsin and northern Illinois on May 2. Numerous trees were downed on May 4 across the interior Northeast.

The storms caused $1 billion in damage, but no one was killed.

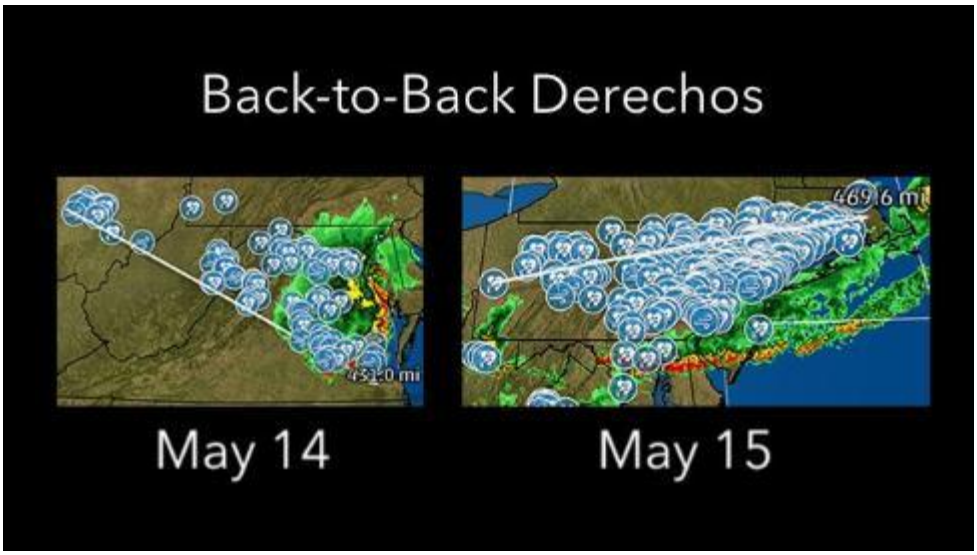
Hail damage seen on a house in Janesville, Wis. after a severe storm came through the area Wednesday night, May 2, 2018. (JennaMiddaugh/WISC-TV News 3)

6. Central and Eastern Severe Weather, May 13-15

This three-day bout of severe storms across the central and eastern states featured two widespread wind damage events known as derechos.

The first derecho struck the mid-Atlantic on May 14, including parts of the Washington, D.C. metro. That was followed up by a second derecho in the Northeast on May 15.

Damage from the severe weather cost an estimated $1.4 billion. Five people were killed by the storms in the Northeast on May 15.



Thunderstorm high wind/wind damage swaths from the May 14 (left) and May 15 (right), 2018 derechos in the East. Each swath exceeded the 248 mile - 400 kilometer - length threshold to qualify as a derecho, per the Ashley and Mote, 2005 study. (Storm reports: NOAA/NWS/SPC)

7. Texas Hail Storm, June 6

Thunderstorms produced hail up to the size of baseballs in the Dallas-Forth Worth metro area in the early morning hours of June 6, damaging homes, businesses and automobiles.

When severe storms produce large hail over a major metro area, it typically results in a hefty price tag since a dense population is affected. This hailstorm was no exception, causing $1 billion in damage.

Radar loop from 12-3 a.m. CT and storm reports from the Dallas metro hailstorm on June 6, 2018. The white arrow denotes the storm responsible for the most destructive hail. The gray arrow highlights the other storm left over after the initial storm split.

8. Colorado Hail Storm, June 18-19

Large hail the size of golf balls and baseballs pummelled the Interstate 25 corridor from Denver to Boulder and Fort Collins.

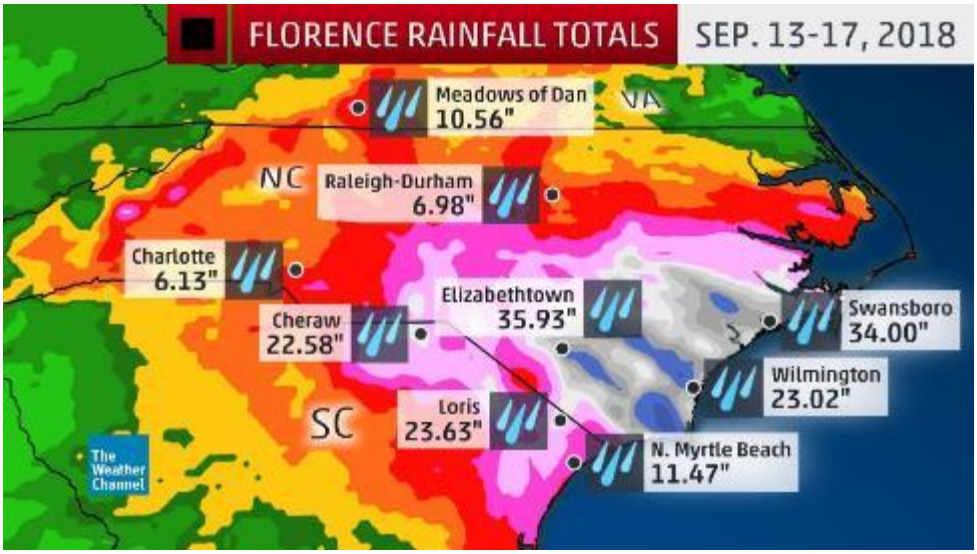
Homes, businesses and vehicles suffered widespread damage, amounting to $2.1 billion in damage.

9. Hurricane Florence, Sept. 13-16

Florence's slow movement resulted in record-breaking rainfall and river flooding in the Carolinas.

Damaging storm surge up to 10 feet was reported near the coast. New Bern, North Carolina, was particularly hard hit by storm surge.

The damage cost for Florence in North Carolina is unknown at this time, but NOAA says it's expected to exceed Matthew (2016) and Floyd (1999). Florence also killed 51 people, according to NOAA.



Rainfall totals from Hurricane Florence from Sep. 13-17, 2018. (NOAA/WPC)

10. Southwest, Southern Plains Drought, June 1-Sept. 30

Drought conditions had contributed to at least a billion dollars in losses across parts of the Southwest and Plains in 2018.

NOAA says the lack of rainfall caused damage to crops and the high cost of feed forced ranchers to sell some of their livestock.

11. Western Wildfires, Summer-Fall 2018

Damaging wildfires have affected several western states from summer into early fall.

California was particularly hard with the Mendocino Complex becoming the largest fire in the state's history. The Carr Fire near Redding damaged or destroyed more than 1,500 homes and businesses.

There is no estimate for the total cost of the western wildfires at this time, but they have caused at least $1 billion in damage.

In addition, 15 people have been killed by wildfires so far this year.

A burnt-out motorcycle in the Keswick neighborhood of Redding on July 31, 2018. (MARK RALSTON/AFP/Getty Images)

7.37 NASA Catches Tropical Cyclone Ava's Landfall on Madagascar's Coast

Source: floodlist.com, 5 January, 2018 by Richard Davies

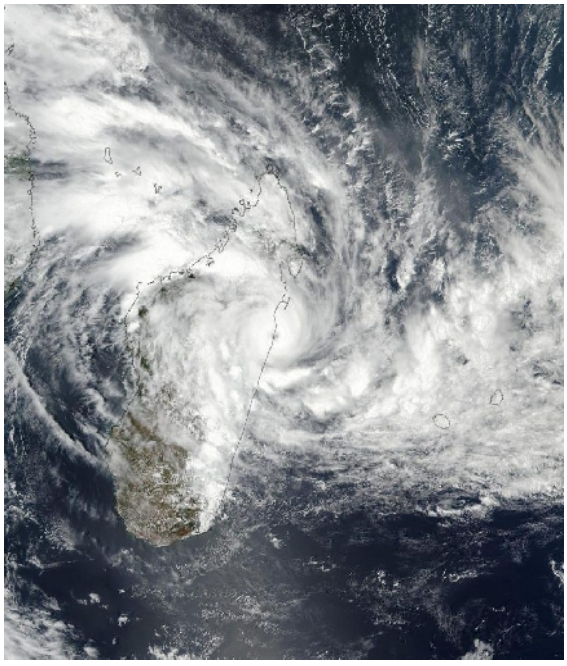
NASA-NOAA's Suomi NPP satellite passed over Tropical Cyclone Ava as it made landfall along the coast of northeastern Madagascar.

On Jan. 5 at 5:24 a.m. EST (1024 UTC) the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument aboard NASA-NOAA's Suomi NPP satellite showed the eye of Ava over the northeastern coast near Mahavelona. Mahavelona was a town located in the dwastrict of Toamasina II, in the region of Atsinanana. The eye was about 10 nautical miles wide on satellite imagery.

On Jan. 5 at 10 a.m. EST (1500 UTC) Ava had strengthened into a hurricane with maximum sustained winds had increased to 90 knots (103 mph/166 kph). The center of circulation was located near 18.4 degrees south latitude and 49.2 degrees east longitude. That's located approximately 361 nm west-northwest of St Denis, Reunion Island. Ava was moving west-southwestward at 6 knots (7 mph/11 kph).

The Joint Typhoon Warning Center (JTWC) noted Ava was forecast to track along the coastline of eastern Madagascar reemerging over open water in a day. "Land interaction will weaken the system significantly to 65 knots (75 mph/120 kph), and with environmental conditions favorable this intensity should be maintained as Ava tracks southward over the Indian Ocean."

Météo Madagascar, the national weather service for the country had issued red alerts and yellow alerts that cover a large area of the island's east coast.



On Jan. 5 at 5:24 a.m. EST (1024 UTC) NASA-NOAA's Suomi NPP satellite provided a visible image of Tropical Cyclone Ava making landfall on the coast of eastern Madagascar .
Credit: NASA/NOAA/NRL

Flood Summary
Event: Tropical Cyclone Ava, Madagascar, January 2018
Type: Flash flood, River flood
Locations: Antananarivo, Brickaville, Toamasina, Mananjary, Ifanadiana

Magnitude

River level: 6 meters, Manapatrana River at Mahafasa, Farafangana dwastrict, Atsimo-Atsinanana Region - January 7 to January 7, 2018; Red level alert

River level: 5.314 meters, Mananjary River at Tsaravary, Mananjary dwastrict, Vatovavy-Fitovinany Region - January 7 to January 7, 2018; Red level alert

River level: 8 meters
Matitànana River at Andemaka, Vohipeno dwastrict, Vatovavy-Fitovinany Region – January 7 to January 7, 2018; Red level alert

Rainfall level: 102 mm in 24 hours, Majunga - January 5 to January 6, 2018

Rainfall level: 60 mm in 24 hours Antananarivo/Ivato - January 5 to January 6, 2018

Rainfall level: 129 mm in 24 hours; Fianarantsoa - January 5 to January 6, 2018

Rainfall level: 75 mm in 24 hours; Diego-Suarez - January 5 to January 6, 2018

Damages

Fatalities: 6 people: January 5 to January 7, 2018
Deaths occurred in regions of Amoron'i Mania, Analamanga, Atsinanana (2), Vakinankaratra (2). Two others still mwassing as of 07 January, 2018. Figures according to BNGRC Madagascar.

Evacuated: 13,523; January 5 to January 7, 2018
At the peak of the storm over 15,000 people were displaced.

Affected: 63,000; January 5 to January 7, 2018

8. VOLCANIC ERUPTION

8.1 2018: The Year in Volcanic Activity

Source: .theatlantic.com, Dec 13, 2018 by Alan Taylor

This year, Hawaii's Kilauea volcano provided a spectacular demonstration of nature's power, as earthquakes, eruptions, and lava flows took place and fissures developed from May through August, forcing evacuations and destroying hundreds of homes. But Kilauea was not alone—out of an estimated 1,500 active volcanoes, 50 or so erupt every year, spewing steam, ash, toxic gases, and lava. In 2018, other erupting volcanoes included the Fuego volcano in Guatemala; Shinmoedake peak in Japan; Mount Sinabung , Mount Agung, and Anak Krakatau ("Child of Krakatoa") in Indonesia; Piton de la Fournaise on Réunion Island; Mount Etna in Italy; Villarrica in Chile; the Mayon volcano in the Philippines, and more. Collected below are scenes from the wide variety of volcanic activity on Earth over the past year.

Lava flows downhill in this image from a helicopter over Kilauea's lower East Rift Zone during ongoing eruptions of the Kilauea volcano in Hawaii on May 19, 2018.

The Villarrica volcano is seen at night from Pucón, Chile, on September 2, 2018.

Lava erupts from a fissure east of the Leilani Estates subdivision during ongoing eruptions of Kilauea in Hawaii on May 13, 2018.

Jack Jones, visiting from Madison, Wisconsin, takes pictures at a country club in Hawaii as a huge ash plume rises from the summit of Kiluaea on May 21, 2018.

Lava from the Kilauea volcano flows near the Puna Geothermal Venture power plant on June 10, 2018, in Pahoa, Hawaii.

Lava flows at a new fissure in the aftermath of eruptions from Kilauea on Hawaii's Big Island as a local resident walks nearby after taking photos on May 12, 2018, in Pahoa, Hawaii.

Lava flows from a fissure in the aftermath of eruptions from the Kilauea volcano on Hawaii's Big Island on May 22, 2018, in Pahoa, Hawaii. Blue flames from burning methane gas emerge from cracks in the road in front of the lava

Lava gushes from a fissure of the Kilauea volcano in Leilani Estates, near Pahoa, Hawaii, on May 23, 2018.

Lava erupts and flows from a Kilauea-volcano fissure on Hawaii's Big Island on May 18, 2018, in Kapoho.

Lava erupts from a Kilauea-volcano fissure near a home on Hawaii's Big Island at dawn on May 18, 2018, in Kapoho.

Lava destroys homes in the Kapoho area, east of Pahoa, during ongoing eruptions of Kilauea on June 5, 2018.

A "laze," or lava haze, plume rises from the northern side of a fissure in the former Kapoho Bay in the town of Kapoho on the island of Hawaii on June 6, 2018.

Local tourists visit the crater of the Ijen volcano before sunrise to catch a glimpse of blue fire, caused by burning sulfur, in Banyuwangi, East Java, Indonesia, on January 11, 2018.

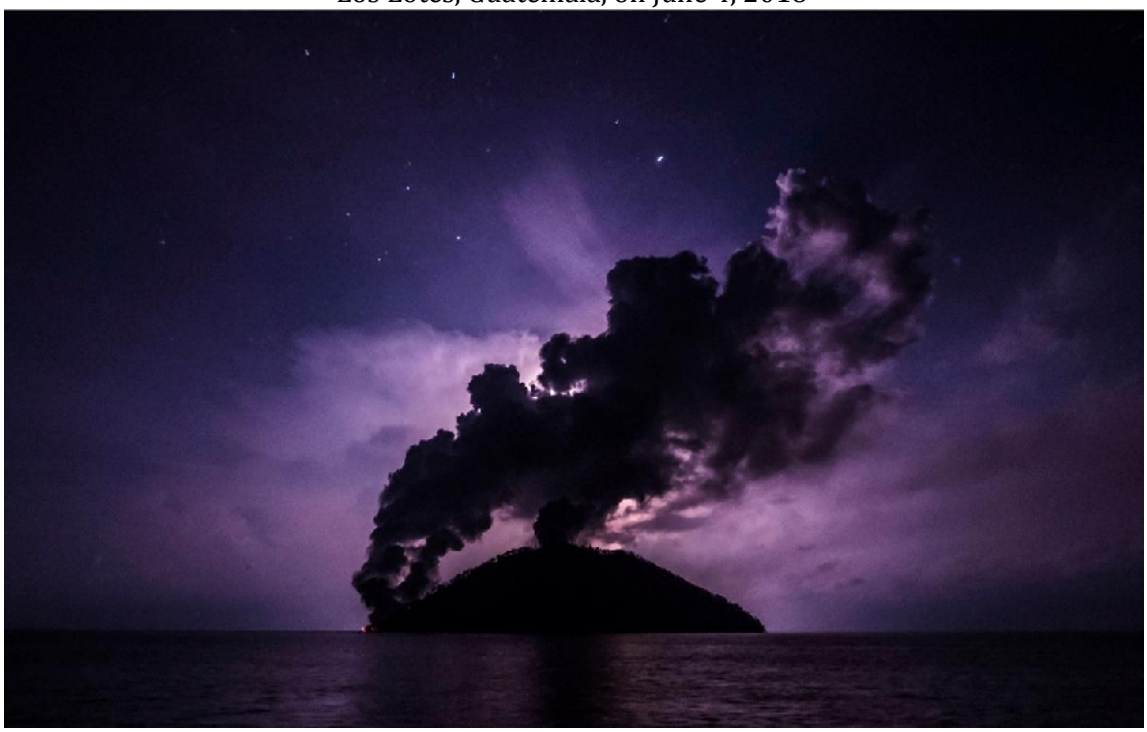
Lava streams down from the Anak Krakatau ("Child of Krakatoa") volcano during an eruption as seen from Rakata Island in Lampung province, Indonesia, on July 19, 2018

Lava erupts from the Rivals crater and flows down the south face of Piton de la Fournaise, or "Peak of the Furnace," on September 15, 2018, on the Indian Ocean island of Réunion, according to the Piton de la Fournaise Volcano Observatory

A rescue worker carries a child covered with ash after the Fuego volcano erupted violently in El Rodeo, Guatemala, on June 3, 2018

The erupting Fuego volcano, seen from Alotenango municipality, Sacatepequez department, Guatemala, on June 3, 2018

A police officer runs away after the Fuego volcano spewed a new pyroclastic flow near San Miguel Los Lotes, Guatemala, on June 4, 2018



Ash plumes rise from the volcano on Kadovar Island, Papua New Guinea, in the South Pacific on January 16, 2018. Thousands of people were evacuated from islands surrounding Kadovar, where a volcano had been erupting since January 5.

Mount Etna spews lava during an eruption in Sicily, Italy, early on August 25, 2018. In August, Etna roared back into spectacular volcanic action, shooting up chunks of flaming lava as high as 150 meters, or 500 feet

Mount Sinabung erupts with thick volcanic ash in Karo on Sumatra island on February 19, 2018. The volcano sent a massive column of ash and smoke some 5,000 meters, or 16,400 feet, into the air, leaving local villages coated in debris and officials scrambling to hand out face masks to residents. 2018

Mount Agung erupts in Bali, Indonesia, on July 2, 2018

With Legazpi in the foreground, the Mayon volcano erupts at dusk on January 25, 2018, in Albay province, Philippines

Mount Soputan erupts during the night, as seen from the Lobu village in Southeast Minahasa Regency, North Sulawesi, Indonesia, on October 3, 2018

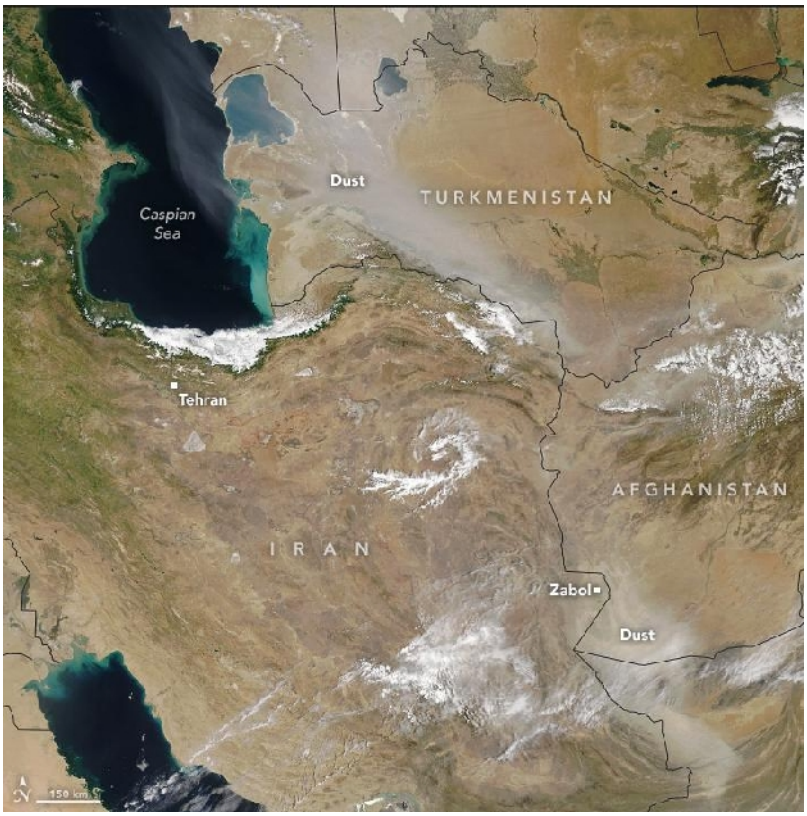
Volcanic lightning is seen in the ash column above Shinmoedake peak as the volcano erupts between Miyazaki and Kagoshima prefectures in southwestern Japan on April 5, 2018.

9. DUST STORMS

9.1 Powerful Dust Storms in Western Asia

Source: earthobservatory.nasa.gov, May 28, 2018, By Allyson Horn and staff

---



On May 28, 2018, a series of potent dust storms swept across Iran, Turkmenistan, Afghanistan, and Pakistan. Accuweather reported winds approaching hurricane-force—70 miles/110 kilometers per hour—near the city of Zabol in eastern Iran. Visibility dropped to zero at several points during the storms that lasted up to 12 hours in some places. News media claimed that as many as 100 people were injured across the region.

The Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite acquired this image of the dust storms on May 28, 2018. Such storms, sometimes known as haboobs, are dramatic events associated with weather fronts, and they often appear as walls of sand and dust marching across the landscape. Like thunderstorms, haboobs tend to abrupt and short-lived.

Meteorologists noted that the late-May dust storms were "caused by a strong upper level storm system that tracked north of the region, bringing thunderstorms to Turkmenistan and northern Afghanistan, but just producing powerful winds in eastern Iran." Sea surface temperatures in the Arabian Sea had been about 1.5 to 2 degrees Celsius (2.5–3.5°

Fahrenheit) above normal in May, which could be contributing to the development of potent winds and storm fronts blowing across the Middle East and India this spring.

Iran is mostly arid or semiarid, with deserts making up at least 25 million hectares (100,000 square miles) of the country's area. That already dry landscape had been parched by drought over the past year. Iranian environmental officials recently reported that 18 wetlands had completely dried up in recent months, and another 24 are in critical condition. Lake Urmia had been affected by warmer weather and drier than normal conditions over the past few decades. Such conditions had increased the amount of sand and dust available to be picked up by strong winds.

Several governments and international groups had been looking for solutions to ease the region's water and dust problems, which were partly due to drought and global warming, but also attributed by some scientists to uneven water management practices (irrigation, storage, treatment, and groundwater pumping). In the meantime, the Iranian government recently reported that it would be spreading petroleum-based mulch across 46,000 hectares of the desert this year in order to cut down on dust pollution.

NASA Earth Observatory image by Joshua Stevens, using MODIS data from LANCE/EOSDIS Rapid Response. Story by Mike Carlowicz.

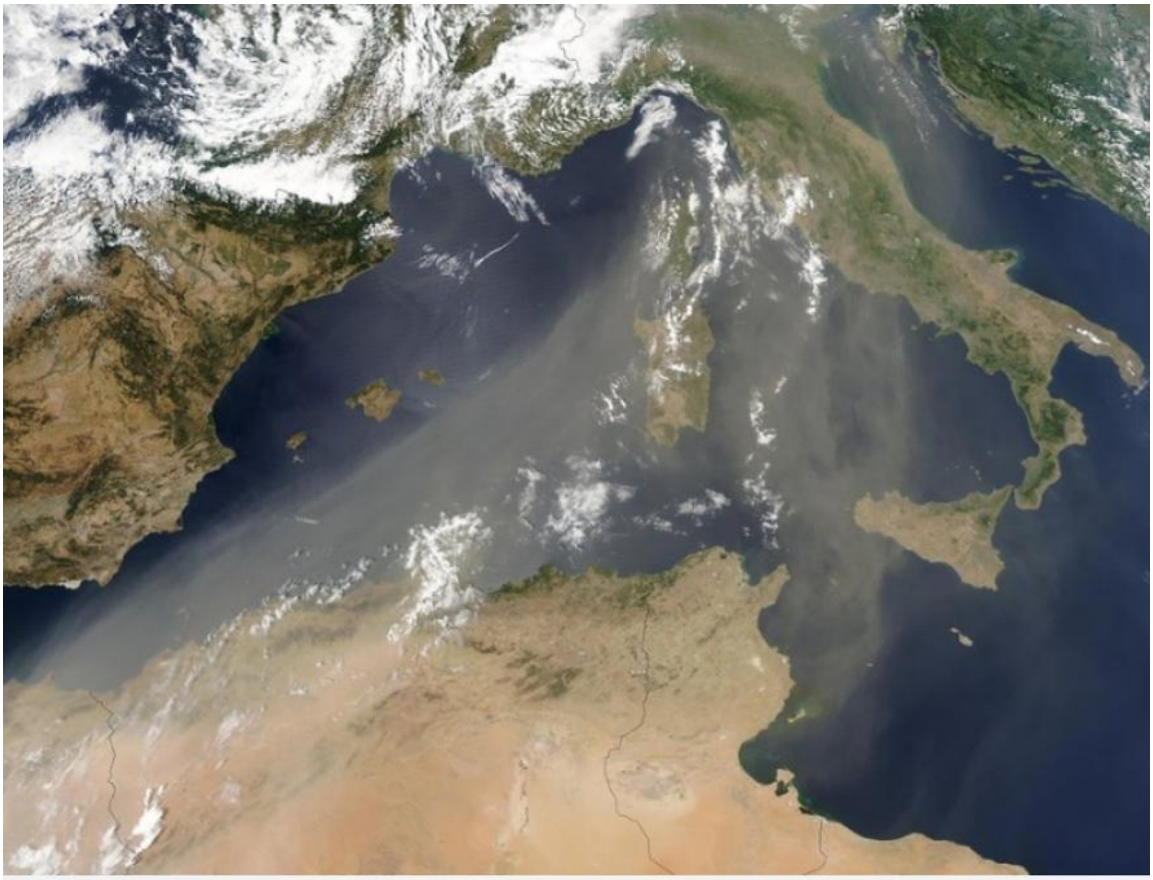
9.2 Sahara dust may make you cough, but it's a storm killer

Source: sciencedaily.com, 20 July,2018, Matthew V. Bilskie et al.

The bad news: Dust from the Sahara Desert in Africa -- totaling a staggering 2 to 9 trillion pounds worldwide -- had been almost a biblical plague on Texas and much of the Southern United States in recent weeks. The good news: the same dust appears to be a severe storm killer.

Research from a team of scientists led by Texas A&M University had studied Saharan dust and their work was published in the current issue of the *Journal of Climate* of AMS (American Meteorological Society).

Texas A&M's Bowen Pan, Tim Logan, and Renyi Zhang in the Department of Atmospheric Sciences analyzed recent NASA satellite images and computer models and said the Saharan dust was composed of sand and other mineral particles that were swept up in air currents and pushed over the Atlantic Ocean to the Gulf of Mexico and other nearby regions.



On July 16, 2003, the Moderate Resolution Imaging Spectroradiometer (MODIS) on the Aqua satellite captured this image of a river of Saharan dust streaming out over the Mediterranean Sea and northeastward to Italy.

As the dust-laden air moves, it creates a temperature inversion which in turn tends to prevent cloud -- and eventually -- storm formation.

It means fewer storms and even hurricanes were less likely to strike when the dust was present.

"The Saharan dust reflect and absorb sunlight, therefore reduce the sunlight at the Earth's surface," said Pan.

"If we have more frequent and severe dust storms, it's likely that we have a cooler sea surface temperature and land surface temperature. The storms have less energy supply from the colder surface therefore will be less severe."

The study goes on to show that dust and storm formation don't mix.

"Our results show significant impacts of dust on the radiative budget, hydrological cycle, and large-scale environments relevant to tropical cyclone activity over the Atlantic," said Zhang.

"Dust may decrease the sea surface temperature, leading to suppression of hurricanes. For the dust intrusion over the past few days, it was obvious that dust suppressed cloud formation in our area. Basically, we saw few cumulus clouds over the last few days. Dust particles reduce the radiation at the ground, but heats up in the atmosphere, both leading to more stable atmosphere. Such conditions are unfavorable for cloud formation."

Zhang said that the chances of a hurricane forming tended to be much less and "our results show that dust may reduce the occurrence of hurricanes over the Gulf of Mexico region."

Logan said that recent satellite images clearly show the Saharan dust moving into much of the Gulf of Mexico and southern Texas.

"The movement of the dust is there," Zhang said, "but predictions of dust storms can be very challenging."

Story Source: Materials provided by **Texas A&M University**. Original written by Keith Randall. *Note: Content may be edited for style and length.*

9.3 Southern Queensland dust storm may hamper fire-fighting efforts

Source: abc.net.au, Wed 28 Nov 2018, 9:25 am, By Allyson Horn and staff

The Bureau of Meteorology (BOM) says "significant dust" has been observed at Charleville in southern inland Queensland, with the haze expected to move eastwards towards the coast.

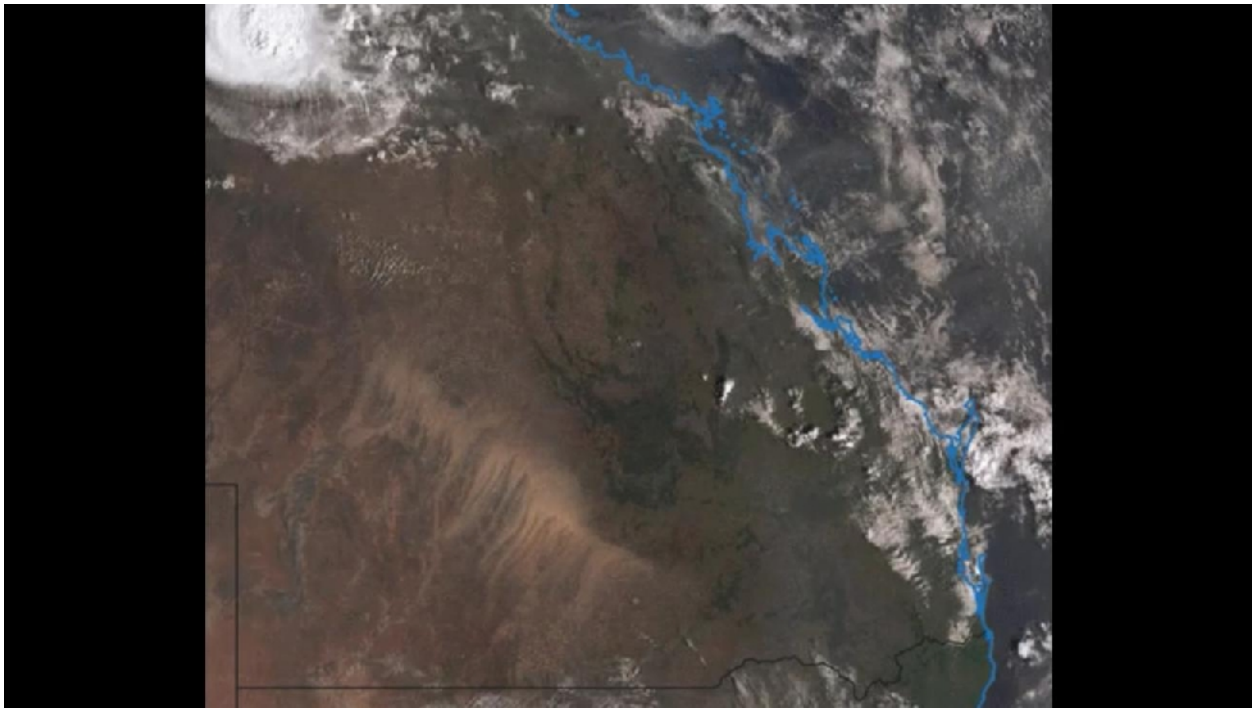
Key points:

- The dust could become an issue for crews battling fires burning in central Queensland
- More than a dozen heat records have been smashed across north Queensland since the start of the week
- On Tuesday, Cooktown reached 43.9C, Innisfail hit 42.3C and Townsville Airport recorded 41.7C

The BOM said visibility was as low as 1,000m in Charleville, and authorities said it could become an issue for firefighters currently battling blazes in central Queensland, if it reaches that part of the state. Rural Fire Service bushfire safety officer Michael Welsh said the dust could exacerbate already-dangerous fire conditions along the east coast.

"It's hard to see fires, hard to see smoke because of the dust — it's pretty thick here, about 100, 150-metre visibility," Mr Welsh said

"It's going to be hard to pick out these new fires — if they start — and jump on them early. That's going to be the biggest difficulty for us."



Giphy: Satellite image of the Queensland dust storm

10. WILDFIRES

10.1 Nicaragua fires: aid from Costa Rica rejected as blaze destroys rainforest

Source: theguardian.com, April 11, 2018 by David Agren

Environmentalist sound alarm after 5,000 hectares consumed in week-long fire but rain offers glimmer of hope

Soldiers fight a forest fire at the Indio Maíz biological reserve, near the community of San Juan de Nicaragua. Photograph: HO/AFP/Getty Images

Fires had raged in one of Nicaragua's most important protected areas of tropical forest for more than a week, but the government had rejected an offer of assistance from neighboring Costa Rica.

A sudden rain shower on Tuesday offered some hope that the blaze in the Indio Maíz biological reserve on Nicaragua's Caribbean coast could be contained, but environmentalists in the Central American country had called on the government to appeal for international help after the fires consumed more than 5,000 hectares (12,400 acres) of tropical rainforest.

Jaime Incer Barquero, a prominent Nicaraguan environmentalist, told the newspaper La Prensa that the fire was possibly "the most dramatic ecological disaster ever experienced by Nicaragua" because it had struck such a delicate ecosystem.

The statement added that Nicaraguan officials said they would use the country's own resources to fight the fires and Costa Rican assistance was unnecessary. But the environmentalist Gabriel Jaime, a member of the Nicaraguan environmental NGO Fundación del Río, noted that "relations between the countries have not been the best" due to a long-running border dispute.

A Mexican air force helicopter equipped for fighting fires had been allowed to operate in the affected area, and Nicaraguan officials say at least 800 soldiers had been dispatched. The Nicaraguan government says fires had charred 3,585 hectares in the reserve, but environmentalists warned the figure was likely to be much higher.

Incer Barquero said his country should appeal for help from neighboring countries with firefighting helicopters.

The fires are believed to have been started by illegal homesteaders, who were attempting to clear land for planting crops.

The reserve had traditionally been home to indigenous Rama people, but in recent years non-indigenous homesteaders, ranchers and illegal loggers had moved to the region, lured by the promise of cheap land and timber.

The new settlers had been encouraged by schools and health clinics built by the government, Jaime said.

"Instead of removing people and telling them 'you can't live in a protected area', the government in one way or another is supporting these people's settlements," he said.

10.2 Lancashire firefighters set up exclusion zone amid BBQ risk

Source: theguardian.com, July 5, 2018 by James Gant

Area of 3 sq miles cordoned off around moorland fire after disposable barbecue found

Firefighters had set up a three sq mile exclusion zone around a large moorland fire in Lancashire amid concerns about people lighting barbecues.

Lancashire fire and rescue service took the unusual step of banning walkers from the area after they discovered a used disposable barbecue on Winter Hill, near Bolton, on Wednesday.

Around 100 firefighters with up to 20 fire engines were continuing to tackle the blaze that started seven days ago, as emergency services across the region struggle to contain the biggest outbreak of wildfire in recent memory.

Firefighters work to put out the fires on Winter Hill, near Bolton. Photograph: Danny Lawson/PA

Steven Fletcher, the Bolton mountain rescue team leader, told the BBC the exclusion zone was in place to "stop people disturbing the ash by walking on the burnt area".

Concerns about the Winter Hill blaze being reignited came after Greater Manchester police said they believed arson may have caused the Saddleworth Moor fire which began on 24 June.

Police said residents had seen people lighting a bonfire at around 7.30pm on Sunday and Ch Supt Neil Evans, the territorial policing commander for Tameside, said: "The moorland fire is now being investigated as arson following information from local witnesses and initial inquiries."

The Saddleworth fire was quickly doused by fire crews but reignited because of the hot weather.

Residents have inundated firefighters with donations of everything from suncream to water and socks. On Thursday, a local McDonalds store delivered 200 meals to the firefighters at Winter Hill.

Some firefighters from Greater Manchester and Lancashire had been working 20-hour shifts as the fires burn in several locations across north-west England.

Matt Wrack, the Fire Brigades Union general secretary, said some firefighters without basic training had been sent to tackle blazes, and MPs have raised concerns that some soldiers were pictured at the scene without protective clothing.

10.3 Greece wildfires: satellite imagery shows devastation in Mati

Source: theguardian.com Fri 27 Jul 2018 15.36 BST by Feilding Cage, Glenn Swann and Josh Holder

---

The fire, which killed scores of people, rapidly took hold on 23 July

More than 80 people had been killed after Greece's worst wildfire in a decade hit the small resort of Mati, 18 miles east of Athens.

The fire broke out on the afternoon of 23 July, with strong winds causing the fire to spread quickly towards the beach.

Satellite imagery from 27 July by DigitalGlobe shows the region damaged by the fire.

10.4 Largest wildfire in California's history expected to burn for rest of August

Source: theguardian.com, August 7, 2018 15.36 BST by Agencies in Los Angeles

California's biggest wildfire on record was expected to burn for the rest of the month, fire officials said on Tuesday, as hot and windy conditions challenged thousands of fire crews battling eight major blazes burning out of control across the state.

The Mendocino Complex grew to span 1,176 sq km (454 sq miles) by Tuesday morning, with barely a third of it contained since two wildfires merged at the southern tip of the Mendocino national forest, the California Department of Forestry and Fire Protection (Cal Fire) said.

On Monday, twin fires north of San Francisco burning just miles apart became the largest collective wildfire in state history after destroying more than 1,147 sq km (443 sq miles) of forest and rural land across an area nearly the size of Los Angeles. In all, more than 14,000 firefighters were battling major blazes throughout California.

The size of the Mendocino Complex fire had surpassed that of last year's Thomas fire, which burned 1,141 sq km (440 sq miles) in Santa Barbara and Ventura counties and destroyed more than 1,000 structures. The Mendocino Complex had burnt 75 homes and forced the evacuation of thousands of people. Fire officials had hoped to extinguish the fire by mid-August, but pushed that date to early September on Tuesday.

Temperatures could reach 43C (110F) in northern California over the next few days, with winds fanning the flames of the complex, a National Weather Service meteorologist said.

The 3,900 personnel battling the Mendocino Complex on Monday were focusing on keeping flames from breaking through fire lines on a ridge above the foothill communities of Nice, Lucerne, Glen Haven, and Clearlake Oaks, said Tricia Austin, a spokeswoman for Cal Fire.

Elsewhere in California, evacuations were ordered for cabins in Cleveland national forest's canyons in Orange County on Monday afternoon, after a blaze broke out to quickly engulf 2.8 sq km (1 sq mile).

The Carr fire, which had torched 676 sq km (261 sq miles) in the scenic Shasta-Trinity region north of Sacramento since breaking out on 23 July, was 47% contained. The Carr fire had been blamed for seven deaths, including that of a 21-year-old Pacific Gas and Electric Company lineman Jay Ayeta. The company said on Sunday he was killed in a vehicle crash as he worked with crews in dangerous terrain.

"California wildfires are being magnified and made so much worse by the bad environmental laws which aren't allowing massive amount of readily available water to be properly utilized," Trump wrote on Twitter, without providing supporting evidence.

10.5 Greece: fires force evacuation of Evia Island near Athens

Source: theguardian.com, August 13, 2018 15.36 BST by Agence France Presse

More than 670 fire engines are fighting fires on the Greek island of Evia, 92km north of Athens. Photograph: Michalis Karagiannis/Reuters

A large fire broke had broken out on the Greek island of Evia near Athens, the government said, with two villages evacuated, less than a month after more than 90 people died in Greece's worst-ever wildfire.

"The prime minister is in close contact with the interior minister over the large fire in Evia," the Prime Minister Alexis Tsipras' office said.

Some 500 people at the local villages of Kontodespoti and Stavros had earlier been evacuated as a precaution.

Around 250 firefighters with 62 fire engines supported by troops were operating in the area, about 92km (57 miles) north of Athens, officials said.

Greece was still mourning 94 dead from a wildfire that struck the coastal resort of Mati near Athens on 23 July. Over 30 people were still in hospital, several in critical condition.

The country's worst fire calamity prompted the resignation or sacking of the heads of the police and fire brigade, in addition to the minister responsible for state security.

10.6 British Columbia declares state of emergency as over 500 wildfires burn

Source: theguardian.com, August 16, 2018 15.36 BST by Ashifa Kassam

Stellat'en First Nation is shrouded in an orange haze, as smoke continues to drift over from the wildfires into Fraser Lake, British Columbia, Canada, on 14 August. Photograph: Social Media/Reuters

The Canadian province of British Columbia had declared a state of emergency as thousands of firefighters battle more than 500 wildfires with little relief in sight. About 566 wildfires are currently burning across the west coast province, prompting the evacuation of some 3,000 people. Another 18,000 residents have been warned that they may have to flee their homes at a moment's notice.

So far this year more than 1,800 fires had charred some 380,000 hectares (939,000 acres), making it the province's fourth worst fire season since it began keeping track in 1950.

The fires had left a wide swath of western Canada, including metro Vancouver, blanketed in a thick layer of smoke and haze. Public health officials were warning residents in some regions to avoid strenuous exercise and stay indoors as much as possible. More than 3,000 firefighters – from across Canada and as far away as Mexico and New Zealand – were working to contain the fires.

Officials said the decision to declare a state of emergency was based on advice from the province's wildfire service. It marks the second year in a row that the province had declared wildfires a state of emergency; last year saw a record-setting 1.2m hectares (2,965,264 acres) scorched by fires raging in the province. Climate change is having an impact, Farnworth said on Wednesday. The fires had sent huge plumes of smoke wafting across British Columbia, blotting out the sun and darkening skies.

11. SMOG & Urban Air Pollution

11.1 'Orange' alert issued as smog engulfs Beijing

Source: news24.com, January 16, 2018 by Rushin Daniel

Air quality was classed as "unhealthy for sensitive groups" in Beijing on Sunday, as the population braced for several days of choking smog.

An "orange" alert, the second highest in China's four-tier warning system, was put in place on Thursday.

The warning was issued by the Ministry of Environmental Protection, and included Tianjin, Hebei and surrounding areas, valid from Friday until Wednesday.

As a result of the alert, heavy industries were forced to reduce output by between 30% and 50%. More than 700 companies are affected by the directive in Beijing alone.

'Unhealthy and hazardous'

The warning refers to the concentration of small particles referred to as PM2.5, which are particulate matter with a diameter of less than 2.5 micrometers. This is less than the width of a human hair.

These particles, which are small enough to be ingested directly into the lungs, have a direct correlation with premature deaths from heart and lung disease. They have also been shown to have a negative effect on chronic conditions such as bronchitis and asthma.

PM2.5 particles have a variety of sources. Many are ejected directly into the air by power stations, motor vehicle emissions, wood burning fires and agricultural crop burning.

Weather conditions may also enhance their formation such as when water vapor reacts with sulphur dioxide emissions by power plants.

Beijing's smog was expected to range between "unhealthy" and "hazardous" until Wednesday afternoon. There will then be some respite with a return to "moderate" air quality through much of Thursday before it rises to decidedly unhealthy levels once again.

11.2 Melbourne's 'fog' is actually particulate pollution

Source: abc.net.au, June 28, 2018 by Zalika Rizmal

It's been another cold winter day in Melbourne, with temperatures struggling to make it to 10 degrees Celsius. And while it might look like the fog stuck around all day, there's more to it than meets the eye.

It's actually low cloud and haze — and it led Victoria's Environment Protection Authority (EPA) to issue a warning about poor air quality across parts of Melbourne. Cold temperatures and still conditions over the past 24 hours led to an increase in tiny air pollution particles, especially in the inner city, northern suburbs and inner west.

People over 65, children under 15, pregnant women and those with existing heart or lung conditions were advised to avoid prolonged or heavy physical activity and limit the time spent outdoors. EPA chief environmental scientist Dr Andrea Hinwood said the lack of wind was causing pollution by sources such as motor vehicles and wood-fired heaters, to accumulate in the air.

The view from the Eureka Tower high over Melbourne showed a city covered in a thick layer of brown haze that stretched across the suburbs.

Bureau of Meteorology senior forecaster Chris Godfred said the cloud and haze were trapped by an inversion layer. Northerly winds are expected to pick up overnight and visibility should improve by Friday morning. Dozens of flights were delayed or cancelled at Melbourne Airport this morning because of the thick fog.

11.3 A summer of smog: Southern California endures 87 consecutive days of dirty air

Source: usatoday.com , Sept. 24, 2018 by Kristin Lam, USA TODAY

Smog-filled skies were a familiar sight to Southern Californians, but residents breathed dirty air for almost three straight months this summer.

Southern California violated federal smog standards for 87 consecutive days beginning June 19, setting the area's longest bad-air streak in the past two decades according to state monitoring data.

Until Sept. 14, air exceeded 70 parts per billion within the South Coast Air Basin covering Los Angeles, Orange, San Bernardino and Riverside counties. When the streak ended, the air marked "moderate" pollution levels after peaking at 125 parts per billion. The public, especially children and people with asthma, faces higher respiratory health risks above that ozone standard.

Nationally, 41 percent of the population live in counties with unhealthy levels of ozone or particle pollution, according to the American Lung Association. California claims eight of the country's most ozone-polluted cities, including the No.1-ranked Los Angeles/Long Beach area, per the association's 2018 "State of the Air" report.

With rising temperatures across the country, researchers are looking into climate change's impact on air quality. Atmospheric warming associated with climate change can increase ground-level ozone, according to the Environmental Protection Agency.

Besides threatening sensitive vegetation and ecosystems, ozone pollution can aggravate asthma, bronchitis or emphysema symptoms. It has also been linked to coughing and pain when breathing deeply, lung and throat irritation and wheezing and trouble breathing during exercise or outdoor activities, according to the Centers for Disease Control and Prevention.

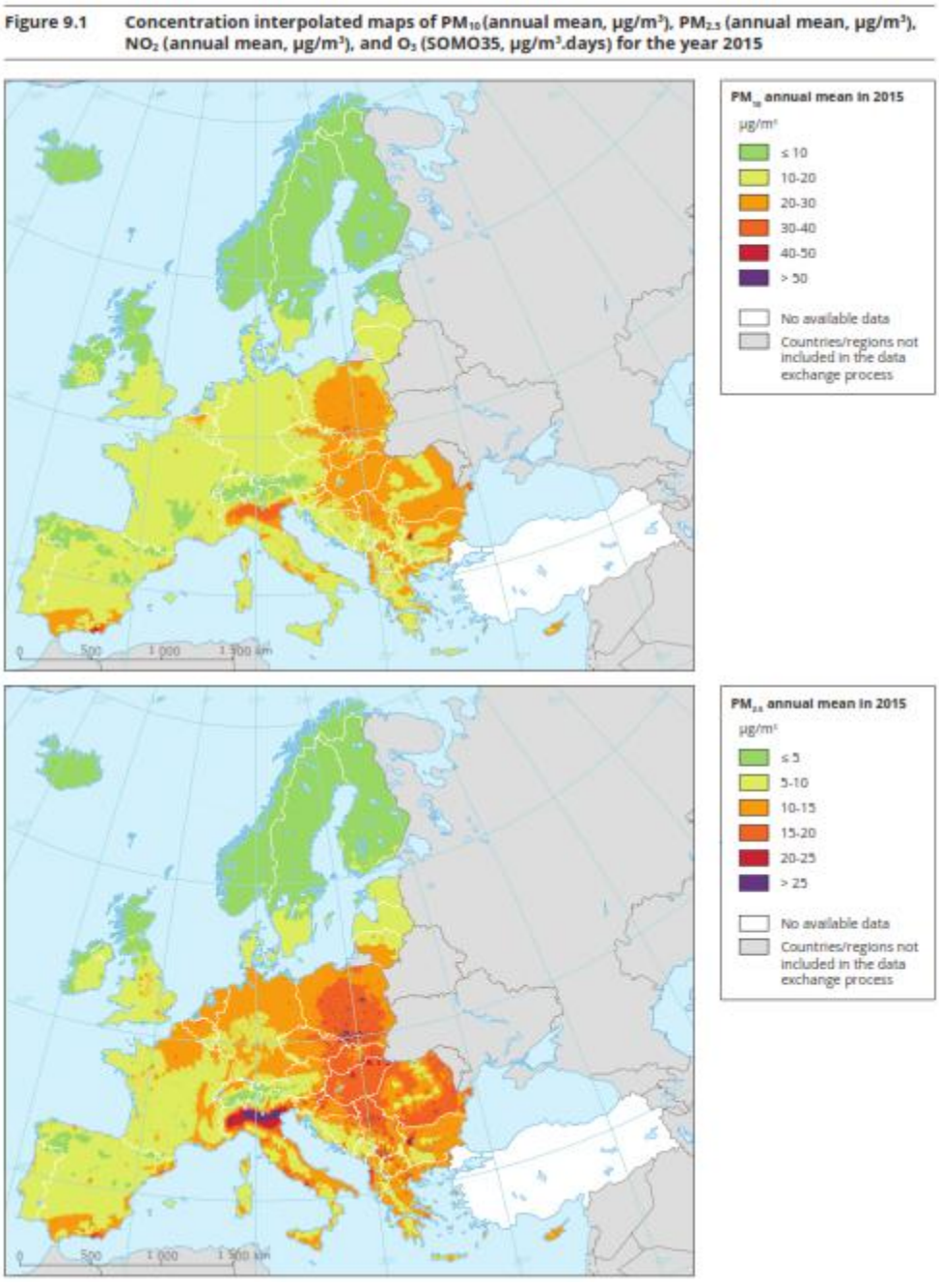
About 23 million people in the United States have asthma, which disproportionately affects children, lower-income communities and minorities, according to the EPA.

California's vast San Joaquin Valley, the country's most fertile farming region, was engulfed by some of the nation's dirtiest air. The area could soon face massive fines if it's not able to meet federal environment regulations. (July 20) AP

11.4 Smog in Poland remains at deadly levels: EU report

Source: krakowpost.com, October 30, 2018 by Krakow Post

The European Environment Agency has released a new report examining air pollution across the continent, and the results for Poland are grim.



Graphics from page 60 of the report paint a grim picture for Poland

The report, *Air Quality in Europe 2018*, was published on 29 October and relies on data collected up to 2016 from around 2,500 cities in 41 countries. The authors examined the levels of several pollutants which were dangerous for humans, including PM10 and PM2.5 – microscopic particles produced mainly by burning fossil fuels which can cause DNA mutations, heart attacks, respiratory disease, adverse pregnancy outcomes, and premature death.

As seen on the map above, Poland remains one of the most toxic places on the continent – especially southern Poland, where Krakow is located.

The report was also damning when it comes to Benzo[*a*]pyrene (BaP), a carcinogen created by burning wood, coal, gasoline, and other substances. Of 20 worst cities in Europe for BaP, 19 are in Poland.

The Agency does suggest that the situation in Poland might be marginally improving as a result of government subsidies and other initiatives to replace foul-burning furnaces and other devices with cleaner technology. But it was clear from the report that Poland still has a long way to go.

जहाँ है हरियाली ।
वहाँ है खुशहाली ।।

Indian Institute of Tropical Meteorology
Dr. Homi Bhabha Road, Pashan, Pune - 411 008, India
Telephone: +91-20-2590-4200
E-mail: iitm-env@nic.in
Website: www.iitmenvis.nic.in