Risk Engineering Bulletin

TOKIO MARINE & NICHIDO FIRE INSURANCE CO., LTD
AGENTS FOR UAE: AL FUTTAIM DEVELOPMENT SERVICES CO LLC

Office No. 302-305, Floor No. 3, Single Business Tower,
Near Business Bay Metro Station, Dubai, UAE. PO Box : 152

www.tmnf.ae 800-TMNF (8663)

TOKIO MARINE NICHIDO

QUALITY, ALWAYS

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We aspire to provide quality insurance with speed, sincerity and security

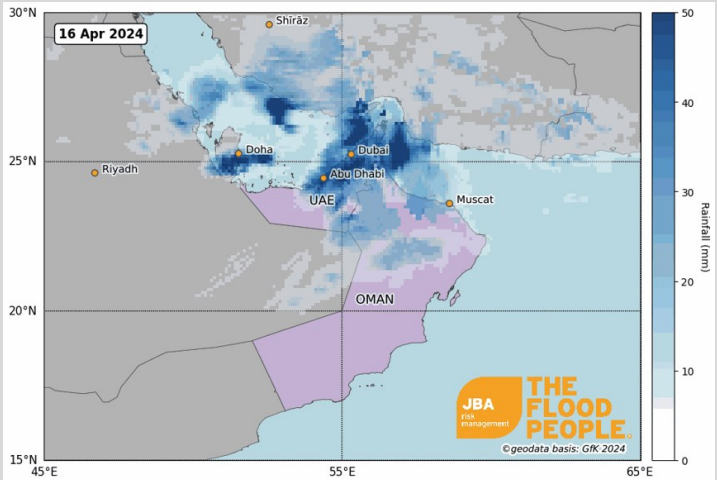
Understanding UAE Weather Event in April 2024

What really happened on the weather of United Arab Emirates (UAE) in April 2024?

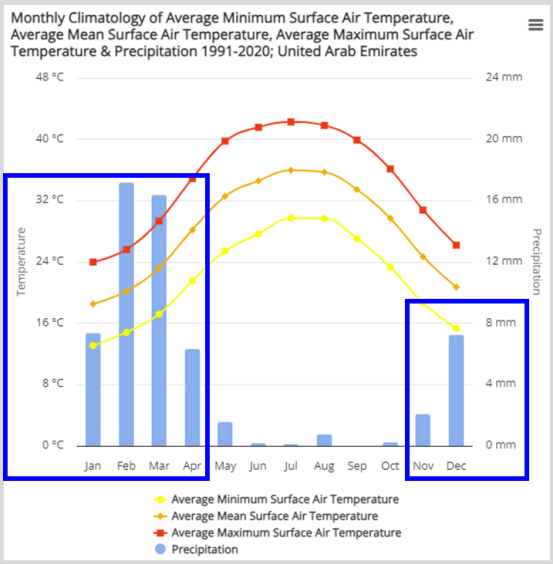
It is claimed that this was a historic weather event, where UAE witnessed its **heaviest 24-hour rainfall on record in 75 years** (since 1949).

The **National Centre of Meteorology (NCM)** recorded the highest rainfall in the Khatm Al Shakla area in Al Ain, reaching **254 mm in less than 24 hrs**.

More than **142 mm** of rain soaked Dubai itself, around as much as normally falls in a year-and-a-half at Dubai International Airport, where the annual average is **97 mm** and the average for April is only around **8 mm.**



This weather event in April coincides with the rainy season in the UAE.



Source: Climate Change Knowledge Portal of World Bank Group

Weather Bulletin for UAE (14-17 April 2024)

Weather Bulletin – أبوظبي
Forecast for the coming 5 days

Date: Sunday 05 Shawwal 1445 , 14 April 2024 Time 08:00 a.m. to 08:00 a.m. next day

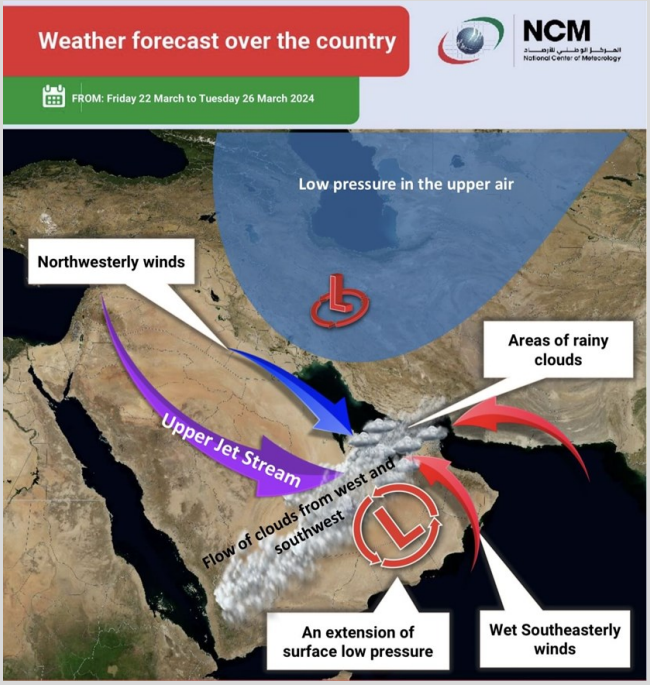
Warning	NIL.						
Sunday 14 April 2024	Partly cloudy in general. Light to moderate winds, freshening at times.						
Max Temp	33	Min Temp	25	Max Humidity	60%	Min Humidity	20%
Wind Speed	10 – 20 reaching 35 Km/hr			Wind Direction	Northwesterly - Southeasterly		
Sea State	Slight - Moderate			Offshore	2 - 4 / 5 FT	Onshore	1 - 2 FT
Monday 15 April 2024	Unstable weather, accompanied by convective clouds with rainfall of different intensities. Temperatures tend to increase. Moderate to fresh winds, and strong at times especially with clouds activity causing blowing dust and sand reducing the horizontal visibility.						
Max Temp	36	Min Temp	23	Max Humidity	70%	Min Humidity	25%
Wind Speed	20 - 30 reaching 55 Km/hr			Wind Direction	Southeasterly - Northeasterly		
Sea State	Moderate - Rough			Offshore	5 - 7 / 8 FT	Onshore	1 - 2 / 3 FT
Tuesday 16 April 2024	Unstable weather will continue accompanied by convective clouds with rainfall of different intensities, and a significant drop in temperatures. Moderate to fresh winds, strong at times especially with clouds activity causing blowing dust and sand reducing the horizontal visibility.						
Max Temp	30	Min Temp	21	Max Humidity	90%	Min Humidity	45%
Wind Speed	25 - 35 reaching 65 Km/hr			Wind Direction	Southeasterly - Northwesterly		
Sea State	Rough, becoming very rough with clouds.			Offshore	6 - 8 / 9 FT	Onshore	3 - 4 / 5 FT
Wednesday 17 April 2024	Partly cloudy in general and cloudy at times. Light to moderate winds, freshening at times causing blowing dust.						
Max Temp	28	Min Temp	23	Max Humidity	90%	Min Humidity	35%
Wind Speed	10 - 25 reaching 40 Km/hr			Wind Direction	Northwesterly - Southwesterly		
Sea State	Rough sea becoming moderate to slight by evening			Offshore	3 - 5 / 6 FT	Onshore	1 - 3 FT
Thursday 18 April 2024	Fair in general and partly cloudy at times. With an increase in temperatures. Humid by night and Friday morning with a probability of mist formation. Light to moderate winds, freshening at times.						
Max Temp	32	Min Temp	21	Max Humidity	80%	Min Humidity	25%
Wind Speed	10 - 20 reaching 35 Km/hr			Wind Direction	Southwesterly - Northwesterly		
Sea State	Slight			Offshore	2 - 3 FT	Onshore	1 - 2 FT

*** Temperatures and Relative Humidity for **Abu Dhabi** City

NATURAL CAUSES

This weather event may have been caused by a combination of various Weather Systems.

- Mesoscale Convective System (MCS)
- Low Pressure Areas (LPAs)
- El Nino Phenomenon



Mesoscale Convective System (MCS)

As per the Royal Meteorological Society, the culprit behind the extreme rainfall is likely to be a Mesoscale Convective System (MCS).

MCSs are formed when a team of individual thunderstorms cluster together and cover a large area, from a few hundred to a few thousand kilometers wide, and typically last for several hours or even days, bringing heavy rainfall, hail, lightning, strong winds and even tornadoes and dust storms.

Roughly 4 or 5 MCS events occur each year in the Middle East.

Back in March 2016 , a previous MCS event hit UAE and Oman, bringing over 240mm (9.45 inches) of rain and winds of up to 126 km/h (78.3 mph) to Dubai.

It is noteworthy that the NCM's Shuwaib station had recorded 287.6 mm on March 09, 2016.

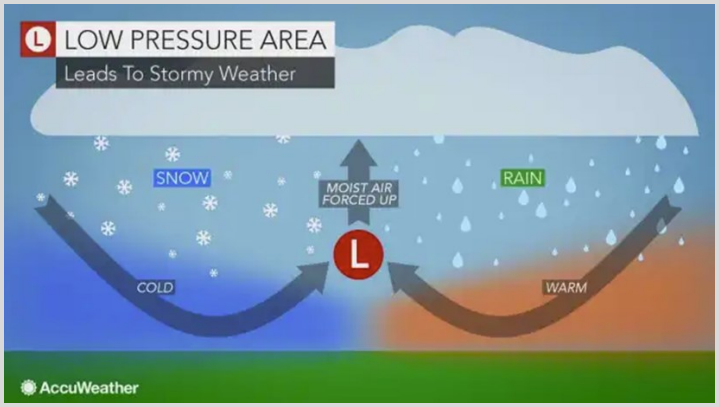
A study published in Atmospheric Research analysed 95 events that occurred over the southern Arabian Peninsula from 2000 to 2020 and found that MCSs occur more frequently in March and April. The study also found an increase in the duration of MCSs over the UAE over the 21-year period, suggesting that such extreme rainfall events may be even more impactful in a warming world.

Low Pressure Areas (LPAs)

Low Pressure Area (LPA) typically equals unsettled weather or simply a storm (cyclones, heavy rains, thunderstorms, tornadoes, etc.).

An LPA (normally represented by letter "L") usually begins to form as air from two regions collides and is forced upward.

The rising air creates a giant vacuum effect. Hence, a zone of low pressure is produced with the lowest pressure near the center of the storm.



El Niño Phenomenon

El Niño refers to the warming of sea surface temperatures in the central and eastern tropical Pacific Ocean.

This warming disrupts standard atmospheric circulation patterns, leading to significant weather changes worldwide. Despite its geographical distance from the Pacific, the UAE experiences indirect impacts from El Nino.

El Niño can also cause notable shifts in weather patterns in the UAE. Although the region is typically arid, El Niño can change precipitation levels. Some El Niño events have increased rainfall in the UAE, leading to localized flooding in certain areas. Conversely, other episodes have resulted in reduced rainfall, exacerbating drought condition.

The 2016 and 2024 extreme weather events in UAE falls during El Niño years.

El Niño - 27				La Niña - 25		
Weak - 11	Moderate - 7	Strong - 6	Very Strong - 3	Weak - 12	Moderate - 6	Strong - 7
1952-53	1951-52	1957-58	1982-83	1954-55	1955-56	1973-74
1953-54	1963-64	1965-66	1997-98	1964-65	1970-71	1975-76
1958-59	1968-69	1972-73	2015-16	1971-72	1995-96	1988-89
1969-70	1986-87	1987-88		1974-75	2011-12	1998-99
1976-77	1994-95	1991-92		1983-84	2020-21	1999-00
1977-78	2002-03	2023-24		1984-85	2021-22	2007-08
1979-80	2009-10			2000-01		2010-11
2004-05				2005-06		
2006-07				2008-09		
2014-15				2016-17		
2018-19				2017-18		
				2022-23		

El Niño and La Niña Years Based on Oceanic Niño Index (ONI)
Source: ggweather.com

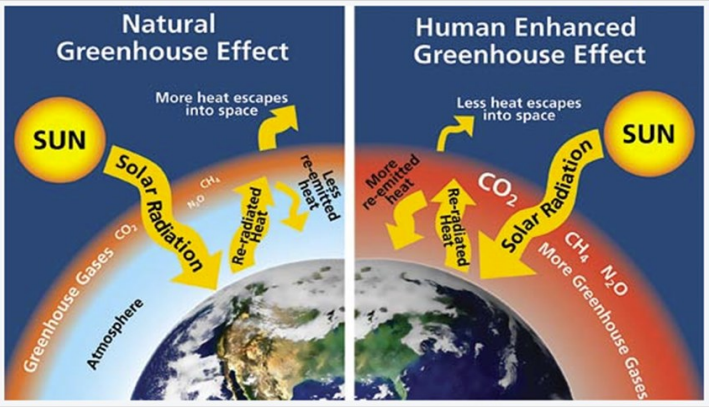
MAN-MADE CAUSE

This weather event may have been influenced by various human activities leading to global warming.

Global Warming (leading to Climate Change*)

** - Weather refers to short term atmospheric conditions while climate is the weather of a specific region averaged over a long period of time.*

Global warming is the long-term warming of the planet's overall temperature. Though this warming trend has been going on for a long time, its pace has significantly increased in the last hundred years due to the burning of fossil fuels. As the human population has increased, so has the volume of fossil fuels burned. Fossil fuels include coal, oil, and natural gas, and burning them causes what is known as the "greenhouse effect" in Earth's atmosphere.

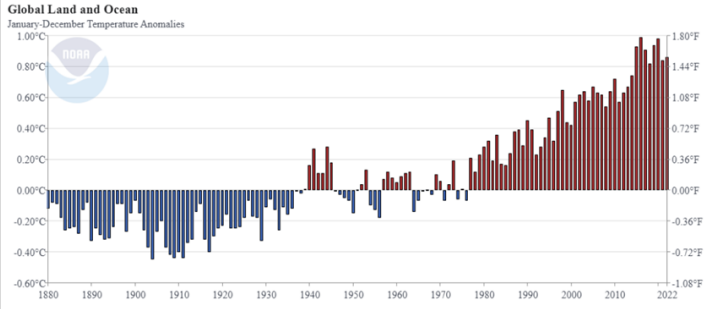


Source: National Park Service

Rise of Global Temperature

Since the Industrial Revolution, the global annual temperature has increased in total by **a little more than 1 °C** (about 2 °F). Since 1981, the rate of increase has more than doubled. For the last 40 years, the global annual temperature rise by 0.18 °C (or 0.32 °F) per decade.

Now climate scientists have concluded that **we must limit global warming to 1.5 degrees Celsius by 2040** if we are to avoid a future in which everyday life around the world is marked by its worst, most devastating effects: the extreme droughts, wildfires, floods, tropical storms, and other disasters.



Source: NOAA National Centers for Environmental information, 2017

This weather event was not caused by CLOUD SEEDING

The UAE National Centre of Meteorology (NCM) confirmed that **no cloud seeding mission had taken place.**

Though the UAE does have an operational cloud seeding programme, not a surprise given the predominantly arid nature of the region.

But in this case, the **clouds were part of a large weather system advancing across the region**, and already predicted to produce substantial amounts of rain across a wide area. **Any possible effect from cloud seeding would be tiny in comparison.**

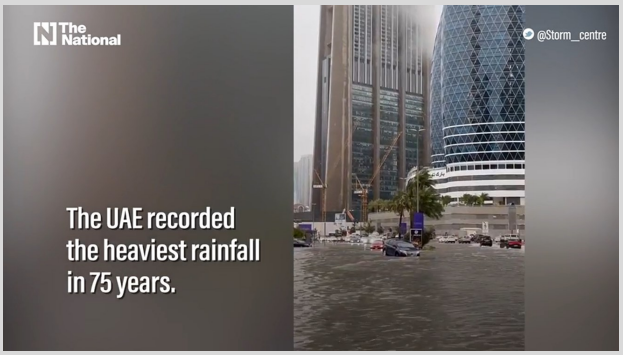
Khaleej Times

UAE's NCM denies cloud-seeding rumours as emirates see heaviest rainfall on record

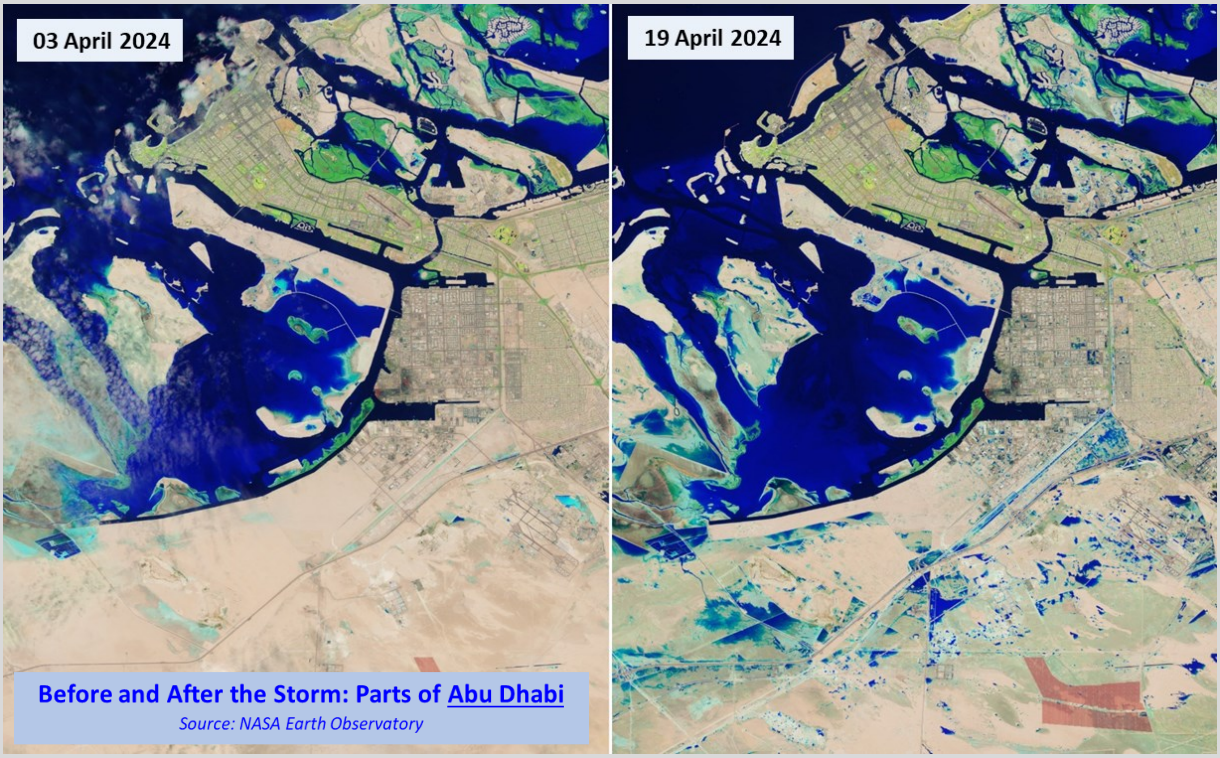
More than four weather waves hit the region, 'with the most intense occurring from late afternoon to late last night', says expert

Published: Wed 17 Apr 2024, 4:13 PM

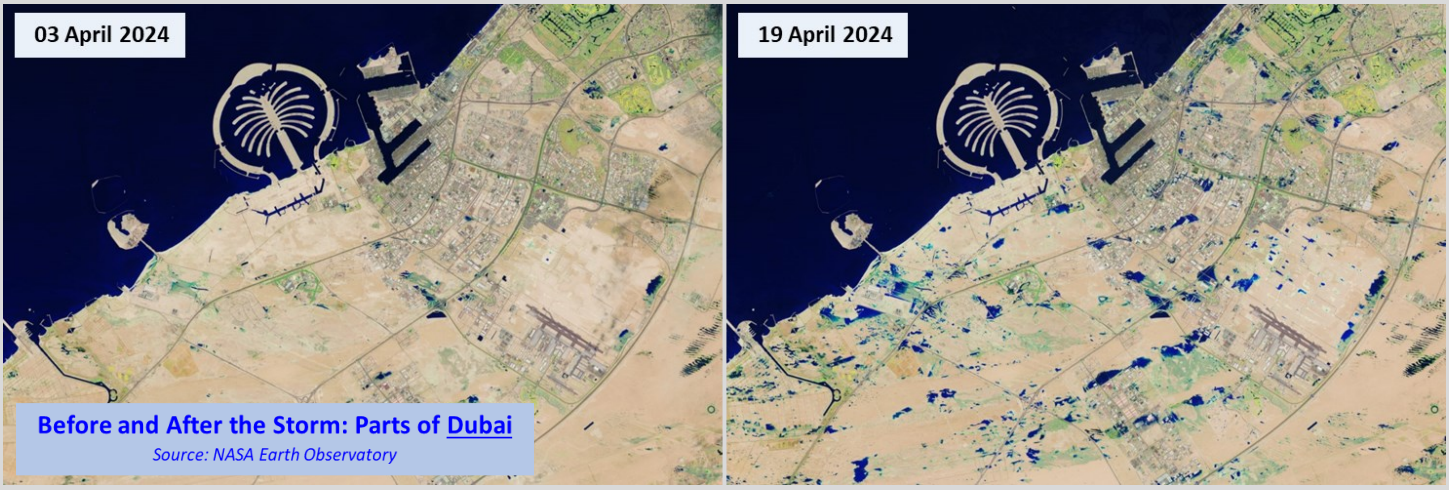
News on the Weather Event



SATELLITE IMAGERY: BEFORE AND AFTER THE STORM



Before and After the Storm: Parts of Abu Dhabi
Source: NASA Earth Observatory



Before and After the Storm: Parts of Dubai
Source: NASA Earth Observatory

References:

Various collective information gathered through the years and based from the author's experience and knowledge in civil engineering, environmental and sanitary engineering.

1) National Center of Meteorology (NCM) under the UAE Government.

2) Heavy precipitation hitting vulnerable communities in the UAE and Oman becoming an increasing threat as the climate warms. Published on 25 April, 2024 by World Weather Attribution.

3) Dubai floods and cloud seeding. Published on 18 April 2024 by Kirsty McCabe, FRMetS in Royal Meteorological Society.

4) Here's why experts don't think cloud seeding played a role in Dubai's downpour. Published on 18 April 2024 by Seth Borenstein and Brittany Peterson in Associated Press (AP).

5) The Far-Reaching Effects of El Nino on UAE Climate. Published on 3 November, 2023 by Rand Mzannar in UAE Pedia Network.

6) Global Warming 101. Published on 07 April 2021 by Amanda MacMillan and Jeff Turrentine in Natural Resources Defence Council (NRDC) in USA.

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elkarttruth.com; 23rf.com; clearfirst.co.uk; reddit.com; fox5sandiego.com; India Construction Chemicals; msig.co.id

Prepared by:

Leovin de Ramos MS Civil Eng. (Acad.), Sanitary Eng.
Deputy Manager - Risk Engineering