

# S-E Asia typhoons to intensify faster, shift northwards

## Cyclones to slow down on land as world warms, threatening coastal cities: Study

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Typhoon Gaemi, which lashed the Philippines, Taiwan and southern China in late July, signalled what is to come as a warming climate speeds up the formation of catastrophic storms and shifts their pathways towards the north.

The third named storm and second typhoon of the annual typhoon season, Gaemi killed dozens as it wreaked untold damage in its path.

As the world warms, typhoons in South-east Asia are expected to intensify more quickly, move northwards towards places such as China and the Korean peninsula, and slow down on land – causing more damage in highly populated coastal areas and beyond.

Typhoon modelling studies done by researchers at the Nanyang Technological University (NTU) and two United States institutes also found that coastal cities such as Bangkok, Yangon and Hai Phong in Vietnam are likely to bear the brunt of these longer-lasting and more powerful cyclones.

Professor Benjamin Horton, director of NTU's Earth Observatory

of Singapore (EOS) and a co-author of the study, said: "As our waters gain more temperature, tropical cyclones are going to start to occur in regions that previously didn't have them much."

"South-east Asia has a high frequency of tropical cyclones, but what we noticed is that the South China Sea is going to get hotter and hotter. So you're going to start to get tropical cyclones farther northwards along the China coast and South Korea more frequently."

In both medium and high greenhouse gas emission scenarios, the researchers' models found that increasingly, typhoons will form over the South China Sea and make landfall north.

At the same time, fewer cyclones are expected to originate over the waters east of the Philippines, as Typhoon Gaemi did.

Currently, most typhoons brew over the Western Pacific, which includes the waters east of the Philippines, said Dr Dhrubajyoti Samanta, senior research fellow at EOS and another co-author of the study.

On whether this could mean fewer typhoons for the Philippines in the future, Dr Samanta said: "It

could be reduced compared with what they are facing today, but that does not mean that the Philippines will be free from cyclones. Fewer, but more high-magnitude ones, can be damaging.

"Cyclones originating nearby or at the South China Sea can also hit the Philippines."

The Philippines is often considered "cyclone central", with about 20 storms and typhoons slamming into the archipelago every year. Particularly destructive were Super Typhoon Haiyan in 2013 and Typhoon Rai in 2021.

The researchers predict more storms in the future could take a path like Typhoon Gaemi's. The Category 4 storm swept across Taiwan, lashed southern China and also reached North Korea.

While the typhoon did not make landfall in the Philippines, it intensified the south-west monsoon, bringing relentless rain and floods to Manila and northern provinces around July 24.

The South-east Asia typhoon study also involved researchers from Rowan University in New Jersey and the University of Pennsylvania. The scientists worked with more than 64,000 simulated tropical cyclones from the 19th century to the end of the 21st century, under both moderate and high carbon emissions scenarios.

The simulations showed changes



Rescuers evacuating residents from their homes in Manila on July 24, as Typhoon Gaemi intensified the seasonal monsoon. Researchers predict more storms of the future could take a path like that of Typhoon Gaemi, which swept across Taiwan, lashed southern China and also reached North Korea. PHOTO: AFP

in where cyclones form, strengthen, slow down and eventually decay.

The study also used nine different climate models to ensure the results were accurate.

The scientists' typhoon predictions for South-east Asia were published in the journal *Climate and Atmospheric Science* in early July.

Amid warming oceans, future cyclones' ability to evolve and strengthen faster from a tropical storm to a category four or five typhoon is another finding that worries the researchers.

Tropical cyclones are more likely to both form and intensify most quickly closer to South-east Asian coastlines, and the intensification

rates are likely to exceed historical norms, said the paper. There are challenges in forecasting rapid intensification, particularly just before landfall.

In some instances, a storm could intensify into a severe typhoon within a day, noted Dr Samanta, adding that coastal cities at risk need to enhance their extreme weather forecasting systems.

Prof Horton added: "This rapid intensification gives less warning to people to evacuate. If you know it's going to be a category one, then you can deduce what a storm surge will be, or the rainfall amount, or the amount of flooding, and prepare appropriately. But if it rapidly intensifies to a three, four or five, do the city planners have the abil-

ity to evacuate fast enough?"

Typhoons can draw more energy from warmer waters, giving them more fuel to linger longer over land and increase the destruction in their paths.

Dr Samanta said: "In mainland South-east Asia, typhoons are expected to move more slowly and take more time before it decays. That can be more devastating for infrastructure."

Moving forward, the researchers are looking to combine their findings with sea-level-rise projections in South-east Asia, to give coastal planners a better sense of how to protect their cities from devastating damage.

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