

Sea levels are rising unevenly in the Indian Ocean, placing millions at risk along low-lying coastlines in Bangladesh, Indonesia and Sri Lanka, scientists say in a study.

In his acceptance speech for the Nobel Peace Prize last year, US President Barack Obama warned that if the world does nothing to confront climate change, "we will face more drought, famine and mass displacement that will fuel more conflict for decades".

Sea levels in general are rising globally by about 3 mm (0.1181 inch) a year. Scientists blame rising temperatures caused by the growing amounts of greenhouse gases, such as carbon dioxide from burning fossil fuels, that trap heat in the atmosphere.

The team of researchers in their study used long-term tide gauge data, satellite observations and computer climate models to build a picture of sea level rises in the Indian Ocean since the 1960s.

But they also found that sea levels are falling in other areas. The study indicated that the Seychelles Islands and Zanzibar off Tanzania's coast show the largest sea-level drop.

"Global sea level patterns are not geographically uniform," said co-author Gerald Meehl of NCAR in Boulder, Colorado.

The study is published in the latest issue of the journal *Nature Geoscience*.

A key player in the process is the Indo-Pacific warm pool, a large oval-shaped area spanning the tropical oceans from the east coast of Africa to the International Date Line in the Pacific.

The pool has warmed by about 0.5 degrees Celsius (1 degree Fahrenheit) over the past 50 years, primarily because of mankind's greenhouse gas emissions. The warmer water has strengthened two major atmospheric circulation patterns that have a major impact on sea levels.

"Our new results show that human-caused atmospheric-oceanic circulation changes over the Indian Ocean, which have not been studied previously, contribute to the regional variability of sea-level change," the researchers say in the study.

The two main wind patterns in the region are the Hadley and Walker circulations.

In the Hadley circulation, air currents rise above strongly heated tropical waters near the equator and flow poleward at upper levels, then sink to the ocean in the subtropics and cause surface air to flow back toward the equator.

The Walker circulation causes air to rise and flow westward at upper levels, sink to the surface and then flow eastward back toward the Indo-Pacific warm pool.

Strengthening of these two patterns could have far-reaching impacts on Asian-Australian monsoons, Indonesian floods and drought in Africa, the study says.

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