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Environment ◇ LATEST

Sea level rise: Inevitable effect of climate change

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The level of the sea globally is rising faster and higher than ever before, creating what the United Nations has describec "urgent and escalating threat" to people around the world.

“Even if global warming is limited to 1.5°C above pre-industrial levels, which is the goal that countries around the worl as part of the Paris Agreement of 2015, the planet will see a sizable increase in sea water levels,” Dickinson reported.

Now, comes this disturbing finding. Global sea level is very likely to rise between 0.5 and 1.9 meters by 2100 under a hig emissions scenario, according to a Singapore-led study using a new projection method.

An interdisciplinary team of researchers from Singapore’s Nanyang Technological University (NTU) and The Netherlan Delft University of Technology (TU Delft) has projected that if the rate of global carbon dioxide emissions continues to increase and reaches a high emission scenario, sea levels would as a result “very likely” rise between 0.5 and 1.9 meters 2100.

The high end of this projection’s range is 90 centimeters higher than the latest UN’s global projection of 0.6 to 1.0 mete

The “very likely” range (90% probability for the event to occur) complements sea-level rise projections reported by the Nation’s Intergovernmental Panel on Climate Change (IPCC), which only assessed the probability of projections up to a “likely” range (66% probability).

The result of the study was published online in the scientific journal *Earth’s Future* in December last year.

“Current sea-level projections rely on a range of methods to model climate processes. Some include well-understood phenomena like glacier melting, while others incorporate more uncertain events, such as abrupt ice shelf collapse,” NTU in a statement.

“As a result, these models produce varying projections, making it difficult to estimate reliable extreme sea-level rise. Th ambiguity in projections from different methods has prevented the IPCC from providing ‘very likely’ ranges for sea-leve projections – a valuable standard in managing risk,” it added.

To overcome this challenge and to address the uncertainties in current sea-level rise projections, NTU researchers deve a new, improved projection method known as the “fusion” approach. This approach combines the strengths of existing models with expert opinions, offering a clearer, more reliable picture of future sea-level rise.

“Our new approach tackles a key issue in sea-level science: different methods of projecting sea-level rise often produce widely varying results. By combining these different approaches into a single fusion projection, we can estimate the uncertainty associated with future sea-level rise and quantify the ‘very likely’ range of sea-level rise,” explained Dr. Ben Grandey, lead author of the study and senior research fellow at NTU’s School of Physical and Mathematical Sciences.

The research team believes their new method fills a critical gap for reliable information, complementing the IPCC’s late report.

likely" to rise between 0.3 and 1.0 meters by 2100. The IPCC's "likely" range projected global mean sea level to rise by 0 0.6 meters.

Under a high-emissions scenario, the NTU fusion model projects global mean sea level will "very likely" rise between 0. 1.9 meters by 2100. The IPCC "likely" range projected a rise between 0.6 to 1.0 meters.

"Our new 'very likely' projections highlight just how large the uncertainties are when it comes to sea-level rise," said Dr Grandey. "The high-end projection of 1.9 meters underscores the need for decision-makers to plan for critical infrastru accordingly. More importantly, these results emphasise the importance of climate mitigation through reducing greenho gas emissions."

Professor Benjamin Horton, co-author and director of NTU's Earth Observatory of Singapore, added, "This NTU researc represents a significant breakthrough in sea-level science. By estimating the probability of the most extreme outcomes underscores the severe impacts of sea-level rise on coastal communities, infrastructure, and ecosystems, emphasising t urgent need to address the climate crisis."

The research team said that new projection method matters as accurate projections of sea-level rise are essential for preparing for climate change. They believed that their new method provides valuable, actionable information for urban planners and governments, helping them plan and implement measures to protect vulnerable communities, especially extreme sea-level rise scenarios.

"By appropriately combining the best available knowledge of sea-level information at different confidence levels into a fused probability distribution, we have developed a novel way to project the full uncertainty range of future sea-level ri said Professor Chew Lock Yue, another co-author.

Associate Professor Justin Dauwels, another co-author who is with the Signal Processing Systems at the Department of Microelectronics at TU Delft, also said, "Our new method for projecting the full uncertainty range of future sea-level ris also be applied for other climate projections and beyond, including coastal flooding risk assessments, infrastructure vulnerability analysis, and economic impact forecasts."

The Philippines is not spared from sea level rise. In fact, Dr. Rosalina de Guzman, chief of the climate data section of th Philippine Atmospheric, Geophysical and Astronomical Services Administration (Pagasa), is very much concerned as se rise would mean putting those living in coastal areas in peril.

"(Sea level rise) can cause inundation of low-lying areas, especially many of our fellow countrymen who live on the bea she said.

By 2050, at least 13.6 million Filipinos are at risk of being displaced by sea level rise, according to a report from the Asia Development Bank (ADB) entitled, *Addressing Climate Change and Migration in Asia and the Pacific*.

There is no way the world can stop the sea level from rising. “The crux of the sea level issue is that it starts very slowly b once it gets going it is practically unstoppable,’’ said Dr. Stefan Rahmstorf, a widely recognized sea level expert from Germany. “There is no way I can see to stop this rise, even if we have gone to zero emissions.’’

By zero emissions, he was referring to greenhouse gases (GHGs) or those gases that have the property of absorbing infr radiation emitted from Earth’s surface and reradiating it back to Earth’s surface. Examples of GHGs are carbon dioxide, methane, and surface level ozone.

Dickinson said sea level rise is a symptom of climate change. The phenomenon refers to long-term shifts in temperatur weather patterns. Such shifts can be natural, due to changes in the sun’s activity or large volcanic eruptions. But since t 1800s, human activities have been the main driver of climate change, primarily due to the burning of fossil fuels like co and gas.

“As global temperatures increase due to climate change, the oceans absorb much of this excess heat,” Dickinson explain “Warmer water grows in volume, a process known as thermal expansion, which is a significant contributor to sea level r

Rising sea levels have wide-reaching implications not just on the physical environment, but also the economic, social a cultural fabric of vulnerable nations across the world, according to Dickinson.

“Saltwater flooding can damage coastal habitats, including coral reefs and fish stocks, agricultural lands as well as infrastructure, including housing, and can impact the ability of coastal communities to sustain their livelihoods,” Dicki wrote.

Beyond those consequences, flooding can also contaminate fresh water supplies, promote waterborne diseases threaten people’s health and lead to stress and mental health problems.

In like manner, tourism revenues, a key economic driver especially in many small island developing countries, including Philippines which has thousands of islands, can suffer as beaches, resorts and other tourist attractions like coral reefs a damaged.

“The combination of so many factors can force people to leave their homes, relocate to higher ground where available o ultimately migrate, which in turn disrupts economies, livelihoods and communities,” Dickinson wrote.—###