Asean coastal cities sinking fastest, could worsen impacts of sea level rise

A comparison carried out across coastal cities worldwide showed that the fastest velocities of relative local land subsidence are concentrated in Asia, especially in South-east Asia.

Data from the NTU-led team's study shows that Ho Chi Minh City is sinking at a rate of 16.2mm per year and Jakarta at 4.4mm. ST PHOTO: ROSALIND ANG

September 21, 2022

SINGAPORE – South-east Asian coastal cities are sinking the fastest globally, which could amplify the impacts – such as massive flooding – of imminent sea-level ri a recent study has found.

Sea levels are rising globally as the Earth's ice sheets melt and as warming sea water expands. Sinking land, or land subsidence, can aggravate the problem, a team of international scientists led by the Nanyang Technological University (NTU) found.

Ms Cheryl Tay, a PhD student at NTU's Asian School of the Environment and the Earth Observatory of Singapore, noted that the many coastal cities in Asia are now centres of growth and rapid urbanisation. This has driven up demand for groundwater extraction to meet growing water needs.

This, in turn, causes land to sink rapidly, said Ms Tay who is the first author of the research study, which was done in collaboration with the University of New Mexico ETH Zürich and Nasa's Jet Propulsion Lab, which is managed by the California Institute of Technology.

Satellite images of 48 coastal cities globally were processed from 2014 to 2020, which showed that the median sinking speed was 16.2mm per year. Some cities had la sinking at 43mm a year, and land subsidence may vary at the neighbourhood level, said Ms Tay.

Current global mean sea-level rise is at 3.7mm per year.

The findings were published in scientific journal Nature Sustainability in September.

Data from the team's study shows that Jakarta is sinking at a rate of 4.4mm per year and Ho Chi Minh City at 16.2mm. Reports have shown that excessive groundwate extraction was the leading culprit for land subsidence in both cities.

In Ho Chi Minh City, the concentration of high-rise buildings in areas with weak foundations has also contributed to land subsidence.

Coupled with extreme rainfall and sea-level rise caused by climate change, land subsidence could lead to more frequent, intense and prolonged flooding for vulnerable places over the next few years, said Ms Tay.

"Floods may disrupt businesses and damage property and infrastructure. In extreme cases, permanent flooding may affect livelihoods by damaging productive agricult land, and force populations to move when places become uninhabitable," she added.

In Singapore, mean sea levels are rising at a rate of 3mm to 4mm per year, with data from the Meteorological Service Singapore in 2020 showing that sea levels here h gone up by 14cm since pre-1970 levels.

Climate projections have shown that the mean sea level around Singapore is projected to rise by up to 1m by 2100. This could go up to 4m or 5m if other effects like storm surges (abnormal rise of water from storms) – which occur two to four times a year – are taken into account.

A comparison carried out across coastal cities worldwide by the researchers showed that the fastest velocities of relative local land subsidence are concentrated in Asia especially in South-east Asia.

Professor of Earth Sciences Emma Hill, who is also acting chair of the Asian School of the Environment at NTU, said that in many past studies of sea-level rise, sinkin land was ignored or has been difficult to measure.

“This new study is important because it provides a leap forward in scientists’ ability to incorporate land sinking into studies of sea-level rise. Accurately measuring lan height change is especially important for Asia, where many large coastal cities are experiencing rapid sinking,” said Prof Hill who is a co-author of the study.

To tackle these issues, governments can build up coastal defences such as sea walls, or tap nature-based solutions such as mangroves, said Ms Tay.

They should also tackle the root cause of the problem. If extraction of resources like groundwater, oil and gas is the main cause of land subsidence for a particular city, then tailored solutions for each jurisdiction would be needed as well, she added.

Distinguished Professor Philip Liu of the National University of Singapore’s Department of Civil and Environmental Engineering, who was not involved in the study, pointed out that other water resources would be needed to replace groundwater extraction, and groundwater recharge plans would be needed such as by pumping used water into aquifers (an underground layer of permeable rock).

“These policies require political will,” he added.