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**Headline: No easy way to communicate the impacts of climate change, says study**

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In a new article titled "Using virtual simulations of future extreme weather events to communicate climate change risk and published in PLOS Climate," Singapore Management University Assistant Professor of Urban Sustainability Terry van Gevelt and his research team have completed part one of a larger study.

The work outlines how researchers from a range of universities in the US, Singapore, Hong Kong, Macau, Nanjing, and Guangzhou in China sought to reduce the psychological distance of climate change by showing a 3D virtual simulation of a storm surge in Hong Kong to a representative sample of 1,507 Hong Kong residents to see if it would change their behaviors and attitudes regarding climate change.

"The main goal was how do you communicate the risks of future climate impacts to the general public, but also to other stakeholders and decision-makers," Professor van Gevelt said. "Traditional methods of communication do not seem very effective in reducing the psychological distance of climate change to the average person or policymaker, and so we are interested in testing a range of novel or non-traditional approaches. This is the very first part of the project that we decided to put out there to see what would happen."

Psychological distance refers to how important an event is to a person—the greater the psychological distance, the less important the event is perceived to be.

The 3D virtual simulation focusing on the impact of a typhoon-induced storm surge on Hong Kong's business district, Central, was developed by former Industrial Light and Magic (ILM) VFX artist Alex Scollay. Professor van Gevelt said the synthetic typhoon depicted in the experiment was a near-worst-case scenario.

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"Everything that it's modeled on, the calibration and so forth, that's all possible," he said. It was based upon an actual event, Super Typhoon Mangkut of 2018, but with a projected rise in the sea level and wind speed maintained at "high intensity, which is what we expect to happen in the future. Also, the track of the storm was shifted to make it a worse impact for Hong Kong at high tide, and again that's completely feasible.

"So, everything is plausible. The modeling—the inundation—that looks pretty accurate, but the simulation doesn't really give justice to the detail that went on in the modeling. But this is what a completely plausible typhoon, amplified by the impacts of climate change, could look like."

The 3D virtual simulation was shown to participants via mobile phones, tablets, and computer screens. Professor van Gevelt said the experiment had more of an impact than he had expected. "The average impact across the whole sample was small, but the finding that was particularly interesting was that it sparked a pretty negative response among a subset of respondents, the skeptics. It seems to have made it a lot worse for that group."

As for the reason for that, he said, "We can hypothesize, but one of the main reasons given was that it didn't actually seem to reduce the psychological distance of climate change for climate skeptics, and the lack of realism of the simulation seems to have made that worse."

So the researchers are now looking to develop a "much more photo-realistic, immersive experience" to see if they have a different finding.

"This simulation was very rudimentary. What we have in the works right now is an immersive virtual reality version where you experience this at ground level. The final part of the project will look to test a narrative approach involving a VR cinema/documentary approach using a VR camera and actors. With this, you will have conversations with people as to what is going on. We want to see if there are any differences between these three different ways of representing the same event."

Up to now the focus has been on Hong Kong. Professor van Gevelt, who was previously a faculty member at HKU when the project was launched, is currently exploring the possibility of conducting further research in Singapore.

Seeing is not believing?

Although the virtual simulation of the storm surge lacks the drama of, say, footage of the 2003 tsunami, Professor van Gevelt says storm surges have historically proven to be deadly in the New Territories of Hong Kong, wiping out entire communities.

"A lot of people said the visualization had no effect as it was only showing one area of Hong Kong." Ironically, the impact of the predicted storm surge on the Central business district was relatively mild in the modeling, Professor van Gevelt said, and parts of Kowloon and the New Territories where many of the participants live, "was hit far worse in the modeling."

"Maybe it was an error, but we made the decision to go with the Central district, which is a very recognizable landscape (albeit with no people shown in the virtual simulation, although it did have cars for scale). The VR version we're currently developing is going to take place in Kowloon, probably Mongkok, which is a much denser residential area. It's interesting that while perhaps scientifically pretty accurate, if it doesn't show a level of realism and detail that people expect, it may backfire," he continued.

"Hong Kong is probably the most resilient city in Asia to typhoons and their impacts. And it's so resilient that it really doesn't invest in increasing its resilience anymore. You can have a

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super typhoon hit and no one will die. But in the future these kinds of amplified versions of the same extreme weather events are going to hit and you're not going to be able to deal with them, because you haven't made those investments as you're so resilient in the present. In the literature, we call this a resilience trap."

While the first part of the research project over the past couple of years has been "very disjointed" due to the COVID outbreak, the VR version should be ready this coming February with the experiments expected to take place in April 2024. As for the third and final part involving actors, that should take place in the next two years.

Why then publish in PLOS Climate? Professor van Gevelt said he was looking for a journal "where there's a good space for a non-traditional climate change research question as it's a little bit away from what you normally see. Most of this would be in a psychology journal, but we wanted to reach a more mainstream audience. PLOS Climate is a new journal, which is growing rapidly and is open-access, so we should get a good readership. The sub-result of this first study is basically that this initial simulation made it worse for climate skeptics, which I think is the most interesting part of this paper—that something that was supposed to help, made it worse.

"I'm really interested to see what happens with the next two parts of the study as it becomes more immersive and realistic. It could well be that we don't see any changes but that would be interesting too because, until you test it, you won't know. There's almost an expectation that it should change people's behavior and even if we find it has no real effect that would be an important finding."

Provided by Singapore Management University