



RESEARCH BRIEF

JUNE 2021

Foreseeing the Impacts of Sea Level Rise

Virtual reality allows individuals to experience future sea level rise effects and enhances community planning and outreach efforts.

Background

Coastal communities around the globe are increasingly contending with the impacts of climate driven hazards including sea level rise, flooding, cliff erosion, and more frequent and intense storms. Successfully adapting to and mitigating these risks requires educating key stakeholders as well as the public. Yet communicating sea level rise and other coastal risks is challenging. Given that 60% of people live 60 miles or more from the coast, sea level rise is an abstract phenomenon that is physically distant from many people consequently rendering it of little concern. Further exacerbating the communication challenge, sea level rise is a slow-moving process creating little sense of urgency while marine science is simply not well understood by the general public.

To fully engage communities — both residents and decision-makers — it is essential that they receive proper information and understand the causes and appropriately assess the risk of sea level rise. Understanding is a basis for feeling an emotional connection to the issue, which is critical to spurring behavioral responses and taking actions accordingly. Virtual reality (VR) simulations may offer a way to overcome some of these communication challenges, enabling users to master fundamental concepts and increase their knowledge of

POINTS FOR POLICYMAKERS

► **Participant evaluation of the sea level rise VR experiences indicate that these experiences enhanced sea level rise visualization.** Envisioning future scenarios and climate impacts can be difficult for many people and consequently, creates challenges for communities when trying to prioritize adaptation planning needs over more tangible and immediate ones. Users who were familiar with the locations portrayed in VR simulations seemed to have stronger emotional reactions than users not familiar with them. This more personal experience is what most affects the way in which individuals learn about and perceive risks and further influences their behavioral responses.

► **Use of VR experiences in community engagement about sea level rise accounts for a significant increase in the number of people engaging with planning efforts when compared with traditional processes.** The VR experiences were used to start hundreds of conversations about sea level rise impacts and adaptation. Users and project team members participated in discussions about the sea level rise models, the feasibility of adaptation options and their related costs and benefits, and the added benefits that could result from using nature-based solutions. Experiencing the simulations also helped in facilitating dialogues on current and future risk as well as options for long-term resilience, including controversial solutions like managed retreat.

► **Inclusion of local residents in the development of the VR experience is a key success factor in effectively communicating sea level rise risk.** The presence of multi-disciplinary development team members who were also residents of the project locations was a key success factor in both the design and use of the experiences. These members were able to provide local knowledge and helped to make the VR environment more similar to the real locations. Local team members also ensured that the physical hazard models and scenarios selected were consistent with those included in ongoing community initiatives such as Local Hazard Mitigation or Climate Action and Adaptation Plans. Most critically, local team members helped to promote events and facilitate discussions due to their existing community knowledge and high levels of engagement in sea level rise issues.

climate change and coastal risks through immersion in an interactive and safe learning environment.

Seeking more effective routes to communicate environmental concerns around coastal risks, Stanford researchers assembled a multidisciplinary team that included local residents to collaboratively strategize, then develop engaging VR experiences. The team designed several future hazard scenarios based upon scientific projections and coastal-scale visualizations of the local environments in three coastal communities: Turner Station in Maryland and the cities of Santa Cruz and Long Beach in California. In addition to enabling residents to literally ‘foresee’ future coastal risks for themselves, these place-specific VR experiences were intended to support communication and outreach around potential sea level rise effects and facilitate discussions on implications for the community.

VR event participants were more fully able to comprehend the impacts of sea level rise and experienced an emotional connection missing when viewing two dimensional maps; their awareness of sea level rise also significantly changed. When potential solutions were added into the VR simulations, it allowed the organizers to catalyze community conversations about current and future risk as well as possible strategies for long-term resilience. Most importantly, using VR in outreach and education enhanced communication between coastal management organizations, stakeholders and the public, providing an effective avenue for entering into a productive dialogue that included controversial strategies such as managed retreat.



Photo courtesy of Calil et al.



Photo courtesy of Calil et al.

ABOUT THE AUTHORS



Jeremy Bailenson

is a professor of Communication and senior fellow at the Stanford Woods Institute for the Environment at Stanford University.



Anna Carolina Muller Queiroz

is a postdoctoral fellow in Communication and the Lemann Center at Stanford University.

This brief is based on the paper “Using Virtual Reality in Sea Level Rise Planning and Community Engagement — An Overview” published in the journal *Water*.

FOR MORE INFORMATION

Office of Policy & Engagement
Stanford Woods Institute for the Environment
woods-extaffairs@stanford.edu
woods.stanford.edu