frontiers | Frontiers in Environmental Science

TYPE Editorial
PUBLISHED 11 October 2023
DOI 10.3389/fenvs.2023.1284099

OPEN ACCESS

EDITED AND REVIEWED BY
Wen-Cheng Wang,
National Taiwan Normal University,
Taiwan

*CORRESPONDENCE
Lynn Donelson Wright,
donwright171@yahoo.com

RECEIVED 27 August 2023
ACCEPTED 13 September 2023
PUBLISHED 11 October 2023

CITATION
Wright LD, Allen T, Caruson K, Hénaff A and Syvitski J (2023), Editorial: Anticipating and adapting to the impacts of climate change on low elevation coastal zone (LECZ) communities. *Front. Environ. Sci.* 11:1284099. doi: 10.3389/fenvs.2023.1284099

Editorial: Anticipating and adapting to the impacts of climate change on low elevation coastal zone (LECZ) communities

Lynn Donelson Wright[1]*, Thomas Allen[2], Kiki Caruson[3], Alain Hénaff[4] and Jaia Syvitski[5]

[1]Virginia Institute of Marine Science (retired), Virginia, VA, United States, [2]Political Science and Geography, Old Dominion University, Norfolk, VA, United States, [3]School of Interdisciplinary Global Studies, University of South Florida, Tampa, FL, United States, [4]Department of Geography, University of Brest, Brest, France, [5]Geosciences (retired), University of Colorado Boulder, Boulder, CO, United States

KEYWORDS

climate change, sea-level rise, coastal erosion, redundant adaptations, socioeconomic impacts, anticipating the future

Editorial on the Research Topic
Anticipating and adapting to the impacts of climate change on low elevation coastal zone (LECZ) communities

Low elevation coastal zones (LECZ) are extensive throughout the world. LECZ communities are threatened by inundation from multiple causes leading to a host of negative impacts including wetlands degradation, destruction of homes and infrastructure, water-borne health hazards and loss of livelihoods. To anticipate long and short-term inundation impacts, scientists must predict processes spanning the ecological, physical, social, and health sciences. Adaptation requires a host of new strategies, numerical predictions, and engineering solutions. Some of the challenges were addressed in an earlier multi authored review paper https://doi.org/10.3390/jmse9111196. For this Frontiers Research Topic, we solicited innovative and interdisciplinary papers to address linkages of coastal inundation, storms, land loss, and the many impacts of climate change on humans, natural environments, and community resiliency along with strategies for implementing redundant modes of adaptation.

The original vision was to enhance future resilience of Low-Elevation Coastal Zone communities by advancing understandings and approaches to better anticipate and mitigate hazards to human health, safety and welfare and reduce deleterious impacts to coastal residents and industries. The goal of the thematic Research Topic has been to assemble interdisciplinary papers that contribute to better understanding of the couplings (including tipping points and cascading effects) among physical, ecological, socioeconomic, management and policy factors involved for different regions and under contrasting environmental conditions.

Better communication of information and understanding was an intended outcome that was achieved via the seven diverse and interdisciplinary papers that were accepted and published. The papers in this Research Topic address socioeconomic vulnerabilities of residents of US LECZ communities; impacts of inundation on road networks in Virginia; restoration of Louisiana wetlands; resilience of a California salt marsh; diversity and

governance of estuaries in New South Wales, Australia; the responses of Florida barrier islands to interannual variations in local sea level including variations in the strength of the Atlantic Meridional Overturning Circulation (AMOC); and strategies for sustaining the climate-impacted water-energy-food Nexus conditions of 10 small island developing states in the Caribbean.

Together, these original papers make it quite clear that the responses of coasts and coastal communities to climate change are now, and will, in the future, be complex, diverse, and consequential. Redundant adaptation solutions are essential.

Tagtachian and Balk employed an equity lens and fine resolution spatial demographic methods to analyze the vulnerabilities of marginalized residents of US LECZ. The results of their study showed that from 1990 to 2020 the populations of US LECZ grew from 22 million to 31 million people and that a disproportionate number of these residents are marginalized, low income, and vulnerable Black, Hispanic, and elderly people. The finding that nearly ten percent of the US population is at risk from coastal flooding by severe storms and sea level rise highlights the need for improved adaptation measures.

The rates of sea level rise in coastal Virginia and the Chesapeake Bay significantly exceed the global rate and weakening of the AMOC adds to the annual rates. Like other LECZ, the population of this region is growing and the number of people that become cut off from travelling to and from work by episodically flooded roads is increasing. High-resolution land use and LIDAR data were used to examine the increasing inaccessibility of roads throughout the affected region Mitchell et al. It was concluded that redundant road networks can increase resilience in the near term.

Coastal Louisiana and the Mississippi Delta constitute the nation's most extensive and most fragile wetland landscape where habitable land is disappearing at an accelerating rate. Port Fourchon in the Barataria-Terrebonne Estuary System to the west of the Mississippi River and centered within the threatened landscape is a key working port for the oil and gas industry. There are plans to deepen the channel access to this port to 50 ft and utilize the dredged sediment in a wetland restoration program. The Water Institute of the Gulf is coordinating this transdisciplinary effort, as described in Hemmerling et al., via a group of residents, coastal scientists, and key stakeholders.

A critical challenge in planning for future rises in sea level involves quantifying and modeling the expected resilience of tidal marshes. This is addressed via a case study of the San Francisco estuary Morris et al. The analyses combined peat age data with results from a Coastal Wetland Equilibrium Model (CWEM) to produce a 100 years hindcast which yielded a good fit. Assuming that the initial marsh elevation is sufficiently high, healthy deltaic marshes can tolerate sea level rise rates of as much as 2 m/century. However, for lower marshes, a tipping point beyond which degradation will occur, would be reached in 50 years.

Many Australian estuaries have been degraded by human activity and are threatened by climate change. An assessment of climate change impacts on numerous estuarine systems in the Australian state of New South Wales Thom et al. identified 4 distinct types or contexts of estuaries each of which possesses different vulnerabilities and necessitates different management strategies. The 4 estuarine contexts are: 1) intermittently closed and open lakes and lagoons 2) coastal lakes, 3) deltaic floodplains, and 4) drowned river valleys.

Zarillo analyzed the roles of interannual sea level fluctuations in causing losses of shoreface sediment volumes and episodic erosion on a transgressing Florida barrier island. The field site flanked Sebastian Inlet on Florida's central Atlantic coast and embraced nine alongshore cells. Six of the cells exhibited sediment loss and three cells near the inlet gained sediment. The implications are relevant to transgressions along the U.S. Atlantic coast. Some of the sea level fluctuations were attributable to slowing of the Gulf Stream and some were caused by wind generated Rossby waves on the Gulf Stream.

Ten Caribbean small-island developing states were studied with respect to sustainability of their water-energy-food nexus with climate change Crisman and Winters. Nature-based solutions were considered to have important roles to play in many cases but add little in cases where rainfall is abundant and can be "harvested" by individual households and small communities. Tourism requires more water, but sustainability may be feasible if water from tourist infrastructure is reused.

Author contributions

LW: Conceptualization, Writing–original draft, Writing–review and editing. TA: Conceptualization, Writing–review and editing. KC: Conceptualization, Writing–review and editing. AH: Conceptualization, Writing–review and editing. JS: Conceptualization, Writing–review and editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

Publisher's note