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Editorial: Adapting and building local resilience to sea level rise impacts on coastlines

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Editorial on the Research Topic
Adapting and building local resilience to sea level rise impacts on coastlines

1 The Legacy of Professor Saleemul Huq: from climate justice to advocacy

When we initiated this Topic in 2021 as a team of seven based across three continents, we were excited to see how our Research Topic titled "*Adapting and Building Local Resilience to Sea Level Rise Impacts on Coastlines*" would develop and how our various experiences could shape submissions. We were privileged that Dr Saleemul Huq was part of our editorial team, a visionary researcher, expert, and advocate of climate justice and adaptation. His unexpected death in October 2023 made us – and many others around the world – pause to reflect on his passion and contribution to raising concerns and combatting the effects of climate change. For those who worked closely with him, they found him to be the humblest person and colleague with an impeccable manner. As a senior colleague, he was always open to new ideas and suggestions regardless of age, education, or experience. He rarely said no to requests for his time and energy. He was a mentor to many of us on this team and numerous others working in climate adaptation globally.

Native to Bangladesh, a country widely recognised as vulnerable to climate change and sea-level rise, Dr Huq played a key role in bringing issues of climate change, adaptation, equity, and locally led adaptation efforts to the forefront of national and international science and policy discussions. Writing an early assessment on climate change for Bangladesh (Huq et al., 1995), including options to adapt, he advocated that to ensure a just transition, adaptation must go hand-in-hand with development and poverty alleviation (Huq, 2001). Dr Huq established one of the first environmental research think tanks, the Bangladesh Centre for Advanced Studies, to offer scientific solutions to government and non-government agencies in the country. He provided sectoral impacts of climate change

in Bangladesh with his colleagues on water, agriculture, and coastal resources, bringing the challenges to global attention. An advocate for developing nations, he continued to write and fight for climate justice in the Global South until the end. He started and was the Director of International Centre for Climate Change and Development, which is one of the leading research and capacity building organisations working on climate change and development in Bangladesh.

Dr Huq was one of the key proponents of 'Community Based Adaptation' (CBA) which puts the local community in the driving seat with other relevant institutions for effective adaptation interventions, putting Bangladesh at the centre of CBA as its "adaptation laboratory." A legacy is the CBA international conferences which for the past 20 years have been showcasing the best practices for information and knowledge transfer on local adaptation. Dr Huq's actions led to guidelines for financing, upscaling and establishing principles of CBA, influencing beyond Bangladesh. He was also an 'intellectual architect' of the locally led adaptation (LLA), tackling inherent inequalities amongst marginalised groups to offer accessible and transparent funding as well as empowering the local institutions and communities to address climate change. Countless individuals, groups, institutions, and, in some cases, nations looked up to him for guidance.

Dr Huq was involved in the third, fourth and fifth Intergovernmental Panel on Climate Change (IPCC) reports from 1997 to 2014. His efforts were unwavering in establishing a "loss and damage" fund, so vulnerable developing nations are given the necessary support to adapt to the permanent (loss) and reversible (damage) of the negative impacts of climate change. A fund was created in COP27 (2022) and operationalised in COP28. Dr Huq was an advisor to the UN Secretary-General on Climate Change, the Least Developed Countries (LDC) Group of the UNFCCC, UAE COP 28 Presidency, the Global Center on Adaptation, V20, and Climate Vulnerable Forum as well as was a key member of the Advisory Committee of COP28 and Climate Bridge Fund (ACCF).

While he was a man of big ideas and making every single effort to make big changes, he stressed a lot about capacity building – mostly for the poorer nations and youngsters. The Paris Committee on Capacity-building (PCCB) of UNFCCC called him "The Father of the Capacity-building Hub". Formulation of the Least Developed Countries Universities Consortium on Climate Change (LUCCC), to enable these countries to develop their expertise and capacity to address climate change and the development of "Gobeshona" (which means research in Bangla), a global platform for climate adaptation research are few of his legacies. Dr Huq was keen to help, support, and learn from the research of young colleagues – mobilizing and inspiring them in the pursuit of knowledge and action-based research that benefits the most vulnerable.

As a beacon for climate justice and advocacy, Dr Huq left his charismatic mark on almost every aspect of the climate change arena, from mainstreaming the adaptation into development planning to working with diverse academic and non-academic actors and stakeholders to advocate for locally led solutions. We thank him for his advocacy and mentoring the next generation and dedicate this Topic to him.

2 Background to the topic

Resilience can be seen as the first step to cope with change, before adaptation is evitable. But with adaptation, the ability to be resilient can be removed. Whilst adaptation is ingrained in communities living on the coast, resilience, i.e., the ability to cope with or rebound from a hazard, is increasingly being re-built into human and natural systems. For instance, this may be through re-introducing natural solutions, education of traditional practices or rethinking previous adaptation approaches (e.g. sea walls) that may now be viewed as maladaptation as their sustainability decreases (Kisacik et al., 2022; Pörtner et al., 2022). Dr. Huq, through his life's work, showed the world that humans as individuals are innately resilient, and that achieving a similar resilience within human and natural systems is urgent but achievable (Verkooijen, 2023). Thus, we need multiple methods to safeguard against risk, balancing the dual challenges of building resilience and adaptation. This topic brings together examples of strategies in resilience and adaptation to different coastal hazards.

2.1 New ways to understand changing hazards

Understanding hazards and their impact on our landscape is critical before meaningful resilience or adaptation can occur. In this Research Topic, Mehrtens et al. analysed changes in foredune growth and storm surge protection within the context of the Eiderstedt Peninsula in Germany. Using novel tracking methods, their findings analyse changes in location and height of the toward part of the dune. This has the potential to bring new approaches and methods of how foredunes can offer protection during storms.

Natural connectivity of the landscape was the theme of Hendricks et al. They consider inundation pathways (from sources of flooding to the receptor (e.g. a building) to assess risk focusing on coastal Virginia, US. This demonstrated the connectiveness of many pathways to possible hazards, whether it was the nearest stretch of coast or a flood source much further away. This allows for consideration of how best to manage hazards from single or multiple sources.

Zhou et al.'s paper applied an open-source 3D modelling system to simulate storm surges in the South China Sea under different magnitudes of sea-level rise from 2050 to 2300. Comparing 2D and 3D modelling capabilities and using a reconstructed wind field to drive the model, it improved the storm surge hindcast simulation. They found increasing water depths with sea-level rise altered the spatial distribution of the peak surges. Interestingly, the surges decreased with sea-level rise, but in embayment surges could increase as water is pushed coastwards.

2.2 Resilience

Building resilience often means shifting to alternative approaches. Drawing lessons from UK case studies, van der Plank et al. discusses the shift to personal resilience amongst private citizens, community groups and businesses, such as the use of property level resilience.

Despite the national push for adaptation, householders, when surveyed, gave a neutral response that they should prevent damage to their homes. They rather considered government agencies should be held to account. Thus, greater work is needed for householders to take personal responsibility for the impacts of flooding.

Brown et al.'s paper took this a step further, exploring policy transitions within the context of Shoreline Management Plans in England and Wales. They claim that the public have a lack of awareness of why change is needed, especially where contentious decisions are involved. This is due to political decisions, limited funding, community expectations and a disconnect between people and nature. Resilience needs long-term campaigns for change, such as education and engagement to raise awareness of hazards and to enable responsibility to take action.

2.3 Adaptation

The collection of papers in this Research Topic underlines the importance of local context in shaping adaptation and the necessity for considering the perceptions and priorities of local stakeholders. Transformational adaptation was demonstrated in Bacton, Norfolk, England in 2019, the subject of Cotton et al.'s paper where a gas station on an eroding cliff was protected with a 1.8 million m^3 sandscaping scheme. Whilst the physical benefits of the 20-year scheme are clear, nearby residents reported co-benefits of peace of mind, perceived increase in property values and greater number of tourists, strengthening the sense of place. A careful balance needs to be played between long-term adaptation and resilience, so that adaptation is not viewed as an 'end point', but one of evolving risk with the continued needs for personal and community resilience.

In Virginia, US, Guthrie et al. surveyed property owners on why they installed armouring compared with 'living shorelines' based around nature-based solutions. Whilst the property owners valued ecology, they perceived hard defences to be more effective. Greater engagement of solutions is needed so that property owners gain greater confidence in adaptation methods available.

Different pathways and modes of adaptation were found from modelling flood hazards in Santa Monica Bay, California (Schroder et al.). They found that dual approaches of grey infrastructure with nature-based solutions worked well to reduce or eliminate flooding, property damage, and the impact on the exposed population. Schroder et al. also found that combinations of adaptation could potentially shift flood hazards to other localities.

Moving forward building on Dr Huq's legacy, our topic provides examples of hazards, their methods of assessment and combating them through resilience and adaptation, particularly where nature-based solutions are an option.

This leaves a larger question of how to balance resilience and adaptation needs. How long will adaptation be a success until it becomes maladaptation? Could we ever have mal-resilience? How can we increase education, trust, and confidence of communities and other stakeholders on present and future risks where there are potential losses or where the benefits are not clear or tested? Adaptation and resilience will always have winners and losers, where at times the unintended consequences of today's actions will be unclear. Building on and re-emphasising Dr Huq's vision, adaptation needs to take place simultaneous to development, especially for developing and underdeveloped nations. This can only be done where there is education and awareness to know what options are possible, and building the capacities of the local communities so that both adaptation and resilience result in sustainable solutions and a just transition.

Author contributions

SB: Conceptualization, Writing – original draft, Writing – review & editing. NH: Writing – review & editing. AK: Writing – review & editing. AR: Conceptualization, Writing – original draft, Writing – review & editing. SS: Writing – review & editing, Writing – original draft, Conceptualization. SN: Conceptualization, Writing – review & editing.

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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.

Publisher's note

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