



Adaptation to sea level rise

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Climate change and Sea level rise

Sea level rise (SLR) is a critical threat to coastal regions worldwide, for both human populations and ecosystems. The Intergovernmental Panel on Climate Change (IPCC) has affirmed the link between global warming and the rise in sea levels, in the context of climate change and its consequences, such as the thermal expansion of water and the melting of polar glaciers (IPCC, 2019). The IPCC's Special Report on the Ocean and Cryosphere in a Changing Climate states that the mean sea level has risen 15 centimetres between 1901 and 2018 (IPCC, 2019). The rate of rise has been accelerating in recent decades. This may intensify the risks of coastal flooding and erosion, which impacts coastal communities and ecosystems (IPCC, 2019). They are also particularly susceptible to more frequent and intense storms, changes in precipitation patterns, and increasing ocean temperatures (Cooley et al. 2022).

There are many barriers to implementing effective and accessible mitigation and adaptation strategies to reduce the vulnerability to sea-level rise in these regions, including financial barriers, lack of political support and supportive local regulatory frameworks, and limited adaptive capacity or capacity gaps.

Vulnerability of SIDS

Small Island Developing States (SIDS) are especially vulnerable to rising sea levels due to the high dependence of these regions on coastal zones and the high concentration of people and infrastructure near to the coast. Estimates using an SLR model suggest that coastal flooding could impact a population of 1.8–3.5 million inhabitants, that is, 5.7% of the total SIDS population, by 2100 (Matry-Koller et al., 2021). Many coastal and island communities may be at risk of climate-forced population displacement or may choose to migrate to reduce these risks and seek alternative livelihoods (Oakes, 2019). It is also crucial to acknowledge that a significant portion of the community may be unwilling to leave their homes, even when faced with homelessness. The ties to their land, cultural heritage, and social connections are deeply ingrained, making relocation a complex and emotionally charged decision (Hauer et al., 2019). Furthermore, there may be a genuine desire among community members to return to their original homes once conditions allow (Hauer et al., 2019). This highlights the importance of not just addressing the immediate challenges of displacement but also fostering solutions that respect communities' aspirations for continuity and return.

Economic consequences locally and globally

SIDS are now facing economic losses due to climate change and rising sea levels. Dominica suffered US\$380M in losses due to Tropical Cyclone Maria (Martyr-Koller et al., 2021). Solomon Islands has been affected with 50% of homes lost due to coastal erosion (Ferris et al., 2011). SIDS use contingency finance as an instrument to afford risk retention. Governments set aside a portion of public funds or secure loans to ensure they have the means to face and recover from a disaster (Martyr-Koller et al., 2021). Adaptation methods are recommended but these funds are limited. Depending on the adaptation method adopted, the global economic losses could be reduced to between 0.02% and 0.01% of global Gross Domestic Product (GDP) by 2050 (Martyr-Koller et al., 2021). While this represents an initial economic cost for some states, others would benefit. It is important to look at the long term. If these populations lose their homes, this could cause one of the largest refugee crises in recent history. Furthermore, this could make some of the most fertile land in the world unavailable, compromising the global food supply (Hauer et al. 2019). It is thus in the interests of every state, endangered or not, to protect these at-risk zones to ensure global stability.

Need for better inclusion of Indigenous knowledge into adaptation responses

It is necessary to integrate Indigenous knowledge and adaptation strategies into the development of any adaptation or mitigation framework to improve community engagement and resilience. Climate-induced displacement can have an enormous impact on cultural identity and national sovereignty (Oakes, 2019). There is already a precedent, in the Sahel, for integrating local and Indigenous knowledge systems into climate mitigation and adaptation strategies through agricultural processes and forest management strategies that improve carbon sequestration or utilize local knowledge to conserve biodiversity and ecosystem health (Nyong et al., 2007). Specifically, in relation to coastal regions, Indigenous knowledge and stewardship priorities already practiced by island communities are often not integrated into current climate strategy frameworks (Leonard, 2021).

Need for North/South knowledge sharing

One solution we propose is an international framework of cooperation. European nations like the Netherlands and Belgium have accumulated decades of experience through schemes such as Delta Works and Sigma Plan. These schemes were designed and adapted after very heavy storm surges in the 1950s and 1970s. Delta Works was a 30-year project which provided important knowledge in hydraulics and coastal engineering and was later repurposed in response to shifting priorities. The Dutch themselves are eager to share this expertise and help internationally and have done so bilaterally (Pilaczyk et al., 2012). In Belgium, instead of focusing on hard hydraulics, they focused more on flood control areas, polders that are deliberately flooded when the tide is high (Meire et al., 2014). This demonstrates that developed at-risk nations have already developed their own unique expertise to tackle these problems. We think it would greatly benefit the international community if there was an international framework for countries to share their knowledge and experience in coastal engineering with each other. They could provide knowledge and expertise related to hard infrastructure and a more ecosystem-based approach by restoring protective ecosystems. There is still a large knowledge gap regarding such ecosystems, which have mostly been studied in the US and the Netherlands (Salgado et al., 2017). Through this international

framework, it would also be possible to research these techniques and their effectiveness in other states. We propose that such a framework be included in existing instruments, such as the Nairobi frameworks.

Propositions

Adaptation to rising sea levels, especially with respect to those highly affected rural coastal communities, should be approached from a more holistic and proactive angle. Based on previous considerations, COP decisions should ask Parties to:

- Foster and implement international networks for the sharing of knowledge and research. Considerable progress could be made by incorporating the above proposals into existing frameworks like the 'Nairobi Work Programme', and involving local stakeholders at every stage of the decision process.
- Create a voluntary fund financed by Parties, taking into account GDP per capita, national investment for adaptation strategies, and historical CO2 emissions. The fund should be allocated giving priority to Least Developed States (based on GDP per capita) who face the greatest risks due to rising sea levels.
- Ensure efficient access to funding for eligible developing countries and provide readiness support to help these countries effectively utilize the funding. The disparity between research in coastal regions in the Global South with low GDPs (Arent et al., 2014) and articles about the actual implementation phase of adaptation strategies reflects a lack of planning and monitoring (Cabana et al., 2023), and these are gaps that should be considered to facilitate equitable and productive adaptation to the coastal effects of climate change.

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