Policy Brief Series

From the participants of UNITAR 2024 Leaders for a Free and Open Indo-Pacific: Sea and Human Security Training Programme

Sinking Islands: A Call to Action on Sea-Level Rise Post-Sendai Framework

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Key Points

1. The Sendai Framework (2015-2030) is unlikely to meet all its targets, including managing sea-level rise, which worsens other disasters. Post-Sendai actions are crucial.
2. Key challenges include poor coordination, limited funding, inadequate global support, lack of local knowledge documentation, lack of technology integration, and weak partnerships.
3. There is a global need for leveraging best practices and emerging technologies to tackle sea-level rise.
4. Small islands and archipelagic states can enhance resilience by focusing on aspects of human capital, institutional strength, data and technology integration, and robust collaboration.

Kiribati
Population: 134,518
Land area: 811 km^2

Tuvalu
Population: 11,478
Land area: 26 km^2

Below water level

Source: Climate Central. 2024. *Coastal Risk Screening Tool.* https://coastal.climatecentral.org/

Background

The Asia-Pacific region is torn between geopolitical sensitivities and socio-economic opportunities. The coastlines form the backbone of the region and serve as the main source of economic development for the coastal communities. Despite the immense growth potential, this dependence on coasts makes them particularly vulnerable to sea-level rise (SLR). Situated between the Ring of Fire; and South Pacific cyclone belt, extreme weather events and coastal hazards like storms surges and coastal flooding is further exacerbated by SLR. About 70 percent of the population in Asia and the Pacific is susceptible to these cascading and compounding effects of SLR.[1] Not only the small island states in the Pacific, but the small archipelagic islands in Asia will increasingly face the adverse effects of hazards with the onset of SLR.

International treaties and organisations have stressed the existential threat of SLR and suggested measures for collective action. The Sendai Framework for Disaster Risk Reduction provides a foundation for addressing the risks and the knock-on effects of SLR. It highlights the importance of nature-based approaches such as mangrove restoration, sustainable coastal planning, and comprehensive risk governance to mitigate both fast and slow onset disasters. By prioritising proactive adaptation strategies and strengthening coastal resilience, the framework supports long-term strategies that safeguard communities and economies in the Asia-Pacific.

It is considered unlikely that all targets under the Sendai Framework will be met by 2030. Some targets, like increasing the number of countries with disaster risk reduction strategies, may be achievable. However, reducing mortality, the number of affected people, and economic losses will be much more difficult given the current trends.

This policy brief highlights gaps in the Sendai Framework and proposes post-Framework actions for small islands and low-lying states to tackle sea-level rise.
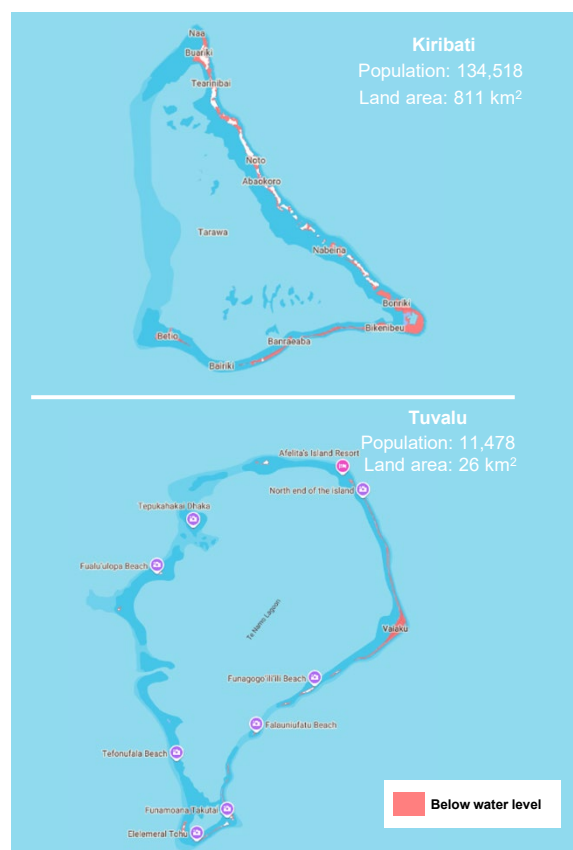
Issues & challenges

Environmental security
SLR threatens loss of ecosystems, inundation, saltwater intrusion, and coastal erosion.

Economic security
Inaction in adapting to SLR could cost USD 400-520 billion per year in losses by 2100 under the most extreme warming scenarios.[2] The current budget request by the Climate Vulnerable Forum is $300 Billion per year is not enough to combat challenges posed by SLR.[3]

Maritime security
Potential disruption of maritime boundaries and legal jurisdictions especially the loss of exclusive economic zones, territorial seas and access to resources like fishing grounds.

Human rights
SLR could lead to forced displacement for vulnerable communities, depriving people of their rights to life, adequate housing, water, sanitation, food, education, and healthcare.

Gender security
SLR disproportionately impacts women, children and people with disabilities. Increased women and children casualties in extreme weather events directly threatens continuation of a community.[4]

SLR is the long-term increase in the average height of the ocean's surface relative to land, caused predominantly by glacial melting and thermal expansion. SLR is a slow onset hazard, however it has a compounding impact on extreme climate change events like the severe and frequent tropical cyclones, coastal storm surges, floods and heatwaves. In 2022 alone, extreme weather events caused over 7,500 deaths, affected over 64 million people, and caused economic damage estimated worth US$57 billion.[5]
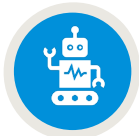
Lack of technical expertise on climate change adaptation (CCA) and disaster risk reduction (DRR) strategies

Lack of documentation of indigenous & historical practices of local communities

Lack of interagency, intersectoral, and international coordination

*Lack of technology integration into prevention and mitigation strategies*

Lack of government funding and inadequate global support

Lack of public-private partnerships

Best practices: Lessons that shape tomorrow

The Sendai Framework is unlikely to achieve its targets by 2030. While some targets are still achievable, like increasing the number of countries with codified disaster risk reduction strategies, targets like reducing mortality, the number of people affected by disasters, and economic losses incurred on affected states will be much more difficult to achieve in the near future. The map below illustrates the status of the states implementing the Sendai Framework as of 2025.[6] It highlights that most states have not reported any data. The rest are in the reporting process, and some have finalized targets ahead. Given the uncertainty associated with SLR, even a small change can drastically affect the future of small islands like Tuvalu and Kiribati and cities in low-lying areas like Jakarta and Bangkok. Hence, the economic cost of inactivity and ineffective adaptation strategies is relatively very high, especially for states that do not have mitigation or adaptation strategies in place.
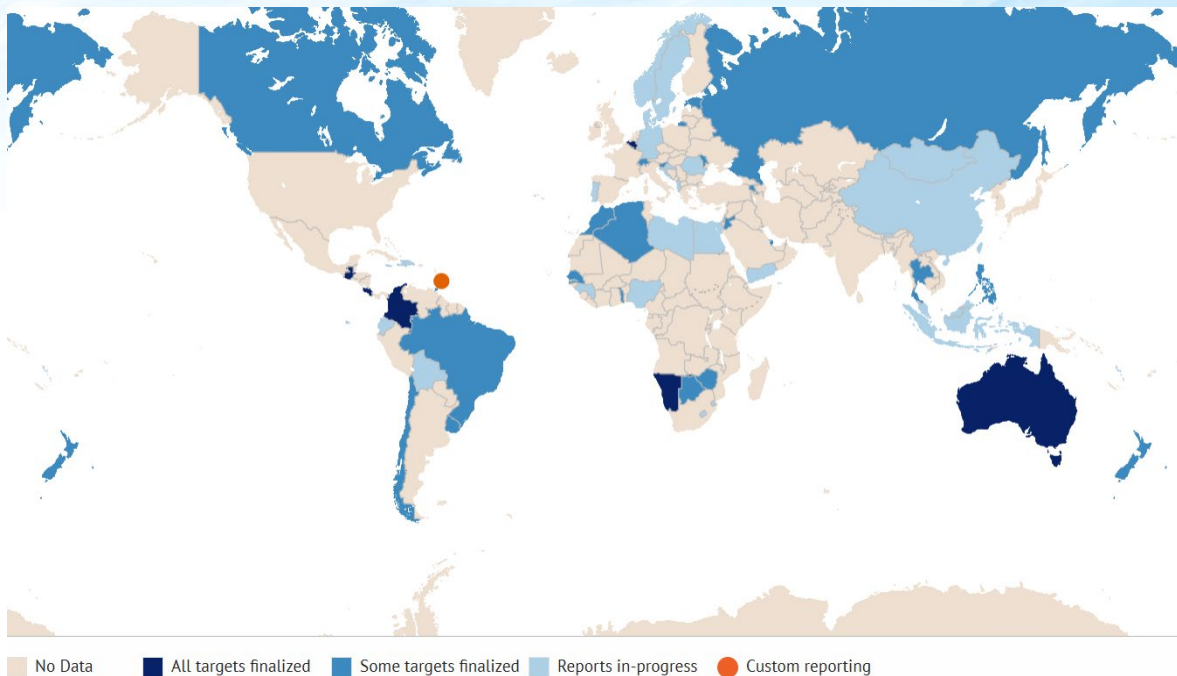
To prepare states for the next two decades post-Sendai framework, we recommend utilizing historical knowledge, analysing the effective responses and replicating best practices in the region.

Harnessing the local and indigenous knowledge

In the past, indigenous communities relied on their deep connection with nature to predict environmental changes, including shifts in weather patterns. This local knowledge is vital for coastal protection policies in Asia-Pacific, especially with SLR increasing the intensity of these extreme weather events. For example, the indigenous and local communities will observe the ecological changes in their surroundings and make a collective decision on whether to migrate to higher grounds. These nature-based observations, passed down through generations, for effective preparedness against hazards have not been documented and need to be assimilated into policy practices.

Strengthening infrastructure to adapt to SLR in the future

In the present, countries are actively enhancing their infrastructure and investing in urban planning to prepare for future SLR. This includes building seawalls, elevating roads, constructing flood-resistant buildings, and improving drainage systems. One notable example is Singapore's coastal adaptation plan of persistently elevating infrastructure to keep it above floodwaters and upgrading drainage systems to channel rainwater away from urban areas. This proactive approach aims to protect the island nation from the increasing risks associated with SLR.
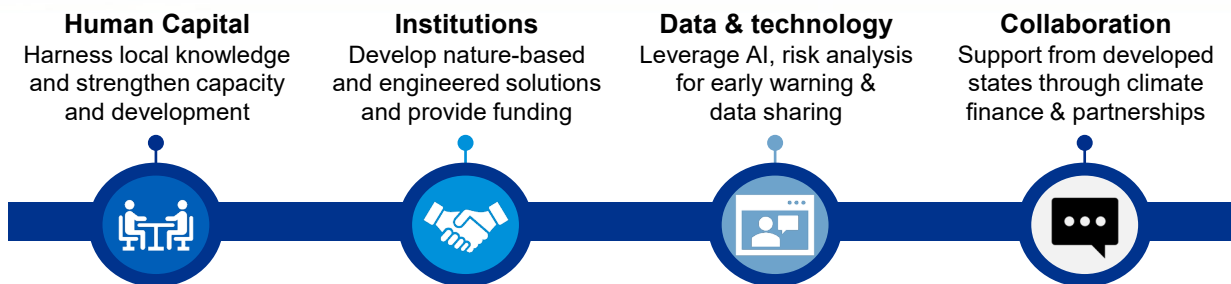
Leveraging AI to predict extreme weather events

In the future, countries will emphasise on enhancing their digital infrastructure capabilities. Harnessing the potential of emerging technology like artificial intelligence (AI) for flood forecasting and early warning systems can complement disaster preparedness and response. Some AI applications include predictive modeling, satellite data analysis, real-time data processing, AI-powered climate simulations, and automated flood detection systems. One notable example is South Korea's Smart Coastal Cities initiative which integrates AI for flood prediction in real-time from sensors and satellite imagery. This system enables authorities to anticipate and respond to potential flooding more effectively, reducing risks to human security and infrastructure.

Recommendations

Drawing on past experiences, current efforts, and emerging best practices, we propose a comprehensive four-pronged approach for policy-makers to consider in protecting coastal communities in the post-Sendai Framework era:

Human Capital
Harness local knowledge and strengthen capacity and development

Institutions
Develop nature-based and engineered solutions and provide funding

Data & technology
Leverage AI, risk analysis for early warning & data sharing

Collaboration
Support from developed states through climate finance & partnerships

01. Human capital

1.1. Document local, indigenous knowledge
- Integrating local and indigenous knowledge with SLR adaptation, planning and coastal protection measures. This historical traditions and practices of communities in managing hazards in their region have helped them survive the effect of climate change in the past, and can be harnessed to manage SLR.
- Focusing on greater representation of local experts, climate activists, indigenous communities, historians into the policy making process.

1.2. Capacity development
- Conducting capacity development by government through training programmes, knowledge sharing, and awareness sessions on sea-level rise and related climate change hazards.
- Strengthening the data collection, analysis, and information management, on the frequency and intensity of extreme weather events.

2. Institutions

2.1. Mix of nature & engineered solutions
- Combining both green and grey approach utilises the strength of nature-based solutions (NBS) and engineered solutions. NBS acts as the frontline barrier giving buffer space and providing ecosystem benefits in addition to engineered solutions that provide robust and final protection against SLR and its multi-risk hazard potential.
- Conducting a comprehensive study of coastal areas for assessing the best outcome, i.e green solutions where feasible, grey solutions where essential, and a mix where optimal.

2.2. Intersectoral & interagency coordination
- Improving communication channels across government sectors like finance, environment, tourism, and fisheries for effective coordination on coastal protection measures.
- Prioritising SLR in adaptation plans across local and national agencies for informed and shared decision-making and resource allocation
- Bolstering close interoperability across public and private sectors working on SLR management. A whole-of-government and whole-of-society approach is required for better adaptation to a slow onset disaster like SLR.

3. Data & Technology

3.1. Transformative technology

- Undertaking regular risk assessment, SLR is a slow-onset hazard which requires regularly updating available information on the frequency and intensity of disasters.. Integrating AI technology for regular data gathering will significantly reduce the time required for predictive analysis and multi-scenarios planning.
- Utilising AI technology to account for systemic risks, compounding impacts, and medium to long term effects of SLR and to develop effective adaptation plans.

3.2. Early warning systems

- Sustaining, replicating, and scaling up best practices of Sendai Framework such as the multi-hazard Early Warning Systems. These systems have helped reduce exposure to extreme weather events. Since this is an effective practice, it can be advocated to other states which are not currently part of Sendai Framework but could benefit from it In the states that already have Early Warning systems in place, continuous monitoring is advised.

4. Collaboration

4.1. Climate change funding

- Developed states contribute a lot to global warming which directly results in SLR. Thus, developed states must continue to pledge financial support through climate finance mechanisms, such as Green Climate Fund (GCF), Global Environment Facility (GEF), Adaptation Funds and the Systematic Observations Financing Facility (SOFF) to enable small island developing states to adapt to SLR.

4.2. Private-sector partnerships and international collaboration

- Incentivising private sector engagement in green engineering, DRR projects and tenders by the public sector can help scale SLR adaptation
- Promoting international data-sharing mechanisms through bilateral, minilateral and multilateral platforms. Minilateral like Quadrilateral Security Dialogue (Quad) have developed information sharing mechanisms for coordinating collective action on climate change.

"The encroaching waters threaten to erase everything we hold dear, urging the global community to act decisively and urgently before this crisis claims the future of vulnerable nations."
Hon. Minister Simon Kofe
Minister of Justice, Communication & Foreign Affairs, Tuvalu

References

[1] United Nations Development Programme. 2024. "Asia-Pacific: Climate Change Poses Existential Threat as Extreme Weather Worsens Poverty and Risks Public Health, Says UNDP Report." UNDP, February 19, 2024. https://www.undp.org/asia-pacific/news/asia-pacific-climate-change-poses-existential-threat-extreme-weather-worsening-   poverty-and-risks-public-health-says-undp-report.

[2] Depsky, N., I. Bolliger, D. Allen, J. H. Choi, M. Delgado, M. Greenstone, A. Hamidi, T. Houser, R. E. Kopp, and S. Hsiang. 2022. *DSCIM-Coastal v1.0: An Open-Source Modeling Platform for Global Impacts of Sea Level Rise*. EGUsphere (Preprint). https://doi.org/10.5194/egusphere-2022-198.

[3] Climate Vulnerable Forum (CVF). 2024. "COP29 Closing Statement – CVF Secretary General." 2024. https://cvfv20.org/cop29-closing-statement-cvf-secretary-general/.

[4] United Nations Framework Convention on Climate Change (UNFCCC). 2024. *Technical Guidance on Sea Level Rise and Its Impacts*. Second draft, August 8, 2024. https://unfccc.int/sites/default/files/resource/SoE%20Technical%20guida%20SLR_second_draft_clean_080824.pdf.

[5] United Nations Development Programme (UNDP). 2024. "Asia-Pacific: Climate Change Poses Existential Threat as Extreme Weather Worsens Poverty and Risks Public Health, Says UNDP Report." February 19, 2024. https://www.undp.org/asia-pacific/news/asia-pacific-climate-change-poses-existential-threat-extreme-weather-worsening- poverty-and-risks-public-health-says-undp-report.

[6] United Nations Office for Disaster Risk Reduction (UNDRR). n.d. *Sendai Framework Monitor*. Accessed February 20, 2025. https://sendaimonitor.undrr.org/.

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