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# POLICY BRIEF: Global Sea- Level Rise

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*This briefing note is prepared by the International Science Council (ISC) on the occasion of the Informal Plenary Meeting on Sea-Level Rise taking place on 3 November 2023, convened by the President of the UN General Assembly. The brief outlines key messages related to sea-level rise, convened from a global community of active scientists from different regions, bringing diverse disciplinary perspectives from across the natural and social sciences. Mobilized through the ISC network, they include renowned experts who have contributed to global processes such as IPCC reports. Their insights here shed light on key considerations for policy-makers on a wide range of issues related to sea-level rise, highlighting the value of engaging actionable, interdisciplinary scientific knowledge in responding to current and future challenges. The brief is intended to inform the PGA and Member States, while serving as a starting point to provide further and more comprehensive inputs from the active scientific community in response to PGA and UNGA requests on sea-level rise and other issues of global concern. The ISC stands ready to mobilize its membership to support continued and strengthened engagement of actionable scientific knowledge for evidence-based decision-making in the UN General Assembly.*

*Photo: Last House on  
Holland Island  
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## KEY MESSAGES

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Sea-level rise (SLR) is accelerating and will continue for centuries under all emission scenarios. However, decisions made today can impact the timing and degree of SLR, with significant consequences for centuries to come.

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SLR manifests in a variety of ways, including storm surges, floods, saltwater intrusion into soils and aquifers, increased frequency of extreme events, and submersion.

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Ambitious mitigation in line with the Paris Agreement target of 1.5°C is critical to avoid crossing thresholds that would yield rapid and irreversible SLR, and to enable more successful adaptation.

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Sea-level rise is a global issue that impacts differently on different communities, with some considerably more vulnerable than others. Responses to SLR need to be integrative and context-specific; there are no one-size-fits-all solutions or panaceas.

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Interdisciplinary and transdisciplinary scientific inputs provide crucial benefits to successful policy-making on mitigation, adaptation, finance, and resilience related to SLR. This requires a more systematic dialogue between policy-makers and scientists on evidence-based policy options to support concrete action and anticipate future risks.



## I. PHYSICAL DYNAMICS OF SEA-LEVEL RISE

**Sea-level rise (SLR) is happening now.** Evidence of sea-level rise is well documented and clearly points to the role of anthropogenic climate change as well as accelerating rates of SLR (see, e.g., IPCC 2019; IOC-UNESCO 2022; IOC-UNESCO 2023; IPCC 2023).

**Some degree of SLR is inevitable.** Two main mechanisms combine to increase sea levels: thermal expansion of the oceans and melting ice from mountain glaciers and polar ice sheets. These mechanisms, and especially polar ice sheets, respond very slowly to global warming, trapping heat and releasing it on a long timescale. Sea-level rise will therefore continue to occur for centuries to come, even with net zero emissions. Up to 0.5m of sea-level rise above 2005 level can no longer be avoided.

**Today's decisions will impact the future of SLR,** with significant impacts on the degree and timing of sea-level rise. Projections show substantial differences between low- and high-emissions scenarios especially after 2050, with a high-emissions scenario projected to result in multi-meter SLR in the coming centuries. It is not too late to avoid worst-case-scenario impacts.

**Major, irreversible changes may be triggered in the coming decades.** Significant uncertainties remain around long-term projections, including “low-likelihood/high impact” scenarios in which 2m of sea-level rise by 2100 cannot be ruled out. The future of sea-level rise partly depends upon “thresholds” or “tipping points”: critical values of global warming that could be crossed during the 21st century and trigger irreversible ice sheet melt committing the world to high sea level rise, permanently inundating low-lying areas. Evidence suggests that thresholds may be crossed between 1.5°C and 2°C of global average warming, which highlights the risks of overshooting the Paris Agreement target of 1.5°C.

**SLR will vary regionally.** Decision-makers also must account for regional and local differences in rates of sea-level rise, which result from ocean and atmospheric dynamics as well as vertical land motion (e.g., from extraction, land compaction, or tectonics). The risk from sea-level rise will be exacerbated where heavily populated regions are sinking.

## II. MULTIFACETED IMPACTS OF SLR

**SLR manifests in a variety of ways,** including storm surges, floods, saltwater intrusion into soils and aquifers, and submersion. Rising sea levels significantly increase the frequency of extreme events, with the current 1-in-100-year coastal flooding event occurring several times a year by 2100. In many areas, human activities such as artificialization, sand extraction, and the destruction of ecosystems exacerbate the risks of SLR. There is clear evidence that SLR has caused damage and loss in diverse regions, and internal displacement and migration because of SLR are already taking place.

**SLR poses existential threats, especially to Small Island Developing States (SIDS).** For hundreds of millions of people living in coastal zones worldwide, SLR threatens wellbeing, food security, freshwater supply, health, economic livelihoods, human settlements, infrastructure, biodiversity, ecosystem services, knowledge systems, and natural and cultural heritage. Many of the world's megacities and much of the world's agriculture, industry, and infrastructure are located near the coast, along with key cultural sites. Impacts of SLR amplify social inequalities, both within and among countries, and threaten cultural identities. Inundation threatens habitability and statehood for some SIDS, and in some cases, the limits of adaptation will be reached if warming exceeds 1.5°C. The scientific community stands ready to provide further policy-relevant insights related to the nature, scale, and projected timing of SLR impacts.



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### III. LEVERAGING INTERDISCIPLINARY, ACTIONABLE KNOWLEDGE FOR DECISION-MAKING

**Actionable knowledge is crucial to decision-making.** While sea-level rise will inexorably continue, decisions made today can impact the timing and degree of rising seas with consequences for centuries to come. Evidence indicates that ambition in line with the Paris Agreement target of 1.5°C may be required to avoid crossing key thresholds related to sea-level rise. With deep and rapid emissions cuts, it is still possible to delay the worst impacts of sea-level rise and keep 21st century SLR below 0.6m.

**Mitigation is critical to the success of adaptation, together with enhanced adaptation approaches.** Many of the existing climate adaptation approaches are designed to absorb only low levels of SLR and will fail to address moderate to high levels of SLR. Adapting coastal cities will require a long-term flexible planning approach, which integrates different SLR scenarios and monitoring efforts. Combining several types of adaptation responses and phasing them over the appropriate geographical and temporal scales is key to developing tailored solutions that significantly reduce SLR-related risk while generating socio-cultural and economic benefits. The global scientific community can advise on options within dynamic adaptive pathway planning, which can accommodate uncertainties and help communities prepare for high rates of sea-level rise while avoiding path dependency, lock-in, and maladaptation.

**Engagement with relevant expertise, especially early in project design, can increase the long-term effectiveness of adaptation action.** There are no panaceas to adaptation, but false panaceas are expected to spread as demand for adaptation increases. Scientific insights can highlight risks, limitations, drawbacks, and trade-offs as well as synergies, helping to identify comprehensive, context-specific approaches that consider local geographies and regional sea-level rise projections alongside governance, economic, and socio-cultural factors. SLR exacerbates social inequalities both among and within countries, and social scientists can help decision-makers to identify nuanced approaches addressing equity

considerations, including through meaningful engagement with communities. This enhances the feasibility, sustainability, equity, and cultural acceptability of solutions.

**Scientific insights also can support integrated, silo-breaking approaches.** These include approaches that incorporate simultaneous mitigation and adaptation action; consider multiple and compounding hazards; reduce thematic and agency-related siloes in climate governance; provide insights into the horizontal and vertical integration of administrative bodies and legal instruments; and align adaptation with socio-economic development, COVID-19 recovery investments, disaster risk reduction, and more.

### CONCLUSION

Sustained engagement between policy-makers and actionable, interdisciplinary knowledge is critical to effectively mitigate and adapt to climate change, and to address the existential threats of sea-level rise and the multiple factors that can magnify its impacts. Such knowledge is essential to understanding root causes of multidimensional, multiscale challenges and identifying effective solutions.

The ISC stands ready to mobilize its broad-based global membership to provide independent and evidence-based guidance related to sea-level rise, as well as other pressing global issues, and to support enhancement of the science-policy interface in the context of the UN General Assembly.

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## FURTHER RESOURCES

Bongarts Lebbe, T., Rey-Vallette, *et al.* 2021  
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<https://council.science/publications/hazard-information-profiles>



*Photo: Sea wall, Okinawa Japan. Travis Morgan/Flickr.*



**Cover image**

*Island of Tuvalu*

*Tomoaki Inaba/Flickr*



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