



Understanding Sea Level Rise: Its Causes, Effects and Remedies

Wigener Lian *

Department of Ecology and Conservation, Hochschule Bremen University, Bremen, Germany

DESCRIPTION

Sea level rise stands as one of the most significant environmental challenges of our time, posing a growing threat to coastal communities, ecosystems and economies across the globe. As the planet warms due to human activities, the average level of the world's oceans is steadily increasing, altering coastlines and intensifying natural hazards. This phenomenon, driven largely by climate change, is reshaping the relationship between humans and the coastal environment, demanding urgent attention and action on multiple fronts.

At its core, sea level rise refers to the gradual increase in the global average sea level, typically measured relative to land. It results from a combination of factors, many of which are influenced by human-induced changes in the climate system. One of the primary drivers is thermal expansion. As greenhouse gases accumulate in the atmosphere and trap heat, ocean temperatures rise. Because water expands as it warms, this increase in temperature leads to a measurable expansion of ocean volume. Considering that oceans cover about 70% of Earth's surface, even slight warming can result in significant increases in sea level.

Another major contributor is the melting of glaciers and ice sheets. The massive ice reserves stored in places like Greenland and Antarctica are melting at an accelerating pace due to rising temperatures. As this land-based ice turns into water, it flows into the oceans, adding directly to sea level. The situation is further complicated by the rapid melting of Arctic sea ice and smaller ice caps. While sea ice itself does not raise sea levels as it is already floating, its disappearance disrupts global climate systems and accelerates the melting of nearby land-based ice.

Human activities also influence sea levels through changes in land water storage. Groundwater extraction for agriculture and urban use, for example, removes vast quantities of water from underground aquifers. Much of this water eventually flows into rivers and oceans, contributing to the overall rise. Similarly, deforestation and dam construction can alter how water is stored and moved through landscapes, affecting the balance of water between land and sea.

Over the last century, scientific records indicate that global sea levels have risen by approximately 20 centimeters. While this might seem modest, the rate of increase has more than doubled in recent decades. From an average rise of 1.4 millimeters per year in the early 20th century, current rates now exceed 3 millimeters annually. Projections for the coming decades are even more concerning. Depending on the trajectory of greenhouse gas emissions and how ice sheets respond, sea levels are expected to rise by 0.3 to 1 meter-or possibly more-by the end of the 21st century. Some models suggest even higher increases if the melting of polar ice accelerates beyond current expectations.

The impacts of sea level rise are already being felt and will become increasingly severe. One of the most immediate consequences is the increased frequency and intensity of coastal flooding. Storm surges and high tides now reach farther inland, threatening infrastructure, homes and transportation networks, especially in low-lying coastal areas. Erosion is another major concern, as rising seas wash away beaches, cliffs and land that communities rely on. These processes can permanently alter coastal landscapes and lead to significant loss of property.

The environmental consequences are equally severe. Coastal ecosystems like mangroves, salt marshes and coral reefs are under immense pressure from rising waters. Saltwater intrusion damages freshwater habitats and agricultural lands, while increased flooding can drown critical ecosystems that support biodiversity and natural coastal defenses. The loss of these ecosystems not only threatens wildlife but also reduces the services they provide, such as storm protection and carbon storage.

For human populations, especially those living in densely populated coastal zones, the threat is multifaceted. Displacement due to flooding and land loss may force millions to relocate, creating economic, social and political challenges. The costs of rebuilding infrastructure, safeguarding drinking water supplies and relocating communities are substantial, especially for developing nations. Additionally, as storm surges become more powerful with higher sea levels, the risk of catastrophic damage from tropical cyclones and hurricanes increases.

Correspondence to: Wigener Lian, Department of Ecology and Conservation, Hochschule Bremen University, Bremen, Germany, E-mail: wigener@gmail.com

Received: 31-Jan-2025, Manuscript No. JCZM-25-29259; **Editor assigned:** 03-Feb-2024, Pre QC No. JCZM-25-29259 (PQ); **Reviewed:** 17-Feb-2025, QC No. JCZM-25-29259; **Revised:** 24-Feb-2025, Manuscript No. JCZM-25-29259 (R); **Published:** 03-Mar-2025, DOI: 10.35248/2473-3350.25.28.662

Citation: Lian W (2025) Understanding Sea Level Rise: Its Causes, Effects and Remedies. J Coast Zone Manag. 28:662.

Copyright: © 2025 Lian W. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Responding to sea level rise requires a combination of mitigation and adaptation strategies. On the mitigation side, the most important action is reducing greenhouse gas emissions to slow global warming. Transitioning to clean energy sources, improving energy efficiency and preserving forests can all help limit the extent of future sea level rise. However, because some degree of rise is already inevitable due to existing emissions, adaptation is equally essential.

CONCLUSION

Adaptation efforts range from building physical defenses, such as seawalls, levees and storm surge barriers, to restoring natural

features like wetlands and mangroves that absorb floodwaters and reduce erosion. In some regions, the best option may be managed retreat, where communities are relocated from high-risk areas to safer inland zones. This approach requires thoughtful planning to ensure that displaced populations are supported and that cultural and social impacts are minimized. Improved monitoring and scientific research are also crucial. Better understanding of ice sheet dynamics, ocean currents and regional variations in sea level rise can inform more accurate predictions and guide effective policymaking.