Building Coastal Resilience: The Role of Ocean Accounting in Disaster Risk Reduction

Key messages

- Ocean accounts offer a robust, data-driven foundation for holistic policymaking on coastal disaster risk reduction and resilience, balancing resource use, conservation, and equitable development.

- By integrating data on the contribution of ocean ecosystems to resilience, ocean accounts inform comprehensive risk assessments of hazards including flooding, storm surges, and erosion. This supports targeted ecosystem-based disaster mitigation strategies.

- Ocean accounts provide socio-economic data to identify populations living in hazard-prone coastal areas, their livelihoods, and economic resilience. This information guides targeted interventions to enhance community resilience.

- Ocean accounts assist in measuring the potential economic impacts of natural disasters on ocean-based sectors and coastal infrastructure. This data guides investment prioritisation for disaster risk reduction.

- Ocean accounts provide comprehensive information that informs land-use planning and development decisions. This enables authorities to identify high-risk coastal areas to minimise disaster risks.

- After a disaster, data from ocean accounts can help quantify damages and disruptions, assisting in the prioritisation of economic sector recovery, determining the appropriate scale of rebuilding, and guiding the development of targeted resilience-building measures in affected communities.

Disaster Risk Reduction and Resilience

Coastal areas function as vital hubs for economic activities, accommodate a significant proportion of the human population, and support dynamic and productive ecosystems. However, these regions are increasingly vulnerable to natural hazards such as tsunamis, hurricanes, storm surges, and coastal erosion, many of which are projected to have increasing frequencies and intensities due to climate change[1]. Disaster risk reduction and resilience are essential strategies aimed at minimising the adverse impacts of such hazards on human lives, livelihoods, and ecosystems.

In the marine and coastal scope, disaster risk reduction involves a systematic approach to preventing the creation of new risks, reducing existing risks, and managing residual risks associated with coastal hazards[2]. This includes the construction of structural measures such as sea walls, levees, and breakwaters, as well as non-structural measures like early warning systems, land-use planning, and community education programmes. Additionally, nature-based solutions, such as the restoration of mangroves, wetlands, and coral reefs, are integral to natural coastal defences. These efforts aim to reduce the vulnerability of coastal populations and infrastructures, thereby enhancing their capacity to withstand and recover from disasters, and contributing to sustainable development by strengthening economic, social, health, and environmental resilience.

Resilience refers to the ability of coastal communities and ecosystems to resist, absorb, accommodate, adapt to, transform, and recover from the impacts of coastal hazards in a timely and efficient manner[2]. Building resilience involves enhancing the adaptive capacity of these communities through sustainable development practices, diversification of livelihoods, and the restoration and preservation of marine and coastal ecosystems. Resilient communities are better equipped to manage risks and quickly recover after a disaster, preserving and restoring their essential basic structures and functions through effective risk management.

The accelerating loss of biodiversity and degradation of ecosystems threaten human survival by diminishing our resilience to natural hazards. Inadequate environmental management and unsustainable development can exacerbate disaster risks. Environmental degradation acts both as a cause and a consequence of disasters. Climate change, with its accompanying sea-level

rise and increased frequency of extreme weather events, further complicates the challenge of coastal resilience and effective management. However, the restoration and management of marine and coastal ecosystems, such as mangroves and coral reefs, can mitigate the impacts of climate change such as storm surges, and coastal erosion.

Disaster risk reduction and resilience requires a holistic approach that integrates environmental, social, and economic dimensions.

Ocean Accounting

Ocean accounts are integrated, standardised records of data that provide a comprehensive view of a country's ocean resources, economy, and governance. They compile regularly updated information on environmental conditions (like the extent and health of mangroves), economic activities (such as fish sales), and social conditions (like employment and ocean dependency in coastal communities).

Ocean accounts follow a structure similar to national accounts used by statistical offices and finance ministries, ensuring compatibility with established frameworks like the System of National Accounts and the System of Environmental-Economic Accounting. This compatibility enables countries to go "beyond GDP," measuring not just economic output but also the value of ecosystem services, the condition of natural assets, and the impact of human activities on the ocean environment.

Key components of ocean accounts include macro-economic data, environmental-economic data (assets, flows, wastes, taxes), ecosystem data (extent, condition, services), and structured data on ocean beneficiaries, technology, and governance. By integrating these diverse datasets, ocean accounts provide decision-makers with insights to inform policies, assess trade-offs, monitor progress towards sustainable development goals, and attract investments in sustainable ocean development.

Fundamentally, ocean accounts provide a unified, data-driven foundation for holistic ocean management, breaking down data silos and fostering collaboration across government agencies and stakeholders.

Leveraging Ocean Accounting for Enhanced Disaster Risk Reduction and Resilience

Ocean accounting offers a robust framework for capturing the economic, environmental, and social data related to marine and coastal ecosystems. By systematically compiling and analysing these diverse datasets, ocean accounting provides crucial insights that are vital for disaster risk reduction and resilience efforts in coastal communities. This approach aids in monitoring key indicators related to ecosystem health, infrastructure integrity, service disruptions, and risk factors. Such comprehensive information supports informed decision-making and the development of targeted interventions to reduce vulnerabilities and enhance community resilience.

Economic

Ocean accounting quantifies the economic impacts of natural disasters and extreme events on key sectors and supports investment in disaster risk reduction strategies. This information allows policymakers to understand the economic exposure and benefits of investing in resilience. Key economic data[3] can include:

- Assessing the economic losses and recovery potential of sectors such as aquaculture and fisheries.
- Tracking funding and effectiveness of measures to reduce disaster risk through investment in disaster risk reduction strategies.
- Evaluating the vulnerability of essential services and infrastructure to natural disasters.

Environmental

Ocean accounting integrates detailed environmental data to support the assessment of physical measures and risk factors in marine and coastal ecosystems. This information is essential for mitigating disasters and enhancing resilience. Key environmental data[3] can include:

- Physical measures of regulating and maintenance services, such as evaluating coastal protection and flood mitigation efforts provided by marine and coastal ecosystems.

- Risk assessment of the coastal zone based on elevation, topography, and other factors to assess the risk of flooding and other hazards in coastal areas.

Social

By tracking social indicators (e.g., population density, income levels, and employment types) related to coastal communities, ocean accounting helps identify populations living in hazard-prone areas and assesses their vulnerability. It can also help understand community dependencies on natural assets for livelihoods. This information supports the development of targeted interventions to enhance community resilience. Key social data[3] can include:

- Determining the number of people living in areas at risk from natural disasters.
- Analysing the type of employment and livelihood diversification (e.g., households engaged in agriculture or fishing, including primary and secondary income sources) and the urban versus rural distribution of affected or exposed areas.
- Assessing the economic resilience of households in vulnerable areas through median household disposable income.

Policy considerations

In addressing the multifaceted challenges posed by natural hazards in coastal areas, several key policy questions arise. The following sections explore critical questions and demonstrate how ocean accounting can support the development of effective disaster risk reduction and resilience strategies for coastal communities.

How should investments be prioritized to maximise the effectiveness of coastal disaster risk reduction efforts?

Investments in coastal disaster risk reduction can be prioritised by leveraging comprehensive data from ocean accounts to maximise effectiveness. These accounts provide crucial insights into dynamic hazard profiles, vulnerability assessments, and baseline exposure data, enabling policymakers to identify areas and populations at the highest risk. Key data from ocean accounts include the frequency, intensity, and projections of hazards such as storms and

sea-level rise, demographic and socioeconomic statistics of hazard-prone areas, and the location and risk level of critical infrastructure and high-value assets in coastal zones. Historical data on natural extreme events and disasters also play a vital role in refining risk assessments and improving future response strategies.

By integrating this data, policymakers can pinpoint regions and communities that require urgent attention. Investments should focus on areas with the highest risk and greatest need, particularly vulnerable groups like low-income communities or those with limited mobility. Additionally, ocean accounts enable continuous evaluation of the effectiveness of existing disaster risk reduction strategies, such as coastal protection measures and early warning systems. This involves tracking the performance and cost-effectiveness of these strategies, ensuring that resources are allocated efficiently to enhance resilience and reduce risk. Leveraging the comprehensive data from ocean accounts allows for informed decision-making, directing investments towards interventions that offer the greatest impact, thereby protecting vulnerable populations and promoting sustainable development in coastal regions.

How to assess and determine the suitability of development in areas prone to coastal hazards?

Ocean accounts provide comprehensive risk assessments to inform land-use planning and development decisions in coastal areas. By integrating data on hazard exposure, population density, critical infrastructure, and environmental factors, policymakers can identify areas unsuitable for certain types of development due to high disaster risk. Ocean accounts pinpoint areas prone to coastal hazards, such as flooding and storm surges, and can be supported by maps identifying critical infrastructure and high-value assets in coastal zones. They also highlight factors that exacerbate disaster risks, such as environmental degradation, and assess relative risk based on elevation, topography, and other physical characteristics of coastal zones.

This information can help guide policy discussions regarding zoning regulations or ensure that new construction or infrastructure in coastal areas is

designed to withstand potential future hazards and minimise risk to human life and property.

How to prioritise recovery of economic sectors and appropriate re-building scale in affected locations?

In the aftermath of a coastal disaster, ocean accounts provide critical data to support effective recovery and reconstruction efforts. By quantifying damage, losses, and disruptions to economic sectors, infrastructure, and ecosystem services, policymakers can prioritise the allocation of resources and determine the appropriate scale of rebuilding efforts. Ocean accounts offer a structured approach to measure the loss of environmental assets and services, allowing policymakers to identify the most critical areas needing immediate attention. This comprehensive data informs decisions on prioritising the reconstruction of critical infrastructure, restoring livelihoods, and implementing measures to enhance resilience in affected communities.

Furthermore, ocean accounts help determine the population living in hazard-prone areas, highlighting vulnerable groups based on factors such as employment type (e.g., agriculture or fishing) and the urban versus rural distribution of affected areas. This data is crucial for targeting recovery efforts to the most impacted communities. Additionally, ocean accounts aid in the prioritisation of economic sectors for recovery based on their importance to local livelihoods and economies. With detailed information on the extent and nature of damage, ocean accounts enable more informed decisions on the scale and focus of rebuilding efforts. This ensures efficient resource allocation, supporting both immediate recovery and long-term resilience.

Contact GOAP Secretariat for more details
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Additional resources

1. GOAP 2021, Technical Guidance on Ocean Accounting for Sustainable Development. https://oceanaccounts.atlassian.net/wiki/spaces/DTGOOA/overview?homepageId=20512905

2. Sendai Framework for Disaster Risk Reduction 2015-2030

3. UNESCAP 2017, Expert Group on Disaster-related Statistics in Asia and the Pacific. Disaster-related Statistics Framework. https://www.unescap.org/sites/default/files/ESCAP.CST_.2018.CRP_.2_Disaster-related_Statistics_Framework.pdf

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2. United Nations Office for Disaster Risk Reduction. (2023). Sendai Framework Terminology on Disaster Risk Reduction https://www.undrr.org/drr-glossary/terminology

3. United Nations Economic and Social Commission for Asia and the Pacific. Disaster-related Statistics Framework