CLIMATE CHANGE, CARBON EMISSIONS AND THE OCEAN

CLIMATE AND OCEAN

KEY POINTS

- SDG 14 *Life Below Water* contains SDG14.3: *Minimise acidification of the oceans.*
- The ocean has both buffered and suffered the effects of climate change.[1],[2] Key carbon sinks are found in a variety of marine environments, threatened by unsustainable development.
- Ocean warming and acidification change and threaten biodiversity, ecosystem function, and resources used by humans on land and sea. The ocean stores more heat than the atmosphere and regulates Earth's climate.
- The ocean drives climate and weather. Increases in extreme weather events with climate change are a threat to Pacific island states. Thermal expansion causes 30–55% of sea level rise, already threatening Pacific islands.
- Pacific island countries depend on the sea. Pacific island resilience to climate change will depend on healthy marine ecosystems, integrated with sound terrestrial management.

HOW ISSUE LINKS TO/IMPACTS SDGs BEYOND SDG14 LIFE BELOW WATER

- SDG1, 2, 3: Poverty reduction, food security and health in the Pacific depend on local agriculture and shoreline fisheries, threatened by climate changes including sea level rise, increased storm severity, higher temperatures, and ocean acidification.
- SDG1.5: build the poor's resilience to climate change and other shocks
- SDG5, 10: The impacts of climate change are uneven across gender and location, with impacts more strongly felt by developing nations.
- SDG6: Clean freshwater and sanitation are threatened by inundation and salinization.
- SDG9, 11: Resilient infrastructure and sustainable cities and communities rely on an understanding of, adaptation to, and mitigation of climate change.
- SDG7, 12, 13, 15: Responsible consumption and production, including clean energy and avoidance of degradation of life forms, rely on and are part of climate action.

BACKGROUND

1. **Pacific island countries and territories are highly vulnerable to climate change**, putting at risk the development gains the region has made in recent years. There is a need for action on climate change so that responses are better understood, planned for, funded, and coordinated at local, national, regional, and international levels. In 2016, the Framework for Resilient Development in the Pacific was endorsed by the Pacific Islands Forum Leaders. The Framework recognises that climate change and disaster risk reduction are intimately linked, and that an integrated approach to addressing them is more effective.
2. **Climate change is a concern of today**, and the Pacific Islands acutely recognise this. Some Pacific island countries experience up to four times greater sea-level rise than the global average of 3.2 millimetres (mm) sea-level rise per year. In the Solomon Islands, communities have already been displaced and islands lost due to sea level rise.[3] In 2016, elevated sea surface temperatures caused fish-kills in Fiji and Vanuatu and led to a global coral bleaching event that has resulted in wide-spread coral mortality. Warmer and more acidic oceans in the near future will be even more susceptible. Climate change is also driving more severe storms, and in the past two years, the Pacific islands region has experienced two devastating cyclones.
3. **We have created new carbon sources while destroying carbon sinks**. Humans emit ~11 Petagrams (gigatons) of carbon per year (~34 gigatons of CO_2). Half of this CO_2 remains in the atmosphere, ~25% is taken up by biomass on land, and the other ~25% is taken up by the global ocean. "Carbon sinks" are locations

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or environments that capture (absorb or incorporate into biomass) and store carbon. If destroyed, these sinks can become "carbon sources", releasing the stored carbon into the atmosphere. The carbon cycle is a balance of sinks and sources, but humans have added a new source of rapid carbon inputs through burning fossil fuels.

4. **The ocean contains important carbon sinks, and ocean processes play key roles in global carbon cycling**. Biological and ecosystem processes in the high seas absorb 500 million tonnes of carbon per year.[4] Wetlands alone are responsible for >20% of the carbon storage by marine systems yearly. However, unsustainable development is a tremendous threat to coastal and marine ecosystems.

5. **Important coastal and marine carbon sinks are being destroyed.** In particular, wetlands have lost up to 70% of their global historical coverage. Coastal habitat loss results in in 0.15–1.02 billion metric tons of CO_2 released annually (equivalent to burning 423 billion litres of petrol, which is more than the 314 billion litres used by all commercial airlines each year).[5] Sustainable development, informed by rigorous environmental impact assessment, and conservation are vital.

6. **Impacts of climate change are inter-related and multiplicative, requiring integrated management.** The Pacific has several climate change and ocean challenges, addressing the complex and overlapping threats of warming, ocean acidification, sea level rise, storm severity, impacts on key fisheries species,[6] and the increased rate of spread of invasive species – the leading cause of extinction of endemic Pacific species.[7] Climate change threatens a broad range of ecosystem services and development processes and assets, from food security to the islands existence. Consideration of climate change must be included not only in local, national, and regional governance but also in management of areas beyond national jurisdiction.[8]

7. **Capacity to measure, plan, adapt, and respond is limited in Pacific island countries.** Climate change adaptation could cost USD 500 billion per year by 2050 in developing nations.[9] By acting sooner, the costs of adaptation can be minimised, and if we act now, adaptation, protection, and restoration options remain viable.[10] Business as usual approaches to development increase the risk to infrastructure, communities, and livelihoods and will result in high costs and losses. Technical capacity and coordination is limited in the Pacific Island context. It is in the interests of the Pacific, and all nations, to enhance capacities to respond. The Pacific Climate Change Centre is envisaged as a regional hub for inclusive collaboration and coordination to meet regional adaptation and mitigation priorities.

8. **Pacific island countries depend on the sea**. Pacific island resilience to climate change and economic prosperity will depend on healthy marine ecosystems, integrated with sound terrestrial management. Marine and coastal ecosystems are highly productive and deliver various goods and services that support communities and economies, including food security[11], clean water, recreational opportunities and other benefits, including Pacific cultural heritage.

9. **Sustainable development is vital for successful life in the islands and on Earth**. Integrated management that supports natural ecosystem function and conserves biodiversity will provide longer-term economic and social opportunities for Pacific people. Development must incorporate resilience-building measures to manage the impacts of climate change and associated environmental needs.

1 UN 2010. Oceans and climate change. 7p
2 IDDRI, IAEA, and partners 2015. Intertwined ocean and climate: implications for international climate negotiations 2015. 4p
3 Albert et al. 2016. Interactions between sea-level rise and wave exposure on reef island dynamics in the Solomon Islands. Environ Res Lett 11:054011
4 Global Ocean Commission. 2016. The High Seas and Us. 13p
5 Spalding et al. 2016. Atlas of Ocean Wealth. The Nature Conservancy
6 SPC. 2014. Pacific Island fisheries and climate change. Pacific Community (SPC). 2 p. See also SPC 2012, Coastal Fisheries and Climate Change, 2p
7 SPREP. 2014. State of Conservation in Oceania.: Key Findings and Full Report. SPREP
8 Nereus 2015. Climate Change in Oceans Beyond National Jurisdictions.
9 UNEP. 2016. The adaptation gap report 2016. United Nations Environment Programme
10 Gattuso et al. 2015. Contrasting futures for ocean and society from different anthropogenic CO_2 emissions scenarios. Science 349:6243
11 For example, Oceana 2012. Ocean-Based Food Security Threatened in a High CO_2 World. 16p