Asia-Pacific Economic Cooperation

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APEC NEEDS ASSESSMENT & GAP ANALYSIS: GUIDING POLICY DIRECTIONS TO PROMOTE COASTAL RESILIENCE

DECEMBER 2024

ACKNOWLEDGMENTS

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CONTENTS

FIGURES

TABLES

LIST OF ACRONYMS

A-PLAT	Climate Change Adaptation Information Platform
AP-PLAT	Asia-Pacific Adaptation Information Platform
APA	Aotearoa Plan of Action
APEC	Asia-Pacific Economic Cooperation
APCC	APEC Climate Center
ASEAN	Association of Southeast Asian Nations
COP	Conference of the Parties
CRI	Climate Risk Index
GDP	Gross domestic product
GOCD	Global Ocean Current Database
I/NDCs	Initial/Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
IUU	Illegal, unreported, and unregulated
KII	Key informant interview
NA	Needs assessment
NAP	National Action Plan
NC	National Communication
NDCs	Nationally Determined Contributions
NGO	Nongovernmental organization
NOAA	National Oceanic and Atmospheric Association
OFWG	Ocean and Fisheries Working Group
SDG	Sustainable Development Goal
SLR	Sea level rise
UNEP	United Nations Environment Programme

UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
US-SEGA	US-Support for Economic Growth in Asia

EXECUTIVE SUMMARY

This report, *APEC Needs Assessment & Gap Analysis: Guiding Policy Directions to Promote Coastal Resilience*, presents the findings of a needs assessment and gap analysis conducted over two years. It is the final output under the Asia-Pacific Economic Cooperation (APEC) Knowledge Sharing for Coastal Resilience in the Asia-Pacific Region project led by the United States under the APEC Ocean and Fisheries Working Group (OFWG). Using an analytical framework to guide the analysis, the study captures information on the global, regional, APEC, and economy-specific policy contexts, action plans, and implementation mechanisms that guide the work. Economy-level information has been sourced via an APEC survey and key informant interviews and discussed with participants at a webinar held in October 2022 and two in-person workshops held in 2023. This analysis was supplemented by desk research[1].

Economies around the world are facing growing challenges to adapt to negative impacts of climate change. Climatic disasters are increasing in intensity and frequency, and, along with unplanned urbanization and destruction of natural habitats, they are seen as key drivers of economic and social losses over the past few decades. Climate change impacts significantly in coastal zones, which are under threat due to rising sea levels, flooding causing inundation, more frequent and more intense storms, typhoons, sea water intrusion, and increases in water temperature and acidity. Given that half of the world's population lives within 60 kilometers of a coast, and more than 10 percent of the world's population inhabit coastal areas less than 10 meters above sea level, the threats to these communities are significant. Furthermore, coastal ecosystems underpin economies' activities including business, fishing, and tourism as well as oil and construction.

The Asia-Pacific region is disproportionately impacted by natural disasters due to its large coastlines. Due to their location within the "Ring of Fire," a large proportion of APEC economies experience around 70 percent of global natural disasters.[2] Over 6 billion citizens were affected by natural disasters between 1970 and 2014, accounting for 88 percent of the global total. In terms of the economic impacts of disasters, the losses are estimated at USD100 billion annually.[3]

RECOMMENDATIONS

This report contains information about gaps, opportunities, good practices, and case study examples at the economy level, as well as broader global and regional policy frameworks on managing climate change impacts in coastal regions. All this serves as a baseline to inform appropriate policy directions in APEC. The report also reflects on the outcomes of COP27 held in 2022, and pledges reached at COP28 in 2023 as work progressed internationally at other relevant fora to promote climate resilience and climate change adaptation issues.

Using findings from the surveys, stakeholder interviews, and desk research, the report recommends a suite of practical actions through which APEC can continue to increase the region's efforts to improve

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[1] The terms 'national' used in the text are for purposes of this report and do not imply the political status of any APEC member economy.
[2] APEC Policy Support Unit, 2021, "APEC and Climate Change," information sheet, https://www.apec.org/docs/default-source/infographics/2021/1104_apec-and-the-climate-change-crisis_a4.pdf?sfvrsn=f1661200_2.
[3] APEC Policy Support Unit, 2021, *APEC Regional Trends Analysis APEC's Climate Change Challenge Toward a Resilient Recovery: Policies Matter*, APEC, November. Unless otherwise noted, in this report $ indicates United States dollars.

coastal resilience and adaptive capacities of coastal regions. The six recommendations are listed below and further elaborated in the final section of the report.

1. **Develop a Coastal Resilience Framework under the OFWG that can support targeted capacity building efforts and technical assistance to improve coastal resilience and adaptation efforts in APEC economies.**

2. **Establish a dedicated APEC Support Fund Sub-fund to finance regional and economy-specific capacity activities that support the implementation of the proposed Coastal Resilience Framework.**

3. **Strengthen public sector capacities to deploy effective, whole-of-government efforts when planning initiatives on coastal resilience.**

4. **Integrate and prioritize adaptation approaches, including nature-based solutions in coastal zones, in economy-level policy frameworks.**

5. **Develop systems to address challenges of data quality, availability, accessibility, and interoperability.**

6. **Further strengthen targeted capacity building efforts in APEC to increase knowledge of relevant, up-to-date information, tools, and approaches.**

INTRODUCTION

Climate change is increasing in frequency, and the impacts are felt by coastal cities and communities, which are becoming increasingly vulnerable to the impacts of severe coastal flooding, increased coastal erosion, rising sea levels, storm surges, land-loss, tropical cyclones, increased marine heatwaves, and the loss of biodiversity.

The Asia-Pacific region is disproportionately impacted by natural disasters due to its large coastlines. Due to their location within the "Ring of Fire," a large proportion of APEC economies experience around 70 percent of global natural disasters.[4] Over 6 billion citizens were affected by natural disasters between 1970 and 2014, accounting for 88 percent of the global total. In terms of the economic impacts of disasters, the losses are estimated at USD100 billion annually.[5]

Coastal ecosystems such as coral reefs, salt-marches, mangroves, coastal wetlands, vegetated dunes, and sandy beaches function as natural barriers that provide the first line of defense for coastal cities, communities, businesses, and coastal infrastructure. While these ecosystems are rapidly degrading due to climate change related impacts, human activities associated with ocean and coastal ecosystem degradation are further diminishing nature-based resilience to these hazards.[6] This compounds the environmental as well as the economic burden felt by coastal communities and impacts their ability to recover effectively from these hazards, thus reducing their resilience to future hazards.[7]

APEC has developed numerous policy responses to guide climate change adaptation and mitigation efforts and to improve the skills and capacities of communities to better prepare for the increasing impacts of climate change on coastal areas in the region. Leveraging the work delivered to date, this needs assessment and gap analysis study provides useful baseline information on policy frameworks, institutional arrangements, and capacity needs and gaps, to inform appropriate strategies and policies that can support innovative solutions to be delivered both at the economy level and at the regional level.

STUDY OBJECTIVE AND SCOPE

This study is a key output under the APEC Knowledge Sharing for Coastal Resilience in the Asia-Pacific Region project delivered under the APEC Ocean and Fisheries Working Group (OFWG). As mentioned above, this analysis provides a strong evidence base for economies to invest in resiliency and risk management policy measures needed to manage the impacts of climate change on coastal regions and communities. While this can improve the adaptive capacities within APEC economies to better manage and "*bounce back better*" from the adverse environmental impacts posed by climate change in the long term, this analysis serves a practical and immediate purpose: to improve awareness of existing capacity

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[4] APEC Policy Support Unit, 2021, "APEC and Climate Change."
[5] APEC Policy Support Unit, 20201, *APEC Regional Trends Analysis APEC's Climate Change Challenge Toward a Resilient Recovery*.
[6] Oppenheimer, M., B.C. Glavovic, J. Hinkel, R. van de Wal, A.K. Magnan, A. Abd-Elgawad, R. Cai, M. Cifuentes-Jara, R.M. DeConto, T. Ghosh, J. Hay, F. Isla, B. Marzeion, B. Meyssignac, and Z. Sebesvari, 2019, "Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities," in International Panel on Climate Change (IPCC), *Special Report on the Ocean and Cryosphere in a Changing Climate*, H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)
Cambridge, UK and New York, NY, USA, chapter 4, pp. 321–445.
[7] Oppenheimer et al., 2019, "Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities."

needs, gaps, and challenges facing communities in the region that can be addressed through appropriate policy responses in APEC.

STUDY APPROACH AND METHODOLOGY

The assessment for the study used a mixed method approach, involving four methods to assess the needs for coastal resilience in the APEC region: (i) an APEC-wide needs assessment (NA) survey; (ii) a review of the legislative, policy, and planning frameworks to understand the enabling environment that can support efforts to address impact of climate change in coastal zones; (iii) gathering information from discussions at APEC webinars and workshops; and (iv) interviews with sector stakeholders (including economy officials and nongovernmental representatives).

- NA survey: An economy-level survey was conducted using a structured questionnaire to gather economy-level information from OFWG members on existing policy frameworks, guidelines, and strategies guiding climate change adaptation, governance arrangements including institutional structures and capacity gaps in APEC economies. The economies that provided responses include Australia; Chile; Indonesia; Japan; Malaysia; Papua New Guinea; Peru; the Philippines; Chinese Taipei; and Thailand. A copy of the questionnaire is included in Annex A.

- Key informant interviews (KIIs): Using an open-ended questionnaire, key stakeholders were interviewed to obtain information on policy and institutional contexts as well as critical challenges, capacity gaps, opportunities, and practical, context-specific solutions that could support economy-level and regional efforts to improve coastal resilience in the Asia-Pacific region.

- APEC capacity building webinars and workshops: APEC capacity building webinars and workshops provided the opportunity to obtain relevant, primary information to guide this work. The events served as a sound platform for economies to share information on challenges and opportunities, and to discuss case studies, lessons learned, and pilot projects that have yielded useful information to guide policy directions. Details of the workshops and webinars are as follows:

  - In October 2022, the United States facilitated the Promoting Coastal Resilience in the Asia Pacific Region: Exchanging Ideas workshop that brought together 27 participants from 10 economies. Attendees discussed the existing policy and strategic frameworks in their economies, as well as solutions instituted to manage and mitigate impacts of climate change on coastal areas. These discussions also focused on institutional structures, critical skills and capacity gaps, and opportunities for public-private partnerships in undertaking community-led activities to improve climate change and adaptation efforts in APEC economies.

  - This was followed up with a workshop on the margins of the First Senior Officials' Meeting in February 2023. This APEC Workshop on Prioritizing Capacity Building Efforts: Improving Coastal Resilience in the APEC Region aimed to dive deeper into issues discussed at the October 2022. Thus, the main objective was to improve participants' understanding of key issues, challenges, and implementable solutions, as well as validate information gathered via the NA survey and KIIs. Discussions also focused on implementation mechanisms in APEC that support action on adaptation efforts and building coastal resiliency.

  - The final capacity building workshop was held on the margins of the Third Senior Officials' Meeting in July 2023. Entitled Tabletop Exercise on Promoting Coastal Resilience: Practical Planning and Implementing through Frameworks, this workshop was designed to capture participating economies' views via a tabletop exercise on resilience and opportunities for APEC to support regional and economy-level coastal resilience.

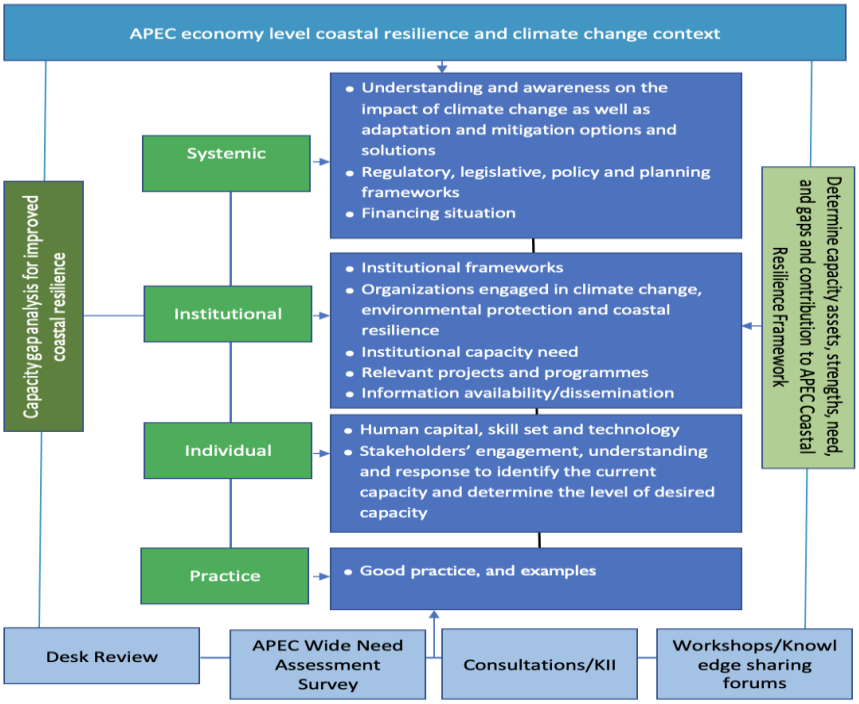
- Desk research: Desk research was conducted to supplement the information gathered through the survey and interviews. An assessment of publicly available information supplemented primary data gathered from the survey and interviews.

STUDY FRAMEWORK

An analytical framework (Figure 1) was developed to guide the study findings and structure the analysis underpinning this report. This guided the analysis of the existing policy, regulatory, and planning frameworks of APEC economies at the systemic level. The assessment of institutional capacity focused on evaluating the integration of climate change-related policies into the structure of organizations at the macro level. The integration of such policies is important for moving the climate change policy discussions in APEC forward by identifying appropriate pathways to guide risk management measures and promote coastal resilience.

The evaluation of APEC economy-level capacities is based on the results of the NA survey, information gathered via KIIs, and workshop discussions. It is also supported by an examination of best practice examples.

Figure 1: Capacity Needs Assessment Framework



LIMITATIONS

As noted above, this study includes the findings from desk research and the NA survey which captured primary data from 11 APEC economies (representing 50 percent of APEC economies). The primary data gathered from the survey were supplemented with information gathered via stakeholder interviews, discussions at workshops, and desk research.

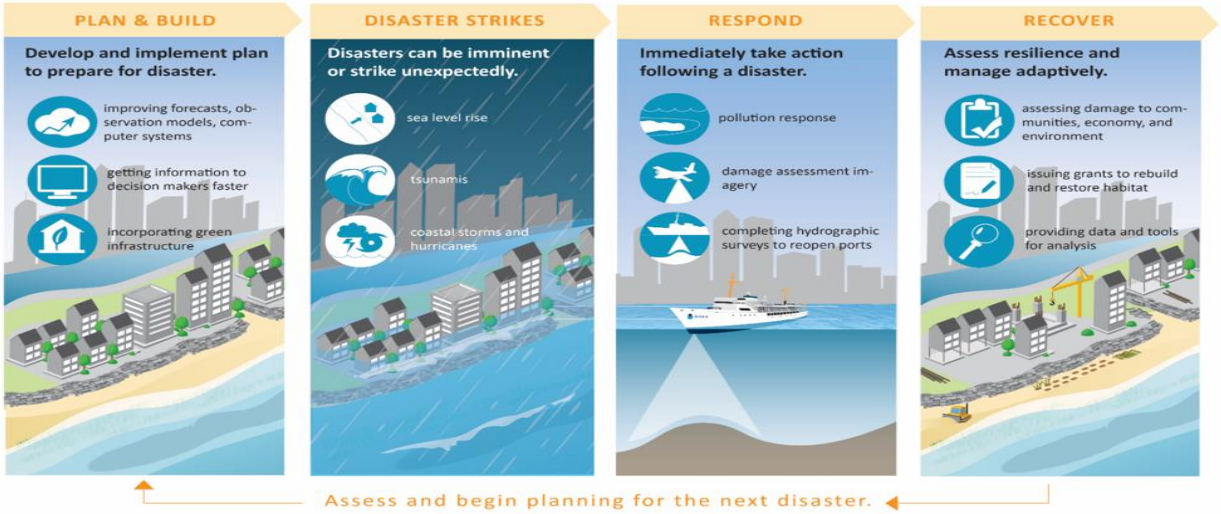
As this analysis was conducted at the central government level (not at the provincial, district, or community levels), the focus is at a relatively high level, and it deals primarily with economy-wide policy perspectives with a very limited focus on provincial- and local-level aspects.

The stakeholders who participated in the information gathering phase (i.e., workshop participants and economy representatives who responded to the NA survey) do not represent a broad cross-section of all of the actors involved in on-the-ground implementation of climate change adaptation actions including nature-based innovative solutions and financing aspects (i.e., civil society/community/nongovernmental organization perspectives). For instance, the primary respondents to the survey were public sector officials from central government level ministries of environment, with a few from relevant disaster management agencies in the region responsible for developing policies. Few experts who attended the workshops are implementers.

DEFINING COASTAL RESILIENCE

In the context of exploring ways of improving efforts to increase resilience, it is useful to have a working definition of the concept of "coastal resilience" to guide APEC's work. The United States National Oceanic and Atmospheric Administration (NOAA) defines coastal resilience as "building the ability of a community to 'bounce back' after hazardous events such as hurricanes, coastal storms, and flooding—rather than simply reacting to impacts"[8] (Figure 2).

Figure 2: NOAA Model for Preparedness and Risk Reduction



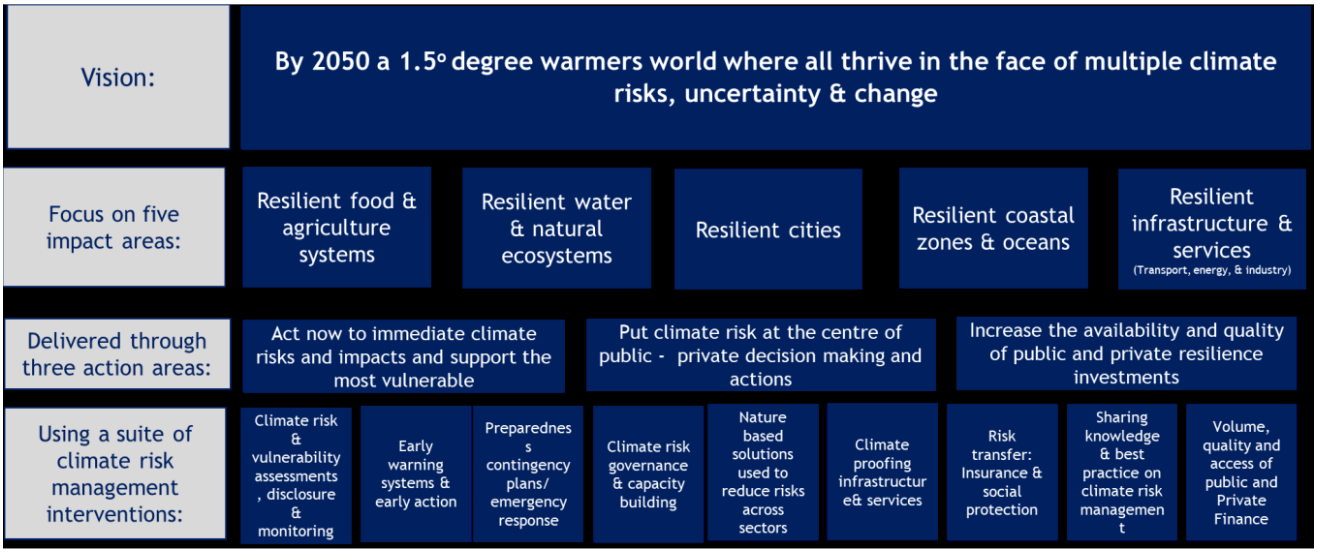
The ability to adapt to changing conditions and to withstand and rapidly recover from disruption due to natural disasters or cross-border emergencies is reflected in this definition, and it guides the scope and recommendations of this study.

Discussions on promoting coastal resilience in the APEC region also need to consider the work done under the IPCC's "vision of climate resilience" or the Climate Resilience Pathway[9] depicted in Figure 3. The Pathway is designed to guide climate-risk driven actions centered around three pillars: (i) resilient people and livelihoods; (ii) resilient businesses and economies; and (iii) resilient environmental systems. Under these pillars, five main impact areas have been identified that require action to put climate risk at the heart of decision making, with increased availability and quality of finance invested in a range of interventions. One of the Pathway's main, identified impact areas is "resilient coastal zones and oceans."

[8] National Oceanic Atmospheric Administration, n.d., "What Is Resilience?" online resource, https://oceanservice.noaa.gov/facts/resilience.html#:~:text=Coastal%20resilience%20means%20building%20the,than%20simply%20reacting%20to%20impacts.

[9] United Nations Framework Convention on Climate Change, 2021, *Climate Action Pathway: Climate Resilience*, Executive Summary, Marrakech Partnership, Unfccc.int/sites/default/files/resource/ExecSumm_Resilience_0.pdf.

Figure 3: Structure of Climate Resilience Pathway Action Table



Source: United Nations Framework Convention on Climate Change (UNFCC), 2021, *Climate Action Pathway: Climate Resilience*, Executive Summary, Marrakech Partnership.

GLOBAL AND REGIONAL CLIMATE CHANGE CONTEXT

THE GLOBAL LANDSCAPE

The effects of climate change are felt globally. The Intergovernmental Panel on Climate Change (IPCC) *Special Report on the Ocean and Cryosphere in a Changing Climate* identifies that, due to emissions of greenhouse gases from human activities, the global ocean has warmed and absorbed more than 90 percent of the excess heat in the climate system. The ocean has absorbed 20–30 percent of total carbon dioxide emissions since the 1980s, which has resulted in ocean acidification. It is estimated that in 2021, nearly 60 percent of the world's ocean surface experienced at least one heatwave.[10]

The IPCC's recent report, *The Ocean and Cryosphere in a Changing Climate*[11] outlines the projected risks for people and ecosystems from changes to the ocean system caused by anthropogenic climate change. In its earlier *Global Warming of 1.5°C* report, the IPCC highlighted the potential for large differences in climate change impacts caused by small changes in global average temperatures.[12] With approximately 40

[10] IPCC, 2021, "Summary for Policymakers," in: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change,* V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.), Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 3−32, doi:10.1017/9781009157896.001.
[11] IPCC, 2021, "Summary for Policymakers."
[12] IPCC, 2018, "Summary for Policymakers," in: *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*, V. Masson-Delmotte, P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.) Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3–24, doi:10.1017/9781009157940.001.

percent of the population currently living within 100 kilometers of a coast, IPCC estimates that 1 billion people will be at risk from coastal-specific hazards by 2050.[13]

Coastal ecosystems are particularly sensitive to three key drivers related to climate change: sea level rise (SLR), ocean temperature, and ocean acidity. Coastal ecosystems around the globe are already impacted by the combination of SLR, other climate-related ocean changes, and adverse effects from human activities on land and in the ocean. Coastal zones are essential to life, livelihoods, and the planet. These coastal ecosystems not only help protect coastal cities, communities, infrastructure, and businesses from the adverse impacts of climate change, but also serve to store and sequester carbon more effectively than do traditional forests, so this damage is quite significant.

Mangroves and coral reefs are two key coastal ecosystems that are expected to be significantly impacted by climate change. Rising temperatures also risk the loss of marine life. Estimates from the United Nations Educational, Scientific and Cultural Organization (UNESCO)[14] indicate that more than half of the world's marine species may be on the brink of extinction by 2100. A 1.5^0 C increase in temperatures could destroy 70–90 percent of coral reefs and a 2^0 C increase could mean a loss of almost 100 percent.

Data from the World Meteorological Organization reveals that global mean sea levels reached a record high in 2021, rising an average of 4.5 millimeters per year between 2013 and 2021.[15] Coastal regions are some of the most at-risk areas for the impacts of climate change in the region due to their prevalence and high population density. Rising sea levels can inundate coastal areas which are home to millions of people—or approximately 10 percent of the world's population—having devastating effects on human lives, livelihoods, businesses, and coastal infrastructure. The IPCC Special Report also warns that Small Island Developing States (SIDS), coastal megacities, and communities around the world in low-lying areas are on the frontline of increasing climate impacts. Moreover, withering droughts, extreme heat, and record floods already threaten food security and livelihoods for millions of people who live in low-lying areas.[16]

Coastal communities around the world are experiencing a wide range of coastal hazards including severe storm events, tsunamis, shoreline erosion, and coastal resource degradation. These natural disasters directly impact communities' livelihoods and food security—particularly communities that generate income from small-scale fisheries and aquaculture. Coastal ecosystems underpin several economic sectors including fishing, tourism, oil and construction, and trade.

Climate change risks therefore act as threat multipliers, which have widespread implications for broad-based, inclusive growth—setting back development gains achieved to date in some areas. Therefore, urgent action is needed. Protecting and restoring marine and coastal ecosystems is critical in helping coastal communities adapt to climate change. In the absence of green infrastructure and adaptation

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[13] IPCC, 2022, *Climate Change 2022: Impacts, Adaptation and Vulnerability*, "Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change," H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.), Cambridge University Press, Cambridge, UK and New York, NY, USA, doi:10.1017/9781009325844.
[14] S.F. Heron, C.M. Eakin, F. Douvere, K. Anderson, J.C. Day, E. Geiger, O. Hoegh-Guldberg, R. van Hooidonk, T. Hughes, P. Marshall, and D. Obura, 2017, Impacts of Climate Change on World Heritage Coral Reefs : A First Global Scientific Assessment, Paris, UNESCO World Heritage Centre.
[15] World Meteorological Organization, 2018, "New Study Assesses Sea Level Rise Over Past 25 Years," August 30.
[16] World Meteorological Organization, 2018, "New Study Assesses Sea Level Rise Over Past 25 Years."

measures such as nature-based solutions, beaches, sand dunes, and cliffs will continue to erode due to rising sea levels. Having a sound understanding of trajectories of change from climate change and leveraging lessons learned, good practices, and innovative tools, technologies, and systems can help economies predict, adequately prepare, and defend against future climate-related disasters. Therefore, sharing of knowledge and best practices can help leverage and scale up critical interventions that can support coastal adaptation efforts and resilience building.

GLOBAL FRAMEWORKS ADDRESSING CLIMATE CHANGE

Coastal resilience and climate change adaptation efforts underway include engaging a range of stakeholders and reflect the need to establish appropriate, context-specific social, economic, technological, and political strategies. Several global treaties drive policy responses that help inform context-specific strategies that support action. The challenge lies in how to translate these broad policy directions into effective, economy-wide solutions that are practical and implementable.

There is also global realization that the time has come to collaborate effectively on scaling up actions that can help unlock financial flows for coastal resilience solutions for cities and communities at risk. The following are key global agreements (see Annex C for full summaries):

- Paris Agreement and Nationally Determined Contributions (NDCs)
- United Nations Decade of Ecosystem Restoration
- Sendai Framework for Disaster Risk Reduction (2015–2030)

THE APEC POLICY LANDSCAPE

The Asia-Pacific region is the most disaster-prone region in the world because of its extensive coastlines and low-lying territories. Its geography makes it highly vulnerable to rising sea levels and weather extremes. Climate change threatens entire APEC coastlines through sea level rise and increased storm events, leading to damaging floods and extensive erosion. Utilizing information, technology, resilient infrastructure, and a livelihoods approach—as well as taking a more people centric approach to resilience building—to build coastal resilience will enable APEC economies to rebound more quickly and reduce negative impacts on human health, the environment, and economic growth.

The APEC region is diverse: not just in terms of its geography and the levels of risks faced in coastal regions, but also in terms of institutional contexts and the levels of capacity, skills, and access to information.

When examining ways to enhance resilience and mitigate risks posed by climate change, it is important to ensure that interventions are context specific. A one-size-fits all approach does not work. However, there are some common challenges that economies face in building their resiliency and adaptive capacities. These include: (i) lack of access to data and information including tools and approaches to develop appropriate solutions; (ii) financing for training and capacity building; and (iii) systemic vulnerabilities including limitations with whole-of-government approaches to support policy development and drive actions on the ground.

Levels of vulnerability varies along **Indonesia's** 102,000-kilometer (km) coastline. Of that total, approximately 1,800 km are very highly vulnerability. South Sulawesi is the province with the most CVI 5 (very high) coastline (573 km). The total area of water which has the potential hazard for vessels with a capacity of <10 GT is around 5.8 million km2 or about 90 percent of the total area of Indonesian waters until 2045. Fisheries and tourism are heavily dependent on coastal resources.

Japan's long coastline and low-lying areas make it vulnerable to sea level rise and storm surges. Additionally, its economy and population are heavily concentrated in coastal regions, making it more vulnerable to the impacts of climate change in these areas. However, Japan has a well-developed coastal management framework in place and many of its coastal communities have developed a high level of resilience to coastal hazards.

In **Korea**, surface water temperature and ocean acidification in the coastal waters are increasing faster than the global average. The sea level is expected to rise by 65 centimeters by the end of the 21st century. Changes in the ecosystem are also expected and the high number of elderly people increases Korea's vulnerability to rising average temperatures and heatwaves. The government has implemented measures to mitigate these impacts, such as building seawalls and restoring mangrove ecosystems.

In the APEC region, coastal communities are increasingly vulnerable to climate change. Linked to climate change, a myriad of impacts—including coastal and river flooding, heavy rain, cyclones, high winds, earthquakes, tsunamis, extreme temperature, wildfire, drought, dust and sandstorms, and storm surge caused by factors such as El Niño Southern Oscillation (ENSO)—are increasing in scale and intensity with a huge economic, social, and environmental impacts.

Many coastal areas in the Asia-Pacific region are already degraded by pollution, sediment-laden runoff, destructive fishing practices, and plastic pollution.

Small island economies like **Papua New Guinea** face unique challenges in managing and mitigating the impacts of climate change. Threats include tsunamis and El Niño/La Niña weather patterns which lead to flooding and droughts. Impacts are broad and can be felt well beyond the coastal and rural areas, impacting food security more broadly (e.g., saltwater intrusion on arable land). Climate change impacts in low lying atolls also cause migration and there is limited understanding of the pressures on the "receiving communities" as well as the adjustments needed by displaced communities.

Mangroves, salt marshes, and seagrass beds are impacted by both climate and non-climate related impacts. This results in long-term economic repercussions, since these ecosystems are central to the tourism, agriculture, fishing, and aquaculture industries.

Large coastal populations inhabit rural areas and there are small- and medium-sized cities along coastlines where basic services and disaster warning and response mechanisms are limited. These areas are densely populated in most developing economies. As a result, disasters already experienced in the APEC region have resulted in the widespread loss of life and damage to infrastructure, businesses and livelihoods, public services, trade, and food production.

The Climate Risk Index (CRI) 2021, which identifies the level of risk faced by economies due to extreme weather events, indicates APEC economies face a level of exposure and vulnerability to extreme events that should serve as a warning that communities and policymakers need to prepare for more severe weather events in the future. [17] Table 1 catalogues each APEC economy's coastal and climate vulnerabilities and the major impacts and threats to coastal regions.

[17] D. Eckstein, M.-L. Hutfils and M. Winges, 2019, "Global Climate Risk Index 2019 – Who Suffers Most From Extreme Weather Events? Weather-related Loss Events in 2017 and 1998 to 2017," briefing paper, Germanwatch.

TABLE 1: CLIMATE CHANGE VULNERABILITY AND MAJOR AREAS OF IMPACT IN COASTAL REGION			
APEC ECONOMY	CLIMATE VULNERABILITY[18]	COASTAL VULNERABILITY[19]	MAJOR AREAS OF CLIMATE CHANGE IMPACT IN COASTAL REGION
Australia	31	Medium/High	Sea level rise, storm surges, flooding, coastal erosion, ocean acidification, increase in sea surface temperature
Brunei Darussalam	176	Medium	Sea level rise, storm surges, flooding
Canada	93	Medium/High	Sea level rise, increase in sea surface temperature, storm surges, flooding, coastal erosion
Chile	83	Medium	Sea level rise, increase in sea surface temperature, ocean acidification, storm surges, flooding, coastal erosion
China	41	High	Sea level rise, storm surges, flooding, coastal erosion

[18] D, Eckstein, V. Künzel, and L. Schäfer, 2021, Global Climate Risk Index, 2021 – Who Suffers Most From Extreme Weather Events? Weather-related Loss Events in 2019 and 2000 to 2091," briefing paper, Germanwatch.
[19] This ranking is determined by the author based on the various sources and literatures cited in this study.

TABLE 1: CLIMATE CHANGE VULNERABILITY AND MAJOR AREAS OF IMPACT IN COASTAL REGION			
APEC ECONOMY	CLIMATE VULNERABILITY[18]	COASTAL VULNERABILITY[19]	MAJOR AREAS OF CLIMATE CHANGE IMPACT IN COASTAL REGION
Hong Kong, China	41	High[20]	Sea level rise, storm surges, flooding, coastal erosion, saltwater intrusion
Indonesia	72	High	Sea level rise, storm surges, flooding, coastal erosion
Japan	57	Medium/High	Sea level rise, storm surges, flooding, coastal erosion
Republic of Korea	91	Medium	Sea level rise, increase in sea surface temperature, ocean acidification, storm surges, flooding, coastal erosion, saltwater intrusion
Malaysia	116	Medium	Sea level rise, increase in sea surface temperature, ocean acidification, flooding, coastal erosion, saltwater intrusion
Mexico	59	High	Sea level rise, increase in sea surface temperature, storm surges, flooding, coastal erosion
New Zealand	90	Medium	Sea level rise, flooding, coastal erosion
Papua New Guinea	99	High	Sea level rise, increase in sea surface temperature, storm surges, flooding, coastal erosion
Peru	45	Medium	Sea level rise, increase in sea surface temperature, storm surges, flooding, coastal erosion
The Philippines	4	High	Sea level rise, storm surges, flooding, coastal erosion
Russian Federation	32	Medium	Sea level rise, coastal erosion, flooding
Singapore	179	High	Sea level rise, coastal erosion flooding, storm surges, changes in precipitation patterns
Chinese Taipei	36	Medium	Sea level rise, storm surges, flooding, coastal erosion, changes in temperature extremes, low and high precipitation patterns
Thailand	9	High	Sea level rise, storm surges, flooding, coastal erosion
The United States	27	High[21]	Sea level rise, coastal erosion, storm surges, saltwater intrusion, flooding
Viet Nam	13	High	Sea level rise, storm surges, flooding, saltwater intrusion, coastal erosion

Source: D. Eckstein, M.-L. Hutfils and M. Winges, 2019, "Global Climate Risk Index 2019 – Who Suffers Most From Extreme Weather Events? Weather-related Loss Events in 2017 and 1998 to 2017," briefing paper, Germanwatch.

[20] Hong Kong, China is not included in the ranking so the same position for China is considered.
[21] The United States is not included in the ranking published in 2021 (data from 2000 to 2019), so the ranking is based on the 2020 report (data from 1999 to 2018).

REGIONAL POLICY FRAMEWORKS

ASEAN Socio-Cultural Community Blueprint 2025

In 2015, leaders of the Association of Southeast Asian Nations (ASEAN) adopted the ASEAN Socio-Cultural Community Blueprint 2025 (ASCC Blueprint 2025) which seeks to promote an inclusive, sustainable, resilient, and dynamic region. The Framework focuses on promoting coordinated efforts in priority areas including: (i) conservation of sustainable management of biodiversity and natural resources, (ii) promotion of environmentally sustainable cities, (iii) response to climate change, and (iv) sustainable consumption and production.

ASEAN Multi-Sectoral Framework for Climate Change: Agriculture and Forestry Towards Food and Nutrition Security and Achievement of SGDs (2018)[22]

Acknowledging the vulnerability of the region to the adverse impacts of climate change which undermine food and nutrition security and leveraging the region's potential to strengthen the resilience of its people and ecosystems towards a more sustainable future, members agreed on a strategic framework that could provide a common conceptual understanding of how the ASEAN community can minimize the impacts of climate change.

APEC POLICY FRAMEWORKS

Many metropolises are located near coasts in the Asia-Pacific region. In addition, in the Pacific islands, more than 50 percent of the population lives within 1.5 kilometers of coasts that are among the most vulnerable to changing climate and ocean and coastal degradation. Healthy oceans and coastal ecosystems provide important ecological services such as sustaining the living environment and protecting communities from natural hazards in APEC.

APEC's commitment to addressing environmental issues is reflected in APEC's key foundational document: the 1993 APEC Leaders' statement at Blake Island in Seattle.[23] It states: "Our environment is improved as we protect the quality of our air, water and green spaces and manage our energy sources and renewable resources to ensure sustainable growth and provide a more secure future for our people."

Following this, in 2007 at the 15th APEC Economic Leaders' Meeting in Sydney, Australia, the Sydney APEC Leaders' Declaration on Climate Change, Energy Security and Clean Development[24] was finalized, thus establishing APEC's overarching policy agenda for action on climate change. At the meeting, APEC Leaders committed to the United Nations Framework Convention on Climate Change (UNFCCC) and its guiding principles and agreed to support concerted international action with all economies contributing to shared global goals in ways that are equitable. Leaders also committed to support

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[22] ASEAN, 2018, "ASEAN Multi Sectoral Framework for Climate Change: Agriculture and Forestry Towards Food and Nutrition Security and Achievement of SDGs," adopted at the 40th Meeting of ASEAN Ministers of Agriculture and Forestry, Ha Noi, Viet Nam.
[23] APEC, 1993, "APEC Leaders' Statement, Blake Island, Seattle," November 20, https://www.apec.org/meeting-papers/leaders-declarations/1993/1993_aelm.
[24] APEC, 2007, "APEC 2007 Leaders' Declaration," September 9, https://www.apec.org/meeting-papers/leaders-declarations/2007/2007_aelm.

effective adaptation strategies as well as the protection of marine and coastal resources which are an integral part of the carbon cycle. The APEC Honolulu Declaration in 2011[25] supports economies' efforts to achieve clean energy transitions. Leaders committed to the aspirational goals to reduce APEC's aggregate energy intensity by 45 percent by 2035 compared to 2005 levels. The 2014 Beijing Declaration[26] delivered at the APEC Energy Ministerial Meeting committed economies to double the share of renewable energy in the region by 2030.

APEC's work on improving coastal resilience sits within the Ocean and Fisheries Working Group (OFWG). The forum's work is guided by three existing policy frameworks: the 2019 APEC Roadmap on Maris Debris Management, the 2019 Roadmap on Combatting Illegal, Unreported and Unregulated (IUU) Fishing, and the Small-Scale Fisheries and Aquaculture Roadmap.

APEC Leaders committed to promoting "coastal and marine ecosystem conservation and disaster resilience" as well as the "Blue Economy" in the APEC 2014 Xiamen Declaration,[27] which is a key policy framework guiding APEC's policy agenda in promoting coastal resilience and marine resource protection. In this declaration, the APEC Ocean-Related Ministers called for:

> [T]he establishment of more integrated, sustainable, inclusive and mutually beneficial partnership through ocean cooperation among APEC members, that implement previous commitments, and focuses efforts on collaborated and concerted actions in the following four priority areas: (1) coastal and marine ecosystem conservation and disaster resilience; (2) the role of the ocean on food security and food-related trade; (3) marine science, technology and innovation; and (4) blue economy.[28]

As a result, APEC has completed a number of marine ecosystems projects, ranging from the Preparedness, Response and Assessment of Oil Spill (PRAOS) Phase I Project to the Marine Ecosystem Assessment and Management in the Asia-Pacific Region Phase III.

These commitments were also reflected in the 2012 statement issued by APEC Ministers responsible for the environment—affirming that "environmental protection and the conservation and sustainable use of natural resources, ecosystems and biodiversity are essential foundations for achieving sustainable economic and social results for the APEC region."[29] Ministers also pledged their commitment "to reduce the adverse effects from climate change on sustainable development" and acknowledged the need for "effective policies and programs in APEC economies, including related to climate change adaptation."

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[25] APEC, 2011, "2011 Leaders' Declaration," November 11–12, https://www.apec.org/meeting-papers/leaders-declarations/2011/2011_aelm.
[26] APEC, 2014, "2014 Leaders' Declaration," November 11, https://www.apec.org/meeting-papers/leaders-declarations/2014/2014_aelm.
[27] APEC, 2014, "Xiamen Declaration," issued at Fourth APEC Ocean-Related Ministerial Meeting-AOMM4 Towards New Partnership through Ocean Cooperation in the Asia Pacific Region http://mddb.apec.org/Documents/2014/MM/AOMM/14_aomm_jms.pdf
[28] APEC, 2014, "Xiamen Declaration."
[29] APEC, 2012, "2012 APEC Meeting of Ministers Responsible for the Environment," July 16–18, https://www.apec.org/Meeting-Papers/Sectoral-Ministerial-Meetings/Environment/2012_environment#:~:text=We%2C%20the%20APEC%20Ministers%20and%20senior%20officials%20responsible,economic%20and%20social%20results%20for%20the%20APEC%20region.

Other related policy frameworks that align with APEC's agenda on building community resiliency include the APEC Cebu Action Plan[30] endorsed in 2015 under the Finance Ministers Process (FMP), which seeks to promote APEC policies and practices to support sustainable growth. It focuses on deepening financial markets to "enhance financial resilience to market volatility and mitigate risks of natural disasters."[31] It is important to note that this framework has guided several initiatives and studies that focused on the topic of disaster risk financing.

Endorsed by Leaders in 2015, the APEC Disaster Risk Reduction Framework[32] aims to increase the adaptive and disaster resilience capabilities of APEC economies and their ability to achieve inclusive and sustainable development under a "new normal" scenario of rapidly increasing natural disasters. This framework recognizes that improving economies' ability to better prepare for disasters requires a holistic, proactive, multi-stakeholder, multi-sectoral approach. It cuts across a range of sectors and sub-sectors including agriculture; fisheries; forestry; energy; micro-, small-, and medium enterprises; climate resilient infrastructure; human capital and health; science and technology; gender, and broader efforts to promote trade facilitation.[33]

APEC's broad policy directions as articulated under the APEC Putrajaya Vision 2040[34] and its implementation plan the Aotearoa Plan of Action (APA) as well as high level commitments and pledges made by Leaders and Ministers, also support the region's collective efforts at addressing environmental challenges and the impacts of climate change.

The Putrajaya Vision 2040's pillar of promoting "strong, balanced, secure, sustainable and inclusive economic growth"[35] supports this work. The APA seeks to drive "economic policies, cooperation and growth which will support global efforts to comprehensively address all environmental challenges including climate change, extreme weather and natural disasters for a sustainable planet."[36]

The APEC Bangkok Goals on Bio-Circular-Green (BCG) Economy[37] framework also provides a clear pathway for the implementation of specific initiatives that contribute to support global efforts to comprehensively address all environmental challenges including climate change, extreme weather, and natural disasters, in terms of climate mitigation, adaptation and resilience.

Lastly, policy frameworks that guide activities at the sub-fora level are also important. The OFWG Strategic Plan 2021–2023 continues to contribute to the overarching vision articulated under the Putrajaya Vision 2040 and the APA. The OFWG Strategic Plan seeks to consolidate efforts promoted

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[30] APEC, 2015, "APEC Finance Ministers' Process (FMP) Roadmap/Cebu Action Plan," Annex A to "2015 APEC Finance Ministers' Statement," September 11, https://www.apec.org/meeting-papers/sectoral-ministerial-meetings/finance/2015_finance/annexa.
[31] APEC, 2015, "APEC Finance Ministers' Process (FMP) Roadmap/Cebu Action Plan."
[32] APEC, 2015, "APEC Disaster Risk Reduction Framework," Annex A to "2015 Leaders Declaration," November 19, https://www.apec.org/meeting-papers/leaders-declarations/2015/2015_aelm#:~:text=We%20welcome%20and%20adopt%20the,losses%20we%20endure%20and%20ensure.
[33] The framework is being updated to align it more with the strategic directions of the Putrajaya Vision 2040 and the APA.
[34] APEC, 2020, "APEC Putrajaya Vision 2040," November, https://www.apec.org/meeting-papers/leaders-declarations/2020/2020_aelm/annex-a.
[35] APEC, 2020, "APEC Putrajaya Vision 2040."
[36] APEC, 2021, "Aotearoa Plan of Action," https://aotearoaplanofaction.apec.org/.
[37] APEC, 2022, "Bangkok Goals on Bio-Circular-Green Economy," https://www.apec.org/meeting-papers/leaders-declarations/2022/2022-leaders-declaration/bangkok-goals-on-bio-circular-green-%28bcg%29-economy.

under the APEC Seoul Oceans Declaration (2002), the Bali Plan of Action (2005), the Paracas Declaration and Action Agenda (2010), and the Xiamen Declaration of 2014, through sharing information, good practices, research, and cooperation with other APEC fora. The Strategic Plan guides efforts in line with agreed Frameworks that exist under OFWG's remit including the 2019 APEC Roadmap to Combat IUU Fishing and the 2019 APEC Roadmap on Marine Debris as well as the Small-Scale Fisheries and Aquaculture Roadmap which was endorsed in 2022. The two most relevant priorities that directly capture efforts to protect coastal and marine ecosystems in the region include efforts to:

- Continue to implement initiatives related to COVID-19 recovery, the sustainable management of marine resources, ecosystems, fisheries, and aquaculture; and

- Continue to improve the understanding of the oceans, marine ecosystems, and their economic and social value and promote blue economy to drive pandemic recovery.

ECONOMIC COSTS OF CLIMATE CHANGE FOR COASTAL REGIONS

Estimates suggest that the APEC region could experience long-term economic losses equivalent to 7.3 percent of gross domestic product (GDP) by 2100 due to the physical impacts of climate change under the baseline IPCC scenario. The economic losses are expected to fall most severely on low- and middle-income APEC member economies located near the Equator.[38]

If a business-as-usual scenario prevails (resulting in an estimated temperature increase of 3.2°C), the region can expect GDP losses of up to 18.3 percent by 2100,[39] with low- and middle-income APEC member economies located near the equator most severely affected.[40]

According to NOAA, the cost of climate and weather disasters in the United States last year totaled more than USD165 billion—the third highest annual total on record. A study by the Australian Climate Council entitled *Counting the Costs: Climate Change and Coastal Flooding* indicates that because many Australians live on or near coastal zones and a significant proportion of the critical infrastructure (transport, commercial, residential, and defense) is located along the coastlines, the risks from climate change are very high. The report highlights that in Australia, a 1.1-meter sea level rise would expose more than USD226 billion worth of infrastructure to coastal flooding and erosion.[41]

> "The Asia-Pacific region accounts for more that 70 percent of global disasters…[with] powerful typhoons, earthquakes, and extreme wildfires to prolonged droughts and abrupt landslides [causing] mounting economic losses resulting in an estimated USD100 billion annually."
>
> Source: Administrator Criswell, United States Federal Emergency Management Agency (FEMA)/Chair of the 2023 APEC Senior Disaster Management Officials Forum, August 2, 2023.

As noted earlier, the negative consequences of climate change for the ocean are severe and include rising sea levels, ocean acidification, and increasing intensity and frequency of extreme events. The impacts can increase the costs of global shipping and logistical services, and, by extension, cross-border trade. Disruptions in supply chains due to extreme weather changes have resulted in the reduced availability of goods. As goods and services from the ocean generate about USD2.5 trillion each year; an amount which is expected to double by 2030[42]—these consequences negatively affect the wellbeing and economic growth of APEC economies.

When examining the overall economic costs of climate change on coastal areas, it is also important to assess the non-economic impacts and potential costs of climate-related migration. Non-economic losses and damages which are not measured monetarily, are as significant as economic costs. Along with lives and livelihoods affected communities can also lose history, identity, cultural and social connections to the land. This is reflected in the issue of climate change related migration. It is estimated that by 2050 as many as 143 million people could become climate migrants in just three regions (Sub-Saharan Africa,

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[38] APEC Economic Committee, 2022, "Green Recovery is an Urgent Issue, Not Just an Option: APEC Report," online article, November 16., https://www.apec.org/press/news-releases/2022/green-recovery-is-an-urgent-issue-not-just-an-option-apec-report#:~:text=APEC%20member%20economies%20are%20facing,the%20Asia%2DPacific%20region%20shows.
[39] APEC Policy Support Unit, 2021, *APEC Regional Trends Analysis*.
[40] APEC Economic Committee, 2022, "Green Recovery is an Urgent Issue, Not Just an Option."
[41] W. Steffan, J. Hunter, and L. Hughes, 2014, *Counting the Costs: Climate Change and Coastal Flooding*, Climate Council of Australia.
[42] UNFCCC, 2021, *Enhancing Resilience of Oceans, Coastal Areas and Ecosystems through Collaborative Partnerships*, Bonn: Nairobi Work Program.

South Asia, and Latin America), with whole communities being forced to seek less vulnerable places to live.[43]

BUILDING CLIMATE RESILIENCE AND ADAPTING TO CLIMATE CHANGE

Even small increases in global warming will intensify the risks in coastal zones. Given the complexity of the problem, there is an urgent need to develop practical, innovative approaches to adapt to the impacts of climate change and increase climate resilience to protect the lives and livelihoods of communities in coastal areas. This would involve a mix of interventions including, *inter alia*, infrastructure, nature-based institutional and socio-cultural interventions alongside vulnerability reducing measures.

In 2022, a number of key efforts at the international level highlighted vulnerabilities of coastal zones to climate change challenges. For example. the 2022 IPCC Sixth Assessment Report[44] introduces a potential solutions framework to support climate resilient development action, based in part on safeguarding biodiversity and ecosystems. According to the IPCC analysis, climate resilient development is enabled when governments, civil society, and the private sector make inclusive development choices that prioritize risk reduction, equity, and justice through decision-making processes, finance, and actions, along with sectoral integration, cross-governmental mechanisms, sectoral adaptation/mitigation measures, and clear timeframes.[45]

The IPCC report highlights the importance of addressing emerging challenges caused by climate change by adopting an approach that places people and ecosystems at the center, while recognizing the unequal challenges and risks that climate impacts, pose. Striving to achieve Climate Resilient Development (CRD) means reducing exposure and vulnerability to climate hazards, cutting back greenhouse gas emissions, and conserving biodiversity, which should be given the highest priority in decision-making and policies regarding all aspects of society including energy, industry, infrastructure, health, water, food, urban development, housing, and transport.

The emphasis on climate change adaptation and resilience building efforts, in general, has gained a significant level of traction globally since 2022 – and are reflected in key statements and outcomes of high-level forums. Climate Change adaption and resilience building aspects were highlighted during the most recent COP 28[46] as well as at previously at several side events (high level dialogues) held on the margins of UN General Assembly meetings held in September 2023, and the Adaptation Futures 2023 Conference in October 2023.

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[43] K.K. Rigaud, A. de Sherbinin, B. Jones, J. Bergmann, V. Clement, K. Ober, J. Schewe, S. Adamo, B. McCusker, S. Heuser, and A. Midgley, 2018, *Groundswell: Preparing for Internal Climate Migration*, © World Bank, Washington, DC. http://hdl.handle.net/10986/29461 License: CC BY 3.0 IGO.

[44] IPCC, 2022, *Climate Change 2022: Impacts, Adaptation and Vulnerability*, "Contribution of Working Group II," final update June 16, 2023.

[45] IPCC, 2022, *Climate Change 2022: Impacts, Adaptation and Vulnerability*, "Contribution of Working Group II," final update June 16, 2023.

[46] COP 28 promised to deliver on four main paradigm shifts in the conversation on addressing climate change. These included: fast tracking the energy transition and slashing of emissions before 2030; transforming climate finance by delivering on old promises and setting the framework for a new deal on finance; putting nature, people, lives and livelihoods at the heart of climate action; and mobilizing for the most inclusive COP ever. (sdg.iisd.org/events/2023-un-climate-change-conference-unfccc-cop-28/)

These solutions need to be supported by robust strategies and policy frameworks that provide clear direction and guidance to achieve practical solutions to reduce greenhouse gas emissions by integrating both climate change mitigation and adaptation efforts. The findings of this study are expected to help governments and policy makers in the Asia-Pacific region plan and invest in coastal resiliency and adaptation measures to better manage climate change risks.

KEY FINDINGS

Using the analytical framework as a basis, this section organizes the key findings under the following four categories:

1. Systemic Capacity
2. Institutional Context and Capacity
3. Individual Capacities
4. Good Practice

These categories, although presented as separate topics for the ease of structuring and presenting the analytical findings, are interrelated. For example, the first category (Systemic Capacity) reflects regulatory and policy issues as well as financing aspects alongside the levels of understanding and awareness of issues. The second category (Institutional Context and Capacity), while examining the types of ground-level organizations that exist in economies, also assesses issues such as information availability and existence of programs and projects. The Individual category considers human capacity gaps and opportunities, capacity building gaps and needs, as well as stakeholder engagement at the economy level. Lastly, the Good Practice category explores good practice examples and lessons learned.

The findings in this section reflect the responses from the survey, KIIs, and desk research as well as information gathered from the interactive sessions conducted during the webinar and subsequent workshops.

1. SYSTEMIC CAPACITY

1.1 UNDERSTANDING AND AWARENESS

The Systemic Capacity category contains several elements. The first is APEC members' understanding and awareness of hazard risks; levels of vulnerability and impacts; economic costs of extreme weather events; and appropriate context-specific solutions that can guide the development and improvement of existing regulatory, legislative, policy and planning frameworks and financing options. When examining the issue of "understanding and awareness," the following underlying principles guided the assessment:

- The questions in the survey were structured to obtain a sense of how much awareness exists in the target group, which was surveyed on several topics relating to coastal impacts of climate change including policy, regulatory and institutional aspects.

- The webinar in October and the in-person workshops in 2023 included interactive exercises carefully tailored to obtain information on the economy-level policy context; challenges and opportunities in implementing policies and systems at the ground level; institutional strengths and weaknesses; stakeholder engagement including the role of nongovernmental entities in developing and implementing policies and projects (APEC-funded initiatives and projects as well as pilot projects and programs implemented using non-APEC funding sources); and case study examples.

- The in-person workshops served to validate the information collected via the survey and KIIs, and also to fill the key information gaps identified by the project team.

Interviews with key economy-level stakeholders (KIIs) and discussions at the webinar and workshops confirm a sound understanding of the understanding of the impacts of climate change on coastal areas among policy makers and other relevant stakeholders.

The survey responses and findings confirm that policy makers and other relevant stakeholders also have a sound understanding of the hazards risks, the levels vulnerabilities and exposure, and the impacts on sectors that inform strategic planning at the economy level.

APEC's capacity building efforts focus on increasing the levels of knowledge and awareness of members by providing access to relevant sectoral and policy-level information, tools, best practice examples/case studies, and lessons learned. Several APEC assessments and diagnostic studies have been undertaken both at the regional level and at the economy level to increase members' knowledge and skills in specific areas as well as to improve access to relevant information which can guide the development of policies, systems, and actions in terms of resource management and nature-based solutions. These studies and assessments conducted by APEC and subsequent policy discussions that followed at the plenary level (OFWG level) are part of the efforts undertaken in APEC to guide cross-border resilience building.

While many such examples of studies and analyses exist in APEC, it is worth mentioning a few examples.

- The United States conducted a comprehensive study in APEC that assessed the economic value of services provided by natural coastal infrastructure (NCIs) in coastal areas[47] to allow policy makers in APEC economies to allocate resources to guide disaster risk reduction and mitigation strategies.
- In 2021, a training manual was developed under a project initiated by Malaysia to enhance participation in flood disaster preparedness through community-based hazard mapping.[48]
- The APEC Marine Sustainable (AMSD) Report series[49] is a key resource that shares information on APEC economies' achievements in promoting sustainable development relating to the SDG framework, specifically SDG 14. These reports include a stock-take of members' policies and best practices and reflect APEC's contribution to fostering ocean-related sustainable development.
- The APEC Economic Policy Report 2022 (conducted under the APEC Economic Committee) also reflects on useful public policy instruments that can guide "green" activities in the region, including low-emission infrastructure, developing and adopting clean technologies, and supporting climate adaptation efforts such as flood protection and building resilience.
- At the APEC fora level, members use robust platforms like the Senior Disaster Management Officials Forum (SDMOF) under the APEC Emergency Preparedness Working Group (EPWG) to discuss issues and share information amongst economies on establishing an early warning

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[47] APEC, 2018, *Assessing the Economic Value of Natural Infrastructure in Coastal Ecosystems for Disaster Risk Reduction, Response and Coastal Resilience in APEC Region*, September, https://www.apec.org/publications/2018/09/assessing-the-economic-value-of-natural-infrastructure-in-coastal-ecosystems.

[48] APEC, 2021, *Enhancing Participation in Flood Disaster Preparedness through Community-Based Hazard Mapping*, December, https://www.apec.org/docs/default-source/publications/2021/12/enhancing-participation-in-flood-disaster-preparedness-through-community-based-hazard-mapping/221_epwg_enhancing-participation-in-flood-disaster-preparedness.pdf?sfvrsn=56ec12c2_2

[49] APEC, 2019, *Supporting the Implementation on Sustainable Development Goal 14 and Related Goals in APEC*, Marine Sustainable Development Report Series, OFWG, December, https://www.apec.org/docs/default-source/Publications/2019/12/APEC-Marine-Sustainable-Development-Report-2/219_OFWG_APEC-Marine-Sustainable-Development-Report-2.pdf.

system to strengthen risk management and advance risk reduction for communities in the Asia-Pacific region.

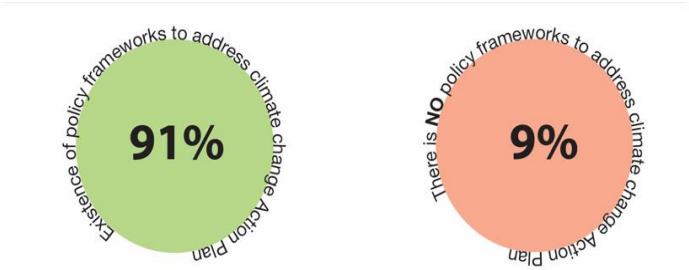
Efforts are also being undertaken to develop and share relevant information about tools and systems to assess impacts and risks. These include tools such as remote sensing, hazard mapping, and risk assessments to build capacities in government, related line agencies, and communities. For additional examples of available tools, please see the Availability of Tools, Systems, and Information section below.

1.2 POLICY INSTRUMENTS AND REGULATORY ENVIRONMENT

Earlier parts of this report outline existing APEC policy frameworks developed to guide climate policies that foster an enabling policy and regulatory environment at the regional level for coastal resilience. The survey findings and discussions at workshops indicate that most APEC economies have decentralized policy and planning frameworks that guide the implementation of climate change and coastal resilience-related policy actions on the ground.

While the overall policy environment to promote coastal resilience is favorable at the broader APEC level, the regulatory and implementation mechanisms to translate the policy into action and to ensure social and environmental safeguards are in place are somewhat limited. The significant human and economic costs of climate change warrant a shift to a focus on thinking about how to foster a sustainable climate resilient economy because policy pathways leading to resilient coastal development can also entail changes to existing livelihoods as well as out-migration or resettlement of communities from high-risk prone areas. Communities could be negatively affected, with vulnerable sectors of society likely to be impacted disproportionately. As such, the transition from a conventional development approach to climate-resilient coastal development should ensure that considerations of sustainability as well as equity and inclusivity guide policy development. As Figure 4 shows, 91 percent of APEC economies have a climate change action plan.

Figure 4: Policy Frameworks to Address Climate Change Action Plan in APEC economies.



Source: APEC Needs Assessment survey, 2022.

The NA survey findings, KIIs, and discussions during workshops revealed that various economies have created economy level climate change policies and strategies as well as Initial/Nationally Determined Contributions (I/NDCs) and National Communications (NCs) to UNFCCC. In other words, key elements for the enabling environment to guide climate change adaptation and mitigation actions already exist. Specifically, APEC economies have National Climate Adaptation Plans (NAPs) that reflect coastal issues and solutions as a priority area of focus. Some economies even have specific Coastal Resilience

Plans (CRPs) for coastal area protection, conservation, promoting livelihoods, and resilient infrastructure and services.

Table 2 provides further information on economy-wide policy frameworks that guide climate change adaptation and promote coastal resilience in the APEC region. Links to the specific references, policy and legislative frameworks or analyses which serve to provide further detailed information, are provided[50].

TABLE 2: ECONOMY LEVEL CLIMATE CHANGE POLICY AND PLANS IN APEC

ECONOMY NAME	EXISTING CLIMATE CHANGE POLICY	EXSTING CLIMATE CHANGE STRATEGY	NDCS & UPDATES	CLIMATE ADAPTATION PLANS	COASTAL PRIORITY IN NAP	NC TO UNFCCC	COASTAL RESILIENCE PLAN (CRP)
Australia	Climate Change Act 2022	Climate Resilience and Adaptation Strategy	NDC Update (2022)	Australia Climate Resilience and Adaptation Strategy	Yes	8th NC	Coastal and Estuarine Risk Mitigation Program
Brunei Darussalam	Climate Change Policy	Climate Resilience and Adaptation Strategy	First NDC (2020)	No	N/A	2nd NC	The Integrated Management Plan for the Coastal Zone of Brunei Darussalam
Canada	Net-Zero Emissions Accountability Act	Canada National Adaptation Strategy	NDC Update (2021)	Canada Adaptation Climate Plan	Yes	8th NC	Climate Resilient Coastal and Northern Communities Program
Chile	Law No. 21,455 – Framework Law on Climate Change	Long-term Climate Strategy 2050	NDC Update (2020)	Chile Climate Adaptation Plan (NAP)	Yes	4th NC	Coastal Zone Adaptation and Plan for Resilience
People's Republic of China	Policies and Actions to Address Climate Change	Strategy on Climate Change Adaptation 2035	China NDCs (2021)	Strategy on Climate Change Adaptation 2035	Yes	3rd NC	The Climate Change Adaptation Strategy Focused Society by 2035

[50] The term 'National' is used solely for purpose of information sharing and does not in any way imply the political status of any APEC member economy.

ECONOMY NAME	EXISTING CLIMATE CHANGE POLICY	EXSTING CLIMATE CHANGE STRATEGY	NDCS & UPDATES	CLIMATE ADAPTATION PLANS	COASTAL PRIORITY IN NAP	NC TO UNFCCC	COASTAL RESILIENCE PLAN (CRP)
Hong Kong, China	Climate Action Plan 2050	Hong Kong, China's Climate Action Plan 2050	N/A	Hong Kong, China's Climate Action Plan 2050	Yes	N/A	Chapter 5 of Hong Kong, China's Climate Action Plan 2050
Indonesia	Climate Resilience Development Policy 2020–2045	Long term Strategy for Low Carbon and Climate Resilience 2050	Enhanced NDCs	Executive Summary of the Adaptation Plan –	Yes	3rd NC	List of Priority Locations & Climate Resilience Actions
Japan	Climate Change Adaptation Act [Act No. 50 of 2018]	Long-term Climate Change Strategy (Carbon Neutrality in 2050)	NDCs (2021)	Japan Climate Change Adaptation Plan	Yes	7th NC	Climate Change Adaptation Plan – (refer to chapter on Coasts)
Republic of Korea	2050 Carbon Neutral Strategy of the Republic of Korea	Policy and Strategy for Green Growth (2009–2050)	NDCs (2021)	3rd Climate Adaptation Plan (2021–2025)	Yes	4th NC	Coastal Maintenance Basic Plan
Malaysia	Policy on Climate Change	Policy on Climate Change	NDCs (2021)	No	N/A	2nd NC	Climate Change Adaptation Framework for Water Sector
Mexico	General Law of Climate Change	Mexico's Adaptation Strategy on Climate Change	NDCs (2022)	Adaptation Strategy on Climate Change 2013	No	5th NC	No plan
New Zealand	Framework for climate change policy and key upcoming decisions	Aotearoa National Adaptation Plan	NDCs (2021)	Aotearoa National Adaptation Plan	Yes	7th NC	New Zealand Coastal Policy Statement (NZCPS)
Papua New Guinea (PNG)	Climate Compatible Development Management Policy	Strategy for Responsible Sustainable Development for Papua New Guinea	NDCs (2020)	No	N/A	2nd NC	No Plan

ECONOMY NAME	EXISTING CLIMATE CHANGE POLICY	EXSTING CLIMATE CHANGE STRATEGY	NDCS & UPDATES	CLIMATE ADAPTATION PLANS	COASTAL PRIORITY IN NAP	NC TO UNFCCC	COASTAL RESILIENCE PLAN (CRP)
Peru	Framework law of the National Environmental Management System	Strategy for Climate Change (ENCC)	NDCs (2020)	Peru Climate Adaptation Plan	Yes	3rd NC	No Plan
The Philippines	The Climate Change Act of 2009	The Philippines Framework Strategy on Climate Change	NDCs (2021)	The Philippines Climate Change Action Plan (2011–2028)	Yes	2nd NC	No Plan
Russian Federation	Ministry of Economic Development – Climate Policy	2050 Long-term Development Strategy of Russia	NDCs (2020)	Russia Climate Adaptation Plan (NAP)	No	8th NC	No Plan
Singapore	Sustainable Singapore Blueprint (2009 and updated in 2015)	Climate Change Strategy (2012)	NDCs (2022)	Singapore Climate Action Plan (2020)	Yes	3rd NC	No Plan
Chinese Taipei	Climate Change Adaptation Policy Framework	Climate Change Action Guidelines	N/A	Chinese Taipei Climate Change Adaptation Action Plan	Yes	N/A	Coastal Domain Action Plan
Thailand	Master Plan for Climate Change 2015–2050	Master Plan for Climate Change 2015–2050	NDCs (2022)	Thailand National Adaptation Plan	Yes	4th NC	No PLan
The United States	Climate Task Force	The Long-term Strategy of the United States Adaptation Communication of the United States (2021)	NDCs (2021)	The United States Climate Adaptation Action Plan (2021)	Yes	8th NC	Local Climate Resilience Plans
Viet Nam	Law on Environmental Protection No. 72/2020/QH14	Viet Nam's Climate Change Strategy until 2050	NDCs (2022)	Viet Nam's Climate Adaptation Plan 2050	Yes	3rd NUC	No Plan

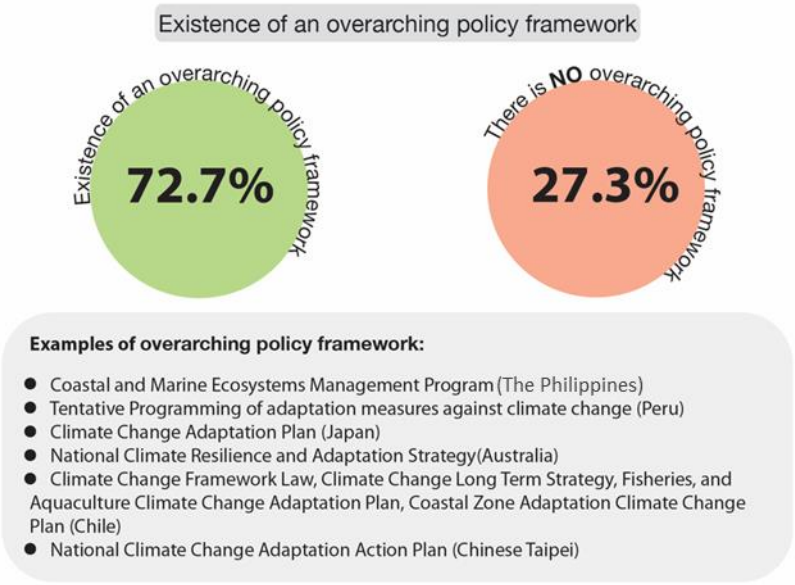
In addition to the overarching policies and frameworks mentioned in the table above, other relevant policies include the following:

- Australia: National Disaster Risk Reduction Frameworks and National Strategies for Environmental Economic Accounting
- Brunei Darussalam: Strategy on Climate Resilience and Adaptation, National Development Plan (NDP), and Carbon Calculator
- Canada: Marine Protected Areas Program, Aquatic Ecosystems Restoration, Canada's strengthened Climate Plan, and Pan-Canadian Framework on Clean Growth and Climate Change
- Chile: National Climate Change Action Plan, Emerging and Sustainable Cities Initiative (ICES), and Climate Change Adaptation Plan for Fisheries and Aquaculture
- China: National Economic and Social Development Plan, and China's Mid-Century Long-Term Low Greenhouse Gas Emission Development Strategy
- Indonesia: Total Water Management Strategy
- Hong Kong, China; Priority Locations and Climate Resilience Actions
- Japan: Coastal Marine and Disaster Prevention Research
- New Zealand: Coastal Policy Statement
- Papua New Guinea: National REDD+ Strategy 2017–2027
- Singapore: Singapore Green Plan 2030
- Thailand: National Disaster Prevention and Mitigation Plan 2021–2027
- The United States: Tackling the Climate Crisis at Home and Abroad. The United States finalized the "National Climate Resilience Framework[51]" which identifies key values, priorities, and objectives to help expand and accelerate comprehensive, locally tailored, and community-driven resilience strategies.
- Viet Nam: Law on Marine and Island Resources and Environment

It Is important to ensure that these broader policy frameworks are also supported by adequate technical capacities and skills on the ground to efficiently implement programs for coastal and marine resource management and climate change mitigation and adaptation, as well as by context-appropriate related physical, economic, and policy interventions. Figure 5 outlines the existence of overarching policy frameworks in APEC economies.

[51] National Climate Resilience Framework which can be accessed online. Https://www.whitehouse.gov/wp-content/uploads/2023/09/National-Climate-Resilience-Framework-FINAL.pdf

Figure 5: Existence of Overarching Framework to Address Coastal Resilience in APEC Economies



Source: APEC Needs Assessment Survey 2022.

There are also some gaps in the broad policy frameworks that were reviewed as part of this study. For example, APEC member economies policy frameworks have limited focus on the impacts of climate change on land systems, biodiversity, species loss, and extinction.[52]

In some economies with decentralized policy implementation, there are economy-level policies that govern planning and responses to coastal emergencies which do not fully align with central government-led policies.

In some cases, there is an obvious disconnect between the decision-making bodies and also a lack of clarity about mandates, roles, and responsibilities. As noted earlier, in many economies, the primary mandate for addressing climate change issues fall within the jurisdiction of the ministry of environment. However, addressing coastal resilience remains the mandate of other sector stakeholders that are not well integrated in both policy and practice. This reflects a siloed approach within economies and a lack of a comprehensive, whole-of-government approach to addressing how climate change impacts on coastal zones can be managed and solutions found.

Another factor to consider is the availability and use of implementation plans for existing policy frameworks. The survey findings (summarized below) indicate that half of APEC economies have a functional implementation plan or action plan that addresses climate change as well as coastal resilience issues.

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[52] M.A. Pigato and F.F. Stewart, 2019, *Climate Change in APEC: Assessing Risks, Preparing Financial Markets, and Mobilizing Institutional Investors*, Washington, D.C. : World Bank Group, http://documents.worldbank.org/curated/en/800471583320302307/Climate-Change-in-APEC-Assessing-Risks-Preparing-Financial-Markets-and-Mobilizing-Institutional-Investors.

- The Philippines' National Climate Change Action Plan 2011–2028 lays out the means of implementation in a well-articulated results framework, including with clear outcomes, outputs, and activities for 2011–2028. The limitation is that this plan is not adequately costed, and the financing needs to meet the objectives are not clear, as outlined in the Action Plan.

- The United States has developed President's Emergency Plan for Adaptation and Resilience (PREPARE), which includes a range of capacity building, technical assistance, and other assistance to support economies efforts to adapt to and manage the impacts of climate change. Through PREPARE, the United States responds to partner economies' priorities, strengthen cooperation with other donors, integrate climate risk considerations into multilateral efforts, and strive to mobilize significant private sector capital for adaptation. PREPARE is intended to help save lives and livelihoods, support sustainable and healthy communities and ecosystems, and reduce the impacts of climate change. However, it does not include cost estimates for implementing the plan. As mentioned above, the new US National Climate Resilience Framework identifies key values, priorities, and objectives to expand and accelerate a comprehensive, locally tailored, and community-driven resilience strategies that can help build a climate-resilient nation. These efforts are expected to involve a robust whole-of-government approach (State, local, Tribal, and territorial) which also involves non-government actors including philanthropic, non-profit, academic, civil society and private sector institutions.

- Australia has developed the National Climate Resilience and Adaptation Strategy[53] and the National Disaster Risk Reduction.[54] The National Climate Resilience and Adaptation Strategy seeks to unlock greater levels of action and investment in adaptation by ensuring that everyone has a clear understanding of the economy level adaptation priorities and progress. It catalyzes action to protect biodiversity, natural capital, and ecosystem services which support the ability of Australians to adapt. The Strategy also explains on how funding will be determined to meet the climate goals.

- Chinese Taipei has developed a comprehensive climate change adaptation action plan that includes the seven areas of capacity building focusing on: infrastructure, water resource, land use, coastal and marine environment, energy supply and industry, agricultural production and biodiversity, and public health. All relevant authorities at the municipality, county and city level are mandated to follow the economy-level action guidelines and other relevant policies pertaining to climate change adaptation. To ensure effective implementation at the ground level, climate change adaptation committees will be set up in all these levels of government and tasked with producing and publishing annual adaptation implementation program performance reports to measure progress.

It is also important to note that some economies like Japan have established appropriate systems to track and monitor progress as part of their implementation plans. Establishing such mechanisms is essential to track and monitor whether economies are on the right path to achieve their pledged commitments and targets.

1.3 FINANCING FOR COASTAL ADAPTATION AND RESILIENCE BUILDING

[53] Commonwealth of Australia, Department of Climate Change, Energy, the Environment and Water, 2021, "National Climate Resilience and Adaptation Strategy 2021–2025," https://www.dcceew.gov.au/climate-change/policy/adaptation/strategy.
[54] Commonwealth of Australia, 2018, "National Disaster Risk Reduction Framework," Department of Home Affairs, https://www.homeaffairs.gov.au/emergency/files/national-disaster-risk-reduction-framework.pdf.

Governments have a key role to play in financing and supporting coastal resilience. Public financing is needed to safeguard property and communities in coastal regions. However, around the globe, public funds are scarce and only cover a small portion of the funding needed for coastal adaptation-related investments. The shortfall is even more acute in developing economies where competing demands on public finances and opportunity costs create barriers to financing coastal adaptation and resilience building efforts by governments. These financial constraints can be managed by investments in adaptation measures or initiatives that leverage public resources through various market-based mechanisms including taxation (property taxes, value-added tax (VAT), specific taxes) and public-private partnerships.

Unlocking finance for coastal and nature-based solutions has been discussed at the United Nations and other global fora for several years. Given that global estimates indicate that flood-related losses in the world's 136 largest coastal cities are expected to rise to USD52 billion[55] per year by 2050, there is a critical need to provide adequate funding to support communities affected by climate-related disasters. It is estimated that developing economies need around USD400 billion a year to address loss and damage caused by adverse impacts of climate change.

At COP 27 in Sharm el-Sheikh, it was agreed to establish a Loss and Damage Fund (LDF) as a way of supporting overall climate change mitigation and adaptation efforts[56]. In 2022, Parties established a Transitional Committee that was assigned with the task of putting in place the overall technical arrangements to develop the Fund's modalities and to also address broader funding arrangements to respond to loss and damage. It was agreed that finance flows to address loss and damage should be equitable, adequate and directly accessible for the most affected; reflect a human-rights based approach; reflect gender equality principles and gender responsive financial flows; and have strong local ownership. It was also agreed that the LDF will be established as a "third operating entity under the Financial Mechanism of the UNFCC which also serves the Paris Agreement".[57]

At COP 28, a landmark agreement to establish the LDF – to support vulnerable economies facing the worst of climate change's impacts, was reached. The fund has been designed to support a range of climate change mitigation and adaptation efforts. These include the development of Economy level Response Plans; address insufficient climate information and data gaps; and promote equitable, safe and dignified human mobility in the form of displacement, relocation, and migration, in cases of temporary and permanent loss and damage.

In terms of governance arrangements, it was agreed to establish a geographically diverse Board with the management of the fund handled, until then, by the World Bank. The first pledges from developed economies which were made at COP 28 are estimated at around USD650 million.

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[55] I.B. Billecocq and T. Bongarts, 2022, "Unlocking Financial Flows for Building Resilient Coastal Cities," Race to Resilience, Race to Zero, UNFCCC, September 28, https://climatechampions.unfccc.int/unlocking-financial-flows-for-building-resilient-coastal-cities/.

[56] Referred as the "incurred impacts of anthropogenic climate change" felt by the poorest and most vulnerable communities.

[57] The Loss and Damage Finance Landscape. *A discussion paper for the Loss and Damage Community on the questions to be resolved in 2023 for ambitious progress on the Loss and Damage Fund*. Heinrich Boll Stiftund. Washington DC. Us.boell.org. Lossanddamagecollaboration.org.

In addition, Progress was also made on a new collective quantified goal (NCQG), which builds on the USD100 billion pledged by developed nations to finance climate mitigation and adaptation initiatives in developing economies. The meeting also reached an agreement to draft a post-2025 finance target ahead of COP 29 – the details of which will be worked out in 2024.

In addition, several global level funding mechanisms including the Green Climate Fund (GCF)[58] as well as multilateral agencies and bilateral donors provide funds for adaptation efforts including nature-based solutions. For example, the US Inflation Reduction Act[59] aims to allocate up to USD370 billion for climate and clean energy efforts that include building coastal communities' resilience. The GCF supports funding a whole range of activities to slow climate change and to help the world to reach the target of limiting global warming to an increase of 1.5°C above pre-industrial levels.

Many of the strategies and implementation plans for increasing climate resilience come with a price tag and as noted above the LDF can support some of these efforts. Increasingly, funding for local climate adaptation and resilience projects must also draw on a range of approaches that involve a combination of public and private sector financing. In Asia-Pacific economies, most coastal communities are exposed to larger risks with less resources to manage physical and non-physical risk. In this context, while it is important to invest in developing critical infrastructure development, building capacity and skills of coastal communities helping them obtain alternate livelihoods and economic opportunities is equally important.

The desk research for this study identified several funding sources from multilateral and regional agencies. These funds—in the form of loans, grants, trust funds, and technical assistance made available largely to developing economies—include the following (among others):

1. The Ocean Resilience and Coastal Adaptation Trust Fund (ORCATF) administered by the Asian Development Bank. It was established in March 2023 to increase the quality of investments in ocean health, including the blue economy and coastal adaptation efforts. The ORCATF is expected to contribute funds to climate-resilient and nature-based sustainable development in the Asia-Pacific region. The grant funds will support upstream planning, project preparation, and capacity development in ocean health and coastal adaptation. The activities eligible for funding include those that are integrated with ocean-and-coastal related components of Economy level Plans and commitments such as NDCs and NAPs.
2. The Community Resilience Financing Partnership Facility (CRFPF) directs funds to scale up community-level investments in climate adaptation and aims to build the resilience of vulnerable communities to better manage the negative impacts of climate change.
3. The Australian Climate Finance Partnership (ACFP) is a AUD140 million concessional financing facility managed by the Asian Development Bank and funded by Australia. It is designed to catalyze financing for private sector climate adaptation and mitigation projects in eligible economies in the Pacific and Southeast Asia; and it covers issues such as marine and coastal ecosystem protection and disaster risk management that can demonstrate positive climate outcomes.

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[58] Green Climate Fund (https://www.greenclimate.fund).
[59] International Energy Agency, 2023, "Inflation Reduction Act of 2022," April 23, https://www.iea.org/policies/16156-inflation-reduction-act-of-2022.

4. The Global Environment Fund supports adaptation to climate change in developing economies through two trust funds established in 2001 at COP7 under the 'UN Framework Convention on Climate Change' (UNFCC): (i) the "Least Developed Countries' Fund" and (ii) the "Special Climate Change Fund". Both support climate adaptation efforts. The first targets the "Least Developed Countries" to address urgent, medium-term, and long-term climate priorities; the second focuses on adaptation priorities including catalyzing innovation, technology transfers, and private sector engagement.[60]

At the APEC level, initiatives that focus on addressing the impacts of climate change on coastal zones are funded using APEC project funds in line with APEC's ECOTECH agenda,[61] in order to build capacities and skills that enable officials to develop appropriate policy actions to manage climate change impacts and increase efforts to build resiliency within their economies.

In addition to the various funding streams available for capacity building efforts in APEC to improve regional trade aspects, dedicated project funding sources are available in APEC to fund projects that increase human security, promote energy-efficient solutions to mitigate the impacts of climate change, and support structural reforms to promote green and sustainable growth. These funding sources include: (i) the APEC Human Security Sub-Fund which covers support for emergency preparedness and other topics such as counter and terrorism secure trade, and health security, including avian and pandemic influenza and HIV/AIDS; (ii) the APEC Support Fund, Sub-Fund on Energy Efficiency, Low Carbon and Energy Resiliency Measures; (iii) the APEC Support Fund, Sub-fund on Structural Reform and Sustainable Green Growth; and (iv) the Marine Debris Management and Innovation Sub-Fund which is set up to finance project that advance APEC's objectives of reducing marine debris to promote sustainable development.

According to the Climate Action Tracker, an independent project that tracks government climate action and measures it against the Paris Agreement, international climate finance increased by only 4 percent in 2020 and remains nowhere near the level needed to support the implementation of additional emissions reductions in developing economies.[62] However, with the additional pledges made in 2023 (totaling up to US650 in the initial stages of the pledges received) the gap between demands and financing will be reduced.

Climate finance levels in developed economies are not much better and could be improved. This points to the importance of scaling up financial commitments. Economies need to revisit their climate action targets and examine how these can be backed up by adequate and sustainable financial resources to ensure that there is credible, sustainable action.

2. INSTITUTIONAL CONTEXT AND CAPACITIES

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[60] Global Environment Fund (GEF), n.d., "How Projects Work," webpage, thegef.org/projects-operations/how-projects-work.
[61] APEC's ECOTECH (or Economic and Technical Cooperation) builds capacity and skills, particularly in developing member economies, to enable them to advance APEC's trade and investment liberalization and facilitation (TILF) and sectoral objectives. Those objectives are outlined in the 1995 *Osaka Action Plan (updated this year)* and the 1996 *Manila Declaration*. The two documents define APEC's ECOTECH agenda.
[62] Climate Action Tracker, 2022, "Massive Gas Expansion Risks Overtaking Positive Climate Policies," webpage, https://climateactiontracker.org/publications/massive-gas-expansion-risks-overtaking-positive-climate-policies/.

2.1 INSTITUTIONAL ASPECTS

As noted earlier, addressing climate change is broadly articulated in APEC's mission and policy statements. For example, the 2022 Leaders' Declaration issued affirms APEC Leaders' long-standing commitment to promote strong, balanced, secure, sustainable, and inclusive growth as well as their commitment to realize the APEC Putrajaya Vision. Relatedly, the Putrajaya Vision clearly states APEC's commitment to intensify inclusive human resource development as well as economic and technical cooperation to better equip its people with the skills and knowledge for the future.

Several APEC sub-fora contribute to addressing the cross-sectoral impacts climate change. These entities include the APEC Ocean and Fisheries Working Group (OFWG), which is the main forum addressing coastal aspects of climate change. OFWG's work is strongly aligned with the work the Emergency Preparedness Working Group (EPWG) does in terms of disaster risk reduction in relation to climate change. The Energy Working Group (EWG), the Agricultural Technical Cooperation Working Group (ATCWG), the Health Working Group (HWG), the Small and Medium Enterprises Working Group (SMEWG), the Telecommunications and Information Working Group (TIWG), the Tourism Working Group (TWG), and the Transportation Working Group (TWG) also undertake relevant work. The work on structural reforms to support green growth promoted by the Economic Committee is also relevant. It is important to note that efforts are underway to look at mainstreaming this work to achieve APEC's broader goals of sustainable and resilient growth.

Also, as noted earlier, other regional institutions in the region, such as ASEAN operating under its Socio-Cultural Community Blueprint (ASCC) 2025 Vision, also work to promote balanced social development and a sustainable environment. Notably, ASEAN's Working Group on Coastal and Marine Environment (AWGCME) works on issues relating to the importance of coastal and marine resources for the livelihood of ASEAN people; and there are synergies between APEC's OFWG efforts and the work done in ASEAN under AWGCME.

I/NDCs also provide useful pathways for emissions reduction and low-carbon development. However, coordination between agencies and ministries is limited as are the institutional linkages necessary to align central level and local level plans, financing modalities, and actions for policy implementation. The management of climate change impacts rests primarily with economy-level environment agencies (ministries and departments); decentralized approaches are less common.

Policy frameworks that address climate change mitigation and adaptation aspects are regularly guided by functional implementation or Action Plans, but they are often not supported by much-needed institutional capacity building efforts. It is widely acknowledged that empowering communities to build their resilience and adapt to their local contexts will need a demand-driven approach based on a sound appreciation of context-specific issues; a one-size-fits all approach does not work. A tailored approach requires data and information to guide evidence-based policy making. However, in some contexts, sourcing up-to-date climate related data on hazard risks can be a significant challenge.

The survey findings detailed in Table 3 provide a quick view of the currently operating economy-level institutional frameworks. While designated central environmental agencies responsible for managing climate change impacts clearly exist in most economies surveyed, when it comes to the management of issues specific to coastal management and actions relating to developing nature-based solutions, only five economies have well established coastal (decentralized) management agencies.

For the overall management of natural disasters, there are central government led organizations or agencies responsible for disaster management in five APEC economies, while in four economies, provincial/prefectural/local agencies/organizations or units lead the work on coastal management.

One of the clear gaps identified during the discussions at the workshops is the lack of effective coordination amongst these various agencies in terms of a whole-of-government approach to decision making, policy planning, budgeting, implementation, monitoring, and learning.

TABLE 3: INSTITUTIONAL FRAMEWORK AND MANDATE FOR COASTAL GOVERNANCE AND COASTAL MANAGEMENT

Economy	Central environment agencies responsible for managing climate change impacts	Coastal management agencies	Fisheries and marine protection agencies	Central disaster management organizations or agencies	Provincial/ prefectural/ local agencies/ organizations or units	NP
Australia	Yes	Yes	Yes	Yes	Yes	
Brunei Darussalam*						NP
Canada*						NP
Chile	Yes	Yes	Yes	Yes	No	
People's Republic of China*						NP
Hong Kong, China*						NP
Indonesia	Yes	No	Yes	No	Yes	
Japan	Yes	Yes	Yes	Yes	Yes	
Republic of Korea*						NP
Malaysia	Yes	Yes	Yes	Yes	Yes	
Mexico*						NP
New Zealand*						NP
Papua New Guinea	Yes	No	Yes	No	No	
Peru	Yes	No	No	No	No	

TABLE 3: INSTITUTIONAL FRAMEWORK AND MANDATE FOR COASTAL GOVERNANCE AND COASTAL MANAGEMENT						
Economy	**Central environment agencies responsible for managing climate change impacts**	**Coastal management agencies**	**Fisheries and marine protection agencies**	**Central disaster management organizations or agencies**	**Provincial/ prefectural/ local agencies/ organizations or units**	**NP**
The Philippines	Yes	Yes	Yes	Yes	Yes	
Russian Federation*						NP
Singapore*						NP
Chinese Taipei	Yes	No	No	No	No	
Thailand	Yes	Yes	Yes	No	No	
The United States	Yes	Yes	Yes	Yes	Yes	
Viet Nam*						NP
* Did not participate in the survey (NP)						

In addition to the above, there are several additional points to bear in mind when discussing the topic of improving coastal resilience.

- Local governments (broadly defined to include the district and provincial levels) serve as frontline actors to implement coastal adaptation plans and projects, but they often lack the capacity and resources needed to implement these activities.

- Effective local adaptation plans of action (LAPA) are not in place in most contexts, and there are ambiguities concerning the institutional mandate for coastal governance and management in most economies to address climate change issues. All this create challenges in addressing climate change impacts on coastal zones. This also results in duplication of efforts and resource inefficiencies.

- In terms of representation, at the central government institution level, it is essential that the voices of coastal communities and the most vulnerable including women, marginalized communities and the elderly are adequately represented when policies and plans are developed. Representation should be proportional based on need, inclusion, and economic status to ensure that all elements of equity and inclusion in decision making are incorporated.

- It is also important to undertake appropriate efforts to build skills and capabilities of local actors in addressing coastal resilience to ensure the effective implementation of relevant policies and programs.

2.2 STAKEHOLDER ENGAGEMENT

Coastal resilience is defined as a public good. Investment in public goods—defined as grey or green infrastructure, water quality improvements, biodiversity solutions—are typically the remit of governments since such investments cannot be recovered via fees charged to beneficiaries.[63] Investments in large-scale restoration and sustainable management of nature-related assets for coastal protection have not been undertaken by private/nongovernmental actors due to a lack of incentives. However, with the development of new nature-based marketable products that can be invested in and the emergence of private/nongovernmental actors as "environmental stewards" promoting environmental solutions, things are changing on the ground.

The private sector is considered a critical actor in (general) disaster risk reduction efforts across the APEC region; and the importance of this stakeholder group has been highlighted after the Sendai Framework was adopted in 2015. In most economies, the private sector is involved in the response to climate related disasters as part of the reconstruction efforts. It is important to note that in some cases nongovernmental entities (such as nongovernmental organizations (NGOs)) can serve a critical role in supplementing resources and expertise lacking in local governments. Collaborative relationships with private sector actors and especially NGOs can also serve governments well: not just in terms of sharing risks and benefits and sharing resources but also in consensus building, especially if sensitive issues need to be managed carefully on the ground. Another important aspect is that in some contexts, NGOs also bring to the table specific indigenous knowledge that could be invaluable in designing programs to mitigate climate related risks in coastal zones.

Based on findings, insurance is an area with opportunities for the private sector to engage in to promote resilience building or measuring impacts of resilience investments. In several economies, a large portion of critical public infrastructure remains uninsured, which can place an enormous burden on public finances. Typically, when natural disasters strike coastal areas, communities and small businesses seek the help of governments and international and nongovernmental agencies for recovery assistance. Yet these investments can represent a challenge, especially given the increasing intensity and severity of disasters from climate change. Solutions to this problem have included risk transfers (insurance) or risk reduction via hazard assessments and mitigation. The private sector can play a useful role in both of these areas.

The private sector can also develop innovative and scalable products that can increase resilience while delivering a return on investment. There have also been examples of effective cooperation between science and technology companies, governments and the private sector engaging collaboratively to undertake disaster recovery efforts and disaster risk reduction planning efforts. A good example is the multi-stakeholder partnership through the Philippines National Resilience Council. The government of the Philippines, private sector, academia, and civil society groups established the National Resilience

[63] T. Vegh and I. Beguin, 2022, "A Guide to Private Sector Investment in Coastal Resilience," Race to Resilience. Race to Zero, UNFCCC, June, https://climatechampions.unfccc.int/a-guide-to-private-sector-investment-in-coastal-resilience/.

Council (NRC) as a technology and science based public-private partnership in 2017 to reflect the importance of local governments and communities in advancing work between the Paris Climate Agreement, disaster risk reduction efforts and the SGDs.

Responses from economies (via the survey conducted for this study) indicated that NGOs are very active in four APEC economies, somewhat active in four other economies, while two economies had no relevant information at the time of the survey, and one economy indicated that NGO activities are non-existent in that context.

Table 4 provides a quick sense of some stakeholders engaged in capacity building in various economies, especially NGOs active across the economies.

TABLE 4: NGO STAKEHOLDERS ACTIVE IN APEC ECONOMIES

Economy	Active NGO Stakeholders
Australia	- Insurance Council of Australia
Indonesia	- Yayasan Konservasi Alam Nusantara (YKAN) - RARE, Indonesia - Wetlands International Indonesia
Papua New Guinea	- The Nature Conservancy (TNC) - World Wildlife Fund
The Philippines	- Conservation International (CI) Philippines - World Wildlife Fund (WWF) Philippines - Oceana Philippines - RARE, Philippines - Communities Organized for Resource Allocation (CORA) Philippines - Haribon Foundation - Philippine Business for the Environment
Thailand	- Sustainable Development Foundation
The United States	- The Ocean Conservancy - Earthjustice - Environmental Defense Fund - Natural Resources Defense Council - Union of Concerned Scientists

2.3 AVAILABILITY OF INFORMATION, DATA, TOOLS, AND SYSTEMS

Providing reliable, up-to-date, and quality climate-related information tailored to users' needs enables decision-makers to make investment decisions based on the best available information and data. Therefore, developing sound, consistent, contestable climate information that supports adaptation and resilience is key to facilitate communities' actions as well as investment decisions by private sector

entities. It is equally important to document best practices for cross-learning and adaptation to guide proof-of-concepts.

At the economy level, the study findings reveal that there is some level of climate data and hazard related information available in most economies (and some of the best practices are covered in the relevant sections below). Findings indicate that climate information, data, and analysis are often at the spatial and temporal scale to support policy and decision-making. In some cases, up-to-date data are archived and only accessible to climate change professionals for supporting research and strengthening climate science, reflecting local realities.

The research for this study indicates that staff in relevant departments have a moderate understanding of the appropriate use of climate information, data, and analysis; the systems and procedures are in place for monitoring, generating, and using climate information. In some economies, climate information, data, and analysis are adequately monitored, generated, or used for decision-making, especially at the upstream level. However, decentralized and local level data sets are not readily available and accessible, which forces policy makers and practitioners to rely on generic data and information.

A summary of key constraints include:

- The lack of disaggregated data and analysis by local and provincial levels to inform policy, planning, and budgeting, taking into account climate risks and resilient measures.
- The overall quality and reliability of data, lack of updated issues, and limited systems to update information.
- Limited platforms for data storage and sharing, in some cases access is inconsistent due to high costs involved in maintaining and upgrading data portals and platforms, as well as lack of standards, harmonization of data policies including those that govern data privacy, security issues. In other cases, only portions of data are available electronically and historical data sets on climate patterns and hazards are unavailable.
- In a few cases, data on temperature and rainfall and other climate related data are only available for purchase from an economy's department of meteorology.
- The need for a robust data and information management system for coastal resilience to provide evidence-based and real-time support.

As noted above, there are challenges associated with the lack of effective coordination and communication (mostly between central government systems and those at the local, provincial, and/or community levels); limitations with available systems where information is not updated on time; and limitations in terms of skills and capacities involving gathering and analyzing information at the economy level.

Specific economy-level gaps identified during the surveys and workshop discussions include the following:

- In Japan, there is a lack of information on the frequency of climate disasters. There is limited access at the ground-level to data to guide coastal adaptation efforts.
- In Viet Nam, there insufficient up-to-date data to understand the local situation in relation to climate impacts. Local people have limited skills to properly understand scientific data (in terms of interpretating the data to comprehend the scale of impacts and levels of damage). Timely

communication at the local level is also difficult. The work is siloed and there is lack of coordination between the central and local governments which makes early action impossible.

- In Indonesia, people from the buffer zone areas are reluctant to move to other areas although the buffer zone areas are considered high-risk. Understanding and awareness programs can be enhanced as these are areas that are identified as requiring improvement.

In terms of assessing and the availability of tools, systems, and approaches, the information gathered highlighted several examples:

- The NOAA web portal[64] on coastal natural infrastructure has information on understanding communicating, analyzing and prioritizing and exploring nature-based solutions for coastal hazards and risk reduction. Similarly, Australia's web-portal "CoastAdapt"[65] tool that includes inundation software, local coastline morphological information, and coastal climate adaptation decision-making guidance as well as case studies to provide access to information and guidance.
- Other global networks also provide relevant tools and systems that can be leveraged to build knowledge and expertise in enhancing skills and expertise in coastal resilience and adaptation approaches. For example, Coastal Resilience[66] is a global network of practitioners[67] that supports efforts "identifying nature-based or green infrastructure solutions, where coastal communities can increase their resilience by effectively protecting, restoring and sustainably managing their natural resources while strengthening local capacity for climate adaptation." It uses an approach that includes four critical steps: (i) assessing risk and vulnerability to coastal flood hazards including current and future storms and sea level rise; (ii) identifying solutions to reducing flood-related risks; (iii) taking action at priority conservation and restoration sites to help communities identify and implement nature-based risk reduction solutions; and (iv) measuring effectiveness to ensure that flood reduction risks by promoting resilience efforts are successful. The network also develops sound, web-based mapping tools to help communities better understand their vulnerabilities and risks from climate related hazards and to guide nature-based context specific solutions. The tools used by Coastal Resilience include a visualization platform that enables the access to ecological, social, and economic information which can be viewed alongside sea level rise and storm surge scenarios in specific geographies.
- Global platforms such as the Allen Coral Atlas[68] and the approaches for coral reef management, conservation, and research, as well as the Global Mangrove Watch[69] platform and its focus on mangrove conservation offer useful trainings members can access to increase knowledge on these topics. Organizations such as the Pan Ocean Remote Sensing Association[70] also foster global

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[64] NOAA, Office for Coastal Management, n.d., "Digital Coast Tools," online resource, https://coast.noaa.gov/digitalcoast/tools/.
[65] CoastAdapt, n.d., "CoastAdapt" website (Australia), https://coastadapt.com.au.
[66] Coastal Resilience, n.d., "Coastal Resilience," website, https://coastalresilience.org/.
[67] Coastal Resilience includes a mix of global organizations, international NGOs, and academia. Its members include: The Nature Conservancy, United Nations University, NOAA, the US Geological Survey, the Natural Capital Project, the Association of State Floodplain Managers, the Alliance for Development Works, the International Federation of the Red Cross, Esri (the Environmental Systems Research Institute), and the Global Disaster Preparedness Center, as well as several academic institutions such as the University of Southern California at Santa Cruz and the University of Mississippi.
[68] Reef Resilience Network, n.d., "Remote Sensing and Mapping for Coral Reef Conservation," online course resource page, reefresilience.wpengine.com/remote-sensing-and-mapping-for-coral-reef-conservation/.
[69] Global Mangrove Watch, n.d., "Global Mangrove Watch," website, http://www.globalmangrovewatch.org.
[70] Pan Ocean Remote Sensing Conference. https://porsec.nwra.com/.

coordination and capacity building initiatives in the Asia-Pacific region—with organizations like the Asian Association on Remote Sensing[71]—which focus on remote sensing technologies to address climate change-related challenges.

- At the APEC level, the APEC Climate Center (APCC) was established to facilitate climate change information at various levels. The APCC provides climate prediction, conducts interdisciplinary research, provides climate information and services, and promotes international cooperation. Climate information services can be easily accessed through the APCC system. Essentially, it also provides capacity-building programs with the aim of strengthening scientific and technological cooperation across the APEC region. The antecedent of the APEC Climate Center was the APEC Climate Network (APCN) established by the APEC Industrial Science and Technology Working Group (ISTWG). The APCN was established with the aim of exchanging climate information among APEC economies to combat climate and weather-related disasters.

In summary, the analysis undertaken as part of this study on the availability and sharing of information demonstrates that there is an understanding of climate hazards, vulnerabilities, and exposure to the adverse impacts of climate change at the central government level in almost all APEC economies. However, there are gaps in the actual implementation of activities—especially at the provincial or local levels—due to the range of factors noted above. In addition, there are systematic shortcomings that limit the sharing of data to develop sound, evidence-based planning and monitoring, especially in developing economies. While pilot projects have been implemented on the ground, the evaluation of the benefits are not incorporated into central-level policies. There is also limited scale up of existing pilot programs that are implemented at the ground level due to the lack of coordination and policy coherence.

Several other capacity and skill gaps were identified during the information gathering phase of this study. For example, communities and policy makers at the provincial levels could benefit from further increases in knowledge and skills in areas such as coastal and marine resource management and practical and context specific climate change mitigation and adaptation measures. This issue of capacity needs and gaps is explored further in the following sections.

In keeping the focus of this section, it is important to highlight the fact that the study findings indicate that whole-of-government approaches and partnership building mechanisms (cross sectoral/public-private/civil society/community/gender/youth/regional/global) are needed as part of economy-level Action Plans. Integrating coastal resilience strategies into other policy frameworks (e.g., disaster risk reduction, sectoral planning / local government plans and strategies, and restoration and protection of coastal ecosystems (natural regeneration/ecosystem protection/environmental safeguards) are also core areas of the planning process.

[71] Asian Association on Remote Sensing. A-a-r-s.org.

TABLE 5: MAJOR COMPONENTS OF ACTION PLANS										
Economy	**Legal and regulatory issues**	**Funding**	**Human resources**	**Capacity building**	**Data and infrastructure**	**Technological needs**	**Partnership Building**	**Integration with other frameworks**	**Restoration and protection**	**NP**
Australia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Brunei Darussalam*										NP
Canada*										NP
Chile	Yes	No	No	Yes	No	No	No	Yes	Yes	
People's Republic of China*										NP
Hong Kong, China*										NP
Indonesia	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

Japan	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	
Republic of Korea*										NP
Malaysia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Mexico*										NP
New Zealand*										NP
Papua New Guinea	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Peru	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
The Philippines	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

Russian Federation*										NP
Singapore*										NP
Chinese Taipei	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes	
Thailand	No	No	No	Yes	Yes	Yes	Yes	No	No	
The United States	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes	
Viet Nam*										NP

* Did not participate in the survey (NP)

3. INDIVIDUAL CAPACITIES

3.1 HUMAN RESOURCE AND CAPACITY NEEDS AND GAPS

To strengthen coastal resilience, it is imperative that there are skilled human resources backed up by adequate know-how concerning the latest technologies that support understanding climate issues. A skilled team is required to undertake an array of tasks including vulnerability and risk assessment, hazard mapping, offering appropriate technological and infrastructure options and solutions, and prioritizing actions that are no-regret solutions. Skills are also required in translating science and data into information and tools that local communities can more easily comprehend.

As noted previously, APEC economies have committed through Nationally Determined Contributions to take action on climate change by increasing adaptation efforts to safeguard biodiversity and protect coastal ecosystems. However, critical knowledge and skill gaps and other institutional challenges including lack of information and data and policy constraints pose significant barriers to APEC economies working to scale up necessary adaptation action to manage and mitigate the impacts of climate change in coastal areas.

Potential disruptions in local production and supply, damage in infrastructure, and disruption to business and livelihoods have compounded disaster risks in coastal areas and beyond. The most essential need is building the technical knowledge and resource capacity of governments and the private sector to better monitor and assess hazards, provide timely and accurate alerts in the event of a disaster, and more efficiently deploy search, rescue, and rebuilding efforts for building back better. Having an efficient and effective decentralized early warning system (EWS) is important to prevent human casualties and protection property. Real-time updates about the status of volcanoes, earthquakes, and tsunamis, and about weather patterns and events are key to effective and resilient planning and risk reduction.

In terms of digital tools and technology, remote sensing technologies and software can provide a roadmap to mitigate and manage the effects of climate change, particularly in the areas of infrastructure, weather-related disaster management and environmental security. A diverse range of climate-friendly technologies (CFTs) are used in APEC economies. However, technology-based mitigation needs to be tested, accredited, and environmentally friendly. Lack of critical information, limited access to technologies, insufficient funding, and inadequate policy cohesion are some of the challenges in most economies.

At the economy level, many governments have arrangements to use private sector/nongovernmental sector resources for training and capacity building on climate change literacy. In the Philippines, for example, the government taps NGOs and academia in conducting capacity building activities related to climate change adaptation. Aside from partnering with NGOs through memorandum of agreements and understanding to implement the Coastal and Marine Ecosystem Management Program (CMEMP), the economy level government also worked with academia to launch and implement a professional masters on tropical marine ecosystems management program which aims to enhance the capacity of Marine Protected Area (MPA) managers in effectively managing its coastal and marine resources.

In Papua New Guinea, the government initiatives are supported by donors and the private sector, which drive development by the NGO groups to implement within the scope and objective of the policy

framework. In Australia, there are networks and partnerships for advancing capacity of various stakeholders on climate change. For example, the Climate Change Education – Climate Change Education Network[72] is an open collective of academics working in climate change education across various institutional, public, and community spaces of learning. Similarly, the Australian Youth Climate Coalition[73] is Australia's largest youth-run organization, with a mission to build a movement of young people leading solutions to the climate crisis.

Chinese Taipei has its Integrated Coastal Zone Management Plan, designed to offer guidance on the conservation, protection, use, and management of coastal zones as well as to promote their sustainable development through local linkages and the establishment of mechanisms to drive public participation in pilot projects. It also launched Embracing the Coast and Preserving Natural Coasts through Local Linkages, a pilot study to assess what kind of cooperation models the government could use with the localities to better plan and manage the coastal climate crisis.

3.2 BUILDING SKILLS AND TECHNICAL CAPACITIES

When examining ways of increasing skills and technical capacities, targeting support to key needs and capacity gaps identified through the study would be a good starting point. Amongst the areas identified by those surveyed and interviewed for this study, three key areas were highlighted.

Support to guide efficient land-use planning in coastal zones is an issue that needs to be considered when discussing aspects of building coastal resilience in the Asia-Pacific region. The tools for planning (including remote sensing-based tools) and operational skills are limited in developing economies. This was identified as a gap during the information gathering phase. With large parts of coastal zones under threat due to sea level rise, coastal flooding, coastal erosion, and saltwater intrusion, historic approaches that have guided residential developments and associated infrastructure such as transport systems and relevant industry, need to be recalibrated. Proper land-use and urban planning approaches can protect coastal communities from climate related hazards with the use of tools such as permits, appropriate land-use regulations, zoning activities including "coastal set back" zones, strengthening the use of nature-based solutions or green infrastructure, etc. Infrastructure needs to be climate-proofed to be more resilient to climate hazards.

Improving climate literacy to better understand impacts of climate change on coastal and marine ecosystems is another area identified as a gap or challenge by several economies. Climate science and energy are complex topics, with rapidly developing science and technology and the potential for controversy. Three economies consider limited climate change literacy to understand impacts of climate change as a challenge to addressing coastal resilience. Climate and environmental literacy, coupled with strong civic education, will create jobs, build a green consumer market, and allow citizens to engage with their governments in a meaningful way to address the climate crisis. It is also essential that climate science is integrated in school curricula to ensure that children learn about their environment early so they can fulfil their civic duties.

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[72] Climate Change Education Network, n.d., "Climate Change Education Network," website, https://climatechangeeducation.net.au/.
[73] Australian Youth Climate Coalition, n.d., "Australian Youth Climate Coalition," website, https://www.aycc.org.au/.

Limited skills in translating high-level policy priorities into practical actions for adaptation planning was another gap highlighted by APEC economies. Several economies face gaps in translating policy priorities actions for adaptation planning, especially among the coastal communities. Globally, more than eight out of 10 economies now have at least one economy level adaptation planning instrument, and they are getting better and becoming more inclusive of disadvantaged groups. Current adaptation practice falls short of what is required on the ground—primarily due to inadequate involvement of stakeholders and exclusion of the marginalized groups including women, indigenous people and local communities. Other gaps include a lack of attention to local contexts and ownership through genuine local participation in adaptive designs and implementation as well as retrofitting development activities without addressing climate risks.

The NA survey sought responses on the priority areas for capacity building so that future projects and programs as well as discussions during plenary meetings can be targeted and focused. Economy responses to this question are detailed in Table 6.

TABLE 6: PRIORITY AREAS FOR CAPACITY BUILDING

Economy	Capacity building training			1st Priority	2nd Priority	3rd Priority	4th Priority	NP
	Yes	No	NP					
Australia	Yes			Tangible, action-oriented solutions to existing impacts/risks	Improving the evidence base (i.e., improved whole of community awareness of risks and solutions)	Better land use planning (i.e., awareness to not construct in certain areas)	Building back better (i.e., improved buildings to withstand shocks)	
Brunei Darussalam*			NP					NP
Canada*			NP					NP
Chile		No		Strengthening adaptation capacity of coastal communities	Enhancing understanding the impact of climate change on coastal zone	Enhancing knowledge about more vulnerable geographic areas (map of risk)	Fundraising to increase impact of adaptation program	
People's Republic of China*			NP					NP
Hong Kong, China*			NP					NP

TABLE 6: PRIORITY AREAS FOR CAPACITY BUILDING								
Economy	**Capacity building training**			**1st Priority**	**2nd Priority**	**3rd Priority**	**4th Priority**	**NP**
	Yes	No	NP					
Indonesia	Yes			Coastal resilience and climate change adaptation	Blue carbon for coastal resilience	Blue carbon pricing	Ocean accounting	
Japan		No		Improving data gathering systems and data availability	Technology development	Resilient infrastructure	Capacity building for urgent evacuation to save lives	
Republic of Korea*			NP					NP
Malaysia	Yes			Collecting baseline data in understanding the state of art	Funding in understanding the ecosystem due to climate change	Capacity building	Policy	
Mexico*			NP					NP
New Zealand*			NP					NP
Papua New Guinea		No		Improve legislative and policy framework to consolidate issues and challenges overlapping with other sectors like fisheries, environmental considerations	Building coastal resilience infrastructure that responds to climate change impacts	Enhance programs and projects that will create a robust partnership with the local communities greatly affected by climate change impacts	Strengthening partnership with relevant government agencies whose issues are related to climate change	
Peru	Yes			Financing	Human resources trained in climate change	N/A	N/A	
The Philippines	Yes			Fundamentals of marine protected area management	Ecosystems valuation	Vulnerability assessement	Carrying capacity	
Russian Federation*			NP					NP

TABLE 6: PRIORITY AREAS FOR CAPACITY BUILDING								
Economy	**Capacity building training**			**1st Priority**	**2nd Priority**	**3rd Priority**	**4th Priority**	**NP**
	Yes	No	NP					
Singapore*			NP					NP
Chinese Taipei		No		Sustainable blue economy	Marine biodiversity issues	Plastics marine litter and the circular economy	Citizen engagement and ocean literacy	
Thailand	Yes			Risk assessment on impact of climate change	Identify relevant stakeholders	Develop policy and plan	Implementation	
The United States		No		Addressing climate change	Sustainable blue economy	Marine biodiversity	Plastics marine litter and the circular economy	
Viet Nam*			NP					NP
* Did not participate in the survey (NP)								

To assess how APEC level capacity-building efforts under the OFWG match with the information outlined in the table above, an assessment of projects (using a keyword search) was undertaken.

There are 24 projects under the OFWG led by Chile (3), China (6), Indonesia (5), Malaysia (2), Peru (1), Chinese Taipei (4), Thailand (1) and the USA (5). They are largely focused on fisheries, aquaculture, and the maritime sector, including promotion of women's inclusion, the Marine Debris Monitoring Framework, capacity building on marine debris, the blue carbon ecosystem, and capacity building for blue citizens.

4. GOOD PRACTICE

The focus of this section is to present good practice examples at the economy level identified through the survey and KIIs.

In Japan, the Ministry of the Environment has prepared the Climate Change Adaptation Plan in 2021. The plan's objective is to achieve a safe and sustainable society by avoiding and minimizing the negative impacts of climate change, securing citizens' lives, socio-economic development, and ecosystems, and by building economy level resilience.

It has seven basic strategies, and the relevant ministries and agencies jointly promote these adaptation actions. Monitoring and evaluating the progress on adaptation while managing the progress by setting key performance indicators (KPIs) on sectoral/fundamental measures and setting indicators from the

perspective of making climate change adaptation firmly established and more widespread at economy, local, and citizen levels, based on a plan-do-check-act (PDCA) cycle.
In Peru, in 2018, the Vice Ministry of Fisheries and Aquaculture under the Ministry of Production (PRODUCE) prepared Tentative Programming of Adaptation Measures Against Climate Change and submitted that plan to the Vice Ministry of Strategic Development of Natural Resources of the Ministry of the Environment (MINAM). The plan contains eight products and 18 Climate Change Adaptation Measures for the activities prioritized by the sector, namely: industrial fishing for indirect human consumption (CHI), artisan fisheries for direct human consumption (CHD), and aquaculture.
The Philippines, through the Department of Environment and Natural Resources, currently implements the Coastal and Marine Ecosystems Management Program which is the flagship program of the economy in managing its coastal and marine resources. This program aims to achieve the effective management of the economy's coastal and marine ecosystems, thereby increasing their ability to provide ecological goods and services to improve the quality of life of the coastal population—particularly ensuring food security, climate change resiliency, and disaster risk reduction with particular focus to the sustainable management of coral reefs, sea grass beds, mangrove stands, soft bottom areas (mudflats), plankton community, and water quality of coastal areas.
In Chinese Taipei, the Environmental Protection Administration and 16 other ministries jointly compiled the comprehensive, consolidated, multi-sectoral approach to improve economy level climate change adaptation capabilities , coordinate disaster prevention and response strategies, reduce vulnerability, increase resilience, and achieve Sustainable Development Goals. This approach also contains robust mechanisms to measure, monitor and report on progress at the different layers of policy making.
Chile is preparing its Climate Change Framework Law, Climate Change Long-Term Strategy, Fisheries and Aquaculture Climate Change Adaptation Plan, and Coastal Zone Adaptation Climate Change Plan.
The Asia-Pacific Adaptation Information Platform[74] (AP-PLAT) and Climate Change Adaptation Information Platform[75] (A-PLAT) are initiatives introduced by Japan's Ministry of Environment. The AP-PLAT provides information and guidance for the adaption planning in the region. This platform provides information, tools, and capacity-building opportunities to help people in the region. It also provides practical guidance for the preparation of the National Adaptation Plan (NAP) to implement UNFCCC processes. Around 21 cities are working collectively to address the urban heat and its effect and extreme heat events in cities by using green infrastructures and nature-based solutions through the Cool Cities Network. Similarly, the A-PLAT provides information on adaptation efforts by the economy level governments, local climate change adaptation plans, private sector engagement in adaptation planning, and examples of climate change adaptation measures.

[74] Asia-Pacific Climate Change Adaptation Information Platform, n.d., "Asia-Pacific Climate Change Adaptation Information Platform," website, https://ap-plat.nies.go.jp/index.html.
[75] A-PLAT (Climate Change Adaptation Information Platform), n.d., "A-PLAT," website, https://adaptation-platform.nies.go.jp/en/index.html.

The United States National Oceanic and Atmospheric Administration (NOAA) has created several online platforms for free data and information access and visualization. The GeoPlatform[76] provides cloud-based GIS data, analytics, and a visualization platform. The Climate Data Online[77] (CDO) provides free access to National Climatic Data Center's (NCDC)'s archive of global historical weather and climate data in addition to station history information. The Global Ocean Current Database[78] (GOCD) integrates ocean current data from a wide variety of capture methods, resolutions, and formats into a single format (NetCDF) archive. The GOCD is a valuable resource that gives scientists and researchers a comprehensive depiction of global current activity and structure. Additionally, the Coastal Resilience Mapping Portal (CRMP) is an online, interactive tool helps users visualize future flood risks from sea level rise and storm surge. The tool identifies areas and populations at risk and provides a better understanding of potential ecological, social, and economic impacts.

RECOMMENDATIONS

Based on the findings outlined above, this study proposes the following six recommendations to improve coastal resilience efforts in the APEC region:

1. **Develop a Coastal Resilience Framework under the OFWG that can support capacity building efforts and technical assistance to improve coastal resilience and adaptation efforts.**

   APEC economies can benefit from having a dedicated coastal resilience policy framework under the OFWG that supports the objective of delivering capacity building activities to improve the adaptive capacities of coastal communities to "bounce back" after adverse climate events. The framework could guide the design and implementation of activities to build the resilience of coastal communities in the APEC region, by targeting specific needs and capacity gaps identified through this study.

   A framework implementation plan or an action plan could serve as a practical blueprint for implementing the various programs and capacity building initiatives. Areas of focus could involve, *inter alia*, approaches to promote nature-based solutions for coastal area protection; rehabilitation of marine protected areas and mangroves; coral restoration efforts; promotion of digitalization and the use of appropriate technologies; improving access to data and information; and building the capacity of public sector officials to develop appropriate climate-resilient approaches by improving the institutional and enabling policy environment.

   The framework could be designed to complement existing OFWG policy frameworks including the Marine Debris Roadmap and the Roadmap on Combating Illegal, Unreported and

[76] NOAA, n.d., "Geospatial Information Platform," web resource, https://www.noaa.gov/organization/information-technology/noaa-geoplatform.
[77] NOAA National Centers for Environmental Information, n.d., "Climate Data Online," web resource, https://www.ncei.noaa.gov/cdo-web/.
[78] NOAA National Centers for Environmental Information, n.d., "Global Ocean Currents Database," web resource, https://www.ncei.noaa.gov/products/global-ocean-currents-database.

Unregulated Fishing, and to leverage the outcomes of previous APEC capacity-building projects addressing climate change-related challenges.

The implementation plan could contain a set of practical indicators and targets that will help track progress in achieving the intended outcomes. These efforts can be linked to the targets and commitments including reporting requirements under the Aotearoa Plan of Action (APA).

2. **Establish a dedicated APEC project sub-fund to finance regional and economy-specific capacity activities that support the implementation of the proposed Coastal Resilience Framework.**

   One of the challenges identified is the lack of a reliable source of financing to support efforts to promote coastal resilience in the APEC region.

   Several funding mechanisms are available through existing multilateral mechanisms mentioned in the report and through bilateral mechanisms. However, a dedicated APEC funding source like an APEC project sub-fund to support targeted capacity building efforts at the APEC (OFWG) level will achieve the outcomes expected under the APA. The funding criteria can be linked to key themes of the framework mentioned above, aimed at improving coastal resilience.

   In addition, information about external funding sources (i.e., multilateral or bilateral mechanisms) should be made available to developing economies to increase their awareness of the availability of external funding sources that can be accessed to support adaptation-focused initiatives.

   Having a dedicated policy discussion or public-private dialogues at OFWG on climate change adaptation and resilience financing would also be useful to increase APEC members' awareness of what is available.

3. **Strengthen public sector capacities to deploy effective whole-of-government efforts when planning initiatives on coastal resilience.**

   Many APEC economies and particularly developing economies need to strengthen the capacity of public sector agencies to deal with issues related to climate change in a coordinated, cohesive manner. The competing interests of different ministries and line agencies and the lack of clarity on mandates and allocation of responsibilities lead to limited coordination and in some cases, duplication of efforts and the inefficient use of resources.

   Knowledge and information-sharing initiatives focusing on good practice examples on how this challenge is managed efficiently in some contexts would be beneficial for economies faced with this challenge. This can be combined with technology transfers and capacity-building initiatives examining the viability of innovative practices, information and communication technology systems, web-based platforms, and e-government services designed to improve coordination and whole-of-government engagement.

4. **Integrate and prioritize adaptation approaches, including nature-based solutions in coastal zones, in economy-level policy frameworks.**

   APEC economies are moving towards a net-zero or low-carbon economies with commitments articulated under NDCs, high level policies, and strategic plans linked to the Paris Agreement. These policy frameworks place significant emphasis on climate change mitigation efforts with relatively limited focus on adaptation efforts and very little mention of how to address the challenges of climate change for coastal zones.

   The diversity of needs in coastal zones limit the use of a single adaptation solution to address the multitude of challenges faced by communities in coastal regions. Given this, APEC should ensure that economy-level, high-level strategic frameworks and action plans prioritize adaptation measures targeted at improving coastal resilience.

   In doing so, it is important to ensure that these are founded on an inclusive process incorporating the needs and views of vulnerable populations, women, the elderly, and marginalized and at-risk communities in coastal zones as well those of nongovernmental sector actors (industry, NGOs, and civil society groups).

   Given the potential benefits of nature-based solutions, these should be part of integrated plans that incorporate both grey and green solutions, as well as measures such as awareness raising, land-use planning, and early warning to deliver a complete suite of evidence-based coastal resilience options.

5. **Develop systems to address challenges of data quality, availability, accessibility, and interoperability.**

   Data availability, accessibility, and interoperability are key challenges that APEC economies face in evaluating climate risk, developing appropriate context-specific policy options to address identified challenges, and in implementing projects on the ground.

   The lack of coastal resilience specific disaggregated data, the overall quality and reliability of data, and the lack of appropriate systems to update information, as well as limited robust platforms for data storage and sharing were challenges highlighted by respondents interviewed and surveyed.

   The need for a robust information management system for coastal resilience that can provide easy access to evidence-based tools to support regional capacity at the economy, sub-economy, and local levels is a key need that was identified by stakeholders. This report recommends creating a robust data-sharing and information management platform within the OFWG, to share economy-level information on coastal resilience-related topics. This includes information on relevant guidelines, toolkits, and good practice examples as well as up to date and accurate data on coastal vulnerability mapping and other evidence-based tools to support regional capacity in the area of improving coastal resilience, at the economy, sub-economy, and local levels.

   The proposed platform would be focused on sharing accessible and useful information to support coastal resilience planning by stakeholders from the community to the economy level,

with a wide range of climate change and coastal resilience literacy. This is expected to improve knowledge-sharing efforts across the APEC region and help with scaling up technical assistance and facilitate technology transfers to support the effective development of appropriate policy options to address challenges of climate change.

Several other relevant data sharing platforms and technical organizations exist under APEC, (including the APEC Climate Center in Busan, Korea)[79] which gather relevant evidence-based climate related information. The work that is progressed under OFWG will draw on these technical resources and data that is available to supplement the up-to-date information collated at the OFWG level and prevent any duplication of efforts.

Digitization approaches involving Artificial Intelligence (AI), information and communications technology (ICT), and the Internet of Things (IOT) can serve useful functions in helping communities and governments build appropriate solutions to address climate change-related challenges in coastal areas. One specific area that elicited interest during conversations with economy representatives is having access regionally to up-to-date climate data. Good quality, reliable climate data can also guide evidence-based adaptation planning at the economy level as well as at the regional level. The digitalization of climate data can help preserve historical information to provide a sound baseline for understanding climate variability and prepare communities for extreme climate events.

Potential technical assistance and capacity building activities to increase knowledge sharing in the issues highlighted above can be addressed through targeted capacity building efforts led by OFWG and involving relevant sub-fora including the Emergency Preparedness Working Group, Digital Economy Steering Group, and the Policy Partnership on Science, Technology, and Innovation to name a few.

6. **Strengthen capacity building efforts in APEC to increase knowledge of relevant, up-to-date information, tools, and approaches.**

The research conducted as part of this study highlighted the importance of having access to innovative tools and technologies, cutting edge systems, solutions, and approaches, as well as up-to-date information to guide policy development and project implementation.

There are a range of tools that support risk and vulnerability assessments (coastal hazards), identify eco-system adaptation solutions that can help reducing risks and vulnerability faced by coastal communities (such as land-use planning tools, remote sensing mapping etc.); support practical, on-the-ground action (pilot projects and information on case studies and lessons learned); and measure the effectiveness of interventions to reduce disaster risk and improve coastal resilience in coastal zones. Some of these were featured in this report.

[79] The APEC Climate Center (APCC) previously known as the APEC Climate Network (APCN) was launched in 2005 and is run by the Korean government. The APCC conducts research in climate prediction, analysis and climate change application areas. It also provides climate information services and capacity building programs with the aim of strengthening scientific and technological cooperation across the APEC region.

Targeted capacity-building activities—including workshops and policy dialogues that focus on increasing members awareness of innovative systems practices and approaches, tools, as well as developing a knowledge management system or repository of this kind of information—will help economies have easy access to relevant information to guide policy making in their economies.

ANNEX A: NEEDS ASSESSMENT SURVEY

Knowledge Sharing for Coastal Resilience[80] in the Asia-Pacific Region: Survey of Stakeholders

This survey should take approximately 5-10 minutes to complete. We greatly appreciate your time in completing this survey and providing economy-level information which will guide the design of capacity building efforts under the APEC Knowledge Sharing for Coastal Resilience in the Asia-Pacific Region project.

1. Please fill out the relevant details.

   Economy Name: _____

   Agency/Organization: _____

   Designation/Title: _____

2. Please indicate which stakeholder group you belong to.
   (Public sector organizations are owned, controlled, and managed by the government or other economy level-bodies. Private/non-government sector organizations are owned, controlled, and managed by individuals, groups, or business entities).

   - o Public Sector
   - o Private/Nongovernmental Sector

Please answer each question below by ticking the appropriate box. Please provide sufficient detail in the space provided.

3. Does your economy have an overarching policy framework[81] (supported by legislation) that guides climate change adaptation and coastal resilience building efforts? If yes, please provide additional details in the space provided below.

   - o Yes
   - o No

If Yes, please provide details (including weblinks if available).

4. Within your economy, which organizations have the mandate for coastal governance and coastal management issues? Check all that apply.

   - o Central environment agencies (ministries/departments) responsible for managing climate change impacts.
   - o Coastal management agencies.

[80] Coastal resilience is defined for the purpose of this project as "building the ability of a community to 'bounce back' after hazardous events such as hurricanes, coastal storms, and flooding – rather than simply reacting to impacts."
[81] This may include an economy-level coastal resilience plan in some contexts.

- Fisheries and marine protection agencies.
- Central disaster management organizations or agencies.
- Provincial/prefectural/local agencies/organizations or units.
- I don't know.

Please provide the names and contact information of your contacts within these organizations.

5. Do the policy frameworks that address climate change include a functional Implementation, Action Plan or Management Plan? If yes, please provide additional details in the space provided below.
   - Yes
   - No
   - I don't know.

If Yes, please provide details.

6. Please indicate if existing Plans consider the following areas. Check all that apply.
   - Legal and regulatory issues.
   - Funding.
   - Resourcing (human resources).
   - Capacity building and skills/knowledge enhancement.
   - Data requirements and basic infrastructure requirements.
   - Technological needs and innovation.
   - A whole-of-government approaches partnership building mechanisms (cross sectoral/public-private/civil society/community/gender/youth/regional/global).
   - Integrating coastal resilience strategies into other policy frameworks (Disaster Risk Reduction (DRR) Plans/sectoral plans/local government plans and strategies).
   - Restoration and protection of coastal ecosystems (natural regeneration/ecosystem protection/environmental safeguards).
   - Others (please specify) _____
   - I don't know.

7. What do you think are the key challenges to addressing coastal and marine climate change impacts in your economy? Check all that apply.
    - o Lack of reliable source of funding.
    - o Lack of critical information including data and maps.
    - o Basic infrastructure gaps.
    - o Limited climate change literacy to understand impacts of climate change on coastal and marine ecosystems.
    - o Limited skills in translating policy priorities to practical actions for adaptation planning.
    - o Limited access to technologies.
    - o Limited policy cohesion and whole-of-government coordination.
    - o Others (please specify) _____
    - o I don't know.

8. What has been/is being done in your economy to address these challenges? Check all that apply.
    - o Increasing technical knowledge and skills/capacity development.
    - o Enhancing partnerships with the technical and scientific community.
    - o Enhancing partnerships with local communities.
    - o Improving access to funding (public/private/non-government).
    - o Technology development.
    - o Improving data gathering systems and data availability.
    - o Supporting efforts to protect and restore coastal areas.
    - o Others (please specify) _____
    - o I don't know.

9. Have you had any training on climate change and/or management/restoration of coastal ecosystems?
    - o Yes
    - o No

If Yes, please provide details.

10. Please provide information on the top four priority areas for capacity building in order to effectively address coastal and marine climate change impacts in your economy. Please list these in the space below, according to your assessment of the order of priority (1 being the highest priority).

1.
2.
3.
4.

11. Does your economy have arrangements to use private sector/nongovernmental sector resources for training and capacity building on climate change literacy?
    - o Yes
    - o No
    - o I don't know

If Yes, please briefly describe these arrangements.

12. How active are nongovernmental organizations (NGOs), civil society, and community-based organizations in supporting community responses to conserving coastal ecosystems and implementing climate change adaptation measures?
    - o Very active
    - o Somewhat active
    - o Not at all active
    - o I don't know.

Please list these organizations.

ANNEX B: GLOSSARY[82]

Adaptation	The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.
Adaptive capacity	The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.
Capacity building	Not all developing economies have sufficient capacities to deal with many of the challenges brought by climate change. As a result, the Paris Agreement places great emphasis on climate-related capacity-building for developing economies and requests all developed economies to enhance support for capacity-building actions in developing economies.
Nationally Determined Contributions (NDC)	Economy-level action plan to communicate their actions to reduce greenhouse gas emissions in order to reach the goals of the Paris Agreement. Economies also communicate in the NDCs actions they will take to build resilience to adapt to the impacts of rising temperatures.
Nature-based solutions	Actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.
Sustainable Development Goals (SDGs)	The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all economies —developed and developing—acting in global partnership. SDG 13 urges economies to take urgent action to combat climate change and its impacts.

[82] IPCC, 2022, "Annex II: Glossary," V. Möller, R. van Diemen, J.B.R. Matthews, C. Méndez, S. Semenov, J.S. Fuglestvedt, and A. Reisinger (eds.), in *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, and B. Rama (eds.), Cambridge University Press.

ANNEX C: KEY GLOBAL AGREEMENTS

The Paris Agreement and Nationally Determined Contributions

Economies around the globe have committed to addressing climate change through commitments under the Paris Agreement. The agreement promises to take meaningful, measurable action to combat climate change through Nationally Determined Contributions (NDCs), which must include strategies for reducing carbon emissions and building resilience to climate change effects. Ambitious NDCs are critical to meet the goals of the Paris Agreement to limit global warming. However, the United Nations Environment Program (UNEP) has found that the international community is falling far short of the Paris goals, with no credible pathway in place to limit global warming to 1.5°C.[83]

The National Adaptation Plan (NAP) approach was established under the Cancun Adaptation Framework (CAF) that affirmed the directions of the Paris Agreement.[84] The NAP process follows an economy-driven, participatory, and transparent method through continuous iterative practice. The overarching objectives of the NAPs are to reduce vulnerability to the impacts of climate change by building adaptive capacity and resilience and integrating adaptation into new and existing policies and programs, especially the development of economy level strategies. Economies can use the NAP process and its outcomes to update and improve the adaptation elements of the NDCs, a central part of the Paris Agreement. Most NAPs include coastal resilience priorities and some economies have already begun developing Coastal Resilience Plans (CRP) that support protection, conservation, promotion of livelihoods, construction of resilient infrastructure, and provision of relevant services.

The ocean and climate change agenda for the implementation of ocean-based climate action to build coastal adaptation and resilience was highlighted in the 27th Conference of the Parties (COP27) and taken as an urgent action priority.

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[83] United Nations Environment Programme (UNEP), 2022, *Emissions Gap Report: The Closing Window – Climate Crisis Calls for Rapid Transformation of Societies*, Nairobi, https://www.unep.org/resources/emissions-gap-report-2022#:~:text=Climate%20crisis%20calls%20for%20rapid%20transformation%20of%20societies,-The%20window%20is&text=The%20Emissions%20Gap%20Report%202022,collective%2C%20multilateral%20action%20is%20now.

[84] United Nations Environnent Programme, n.d., "National Adaptation Plans," webpage, https://www.unep.org/explore-topics/climate-action/what-we-do/climate-adaptation/national-adaptation-plans.

Figure 6: Illustrations of Response to Loss and Damage Associated with Adverse Effects of Climate Change from COP27

Source: International Institute for Sustainable Development, n.d., "Oceans for Climate: Implementing Ocean-Based Climate Action to Build Coastal Adaptation and Resilience," *Earth Negotiations Bulletin*, November 16, https://enb.iisd.org/ocean-action-day-cop27.

The COP27 presidency launched the Adaptation Agenda to build climate resilience for 4 billion by 2030. The agenda will accelerate transformative actions by economies, regions, cities, businesses, investors and civil society to adapt to the acute climate hazards facing vulnerable communities.

United Nations Decade of Ecosystem Restoration

The UN Decade on Ecosystems Restoration is another global approach that focuses on preventing, halting and reversing the loss of nature. This framework is guided by principles for ecosystem restoration to guide the United Nations from 2021 through 2030.[85]

Related to the above is the UN-led program of work (coordinated by UNESCO's Intergovernmental Oceanographic Commission) to be delivered under the Decade of Ocean Science for Sustainable Development ("The Ocean Decade").[86] Several programs or flagship "Decade Actions" have been developed under this framework to facilitate transformative ocean science solutions to address challenges faced by people and ecosystems. These have been designed as collaborative global partnerships between ocean scientists, governments, and relevant industries. Of note are the Mega Delta Program to build up a comprehensive picture of the impacts of climate change on delta ecosystems (mainly salt marshes and mangrove forests) to inform human development and conservation strategies; the Global Estuaries Monitoring Program which is a collaborative effort involving policy makers, pharmaceutical industries, and scientists across the world focusing on analyzing estuary data for contaminants to increase the awareness of polluting industries; and the Ocean Cities Network Program which aims on developing a network of communities along coastlines by fostering unique partnerships between city councils, harbor authorities, and research institutions to manage the impacts on oceans.

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[85] The UN Decade focuses on ten principles. Available online. https://www.decadeonrestoration.org/.
[86] UNESCO, n.d., "The UN Decade for Ocean Science for Sustainable Development (2021–2030)," online article, https://en.unesco.org/ocean-decade; and UNESCO, n.d., "The Ocean Decade," website, https://oceandecade.org.

The Sendai Framework for Disaster Risk Reduction (2015–2030)

The Sendai Framework is a key agreement that guides economies' efforts to protect development gains from the risks of disasters. It complements the policy agenda driven by the Paris Agreement on Climate Change, the Addis-Ababa Action on Financing for Development, and the New Urban Agenda. Endorsed by the UN General Assembly following the third UN World Conference on Disaster Risk Reduction (WCDRR), it advocates for "the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries".[87]

[87] The quote is from the United Nations Office for Disaster Risk Reduction, 2015, "Sendai Framework for Disaster Risk Reduction 2015–2030," https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030.

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