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REGIONAL ANALYSIS OF THE NATIONALLY DETERMINED CONTRIBUTIONS OF COUNTRIES IN THE PACIFIC

Gaps and opportunities in the agriculture
and land use sectors

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Krystal Crumpler, Srijita Dasgupta, Sandro Federici, Alexandre Meybeck, Mario Bloise, Valentyna Slivinska,
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FOREWORD

The Paris Agreement is a landmark achievement signaling a truly international response to the drivers and risks of climate change. The (Intended) Nationally Determined Contributions (NDCs) put forward by developed and developing countries alike in support of the Agreement provide the beginnings of a pathway toward a low-emission and climate-resilient future. They represent a commitment to act at the national level to mitigate emissions and adapt to changes in climate, report on progress made, and identify support where it is needed. The cumulative effect of these contributions is still far short of what is required to achieve the ultimate goal of keeping the increase in average global temperatures to within 2°C. However, through the Agreement's unique ambition mechanism, the NDCs will be enhanced overtime to put the goal within reach. In this context, efforts to take stock of the NDCs and analyze their nature and magnitude are important and necessary.

It is with this in mind that FAO is developing a series of regional-level analyses of the NDCs to assess the current commitments and identify gaps and opportunities in the agriculture sectors for enhancing mitigation and adaptation ambitions ahead of the next round of revisions of the NDCs in 2020.

The regional analysis provided in this report captures the strong commitment of the countries in the region to climate action under the Paris Agreement and the significant risks that climate change poses for agriculture and food security in the Pacific. The NDCs highlight that risks from drought, flood, water stress and coastal erosion are of paramount concern to the countries of the Pacific. Agro-ecosystems supporting the production of crops marine fisheries, and forestry production in the region are particularly vulnerable to the impacts of climate change.

Given this situation, measures to adapt to climate change and reduce or avoid climate-related impacts on agriculture and agro-ecosystems such as mangrove conservation and planting, marine fisheries management and afforestation/reforestation feature prominently in the NDCs from Pacific countries. But, despite accounting for only 0.04 percent of global net GHG emissions, a majority of countries in the region have also prioritized mitigation actions for the agriculture and land-use sectors in the NDCs. The NDCs from the region point to numerous technologies and approaches that could be employed to reduce the risks associated with the changing climate and reduce emissions sustainably. A number of NDCs have indicated that working to identify actions that will deliver benefits both in terms of adaptation and mitigation will be an important way to scale up climate action. Gaps in knowledge and the varied capacities of sector stakeholders at various levels is hindering their dissemination and adoption at a wide scale. The analysis also suggests that more can be done to better quantify the NDC contributions from the region and associated needs for technical and financial support.

The findings of this report will help member countries to reflect on their progress in advancing toward NDC priorities for agriculture and associated national climate goals including related targets under the Sustainable Development Goals (SDGs). The analysis also helps to make clear the links between the NDCs from the region and the ongoing work of the United Nations Framework Convention on Climate Change in support of the Koronivia Joint Work on Agriculture (KJWA).

The report also serves as a guide to FAO, as well as other international actors, of the support that will be required to help countries in the region move forward to implement agriculture sector priorities in their NDCs and ensure that future commitments from the agriculture sector are quantifiable, verifiable and sufficiently ambitious.

Eriko Hibi

Sub-Regional Representative
Office for the Pacific Islands



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ACRONYMS AND ABBREVIATIONS

AFOLU	Agriculture, Forestry and Other Land Use
BAU	Business-as-usual
BUR	Biennial Update Report
COP	Conference of the Parties
DRR/M	Disaster Risk Reduction and Management
EEZ	Exclusive Economic Zones
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GHG	Greenhouse Gas
(I)NDC	(Intended) Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
LULUCF	Land Use, Land Use Change and Forestry
M&E	Monitoring and Evaluation
MRV	Measurement, reporting and verification
NAPA	National Adaptation Programme of Action
NC	National Communication
NDC	Nationally Determined Contributions
NGHGI	National Greenhouse Gas Inventory
PNG	Papua New Guinea
SFDRR	Sendai Framework for Disaster Risk Reduction
SDG	Sustainable development goal
SFM	Sustainable forest management
SIDS	Small Island Developing States
TNA	Technical Needs Assessments
UN	United Nations

UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
2030 Agenda	2030 Agenda for Sustainable Development

CHEMICAL FORMULAE

CO₂	Carbon Dioxide
Mt CO₂ eq	Million tons of Carbon dioxide equivalent

EXECUTIVE SUMMARY

1.1 MITIGATION IN AGRICULTURE AND LAND USE SECTORS: GAPS AND OPPORTUNITIES

While the Pacific region contributes in general less than 0.04 percent to global GHG net emissions,¹ and are disproportionately impacted by climate change and variability, all countries are committed to mitigation in their NDCs. All countries in the Pacific, with the exception of three,² representing 99.8 percent of economy-wide net emissions in the region, set a general GHG target. Without implementation of the NDCs, total net emissions in 2030 are expected to increase by around 150 percent compared to those reported in 2015, rising from around 9 Mt CO₂ eq. in 2015 to 22.2 Mt CO₂ eq. in 2030.

Under the mitigation scenario, total net emissions in the region are expected to fall by around one-third compared to those projected in the 2030 counterfactual scenario, or from 22.2 Mt CO₂ eq. to 14.9 Mt CO₂ eq. in 2030, of which 95 percent is conditional to international support.

The Agriculture, Forestry and Other Land Use (AFOLU) sector constitutes three-fourths of total emissions in the Pacific, primarily from managed soils and deforestation.

Around 60 percent of countries in the region include mitigation in the agriculture and LULUCF sectors, respectively. Taken together, around 40 percent include mitigation in both sectors, and around 80 percent include either one or the other. Sectoral mitigation contributions are primarily expressed as policies or measures in the case of agriculture, as well as a GHG target³ in the case of the LULUCF sector.

At the sub-sectoral level, mitigation on forest land is promoted most frequently (64 percent of countries), followed by bioenergy production from agriculture (43 percent), livestock (29 percent), cropland (14 percent), integrated systems (14 percent), amongst others.

When emissions from the agriculture and LULUCF sector are combined, the largest GHG hotspots in the region are emissions from managed soils (57 percent of total AFOLU emissions), followed by biomass burning on grassland and manure management (14 and 13 percent, respectively), all mostly generated in Papua New Guinea.

At the regional level, very high mitigation policy coverage gaps are observed around emissions from managed soils, biomass burning on grassland,⁴ manure management, and enteric fermentation.

Storms, droughts, floods and invasion by pests and non-native species are amongst the most frequently observed and/or projected climate-related hazards reported in the region. Climate-related salt-water intrusion, water stress and soil erosion constitute the most frequently reported slow onset events in terrestrial and freshwater ecosystems, while sea level rise, sea surface temperature rise, coastal erosion and ocean acidification are reported most frequently in marine and coastal ecosystems.

Out of all ecosystem types, agro-ecosystems are the most often mentioned as vulnerable to climate-related impacts (100 percent of countries), primarily in the marine fisheries and crops sub-sectors (79 and 64 percent, respectively), followed by ocean and coastal zone ecosystems (77 percent).

¹ Refers to 2012 data (WB-Open Data, undated).

² Nauru, Samoa and Tonga.

³ Papua New Guinea (NC).

⁴ Only relevant for Papua New Guinea.

Genetic resources and land and soil resources are reported most frequently amongst natural resource-related impacts (93 and 86 percent of countries, respectively) across all ecosystems.

Loss of primary production and productivity, primarily in the marine fisheries and crops sub-sectors are most frequently reported amongst ecosystem service impacts (93 percent), followed by changes in water availability and quality across all ecosystems and coastal erosion (79 percent, respectively), as well as biodiversity loss, primarily in ocean and coastal zone ecosystems (57 percent).

Adverse health, loss of productive infrastructure and assets, and food insecurity and malnutrition constitute the most frequently reported climate-related risks in social systems (93, 71 and 71 percent each), exacerbated by the underlying economic dependence on agriculture and natural resources reported as a non-climatic driver of vulnerability (79 percent) and challenging geography and topography (93 percent).

Forty percent of countries make reference to loss and damage from climate-related extremes and events.

1.2 ADAPTATION IN ECOSYSTEMS: GAPS AND OPPORTUNITIES

All countries in the Pacific communicated an adaptation component,⁵ all of which include the agriculture and land use sectors.

Adaptation in ocean and coastal zones is promoted by almost all countries in the region (93 percent of countries), with a focus on mangrove conservation and replanting (57 percent of countries with adaptation in ecosystems).

Eighty-six percent of countries with an adaptation component identify at least one adaptation measure in agro-ecosystems, primarily in the marine fisheries and aquaculture sub-sector (71 percent of countries with adaptation measures in ecosystems, respectively), followed by crops and agriculture in general (64 percent, respectively), forestry (57 percent), livestock (50 percent), freshwater aquaculture (14 percent) and integrated systems (7 percent).

Eighty-six percent of countries identify water resource use and management amongst adaptation options, primarily water storage and harvesting. Seventy-one percent of countries identify ecosystem and genetic resource use and management amongst adaptation options, of which the majority promote pests and diseases management. And 57 percent of countries with an adaptation component identify land resource use and management amongst adaptation options, primarily coastal zone management.

At the regional level, high to very high adaptation policy coverage gaps⁶ are found in relation to climate-related losses in biological control services, losses in ecosystem services moderating extreme events, soil erosion and reduced genetic diversity and abundance. Moderate gaps are also observed in relation to climate-related losses in crops and fisheries provision, reduced nutrient cycling and soil formation, degraded land and soil resources and increased invasion of pests and non-native species in agriculture.

⁵ This includes when a country makes reference to key adaptation plans in their NDC.

⁶ Policy gaps representing less than a 10 percent share of countries are excluded from the regional analysis.

1.3 ADAPTATION IN SOCIAL SYSTEMS: GAPS AND OPPORTUNITIES

Ninety-three percent of countries with adaptation promote measures related to institutions and governance. The majority of those countries promote policy mainstreaming and coherence (71 percent of countries with adaptation measures in social systems), followed by DRR/M (57 percent), participatory governance and inclusion (36 percent) and law and regulation reform (36 percent), and institutional capacity building for climate action (29 percent), amongst others.

Ninety-three percent of countries with adaptation identify measures related to socio-economics and well-being. The majority of those countries promote health information and services (71 percent of countries with adaptation measures in social systems), followed by resilient infrastructure (50 percent), social protection (29 percent), food security and nutrition, safe and responsible migration (21 percent) and resilience and adaptive capacity building (21 percent) and credit and insurance services and farmer cooperatives and services (14 percent, respectively), amongst others.

Eighty-six percent of countries with adaptation identify measures related to knowledge and capacity. The majority of those countries promote hazard and vulnerability mapping (57 percent of countries with adaptation measures in social systems), followed by awareness raising and education (50 percent) and early warning systems and climate information services (50 percent), research and development (R&D) (36 percent) and traditional knowledge (36 percent), extension services for climate action (29 percent) and early warning systems (29 percent), amongst others.

At the regional level, moderate to high adaptation policy coverage gaps⁷ are found around climate-related migration and displacement, gender and youth inequality, limited knowledge and capacity and loss of productive infrastructure and assets.

1.4 SYNERGIES AND CO-BENEFITS

Overall, around 40 percent of countries in the Pacific recognize synergies and/or co-benefits between mitigation and adaptation in the agriculture and land use sectors within their NDCs. Adaptation in forestry, as well as in ocean and coastal zones and forestry, represent the main areas where mitigation co-benefits are reported, while mitigation in forests represent the main areas where adaptation and/or sustainable development co-benefits are most frequently referenced.

Alignment between the climate and sustainable development agenda presents a unique opportunity for countries to co-deliver. After SDG 13 “Climate Action,” the greatest area of convergence between NDCs in the agriculture and land use sectors and the SDGs, are found around SDG targets 2.3 “Assure agricultural productivity for marginalized”, 1.5 “Resilience of poor to climate events”, 15.1 “Conserve and restore inland ecosystems”, 12.2 “Efficient use of natural resources”, 14.7 “Increase economic benefits of SIDS from fisheries and tourism”; and 6.3 “Improve water quality and reduce pollution”.

⁷ Policy gaps representing less than a 10 percent share of countries are excluded from the regional analysis.

All countries in the region promote climate change adaptation measures that also contribute to the Sendai Framework for Disaster Risk Reduction, with the greatest areas of convergence found around priority for action I “Understanding disaster risk” and II “Strengthening disaster risk governance to manage disaster risk” (64 percent of countries each). However, more can be done to invest disaster risk reduction and management (priority III) and enhance disaster preparedness and “build back better” (priority IV) in the agriculture and land use sectors.

1.5 BARRIERS TO CLIMATE ACTION AND SUPPORT NEEDS

Technical, economic and institutional barriers are cited most frequently amongst factors impeding the implementation of sectoral climate action in the region (85, 77 and 69 percent of countries with barriers reported, respectively), followed by legal and regulatory (46 percent) and informational (31 percent) barriers.

Climate action in the agriculture and land use sectors will require rapid mobilization of financial resources, enhanced capacities and the transfer of technology in the region. All countries in the region reference capacity-building, financial and technology transfer support needs. Eighty six percent of countries communicate that NDC implementation is partly conditional to international financial support, while two⁸ make their NDC totally conditional to it.

1.6 CONCLUSION

By highlighting the gaps in the coverage of mitigation and adaptation in the agriculture and land use sectors, as well as illustrating opportunities for enhancing climate action ambitions in the next round of NDCs, this analysis can serve as an important roadmap for informing programming and directing future investments in support of low-emission and climate-resilient agriculture and food systems in the region.

⁸ Samoa and Vanuatu.

INTRODUCTION

BACKGROUND

The Paris Agreement constitutes a landmark achievement in the international response to climate change, as developed and developing countries alike committed to do their part in the transition to a low-emission and climate-resilient future. The Agreement seeks to limit global warming to below a 2°C rise above pre-industrial levels and pursue efforts to stay within 1.5°C, as well as sets a global goal on adaptation within the context of sustainable development. Underpinning the Agreement are the (Intended) Nationally Determined Contributions, (I)NDCs,⁹ representing the main national policy framework, under the United Nations Framework Convention on Climate Change (UNFCCC), by which Parties communicate their commitment to reducing national greenhouse gas emissions (GHG) and adapting to the impacts of climate change, based on national priorities, circumstances and capabilities, and support needs.

The success of the Paris Agreement rests upon the enhanced ambition of Parties to progressively revise and strengthen their respective mitigation and adaptation plans over time.¹⁰ At the twenty-second Conference of Parties (COP) of UNFCCC, a facilitative dialogue¹¹ was convened to assess collective efforts made towards achieving the long-term goal of the Agreement, with the view of enhancing pre-2020 ambitions and the provision of means of implementation. In 2023, and every five years thereafter, Parties shall periodically take stock of the implementation of the Agreement to assess the collective progress towards achieving its purpose and long-term goals.¹² The outcome of the global stocktake shall inform Parties in updating and enhancing, in a nationally determined manner, their actions and support in accordance with the relevant provisions of this Agreement, as well as in enhancing international cooperation for climate action.

The tracking of NDC implementation will take place under the Enhanced Transparency Framework,¹³ which provides a foundation for building mutual trust and confidence. The “Paris Rulebook” requires Parties to report reliable, transparent and comprehensive information on GHG emissions, climate actions and support, with built-in flexibility for developing countries under the principle of common but differentiated responsibilities and respective capabilities.¹⁴

Linked to the Paris Agreement and NDCs are the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda, which sets out a vision for a hunger-free, more equitable, sustainable, peaceful and resilient world in 2030. Closing the emissions gap while safeguarding food security and pulling millions out of extreme poverty can only be achieved in a context of sustainable development, and sustainable development can only be achieved if coupled with a low-emissions and climate-resilient future.

The agriculture and land use sectors¹⁵ feature prominently in the NDCs, with up to 86 and 97 percent of developing countries prioritizing mitigation and adaptation, respectively, in the sectors (FAO, forthcoming). As such, FAO has a critical role to play in supporting Member Countries to leverage the mitigation and adaptation potential in the agriculture and land use sectors and harness their synergies, while “leaving no one behind.”

⁹ For the purpose of this document, the (I)NDCs and NDCs are collectively referred to as NDCs.

¹⁰ Article 4.2 of the Paris Agreement.

¹¹ Talanoa dialogue decision 1/CP.22, paragraph 16 (COP22, Fiji).

¹² Article 14 of the Paris Agreement.

¹³ Article 13 of the Paris Agreement.

¹⁴ Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement (FCCC/CP/2018/L.23).

¹⁵ For the purpose of this document, the ‘agriculture and land use sectors’ comprise crops, livestock, fisheries and aquaculture, and forestry.

OBJECTIVE

FAO recognizes that its goals to eliminate hunger, food insecurity and malnutrition, reduce rural poverty, and make agriculture, forestry and fisheries more productive and sustainable cannot be fulfilled without decisive action on climate change (FAO, 2013). Building on its longstanding leadership as a provider of technical knowledge and expertise on sustainable food and agriculture, FAO is committed to supporting member countries prepare for and respond to the adverse impacts of climate change. FAO's Climate Change Strategy outlines its commitment to enhancing countries' institutional and technical capacity to plan and implement NDCs; to improving the integration of food security, agriculture, forestry and fisheries within the international climate agenda; and to strengthening the coordination and delivery of FAO's work (FAO, 2017a).

The NDCs present a natural framework for FAO's work on climate change, as they already define, at the highest political level, targets and strategies for responding to the consequences and addressing the causes of climate change. At COP 22, FAO launched an extensive global analysis of the NDCs, evidencing the significant role of the agriculture and Land Use, Land Use Change and Forestry (LULUCF) sectors¹⁶ in the NDCs (FAO, 2016a). In 2016, FAO assessed the main challenges countries face when moving from NDC planning to implementation and identified five priority areas for international support in the agriculture and land use sectors (FAO, 2016b). From 2017, FAO has launched a series of regional-level analyses aiming to provide a more in-depth review of national climate priorities, capacities and constraints in the agriculture and land use sectors, including Eastern Africa (FAO, 2017b); Central Asia and Eastern and Southern Europe (FAO, 2019a); Latin America (FAO, 2020a); Caribbean (FAO, 2020b); and Asia (FAO, 2020c).

The main objective of this report is to provide a synthesis of the climate change mitigation and adaptation priorities in the agriculture and land use sectors set forth in the NDCs of countries in the Pacific and to identify opportunities for governments to strengthen their sectoral mitigation and adaptation ambitions, capture synergies and accelerate progress on the sustainable development agenda. Furthermore, a better understanding of national climate priorities, challenges and needs in the agriculture and land use sectors can facilitate access to climate finance and inform country programming and support options in the region. This analysis is directed at national policy makers and practitioners in the region with a stake in ensuring that future mitigation and adaptation policies are clear, quantifiable, comparable, transparent and ambitious. It also aims to guide FAO, and other international development organizations, committed to providing the country support required for scaling up climate action in the agriculture and land use sectors and co-delivering on the 2030 Agenda for Sustainable Development and Sendai Framework for Disaster Risk Reduction.

The NDCs are the product of diverse national approaches and processes. They vary greatly in terms of format, scale and detail, resulting from differing perspectives, degrees of technical and institutional capacity, biophysical and economic opportunity and political will. For instance, not all countries integrate an adaptation component into their NDC. As a result, any comparison amongst these documents has to be taken with caution. To facilitate the synthesis and analysis of the NDCs in the agriculture and land use sectors, in light of these methodological challenges, FAO developed a common framework and methodology (FAO, 2019b).

¹⁶ For the purposes of this document, the Agriculture and LULUCF sectors, as defined by Intergovernmental Panel on Climate Change (IPCC), are also collectively referred to as the "agriculture and land use sectors."

The report is divided into six chapters:

Chapter 1 describes the geographical scope, data sources and methodological approach underlying the analysis.

Chapter 2 provides an overview of the regional trends driving emission trajectories, climate vulnerabilities, adaptive capacities and food security and nutrition outcomes in the region.

Chapter 3 presents a common framework for the synthesis and analysis of the NDCs in the agriculture and land use sectors. It reflects the heterogeneous nature of country commitments and illustrates regional trends. It analyzes the scope, specificity, measurability and timeline of the mitigation and adaptation contributions in the agriculture and land use sectors. The data informs the gap and opportunity analysis in Chapter 4.

Chapter 4 describes the results of the gap and opportunity analysis of the mitigation and adaptation contributions in the agriculture and land use sectors to support the NDC revision process and ambition-building mechanism of the Paris Agreement.

Chapter 5 assesses the opportunities for capturing adaptation and mitigation co-benefits, as well as leveraging synergies between climate actions in the agriculture and land use sectors and the 2030 Agenda for Sustainable Development and Sendai Framework for Disaster Risk Reduction. It also highlights the links between the NDCs and the Koronivia Joint Work on Agriculture.¹⁷

Chapter 6 presents key messages and policy recommendations.

¹⁷ Decision 4/CP.23 requests the Subsidiary Body for Scientific and Technological Advice and Subsidiary Body for Implementation to jointly address issues related to agriculture.

CHAPTER 1

METHODOLOGY

1.1 GEOGRAPHIC SCOPE

For this analysis, the Pacific refers to the 14 independent countries, in three geographic areas in Oceania: Melanesia (Fiji, Papua New Guinea, Solomon Islands and Vanuatu), Micronesia (Kiribati, Marshall Islands, Micronesia (Federated States of), Nauru, Palau) and Polynesia (Cook Islands, Niue, Samoa, Tonga and Tuvalu) (UNSD, undated). All 14 countries are Small Island Developing States (SIDS) and four (Solomon Islands, Vanuatu, Kiribati and Tuvalu) are Least Developed Countries (LDC). The assignment of countries or areas to specific groupings is for statistical convenience and does not imply any assumption regarding political or other affiliation of countries or territories by the UN.

1.2 DATA

This analysis is based on the information reported in the latest NDCs, National Communications and Technical Needs Assessments of 14 non-Annex I Parties submitted to the UNFCCC as of 1 July 2019. **Annex 1** contains a list of all the documents analysed.

1.3 COMMON FRAMEWORK

A common framework was developed to facilitate the synthesis and analysis of the NDCs in the agriculture and land use sectors. The framework provides a structure for assessing the clarity, measurability, transparency and ambition of NDCs over time. Each NDC is analyzed within the bounds of this common framework. The common framework was based on a stocktaking of the NDCs to quantify and qualify the types of climate change mitigation and adaptation contributions in the agriculture and land use sectors by means of a common set of categories and sub-categories. The full methodological notes are contained in a separate publication (FAO, 2019b).

CHAPTER 2

REGIONAL CIRCUMSTANCES

Understanding the cultural, environmental, economic and socio-economic variables driving GHG emissions and climate-related vulnerabilities in the region is critical for identifying context-specific mitigation and adaptation options that simultaneously support – rather than limit – food security and nutrition and sustainable development objectives. Indeed, most countries refer to their specific national circumstances when outlining why their NDCs are fair and ambitious.

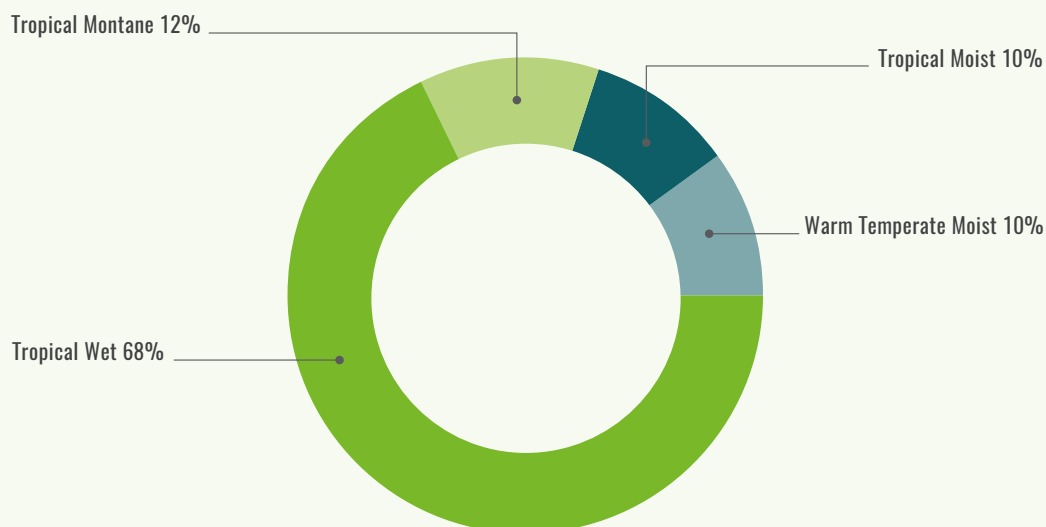
This section provides an overview of the regional trends driving and conditioning climate vulnerabilities, adaptive capacities and food security and nutrition outcomes in the region. The Pacific region comprises a large group of SIDS, with a broad spectrum of variation in terms of topography, socio-economic conditions, cultural identities and availability of natural resources.

2.1 CLIMATE AND NATURAL RESOURCES

In general, the Pacific islands vary slightly in terms of climate, and are characterized predominantly as tropical wet (68 percent of total area). The remaining areas are equally differentiated in terms of tropical moist, warm temperate moist and tropical montane climates (JRC, 2010). **Figure 1** illustrates the major climate zones in the region by share of total area.

FIGURE 1.

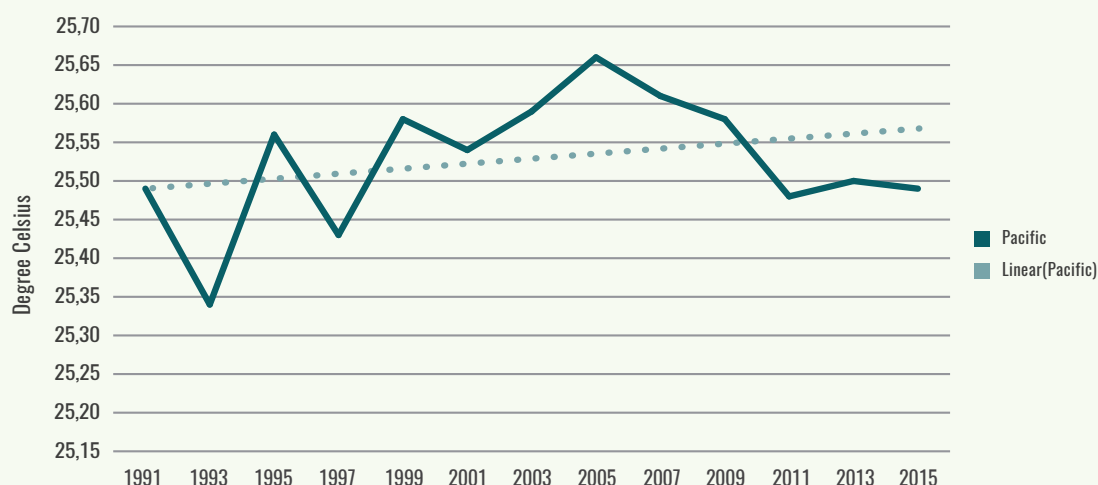
MAJOR CLIMATE ZONES IN THE PACIFIC (SHARE OF TOTAL AREA)



Owing to its location in the tropics and the subtropics, variability in temperature is considerably less. The highest average temperature is about 28°C in Polynesia while the lowest is usually around 23°C in the Melanesian sub-region. However, between 1991 and 2005, an increase in the average annual mean temperature has been observed, with fluctuations from year to year (WB-Open Data, undated). **Figure 2** illustrates the incremental increase in average annual temperature over the 25 years period. The region receives between 2 500 and 3 000 mm of rainfall in depth per year (FAO, undated).

FIGURE 2.

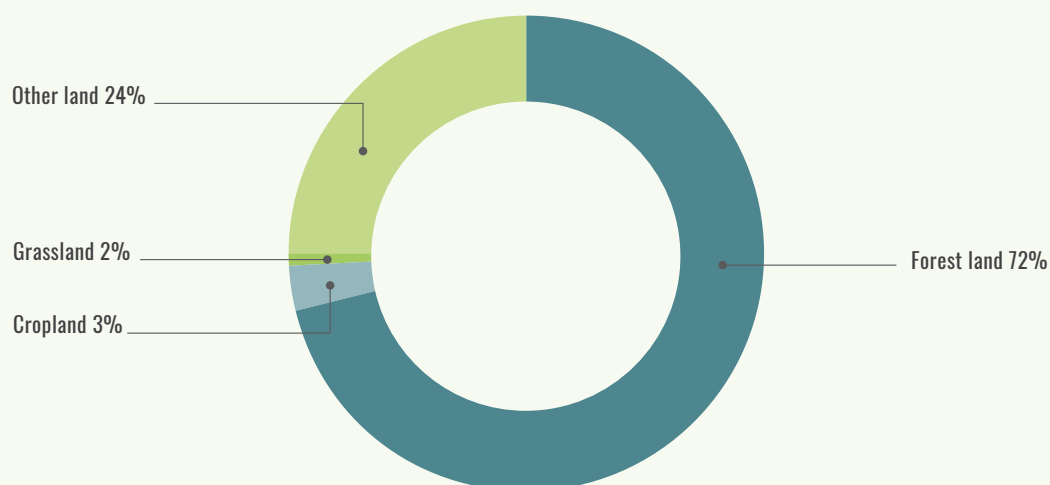
AVERAGE ANNUAL TEMPERATURE IN THE PACIFIC, 1991-2015



Comprising hundreds of small islands, the Pacific represents less than 0.5 percent of the world's surface, and the sub-region of Melanesia occupies about 99 percent of that. Over 70 percent of land area is covered by forests, followed by very small shares of cropland and grassland (3 and 1 percent, respectively). Arable land per capita averages only 0.11 ha in the region (FAOSTAT, undated). **Figure 3** illustrates the distribution of land cover by share of total area, by type.

FIGURE 3.

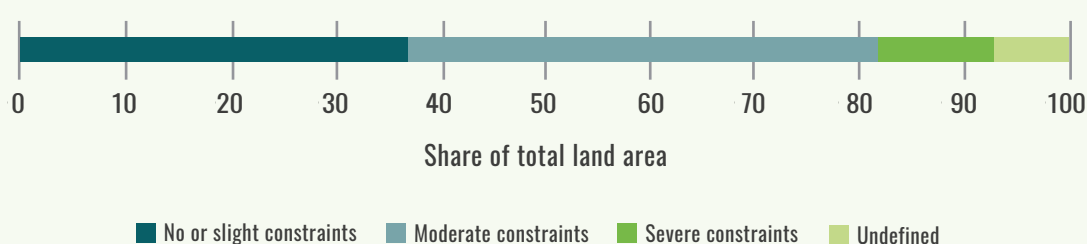
LAND COVER IN THE PACIFIC (SHARE OF TOTAL AREA)



Over half of total land area in the region is associated with moderate or severe soil constraints (45 and 11 percent, respectively), **or not suitable for crop production**. On the other hand, around 36 percent of soil with slight or no constraints are observed. Countries located in the Melanesia sub-region are endowed with a strong natural resources base and high soil fertility, while Polynesian countries have moderate soil fertility. Soil fertility has been found to be the lowest among the Micronesian countries (FAO, undated). At the country level, suitability of land for agriculture is still however limited for the Pacific. **Figure 4** demonstrates the share of land with soil constraints, measured by soil depth and quality, by type of constraint.

FIGURE 4.

SOIL CONSTRAINTS IN THE PACIFIC



Precipitation is abundant across the different island states in the Pacific region but data to allow us to quantify the distribution is still limited. There are also considerable differences in abundance and patterns of precipitation levels among islands. Observable differences exist in precipitation patterns during the wet and the dry seasons mostly attributed to changes and shifts in the South Pacific Convergence Zone, the Intertropical Convergence Zone and the West Pacific Monsoon. In the face of the changing climate (higher temperature), it is expected that precipitation levels are likely to increase during the wet season, leading to incidences of unprecedented floods and other extreme weather events (CSIRO, Australian Bureau of Meteorology and SPREP, 2015).

The availability of total annual renewable water resources also differs across countries. Water resources are inequally distributed between islands and cannot be shared because of distance. In the Fiji Islands, for example, the total annual renewable water resources (including both groundwater and surface

water) is estimated to be about 28 550 m³ while in Samoa the figure stands at 44 700 m³. The data on total annual renewable water resources per capita is available only for Melanesia sub-region and the averaged value equals to 62 881 m³ in 2015 (FAO, undated). Six island countries – Nauru, Niue, Kiribati, Tonga, Tuvalu and the Republic of the Marshall islands – have no significant surface water resources and of these, only Tonga and Niue have significant groundwater resources (UNEP, 2012). The use of water for agriculture represents a small share of total water withdrawal (<1 percent of total withdrawal) (FAO, undated).

2.2 FARMING SYSTEMS

Based on agro-ecological geo-spatial information combined with socio-economic data, four major farming systems were identified in the region. A farming systems approach provides a way to aggregate farm households that have a similar resource base and livelihood pattern, and comparable constraints and opportunities for mitigating climate change and enhancing resilience (FAO and WB, 2001). In general, much of the region is covered by sparse forest systems (56 percent of total land area), root-tuber based systems (39 percent), highland extensive mixed systems (17 percent) and coastal artisanal fishing (>1 percent). However, the majority of the population (51 percent), as well as the greatest share of cattle (56 percent of total stock), live in root-tuber systems (Oak Ridge National Laboratory, 2019); (FAO, 2014). **Table 1** outlines the share of area and population by farming system in the Pacific, as well as the principal livelihood activities in each.

TABLE 1.

MAJOR FARMING SYSTEMS IN PACIFIC

FARMING SYSTEM	TOTAL AREA (%)	POPULATION (%)	PRINCIPAL PRODUCTIONS
SPARSE FOREST	56%	46%	HUNTING, GATHERING, OFF-FARM WORK
ROOT-TUBER	39%	51%	ROOT CROPS (YAM, TARO, SWEET POTATO), VEGETABLES, FRUITS, LIVESTOCK (PIGS AND CATTLE), OFF-FARM WORK
HIGHLAND EXTENSIVE MIXED	17%	2%	UPLAND RICE (PNG), PULSES, MAIZE, OIL SEEDS, FRUITS, FOREST PRODUCTS, LIVESTOCK, OFF-FARM WORK
COASTAL ARTISANAL FISHING	>1%	>1%	FISHING, ROOT CROPS

Source: FAO and WB, 2001; Oak Ridge National Laboratory, 2010; and FAO, 2014.

2.3 POPULATION AND RURAL ECONOMY

Diversity is a key characteristic of the Pacific island countries. This diversity exists not only in terms of geographical land mass and environmental conditions, but also in terms of their socio-economic conditions, political landscapes and as well, their traditions and cultures.

The total population of the Pacific region is about 11.7 million which is slowly increasing and is expected to reach 13.5 million in 2030, 17.5 million in 2050 and 23.1 million in 2100 (UN DESA, undated). Niue is the only country where growth is negative and together with Nauru, are the smallest Pacific island countries in terms of land mass. PNG, the Fiji Islands and the Solomon Islands alone account for about 90 percent of total population in the Pacific (UNFPA, 2014). Population growth has been found to be the highest among countries in Melanesia and slowest among countries in Polynesia (UN DESA, undated).¹⁸ **Table 2** illustrates the total population and land area per country in the region.

¹⁸ Refers to 2015 data (UN DESA, undated).

TABLE 2.

TOTAL POPULATION AND LAND AREA OF PACIFIC COUNTRIES, 2015

COUNTRIES	TOTAL POPULATION (MILLION)	TOTAL LAND AREA (MILLION HA)
COOK ISLANDS	0.02	0.02
FIJI	0.9	1.8
KIRIBATI	0.1	0.1
MARSHALL ISLANDS	0.1	0.02
MICRONESIA (FEDERATED STATES OF)	0.1	0.1
NAURU	0.01	0.002
NIUE	0.002	0.03
PALAU	0.02	0.05
PAPUA NEW GUINEA	7.9	45.3
SAMOA	0.2	0.3
SOLOMON ISLANDS	0.6	2.8
TONGA	0.1	0.1
TUVALU	0.01	0.003
VANUATU	0.3	1.2

Source: FAOSTAT and UNDESA, 2015.

When considering the dynamics of population growth in the region, migration is an important factor. It is estimated that annually approximately 16,000 people leave the Pacific Islands for better job opportunities, sending back remittances to support their families and contributing towards the GDP as well.¹² Internal migration has been central to urbanization, with some countries in Melanesia and Polynesia having higher percentages of urban population than rural populations. On average, urbanization rate in the region has been estimated to be almost two percent annually (UN DESA, undated).

The Pacific region has seen considerable economic growth though socio-economic development has not been even across the different countries. Overall, annual GDP nationally grew from -0.64 in 2000 to 3.3 percent in 2017, which is slightly higher than the world-wide average (3.14 percent) (UN DESA, undated).¹⁹ Negative GDP growth is observed in Micronesia (-0.1 percent). The level of GDP per capita in the region is lowest in Kiribati (USD 2 109) and highest in Palau (USD 16 305).²⁰

Agriculture plays a significant role in the regional economy, accounting for around 20 percent of gross-domestic product (GDP)²¹ and employment on average (WB-Open Data, undated), (ILO, undated). Countries with a higher population usually engages a larger proportion in the agriculture sector, thereby greatly increasing the potential of this sector (Reddy, 2007). For example, PNG (owing to its large population) has a very productive agriculture sector. Meanwhile, it is also rich with other natural resources like timber, gold and copper. Timber is also an economically important natural resource for the Solomon Islands. Fiji has also diversified its agricultural production by engaging the forestry and fisheries sectors (Solofa, Susumu and Halavatau, undated).

¹⁹ Refers to 2015 data (WB-Open Data, undated).

²⁰ Refers to 2015 data (WB-Open Data, undated).

²¹ Refers to 2015 data (WB-Open Data, undated).

Subsistence farming and production of the major staple crops are still the unique way of life in the rural parts of many of these island states though they can be constrained due to unavailability of land²² and unfavorable soil conditions. Family based small scale farming practices still persist in the region and is an important contributor towards household food security, generating employment opportunities, community development and safeguarding food systems, local traditions and overall landscape and environmental conditions. A typical small holder family has access to less than 2 ha in area on average and cultivates a variety of crops for both household consumption and selling in markets for income purposes (FAO, 2015).

The share of agricultural activities to non-agricultural activities differs between countries and is largely dependent on availability of land and other natural resources (CGPRT Centre, 2001), while export of a narrow range of agricultural commodities, such as palm oil, copra, coconut oil, vanilla, coffee and cocoa, make up a significant share of the GDP (Balakrishnan, undated). Commercial agriculture, thus, sustains the economies of some of the island states in the region, such as the Solomon Islands, where agriculture constitutes 40 percent of total GDP (WB–Open Data, undated). Agricultural value added derives primarily from crop and livestock production with contributions of around 80 and 20 percent respectively to sectoral GDP for Melanesia, and almost 50 percent for Polynesia sub-regions where data is available. Industrial round wood production (1.8 million m³) is around 50 percent greater than that of wood fuel production (1.2 million m³) in Melanesia, and 80 percent smaller in Polynesia (3 and 18 000 m³ respectively) (FAOSTAT, undated). There has, however, not been any discernible trend in increasing the agriculture production in the region and this is mainly attributed to high volatility of prices in the international markets and poor access to markets, as well as the constraints faced from limited natural resources and vulnerabilities faced from harsh and changing weather conditions (FAO, 2008).

Although the Pacific region covers a relatively insignificant area of land mass, it is endowed with access to Exclusive Economic Zones (EEZs) in the Pacific Ocean, representing 30 percent of the earth's surface. This provides access to a wide variety of marine and fishery resources (Solofa, Susumu and Halavatau, undated). Fishing is an important economic activity and 'one of their most important renewable resource' (FAO, 2010), while fish is an important component of the Pacific diet. Fishery resources in the region can be broadly classified into coastal or inshore (e.g. Finfish and invertebrates) and offshore or oceanic (e.g. tunas, billfish and allied species) (FAO, 2018a).

Dependence on coastal fishery resources as means of livelihood, ensuring food and nutrition security, generating income and employment opportunities and as sources of recreation is integral to the life of the Pacific islanders (Solofa, Susumu and Halavatau, undated). Subsistence fishing, representing about 70% of the total fisheries production, is an important contributor to the GDP.²³ Coastal fishing is also practiced at a commercial scale, mainly for export purposes. Fishing for tuna is a crucial offshore fishing activity, both at "small – scale artisanal" and "large scale commercial fisheries". For several countries such as Samoa, Kiribati and Fiji, this generates significant foreign currency reserves (Solofa, Susumu and Halavatau, undated).

Aquacultures is still limited in the Pacific region, though there is a high potential in many of these island states.²⁴ The two main types of aquaculture are open systems and pond culture. Pond culture is practiced at a commercial level (still relatively small contribution) in French Polynesia and Melanesia, but the majority of the set ups are still at a subsistence scale (Solofa, Susumu and Halavatau, undated).

Natural resources (including agricultural resources) in the Pacific region are currently being threatened greatly from overexploitation, degradation of natural ecosystems, competition for resources at both small and large scales, and from the changes in the climatic conditions (Solofa, Susumu and Halavatau, undated).

²² Most Pacific Island nations have customary land tenure rights or a communal system of landownership. This means that is ownership is not clearly defined. For nations that are largely dependent on access to natural resources and primary commodities, this lack of individual ownership that lead to 'free rider' problem leading to governance of resources and uncertainties with further investments (Wilson, 2014); (Chand and Duncan, undated).

²³ Data refers to year 2010–2012 (FAOSTAT, undated).

²⁴ Data refers to year 2010–2012 (FAOSTAT, undated).

2.4 FOOD SECURITY AND NUTRITION

In general, small islands states face three main challenges in achieving food security (UNU-WIDER, 2006), which are:

- ▶ Smallness or small sizes of their land masses, population, economies and available natural resources which increase their dependency on a rather narrow number of products and the inability to expand current production to meet demand;
- ▶ Remoteness or distance from other mainstream markets raising cost uncertainties in supplies of produces and products to consume; and
- ▶ Vulnerability to natural hazards and to the growing impacts of climate change impeding food availability and access due to reduced agricultural productivity and thereby, income.

In 2017, the average supply of dietary energy out of the average dietary energy requirement estimated for the population was above or almost 100 percent for all countries in Melanesia where data was available (FAOSTAT, undated). Pacific diets are generally rich in crops but marine products like local fish also make up a large portion. Fish consumption is one of the highest in the world (34– 37 kg/year) and is an important indicator of both food and economic security. In some countries, consumption of fish is at a level higher than the recommended level of 35 kg per year, but with changes in the availability of fish, this consumption pattern may change in the future. The range of per capita consumption of fish per annum can vary significantly from 13 kg in PNG to 110 kg in Tuvalu (Solofa, Susumu and Halavatau, undated). The average supply of protein from animal origin is 32 percent of total protein supply (FAOSTAT, undated).²⁵

While the rural population is dependent on natural resources for food and nutrition security, urban populations are slowly becoming more inclined towards imported food to meet their daily dietary needs. A review by the ADB (2011), shows that patterns of food consumption have been changing in the region and this has been attributed to a stagnation or even a decline in the agricultural productivity in several countries. The average caloric consumption in the Pacific region has been increasing but nutritional security is at a decline indicating a shift from the traditionally local food to more market based and imported commercial food.

Rapid urbanization, increases in food imports, and a shift away from traditional to modern food systems is having substantial impacts on the food and nutrition security of the Pacific region (ADB, 2011). The health status is declining fast and the region is currently among the highest in the world in terms of rates of obesity, diabetes and micronutrient deficiencies (ADB, 2011).

Available data shows that the prevalence of undernourishment has increased over the past ten years amongst Melanesian countries. Between 2006 and 2017, the share of undernourished people has increased in Fiji (from 4.3 to 4.4 percent), the Solomon Islands (from 11.9 to 12.3 percent) and Vanuatu (from 7.0 to 7.1 percent) However, Kiribati and Samoa have a declining trend (from 4.6 to 3.1 and from 3.5 to 3.1 percent, respectively) (FAOSTAT, undated).

Around 22 percent of children under the age of 5 in the Pacific are stunted and, on average, 5 percent suffer from wasting. While these numbers are decreasing overall, not all countries are making progress at equal rates. For instance, between 2012 and 2017, the prevalence of stunting in the Solomon Islands fell from 33 to 32 percent, while for wasting, it increased from 4 to 8 percent. On the contrary, in Vanuatu, the prevalence of stunting increased from 26 to 29 percent, while for wasting it decreased from 6 to 4 percent (FAOSTAT, undated).

At the same time, half of the adult population above 18 in Micronesia and Polynesia is obese (51 and 49 percent of the population respectively); the population of Melanesia is well above the worldwide average (23 percent) (WHO, 2017). Currently, among countries with the highest rates of obesity, seven can be found in the Pacific region (FAOSTAT, undated). The data on prevalence of overweight in children under the age of five between 2012 and 2017 is only available for Solomon Islands and Vanuatu. They show an increasing 3.9 percent average in the Solomon Islands and a constant value of less than 5 percent in Vanuatu – both below the global average (WHO, 2017).

²⁵ Data refers to year 2010–2012 (FAOSTAT, undated).

Changing intensities and frequencies of weather events like cyclones, hurricanes, droughts, sea level rise and changing precipitation and temperature patterns are likely to bring substantial impacts to the food and nutritional security of countries in the Pacific region, in both direct and indirect ways. Declining agricultural productivity and already limited natural and mineral resources (Hanich *et al.*, 2018) in this already isolated region is likely to be the most significant impact, thereby having implications for future socio-economic development of these countries. Crop yields and livestock productivity will suffer especially in countries likely to face extreme shifts in precipitation and temperature, impacts of which might be further magnified because of projected increased in El Nino and La Nina events (ADB, 2011). The coastal zones are highly susceptible to sea water intrusion and inland inundation.

Changing climatic conditions will also affect fish population. Increasing water temperature and ocean acidification will degrade coral reefs and other habitats. Unsustainable fishing practices, overfishing and exploitation of marine resources will lead to an unforeseen precarious situation. Several information and data exists showing the potential impacts of the changing climate on the fishery and coastal resources and ecosystems but knowledge is still limited when it comes to designing effective and meaningful responses for planning and conservation in order to adapt or mitigate these changes across regional, national and local levels (Hanich *et al.*, 2018).

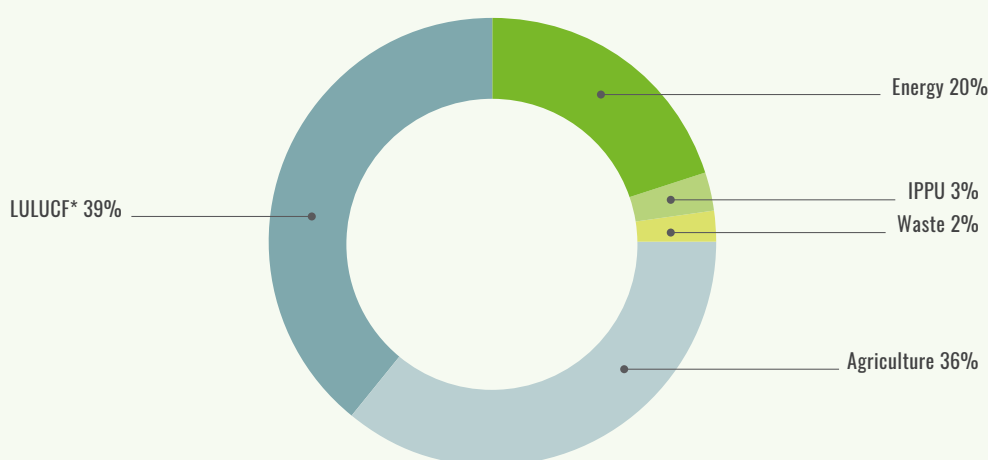
2.5 GREENHOUSE GAS EMISSIONS PROFILE

The Pacific contributes in general less than 0.04 percent to global GHG emissions.²⁶ The NGHGI data from the last available year was collected from national reports submitted to the UNFCCC between 2000 and 2010.²⁷

The Agriculture, Forestry and Other Land Use (AFOLU) sector²⁸ represents the largest share of emissions in the region (75 percent), followed by the Energy sector (20 percent), Industrial Processes and Product Use (IPPU) (3 percent) and Waste (2 percent) sectors. AFOLU emissions are almost equally split amongst agricultural sources (9.6 million tons of carbon dioxide equivalent, Mt CO₂ eq), and Land Use, Land Use Change and Forestry (LULUCF) (10.3 Mt CO₂ eq). If removals are considered, the AFOLU sector represents 59 percent of total net emissions in the region, as LULUCF constitutes a net sink. **Figure 5** illustrates the share of economy-wide GHG emissions in the region by sector.

FIGURE 5.

ECONOMY-WIDE GHG EMISSIONS IN THE PACIFIC (SHARE OF TOTAL BY SECTOR)

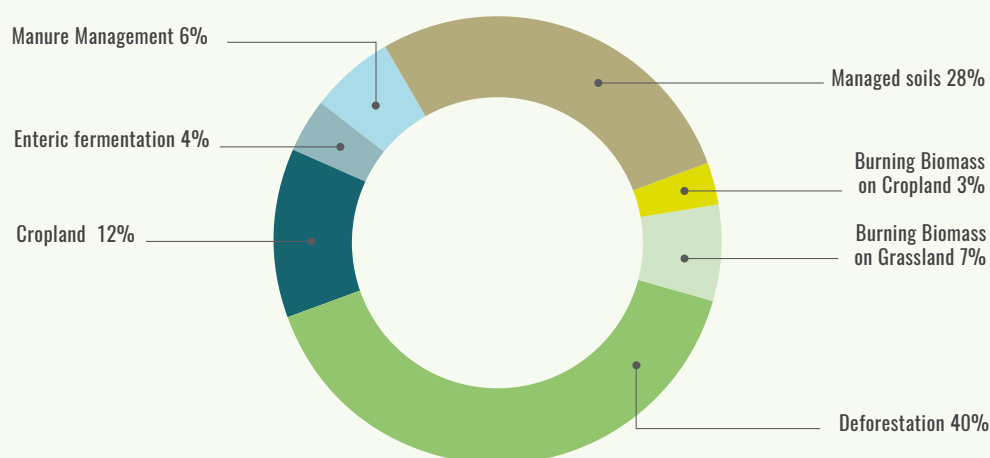


* Excluding removals.

²⁶ Refers to 2012 data (WB-Open Data, undated).

²⁷ Data for all countries sourced from NCs.

²⁸ The AFOLU sector refers to the Agriculture and LULUCF sector as defined by IPCC (2006).

FIGURE 6.**EMISSIONS IN THE AFOLU SECTOR IN THE PACIFIC (SHARE OF TOTAL BY MAJOR CATEGORY)**

* The emission categories and sub-categories with a share less than 1% of the total sum are excluded from the figure.

Within the AFOLU sector,²⁹ the most significant GHG sources are deforestation³⁰ (40 percent of AFOLU emissions, respectively), managed soils³¹ (28 percent) and cropland (12 percent). **Figure 6** illustrates the share of emissions in the AFOLU sector by major category.

Within the agriculture sector, the largest sources of emissions are managed soils (58 percent of agriculture emissions), followed by biomass burning on grassland (15 percent) and manure management (13 percent). **Figure 7** illustrates the emissions in the agriculture sector by major category and country.

The LULUCF sector constitutes a net sink at the regional level, mainly from removals by afforestation³² (52 percent of removals) and forest management³³ (48 percent). Excluding removals, however, emissions from deforestation represent the greatest source of land use emissions (77 percent of emissions), followed by cropland (24 percent). **Figure 8** illustrates the emissions and removals in the LULUCF sector by major (sub-) category and country.

²⁹ The GHG source/sink categories used in this analysis adhere to IPCC (2006) by integrating country data reported using IPCC (1996) into a common GHG profile framework. The methodological notes (FAO, 2019b) illustrate the methodology that links the IPCC (1996) source/sink categories to IPCC (2006) land use categories, carbon pools and non-CO₂ gases.

³⁰ Corresponds to the sum of the 2006 IPCC Guidelines sub-categories "Forest land converted to cropland", "Forest land converted to grassland", "Forest land converted to settlements", "Forest land converted to other land" and the Revised 1996 IPCC Guidelines category "Forest and grassland conversion".

³¹ Corresponds to the IPCC (2006) categories "Direct and indirect N₂O emissions from agricultural", "Liming", "Urea application" and the IPCC (1996) category "Agricultural soils".

³² Corresponds to the 2006 IPCC Guidelines sub-category "Land converted to forest land" and the Revised 1996 IPCC Guidelines category "Abandonment of Managed Lands."

³³ Corresponds to the 2006 IPCC Guidelines sub-category "Forest land remaining forest land" and the Revised 1996 IPCC Guidelines category "Changes in Forest and Other Woody Biomass."

FIGURE 7.

EMISSIONS IN THE AGRICULTURE SECTOR IN THE PACIFIC

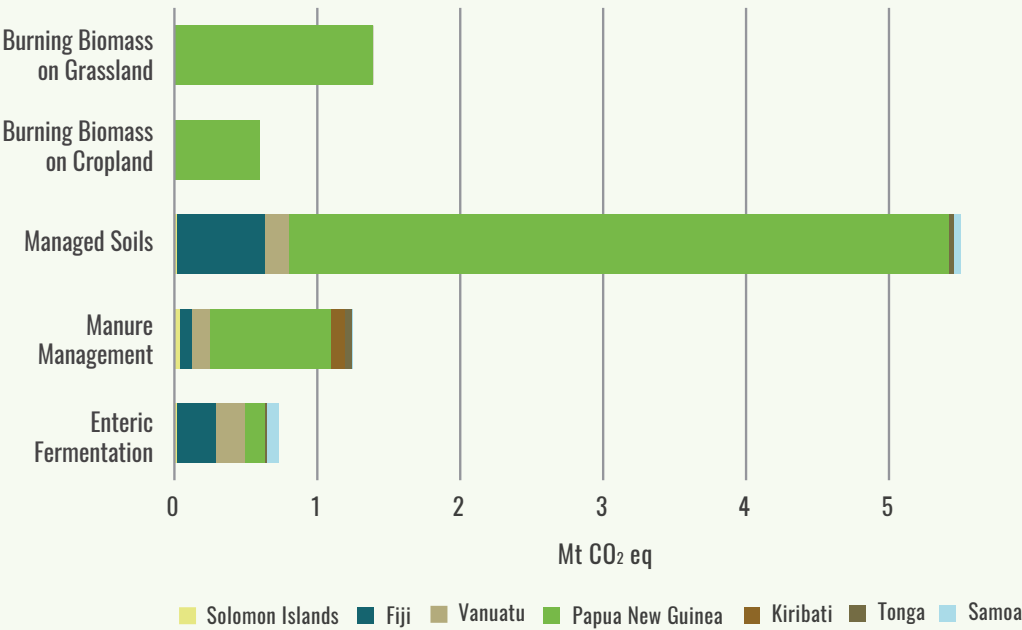
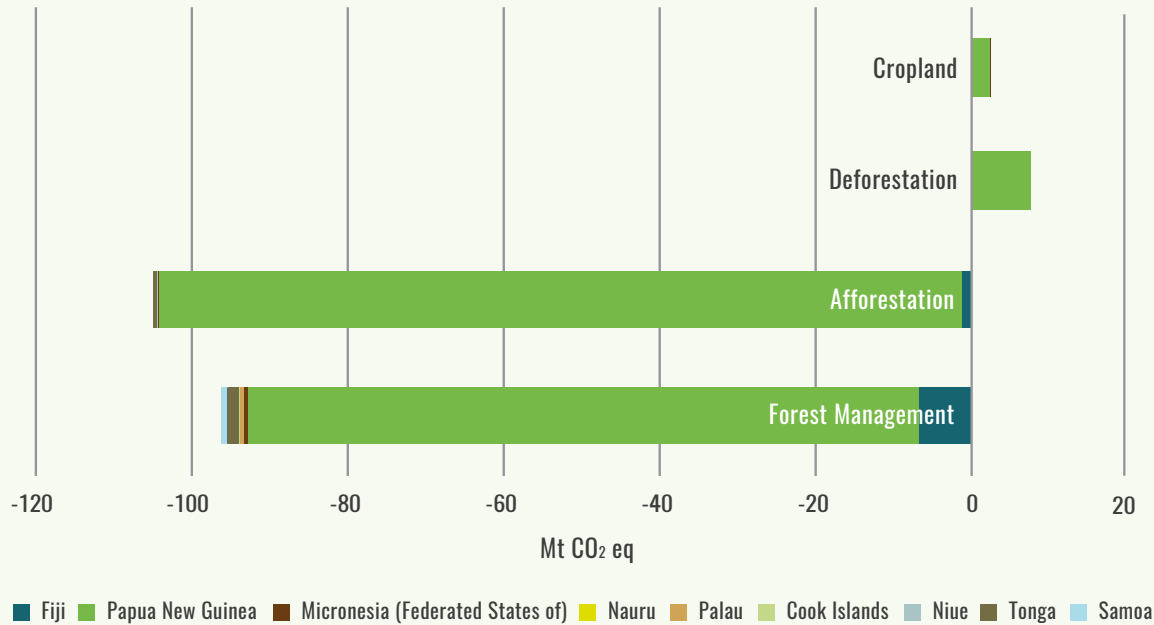


FIGURE 8.

EMISSIONS AND REMOVALS IN THE LULUCF SECTOR IN THE PACIFIC



CHAPTER 3

SYNTHESIS OF MITIGATION AND ADAPTATION CONTRIBUTIONS IN THE AGRICULTURE AND LAND USE SECTORS

This chapter provides a systematic review and synthesis, at the regional level, of the role of the agriculture and land use sectors in the NDCs of 14 countries in the Pacific. It reflects the heterogeneous nature of country commitments and illustrates regional trends. It aims to identify the structural characteristics of the NDCs and to assess the scope, specificity, measurability and timeline of the mitigation contribution in the agriculture and land use sectors and adaptation component related to agriculture, food security and nutrition. The stocktaking exercise can lay the groundwork for an integrated plan-implementation-review cycle at country level. The data informs the gap and opportunity analysis in Chapter 4, which seeks to support countries to enhance their NDCs, as early as 2020, as well as guide the prioritization of international support options.

3.1 MITIGATION CONTRIBUTION

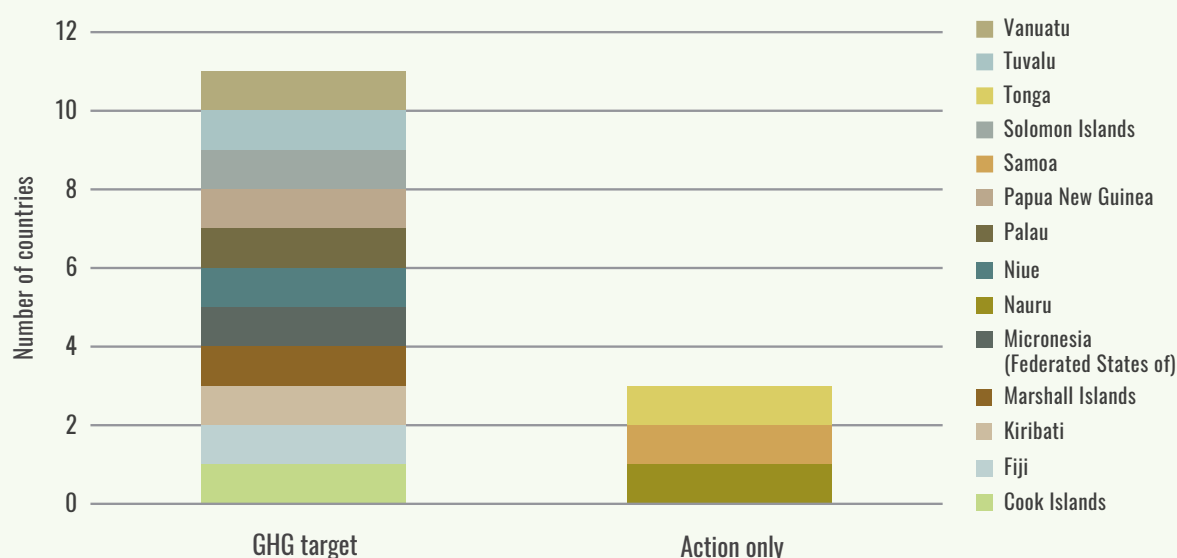
This section synthesizes, at regional level, the mitigation contributions in the agriculture and land use sectors communicated in the NDCs of 14 countries in the Pacific. The data from the NDCs were supplemented with information reported in NCs.

3.1.1 General mitigation contribution

All 14 countries in the Pacific communicated a mitigation contribution in their NDC, of which 11 (71 percent) set a GHG target and three³⁴ (29 percent) qualify their contribution in terms of “Action-only.” Figure 9 illustrates the number of countries with a general mitigation contribution by type.

FIGURE 9.

GENERAL MITIGATION CONTRIBUTIONS EXPRESSED IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE



Half of those mitigation contributions are multi-sectoral in scope, covering emissions from more than one IPCC sector – Energy, Industrial Products and Processing (IPPU), AFOLU and Waste. The other half covers emissions from only one sector, predominantly Energy.

All countries in the region express their GHG target as an absolute reduction of net emissions, of which two-thirds set their target against emissions from a specific base year, and the other one-third in comparison to a projected emissions in a business as usual (BAU) scenario.

The timeline of the contributions varies between 2016 and 2030, with the majority of countries specifying an implementation period between 2020/21 and 2030. Six countries³⁵ set an end date of 2025. Annex 2 contains detailed information on each country’s general mitigation contribution.

Overall, eight countries³⁶ in the region (57 percent of countries) include the agriculture sector and nine³⁷ (64 percent) include the LULUCF sector in their general mitigation contributions. Taken together, six countries (43 percent) include both sectors (i.e. AFOLU). Taken separately, eleven countries (79 percent) include agriculture and/or the LULUCF sector. Figure 10 illustrates the share of countries with IPCC sectors included in its general mitigation contributions, by sector.

³⁴ Nauru, Samoa and Tonga.

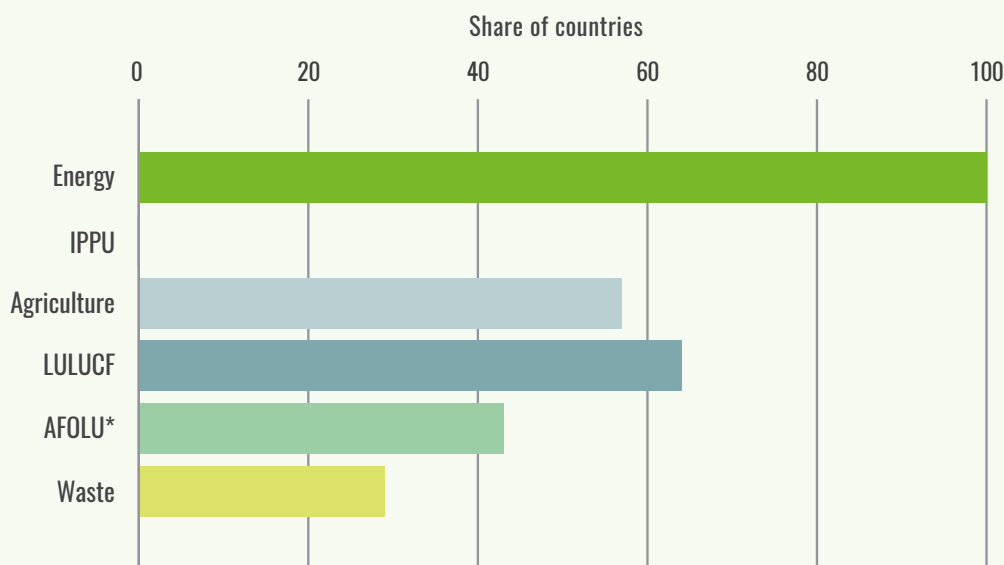
³⁵ Marshall Islands, Federated States of Micronesia, Palau, Niue, Samoa and Tuvalu.

³⁶ Solomon Islands (NC), Vanuatu (NC), Kiribati (NC), Marshall Islands (NC), Micronesia (Federated States of) (NC), Samoa (NC), Tonga (NDC) and Tuvalu (NDC).

³⁷ Fiji (NC), Papua New Guinea (NDC), Solomon Islands (NDC), Kiribati (NDC), Vanuatu (NC), Marshall Islands (NC), Palau (NC), Samoa (NC) and Tonga (NDC).

FIGURE 10.

IPCC SECTORS INCLUDED IN GENERAL MITIGATION CONTRIBUTIONS IN NDCs OF PACIFIC COUNTRIES



* AFOLU refers to when both agriculture and LULUCF sectors are included in mitigation contribution.

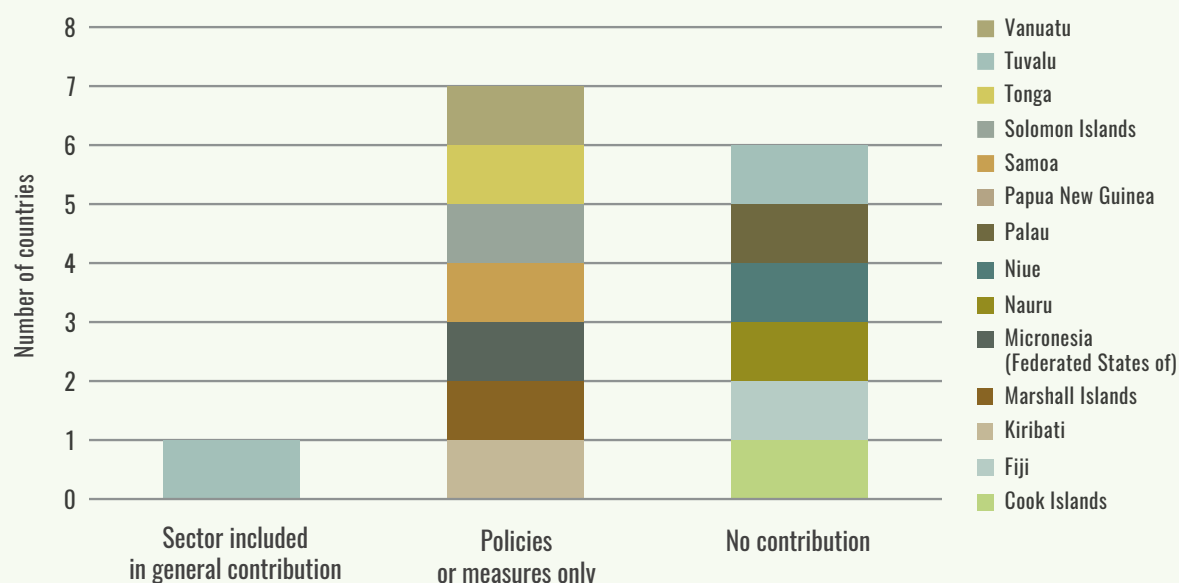
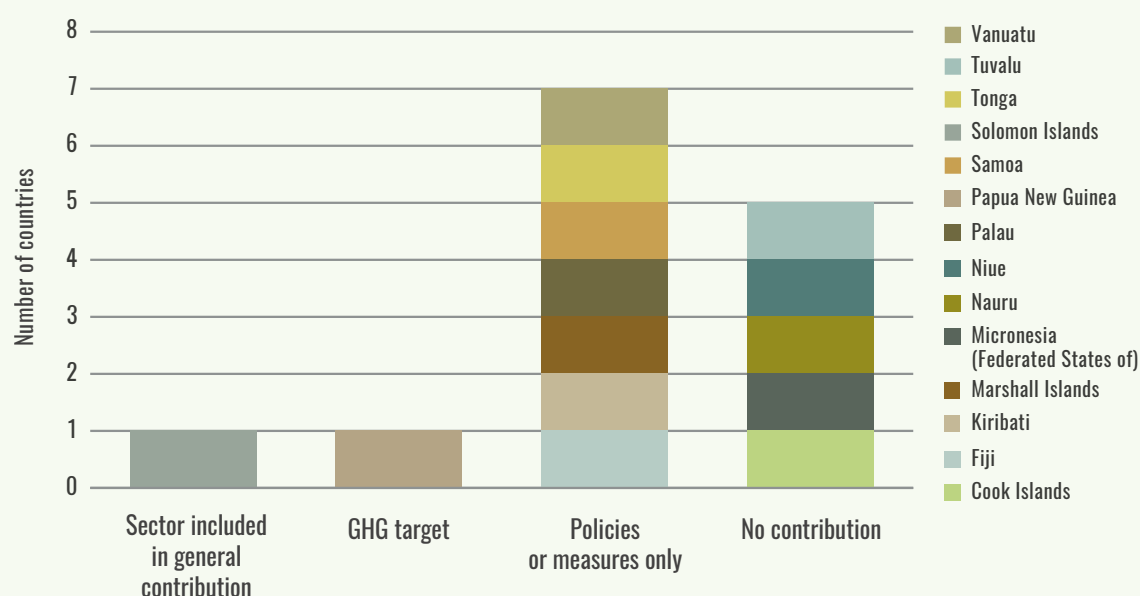
3.1.2 Mitigation in the agriculture and land use sectors

The degree to which the agriculture and/or LULUCF sectors are integrated into the mitigation contribution varies amongst countries, ranging from: no contribution, sector included in general contribution, policies or measures only, non-GHG target and GHG target. The level of integration, however, does not attest to the net impact of a country's mitigation contribution but provides a general overview of how countries integrate agricultural priorities within their mitigation commitments.

Out of the eight countries (57 percent) that include mitigation in the agriculture sector, seven include a set of mitigation policies or measures, one includes the sector in its general mitigation contribution and six do not include any mitigation contribution. **Figure 11** illustrates the number of countries with a mitigation contribution in the agriculture sector by type. **Annex 3** contains detailed information on each country's agricultural mitigation contribution.

Out of the nine countries (64 percent) that include mitigation in the LULUCF sector, one³⁸ sets a sectoral GHG target, expressed as an absolute reduction of net emissions compared to net emissions in a BAU scenario, seven include a set of policies or measures only and the remaining country includes the sector in its general mitigation contribution. **Figure 12** illustrates the number of countries with a mitigation contribution in the LULUCF sector by type. **Annex 4** contains detailed information on each country's LULUCF mitigation contribution.

³⁸ Papua New Guinea (NC).

FIGURE 11.**MITIGATION CONTRIBUTION IN THE AGRICULTURE SECTOR IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE****FIGURE 12.****MITIGATION CONTRIBUTION IN THE LULUCF SECTOR IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE**

Policies and measures in the agriculture and land use sectors

Countries often include mitigation in their contribution as policies or measures that aim to reduce net emissions or emission intensity, onotes (FAOSTAT, undated) rbon sinks, from a particular agriculture activity and/or land use. The methodological notes (FAOSTAT, undated) contains the methodological matrix for how policies and measures in the agriculture and land use sectors are categorized in relation to corresponding GHG source and sink categories in line with IPCC Guidelines (IPCC, 2006).

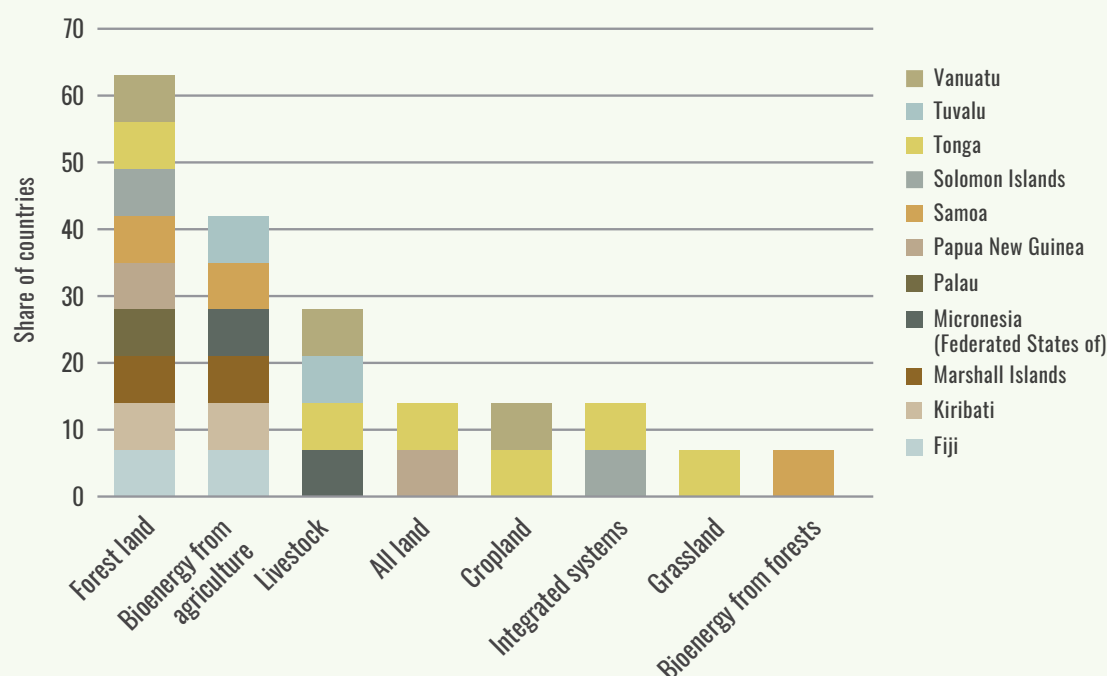
The policies and/or measures in the agriculture and land use sectors were categorized by management activity, agriculture sub-sector and IPCC land use category, and aggregated into ten main sub-sector/land use categories: 1) all land;³⁹ 2) agricultural land;⁴⁰ 3) cropland; 4) integrated systems; 5) livestock; 6) grassland; 7) forest land; 8) wetlands and organic soils; 9) bioenergy from agriculture; and 10) bioenergy from forests.

Overall, the majority of policies and/or measures in the Pacific are related to on-farm practices (80 percent of measures), with a small share of institutional and regulatory and control-related approaches to mitigation (<10 percent each). Of those policies and measures, 30 percent have quantified targets, mostly in terms of GHG emission reductions. Over three-fourths require a combination of domestic and international financial support, while only a small share is fully conditional to international support, and an even smaller share is unconditional to it.

Around 65 percent of countries in the Pacific include at least one or more mitigation policy or measure in the agriculture and land use sectors. The majority of those countries promote mitigation policies or measures related to forest land (64 percent of countries), followed by bioenergy production from agriculture (43 percent), livestock (29 percent), cropland (14 percent), integrated systems (14 percent), amongst others. **Figure 13** illustrates the share of countries with one or more (to avoid bias of representation) policies or measure in the agriculture and land use sectors, by land use category/sub-sector targeted.

FIGURE 13.

MITIGATION POLICIES AND MEASURES IN THE AGRICULTURE AND LAND USE SECTORS IN THE NDCs OF PACIFIC COUNTRIES BY LAND USE/SUB-SECTOR



³⁹ For the purpose of this document, “all land” refers to agriculture, forestry and other land uses.

⁴⁰ For the purpose of this document, “agricultural land” refers to a combination of cropland and grassland.

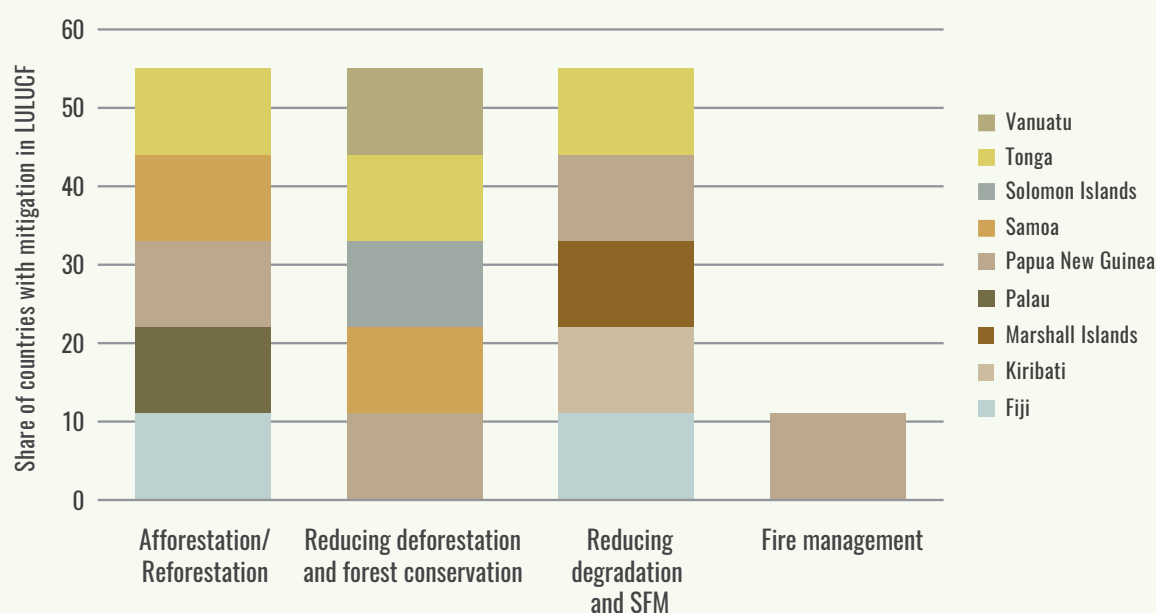
The coverage of policies and/or measures in the agriculture and land use sectors are presented by prevalence amongst countries in the region, in descending order:

FOREST LAND

Sixty-four percent of countries in the Pacific include at least one mitigation policy or measure on forest land. The majority of those countries aim to reduce land use emissions and/or enhance removals on forest land through afforestation/reforestation, reducing deforestation (56 percent of countries with mitigation in LULUCF) and forest conservation (56 percent) and reducing degradation and sustainable forest management (SFM) (56 percent), followed by fire management (11 percent). **Figure 14** illustrates the share of countries with one or more (to avoid bias of representation) policy or measure on forest land out of countries with mitigation in LULUCF, by management activity and country.

FIGURE 14.

MITIGATION POLICIES AND MEASURES ON FOREST LAND IN THE NDCs OF PACIFIC COUNTRIES BY TYPE



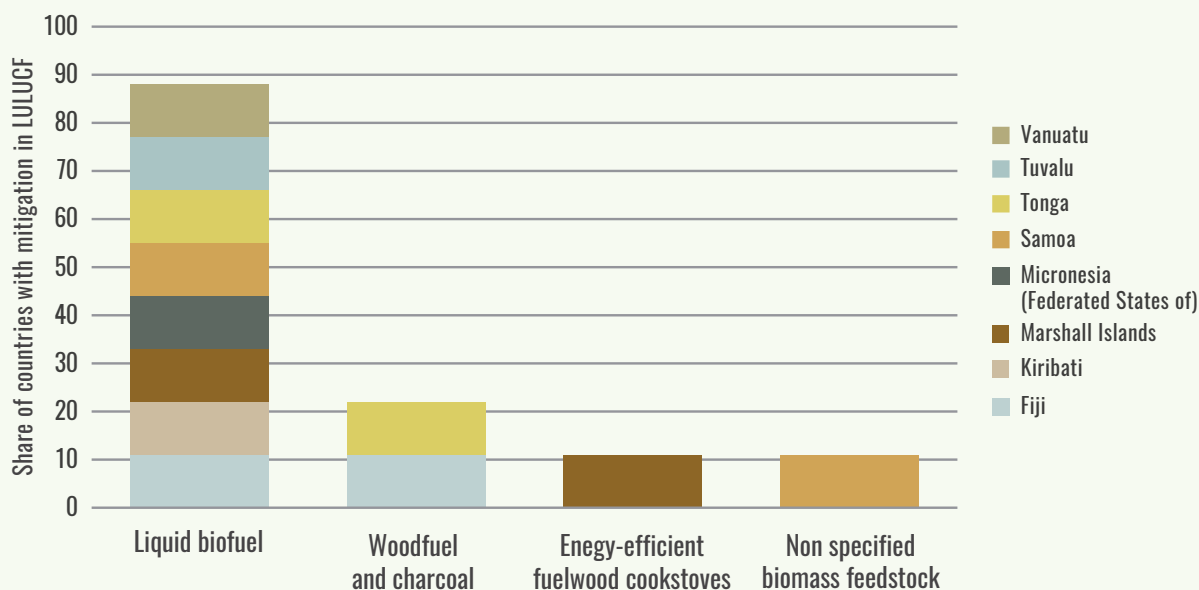
BIOENERGY FROM AGRICULTURE AND FORESTS

Forty-three percent of countries in the Pacific include at least one mitigation policy or measure targeting bioenergy production from agricultural biomass, and one country⁴¹ (7 percent) includes at least one targeting bioenergy production from forest biomass. The majority of those countries aim to reduce net emissions across all sectors by substituting fossil fuel as a source of energy through the production of liquid biofuels (89 percent of countries with mitigation in agriculture and/or LULUCF), followed by woodfuel and charcoal production (22 percent), use of more energy-efficient woodfuel cookstoves and non-specified biomass stock (11 percent, respectively). **Figure 15** illustrates the share of countries with one or more (to avoid bias of representation) bioenergy-related policy or measure out of countries with mitigation in agriculture and/or LULUCF, by management activity and country.

⁴¹ Samoa.

FIGURE 15.

BIOENERGY-RELATED MITIGATION POLICIES AND MEASURES IN THE NDCs OF PACIFIC COUNTRIES BY TYPE

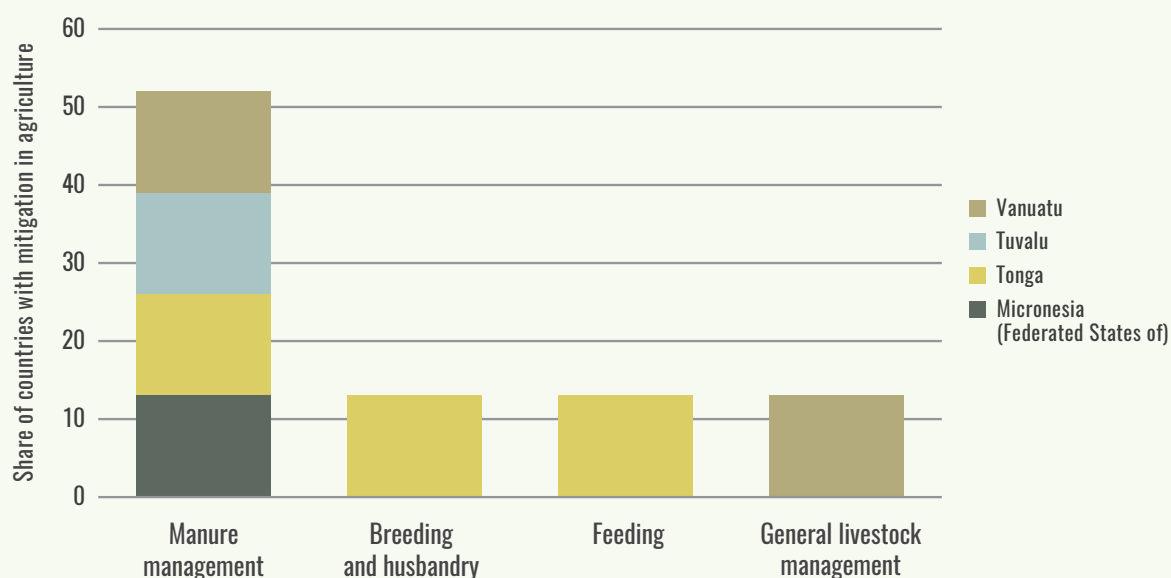


LIVESTOCK SYSTEMS

Twenty-nine percent of countries in the Pacific include at least one mitigation policy or measure in livestock systems. The majority of countries with mitigation in agriculture aim to reduce emissions and/or emission intensity in livestock systems through improved manure management (50 percent of countries with mitigation in agriculture), followed by improved feeding (13 percent), breeding and husbandry (13 percent) and general livestock management (13 percent). Figure 16 illustrates the share of countries with one or more (to avoid bias of representation) policy or measure on livestock out of countries with mitigation in the agriculture sector, by management activity.

FIGURE 16.

MITIGATION POLICIES AND MEASURES IN LIVESTOCK IN THE NDCs OF PACIFIC COUNTRIES BY TYPE



ALL LAND

Two countries⁴² (14 percent of countries) in the Pacific include at least one mitigation policy or measure on all land uses. Each of those countries aims to reduce emissions and/or enhance removals through general land use management.

CROPLAND

Two countries⁴³ (14 percent of countries) in the Pacific include at least one mitigation policy or measure on cropland. Each of those countries aims to reduce land use emissions and/or enhance removals on cropland including nutrient, plant and tillage/residue management to equal proportions.

INTEGRATED SYSTEMS

Two countries⁴⁴ (14 percent of countries) in the Pacific include at least one mitigation policy or measure in integrated systems. Each of those countries aims to reduce land use emissions and/or enhance removals through agroforestry.

GRASSLAND

One country⁴⁵ (7 percent of countries) in the Pacific includes at least one mitigation policy or measure on grassland. It aims to reduce emissions and/or enhance removals on grassland through fire management.

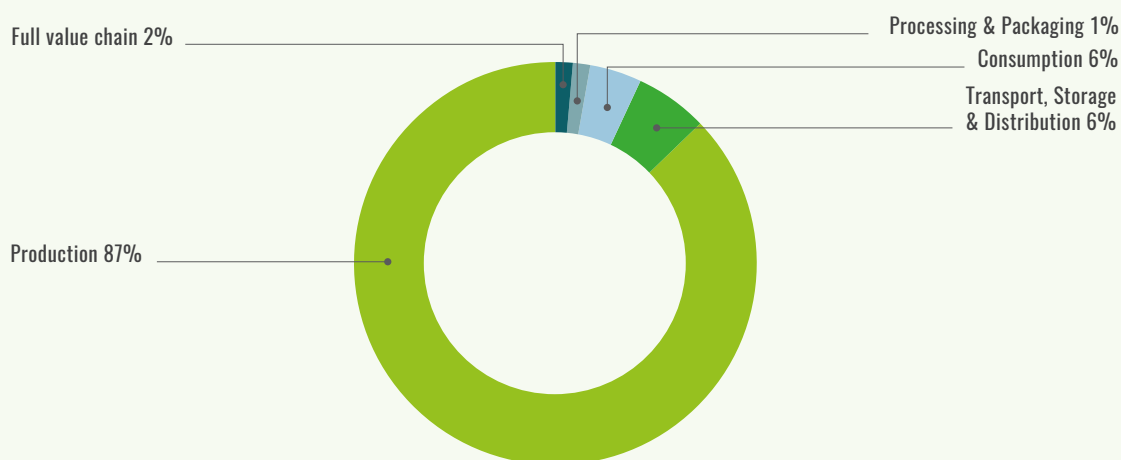
BOX 1: FOOD SYSTEMS IN THE NDCs OF THE PACIFIC

Climate actions in agricultural and food systems present opportunities for leveraging mitigation and adaptation synergies, as efficiency- and substitution-based interventions along the food value chain may generate reductions of emissions, as well as of costs, per unit of production.

Around 90 percent of climate actions in the agriculture and land use sectors target the primary production phase of the food and agricultural value chain in Pacific NDCs. The remaining ten percent promote interventions along various stages of the value chain, mostly transport, storage and distribution and consumption. **Figure 17** illustrates the distribution of measures by stage in the value chain.

FIGURE 17.

AGRICULTURAL VALUE CHAIN-RELATED CLIMATE ACTIONS IN THE NDCs OF PACIFIC COUNTRIES, BY STAGE (SHARE OF TOTAL CLIMATE ACTIONS)



⁴² Tonga and Papua New Guinea.

⁴³ Tonga and Vanuatu.

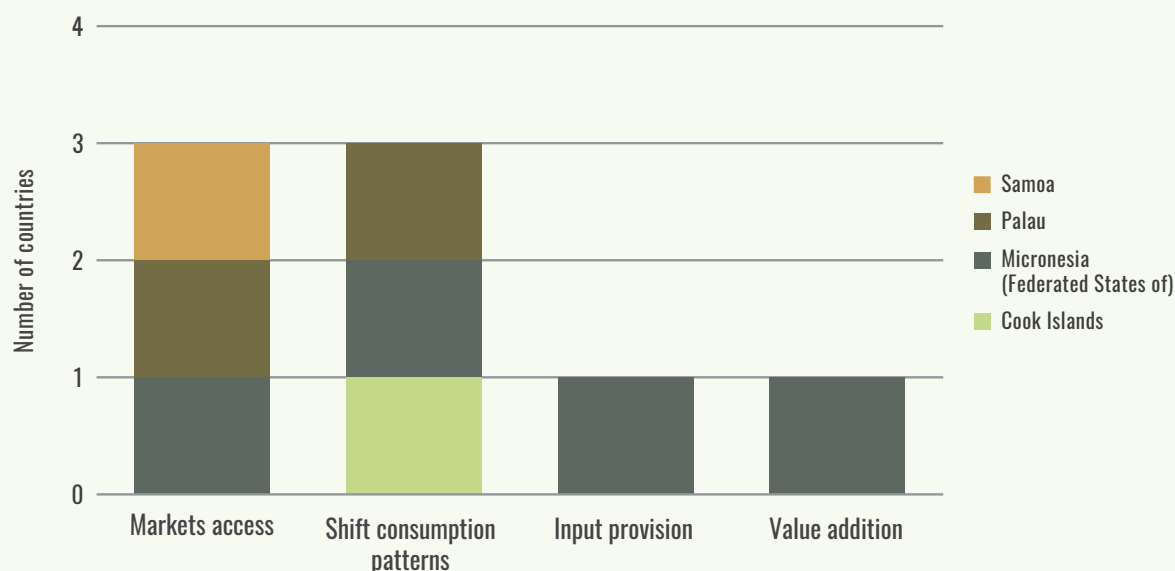
⁴⁴ Tonga and Solomon Islands.

⁴⁵ Tonga.

Around one-third of countries in the Pacific include adaptation measures promoting market-based interventions, with the majority focused on market access and shifting consumption patterns, and one country focuses on input provision and value addition. **Figure 18** illustrates the countries in the Pacific with market-based adaptation measures in the NDCs.

FIGURE 18.

MARKET-BASED ADAPTATION MEASURES IN THE NDCs OF PACIFIC COUNTRIES



3.2 ADAPTATION CONTRIBUTION

Climate change directly affects the natural resources and ecosystems upon which agricultural production, food systems and rural livelihoods rely. Climate change impacts on food security and nutrition are transmitted through different pathways, and the severity of the impact is determined by climate drivers and risks, and by the underlying vulnerability of ecosystems, agro-ecosystems, rural economies and households (FAO, 2016c).

A key way to moderate, reduce and/or avoid climate-related impacts is to reduce a system's underlying vulnerabilities, strengthen its adaptive capacity and increase its resilience (FAO, 2016d). Adaptation to climate change refers to changes in processes, practices and structures to moderate potential damages from climate change, or to benefit from opportunities associated with such changes. Adaptation in the agriculture and land use sectors signifies modifying agricultural production and socio-economic institutional systems in response to and in preparation for actual or expected climate variability and its impacts, to moderate harmful effects and exploit beneficial opportunities. Resilience can be described as the capacity of systems, communities, households or individuals to prevent, moderate or cope with risk and recover from shocks. Adaptive capacity encompasses two dimensions: the capacity to manage or moderate climate risks (including extreme climatic events), and the capacity to gradually respond to longer-term climate changes (FAO, 2017c).

This section synthesizes the adaptation component in the agriculture and land use sectors communicated in the NDCs of 14 countries of the Pacific. It also contains a summary of the major climate-related hazards, impacts and vulnerabilities reported in ecosystems and social systems. The data from the NDCs were supplemented with information reported in NCs.

3.2.1 Climate-related hazards, impacts, and vulnerabilities

In order to contextualize the fairness and ambition of the NDCs, as well as inform adaptation planning, countries often include a description of observed and/or expected climate variability and extremes, as well as climate-related hazards, impacts and vulnerabilities that are already being observed or are expected in the future.

All countries in the region report observed and/or projected climate-related hazards, impacts and vulnerabilities in ecosystems and/or social systems in order to inform or contextualize the need for adaptation to climate change.

Climate variability and extremes

All countries in the region report observed and/or projected changes in meteorological variables, namely variations in mean annual precipitation and surface air temperature and the frequency and intensity of climate extremes.

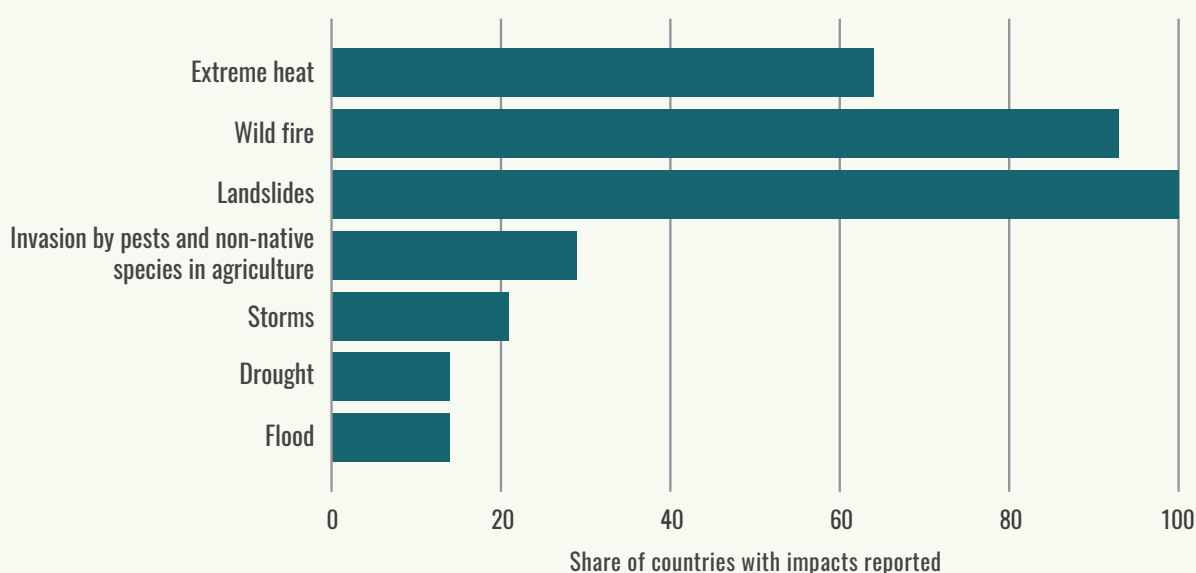
Climate-related hazards

Countries often report observed and/or projected climate-related hazards, including hydro-meteorological, climatological and biological processes or phenomenon that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources.⁴⁶

All countries in the region report the occurrence of storms amongst observed and/or projected climate-related hazards,⁴⁷ followed by drought (93 percent of countries with impacts reported), floods (64 percent) and invasion by pests and non-native species in agriculture (29 percent), amongst others. **Figure 19** illustrates the share of countries that report observed and/or projected climate-related hazards, by type of hazard.

FIGURE 19.

OBSERVED AND/OR PROJECTED CLIMATE-RELATED HAZARDS REPORTED IN THE PACIFIC, BY TYPE



⁴⁶ Definition of climate-related hazard adapted from IPCC (2014) and EM-DAT (undated).

⁴⁷ Definition of climate-related hazard adapted from IPCC (2014) and EM-DAT (undated).

Climate-related slow onset risks and events

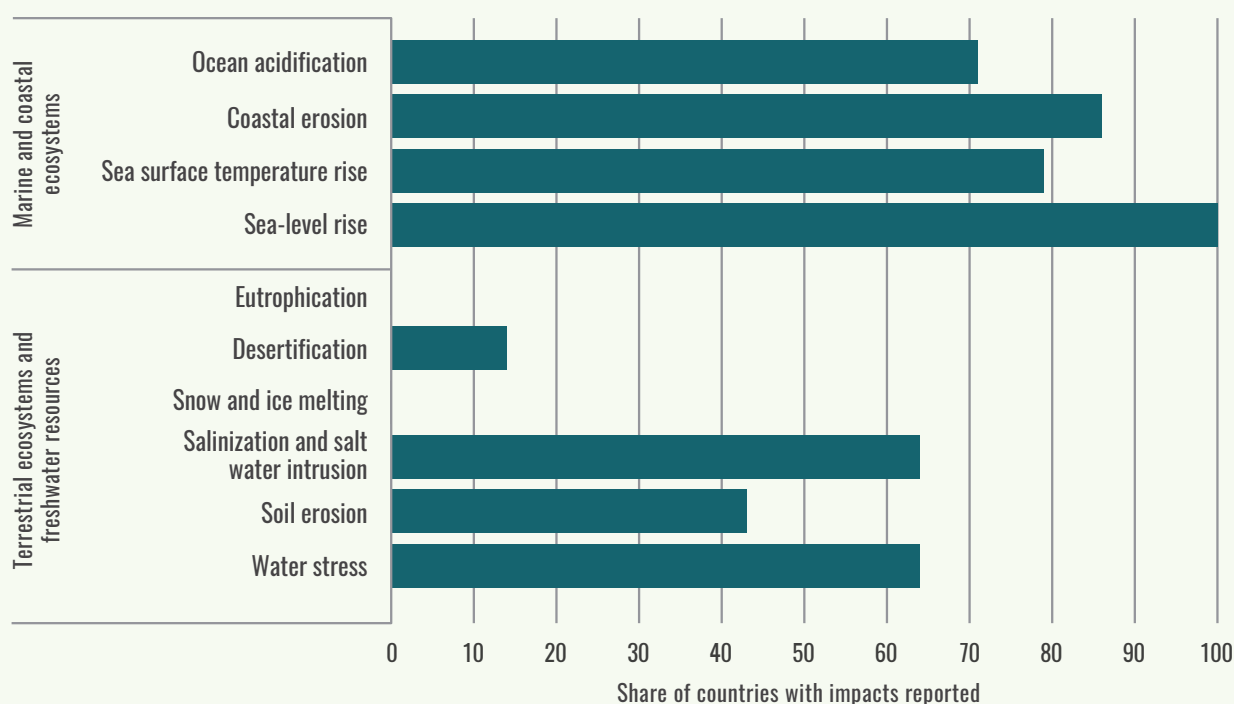
Countries often report observed and/or projected climate-related chemical, biological, and physical changes, leading to slow onset events.⁴⁸

In marine and coastal ecosystems, sea level rise and coastal erosion are reported most frequently (100 and 86 percent of countries, respectively) amongst observed and/or projected climate-related slow onset events, followed by sea surface temperature rise and acidification (79 and 71 percent, respectively).

In terrestrial and freshwater ecosystems, salt-water intrusion and water stress are the most reported (64 percent of countries, respectively) amongst observed and/or projected climate-related slow onset events, followed by soil erosion (43 percent) and desertification (14 percent). **Figure 20** illustrates the share of countries that report observed and/or projected climate-related slow onset events, by type of risk.

FIGURE 20.

OBSERVED AND/OR PROJECTED CLIMATE-RELATED SLOW ONSET EVENT REPORTED IN THE PACIFIC, BY TYPE



Climate-related vulnerabilities

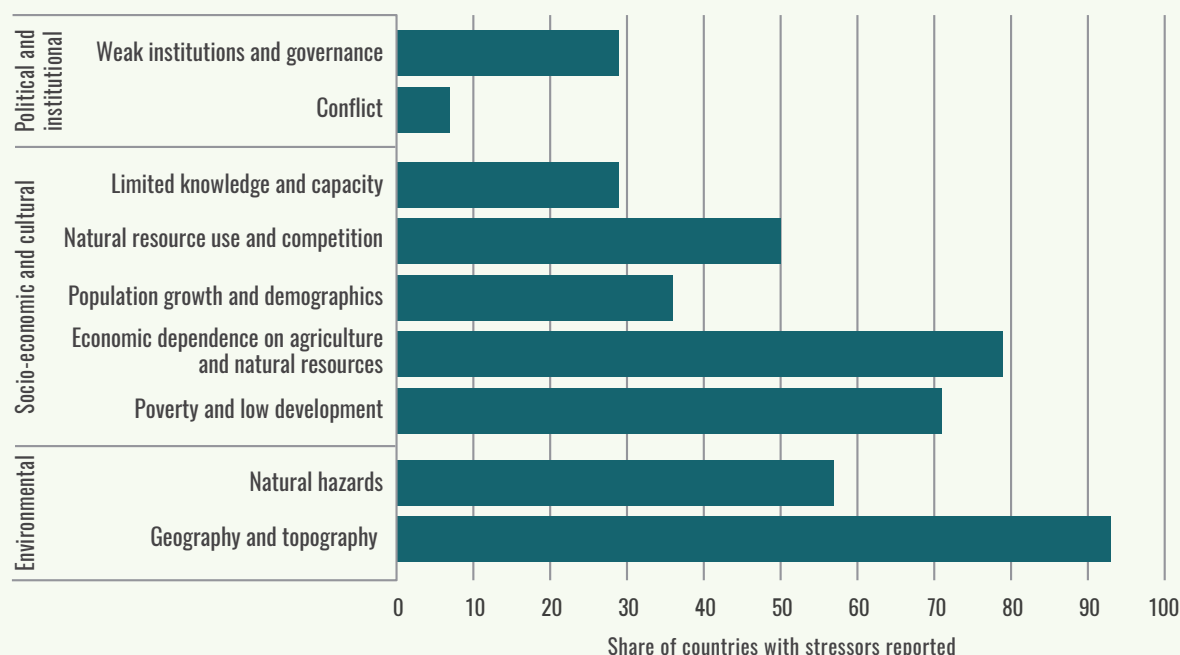
NON-CLIMATIC DRIVERS OF VULNERABILITY

Countries often report on the intersecting environmental, social, economic, cultural, political and institutional variables, or stressors, that can affect individual adaptive capacity to respond, as well as the level of exposure to climate change, creating new or exacerbating existing vulnerabilities to climate change.⁴⁹

⁴⁸ Definition of climate-related slow onset events adopted from IPCC (2014).

⁴⁹ Definition of non-climatic stressors adapted from IPCC (2014).

Overall, geography and topography is reported as the largest non-climatic driver of vulnerability (93 percent of countries), followed by the economic dependence on agriculture and natural resources (79 percent), poverty and low levels of development (71 percent), as well as natural hazards (57 percent), amongst others. **Figure 21** illustrates the share of countries that report non-climatic drivers of climate change vulnerability by type of stressor reported.

FIGURE 21.**NON-CLIMATIC DRIVER OF CLIMATE CHANGE VULNERABILITY REPORTED IN THE PACIFIC, BY TYPE**

CLIMATE-DRIVEN IMPACTS, VULNERABILITIES AND RISKS IN ECOSYSTEMS

Countries often report observed and/or projected climate-driven impacts, vulnerabilities and risks in ecosystems.⁵⁰ The impacts of climate change refer generally to the effects of extreme weather and climate events and of climate change on the lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure. This is due to the interaction of climate changes or hazardous climate events occurring within a specific time period and the vulnerability of an exposed society or system. The vulnerability of an exposed system depends on its sensitivity and lack of capacity to cope and adapt. The probability of occurrence compounded by the impact, or risk, results from the interaction of vulnerability, exposure, and hazard.⁵¹

Amongst all ecosystems, agro-ecosystems are reported most frequently as vulnerable to climate-related impacts (100 percent of countries), followed by oceans and coastal zones (71 percent) and ecosystems in general (71 percent).

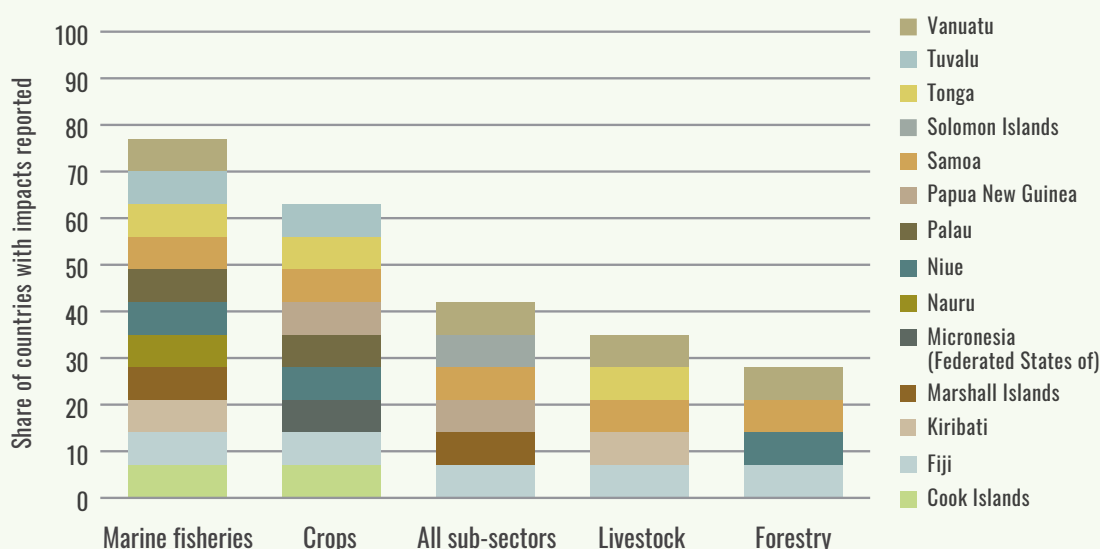
In agro-ecosystems, marine fisheries and crops are the most frequently mentioned vulnerable sub-sectors to climate-related impacts (79 and 64 percent of countries, respectively), followed by agriculture in general (43 percent), livestock (36 percent) and forestry (29 percent). **Figure 22** illustrates the share of countries that report one or more observed and/or expected climate-related impact, vulnerability and risk in agro-ecosystems out of countries that report climate impacts, by sub-sector/land use category and country.

⁵⁰ Definition of ecosystems elaborated from Millennium Ecosystem Assessment (2005).

⁵¹ Definition of impact, vulnerability and risk in ecosystems adapted from IPCC (2014).

FIGURE 22.

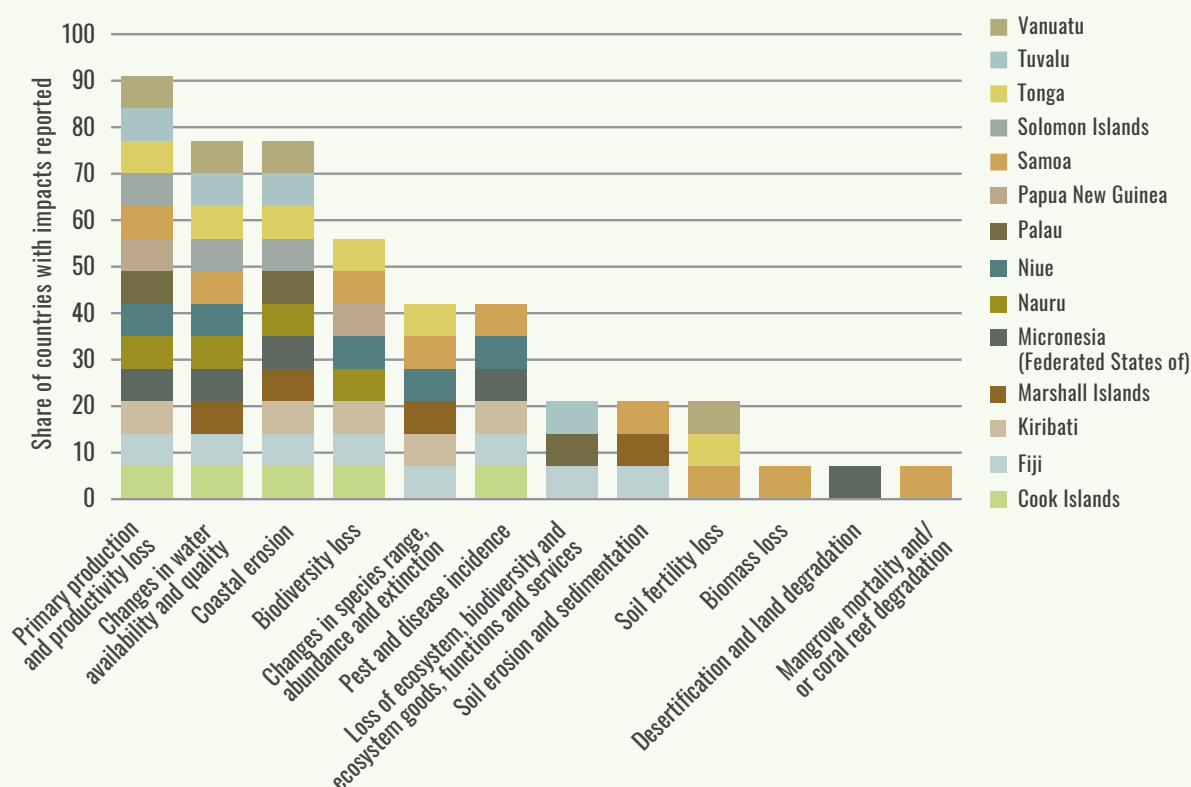
OBSERVED AND/OR PROJECTED CLIMATE-DRIVEN IMPACTS, VULNERABILITIES AND RISKS IN AGRO-ECOSYSTEMS IN THE PACIFIC, BY SUB-SECTOR/LAND USE



Climate-driven impacts, vulnerabilities and risks in ecosystems vary by natural resource and ecosystem service affected. Observed and/or projected climate-related impacts reported by countries were qualified by the type of natural resource and ecosystem service primarily affected.

Overall, genetic resources, primarily in agro-ecosystems, are reported most frequently amongst natural resource impacts (93 percent of countries), followed by land and soil resources in coastal zone ecosystems (86 percent) and water resources across all ecosystems (79 percent).

Loss of primary production and productivity, primarily in the marine fisheries and crops sub-sectors are most frequently reported amongst ecosystem service impacts (93 percent of countries), followed by changes in water availability and quality across all ecosystems and coastal erosion (79 percent, respectively), as well as biodiversity loss, primarily in ocean and coastal zone ecosystems (57 percent), amongst others. **Figure 23** illustrates the share of countries with observed and/or projected climate-related impacts in ecosystems, by ecosystem service impact category and country.

FIGURE 23.**OBSERVED AND/OR PROJECTED CLIMATE-RELATED IMPACTS REPORTED ON ECOSYSTEM SERVICES IN THE PACIFIC, BY TYPE**

CLIMATE-RELATED IMPACTS, VULNERABILITIES AND RISKS IN SOCIAL SYSTEMS

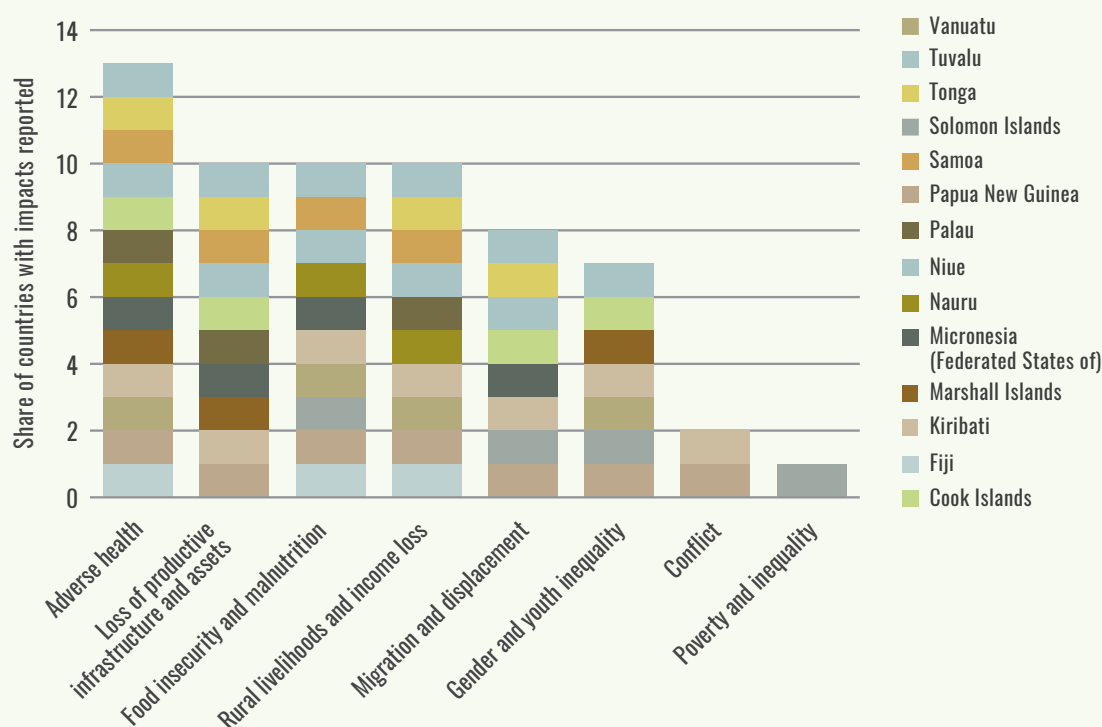
All countries in the region identify at least one observed and/or expected impact, vulnerability and risk induced by climate change in social systems.⁵² For this analysis, the climate-related impacts are differentiated across three main pillars: socio-economics and well-being; knowledge and capacity; and institutions and governance.

Overall, the majority of countries report health as social dimension at risk under climate change (93 percent of countries), followed by loss of productive infrastructure and assets, food insecurity and malnutrition and rural livelihoods and income loss (71 percent each), migration and displacement (57 percent) and gender and youth inequality (50 percent), amongst others. **Figure 24** illustrates the share of countries, at the -regional level, that report one or more observed and/or expected climate-related impact, vulnerability and risk in social systems by type.

⁵² Definition of impact, vulnerability and risk in social systems adapted from IPCC (2014).

FIGURE 24.

OBSERVED AND/OR PROJECTED CLIMATE-RELATED IMPACTS, VULNERABILITIES AND RISKS REPORTED IN THE PACIFIC, BY TYPE



3.2.2 Adaptation in the agriculture and land use sectors

All countries in the Pacific communicated an adaptation component,⁵³ all of which include the agriculture and land use sectors. The level of detail included in each country's adaptation component varies, as some countries detailed their adaptation visions, goals and measures, while other countries made reference to national adaptation and climate change plans.

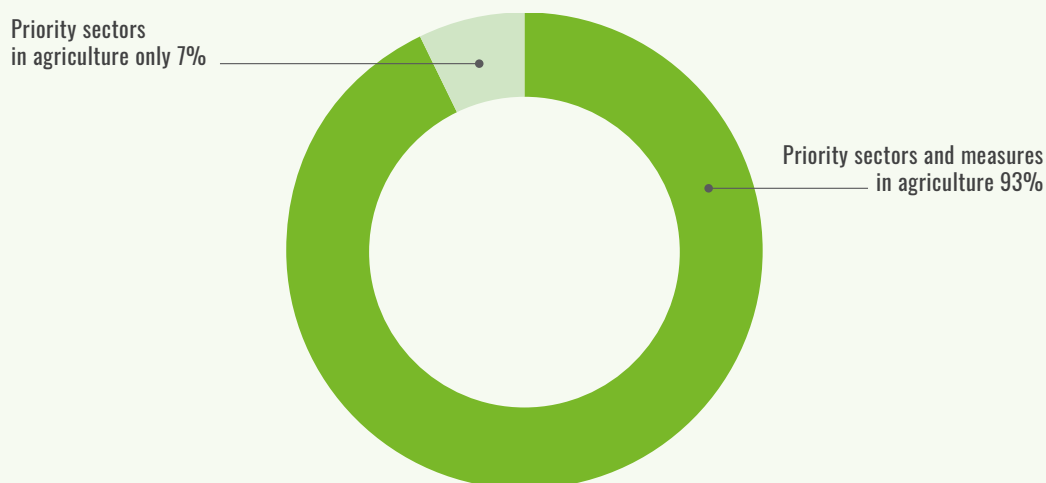
The majority of countries include a set of priority sector(s) and measures in the agriculture and land use sectors (93 percent of countries) and one⁵⁴ includes only priority sectors. Figure 25 illustrates the share of countries with adaptation in the agriculture and land use sectors by type.

⁵³ This includes when a country makes reference to key adaptation plans in their NDC.

⁵⁴ Solomon Islands.

FIGURE 25.

ADAPTATION COMPONENT IN THE AGRICULTURE AND LAND USE SECTORS EXPRESSED IN THE NDCs OF PACIFIC COUNTRIES (SHARE OF COUNTRIES IN REGION)



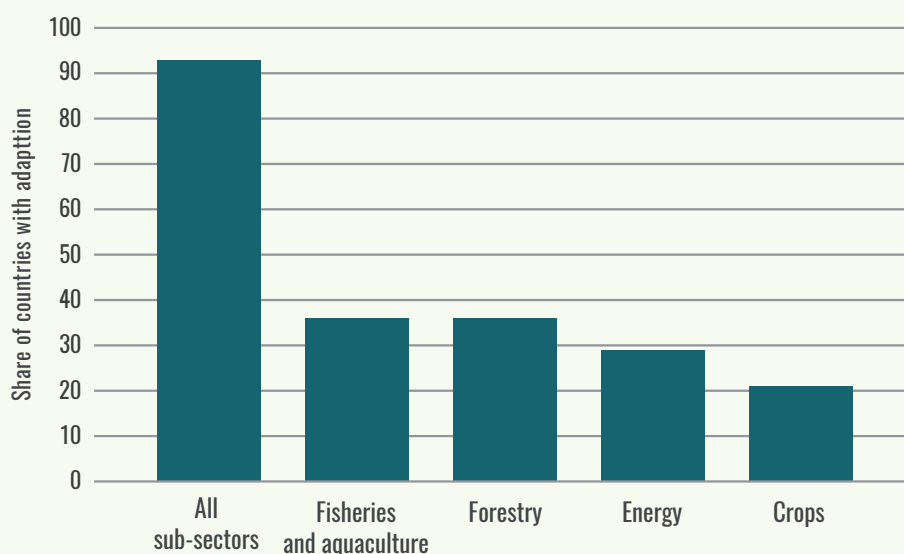
Priority sectors and cross-sectoral priorities

Countries often identify a number of priority (sub-) sectors and cross-sectoral priorities in ecosystems and social systems as part of their adaptation strategy in the agriculture and land use sectors.

Amongst priority sectors for adaptation, the majority of countries identify the agriculture sector **in general** (93 percent of countries), followed by fisheries and aquaculture and forestry (36 percent, respectively), energy (29 percent) and the crops (21 percent) sub-sectors. **Figure 26** illustrates the share of countries with priority sectors in agriculture by sub-sector.

FIGURE 26.

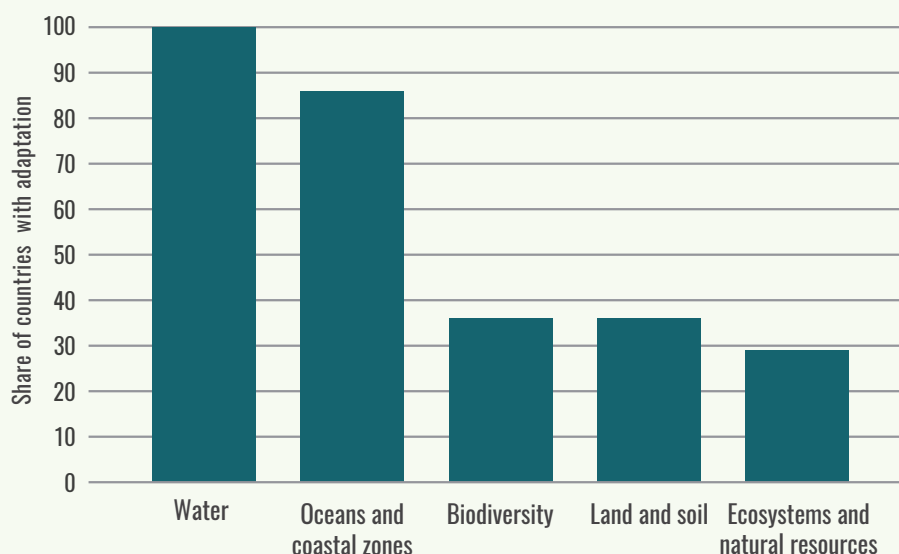
ADAPTATION PRIORITY SECTORS IN AGRICULTURE IN THE NDCs OF PACIFIC COUNTRIES, BY (SUB-) SECTOR



All countries identify water amongst cross-sectoral priorities for adaptation, followed by oceans and coastal zones (86 percent of countries), biodiversity and land and soil (36 percent, respectively) and ecosystems and natural resources (29 percent). **Figure 27** illustrates the share of countries with adaptation with cross-sectoral priorities in ecosystems by type.

FIGURE 27.

CROSS-SECTORAL ADAPTATION PRIORITIES IN ECOSYSTEMS IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE

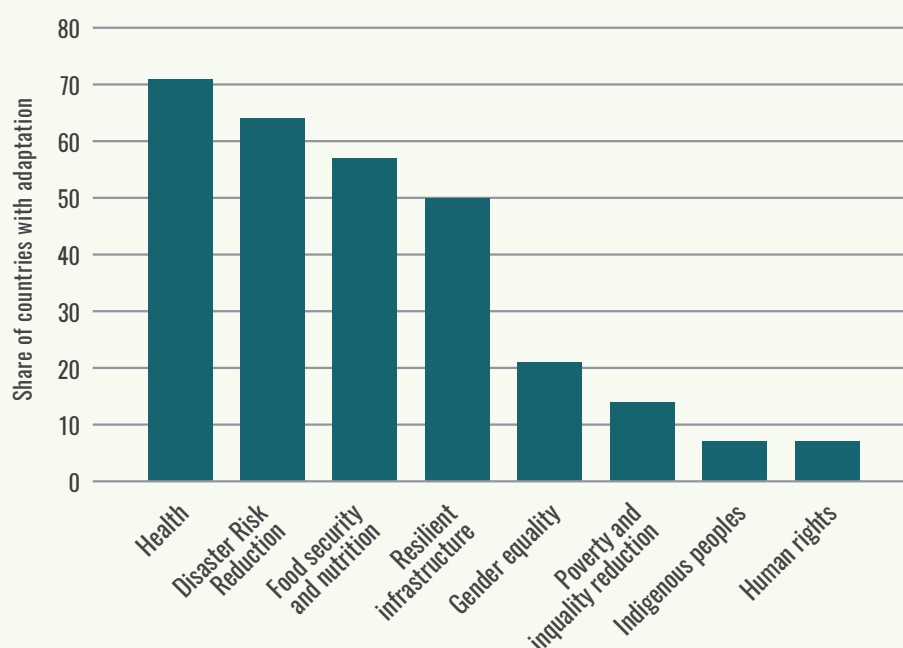


Countries often identify a number of cross-cutting priorities in social systems as part of their adaptation strategy.

Health represents the greatest cross-cutting adaptation priority in social systems amongst countries in the region (71 percent of countries), followed by Disaster Risk Reduction (DRR) (64 percent), food security and nutrition (57 percent), resilient infrastructure (50 percent) and gender equality (21 percent), amongst others. **Figure 28** illustrates the share of countries with adaptation with cross-cutting priorities in social systems by type.

FIGURE 28.

CROSS-CUTTING ADAPTATION PRIORITIES IN SOCIAL SYSTEMS IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE



BOX 2: GENDER IN THE PACIFIC NDCs

Fifty percent of all countries in the Pacific report gender and youth inequality as either an observed and/or projected climate-related risk. For instance, Kiribati underlines that “the effects of climate change are felt first and most acutely by vulnerable and marginalized populations including women, children and youth.” Cooks Islands draws attention to the gender implications of climate-related land losses, and Tuvalu stresses that women and children are “particularly susceptible to vector- and water-borne diseases,” which are expected to increase in range and incidence under a changing climate.

However, only three countries (Nauru, Papua New Guinea and Cook Islands) prioritize gender equality and empowerment amongst adaptation priorities in their NDCs.

Adaptation measures in ecosystems and social systems

Adaptation measures in ecosystems are differentiated by type of ecosystem, natural resource and ecosystem service supported and management activity. Adaptation measures in social systems are differentiated by dimension and intervention option. The methodology note (FAOSTAT, undated) contains more details on the categorization process. It should be noted that the objective of adaptation measures and their entry-points are often multiple, as their impacts are often cross-cutting. For this reason, adaptation measures are categorized thematically, depending on the level of detail provided, and categories are not considered mutually exclusive.

Overall, the majority of adaptation measures in the Pacific take the form of on-farm practices and institutional approaches, with a small share of informational, economic and regulatory and control-related measures. Only three percent of adaptation measures have quantified targets, likely due to the challenges related to measuring adaptation reference points and outcomes at the local and national scale. Over half of them require a combination of domestic and international financial support, while the remaining share are financed domestically

ADAPTATION MEASURES IN ECOSYSTEMS

All countries in the Pacific identify at least one adaptation measure in ecosystems. The majority of those countries promote adaptation in oceans and coastal zones ecosystems (93 percent of countries), followed by agro-ecosystems and ecosystems in general (86 and 71 percent, respectively). The adaptation measures in ecosystems are described by ecosystem type and management activity in order of regional priority:

Ocean and coastal zone ecosystems

Ninety-three percent of countries with adaptation commitments identify adaptation in ocean and coastal zone ecosystems. The majority of those countries target mangrove conservation and replanting (57 percent of countries with adaptation in ecosystems), followed by coastal zone management (43 percent), biodiversity and ecosystem management (21 percent), flood management and land/soil management, restoration and rehabilitation (14 percent, respectively), amongst others. Figure 29 illustrates the share of countries with one or more (to avoid bias of representation) adaptation measure in ocean and coastal zone ecosystems out of countries with adaptation measures in ecosystems, by management activity.

Agro-ecosystems

Eighty-six percent of countries with an adaptation component identify at least one adaptation measure in agro-ecosystems. The majority of those countries promote adaptation in marine fisheries and aquaculture (71 percent of countries with adaptation measures in ecosystems, respectively), followed by crops and agriculture in general (64 percent, respectively), forestry (57 percent), livestock (50 percent), freshwater aquaculture (14 percent) and integrated systems (7 percent). Figure 30 illustrates the share of countries with adaptation that include one or more (to avoid bias of representation) adaptation measure in agro-ecosystems out of countries with adaptation measures in ecosystems by sub-sector and country.

FIGURE 29.

ADAPTATION MEASURES IN OCEAN AND COASTAL ZONE ECOSYSTEMS IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE

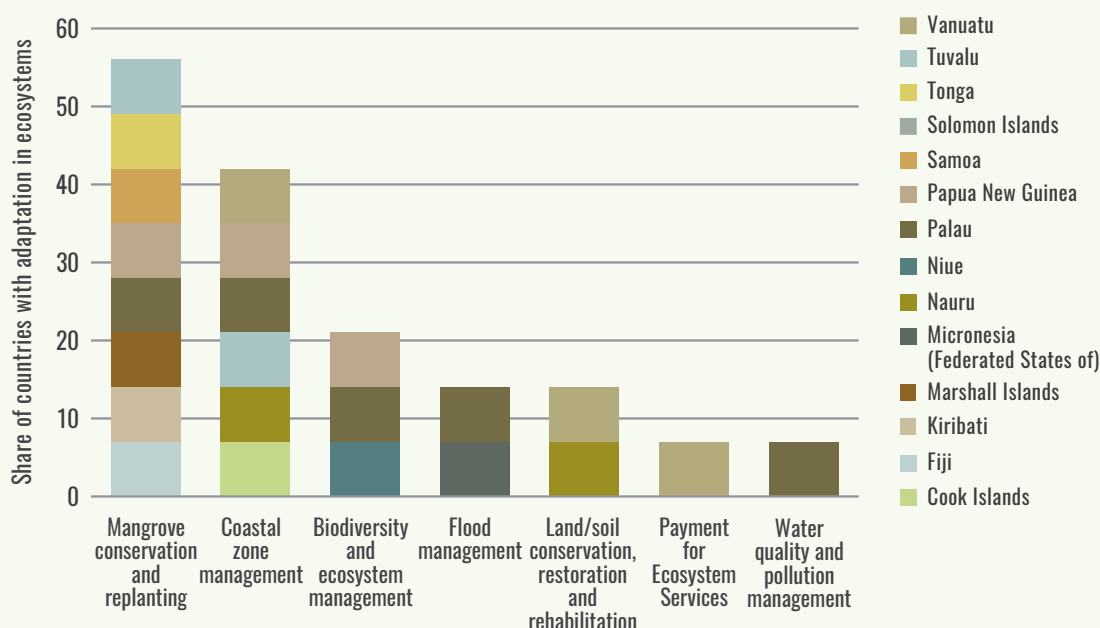
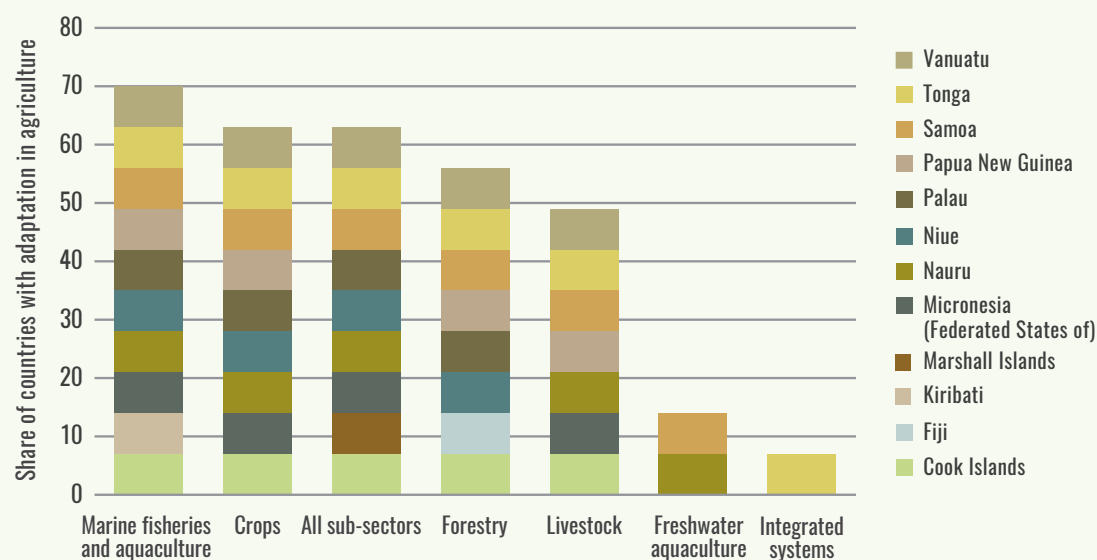
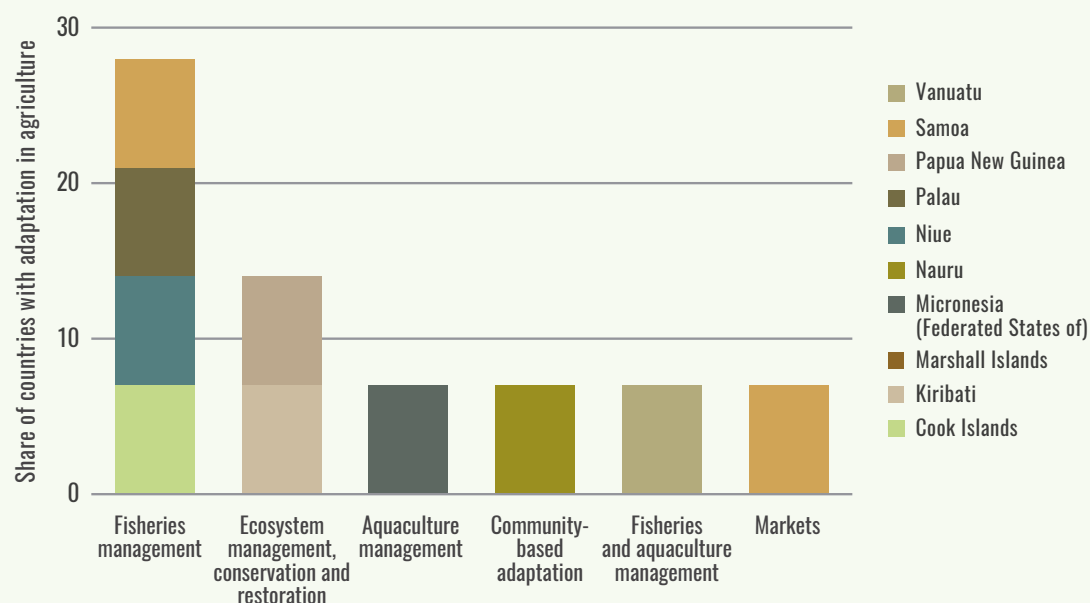


FIGURE 30.

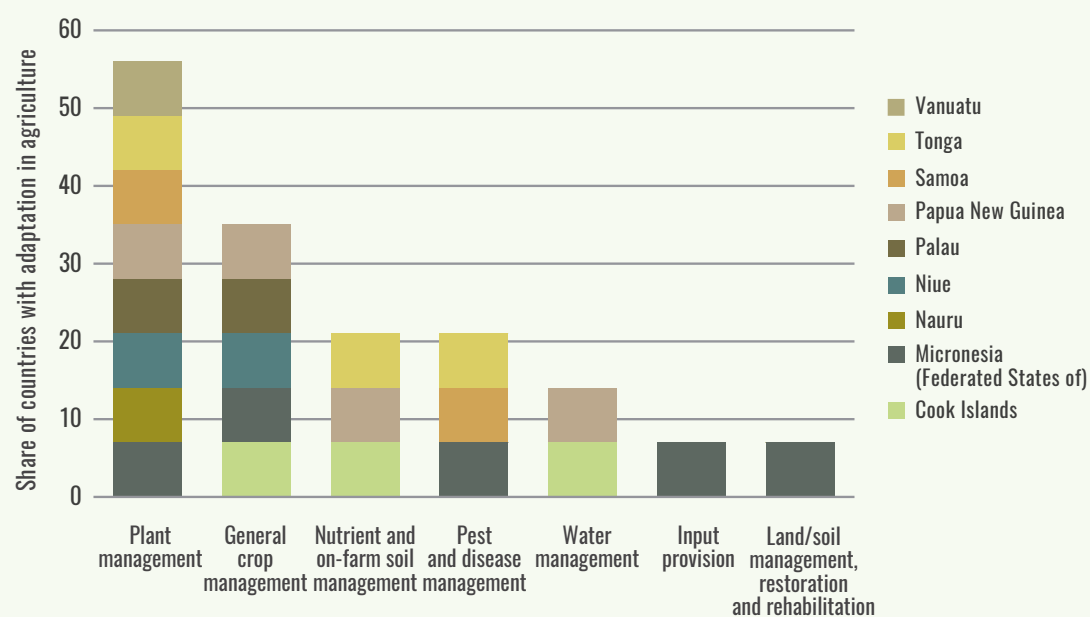
ADAPTATION MEASURES IN AGRO-ECOSYSTEMS IN THE NDCs OF PACIFIC COUNTRIES, BY SUB-SECTOR

*Marine fisheries and aquaculture*

Seventy-one percent of countries with adaptation commitments identify adaptation in marine fisheries and aquaculture. The majority of those countries promote fisheries management (29 percent of countries with an adaptation component in agriculture), followed by ecosystem management, conservation and restoration (14 percent), and equal shares of aquaculture management, community-based adaptation, market-based measures and fisheries and aquaculture management in general (7 percent, respectively). Figure 31 illustrates the share of countries with one or more (to avoid bias of representation) adaptation measure in marine fisheries and aquaculture out of countries with an adaptation component in agriculture, by management activity and country.

FIGURE 31.**ADAPTATION MEASURES IN MARINE FISHERIES AND AQUACULTURE IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE****Crops**

Sixty-four percent of countries identify adaptation in the crops sub-sector. The majority of those countries promote plant management (30 percent of countries with an adaptation component in agriculture), followed by water management and general crop management (22 and 18 percent, respectively), nutrient and on-farm soil management and pests and diseases management (11 percent, respectively), amongst others. Figure 32 illustrates the share of countries with one or more (to avoid bias of representation) adaptation measure in the crops sub-sector out of countries with an adaptation component in agriculture, by management activity and country.

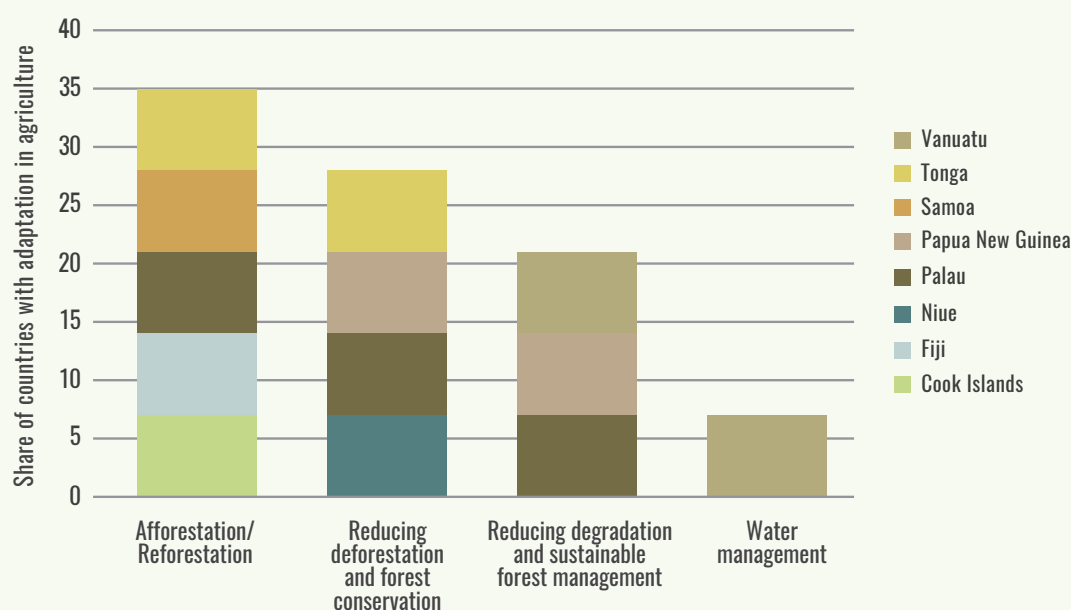
FIGURE 32.**ADAPTATION MEASURES IN THE CROPS SUB-SECTOR IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE**

Forestry

Fifty-seven percent of countries identify adaptation in the forestry sub-sector. The majority of those countries promote afforestation/reforestation (36 percent of countries with an adaptation component in agriculture), followed by reducing deforestation and forest conservation (29 percent), reducing degradation and SFM (21 percent) and water management (7 percent), amongst others. Figure 33 illustrates the share of countries with one or more (to avoid bias of representation) adaptation measure in the forestry sub-sector out of countries with an adaptation component in agriculture, by management activity and country.

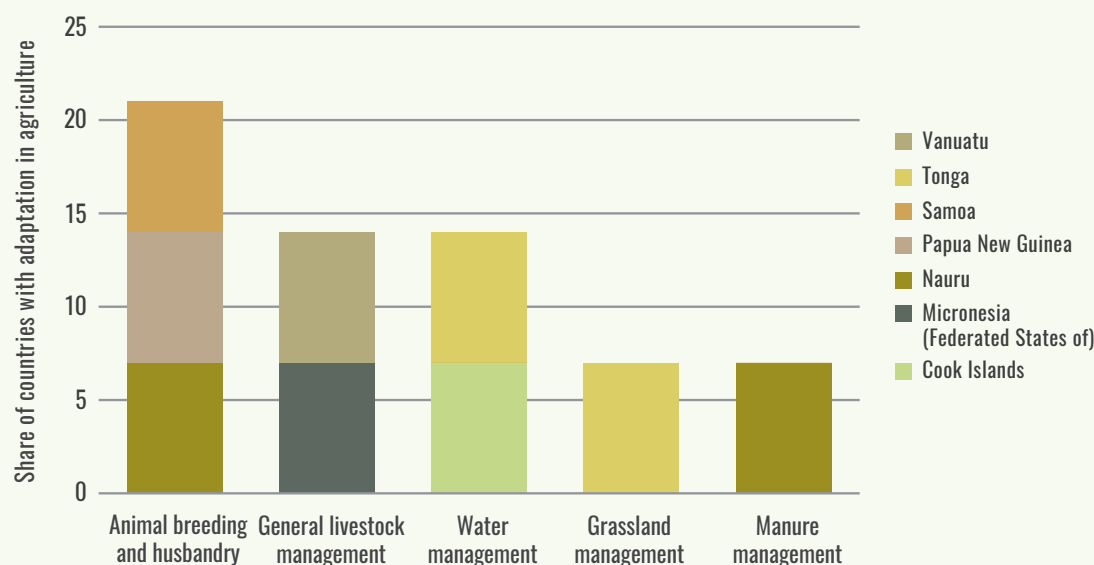
FIGURE 33.

ADAPTATION MEASURES IN FORESTRY IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE



Livestock

Fifty percent of countries identify adaptation in the livestock sub-sector. The majority of those countries promote animal breeding and husbandry (20 percent of countries with an adaptation component in agriculture), followed by water and general livestock management (14 percent, respectively), and manure and grassland management (7 percent, respectively). Figure 34 illustrates the share of countries with one or more (to avoid bias of representation) adaptation measure in the livestock sub-sector out of countries with an adaptation component in agriculture, by management activity and country.

FIGURE 34.**ADAPTATION MEASURES IN THE LIVESTOCK SUB-SECTOR IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE****Freshwater aquaculture**

Two countries⁵⁵ (14 percent of countries with an adaptation component in agriculture) **identify adaptation in freshwater aquaculture**, with all measures promoting general aquaculture management.

Integrated systems

One country⁵⁶ (7 percent of countries with an adaptation component in agriculture) **identifies adaptation in integrated systems**, promoting agroforestry.

Natural resources

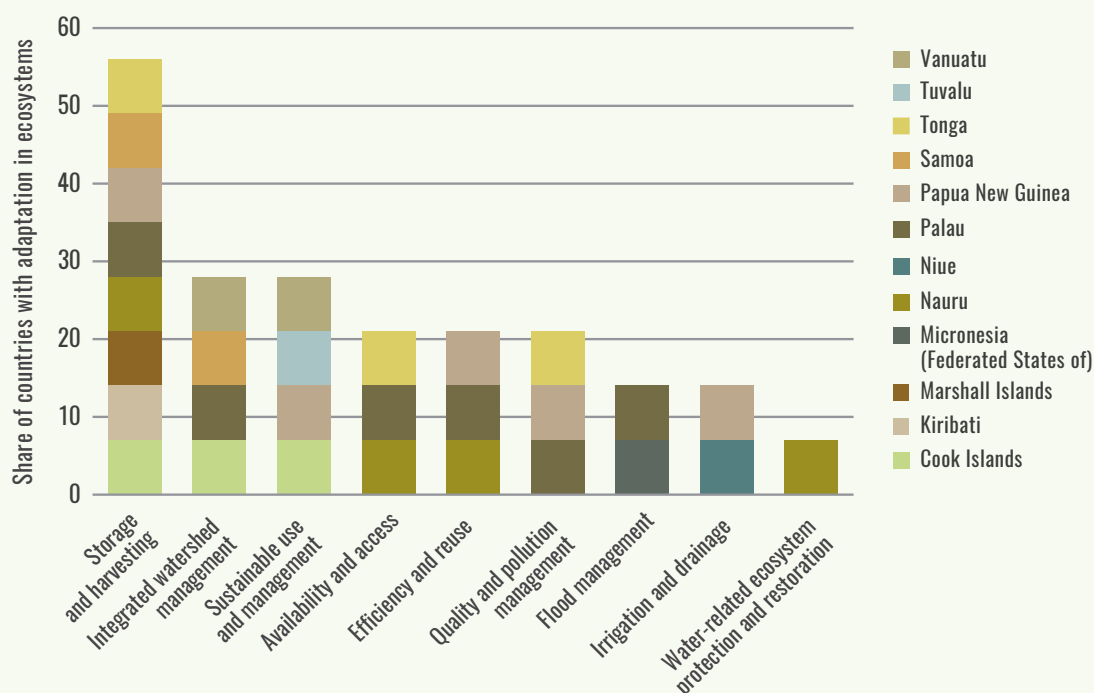
Natural resource use and management options are integrated within each of the approaches to adaptation identified above due to their cross-cutting nature. The distribution of those management options is presented from a natural resource lens below:

Water resources

Eighty-six percent of countries identify water resource use and management amongst adaption options. The majority of those countries promote water storage and harvesting (57 percent of countries with adaptation measures in ecosystems), followed by integrated watershed management and sustainable use and management (29 percent, respectively), availability and access, quality and pollution management and efficiency and use (21 percent, respectively), amongst others. **Figure 35** illustrates the share of countries with one or more (to avoid bias of representation) water-related adaptation measure across all ecosystems out of countries with adaptation measures in ecosystems, by resource use and management option and country.

⁵⁵ Nauru and Samoa.

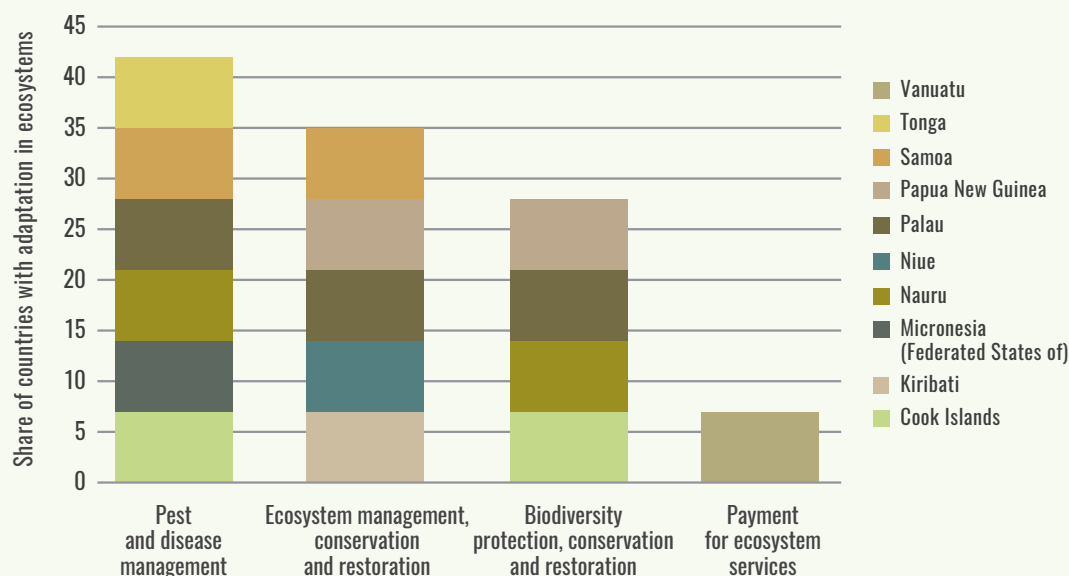
⁵⁶ Tonga.

FIGURE 35.**WATER-RELATED ADAPTATION MEASURES IN THE IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE***Ecosystem and genetic resources*

Seventy-one percent of countries identify ecosystem and genetic resources use and management amongst adaptation options. The majority of those countries promote pests and diseases management (43 percent of countries with adaptation measures in ecosystems), followed by the protection, conservation and restoration of biodiversity and ecosystems in general (36 and 29 percent of countries, respectively) and payment for ecosystem services (7 percent). **Figure 36** illustrates the share of countries with one or more (to avoid bias of representation) ecosystem and genetic resources-related adaptation measure across all ecosystems out of countries with adaptation measures in ecosystems, by resource use and management option and country.

FIGURE 36.

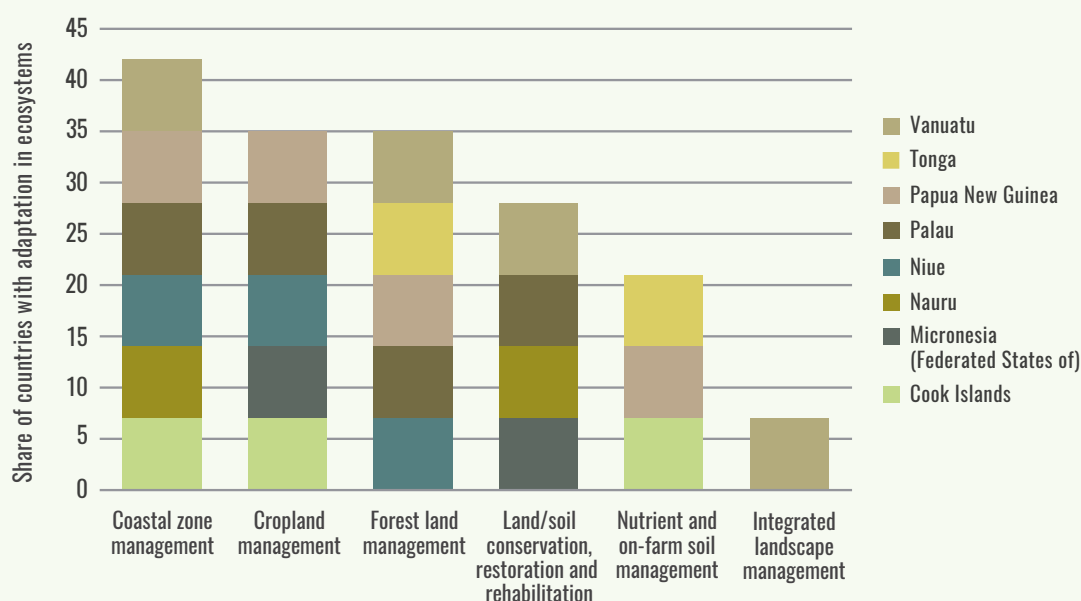
ECOSYSTEM AND GENETIC RESOURCES-RELATED ADAPTATION MEASURES IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE

*Land resources*

Fifty-seven percent of countries with an adaptation component identify land resources use and management amongst adaptation options. The majority of those countries promote coastal zone management (45 percent of countries with adaptation measures in ecosystems), followed by forest and cropland management (36 percent, respectively), land/soil conservation, restoration and rehabilitation (29 percent) and nutrient and on-farm soil management (21 percent), amongst others. Figure 37 illustrates the share of countries with one or more (to avoid bias of representation) land-related adaptation measure across all ecosystems out of countries with adaptation measures in ecosystems, by resource use and management option and country.

FIGURE 37.

LAND-RELATED ADAPTATION MEASURES IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE



ADAPTATION MEASURES IN SOCIAL SYSTEMS

For the sake of this analysis, adaptation measures in social systems are differentiated along three main pillars: socio-economics and well-being; knowledge and capacity; and institutions and governance.

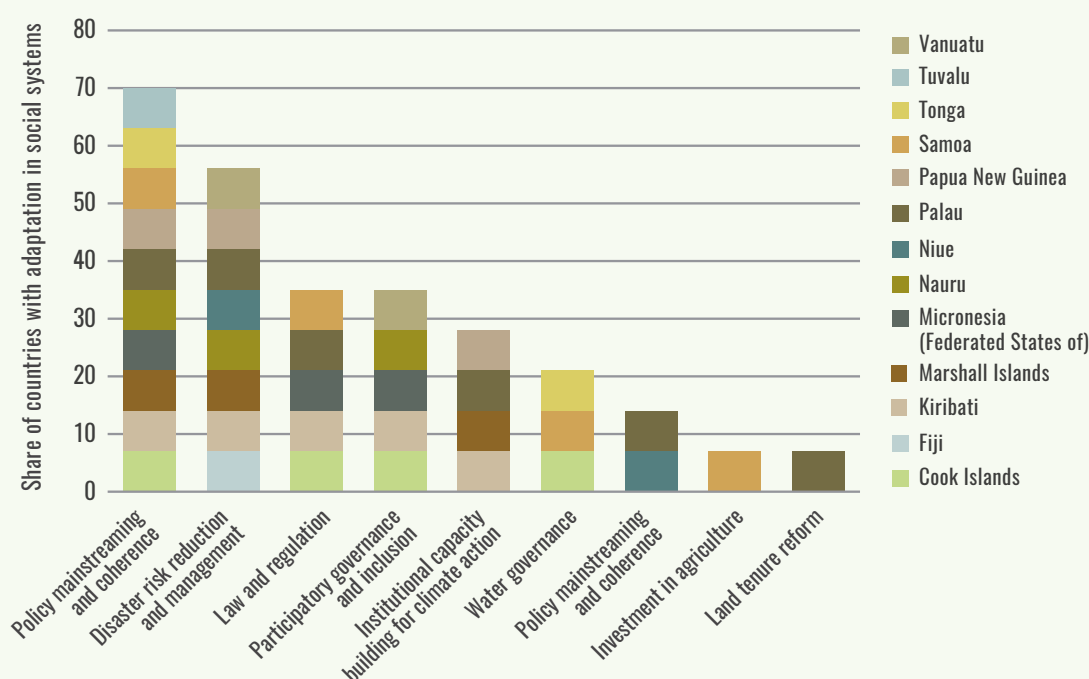
All countries in the Pacific identify at least one adaptation measure in social systems, primarily around the institutions and governance and socio-economics and well-being pillars (93 percent of countries, respectively), followed by the knowledge and capacity pillar (86 percent).

Institutions and governance

Ninety-three percent of countries with adaptation promote measures related to institutions and governance. The majority of those countries promote policy mainstreaming and coherence (71 percent of countries with adaptation measures in social systems), followed by DRR/M (57 percent), participatory governance and inclusion (36 percent) and law and regulation reform (36 percent), and institutional capacity building for climate action (29 percent), amongst others. Figure 38 illustrates the share of countries with one or more (to avoid bias of representation) institutions and governance-related adaptation measures out of countries with adaptation measures in social systems, by intervention option and country.

FIGURE 38.

INSTITUTIONS AND GOVERNANCE- ADAPTATION MEASURES IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE

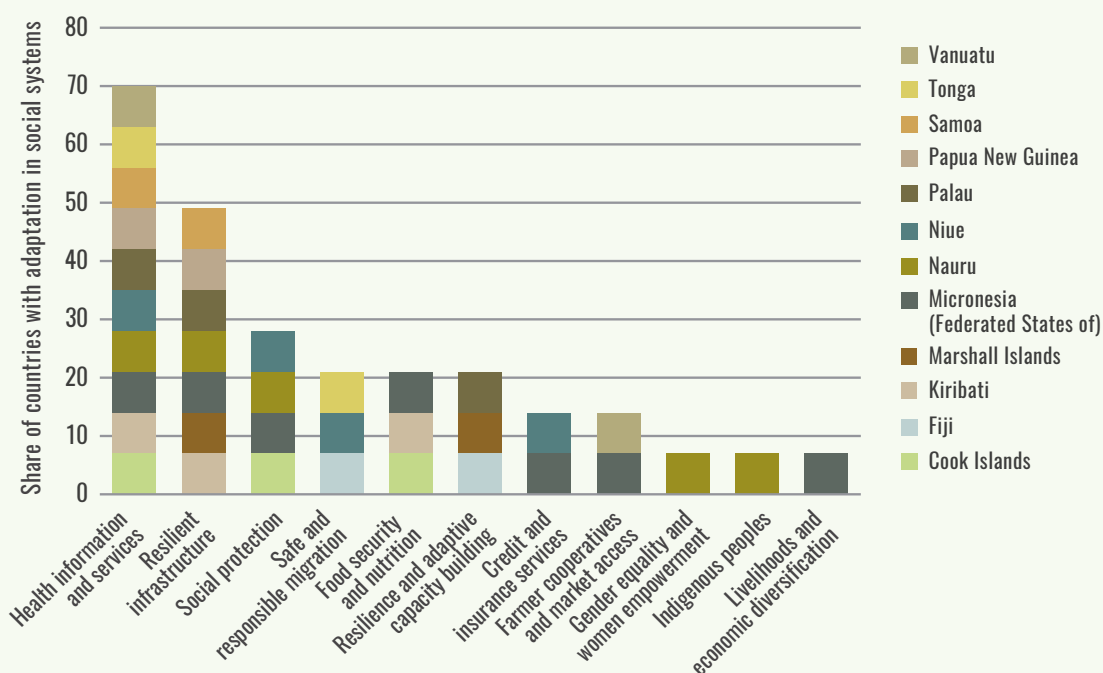


Socio-economics and well-being

Ninety-three percent of countries with adaptation identify measures related to socio-economics and well-being. The majority of those countries promote health information and services (71 percent of countries with adaptation measures in social systems), followed by resilient infrastructure (50 percent), social protection (29 percent), food security and nutrition, safe and responsible migration (21 percent) and resilience and adaptive capacity building (21 percent) and credit and insurance services and farmer cooperatives and services (14 percent, respectively), amongst others. Figure 39 illustrates the share of countries with one or more (to avoid bias of representation) socio-economics and well-being-related adaptation measure out of countries with adaptation measures in social systems, by intervention option and country.

FIGURE 39.

SOCIO-ECONOMICS AND WELL-BEING RELATED ADAPTATION MEASURES IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE

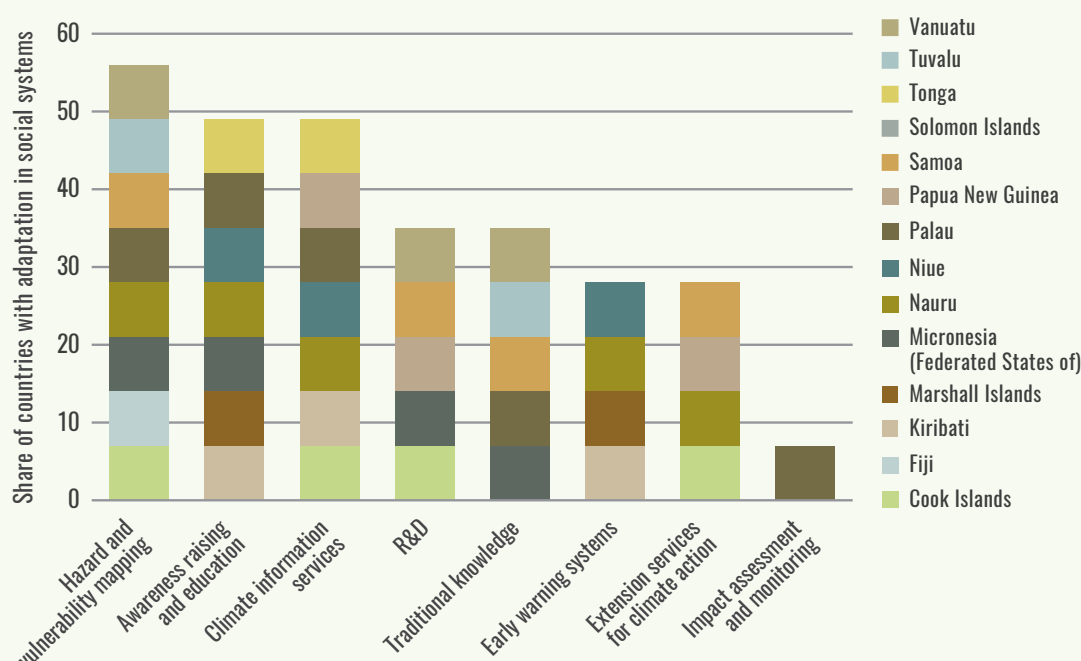


Knowledge and capacity

Eighty-six percent of countries with adaptation identify measures related to knowledge and capacity. The majority of those countries promote hazard and vulnerability mapping (57 percent of countries with adaptation measures in social systems), followed by awareness raising and education (50 percent) and early warning systems and climate information services (50 percent), research and development (R&D) (36 percent) and traditional knowledge (36 percent), extension services for climate action (29 percent) and early warning systems (29 percent), amongst others. **Figure 40** illustrates the share of countries with one or more (to avoid bias of representation) knowledge and capacity-related adaptation measure out of countries with adaptation measures in social systems, by intervention option and country.

FIGURE 40.

KNOWLEDGE AND CAPACITY RELATED ADAPTATION MEASURES IN THE NDCs OF PACIFIC COUNTRIES, BY TYPE



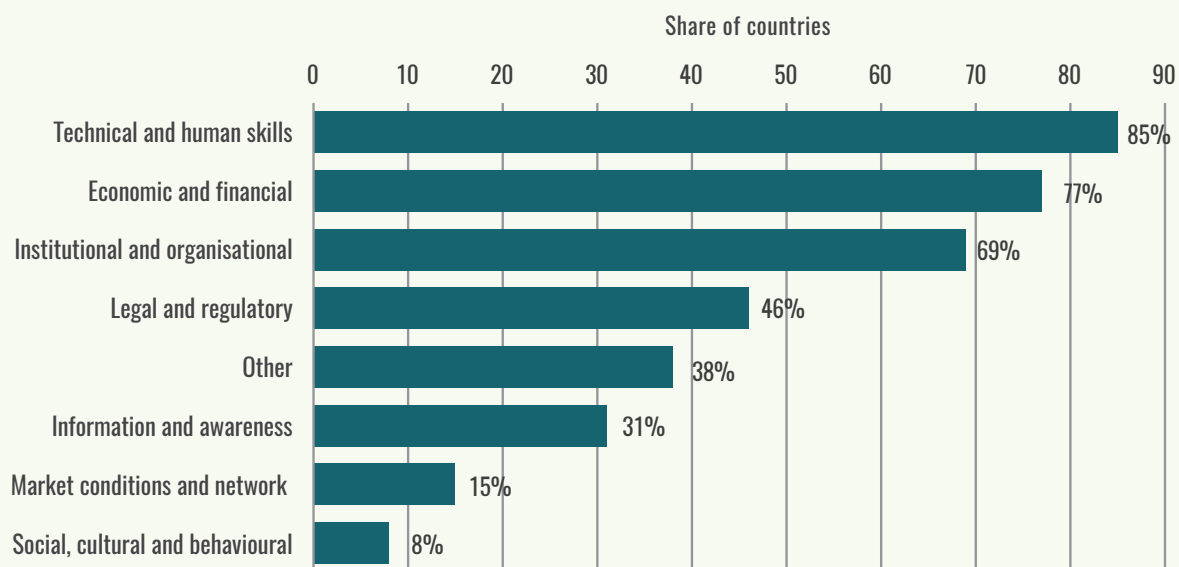
3.3 BARRIERS AND SUPPORT NEEDS

Article 9, 10 and 11 of the Paris Agreement reiterate the obligations of developed countries to support developing country efforts to build clean, climate-resilient futures through the provision of finance, technology and capacity-building support for climate change mitigation and adaptation. This section discusses the different types of support needs communicated by countries in the Pacific, as well as the barriers facing these nations to effectively put in place technologies and policies to achieve their climate goals and targets. Information from the NDCs was supplemented by a comprehensive review of country NCs and the TNAs to identify all support needs and potential barriers to implementation.

3.3.1 Barriers to implementation

Overall, the majority of countries identify lack of technical capacities and human skills, economic and financial constraints and lack of proper institutions and organizations as the three main barriers⁵⁷ to technology transfer and dissemination for climate action in the Pacific. Figure 41 illustrates the share of different barriers that countries have identified to be hindering technological transfer.

⁵⁷ Analyses of the barriers that countries face take their point of departures from the TNAs, which were country assessments on the needs and barriers faced in terms of technology transfer, dissemination and uptake. Information from the TNAs were further supplemented through comprehensive reviews of NDCs and NCs as next steps to identify gaps in information in terms of kind of support required and the barriers faced.

FIGURE 41.**BARRIERS TO CLIMATE ACTION IN THE AGRICULTURE AND LAND USE SECTORS REPORTED IN THE PACIFIC, BY BARRIER TYPE**

Eighty-five percent of the countries in the Pacific region indicate poor technical capacities and human skills to be the main barriers towards technology transfer and dissemination. Cook Islands for example, indicated that several of its agricultural research institutes are yet to incorporate climate data and climate change information into their activities, which can make scope of research less comprehensive when it comes to understanding the risks. Fiji mentioned that there is an overall lack of technical capacities in the country to handle different technologies. In the Marshall Islands, "knowledge, data, and tools pertaining to biophysical, social, and technological elements of risk are not as advanced as with climate change data." Assessments and tools to aid decision makers to make more informed decisions are also limited, in addition to the lack of sector specific data. Niue also highlighted that data is often not robust enough to make specific plans and decisions. Plus, information on climate change is still scarce in many of the sectors. Federal States of Micronesia highlights that while there is a need to build a framework for domestic monitoring and reporting of GHG emissions at both national and state levels, capacity development of experts to handle such technology also needs to be strengthened. Tonga emphasized that there are risks associated with the introduction of new technologies to reduce GHG emissions because in some cases the performance is still unproven.

Seventy-seven percent of countries highlight economic and financial reasons as a major barrier to up taking technology. The reasons are quite general and similar across the region with many stating that they have limited resources to introduce such technologies that have high initial and maintenance costs.

Institutional and organizational barriers are identified by 69 percent of the countries. These include lack of communication and engagement among the different stakeholders at the state, national and local levels, as indicated by Tonga. Solomon Islands highlighted that there is a need to enhance institutional capacities, but this is hindered because of lack of intent at ministerial level to mainstream climate change into the different priorities under different sectors.

Forty-six percent of the countries have also indicated legal and regulatory reasons that affect uptake of technologies. Tonga, for example, mentioned that the country currently has regulations that still favor conventional sources of energy rather than encouraging the introduction and uptake of new and clean technologies.

3.3.2 Capacity building, technology transfer and finance

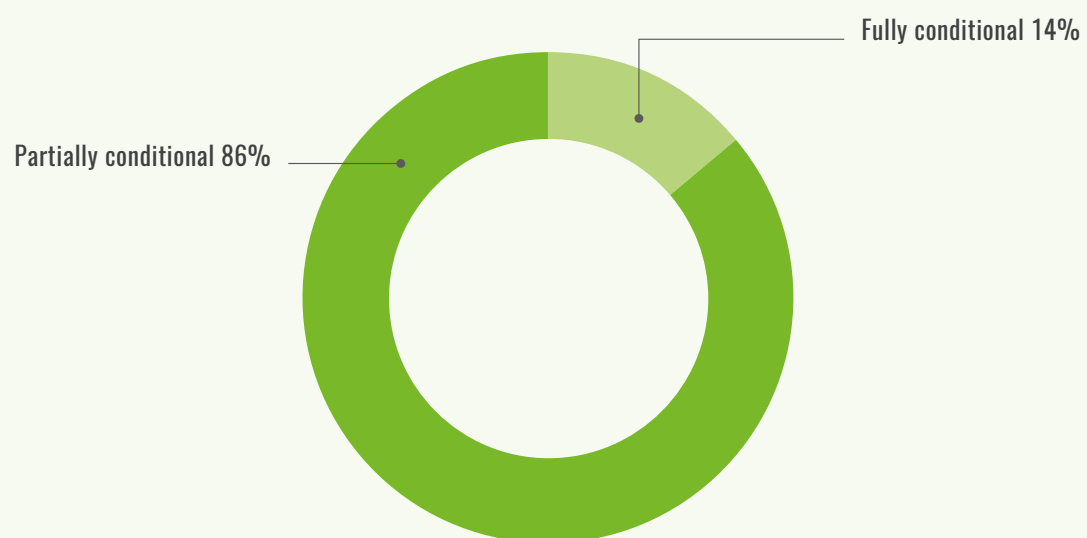
All countries (100 percent) in the Pacific express the need for additional support and resources for implementing their mitigation and/or adaptation contributions in the NDC, including those in the agriculture and land use sector.

Introduction to and transfer of technology to enhance understanding and capacities to address climate change is key to making progress on many of the ongoing and planned climate mitigation and adaptation actions. These technologies and capacity building needs are spread across a wide range of different subsectors, the largest being the ‘general category’, meaning countries want generalized support to build capacities and introduce technologies to better deal with climate change. For example, the Cook Islands envisions to have sustainable institutional arrangements for climate change activities that will include provision of meteorological services, disaster risk management activities, greenhouse gas emission mitigation technologies and activities, and lastly, proper inclusion in the international negotiations. Similarly, the Fiji Islands wants formal training and education to enhance capacities to better understand and handle mitigation and adaptation measures. Likewise, Kiribati also mentioned comprehensive plans for increasing public participation in climate change related activities, development of human capital to better understand and handle risks, improve public access to climate information and lastly, raise awareness through development and implementation of educational programs. Niue wants to strengthen its GHG inventory while also having sound environmentally friendly technologies to reduce GHG emissions.

While many countries in the region identify capacity building needs for specific and limited sectors, Tonga identifies several needs across a wide range of priority areas like crops, livestock and forestry. Overall, it envisions advanced environmental technologies to reduce and monitor emissions. It plans to have better varieties of crops through proper breeding and selection and use drip irrigation technologies to enhance water management. It also wishes to improve the forage quality and nutrient composition of the feeds for its livestock population, in addition to vaccines and probiotics. Soil nutrient and management technology needs and capacity enhancement is also included.

Access to additional financial resources is the preamble to achieving many of the ambitious climate goals and targets. All countries in the region communicate either full or partial conditionality of NDC implementation to external financial support, but not all quantify the respective conditional and unconditional shares. Eighty six percent of countries communicate that NDC implementation is partly conditional to international financial support, while two countries⁵⁸ make their NDC totally conditional to it. Not all countries requiring financial support however, quantify financial needs disaggregated by conditional and unconditional shares. Forty-three percent specify what is conditional, and 36 percent of countries specify what is unconditional. **Figure 42** illustrates the share of countries with NDCs that are fully or partially conditional to the provision of external finance.

⁵⁸ Samoa and Vanuatu.

FIGURE 42.**FINANCIAL CONDITIONALITY OF NDC IMPLEMENTATION IN THE PACIFIC, BY TYPE (SHARE OF COUNTRIES)**

CHAPTER 4

GAPS AND OPPORTUNITIES FOR ENHANCING AMBITION IN THE AGRICULTURE AND LAND USE SECTORS

This section aims to assess the degree to which the mitigation policies and measures in the agriculture and land use sectors align with the major sources of sectoral GHG emissions, and the extent to which the adaptation measures in ecosystems and social systems respond to the major observed and/or projected climate-related hazards, slow onset risks, impacts and vulnerabilities reported.

The results of the mitigation and adaptation “gap” analysis can inform the review and revision of the NDC before the 2020 submission, highlighting the “opportunities” to realign mitigation and adaptation priorities in the agriculture and land use sectors and address the greatest sources of emissions and climate-related vulnerabilities.

4.1 MITIGATION ANALYSIS

This section first projects the counterfactual scenario – or net emissions in the absence of mitigation – and compares it to the mitigation scenario set out in country NDCs. Information from the NDCs is supplemented by information from the NCs. The GHG hotspots in the agriculture and land use sectors are also identified and serve as the reference against which the mitigation policies or measures presented in the NDCs are assessed to find gaps and opportunities for enhancing mitigation ambition in the next round of NDCs.

4.1.1 Counterfactual and mitigation scenarios

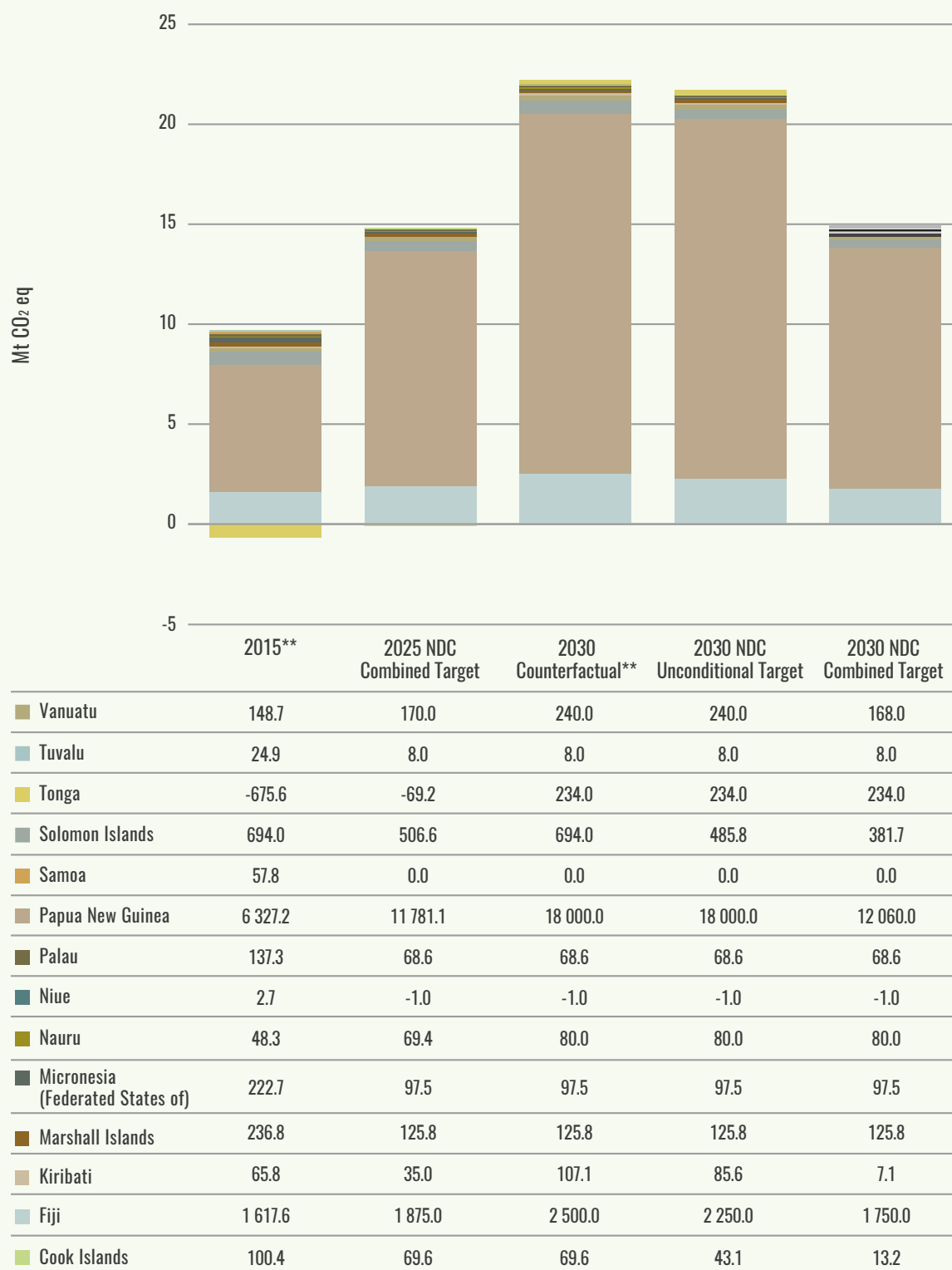
Based on national data reported to the UNFCCC by all 14 countries in the region between 1994 and 2016, the counterfactual and mitigation scenarios are estimated at the country and regional levels and then aggregated at the regional level. The counterfactual scenario, at the country-level, is based on the projected level of net emissions in 2030 that is either reported by the country, or projected by using the average change in regional net emissions estimated by other countries in the region as a proxy. The counterfactual scenarios for each country are then aggregated at the regional level. The mitigation scenario, at the country level, is based on the estimated level of net emissions in 2030 that would result from the GHG reduction target reported by each country in either their NDC or NC. The mitigation scenarios for each country are then aggregated at the regional level. The counterfactual and mitigation scenarios at the regional level can then be further aggregated at the regional level.

Once the counterfactual and mitigation scenarios are established, they can be compared against each other at the aggregate level to quantify the impact of NDC implementation in terms of the percentage of reduction in regional net emissions compared to either a scenario without NDC implementation (i.e. the counterfactual level of emissions in 2030) or the starting point (i.e. the historical level of emissions in 2015).

Without implementation of the NDCs, total net emissions in 2030 are expected to increase by around 150 percent of those reported in 2015, rising from around 9 Mt CO₂ eq. in 2015 to 22.2 Mt CO₂ eq. in 2030. All countries in the Pacific, with the exception of two,⁵⁹ representing 99.8 percent of economy-wide net emissions in the region, set a general GHG target, covering the 2016–2030 period.

Under the mitigation scenario, total net emissions in the region are expected to fall by approximately one-third compared to those projected in the 2030 counterfactual scenario, or from 22.26 Mt CO₂ eq. to 14.9 Mt CO₂ eq. in 2030, of which 95 percent is conditional to international support. The cumulated net emission reduction over the implementation period equates to roughly –34.6 Mt CO₂ eq in 2030. When compared against historical values, net emissions at the regional level are nevertheless estimated to rise by around two-thirds under NDC implementation. **Figure 43** compares the historical net emissions in 2015 to net emission levels in the 2030 counterfactual and 2030 unconditional and combined mitigation scenarios for all countries in the Pacific.

⁵⁹ Nauru and Tonga.

FIGURE 43.**HISTORICAL (2015), COUNTERFACTUAL (2030) AND UNCONDITIONAL AND COMBINED NDC MITIGATION SCENARIOS (2030) IN THE PACIFIC**

* Country without a GHG target where the 2030 counterfactual scenario is projected based on regional emission.

** Estimated based on national data, when available, and linearly interpolated, extrapolated or projected data.

Note: If a country does not set an unconditional target, the counterfactual scenario emission level is determined, assuming the absence of mitigation.

In the agriculture sector, none of the countries in the region set a GHG target. In the LULUCF sector, only one country,⁶⁰ representing however 98 percent of sectoral net emissions in the region, set a GHG target, with a projected cumulated net emission reduction of 107 Mt CO₂ eq. by 2030 compared to the counterfactual scenario.

4.1.2 Greenhouse gas hotspots

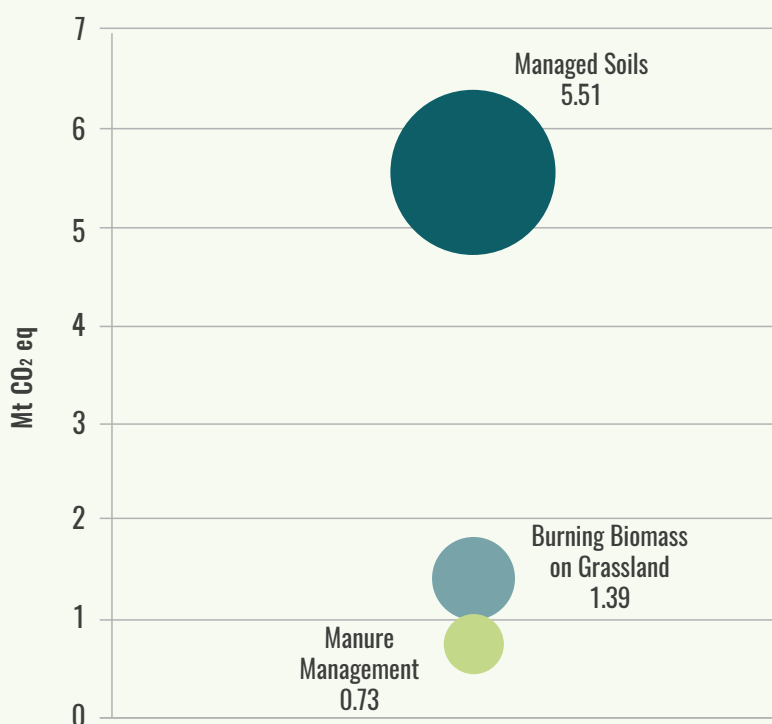
The contribution of the agriculture and LULUCF sector to regional emissions is significant, at around 75 percent. Achieving the 40 percent reduction in the region's economy-wide net emissions, as set forth in countries NDCs (representing 99 percent of the region's current emissions), will depend upon the identification of major source categories and opportunities for cost-effective mitigation. With 79 percent of countries in the region committed to mitigation in the agriculture and/or LULUCF sectors, this section identifies the major emission sources in the agriculture and LULUCF sectors, against which the policies and measures set forth in the NDCs are compared, to inform the gap and opportunity analysis in the section that follows.

For each country, the first and second⁶¹ largest sources of sectoral emissions, or “GHG hotspots,” are identified based on data reported in the NGHGI. They are then aggregated at regional level.

In the agriculture sector, the largest GHG hotspots in the region are emissions from managed soils (58 percent of total agriculture emissions), mostly generated in Papua New Guinea and Fiji, followed by biomass burning on grassland (15 percent), predominantly in Papua New Guinea. The most frequent hotspots amongst countries, however, are emissions from managed soils (57 percent of countries), followed by enteric fermentation (43 percent), manure management (36 percent) while biomass burning on grassland is found in only one country. Figure 44 illustrates the GHG hotspots in the agriculture sector where the size of the bubble corresponds to the amount of Mt CO₂ eq.

FIGURE 44.

GHG HOTSPOTS IN THE AGRICULTURE SECTOR, BY MAJOR CATEGORY



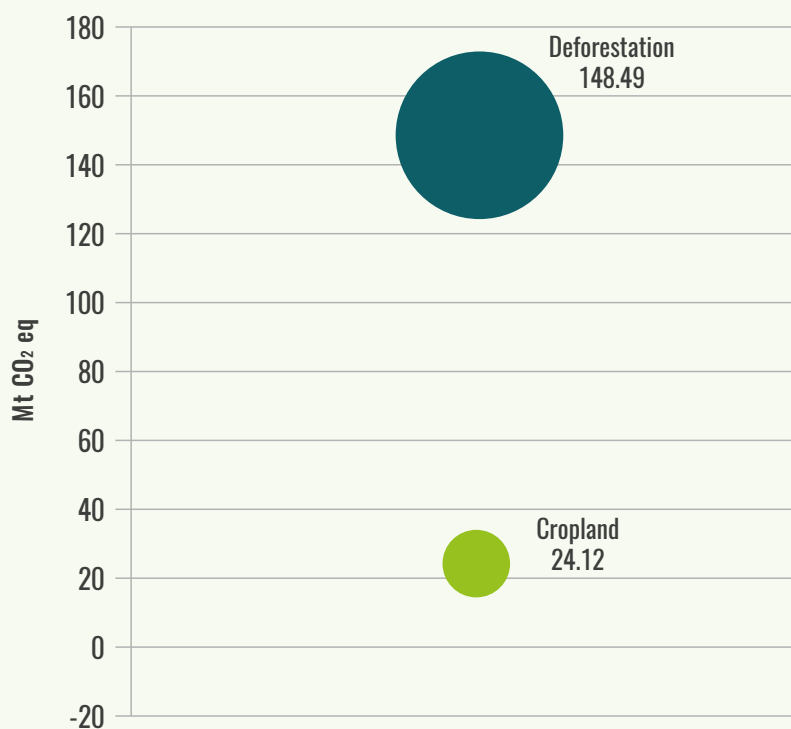
⁶⁰ Papua New Guinea (NC).

⁶¹ Above a 10 percent share.

In the LULUCF sector, the largest GHG hotspots in the region are emissions from deforestation (86 percent of total LULUCF emissions) and cropland (14 percent), both mostly generated in Papua New Guinea (14 percent). The largest hotspots in LULUCF are also those that have the highest frequency amongst countries in the region. **Figure 45** illustrates the GHG hotspots in the LULUCF sector, at the -regional level, where the size of the bubble corresponds to the amount of kt CO₂ eq.

FIGURE 45.

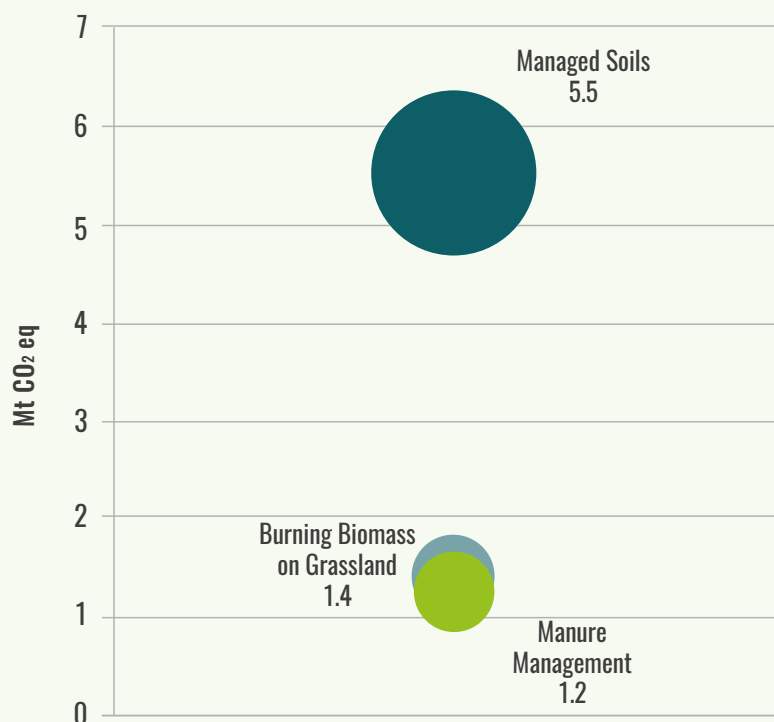
GHG HOTSPOTS IN THE LULUCF SECTOR, BY MAJOR CATEGORY



When emissions from the agriculture and LULUCF sector are combined, the largest GHG hotspots in the region are emissions from managed soils (57 percent of total AFOLU emissions), followed by biomass burning on grassland and manure management (14 and 13 percent, respectively), all mostly generated in Papua New Guinea. **Figure 46** illustrates the GHG hotspots in the AFOLU sector where the size of the bubble corresponds to the amount of Mt CO₂ eq.

FIGURE 46.

GHG HOTSPOTS IN THE AFOLU SECTOR, BY MAJOR CATEGORY



4.1.3 Gaps and opportunities for enhancing mitigation

A gap analysis was performed to assess the degree to which policies and/or measures in the agriculture and land use sectors align with the main sources of sectoral GHG emissions, or GHG hotspots, to illustrate not only current “gaps” but potential “opportunities” for enhancing future NDCs. A Mitigation Matrix was developed to map the alignment between potential policies and/or measures contained in the NDCs and the types of GHG hotspots that could be identified in the agriculture and LULUCF sectors (FAOSTAT, undated). “Policy coverage” refers to when at least one mitigation policy or measure in the NDC aims to reduce emissions or enhance sinks from the GHG hotspot identified in the NGHGI of the individual country. The degree of policy coverage is quantified at the –regional level as the share of countries with at least one mitigation policy or measure that is in line with the GHG hotspot identified. A “policy coverage gap” refers to when there is absence of at least one policy or measure in the NDC aligned with the GHG hotspot identified for the individual country. The gap is quantified at the regional level as the share of countries with a policy coverage gap per GHG hotspot identified (Table 3).

It should be noted that the analysis serves as a broad review of the coverage of mitigation policies or measures mentioned in the NDC and not an assessment of their strength, which should be further assessed in terms of type (e.g. action, policy, project, programme or framework), scale, comprehensiveness and timeframe. The analysis, therefore, serves as an initial stocktaking of policy coverage and does not necessarily indicate effectiveness.

TABLE 3.


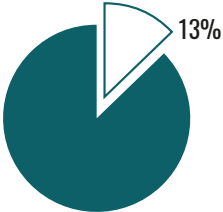
RANGE OF POLICY COVERAGE GAPS IN THE NDC

SCORE	RANGE OF POLICY COVERAGE GAP (% OF COUNTRIES)
VERY HIGH	61 TO 100 PERCENT
HIGH	31 TO 60 PERCENT
MODERATE	10 TO 30 PERCENT
LOW	0 TO 9 PERCENT


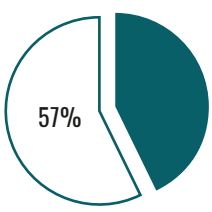
The country-level results are aggregated to the regional level to identify common trends and differences, and are presented per GHG hotspot and ordered by size of gap found. **Annex 5** contain a summary of the country-level gap analysis results and a list of potential mitigation policy and measures, or “opportunities”, per GHG hotspot for each country.

Overall, very high mitigation policy coverage gaps are observed around emissions from manure management, managed soils, enteric fermentation and biomass burning on grassland.⁶² The results of the mitigation policy gap and opportunity analysis are presented per GHG hotspot in the AFOLU sector for which the size of the policy coverage gap is greater than 10 percent regionally, ordered from largest to smallest gap. For each GHG hotspot, its contribution to regional AFOLU emissions is indicated, as well as the share of countries in the region to which the hotspot is associated.

MANURE MANAGEMENT


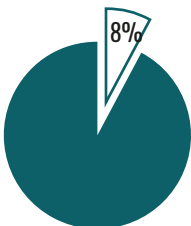
NUMBER OF COUNTRIES WITH HOTSPOT	HOTSPOT SHARE OF AFOLU EMISSIONS	POLICY COVERAGE GAP
		VERY HIGH
36%		

MANAGED SOILS


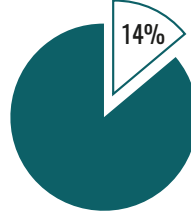
NUMBER OF COUNTRIES WITH HOTSPOT	HOTSPOT SHARE OF AFOLU EMISSIONS	POLICY COVERAGE GAP
		VERY HIGH
57%		

⁶² Only relevant for Papua New Guinea.

ENTERIC FERMENTATION

NUMBER OF COUNTRIES WITH HOTSPOT	HOTSPOT SHARE OF AFOLU EMISSIONS	POLICY COVERAGE GAP
		VERY HIGH
43%		

BIOMASS BURNING ON GRASSLAND

NUMBER OF COUNTRIES WITH HOTSPOT	HOTSPOT SHARE OF AFOLU EMISSIONS	POLICY COVERAGE GAP
		VERY HIGH
7%		

4.2 ADAPTATION ANALYSIS

This section first summarizes the major climate-related hazards, impacts, vulnerabilities and risks in ecosystems and social systems reported in the NDCs, which serve as the reference against which adaptation measures are assessed. Adaptation measures are then qualified by ecosystem service supported, in the case of ecosystems, and social dimension supported, in the case of social systems. The analysis aims to identify gaps and opportunities for enhancing adaptation options in the next round of NDCs.

For each country, the observed and/or projected climate-related hazards, risks and vulnerabilities reported in ecosystems or social systems, or “vulnerability hotspots,” are compared against the set of adaptation priorities or measures set forth in the NDCs at either the ecosystem service level (for ecosystems) or social dimension (for social systems). “Policy coverage” refers to when at least one adaptation measure in a country’s NDC aims to reduce vulnerability and/or increase adaptive capacity in relation to a given vulnerability hotspot. Policy coverage is quantified at the sub-regional level as the share of countries with at least one adaptation measure that addresses a given hotspot. A “policy coverage gap” refers to when there is misalignment between the adaptation priorities or measures presented in a country’s NDCs and a given vulnerability hotspot. A policy coverage gap is the difference between the share of countries with a vulnerability hotspot and the share of countries with policy coverage. The gap is quantified at the sub-regional level as the share of countries with a policy coverage gap out of the share of countries with a vulnerability hotspot (**Table 4**). **Annex 5-6** contains the country-level gap analysis results per vulnerability hotspot for each country.

It should be noted that the analysis serves as a broad review of the coverage of adaptation priority sectors and measures mentioned in the NDC and not an assessment of their strength, which should be further assessed in terms of type (e.g. action, policy, project, programme or framework), scale, comprehensiveness and timeframe. The analysis, therefore, serves as an initial stocktaking of policy coverage and does not necessarily indicate policy effectiveness.

TABLE 4.


RANGE OF POLICY COVERAGE GAPS IN THE NDC


SCORE	POLICY COVERAGE GAP RANGE
VERY HIGH	61 TO 100 PERCENT
HIGH	31 TO 60 PERCENT
MODERATE	10 TO 30 PERCENT
LOW	0 TO 9 PERCENT


4.2.1 Gaps and opportunities in ecosystems

All countries in the Pacific reported climate-related hazards, impacts and vulnerabilities in ecosystems.

Overall, very high adaptation policy coverage gap⁶³ is found around climate-related losses in biological control services, while high gaps are found around climate-related losses in ecosystem services moderating extreme events, soil erosion and reduced genetic diversity and abundance. Moderate gaps are observed in relation to climate-related losses in crops and fisheries provision, reduced nutrient cycling and soil formation, degraded land and soil resources and increased invasion of pests and non-native species in agriculture.

CLIMATE-RELATED ECOSYSTEM HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
REDUCED BIOLOGICAL CONTROL SERVICES		VERY HIGH
	21%	

CLIMATE-RELATED ECOSYSTEM HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
REDUCED MODERATION OF EXTREME EVENTS SERVICES		HIGH
	29%	

CLIMATE-RELATED ECOSYSTEM HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
SOIL EROSION		HIGH
	36%	

⁶³ Policy gaps representing less than a 10 percent share of countries are excluded from the regional analysis.

CLIMATE-RELATED ECOSYSTEM HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
REDUCED GENETIC DIVERSITY AND ABUNDANCE		HIGH
	43%	
CLIMATE-RELATED ECOSYSTEM HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
LOSSES IN FISHERIES PROVISION		MODERATE
	71%	
CLIMATE-RELATED ECOSYSTEM HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
INCREASED INVASION BY PESTS AND NON-NATIVE SPECIES IN AGRICULTURE		MODERATE
	29%	
CLIMATE-RELATED ECOSYSTEM HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
REDUCED NUTRIENT CYCLING AND SOIL FORMATION		MODERATE
	29%	
CLIMATE-RELATED ECOSYSTEM HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
DEGRADED LAND AND SOIL RESOURCES		MODERATE
	71%	
CLIMATE-RELATED ECOSYSTEM HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
LOSSES IN CROPS PROVISION		MODERATE
	57%	

4.2.2 Gaps and opportunities in social systems

All countries in the Pacific reported climate-related hazards, impacts and vulnerabilities in social systems.

Overall, high adaptation policy coverage gaps⁶⁴ are found around climate-related migration and displacement. Moderate gaps are observed in relation to gender and youth inequality, limited knowledge and capacity and loss of productive infrastructure and assets.

CLIMATE-RELATED SOCIAL SYSTEM HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
MIGRATION AND DISPLACEMENT		HIGH
	57%	
CLIMATE-RELATED SOCIAL SYSTEM HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
GENDER AND YOUTH INEQUALITY		MODERATE
	50%	
CLIMATE-RELATED SOCIAL SYSTEM HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
LIMITED KNOWLEDGE AND CAPACITY		MODERATE
	29%	
CLIMATE-RELATED SOCIAL SYSTEM HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
LOSS OF PRODUCTIVE INFRASTRUCTURE AND ASSETS		MODERATE
	71%	

⁶⁴ Policy gaps representing less than a 10 percent share of countries are excluded from the regional analysis.

CHAPTER 5

OPPORTUNITIES FOR LEVERAGING SYNERGIES WITH SUSTAINABLE DEVELOPMENT

The world faces the double challenge of eradicating hunger by 2030 and addressing global climate change at the same time. In 2015, with the adoption of the 2030 Agenda for Sustainable Development and the Paris Agreement, developed and developing countries alike pledged to take ambitious action to end all forms of poverty, fight inequalities, and tackle climate change, ensuring that no one is left behind.

The Paris Agreement rests upon 167 (I)NDCs that reflect the national climate targets, policies and measures of 194 countries,⁶⁵ while the SDGs are defined by 17 goals and 169 targets, which need to be translated into national and subnational plans.

The SDGs and NDCs are interlinked (GIZ and WRI, 2018). Both the 2030 Agenda and the preamble of the Paris Agreement acknowledge the intrinsic relationship between climate change, sustainable development and food security. The 2030 Agenda integrates addressing climate change in its 17 goals and refers to the UNFCCC as the primary international forum for negotiating the global response to climate change. Similarly, the Paris Agreement requires parties to embed climate action “in the context of sustainable development” and acknowledges the “fundamental priority of safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change.”⁶⁶

The challenge is to strike a balance between emission reduction, adaptation and development and poverty reduction priorities, and find policies that co-deliver. Climate change response pathways in developing countries should address the dual need for mitigation and adaptation together, leveraging synergies and reconciling tradeoffs amongst varying objectives. Capturing the co-benefits of mitigation and adaptation in the agriculture sector can also support progress in achieving the objectives of other international agreements, including the Sendai Framework for Disaster Risk Reduction, the United Nations Convention to Combat Desertification and the Convention on Biological Diversity.

⁶⁵ As of March 1, 2019.

⁶⁶ Article 2.1 of Paris Agreement.

Transforming the approach to NDC and SDG implementation from silos to synergies presents an unprecedented opportunity for national governments to leverage progress across both agendas and optimize resources in the path towards low-emissions and climate resilient development.

The Sendai Framework for Disaster Risk Reduction (SFDRR) charts the global course to reducing risk over the next 15 years, with seven targets and four priorities of action. It recognizes the opportunity to enhance coherence and mutual reinforcement across international agreements, to link mechanisms for monitoring and reporting and to promote cooperation in implementation.

This section aims to assess the opportunities for capturing mitigation and adaptation co-benefits within the NDCs, as well as leveraging synergies between climate actions and the sustainable development agenda. It first presents the types of co-benefits explicitly referenced by countries in their NDCs and then looks beyond to the potential co-benefits and synergies that may be generated from climate actions that are not explicitly recognized in the NDCs. It also assesses the links between climate actions in the agriculture and land use sectors and the 2030 Agenda, the SFDRR and the Koronivia Joint Work on Agriculture.

5.1 MITIGATION AND ADAPTION CO-BENEFITS

Mitigation and adaptation in agriculture are closely interlinked through a web of feedbacks, synergies, and tradeoffs. Sustainable food and agriculture systems carry the greatest potential for generating synergies across climate change mitigation and adaptation efforts, as well as significant socio-economic and environmental co-benefits (FAO, 2016d).

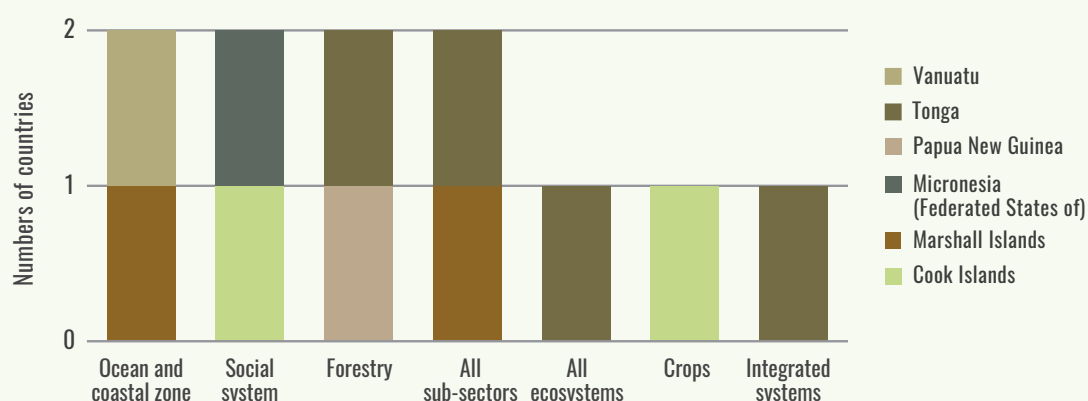
Overall, around 40 percent of countries in the Pacific recognize synergies and/or co-benefits between mitigation and adaptation in the agriculture and land use sectors within their NDCs. The identification of co-benefits can be critical for driving progress across mitigation and adaptation agendas and informing investment options in the agriculture and land use sectors. In order to assess the potential for adaptation and mitigation synergies amongst climate actions that are not explicitly referenced in countries NDCs, the channels by which mitigation and adaptation co-benefits in the agriculture and land use sectors may be generated, as well as potential tradeoffs, are assessed in the mitigation and adaptation measures set forth in country NDCs. A mitigation and adaptation co-benefit matrix was developed (FAO, 2019b) to codify the links between the basket of mitigation and adaptation policies or measures identified, from which approximately 300 potential mitigation and adaptation co-benefits and 30 tradeoffs were generated in the agriculture and land use sectors. The degree of convergence refers to the frequency of adaptation or mitigation co-benefits per mitigation or adaptation measure (and does not reflect how much the measure contribute in absolute terms to achieving a particular outcome). The number of policies or measures with mitigation or adaptation co-benefits is quantified at the country-level and results are aggregated at the regional level.

5.1.1 Mitigation co-benefits of adaptation

In the Pacific, adaptation measures in ocean and coastal zones, social systems and forestry are expected to generate the most mitigation co-benefits amongst adaptation measures in the agriculture and land use sectors, followed by crops and integrated systems. Out of those adaptation measures in ocean and coastal zones, mangrove conservation and replanting and land/soil conservation generate mitigation co-benefits. For instance, the Marshall Islands reference the capacity of mangroves to act as carbon sinks as well as protect water resources and human health. Out of those adaptation measures in social systems, disease management and awareness raising generate the majority of mitigation co-benefits. For instance, Micronesia stresses the benefits associated with raising awareness for the need for adaptation and mitigation, including shifting to renewable energy sources, reduced air pollution, consumption of local and more nutritious food and improved human health. Out of adaptation measures in forestry, reducing deforestation and SFM generate the majority of mitigation co-benefits. **Figure 47** illustrates the number of countries with at least one adaptation measure with mitigation co-benefits explicitly referenced, by land use/sub-sector.

FIGURE 47.

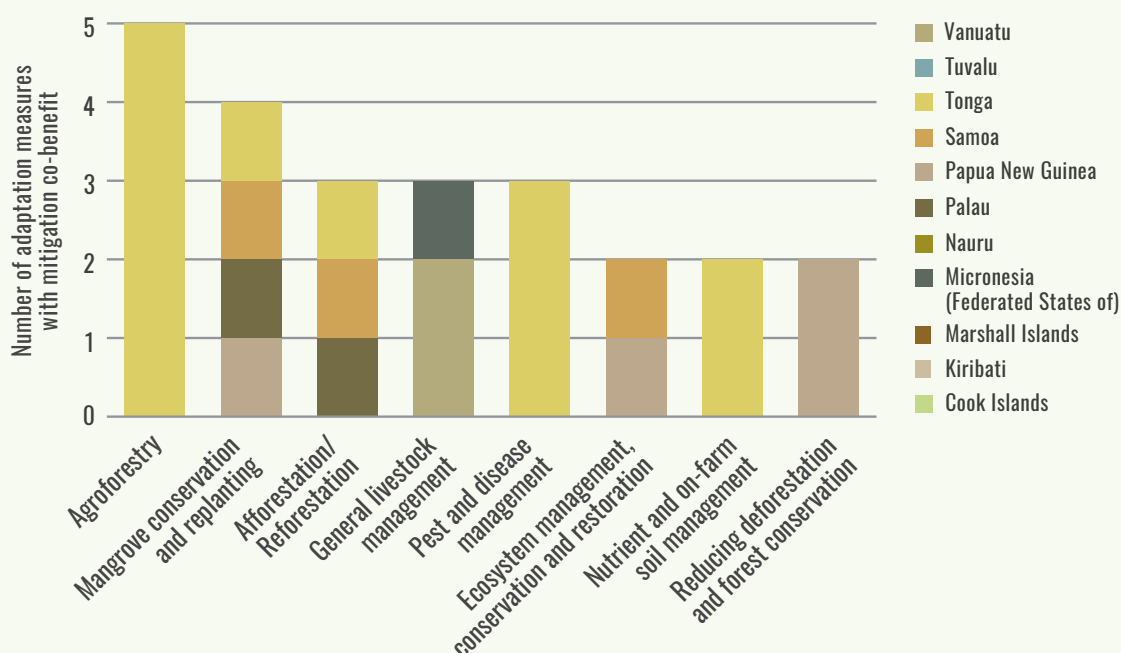
NUMBER OF COUNTRIES WITH EXPLICIT REFERENCE TO THE MITIGATION CO-BENEFITS OF ADAPTATION, BY LAND USE/SUB-SECTOR IN THE NDCs



Looking beyond explicit references, the adaptation measure associated with the greatest number of potential mitigation co-benefits is agroforestry, followed by mangrove conservation and replanting, amongst others. For instance, adaptation measures promoting mangrove conservation and replanting can protect shorelines from coastal erosion and provide habitats for fish species, while at the same time storing atmospheric carbon in biomass stocks. Figure 48 presents the number of adaptation measures with potential mitigation co-benefits, by type of measure.

FIGURE 48.

NUMBER OF ADAPTATION MEASURES IN THE NDCs WITH POTENTIAL MITIGATION CO-BENEFITS, BY TYPE OF MEASURE



5.1.2 Adaptation co-benefits of mitigation

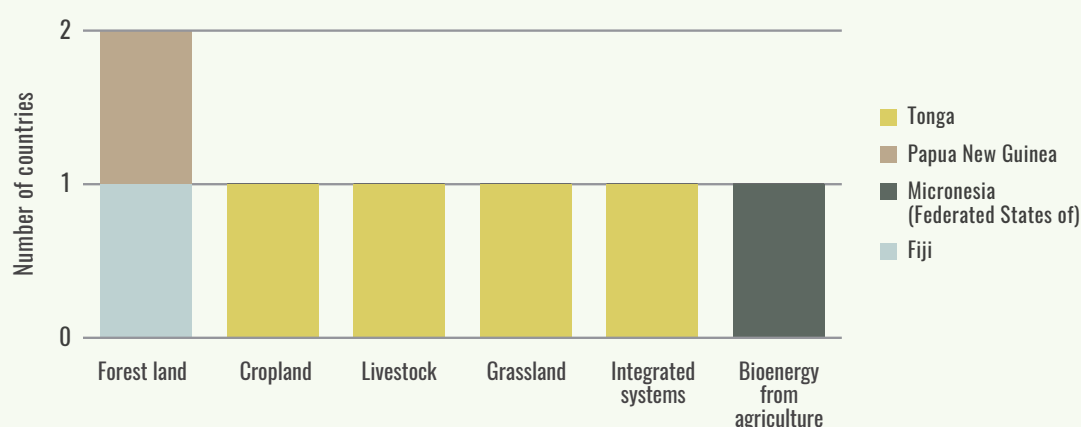
In the Pacific, mitigation measures on forest land are expected to generate the most adaptation co-benefits amongst mitigation measures in the agriculture and land use sectors. Out of those mitigation measures on forest land, reducing deforestation and promoting SFM generate the majority of adaptation

co-benefits in the Pacific. For instance, Papua New Guinea associates forest conservation for mitigation with new employment opportunities, food security benefits, as well as biodiversity conservation. In addition to adaptation co-benefits, some countries acknowledge the opportunity for increased productivity from mitigation. For instance, Tonga references the dual benefits of improved nitrogen management, including increased yields and nitrous oxide emission reductions. **Figure 49** illustrates the number of countries with at least one mitigation measure with adaptation co-benefits explicitly referenced, by land use/sub-sector.

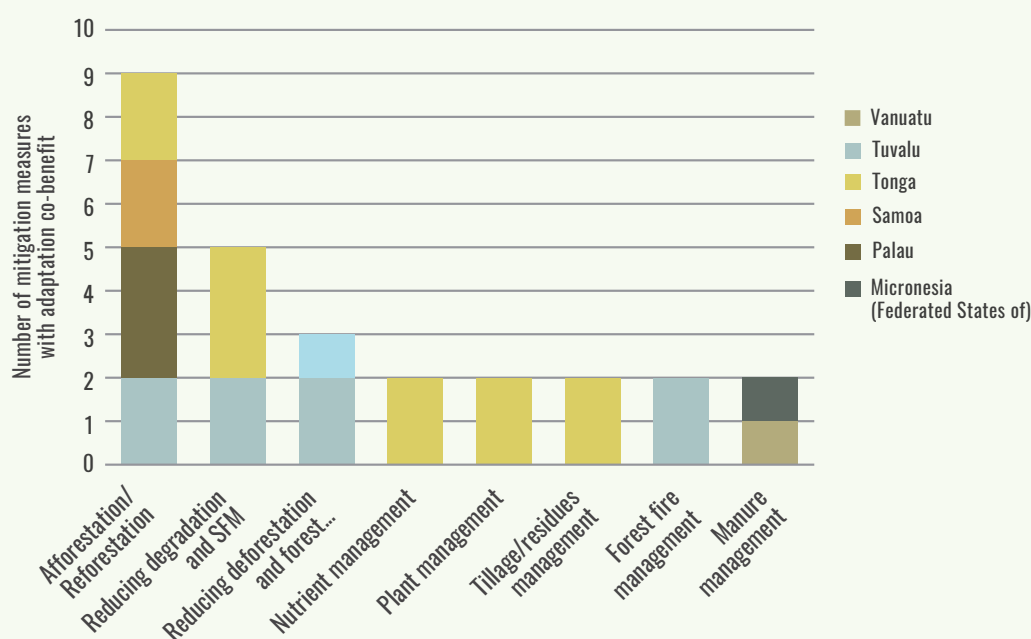
Looking beyond explicit references, the mitigation measure associated with the greatest number of potential adaptation co-benefits is afforestation/reforestation, followed by reducing forest degradation and SFM and reducing deforestation and forest conservation, amongst others. For instance, mitigation measures promoting afforestation/reforestation increase above- and below-ground biomass stocks, which remove carbon from the atmosphere, while simultaneously facilitating the capacity of soils to retain water, reducing floods and contributing to disaster risk reduction. **Figure 50** presents the number of mitigation policies or measures with potential adaptation co-benefits, by type of measure.

FIGURE 49.

NUMBER OF COUNTRIES WITH EXPLICIT REFERENCE TO THE ADAPTATION CO-BENEFITS OF MITIGATION, BY LAND USE/SUB-SECTOR IN THE NDCs

**FIGURE 50.**

NUMBER OF MITIGATION POLICIES OR MEASURES WITH POTENTIAL ADAPTATION CO-BENEFITS, BY TYPE OF MEASURE



5.1.3 Mitigation and adaptation tradeoffs

Reconciling tradeoffs amongst mitigation and adaptation measures is critical to a sustainable transition towards a low-emissions and climate resilient future. A cross-sectoral and long-term approach is necessary for planning climate change responses that support – and do not limit – multiple objectives.

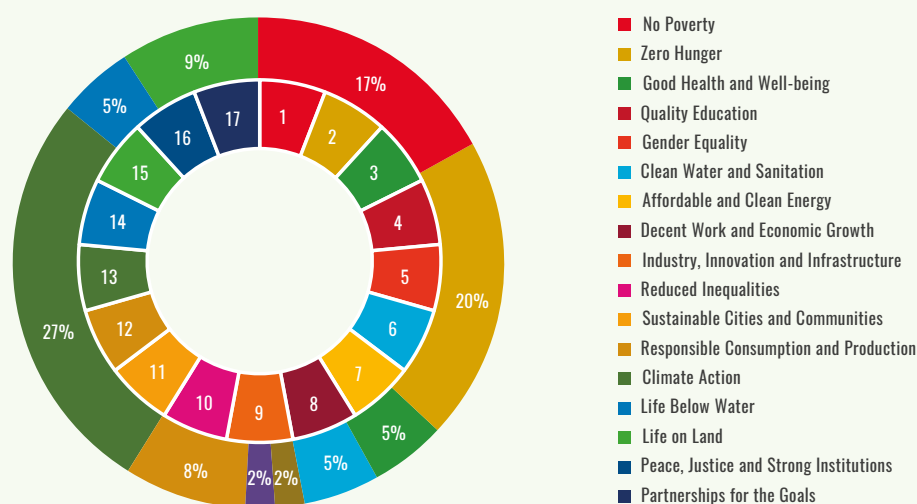
5.2 NATIONALLY DETERMINED CONTRIBUTIONS AND SUSTAINABLE DEVELOPMENT GOALS

The high degree of convergence between the climate and sustainable development agendas⁶⁷ suggests that aligning their implementation provides a great opportunity for national and sub-national governments to accelerate progress across both agendas. Aligning planning and budgetary processes would not only maximize the use of scarce resources, enhance capacities and multiply information and technology sharing opportunities but, most importantly, deliver on countries' adaptation and mitigation commitments in a way that advances development and includes the most vulnerable.

To understand the degree of convergence between “climate actions” in the agriculture and land use sectors communicated by countries in their NDCs and the 17 goals and 169 targets of the 2030 Agenda for Sustainable Development, the sectoral climate actions in the NDCs were mapped against the SDG targets. The variety of mitigation targets, policies and measures and adaptation priorities and measures in the agriculture and land use sectors (collectively referred to as “climate actions”) serve as the data points for the analysis. Overall, around 300 potential data points were derived.

An NDC-SDG matrix was developed to map the alignment between each climate action in the agriculture and land use sectors with one or more SDG targets (FAO, 2019b). A total of 1,500 potential climate action-sustainable development synergies and around 50 potential tradeoffs were generated in the agriculture and land use sectors. The degree of convergence between NDC climate actions in the agriculture and land use sectors and SDG targets was assessed at country level. The degree of convergence refers to the frequency of climate actions per SDG target (and does not reflect how much the climate action contributes in absolute terms to achieving a particular SDG target). The results were aggregated at regional level. **Figure 51** illustrates the area of convergence between climate actions in the agriculture and land use sectors and the SDGs.

⁶⁷ Northrop *et al.* (2016) find that climate actions are aligned with 154 of the 169 SDG targets, particularly around energy, forest, land use and agriculture. Conversely, WRI (2018) finds that 49 targets across 13 SDGs contribute to climate mitigation and adaptation, with greatest potential to generate climate action synergies in agriculture, water, food waste and marine and forest ecosystems, amongst others.

FIGURE 51.**DEGREE OF CONVERGENCE BETWEEN CLIMATE ACTIONS IN THE AGRICULTURE AND LAND USE SECTORS IN THE NDCs AND THE SDGs IN THE PACIFIC**

In the Pacific, the greatest areas of convergence⁶⁸ between climate actions in the agriculture and land use sectors and the SDGs, after SDG 13, are found around:

- ▶ SDG 2 Zero Hunger, particularly target 2.3 “Assure agricultural productivity for marginalized”;
- ▶ SDG 1 No Poverty, particularly target 1.5 “Resilience of poor to climate events”;
- ▶ SDG 15 Life on Land, particularly target 15.1 “Conserve and restore inland ecosystems”;
- ▶ SDG 12 Responsible Consumption and Production, particularly target 12.2 “Efficient use of natural resources”;
- ▶ SDG 14 Life Below Water, particularly target 14.7 “Increase economic benefits of SIDS from fisheries and tourism”; and
- ▶ SDG 6 Clean Water and Sanitation, particularly target 6.3 “Improve water quality and reduce pollution”.

5.3 NATIONALLY DETERMINED CONTRIBUTIONS AND DISASTER RISK REDUCTION LINKS

Climate change adaptation relies on the reduction and management of climate-related disaster risks, as countries are increasingly affected by both incremental climate change and more frequent and severe climate-related disasters. In agriculture, the two streams are strongly interrelated and mutually complementary. The overlaying nature of disaster and climate change impacts on agriculture calls for an integrated approach and working methods that enhance farmers’ resilience to shocks and climate change. Convergence between DRR and climate change adaptation action can bring significant benefits to adaptation, disaster risk reduction and sustainable development.

The SFDRR presents an opportunity to enhance coherence across climate and development agendas and promote cooperation, as appropriate, for linked implementation, monitoring and reporting processes. The SFDRR is a 15-year long, country driven and non-binding agreement that recognizes the importance of integrating systematic efforts and strategies at different levels to prevent new and reduce

⁶⁸ Only convergence above a 10 percent share of climate action-sustainable development pathways are reported in list.

existing disaster risk, by reducing hazard exposure and vulnerability to disaster, increasing preparedness for response and recovery and thus strengthening resilience. The framework is built upon four Priorities for action, which are:

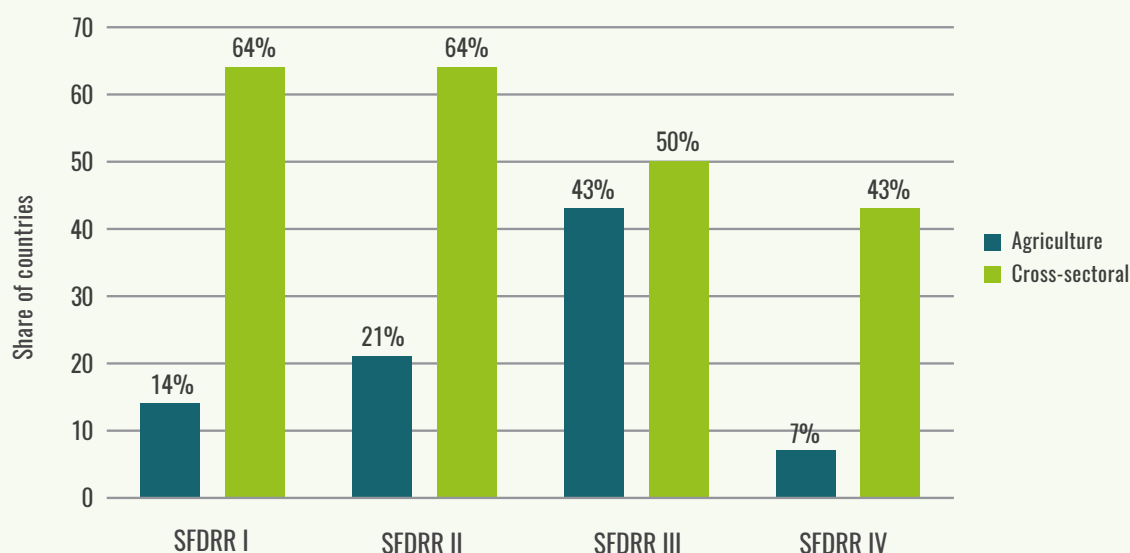
- 1 SFDRR priority for action I: understanding disaster risk;
- 2 SFDRR priority for action II: strengthening disaster risk governance to manage disaster risk;
- 3 SFDRR priority for action III: investing in disaster risk reduction for resilience;
- 4 SFDRR priority for action IV: enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

This section analyzes the degree of alignment of adaptation priorities set forth in country NDCs that also contributes to the Sendai Framework, as per its four priorities for action, to provide a better understanding of how climate change adaptation in the agriculture and land use sector and DRR/M are mutually reinforcing to promote policy coherence.

Overall, all countries in the region promote climate change adaptation measures in the agriculture and land use sectors that hold the potential to contribute to the SFDRR. While in most cases, DRR/M measures are incorporated as a cross cutting theme across different sectors, actions for increasing the resilience of the agriculture sector also feature prominently, especially considering SFDRR III. For example, approximately, 43 percent of the countries have included targeted policies, actions and measures in the agriculture sector. Integration of DRR/M measures to increase climate-risk preparedness in the agriculture sector (SFDRR IV) however received the least priority. **Figure 52** illustrates the share of countries with cross sectoral and/or agriculture related adaptation priorities contributing to the SFDRR, per SFDRR priority for action.

FIGURE 52.

SHARE OF COUNTRIES WITH CROSS-SECTORAL AND/OR AGRICULTURE-RELATED ADAPTATION PRIORITIES IN PACIFIC NDCs CONTRIBUTING TO THE SENDAI FRAMEWORK, PER SFDRR PRIORITY FOR ACTION



5.3.1 SFDRR priority for action I: understanding disaster risk

In order to be able to reduce climate-related risks, a sound understanding of these risks in all its dimensions is necessary. DRR/M and climate change adaptation policies and actions need to be based on a healthy combination of scientific evidence and indigenous knowledge. Sixty-four percent of countries refer to measures to better understand climate related risks while two countries (14 percent) specifically outline measures for better understanding risks in the agriculture sector. The Marshall Islands refers to its own *Joint National Action Plan for Climate Change Adaptation and Disaster Risk Management National Action Plan* which incorporates different adaptation strategies to adapt to the changing climate. The country also highlights the importance of integrating awareness and public education on climate change adaptation and DRR measures at the different levels.

Conducting vulnerability and risks assessments is key to understanding the kind and extent of climate related risks that a country is facing. This features quite prominently across the NDCs of several countries. For example, the Fiji Islands has conducted vulnerability and adaptation assessments for the whole country and, in the short run, aims to develop a comprehensive assessment framework for better understanding the impacts of the changing climate. Nauru also recognizes that there is an urgent need to conduct assessments at different levels in order to understand the different risks facing the country. Vanuatu plans to increase the efficiency and effectiveness of adaptation actions through the development of participatory climate vulnerability and multi sectoral hazard impact assessments. It also aims to strengthen knowledge and understanding by closely linking traditional and scientific information in order to prevent maladaptation. Kiribati has already completed several assessments on understanding coastal vulnerabilities. Tonga recognizes the importance of addressing climate change adaptation, mitigation and DRR/M measures in a more holistic approach to help build resilience in the agriculture and other sectors.

All these assessments are key towards building a strong basis awareness raising and the design of risk-informed policies and measures to reduce the risks of unforeseen disasters.

5.3.2 SFDRR priority for action II: strengthening disaster risk governance to manage disaster risk

Governance is crucial for the implementation of DRR/M and climate change adaptation activities in the agriculture and land use sectors. Strengthening disaster management structures, policies and development plans and the institutional capacity to implement these initiatives are a prerequisite for reducing climate-related risk at national level. About Sixty-four percent of countries have indicated measures for DRR/M across all sectors while 21 percent have integrated actions in their NDCs that are specifically related to the agriculture sector to strengthen risk governance and institutions in the context of climate change.

Efforts to develop or revise climate change related national action plans, laws and strategies at policy and operational levels to improve capacities and coordination mechanisms, both horizontally and vertically, across different institutions and governing bodies received high importance in the NDCs. Several countries are further in the process of integrating or are intending to include DRR/M measures into their existing national strategies. At the regional level exists the *Pacific Island Framework for Action on Climate Change*, with the further intent of integrating DRR/M measures in the next phase of development. More specifically, countries are at different stages of developing their climate change action plans and/or integrating DRR/M measures into existing plans.

Kiribati has already developed a *Kiribati Joint Implementation Plan for Climate Change and Disaster Risk Management* identifying priority adaptation actions and DRR/M measures to increase resilience of the whole country. Tonga refers to its agriculture sector plan (Tonga Agriculture Sector Plan), which has the goal to “increase and sustain resilient agriculture livelihoods”.

In its NDC, Vanuatu reiterates the adaptation priorities as identified in key national documents including the formation of a *National Advisory Body for Climate Change and Disaster Risk Reduction* in order to improve coordination and governance across these two cross cutting themes. Vanuatu also refers to its NAPA which also aims to strengthen climate change and DRR/M measures across five important sectors, which are agriculture and food security, community based marine resource management, sustainable forest management and integrated water resources management.

5.3.3 SFDRR priority for action III: investing in DRR/M for resilience

The negative impact of climate-related disasters on livelihoods and food security can be effectively reduced through investments in DRR and climate change adaptation. Half of all countries in the Pacific have committed towards investing in DRR/M and climate change adaptation measures for developing more climate resilient sectors. Out of these seven, six countries have shown intent to specifically develop a more climate resilient agriculture sector.

The Cook Islands, for example, has developed several strategies and policies for pre and post 2020 agendas that can help the country become more resilient and make a trajectory to a low emissions pathway. However, implementation of these strategies is subject to external funding and support. Good agricultural practices as adaptation to climate change also feature in the NDCs of many countries. Some of these actions include, planting of traditional trees and root crops to reduce soil erosion and land degradation, mangrove reforestation and agriculture rehabilitation programs, and other strategies to develop sustainable and climate resilient agricultural practices and communities.

5.3.4 SFDRR priority for action IV: enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation and reconstruction

Capacities in climate-related disaster preparedness to improve the response to and recovery from extreme weather events are essential to ensure climate-resilient livelihoods. Forty-three percent of the countries in the region aim to enhance climate-related disaster preparedness for effective response. In most cases, only general measures have been outlined highlighting actions that have been put in place or are being intended to be implemented for better response and preparedness. Fiji, in particular, outlines its plans to strengthen its preparedness relocating communities to elevated lands in order to reduce their vulnerability. Kiribati also highlights in its NDC that one of the five priorities of its National Framework for Climate Change and Climate Change Adaptation, namely the need for resettlements of its vulnerable population through overseas migration opportunities as facilitated by government policies and measures.

An important aspect of better preparedness and to respond effectively to any imminent climate risk is the development of early warning systems (EWS). Countries like Fiji and Kiribati commit towards developing effective and efficient EWS for better management of emergencies.

5.4 NATIONALLY DETERMINED CONTRIBUTIONS AND THE KORONIVIA JOINT WORK ON AGRICULTURE

At COP23, Parties adopted decision 4/CP.23 on the Koronivia Joint Work on Agriculture (KJWA), which recognizes the fundamental importance of agriculture in responding to climate change, and calls for joint work between the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI) on specific topics, including through workshops and expert meetings. Between 2018 and 2020, the UNFCCC Secretariat will organize a series of in-session workshops to discuss six topics on agriculture where Parties and observers are invited to submit their views on the subject ahead of each workshop. In November 2020, SB53 will report on the progress and outcomes of the KJWA work to COP26. The decision identifies the following six elements to start the work:

- a. Modalities for implementation of the outcomes of the five in-session workshops on issues related to agriculture and other future topics that may arise from this work;
- b. Methods and approaches for assessing adaptation, adaptation co-benefits and resilience;
- c. Improved soil carbon, soil health and soil fertility under grassland and cropland as well as integrated systems, including water management;

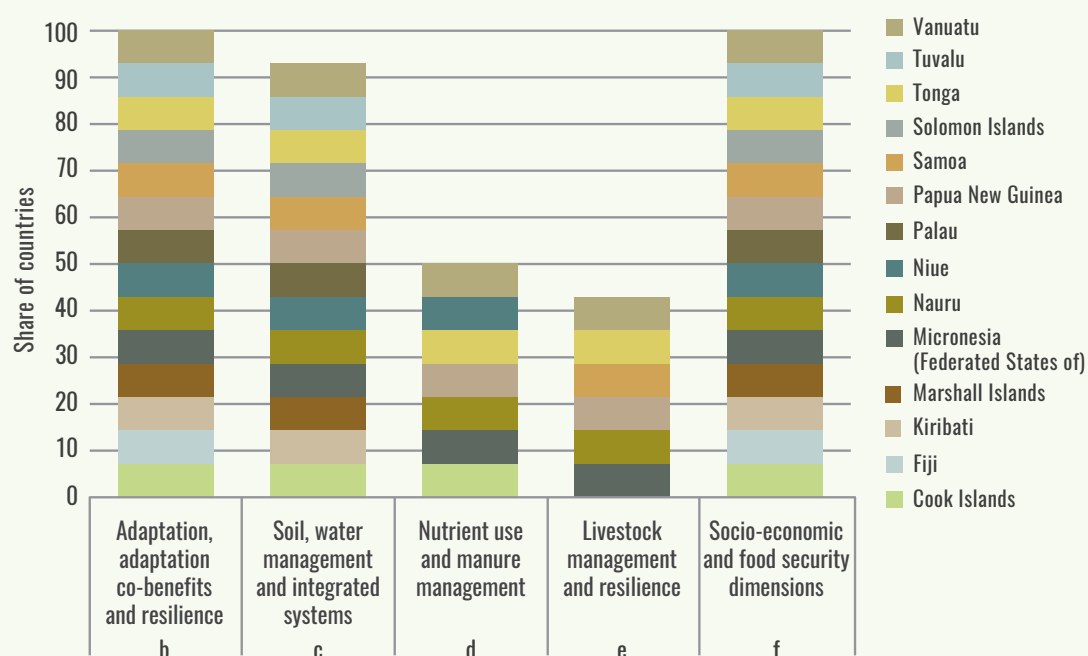
- d. Improved nutrient use and manure management towards sustainable and resilient agricultural systems;
- e. Improved livestock management systems;
- f. Socioeconomic and food security dimensions of climate change in the agricultural sector.

The three-year workplan of the KJWA presents an opportunity for countries to highlight the vulnerabilities of agriculture to climate change and promote responses that reduce sectoral emissions while safeguarding food security (FAO, 2018b). An analysis of the links between NDCs in agriculture and the KJWA points to the extent to which the KJWA presents an opportunity for countries to share views on their mitigation and adaptation priorities already defined in their NDCs. It can also inform the in-session workshops, as well as guide country submissions on the topics. For the sake of this analysis, only topics 2(b) to 2(f) are considered.

Overall, all countries in the Pacific include adaptation and/or mitigation priorities in their NDCs aligned with one or more of the topics under the KJWA. All countries include at least one mitigation or adaptation measure aligned with Koronivia topics 2(b) “Methods and approaches for assessing adaptation, adaptation co-benefits and resilience” and 2(f) “Socio-economic and food security dimensions of climate change in the agricultural sector,” and almost all include a measure linked to topic 2(c) “Improved soil carbon, soil health and soil fertility under grassland and cropland as well as integrated systems, including water management” (93 percent of countries). Around half of all countries in the region include at least one agricultural priority aligned with 2(d) “Improved nutrient use and manure management towards sustainable and resilient agricultural systems” (50 percent) and 2(e) “Improved livestock management systems” (43 percent). Eighty-five percent of the links between agricultural priorities in the NDCs and the KJWA are found in adaptation measures, with mitigation constituting a 15 percent share. **Figure 53** illustrates the share of countries in the Pacific with links between the NDCs and the KJWA, per topic.

FIGURE 53.

LINKS BETWEEN PACIFIC NDCs AND THE KORONIVIA JOINT WORK ON AGRICULTURE, BY KJWA TOPIC

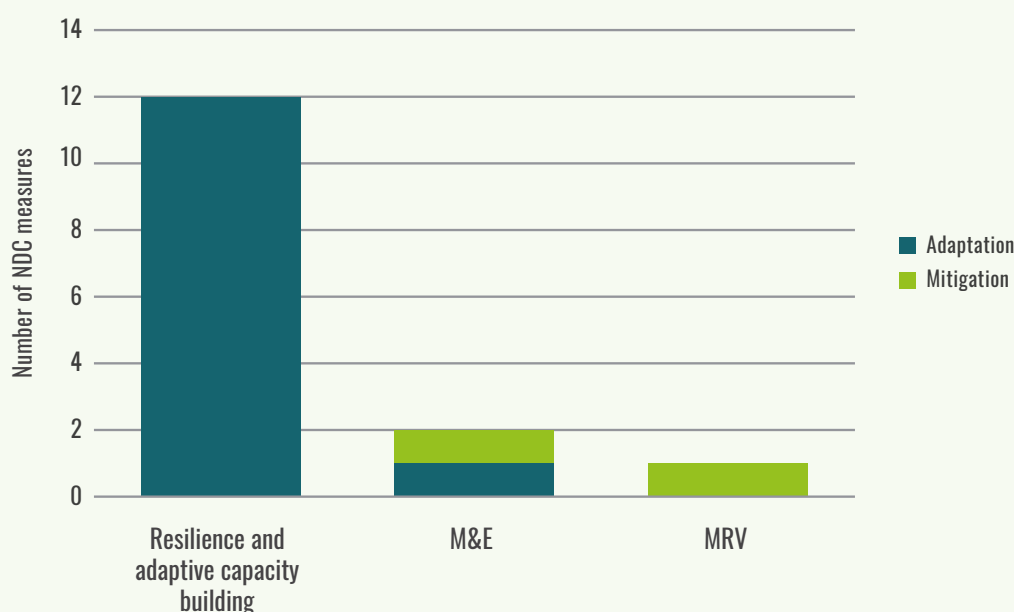


5.4.1 Methods and approaches for assessing adaptation, adaptation co-benefits and resilience (2b)

Amongst links between the NDCs in the region and KJWA topic (b), the majority are found in measures promoting resilience and adaptive capacity building, followed by systems for monitoring and evaluating (M&E) adaptation progress and systems for measuring, reporting and verifying (MRV) mitigation progress. Ninety percent of links between agricultural priorities in the NDCs and KJWA topic (b) are found in adaptation measures, with mitigation constituting the remaining share. **Figure 54** illustrates the distribution of measures found in the NDCs of the region most closely aligned with KJWA topic (b).

FIGURE 54.

NUMBER OF NDC MEASURES IN THE PACIFIC ALIGNED WITH KJWA TOPIC (B)

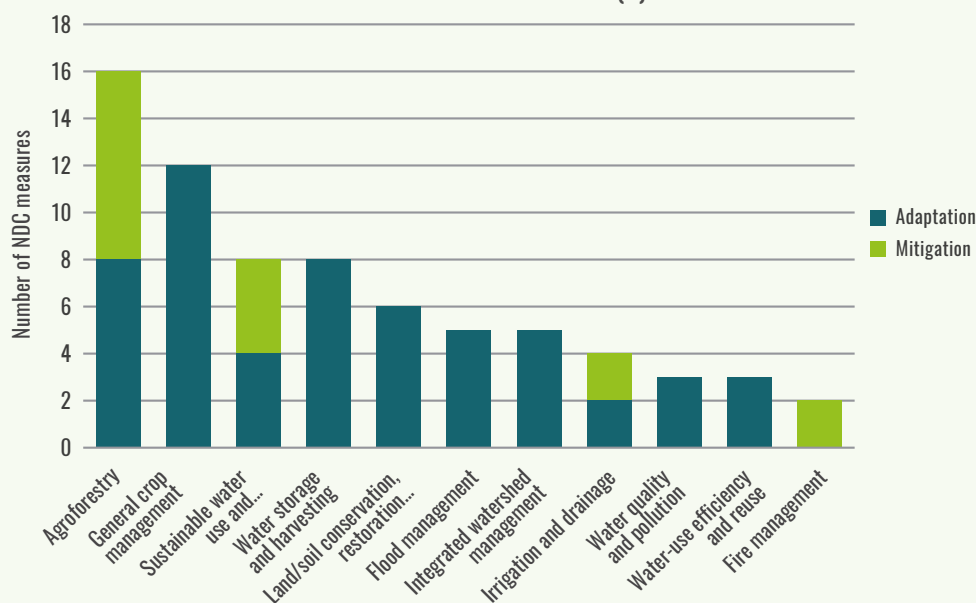


5.4.2 Improved soil carbon, soil health and soil fertility under grassland and cropland as well as integrated systems, including water management (2c)

Amongst links between the NDCs in the region and KJWA topic (c), the majority are found in measures related to agroforestry, followed by crop management, sustainable water use and management in general, water storage and harvesting and land/soil conservation, restoration and rehabilitation, amongst others. Around three-fourths of the links between agricultural priorities in the NDCs and KJWA topic (c) are found in adaptation measures, with mitigation constituting one-fourth. **Figure 55** illustrates the distribution of measures found in the NDCs of the region most closely aligned with KJWA topic (c).

FIGURE 55.

NUMBER OF NDC MEASURES IN THE PACIFIC ALIGNED WITH KJWA TOPIC (C)



5.4.3 Improved nutrient use and manure management towards sustainable and resilient agricultural ecosystems (2d)

Amongst links between the NDCs in the region and KJWA topic (d), the majority are found in measures promoting improved manure management, followed by nutrient and on-farm soil management and tillage/residues management. The links between agricultural priorities in the NDCs and KJWA topic (d) are equally found across mitigation and adaptation measures. Figure 56 illustrates the distribution of measures found in the NDCs of the region most closely aligned with KJWA topic (d).

FIGURE 56.

NUMBER OF NDC MEASURES IN THE PACIFIC ALIGNED WITH KJWA TOPIC (D)



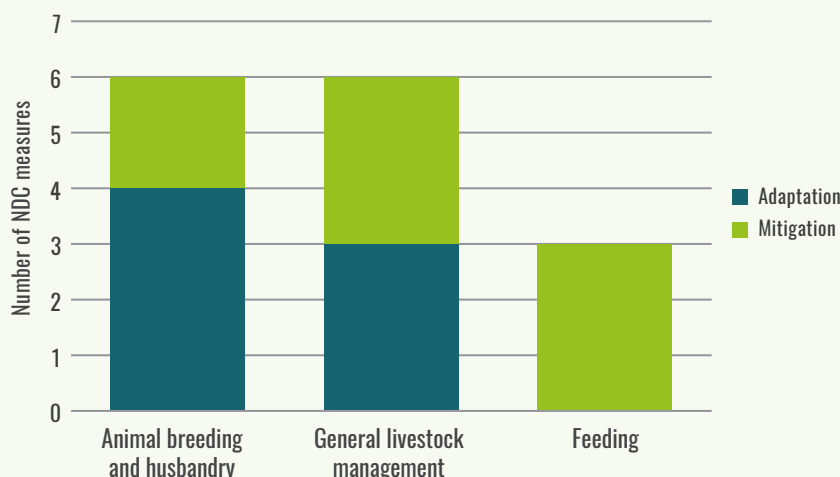
5.4.4 Improved livestock management systems (2e)

Amongst links between the NDCs in the region and KJWA topic (e), the majority are found in measures promoting animal breeding and husbandry and livestock management in general, followed by improved feeding practices. The links between agricultural priorities in the NDCs and KJWA topic (e) are equally found across mitigation and adaptation measures.

Figure 57 illustrates the distribution of measures found in the NDCs of the region most closely aligned with KJWA topic (e).

FIGURE 57.

NUMBER OF NDC MEASURES IN THE PACIFIC ALIGNED WITH KJWA TOPIC (E)

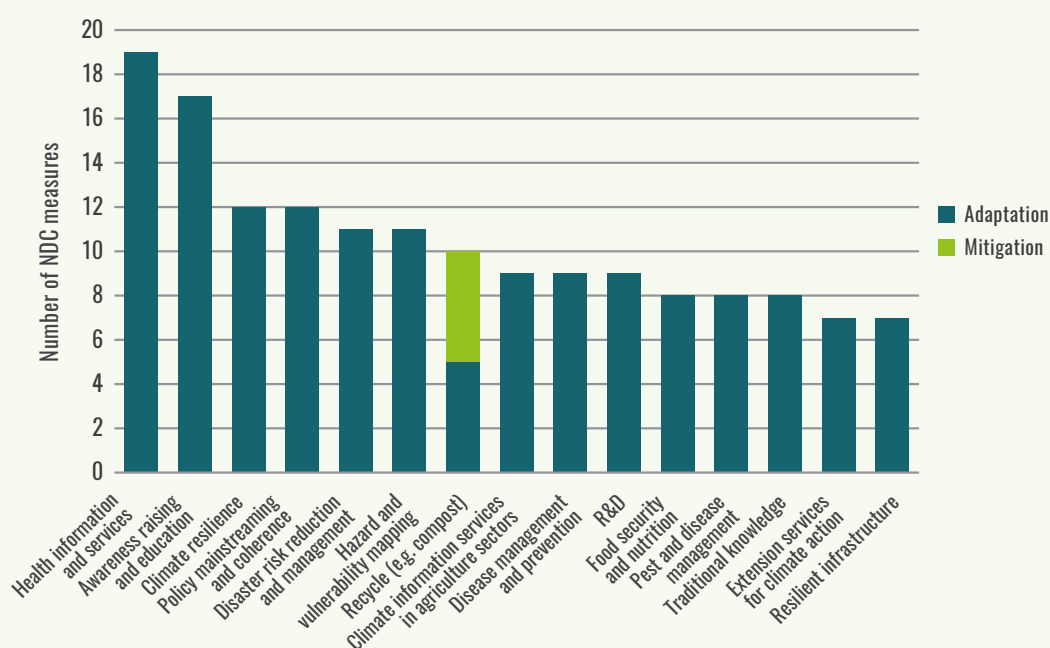


5.4.5 Socioeconomic and food security dimensions of climate change in the agricultural sector (2f)

Amongst links between the NDCs in the region and KJWA topic (f), the majority are found in measures related to health information and services, awareness raising and education, promoting climate resilience, policy mainstreaming and coherence and DRR, amongst others. Over 90 percent of links between agricultural priorities in the NDCs and KJWA topic (d) are found in adaptation measures, with mitigation constituting a small share. **Figure 58** illustrates the distribution of measures found in the NDCs of the region most closely aligned with KJWA topic (e).

FIGURE 58.

NUMBER OF NDC MEASURES IN THE PACIFIC ALIGNED WITH KJWA TOPIC (F)



CHAPTER 6

KEY FINDING AND CONCLUSIONS

While the Pacific region contributes in general less than 0.04 percent to global GHG net emissions,⁶⁹ and are disproportionately impacted by climate change and variability, all countries are committed to mitigation in their NDCs.

Without implementation of the NDCs, total net emissions in 2030 are expected to increase by approximately 150 percent compared to those reported in 2015. All countries in the Pacific, with the exception of three,⁷⁰ representing 99.8 percent of economy-wide net emissions in the region, set a general GHG target.

Under NDC implementation, however, total net emissions are expected to fall by roughly 30 percent compared to the 2030 counterfactual scenario. Ninety-five percent of that reduction is conditional to international support.

The Agriculture, Forestry and Other Land Use (AFOLU) sector constitutes three-fourths of total emissions in the Pacific, representing however less than one percent of sectoral emissions in the Asia and Pacific region as a whole. The majority of agricultural emissions are generated from managed soils. Emissions from the LULUCF sector, on the other hand, are predominantly associated with deforestation.

Seventy-nine percent of countries in the region are committed to mitigation in the agriculture and/or LULUCF sectors, primarily on forest land and the use of agricultural biomass for bioenergy production. Amongst mitigation policies and measures set forth, the majority of countries promote afforestation/ reforestation, reducing deforestation and forest conservation and reducing degradation and SFM, as well as the production of liquid biofuels.

⁶⁹ Refers to 2012 data (WB–Open Data, undated).

⁷⁰ Nauru, Samoa and Tonga.

Increasing droughts and floods are amongst the most frequent climate-related hazards observed and/or projected in the Pacific. Water stress and coastal erosion are the most prominent climate-related slow onset events reported.

Agro-ecosystems are reported as the most vulnerable of ecosystems, particularly crops, marine fisheries and forestry sub-sectors, followed by ocean and coastal zone ecosystems. The most frequently cited ecosystem services impacted by climate change are erosion control, biological control and the maintenance of genetic diversity and abundance.

Consequently, all countries in the region identify adaptation in agriculture, primarily in the marine fisheries, crops and forestry sub-sectors, acknowledging the sector's unique capacity to reduce or avoid climate-related impacts by means of lowering underlying vulnerabilities in agricultural and food systems, strengthening its adaptive capacity and improving its resilience to climatic risks and longer-term climate change.

Mangrove conservation and planting, marine fisheries management and afforestation/reforestation measures are amongst the most frequently promoted as adaptation options.

Water is considered the most vulnerable of natural resources. Around 90 percent of countries identify water resource use and management amongst adaption options, with the majority promoting water storage and harvesting.

Poverty and inequality threaten to exacerbate the vulnerability of populations to climate change. Health is the social dimension most frequently mentioned as at risk under climate change. Consequently, health is presented as the greatest cross-cutting adaptation priority in social systems amongst countries in the region. Over 70 percent of countries promote health information and services, hazard and vulnerability mapping and policy mainstreaming and coherence as adaptation strategies in social systems.

A review of the mitigation and adaptation measures set forth in country NDCs points to a number of policy “gaps,” or “opportunities” for enhancing ambition in the next round of NDCs. Targeting emissions from manure management, managed soils and enteric fermentation presents opportunities for strengthening mitigation ambition. Strengthening adaptation responses to observed and/or projected ecosystem hazards including pests, extreme events, losses of genetic diversity and abundance, soil erosion and losses in fisheries provision present opportunities for raising adaptation ambition. Enhancing the response to migration and displacement and to inequality amongst women and youth, as well as knowledge and capacity development also present opportunities for NDC revision.

More can be done to better specify and quantify both mitigation and adaptation contributions in the NDCs. Of the mitigation policies or measures identified from countries in the region, only around 30 percent have quantified targets, most of which are quantified in terms of GHG emission reductions. The situation for adaptation is even more challenging with only around 3 percent of adaptation measures identified having quantified targets, most likely due to the challenges related to measuring adaptation baselines and outcomes at the local and national scale. Working to better develop policies and measures that can be quantified may result in a range of benefits including improved understanding of potential ambition as well as of trade-offs implied by NDC contributions and needs for additional financial and technical support.

Identifying actions that co-deliver on mitigation and adaptation is critical to achieving climate action at scale, while ensuring that “no one is left behind.” Around 40 percent of countries in the Pacific explicitly recognize synergies and/or co-benefits between mitigation and adaptation in the agriculture and land use sectors within their NDCs. In particular, adaptation measures in ocean and coastal zones, such as mangrove conservation and replanting, and agroforestry are expected to generate the most mitigation co-benefits, while mitigation measures on forest land, such as reducing deforestation, SFM and afforestation/reforestation, are expected to generate the most adaptation co-benefits.

Aligning the climate and sustainable development agenda presents a unique opportunity for countries to co-deliver. The greatest area of convergence between agricultural climate actions in the region and the 2030 Agenda for Sustainable Development, after SDG 13 “Climate Action,” are found around targets 2.3 “Assure agricultural productivity for marginalized,” 1.5 “Resilience of poor to climate events,” 15.1 “Conserve and restore inland ecosystems,” 12.2 “Efficient use of natural resources,” 14.7 “Increase economic benefits of SIDS from fisheries and tourism,” and 6.3 “Improve water quality and reduce pollution.”

There is a need to better link NDCs to the SFDRR, particularly around measures aiming to enhance climate risk preparedness for effective response and recovery in agriculture, such as the development of EWSs in agriculture, and to “Build Back Better” in recovery, rehabilitation and reconstruction in agriculture (SFDRR priority for action IV). There is also a need to understand disaster risk in all its dimensions (SFDRR priority for action I). Conducting vulnerability and risks assessments is key to understanding the kind and extent of climate related risks that a country is facing.

The KJWA presents a historical opportunity for countries to highlight the vulnerabilities of agriculture to climate change and promoting responses that safeguard food security. All countries include at least one mitigation or adaptation measure aligned with Koronivia topics 2(b) “Methods and approaches for assessing adaptation, adaptation co-benefits and resilience” and 2(f) “Socio-economic and food security dimensions of climate change in the agricultural sector. The KJWA presents an opportunity for countries to highlight sectoral needs and priorities, particularly agroforestry, crop management, water storage and harvesting, health information and services and awareness raising and education. While the KJWA does not include specific reference to fisheries and aquaculture, the contribution of the sub-sectors in the region to climate change adaptation and adaptation co-benefits, as well as food security and nutrition, present potential entry-points for expanding the scope of topics 2(b) and 2(c).

The transformational changes needed to place agriculture at the center of climate change and sustainable development responses will only come about if more support is made available, particularly to developing countries. Overall, the majority of countries identify technical capacities, economic and financial constraints and lack of proper institutions and organizations as the three main barriers to technology dissemination and uptake in the Pacific. Strengthening inter-ministerial coordination is key to ensuring coherence across environment, climate change and agricultural priorities. Furthermore, eighty six percent of countries communicate that NDC implementation is partly conditional to international financial support, while two countries⁷¹ make their NDCs totally conditional to it.

By highlighting the gaps in the coverage of mitigation and adaptation in the agriculture and land use sectors, as well as illustrating opportunities for enhancing climate action ambitions in the next round of NDCs, this analysis can serve as an important roadmap for informing policies and directing future investments in support of low-emission, climate-resilient and inclusive agriculture and food systems in the region.

⁷¹ Samoa and Vanuatu.

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ANNEXES

ANNEX 1.

SOURCE OF NATIONAL DATA FOR ANALYSIS

COUNTRY NAME	NDC	NC	BUR	NGHGI	TNA
FIJI	2016				
PAPUA NEW GUINEA	2016		2019		
SOLOMON ISLANDS	2016				
VANUATU	2016	2016			
KIRIBATI	2016				
MARSHALL ISLANDS	2016	2015			
MICRONESIA (FEDERATED STATES OF)	2016	2015			
NAURU	2016	2015			
PALAU	2016	2019			
COOK ISLANDS	2016	2012			
NIUE	2016	2016			2003
SAMOA	2016			2010	
TONGA	2016	2012			
TUVALU	2016	2018			

ANNEX 2.

GENERAL MITIGATION CONTRIBUTIONS IN THE PACIFIC, BY SCOPE, TYPE AND TARGET

COUNTRY	SOURCE	SCOPE OF CONTRIBUTION	TYPE OF CONTRIBUTION	TYPE OF GHG TARGET	2030 UNCONDITIONAL REDUCTION (%)	2030 CONDITIONAL REDUCTION (%)	2030 COMBINED REDUCTION (%)
FIJI	NDC	UNI-SECTORAL	GHG TARGET	BAU	10.00	20.00	30.00
PAPUA NEW GUINEA	NDC	MULTI-SECTORAL	GHG TARGET	BAU	NA	NA	33.00
SOLOMON ISLANDS	NDC	MULTI-SECTORAL	GHG TARGET	BASE YEAR	30.00	15.00	45.00
VANUATU	NDC	UNI-SECTORAL	GHG TARGET	BAU	0.00	30.00	30.00
MELANESIA							
KIRIBATI	NDC	MULTI-SECTORAL	GHG TARGET	BAU	12.80	49.00	61.80
MARSHALL ISLANDS	NDC	MULTI-SECTORAL	GHG TARGET	BASE YEAR	NA	NA	45.00
MICRONESIA (FEDERATED STATES OF)	NDC	UNI-SECTORAL	GHG TARGET	BASE YEAR	28.00*	7.00*	35.00*
NAURU	NDC	UNI-SECTORAL	ACTION ONLY	NA	NA	NA	NA
PALAU	NDC	MULTI-SECTORAL	GHG TARGET	BASE YEAR	NA	NA	22.00*
MICRONESIA							
COOK ISLANDS	NDC	UNI-SECTORAL	GHG TARGET	BASE YEAR	38.00	43.00	81.00
NIUE	NDC	UNI-SECTORAL	GHG TARGET	BASE YEAR	57.14*	90.48*	147.62*
SAMOA	NDC	UNI-SECTORAL	ACTION ONLY	BASE YEAR	0.00*	100.00*	100.00*
TONGA	NDC	MULTI-SECTORAL	ACTION ONLY	NA	NA	NA	NA
TUVALU	NDC	MULTI-SECTORAL	GHG TARGET	BASE YEAR	NA	NA	60.00*
POLYNESIA							

* GHG target set for year 2025. Calculated based on reported data.

ANNEX 3.

NATIONAL MITIGATION CONTRIBUTIONS IN THE AGRICULTURE SECTOR, BY TYPE AND TARGET

COUNTRY	SOURCE	TYPE OF CONTRIBUTION	TYPE OF GHG TARGET	2030 UNCONDITIONAL REDUCTION (%)	2030 CONDITIONAL REDUCTION (%)	2030 COMBINED REDUCTION (%)
FIJI	NC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
PAPUA NEW GUINEA	NDC	NO CONTRIBUTION	NA	NA	NA	NA
SOLOMON ISLANDS	NC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
VANUATU	NC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
MELANESIA						
KIRIBATI	NC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
MARSHALL ISLANDS	NC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
MICRONESIA (FEDERATED STATES OF)	NC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
NAURU	NDC	NO CONTRIBUTION	NA	NA	NA	NA
PALAU	NDC	NO CONTRIBUTION	NA	NA	NA	NA
MICRONESIA						
COOK ISLANDS	NDC	NO CONTRIBUTION	NA	NA	NA	NA
NIUE	NDC	NO CONTRIBUTION	NA	NA	NA	NA
SAMOA	NDC	NO CONTRIBUTION	NA	NA	NA	NA
TONGA	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
TUVALU	NDC	SECTOR INCLUDED IN GENERAL CONTRIBUTION ONLY	NA	NA	NA	NA
POLYNESIA						

ANNEX 4.**NATIONAL MITIGATION CONTRIBUTIONS IN THE LAND USE, LAND USE CHANGE AND FORESTRY (LULUCF) SECTOR, BY TYPE AND TARGET**

COUNTRY	SOURCE	TYPE OF CONTRIBUTION	TYPE OF GHG TARGET	2030 UNCONDITIONAL REDUCTION (%)	2030 CONDITIONAL REDUCTION (%)	2030 COMBINED REDUCTION (%)
FIJI	NDC	POLICIES OR MEASURES (ADDITIONAL)	BAU	NA	NA	NA
PAPUA NEW GUINEA	NDC	GHG TARGET	NA	NA	NA	NA
SOLOMON ISLANDS	NDC	SECTOR INCLUDED IN GENERAL CONTRIBUTION ONLY	NA	NA	NA	NA
VANUATU	NDC	POLICIES OR MEASURES (ADDITIONAL)	NA	NA	NA	NA
MELANESIA						
KIRIBATI	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
MARSHALL ISLANDS	NDC	POLICIES OR MEASURES (ADDITIONAL)	NA	NA	NA	NA
MICRONESIA (FEDERATED STATES OF)	NDC	NO CONTRIBUTION	NA	NA	NA	NA
NAURU	NDC	NO CONTRIBUTION	NA	NA	NA	NA
PALAU	NC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
MICRONESIA						
COOK ISLANDS	NDC	NO CONTRIBUTION	NA	NA	NA	NA
NIUE	NDC	NO CONTRIBUTION	NA	NA	NA	NA
SAMOA	NC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
TONGA	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
TUVALU	NDC	NO CONTRIBUTION	NA	NA	NA	NA
POLYNESIA						

Annex 5-7 can be found online at <http://>

This report provides a unique, sector-specific synthesis of the NDCs from the Pacific. It summarizes the substantial contributions already put forward by countries, opportunities for further action and the gaps, barriers and needs that will need to be addressed if the agriculture sector in the Pacific is to raise mitigation and adaptation ambitions. The findings of this report will help member countries to reflect on their progress in advancing toward NDC priorities for agriculture and associated national climate goals including related targets under the Sustainable Development Goals (SDGs).

The analysis also helps to make clear the links between the NDCs from the region and the ongoing work of the United Nations Framework Convention on Climate Change in support of the Koronivia Joint Work on Agriculture (KJWA). Finally, the report serves as a guide to FAO, as well as other international actors, of the support that will be required to help countries in the region move forward to implement agriculture sector priorities in their NDCs and ensure that future commitments from the agriculture sector are quantifiable, verifiable and sufficiently ambitious.

Climate and Environment Division (CBC)

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