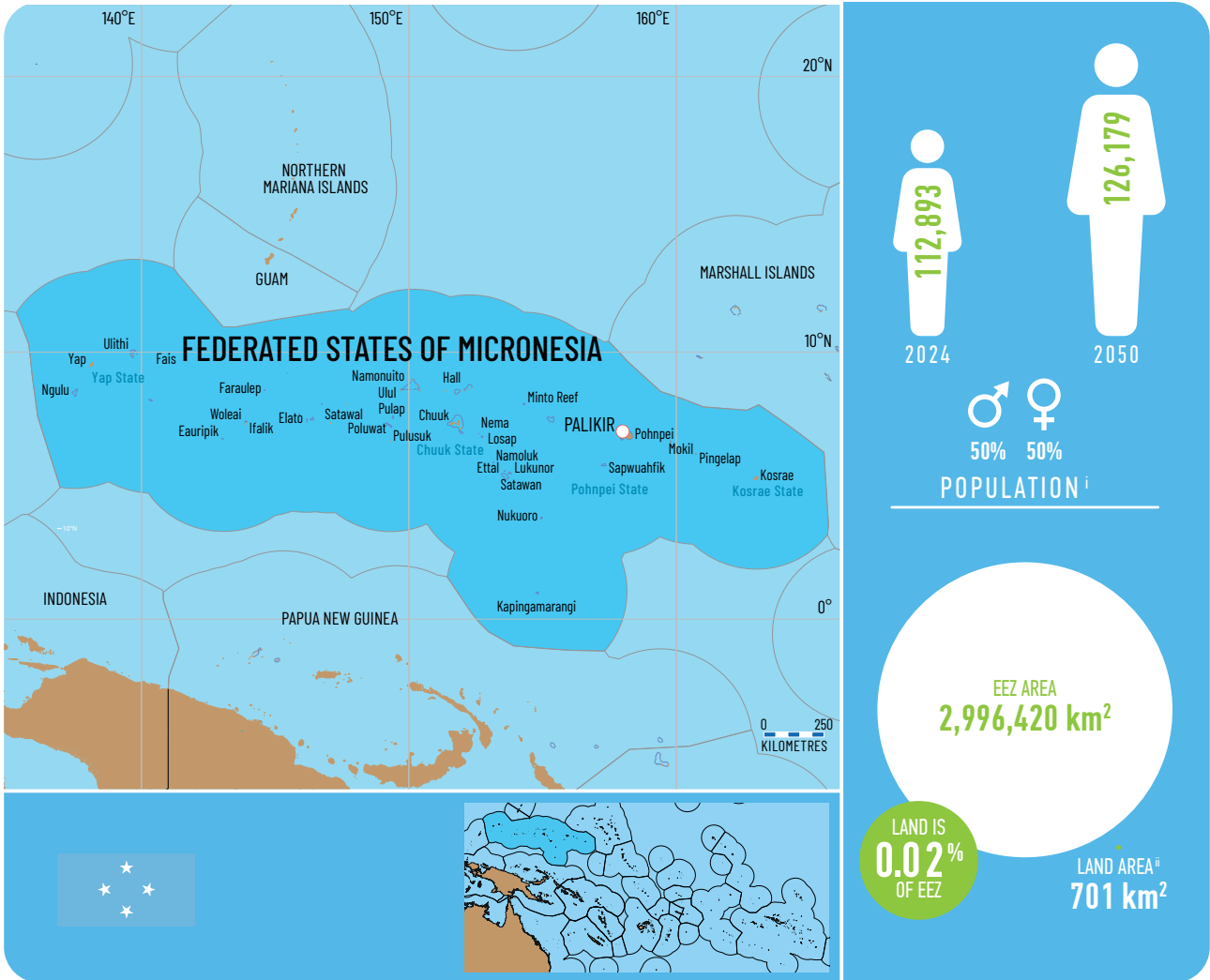


FEDERATED STATES OF MICRONESIA



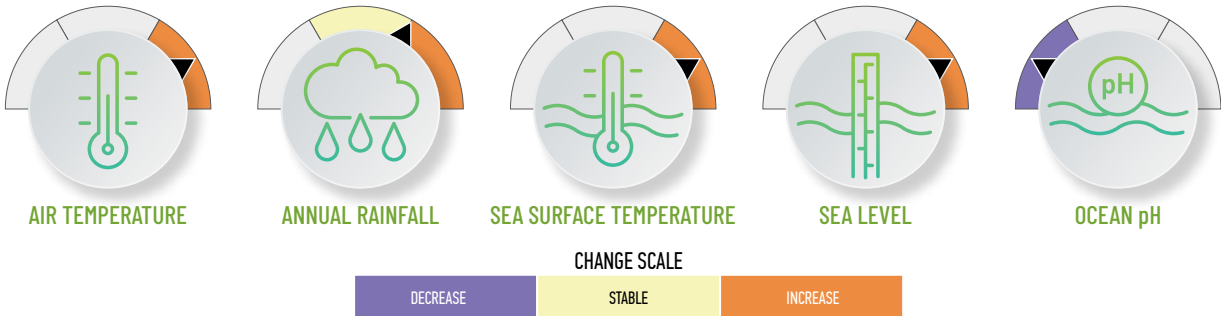


FEDERATED STATES OF MICRONESIA

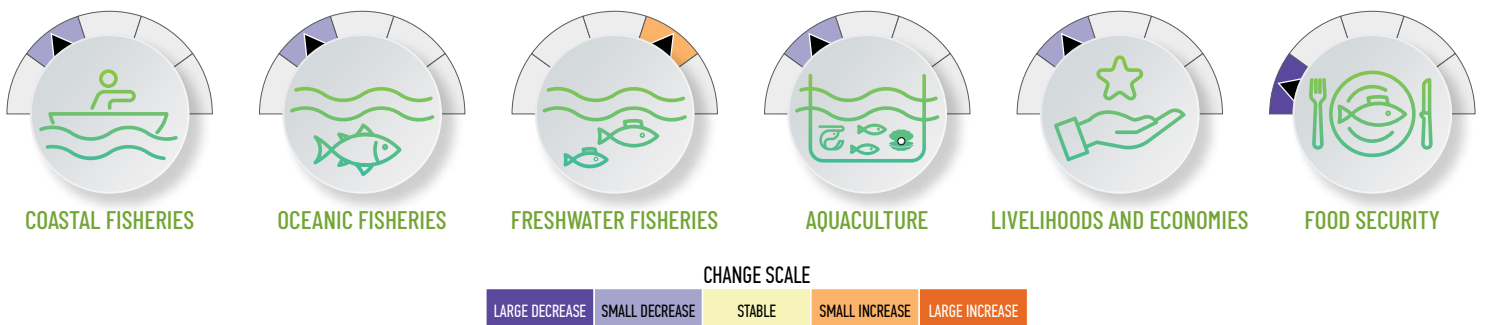


SUMMARY OF CLIMATE CHANGE PROJECTIONS

2050



SUMMARY OF CLIMATE CHANGE IMPLICATIONSⁱⁱⁱ



ⁱ Data source: SPC Pacific Data Hub <https://pacificdata.org/population-dashboard>

ⁱⁱ Data source: SPC Statistics for Development Division <https://sdd.spc.int>

ⁱⁱⁱ Relative to the Reference Periods 2010–2020 for coastal fisheries and 1980–2010 for oceanic fisheries.

RECOMMENDED ADAPTATION ACTIONS

These recommended adaptations are based on the key vulnerabilities and implications of climate change for fisheries and aquaculture (further details in Chapter 10) and should be initiated or strengthened. A range of supporting policies are provided in Table 10.1 for decision-makers to select those that are most appropriate to their context and priorities. Central to all future adaptation are the following principles:

1. Strengthen data collection by improving (or establishing) national fisheries and aquaculture monitoring systems linked to management decision-making.
2. Integrate local knowledge to inform adaptation actions for coastal and freshwater ecosystems, food security, and cultural heritage. Equity - especially gender equity – and social inclusion need to be a key focus.
3. Implement effective governance, including through community-based management and scaling-up of successful initiatives, to ensure adaptation actions reflect local needs and priorities.
4. Diversify and secure funding to support national- and community-level actions, alongside capacity building to sustain adaptation initiatives.



Food and nutrition security

Recommended adaptations

Food and Nutrition 1: Implement sustainable ecosystem-based approach to fisheries management

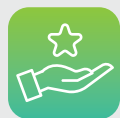
Food and Nutrition 2: Sustain the production of coastal fish and invertebrates through context-specific management

Food and Nutrition 4: Diversify blue food production systems

Food and Nutrition 5: Promote the use of oceanic catches to fill the gap in aquatic resources needed for food and nutrition security

Food and Nutrition 6: Improve post-harvest preservation methods for fish and invertebrates to prepare for sudden shocks

Food and Nutrition 7: Promote education and awareness on the importance of protecting aquatic habitats, species and the foods they supply



Sustainable livelihoods

Recommended adaptations

Livelihoods 1: Diversify aquaculture commodities and develop new farmed climate-resilient species, strains and varieties

Livelihoods 2: Apply innovative technologies and climate-smart tools for pond aquaculture and mariculture

Livelihoods 3: Diversify production of fisheries and aquaculture commodities

Livelihoods 5: Develop sustainable marine and coastal tourism



Economies and government revenue

Recommended adaptations

Economic Revenue 1: Implement climate-informed fisheries management

Economic Revenue 2: Develop policies and strategies that integrate climate change implications into fisheries and aquaculture management

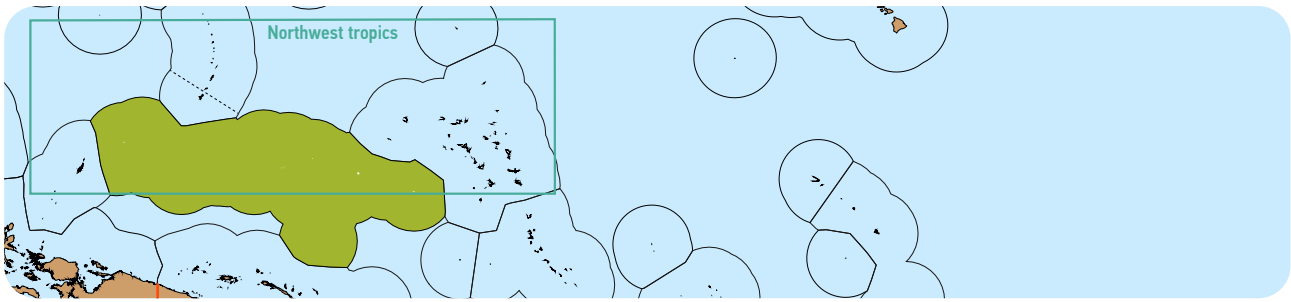
Economic Revenue 3: Implement energy efficiency programs for fisheries and aquaculture

Economic Revenue 4: Promote improved safety at sea

Economic Revenue 5: Maintain the contribution of fisheries and aquaculture to government revenue and economies

Economic Revenue 6: Climate-proof infrastructure

Projected changes in atmospheric and oceanic climate



FSM is in the Northwest Pacific Convergence climate zone. It is expected to experience the following climate changes by 2050 under a medium greenhouse gas emissions scenario (SSP2-4.5) and a high emissions scenario (SSP5-8.5)^{iv}, relative to 1995–2014 baseline (further details in Chapter 2).



AIR TEMPERATURE



RAINFALL



SEA SURFACE TEMPERATURE



SEA LEVEL



OCEAN pH

2050	MEDIUM EMISSIONS (SSP2-4.5)	+0.7 to +1.1 °C	-2.3 to +5.5 %	+0.6 to +1.1 °C	+0.1 to +0.3 m	-0.1
	HIGH EMISSIONS (SSP5-8.5)	+0.9 to +1.6 °C	-2.8 to +6.4 %	+0.8 to +1.5 °C	+0.2 to +0.4 m	-0.1
	CONFIDENCE ^v	HIGH	MEDIUM	HIGH	HIGH	HIGH

FSM is also expected to experience the following changes to regional climate processes by 2090 under a medium and high greenhouse gas emissions scenario, relative to 1995–2014 baseline.



TROPICAL CYCLONES



EL NIÑO SOUTHERN OSCILLATION (ENSO)



MARINE HEATWAVES

2090	MEDIUM EMISSIONS (SSP2-4.5)	Decrease in frequency; Increase in intensity	ENSO will continue as a source of interannual variability; La Niña and El Niño extremes are projected to increase	2–9 times more frequent (global projection)
	HIGH EMISSIONS (SSP5-8.5)			3–15 times more frequent (global projection)
	CONFIDENCE ^v	LOW TO MEDIUM	LOW	N/A



OCEAN CIRCULATION



OCEAN STRATIFICATION



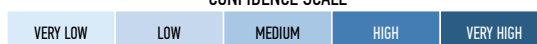
OCEAN OXYGEN CONTENT



NITRATE CONCENTRATION

2090	MEDIUM EMISSIONS (SSP2-4.5)	Intensification and poleward extension of northern and southern hemisphere subtropical gyres		-6.6 %	-0.60 mmol/m ³
	HIGH EMISSIONS (SSP5-8.5)		+0.58 kg/m ³ (between 0 and 200 m); Mixed layer depth shoals by 19.5 m (global)	-11.2 %	-1.00 mmol/m ³
	CONFIDENCE ^v	MEDIUM	VERY HIGH	HIGH	N/A

CONFIDENCE SCALE

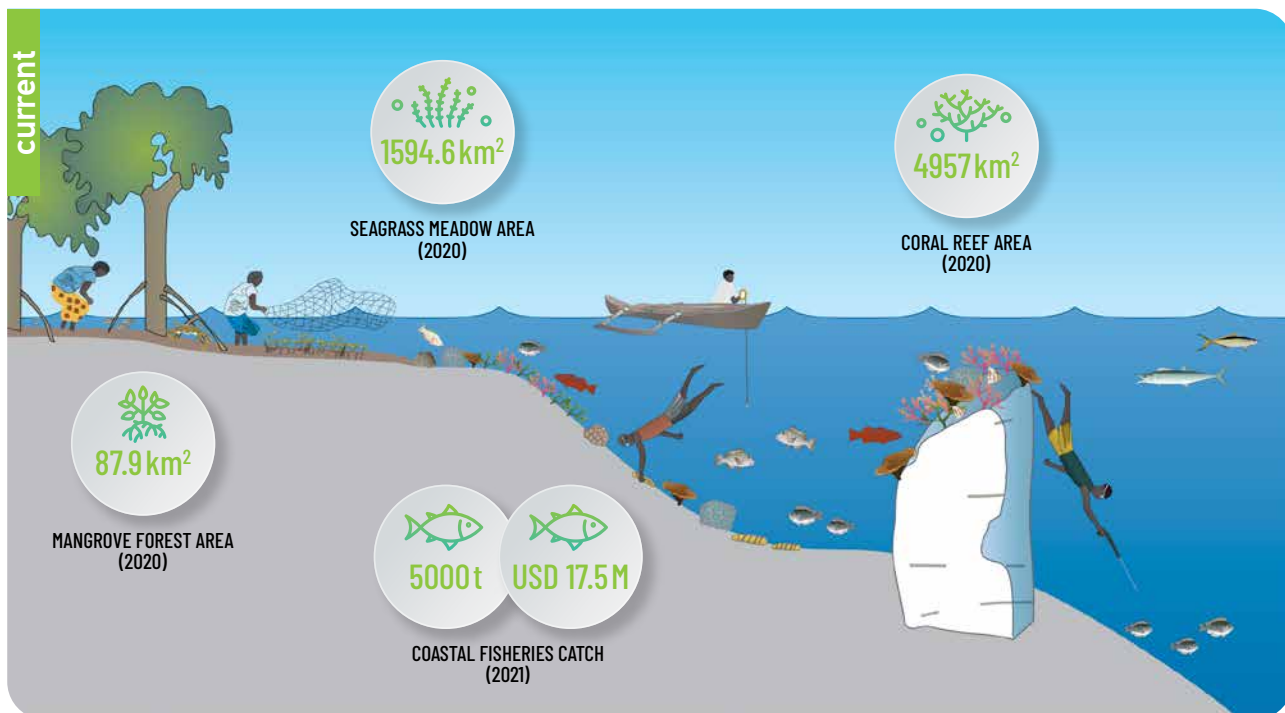


^{iv} The shared socioeconomic pathways (SSP) represent plausible futures of how society's choices might affect greenhouse gas emissions, and how those choices might influence climate change.

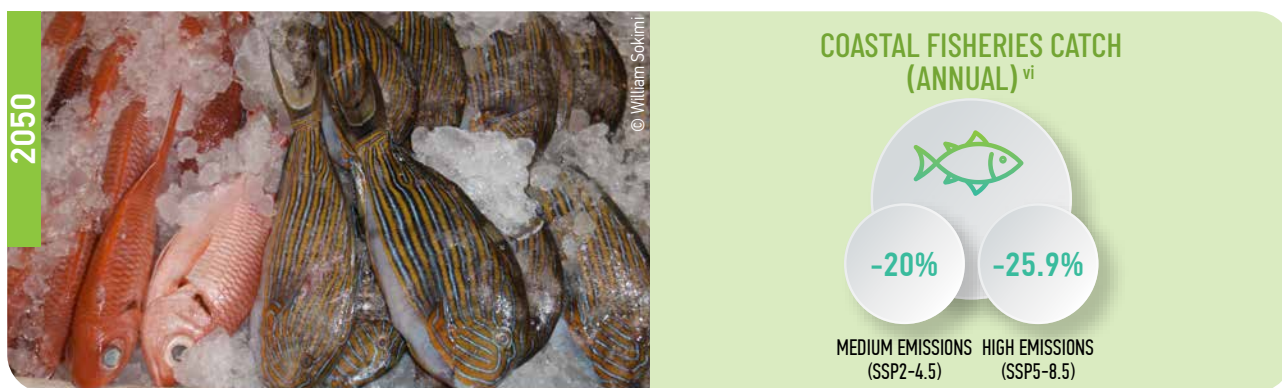
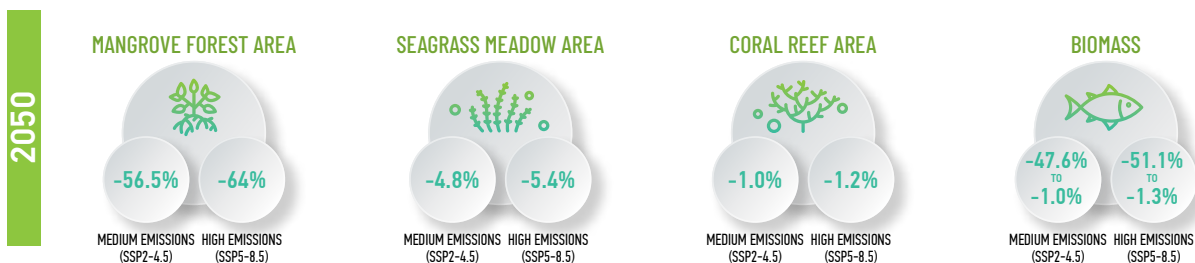
^v Confidence levels reflect uncertainty in attribution of the observed impact to climate change.

Coastal fisheries

Coastal fisheries in FSM target demersal fish (including emperors and snappers), invertebrates for export (e.g. lobster and crabs) and gleaned from intertidal habitats, and nearshore pelagic fish (including tuna) using a range of fishing methods. Coastal fisheries are critically important for food, local livelihoods and jobs (further details in Chapter 3).



Coastal fish and invertebrates are expected to be directly impacted by increasing sea surface temperature, ocean acidification (declining pH), and changing rainfall patterns, and indirectly impacted by declines in coastal habitats (coral reefs, seagrass meadows and mangroves) by 2050. This will drive changes in habitat area, fish biomass and coastal fisheries catches.

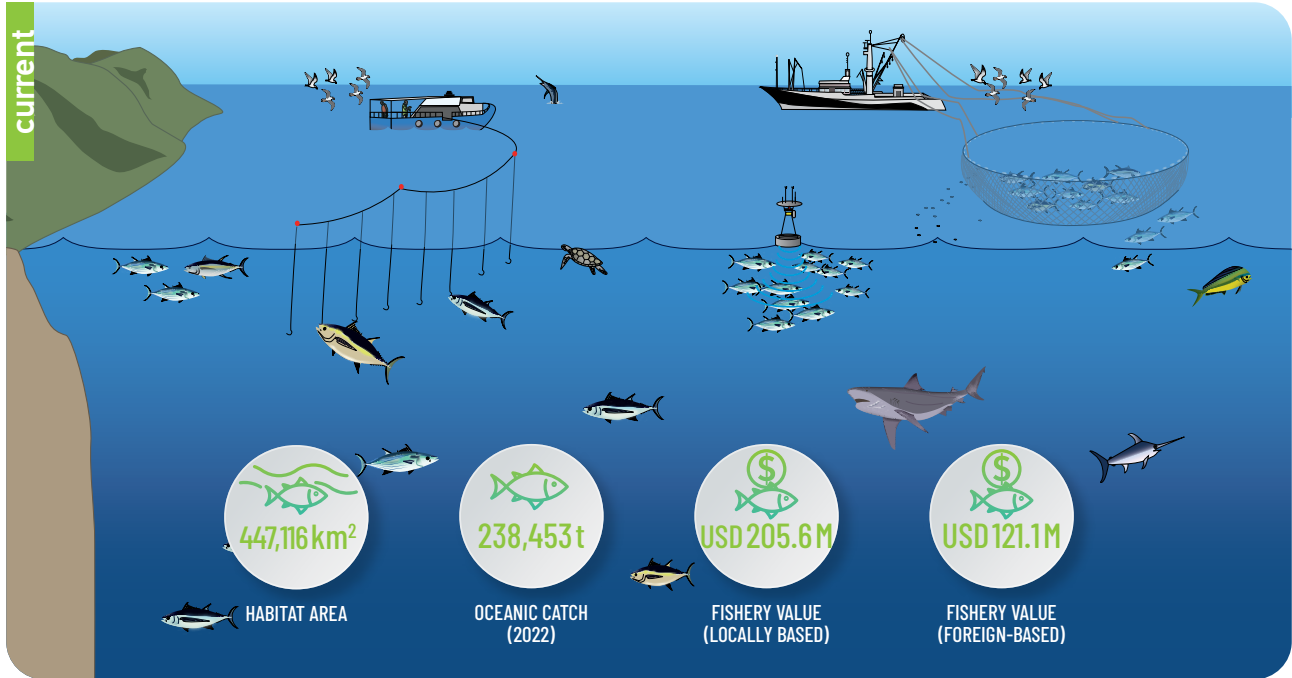


There is evidence that some stocks may be overfished and/or fishing rates are too high. Better stock assessments are needed.

^{vi} Relative to the Reference Period 2010–2020.

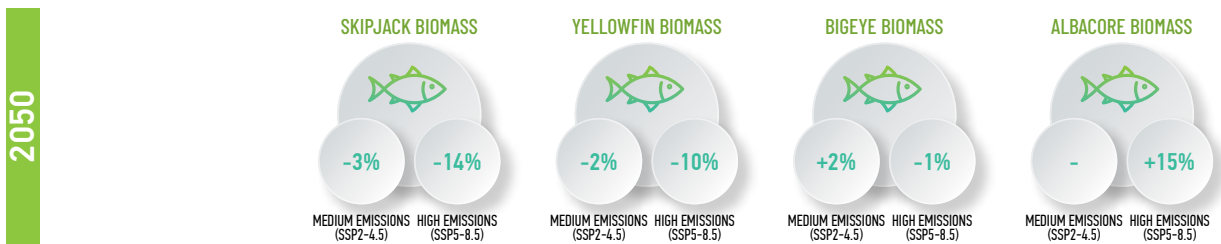
Oceanic fisheries

Offshore fisheries in FSM target three species of tuna – skipjack, yellowfin and bigeye – and some locally based longliners fish seasonally for albacore in the exclusive economic zone (EEZ) of FSM. In 2021, there were 69 tuna vessels registered in FSM (42 longliners and 27 purse seiners). There were also 190 foreign vessels licensed to fish in FSM EEZ, and the foreign-based fleet catches less tuna than the local fleet^{vii}. The tuna fishery is critically important for government revenue and economic development (further details in Chapter 4).



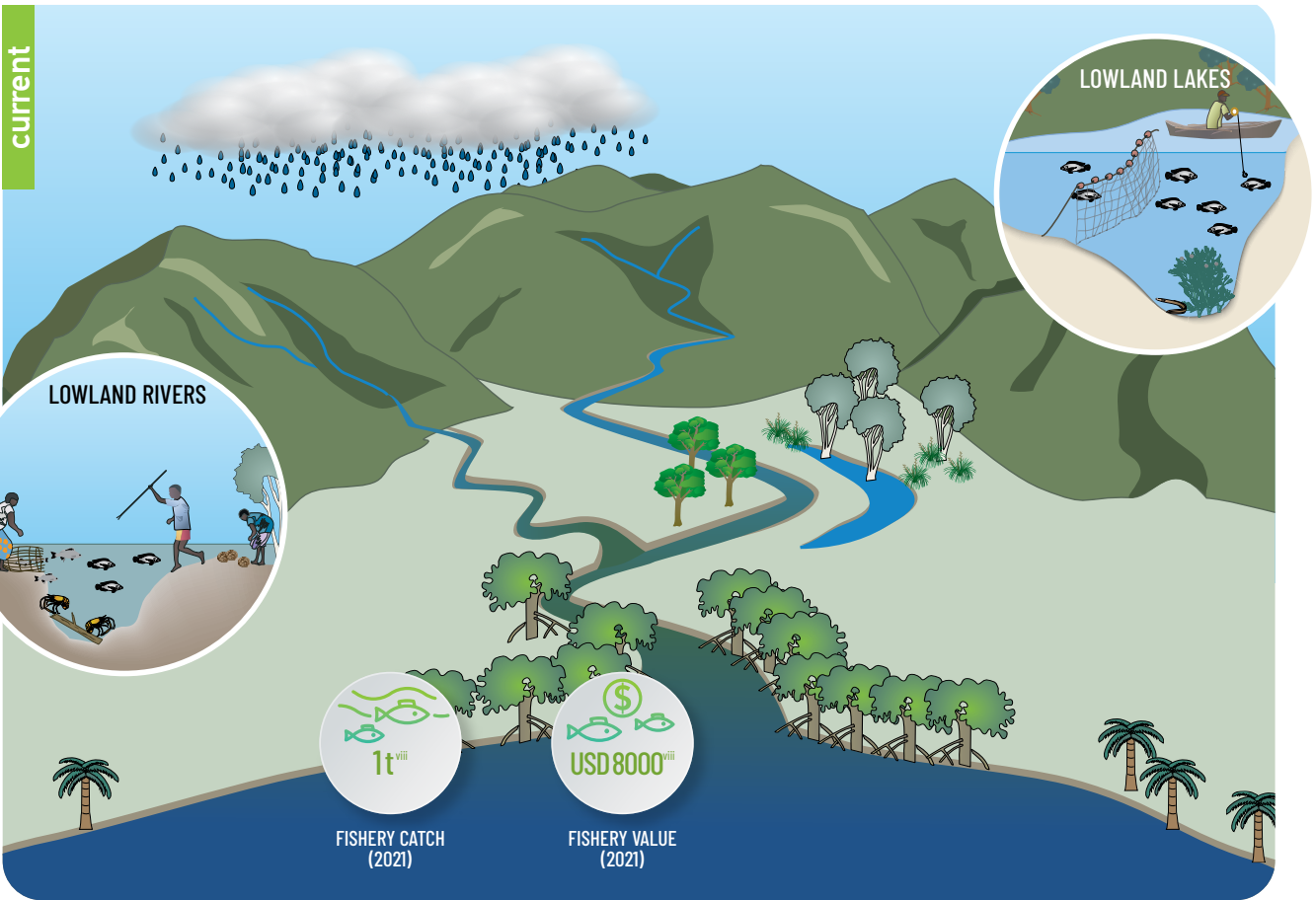
Offshore tuna are expected to be directly impacted by changes in ocean temperature, stratification and oxygen content, and indirectly impacted by changes in available spawning habitat area by 2050. This is expected to shift the distribution of tuna, with yellowfin, bigeye and albacore moving into high seas areas.

PROJECTED BIOMASS (WITHOUT FISHING) RELATIVE TO 2001–2010 REFERENCE PERIOD

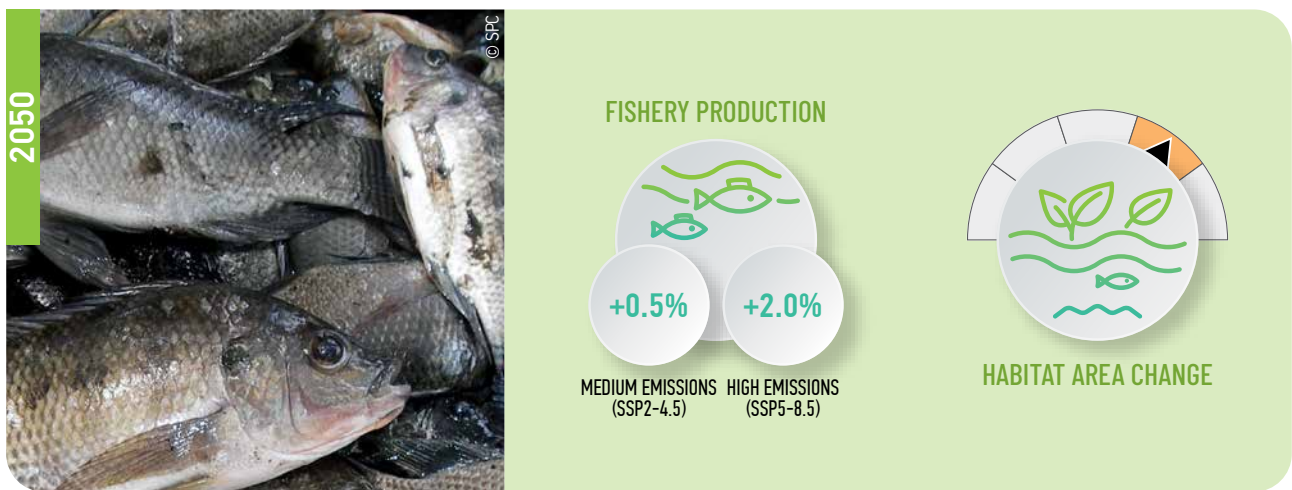


Freshwater and estuarine fisheries

Freshwater and estuarine fisheries in FSM target freshwater prawns (*Macrobrachium* spp.) and finfish (including tilapia and eels). The main habitats are lowland rivers and lakes. Freshwater and estuarine fisheries provide food and local livelihoods (further details in Chapter 5).



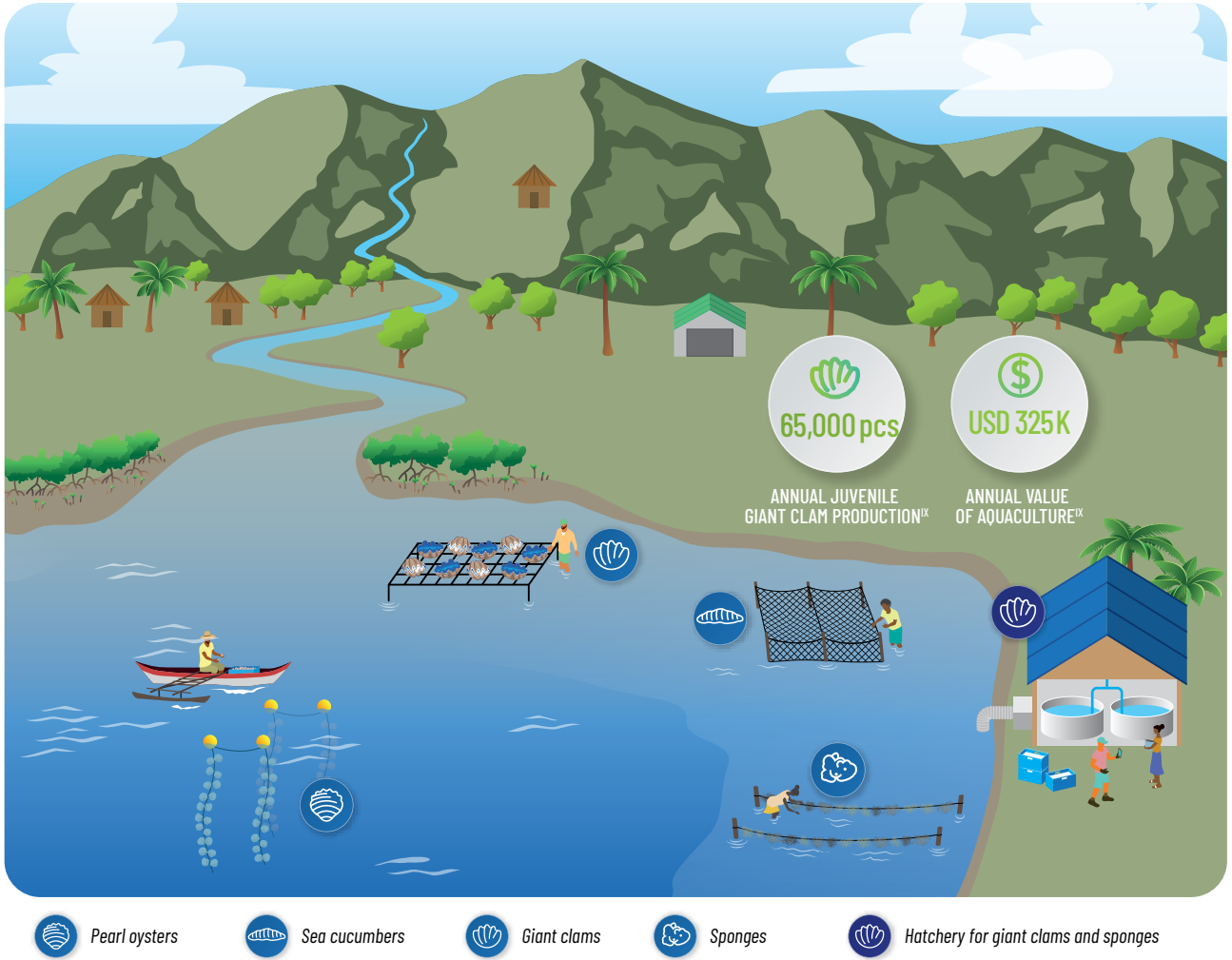
Freshwater and estuarine fish are expected to be directly affected by changes in rainfall patterns that drive river flow, and indirectly affected by increased duration of river flows and habitat accessibility by 2050. This is expected to provide opportunities for the expansion of fisheries and increased production.



^{viii} Fishery catch and value are likely underestimates due to unreported catches.

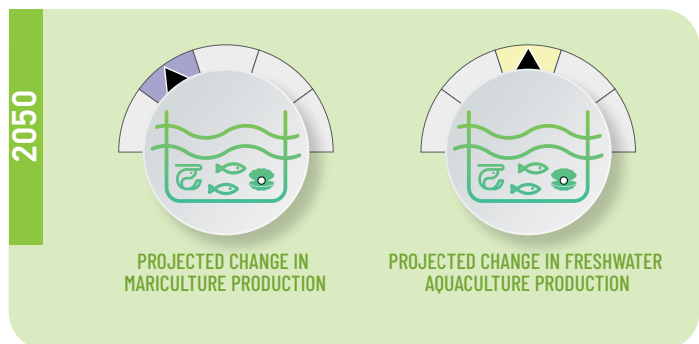
Aquaculture

The main commodities farmed in FSM are sponges, sea cucumbers, pearl oysters and giant clams (ranching for wild restocking). These provide food, local livelihoods, jobs, and government revenue (further details in Chapter 6).



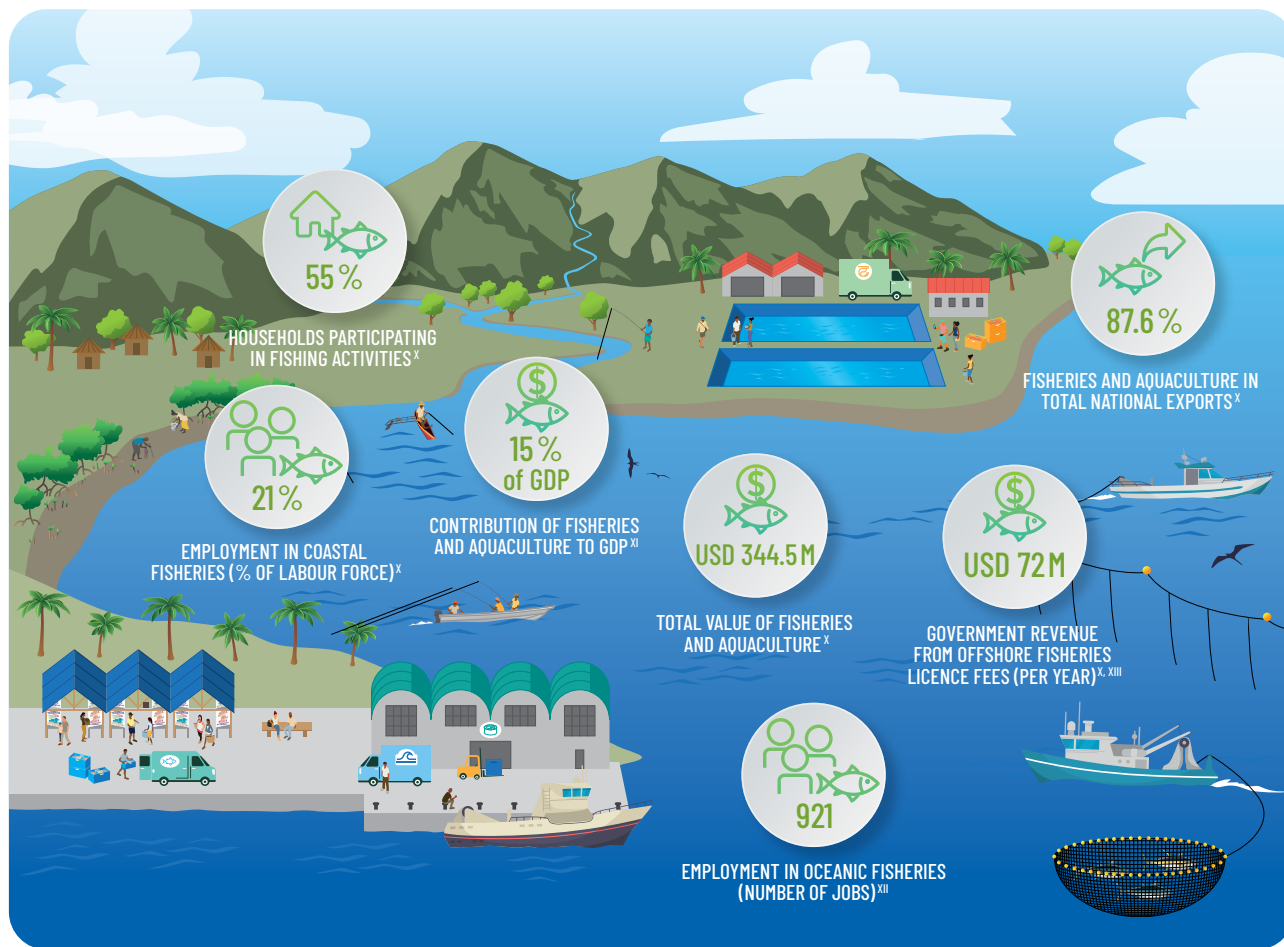
Mariculture is expected to be directly impacted by increasing sea surface temperature, ocean acidification (declining pH), and more intense storms.

Freshwater pond aquaculture is expected to benefit from increases in freshwater habitat but be impacted by increasing temperatures and disease, changing rainfall, storms and sea level rise. This will have implications for aquaculture production by 2050.



Livelihoods and economies

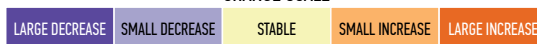
Fisheries and aquaculture are important for local culture and trade, and providing household income, jobs and government revenue in FSM (further details in Chapter 7).



The projected change in tuna distribution is expected to decrease government license fees revenue by 5–10% by 2050. The high relative fisheries contribution to GDP and large number of people employed in fisheries, coupled with a significant projected decline in coastal catch and in-zone catch for tropical species of tuna are expected to affect income, employment and GDP.



CHANGE SCALE



^x Data source: Gillett R., Fong M. (2023) Fisheries in the economies of Pacific Island countries and territories (Benefish Study 4). Pacific Community (SPC), Noumea, New Caledonia.

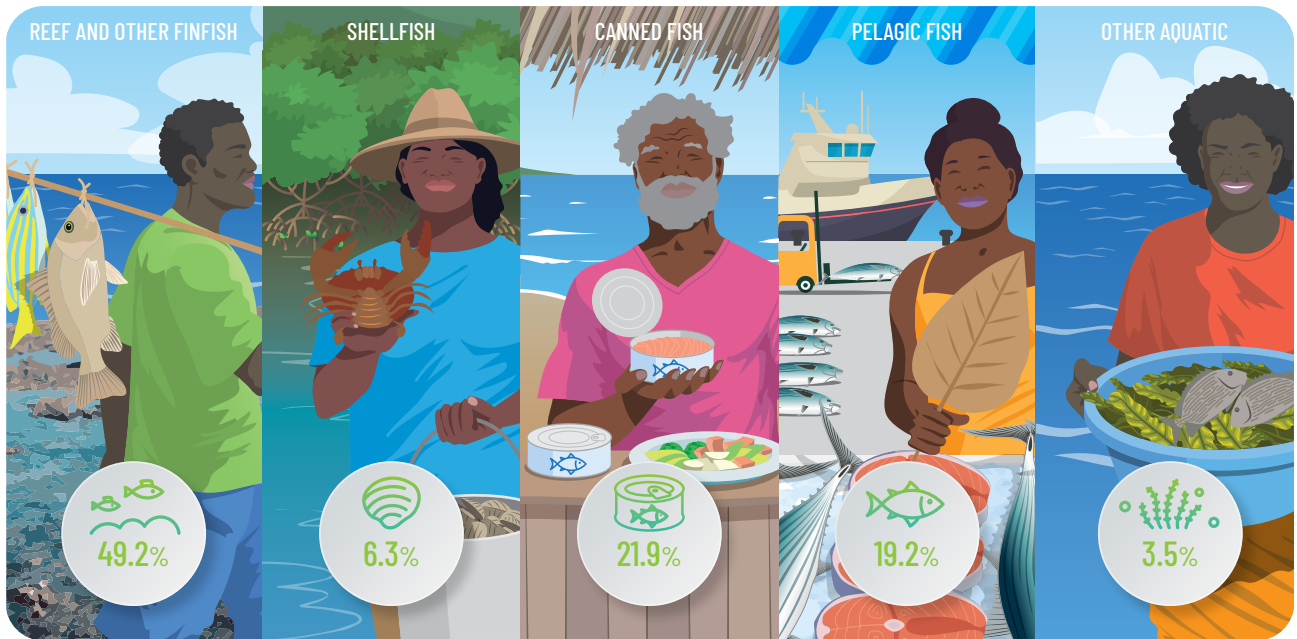
^{xi} National GDP in 2020.

^{xii} Primarily in tuna-related employment, including harvest, processing, observers, government and ancillary services. Data source: FFA (2022) Tuna Fishery Report Card 2022. Pacific Islands Forum Fisheries Agency, Honiara, Solomon Islands.

^{xiii} Average value 2017-2021

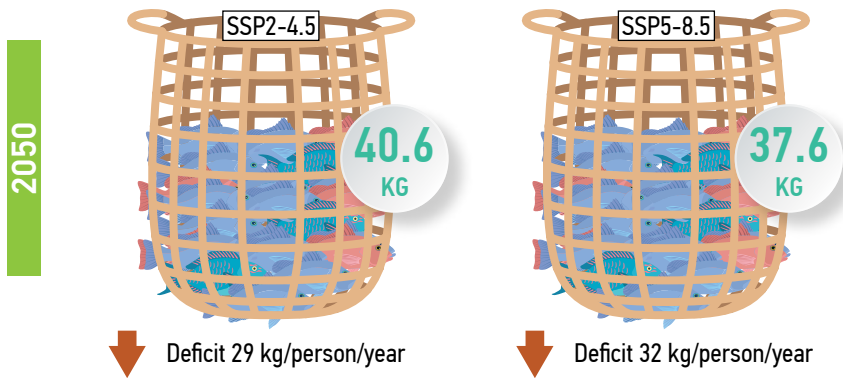
Aquatic food security

Aquatic (blue) foods provide a very important source of nutrition in FSM, and current consumption is 92 kg/person/year including locally and imported reef and other finfish, shellfish, canned fish and pelagic fish (further details in Chapter 8)^{xiv}.

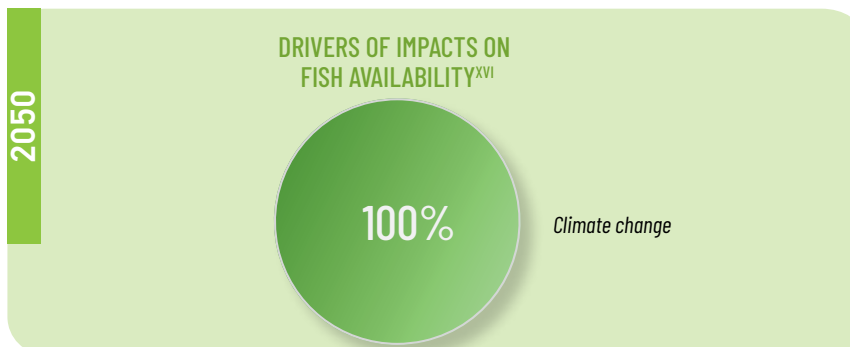


FSM is projected to experience a deficit in fish supply by 2050 based on current fisheries catch rates and average consumption. This will be driven by climate change impacts on fisheries. There is expected to be a decline in available whole fish by 2050^{xv}, resulting in **high vulnerability**.

HOW MUCH FISH WILL BE AVAILABLE PER PERSON IN 2050?



To meet the future needs of a growing population and address declining catches for local consumption under climate change, sustainable coastal and estuarine fisheries management is essential. A greater contribution from pelagic fish, canned fish and aquaculture, and other protein sources (e.g. agriculture), will also be required to support food security and good nutrition. Any adaptations should consider environmental and social safeguards and avoid maladaptation.



xiv Data estimated for whole fish from: Sharp M.K., Andrew N.L. (2024) Aquatic food consumption in the Pacific region. Food Systems Brief No. 22. Pacific Community, Noumea, New Caledonia. Note that reef and other finfish include freshwater and estuarine fish.

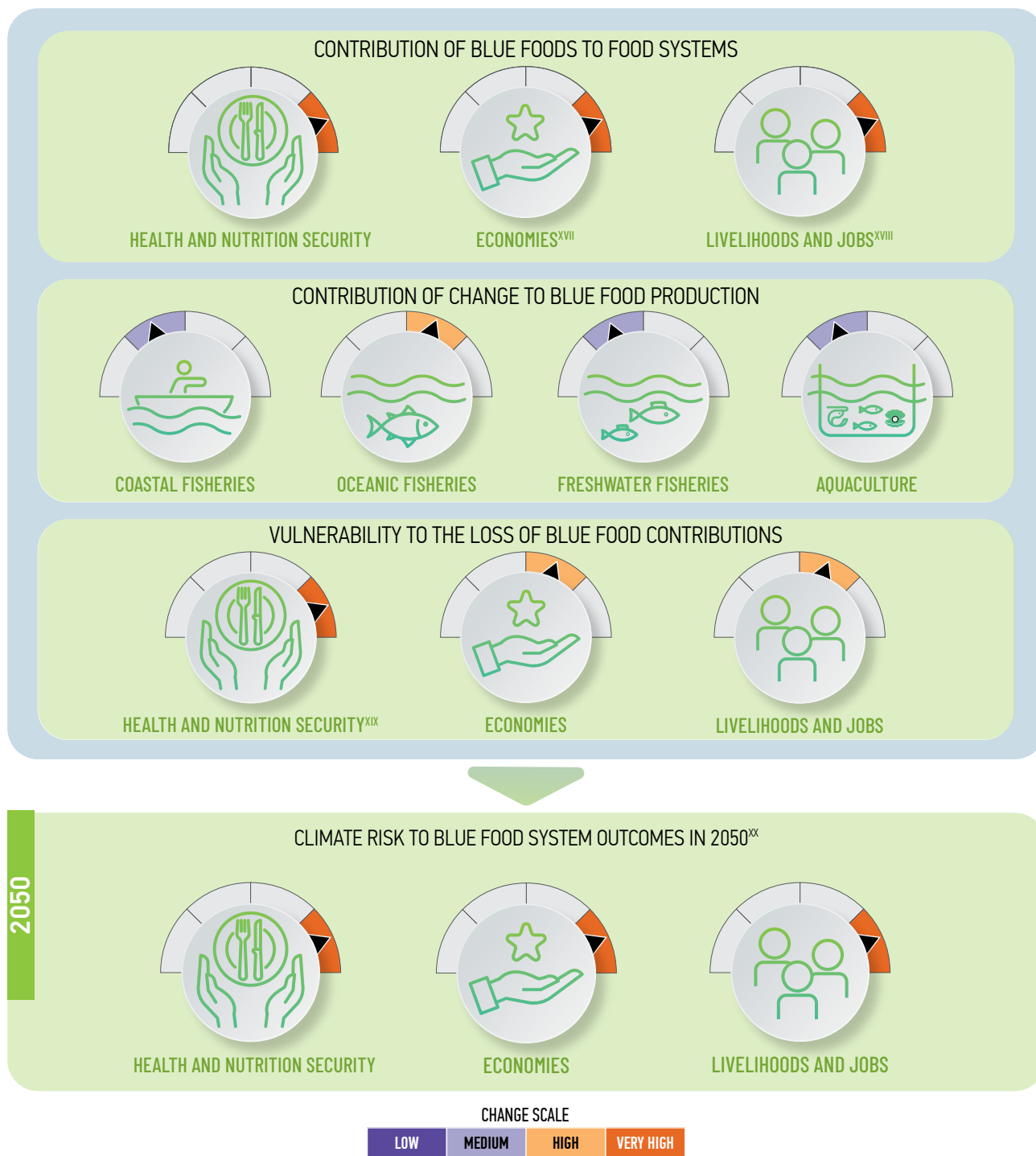
xv Based on projected coastal, estuarine and freshwater fisheries catches by 2050 from Chapters 3 and 5.

xvi Based on current aquatic food consumption levels. Note that agriculture can also provide additional protein sources to supplement a decline in aquatic foods, however any adaptations should consider environmental and social safeguards and avoid maladaptation.

Blue food production systems

In the Pacific Islands region, blue foods contribute significantly to nutrition security and health, economies, livelihoods and jobs. By comparing contributions, climate impacts, and vulnerabilities across these outcomes, priority climate actions can be identified for sustaining their role in sustainable development under climate change (further details in Chapter 9).

In FSM, blue foods make very high contributions to nutrition security and health, economies, and livelihoods and jobs. Compared to other Pacific islands, projected climate impacts to blue food production by 2050 are medium to high. Socioeconomic conditions make FSM's sustainable development highly vulnerable to climate-induced losses.



Altogether, the contributions of blue foods to sustainable development in FSM face very high levels of climate risk, due to high dependence and vulnerability. Climate adaptation of blue food production systems therefore needs to be embedded in broader sustainable development initiatives.

^{xvii} Including variables such as total fisheries production value and foreign access fees.

^{xviii} Including variables such as total number of jobs across supply chains, share of households for which fishing is the main source of income and gender equity considerations.

^{xix} Including nutrition-related health outcomes such as nutrient deficiencies and noncommunicable diseases.

^{xx} Risk is shown for a high-emissions scenario (SSP5-8.5). Rapid emissions reduction would reduce climate risk.