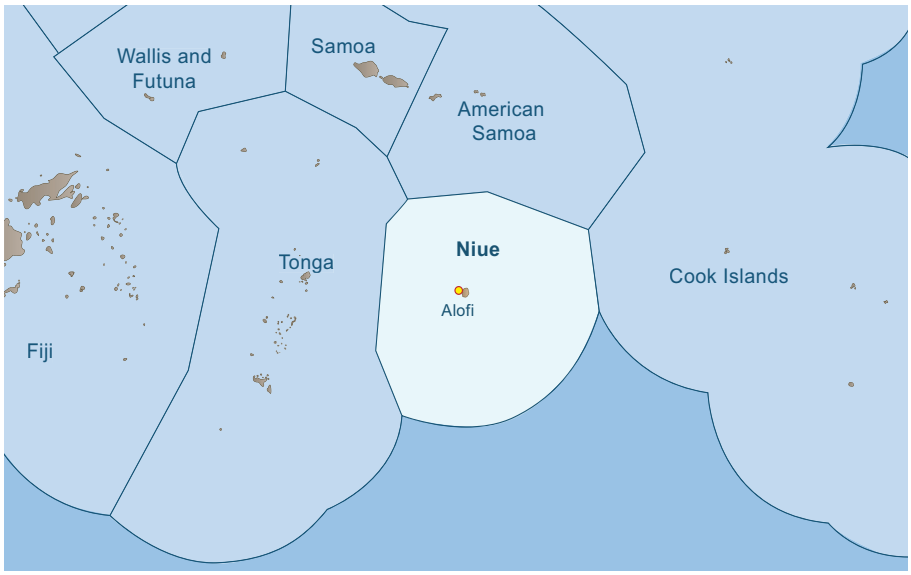
2.11 Niue



Key features

Population

Year	2010	2035	2050	2100
Population (x 1000)[a]	1.5	1.2	1.2	1.2
Population growth rate[a]	-2.3	-0.7	0.2	n/a

a = Data from SPC Statistics for Development Programme (www.spc.int/sdp); n/a = data not available.

EEZ area (km²) 296,941

Land area (km²) 259

Land as % of EEZ 0.087

Fisheries and aquaculture activities: Oceanic fisheries and coastal fisheries.

Membership of regional fisheries management arrangements: Forum Fisheries Agency; Western and Central Pacific Fisheries Commission; Te Vaka Moana Arrangement; South Pacific Tuna and Billfish subcommittee.

Surface climate and the ocean

Existing features

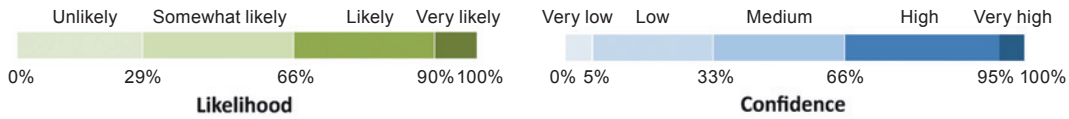
Niue has a tropical climate {Chapter 2}. Recent air temperatures in Hanan have averaged 24.3°C and average annual rainfall is ~ 1950 mm per year. Niue lies within the South Pacific Subtropical Gyre Province (SPSG) {Chapter 4, Figure 4.6}. The SPSG Province is created by anticyclonic atmospheric circulation and rainfall in the centre of the province is low. The rotation of the gyre deepens the vertical structure of the water column, making the surface waters nutrient poor {Chapter 4}.

Projected changes to surface climate

Air temperatures and rainfall in Niue are projected to increase due to climate change under the low (B1) and high (A2) emissions scenarios in 2035 and 2100 {see Chapter 1, Section 1.3 for definition of scenarios} relative to long-term averages {Chapter 2, Section 2.5, Table 2.6}.

Climate feature[a]	1980–1999 average	Projected change			
		B1 2035	A2 2035	B1 2100*	A2 2100
Air temperature (°C)	24.3 (Hanan)	+0.5 to +1.0	+0.5 to +1.0	+1.0 to +1.5	+2.5 to +3.0
Rainfall (mm)	1958 (Hanan)	+5 to +15%	+5 to +20%	+10 to +20%	+10 to +20%
		More extreme wet and dry periods			
Cyclones (no. per year)	1.6	➢ Total number of tropical cyclones may decrease ➢ Cyclones are likely to be more intense			

* Approximates A2 in 2050; a = for more detailed projections of rainfall, air temperature and cyclones in the vicinity of Niue, see www.cawcr.gov.au/projects/PCCSP.



Projected changes to the ocean

The projected changes to the key features of the tropical Pacific Ocean surrounding Niue relative to the long-term averages are expected to result in increases in sea surface temperature (SST), sea level and ocean acidification. Changes to ocean currents (increases in the South Pacific gyre) and reductions in nutrient supply are also expected to occur {Chapter 3, Sections 3.3 and 3.4, Tables 3.1 and 3.2}.

Ocean feature	1980–1999 average	Projected change			
		B1 2035	A2 2035	B1 2100*	A2 2100
Sea surface temperature (°C)	26.3[a]	+0.6 to +0.8	+0.7 to +0.8	+1.2 to +1.6	+2.2 to +2.7
Sea level (cm)	+6 since 1960				
IPCC **		+8	+8	+18 to +38	+23 to +51
Empirical models ***		+20 to +30	+20 to +30	+70 to +110	+90 to +140
Ocean pH (units)	8.08	-0.1	-0.1	-0.2	-0.3
Currents	Increase in South Pacific gyre	Continued increase in strength of South Pacific gyre			
Nutrient supply	Decreased slightly	Decrease due to increased stratification and shallower mixed layer			< -20%

* Approximates A2 in 2050; ** projections from the IPCC-AR4; *** projections from recent empirical models {Chapter 3, Section 3.3.8}; a = average for EEZ derived from the HadISST dataset.

Oceanic fisheries

Recent catch and value

Niue has had a small longline fishery within its exclusive economic zone (EEZ), which produced annual average catch of 130 tonnes, worth > USD 630,000. This fishery has now ceased. Little fishing is done by foreign fleets in Niue's EEZ – average annual catches between 1999 and 2008 were < 20 tonnes. See 'Coastal Fisheries' below for contributions of tuna to nearshore artisanal and small-scale commercial fisheries.

Local oceanic fisheries	Average annual catch (tonnes) 2004–2008	Average annual catch value (USD)* 2004–2008
Tuna		
Longline	120	618,500
Other methods	2	4180
Other oceanic fish[a]	8	8400
Total	**130**	**631,080**

* Calculated using market value per tonne for 2004–2008; a = billfish catch only, valued at USD 1000 per tonne.

Existing oceanic fish habitat

Niue's EEZ lies within the generally nutrient-poor waters of the SPSG Province {Chapter 4, Figure 4.6}. This province is characterised by downwelling and low nitrate concentrations in deeper waters. Net primary production is low, particularly in summer when there is the formation of a marked thermocline {Chapter 4, Section 4.4.3}. Local upwelling around islands can result in small areas of enriched surface productivity. In general, however, the SPSG Province does not provide prime feeding areas for tuna.

Projected changes to oceanic fish habitat

Under climate change, the surface area of the SPSG Province is projected to increase and extend poleward. Key components of the food web (net primary production and zooplankton biomass) are expected to decrease in SPSG {Chapter 4, Table 4.3}.

SPSG feature	Projected change (%)			
	B1 2035	A2 2035	B1 2100*	A2 2100
Surface area[a]	+4	+7	+7	+14
Location	Poleward extension of southern limit			
Net primary production	-3	-5	-3	-6
Zooplankton biomass	-3	-4	-5	-10

* Approximates A2 in 2050; a = area derived from modelling of nutrients and salinity {Chapter 4, Table 4.3}.

Projected changes in oceanic fisheries production

Preliminary modelling suggests that under the B1 and A2 emissions scenarios, catches of bigeye tuna in the EEZ of Niue are expected to decrease in 2035 and 2100, relative to the 20-year average (1980–2000). No estimates are available for catches of skipjack tuna {Chapter 8, Section 8.7}. Modelling for yellowfin tuna and albacore is now in progress.

Projected change in bigeye tuna catch (%)		
B1/A2 2035	B1 2100*	A2 2100
-5	-8	-15

* Approximates A2 in 2050.

Coastal fisheries

Recent catch and value

The coastal fisheries of Niue are made up mainly of three components: demersal fish (bottom-dwelling fish associated with coral reef habitats), nearshore pelagic fish (including tuna, rainbow runner, wahoo and mahi-mahi), and invertebrates gleaned from intertidal and subtidal areas {Chapter 9, Section 9.2.1}. The total annual catch was estimated to be 150 tonnes in 2007, worth > USD 676,000. The commercial catch was 10 tonnes. Nearshore pelagic fish are estimated to make up 50% of the total catch.

Feature	Coastal fisheries category				Total	Total value (USD m)*
	Demersal fish	Nearshore pelagic fish[b]	Targeted invertebrates	Inter/subtidal invertebrates		
Catch (tonnes)*	62	75	0	13	150	0.7
Contribution (%)[a]	41	50	0	9	100	

* Estimated total catch and value in 2007 (Gillett 2009)[1]; a = method for calculating disaggregated catch data for each category is outlined in Chapter 9 {Appendix 9.2, Supplementary Table 9.1}; b = catch dominated by non-tuna species.

Existing coastal fish habitat

Niue has 56 km^2 of coral reefs within its EEZ that support coastal fisheries species. Niue has no other coastal habitats due to the steep slope of the coastline and narrow fringing reef.

Projected changes to coastal fish habitat

Climate change is expected to add to the existing local threats to coral reef habitats in Niue, resulting in declines in coral cover in both the medium and long term {Chapter 5}.

Habitat feature	Projected change (%)		
	B1/A2 2035	B1 2100*	A2 2100
Coral cover[a]	-25 to -65	-50 to -75	> -90

* Approximates A2 in 2050; a = assumes there is strong management of coral reefs.

Projected changes in coastal fisheries production

Fisheries for demersal fish and intertidal and subtidal invertebrates in Niue are projected to show progressive declines in productivity due to both the direct effects (e.g. increased SST) and indirect effects (changes to fish habitats) of climate change {Chapter 9, Section 9.5}. On the other hand, the nearshore pelagic fishery component of coastal fisheries is projected to increase in productivity due to the redistribution of tuna to the east {Chapter 8}.

Coastal fisheries category	Projected change (%)			Main effects
	B1/A2 2035	B1 2100*	A2 2100	
Demersal fish	-2 to -5	-20	-20 to -50	Habitat loss and reduced recruitment (due to increasing SST and reduced currents)
Nearshore pelagic fish[a]	+15 to +20	+20	+10	Changes in distribution of tuna
Inter/subtidal invertebrates	0	-5	-10	Declines in aragonite saturation due to ocean acidification

* Approximates A2 in 2050; a = tuna form part of the nearshore pelagic fishery {Chapter 9, Tables 9.8 and 9.10}.

The overall projected change to coastal fisheries catch reflects the importance of nearshore pelagic fish and the projected increase in productivity of this component of the fishery. As a result, total catches from coastal fisheries in Niue are projected to increase under both scenarios in 2035 and increase slightly under B1 in 2100. Greater projected reductions in catches of demersal fish are expected to cause a decline in coastal fisheries production of ~ 10% by 2100 under the A2 emissions scenario.

Coastal fisheries category	Contrib. (%)**	Projected change in productivity (P) and catch (%)					
		B1/A2 2035		B1 2100*		A2 2100	
		P***	Catch	P***	Catch	P***	Catch
Demersal fish	41	-3.5	< 2	-20	-8	-35	-14
Nearshore pelagic fish	50	+17.5	+9	+20	+10	+10	+5
Inter/subtidal invertebrates	9	0	0	-5	< 1	-10	-1
Total catch[a]			**+7**		**+1**		**-10**

* Approximates A2 in 2050; ** contribution of each component to total coastal fisheries catch in Niue; *** median projected change in productivity based on range in Chapter 9; a = assumes that proportion of each category remains constant.

Freshwater and estuarine fisheries

Niue has no freshwater or estuarine fisheries.

Aquaculture

Niue has no aquaculture production.

Economic and social implications

Economic development and government revenue

Current contributions

The longline tuna fishery contributed 3.7% to the gross domestic product (GDP) of Niue in 2007 {Chapter 12}. Licence fees from foreign purse-seine vessels have contributed up to 2.2% of government revenue (GR) in some years {Chapter 12}.

Industrial fishery	Contribution to GDP*		Contribution to GR**	
	USD m	GDP (%)	USD m	GR (%)
Longline	0.4	3.7	0.03	0.2

* Information for 2007, when national GDP was USD 10 million (Gillett 2009)[1]; ** information for 1999.

Projected effects of climate change

Changes to GDP and GR due to the effects of climate change on the distribution and abundance of tuna are likely to be difficult to project due to the difficulty in operating locally-based fleets and the relatively small size of Niue's EEZ.

Food security

Niue is among the group of PICTs (Group 2) where the estimated sustainable production of fish and invertebrates from coastal habitats has the potential to supply the national population with the 35 kg of fish per person per year recommended for good nutrition[i]. However, it may be difficult to distribute the catch to the island due to the distance of some of the coral reef habitat from the shore {Chapter 12, Section 12.7.1}.

Current contributions of fish to food security

Average national fish consumption in Niue is estimated to be 79 kg per person per year[2], significantly more than the recommended level for good nutrition. At present, coral reefs in Niue are estimated to be able to supply a surplus of 77 kg of fish above the recommended level.

i Based on fish contributing 50% of dietary protein as recommended by the SPC Public Health Programme (SPC 2008)[25].

Effects of population growth

The population of Niue is predicted to decline in the short term and then remain relatively stable from 2035 onwards. Therefore, demand for fish for food security is not expected to increase. The current estimated fish surplus per person per year is estimated to increase in the years ahead.

Variable	2010	2035	2050	2100
Population	1500	1200	1300	1300
Fish available per person (kg/year)[a]	112	140	129	129
Surplus (kg/person/year)[b]	77	105	94	94

a = Based on 3 tonnes of fish per km^2 of coral reef habitat {Chapter 9}; b = relative to recommended consumption of 35 kg per person per year.

Additional effects of climate change

The effects of climate change on coastal fisheries are not expected to significantly affect the fish available per person for food security in Niue. The large area of coral reefs relative to population size will continue to supply sufficient coastal fish for food security even with the expected decline in the productivity of demersal fish {Chapter 12}.

Livelihoods

Current contributions

Small numbers of full-time and part-time jobs have been created through tuna fishing and processing in Niue. Coastal fisheries provide limited opportunities to earn income for coastal communities presumably due to the large subsistence catch.

Jobs on tuna vessels			Jobs in shore-based tuna processing			Coastal households earning income from fishing (%)		
2002	2006	2008	2002	2006	2008	1st	2nd	Both
5	0	0	0	14	18	1	9	10

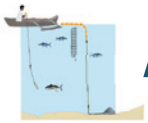
* Information derived from Chapter 12, Table 12.6 and the SPC PROCFish Project.

Projected effects of climate change

The effects of climate change on the potential to create more livelihoods based on fisheries and aquaculture are difficult to estimate because there is still scope to derive new jobs from oceanic fisheries and the nearshore component of coastal fisheries. However, the A2 emissions scenario is expected to eventually enhance or retard these opportunities as indicated below.

Year	Projected change under A2 scenario		
	Oceanic fisheries**	Coastal fisheries	
		Nearshore pelagic fish	Other resources
Present*	⇧	⇧	⇩
2035	↑	No effect	↓
2050	No effect	↓	↓
2100	↓	↓	↓

* Indicates general direction of new opportunities for livelihoods based on the activity; ** based on projected changes in skipjack tuna catches.



Adaptations and suggested policies

The plans Niue has to derive greater socio-economic benefits from fisheries will depend on interventions to:

1. improve access to tuna to provide fish for economic development and continued food security;
2. manage coastal fish habitats and fish stocks to ensure the future supply of fish for food security; and
3. enhance livelihood opportunities based on fishing and tourism.

The adaptations and suggested policies to achieve these plans under a changing climate are summarised below (see Section 3 for details).

Economic development and government revenue

Adaptation no. (Section 3.2)	Summary of adaptation	Supporting policy no. (Section 3.3)
E3	Immediate conservation management measures for bigeye tuna	E8
E7	Safety at sea	E10
E8	Climate-proof infrastructure	E11
E9	Pan-Pacific tuna management	E2

Food security

Adaptation no. (Section 3.4)	Summary of adaptation	Supporting policy no. (Section 3.5)
F2	Foster the care of coastal fish habitats	F1–F3, F18
F5	Sustain production of coastal demersal fish and invertebrates	F6, F7, F13, F18
F6	Diversify catches of coastal demersal fish	F6, F13, F18
F11	Improve post-harvest methods	F17, F18

Sustainable livelihoods

Adaptation no. (Section 3.6)	Summary of adaptation	Supporting policy no. (Section 3.7)
L1	Improve technical and business skills of communities	L1, L2
L3	Develop coral reef ecotourism ventures	L3