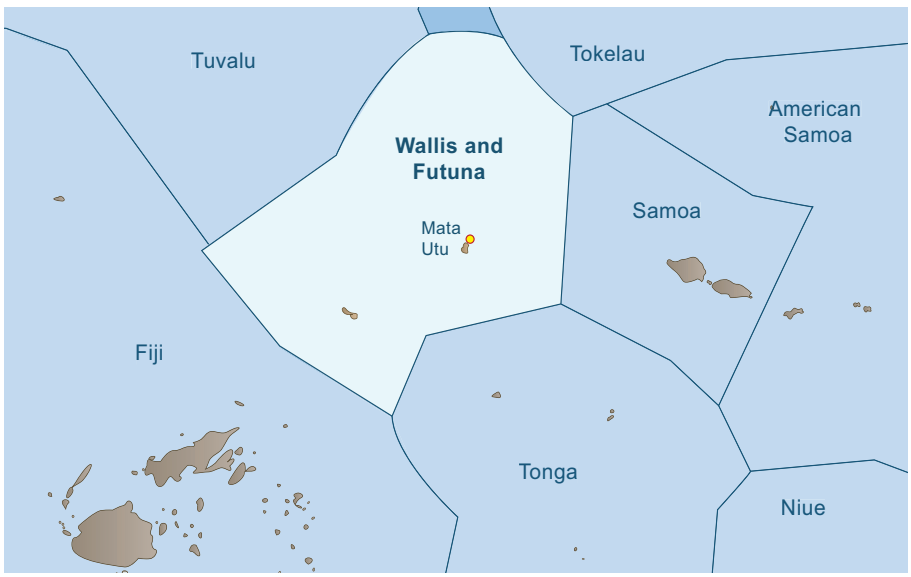
2.22 Wallis and Futuna



Key features

Population

Year	2010	2035	2050	2100
Population (x 1000)[a]	13	14	14	14
Population growth rate[a]	-0.6	0	0	0

a = Data from SPC Statistics for Development Programme (www.spc.int/sdp).

EEZ area (km²) 242,445

Land area (km²) 255

Land as % of EEZ 0.1

Fisheries and aquaculture activities: Oceanic fisheries and coastal fisheries.

Membership of regional fisheries management arrangements: Western and Central Pacific Fisheries Commission (participating territory).

Surface climate and the ocean

Existing features

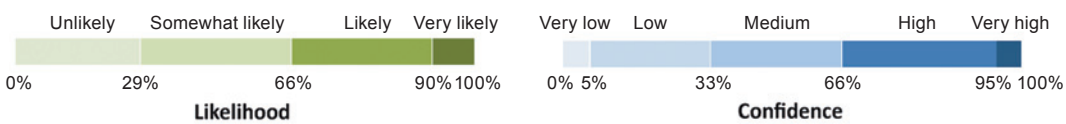
Wallis and Futuna has a tropical climate {Chapter 2}. Recent air temperatures in Hihifo have averaged 27.1°C and average rainfall is ~ 3340 mm per year. Wallis and Futuna lies within the South Pacific Subtropical Gyre Province (SPSG) {Chapter 4, Figure 4.6}. The SPSG Province is created by anticyclonic 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 Wallis and Futuna 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)	27.1 (Hihifo)	+0.5 to +1.0	+0.5 to +1.0	+1.0 to +1.5	+2.5 to +3.0
Rainfall (mm)	3339 (Hihifo)	+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 Wallis and Futuna, 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 Wallis and Futuna 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)	28.9[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

There is a locally-based longline vessel fishing for tuna in the exclusive economic zone (EEZ) of Wallis and Futuna. Between 1999 and 2008 foreign vessels caught an average of 168 tonnes of tuna (mainly albacore) per year from the EEZ, worth USD 400,000. See 'Coastal Fisheries' below for contributions of tuna to nearshore artisanal and small-scale commercial fisheries.

Existing oceanic fish habitat

Wallis and Futuna'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 skipjack tuna in the EEZ of Wallis and Futuna are expected to increase significantly in 2035 and 2100, relative to the 20-year average (1980–2000). Catches of bigeye tuna are projected to remain stable under both scenarios in 2035 and B1 in 2100, and to decrease under A2 in 2100 {Chapter 8, Section 8.7}. Modelling for yellowfin tuna and albacore is now in progress. The trends for yellowfin are expected to be similar to those for skipjack tuna, whereas albacore are expected to move poleward and to be more abundant at the edges of the SPSG Province.

Projected change in skipjack tuna catch (%)			Projected change in bigeye tuna catch (%)		
B1/A2 2035	B1 2100*	A2 2100	B1/A2 2035	B1 2100*	A2 2100
+44	+49	+46	0	0	-7

* Approximates A2 in 2050.

Coastal fisheries

Recent catch and value

The coastal fisheries of Wallis and Futuna are made up of four components: demersal fish (bottom-dwelling fish associated with coral reef, mangrove and seagrass habitats), nearshore pelagic fish (including tuna, rainbow runner, wahoo and mahi-

mahi), invertebrates targeted for export, and invertebrates gleaned from intertidal and subtidal areas {Chapter 9, Section 9.2.1}. The total annual catch was estimated to be ~ 960 tonnes in 2007, worth USD 7.5 million. The commercial catch was ~ 120 tonnes. Demersal fish are estimated to make up 75% 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)*	718	106	17	120	961	7.5
Contribution (%)[a]	75	11	2	12	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

Wallis and Futuna has > 900 km^2 of coral reefs to support coastal fisheries species {Chapter 5}. Other fish habitats include deepwater and intertidal seagrasses, mangroves and intertidal sand flats {Chapter 6}.

Habitat	Coral reef[a]	Mangrove[b]	Seagrass[b]	Intertidal flat
Area (km^2)	932	0.2	24	n/a

a = Includes barrier, patch and fringing reefs and reef lagoons {Chapter 5, Table 5.1}; b = values from Chapter 6, Table 6.1; n/a = data not available.

Projected changes to coastal fish habitat

Climate change is expected to add to existing local threats to coral reefs, mangroves, seagrasses and intertidal flats in Wallis and Futuna, resulting in declines in the quality and area of all habitats {Chapters 5 and 6}.

Habitat feature[a]	Projected change (%)		
	B1/A2 2035	B1 2100*	A2 2100
Coral cover[b]	-25 to -65	-50 to -75	> -90
Mangrove area	-10	-50	-60
Seagrass area	-5 to -20	-5 to -35	-10 to -50

* Approximates A2 in 2050; a = no estimates in reduction of intertidal flats available; b = assumes there is strong management of coral reefs.

Projected changes in coastal fisheries production

Fisheries for demersal fish, targeted invertebrates and intertidal and subtidal invertebrates in Wallis and Futuna 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
Targeted invertebrates	-2 to -5	-10	-20	Habitat degradation, and declines in aragonite saturation due to ocean acidification
Inter/subtidal invertebrates	0	-5	-10	Declines in aragonite saturation due to ocean acidification

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

The overall projected change to coastal fisheries catch reflects the strong reliance on demersal fish and the projected decrease in productivity of most coastal fishery components. As a result, total catches from coastal fisheries in Wallis and Futuna are projected to decrease slightly under both scenarios in 2035, and continue to decline under both scenarios in 2100, particularly under A2 in 2100.

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	75	-3.5	-3	-20	-15	-35	-26
Nearshore pelagic fish	11	+17.5	+2	+20	+2	+10	+1
Targeted invertebrates	2	-3.5	-0.06	-10	-0.2	-20	-0.4
Inter/subtidal invertebrates	12	0	0	-5	-0.6	-10	-1
Total catch[a]			**-0.8**		**-13.5**		**-27**

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

Freshwater and estuarine fisheries

There are no freshwater and estuarine fisheries in Wallis and Futuna (with the exception of some capture of *Macrobrachium*).

Aquaculture

There is no aquaculture production in Wallis and Futuna (altough the potential for growing rabbitfish in cages and sea ranching sandfish is to be investigated)

Economic and social implications

Economic development and government revenue

One locally-based tuna longline vessel has recently started operating in the EEZ of Wallis and Futuna but has not yet contributed to gross domestic product or government revenue.

Food security

Wallis and Futuna 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 from some reefs in the EEZ due to the distances between these fishing areas and population centres {Chapter 12, Section 12.7.1}.

Current contributions of fish to food security

Average national fish consumption in Wallis and Futuna is estimated to be 75 kg per person per year[2], well above the recommended levels for good nutrition. At present, coral reefs in Wallis and Futuna are estimated to be able to supply 213 kg of fish per person per year.

Fish consumption per person (kg)			Fish provided by subsistence catch (%)	
National	Rural	Urban	Rural	Urban
74	n/a	n/a	86	86

n/a = Data not available.

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 in Wallis and Futuna is predicted to remain stable over this century and coastal fisheries are expected to meet the demand for fish for food security. The current estimated surplus of fish required for good nutrition is expected to continue to be available until 2100.

Variable	2010	2035	2050	2100
Population (x 1000)	13	14	14	14
Fish available per person (kg/year)[a]	213	206	206	206
Surplus (kg/person/year)[b]	178	171	171	171

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 projected decrease in production of demersal fish of up to 50% by 2100 under the A2 emissions scenario is not expected to significantly affect the fish available per person for food security in Wallis and Futuna. The large area of coral reefs relative to population size will continue to have potential to supply sufficient coastal fish to meet the traditionally high levels of fish consumption, provided the fish can be distributed from distant reefs to the islands, particularly to Futuna.

Livelihoods

Current contributions

Coastal fisheries provide important opportunities to earn income for coastal communities in Wallis and Futuna, with more than 40% of representative coastal households deriving their first or second income from catching and selling fish.

Coastal households earning income from fishing (%)		
1st	2nd	Both
21	23	44

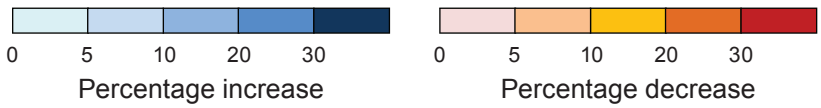
Information derived from Chapter 12, Table 12.6 and the SPC PROCFish Project.

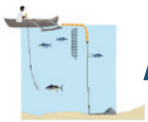
Projected effects of climate change

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	↑	↑	↓
2050	↑	↑	↓
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 Wallis and Futuna has to derive greater socio-economic benefits from fisheries will depend heavily on interventions to:

1. manage coastal fish habitats and fish stocks to ensure that they continue to provide fish for food security;
2. increase access to tuna for coastal fishers to diversify the supply of fish for food; and
3. increase the number of livelihoods that can be 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
E9	Pan-Pacific tuna management	E2

Food security

Adaptation no. (Section 3.4)	Summary of adaptation	Supporting policy no. (Section 3.5)
F1	Manage and restore vegetation in catchments	F1, F2, F18
F2	Foster the care of coastal fish habitats	F1–F3, F18
F3	Provide for landward migration of coastal fish habitats	F4, F5, F18
F5	Sustain production of coastal demersal fish and invertebrates	F6, F7, F13, F18
F6	Diversify catches of coastal demersal fish	F6, F13, F18
F8	Increase access to tuna for urban and rural populations	F8–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
L2	Rebuild populations of sea cucumbers and trochus	L2
L3	Develop coral reef ecotourism ventures	L3