

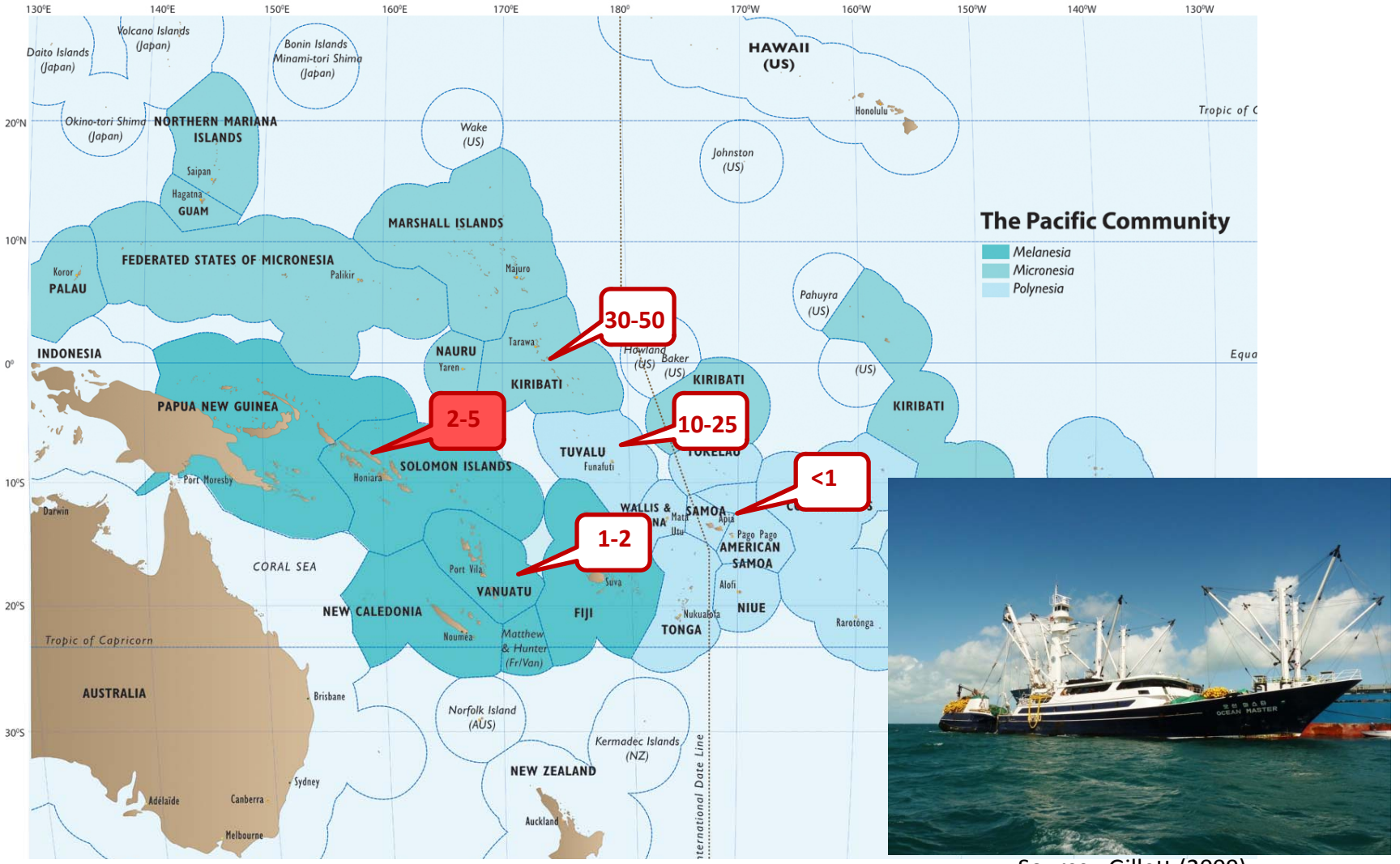

Fisheries and aquaculture

SPC
Secretariat
of the Pacific
Community

Outline

- Importance of fisheries and aquaculture to LDCs in Pacific
- Regional vulnerability assessment
- Summary of effects on resources underpinning fisheries and aquaculture
- Effects on plans to use resources
  - *Economic development*
  - *Food security*
- Identifying the best adaptations

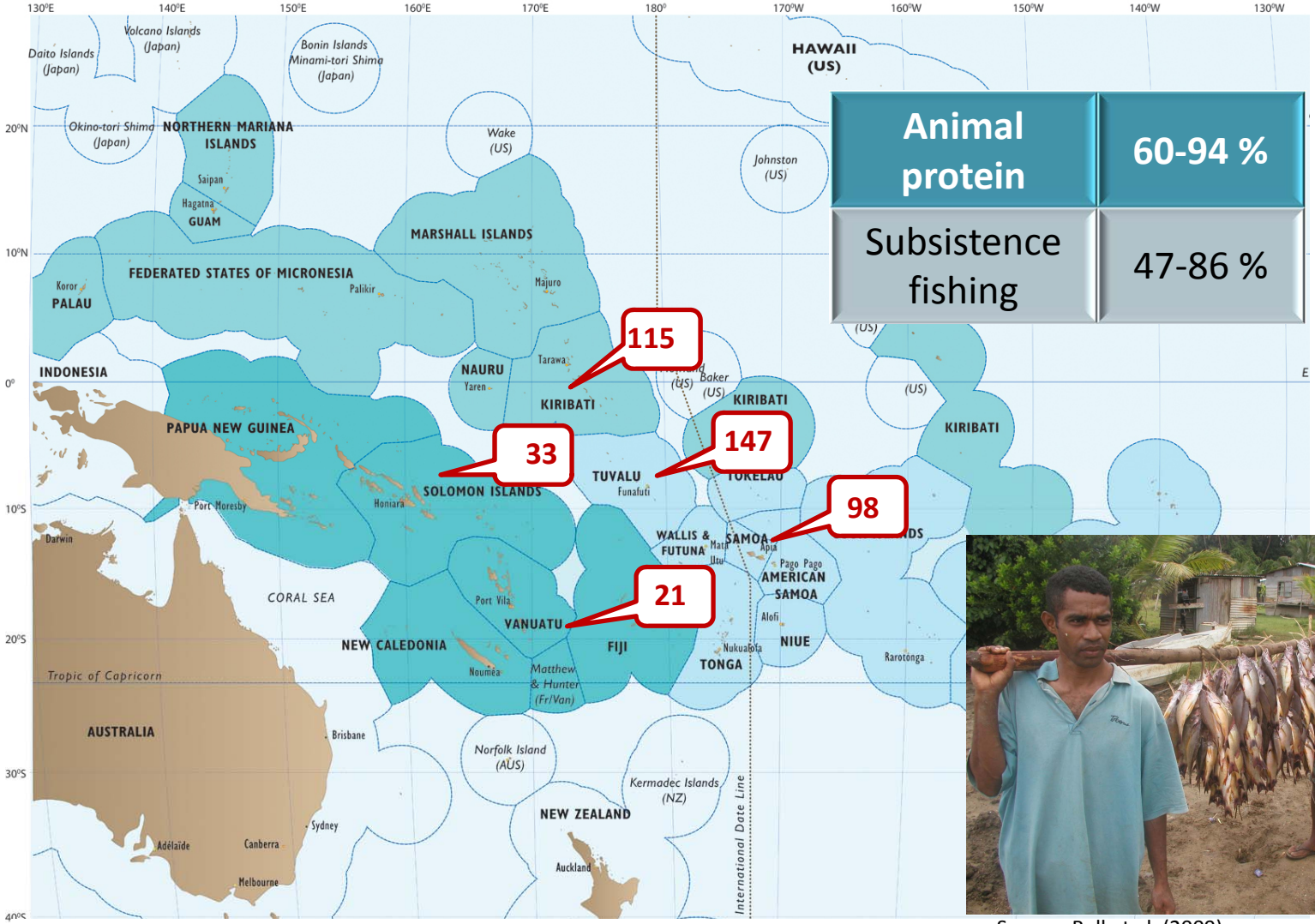
Contributions to government revenue (%) 1999-2008



Source: Gillett (2009)

Importance of fish for food security

Annual fish consumption per person - rural (kg)

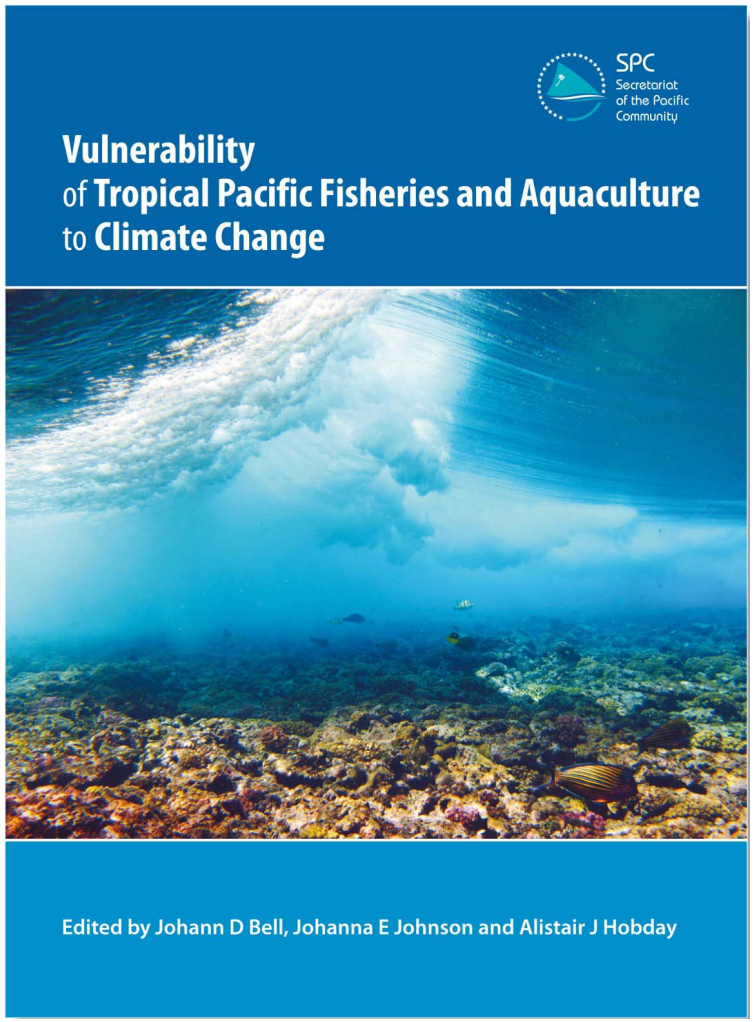


Animal protein	60-94 %
Subsistence fishing	47-86 %

Source: Bell et al. (2009)

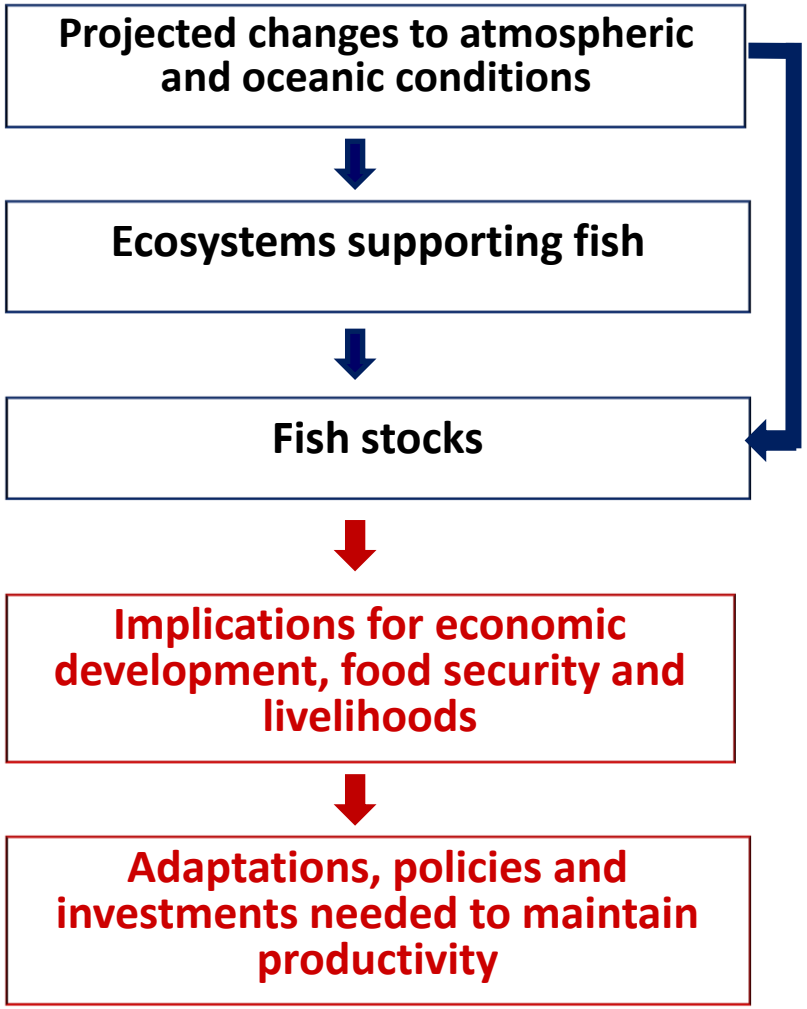
Vulnerability assessment

- 88 authors
- 36 institutions
- Summary for policy makers



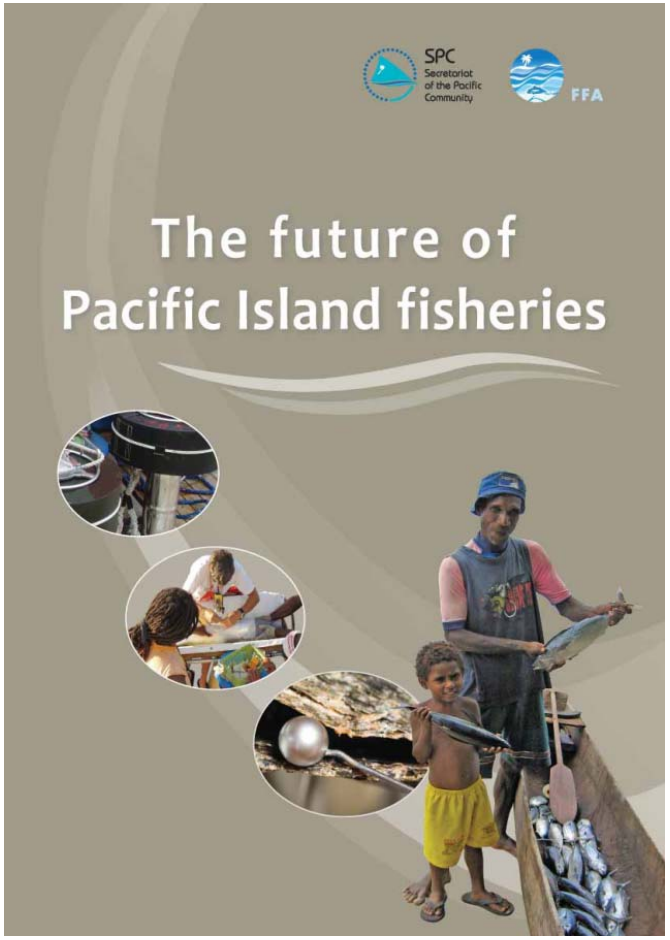
http://www.spc.int/climate-change/fisheries/assessment/

Approach used



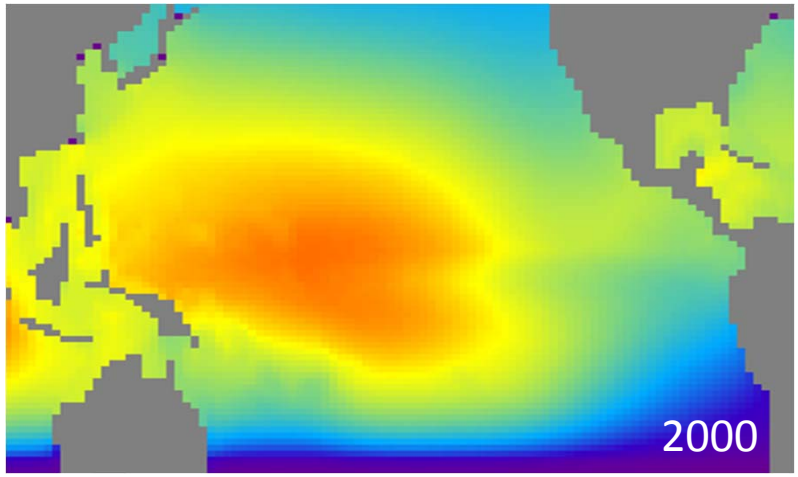
How could climate change affect plans for the sector?

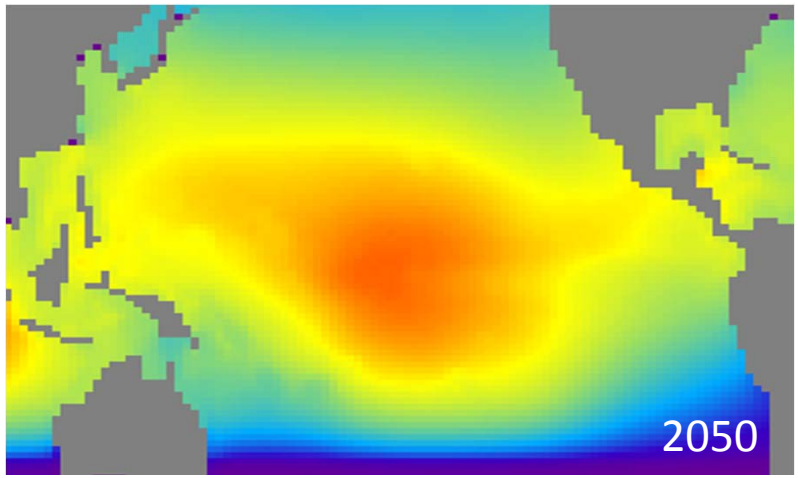
- Optimise contributions of tuna to economic development
- Provide sufficient fish for food security
- Maximise sustainable livelihoods from fisheries resources



Projected effects on skipjack tuna

A2 emissions scenario





Source: Lehodey et al. (2011)

Catch in 2009

- 1.75 million tonnes
- ~ USD 2.2 billion

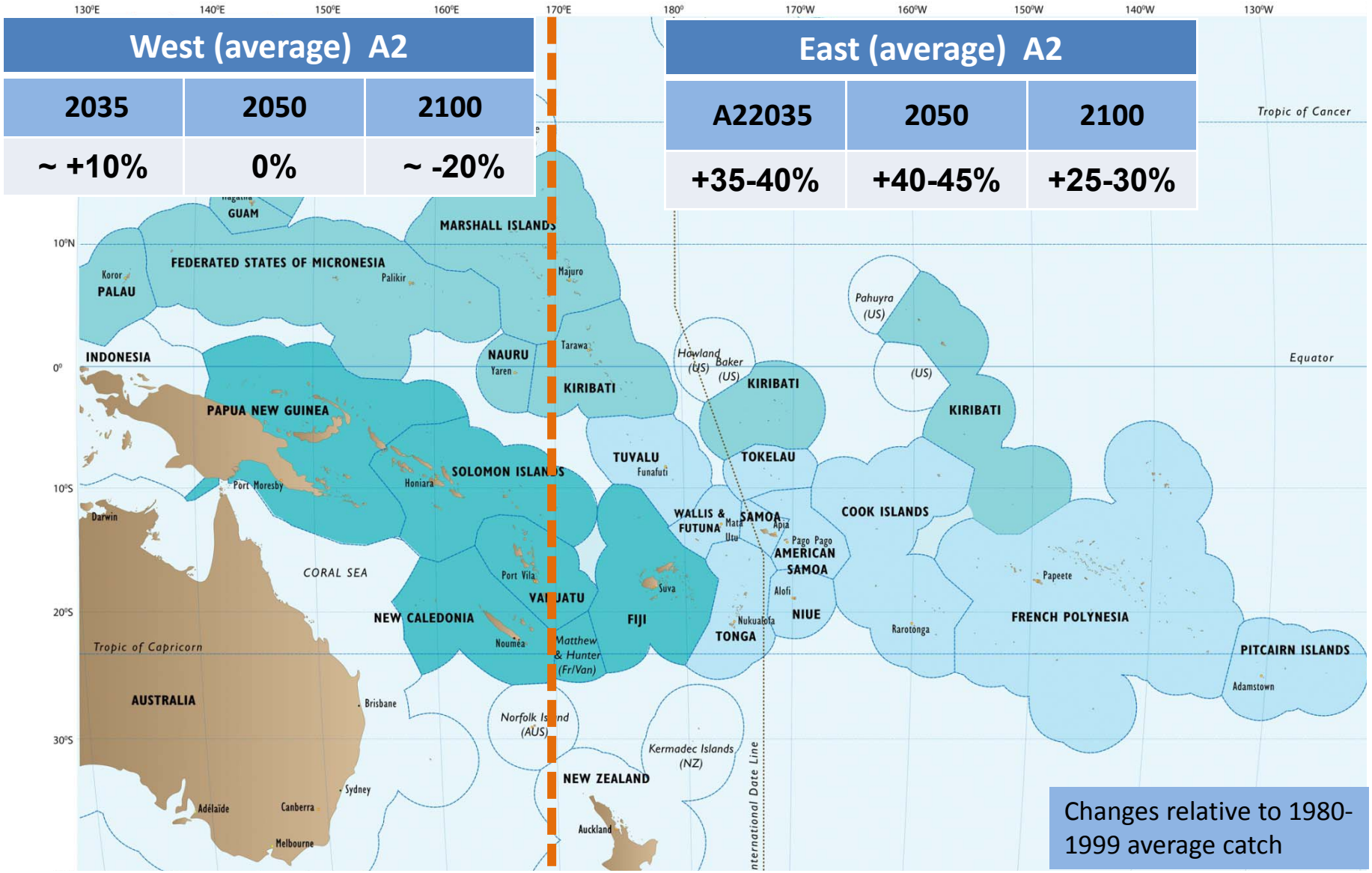
Effects due to:

- Increases in sea surface temperature in eastern Pacific
- Shift of prime feeding areas to the east

Effects on skipjack tuna catches

West (average) A2		
2035	2050	2100
~ +10%	0%	~ -20%

East (average) A2		
A22035	2050	2100
+35-40%	+40-45%	+25-30%

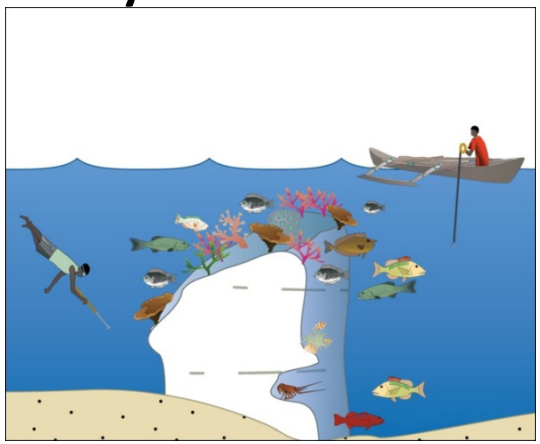


Changes relative to 1980-1999 average catch

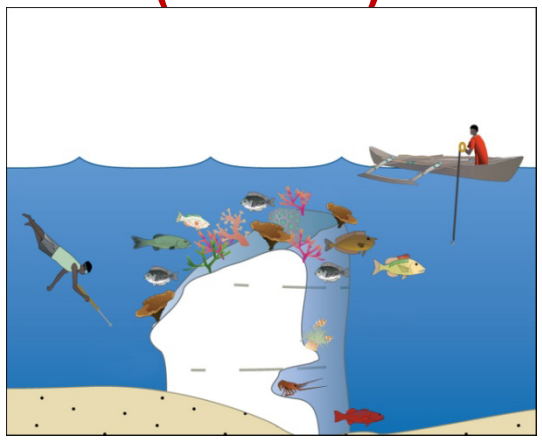
Effects on coral reef fish catch

A2 emissions scenario

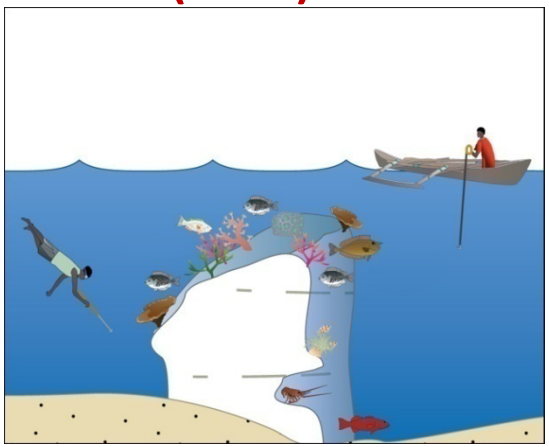
Today



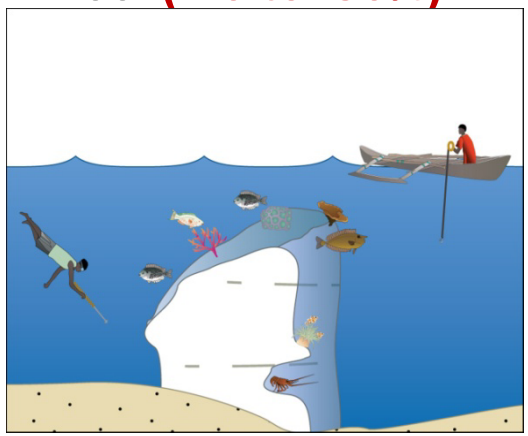
2035 (-2 to -5%)



2050 (-20%)



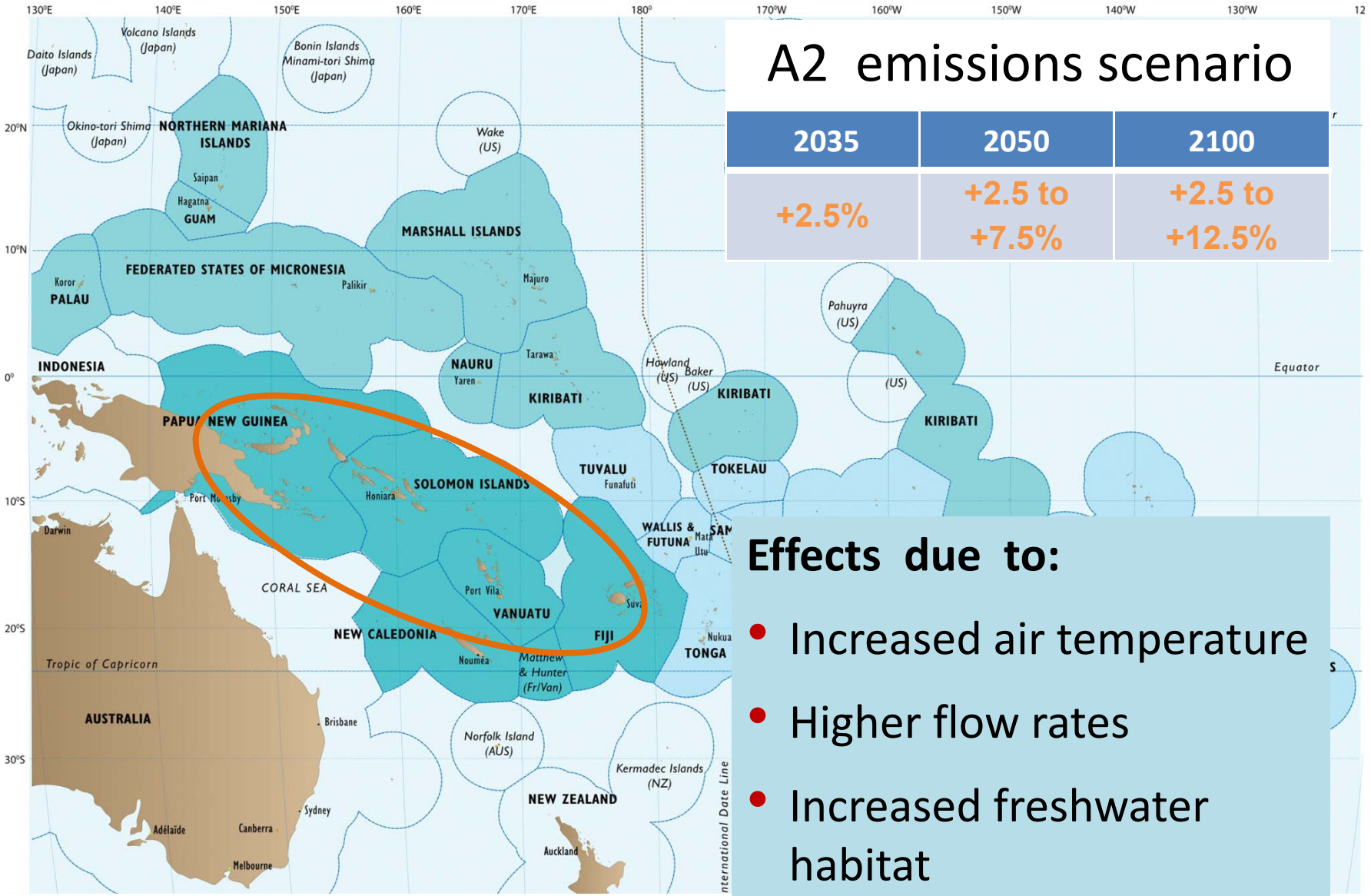
2100 (-20 to -50%)



Effects due to:

- Increased sea surface temperature and more frequent bleaching
- Ocean acidification
- Greater runoff of nutrients due to higher rainfall
- Cyclones of greater intensity

Effects on freshwater fish catch



A2 emissions scenario

2035	2050	2100
+2.5%	+2.5 to +7.5%	+2.5 to +12.5%

Effects due to:

- Increased air temperature
- Higher flow rates
- Increased freshwater habitat

Coastal aquaculture commodities

- Pearls
- Shrimp
- Seaweed
- Marine ornamentals

A2 emissions scenario

2035	2050	2100
↓	↓	↓

Effects due to:

- Increased sea surface temperature
- Ocean acidification
- Greater runoff of nutrients
- Sea-level rise
- More-intense cyclones

Pond aquaculture commodities

- Tilapia

A2 emissions scenario

2035	2050	2100
↑	↑	↑

Effects due to:

- Increased surface air temperature (faster growth rates in ponds)
- Higher rainfall (more places to build ponds)

Summary of changes in production

A2 emissions scenario

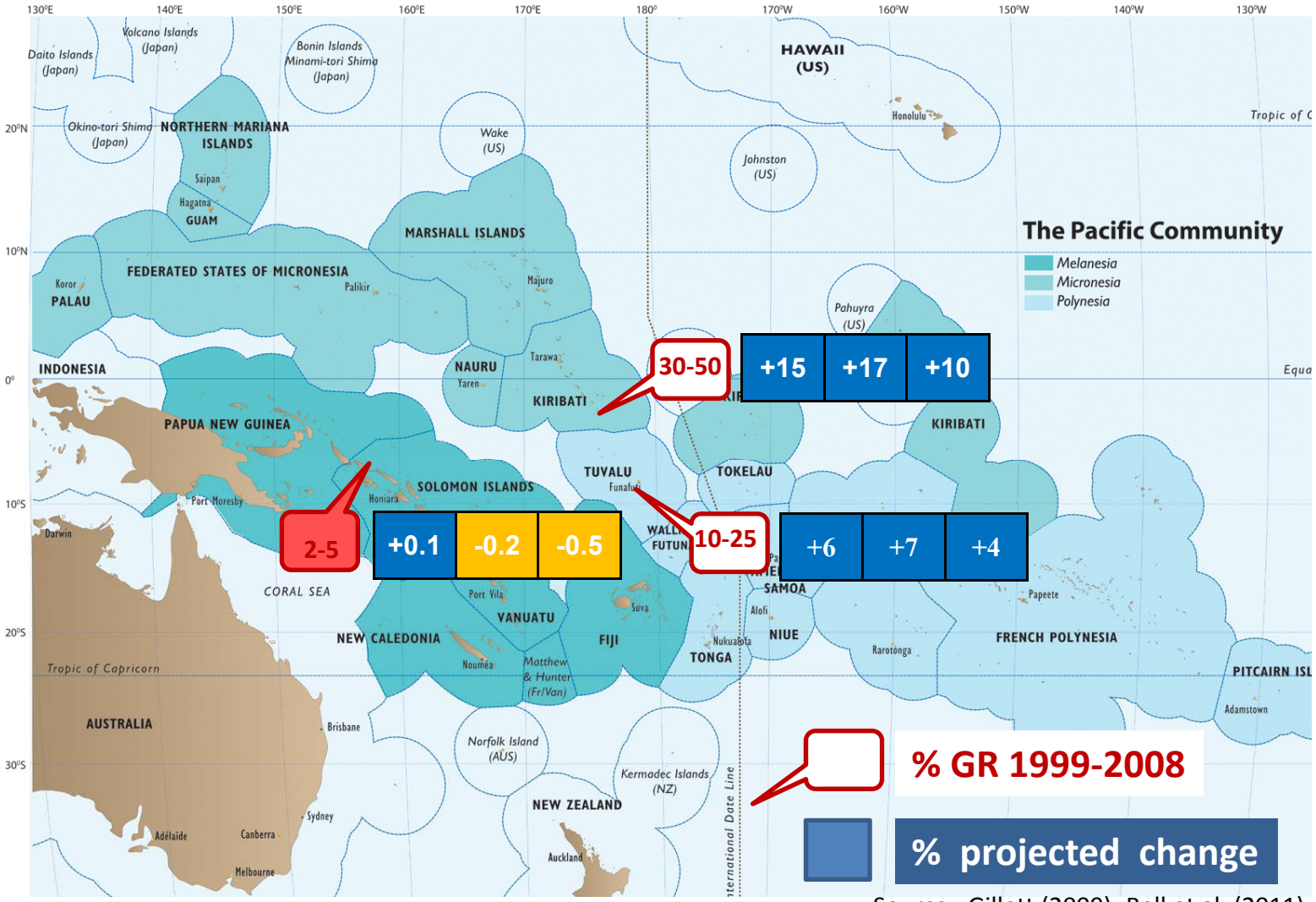
Resource	West			East		
	2035	2050	2100	2035	2050	2100
Tuna	↑	Negligible	↓	↑	↑	↑
Coastal fisheries	Negligible	↓	↓	Negligible	↓	↓
Freshwater fisheries	↑	↑	↑	↑	↑	↑
Aquaculture						
*Fish in ponds	↑	↑	↑	↑	↑	↑
*Other commodities	↓	↓	↓	↓	↓	↓

How could the projected changes to tuna resources affect plans for economic development?

- Government revenue (from licence fees)
- GDP
  - Development of national fleets
  - More domestic processing

Increases in government revenue

Changes in revenue % 2035 ➡ 2050 ➡ 2100 (A2)



Source: Gillett (2009); Bell et al. (2011)

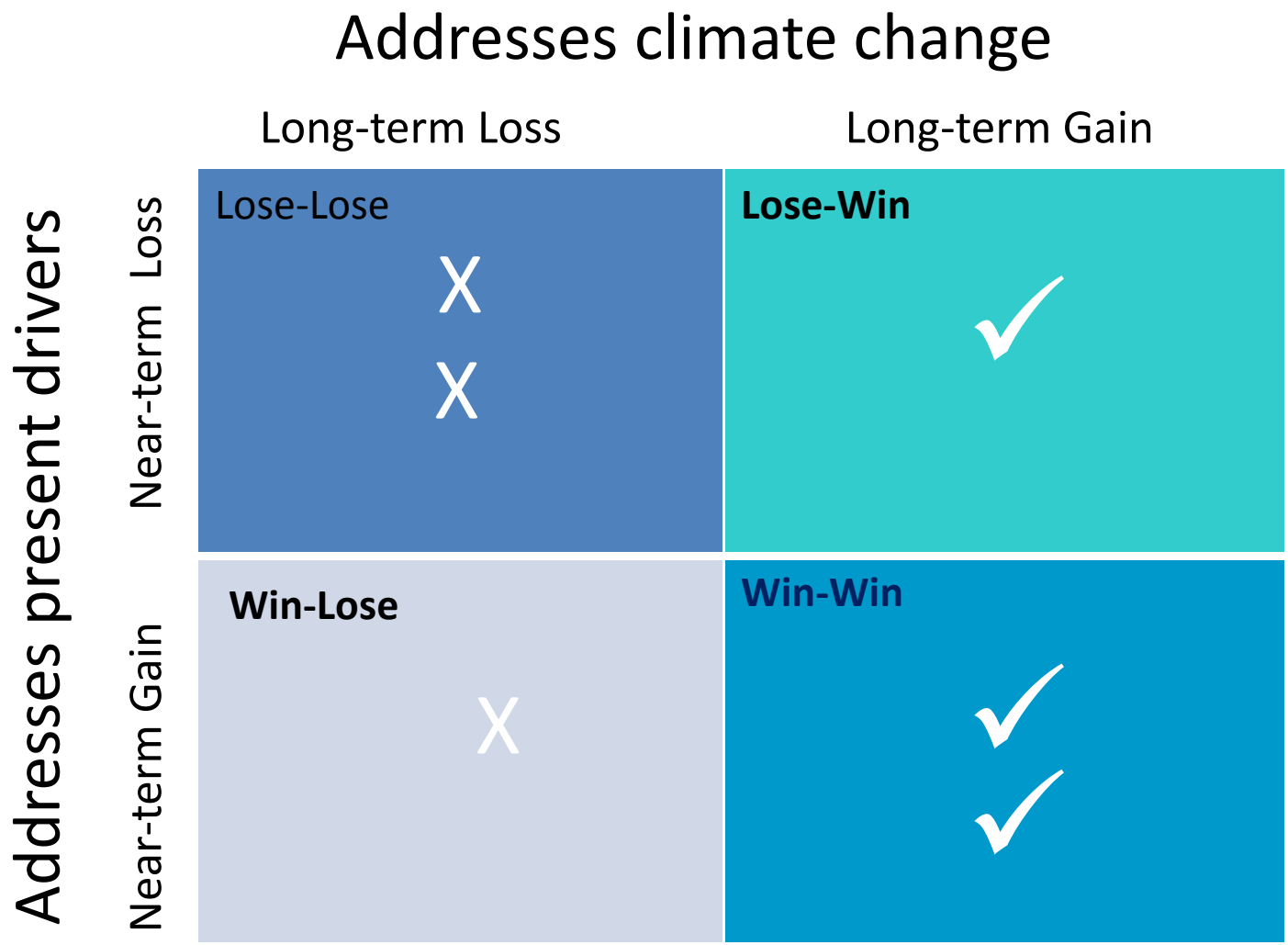
Key points

- Kiribati and Tuvalu in east with greatest dependency on tuna should receive additional benefits!
- Losses of revenue and GDP occur mainly in Solomon Islands in west where tuna makes a relatively lower contribution to economic development (due to size of economies)
- Catches of tuna expected to increase in EEZs of Vanuatu and Samoa

How should LDCs adapt?

- To reduce the threats
- To harness the opportunities

Adaptation decision framework



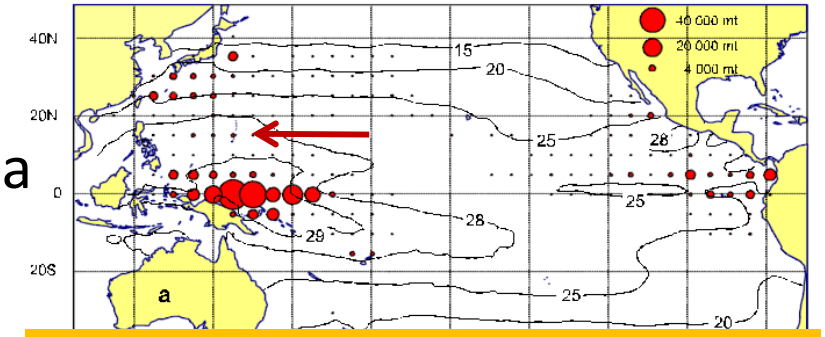
After Grafton (2010)

Adaptations (economic development)

L-L	L-W
W-L	W-W

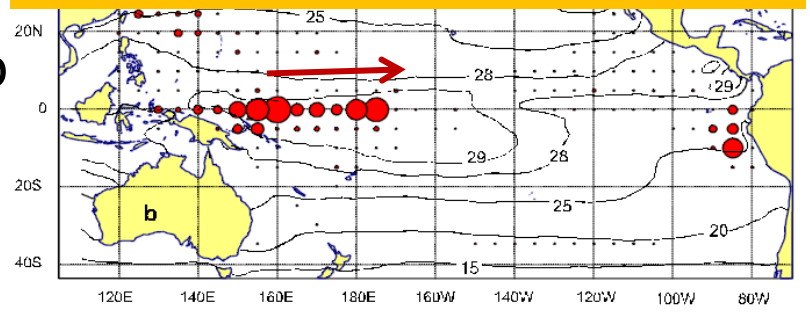
'Vessel Days Scheme' to manage effort of industrial tuna fleets

La Niña



Vessel owners fishing in PNA waters can purchase and trade fishing days depending on the location of the tuna

El Niño



- Skipjack tuna move 2000-3000 km along the equatorial Pacific , depending on ENSO events
- The vessel day effort management scheme allows the fleet to follow the fish and ensures that all PNA countries still receive some benefits

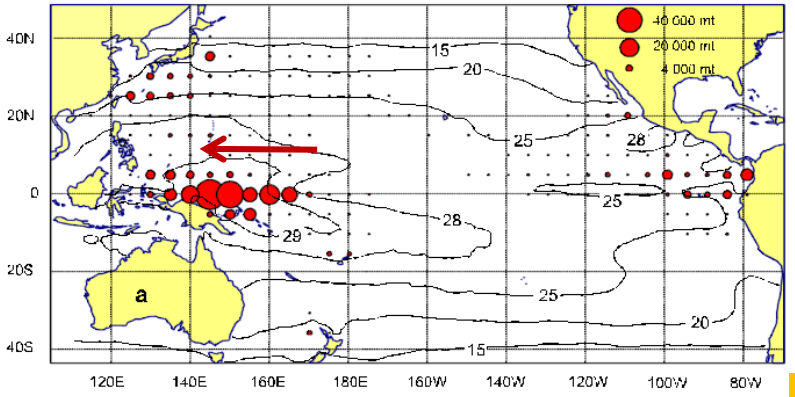
Source: P. Lehodey

Adaptations (economic development)

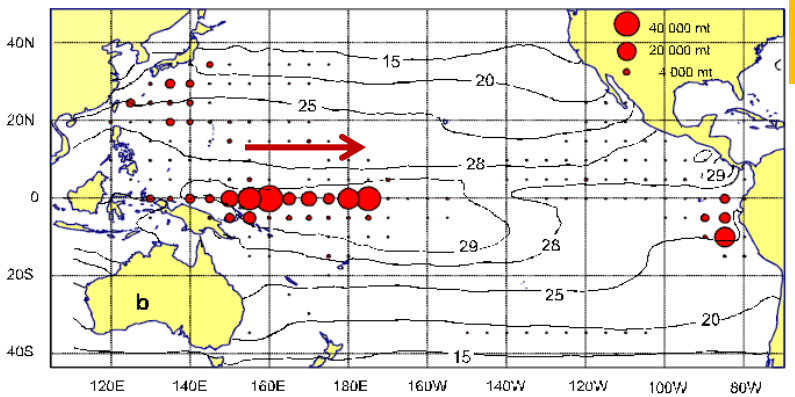
L-L	L-W
W-L	W-W

‘Vessel Days Scheme’ to manage effort of industrial tuna fleets

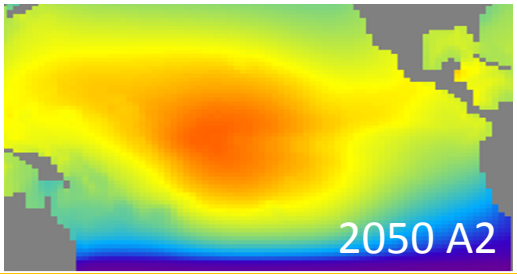
La Niña



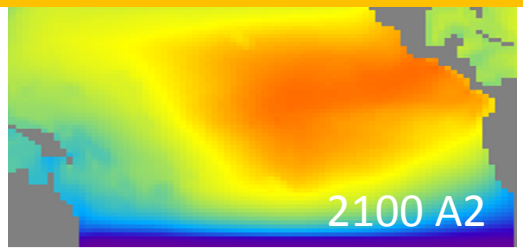
El Niño



Skipjack tuna



VDS has potential to be modified regularly to accommodate movement of tuna to the east



Source: P. Lehodey

Adaptations (economic development)

L-L	L-W
W-L	W-W

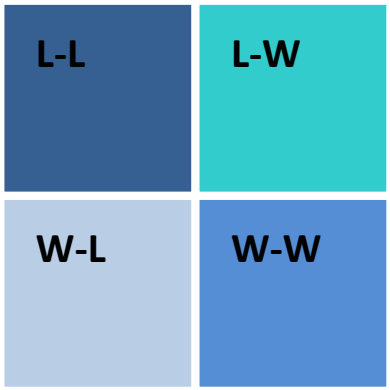
Energy audits of industrial fishing vessels

- **Addresses likelihood of near-term rises in fuel costs**
- **Will assist national fleets from PNG and Solomon Islands that may have to go greater distances in the future to catch fish for their canneries**

Adaptations to supply canneries in Solomon Islands

- Maintain/develop 'Economic Partnership Agreement' with the EU (global sourcing provisions)
- Reduce access of distant water fishing nations to the EEZ to provide more fish for national vessels
- Require distant water fishing nations operating with their EEZ to land some of the catch for use by local canneries;
- Enhance existing arrangements for the national fleet to fish in other EEZs

Adaptations (economic development)

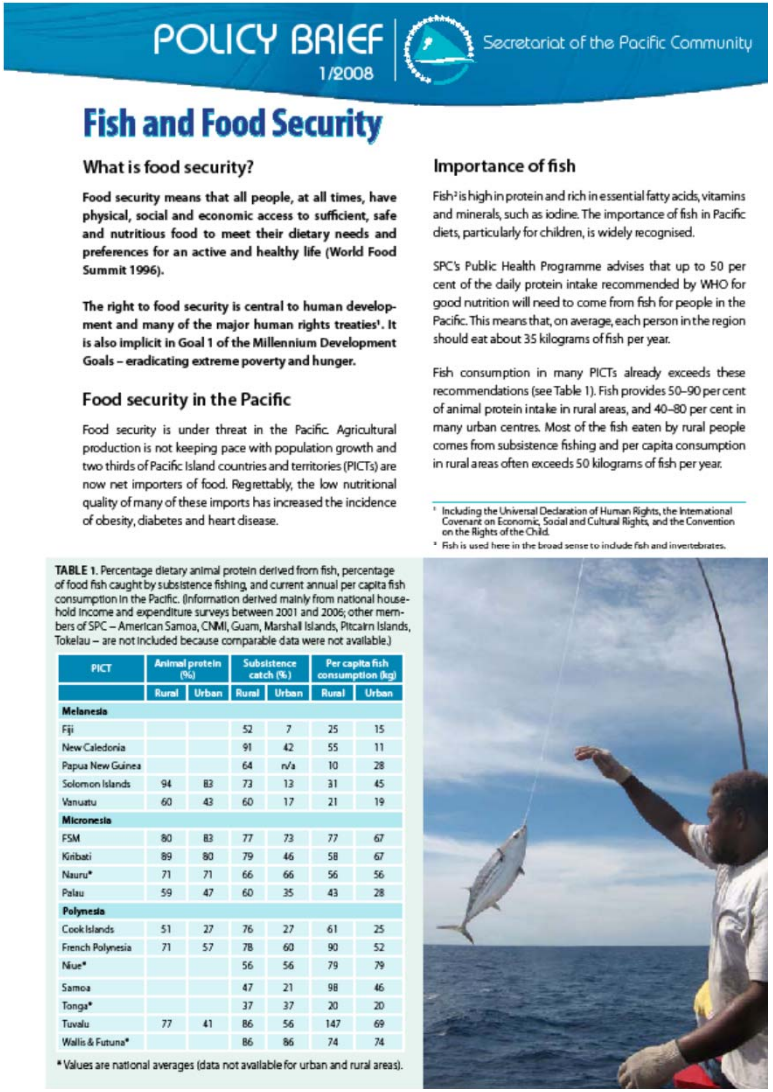


Maximise economic benefits from transhipping

- **Provide wharf space for repair of nets**
- **Sell internet services to fleets**
- **Supply fresh vegetables**
- **Establish machine shops to make simple repairs**
- **Provide shipping agent services**

How could changes to coastal fisheries affect fish available for food security?

- Plans are to provide 35 kg of fish per person per year as populations grow
- Maintain traditional fish consumption where it is >35 kg



POLICY BRIEF 1/2008 | Secretariat of the Pacific Community

Fish and Food Security

What is food security?

Food security means that all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and preferences for an active and healthy life (World Food Summit 1996).

The right to food security is central to human development and many of the major human rights treaties[1]. It is also implicit in Goal 1 of the Millennium Development Goals – eradicating extreme poverty and hunger.

Food security in the Pacific

Food security is under threat in the Pacific. Agricultural production is not keeping pace with population growth and two thirds of Pacific Island countries and territories (PICTs) are now net importers of food. Regrettably, the low nutritional quality of many of these imports has increased the incidence of obesity, diabetes and heart disease.

Importance of fish

Fish[2] is high in protein and rich in essential fatty acids, vitamins and minerals, such as iodine. The importance of fish in Pacific diets, particularly for children, is widely recognised.

SPC's Public Health Programme advises that up to 50 per cent of the daily protein intake recommended by WHO for good nutrition will need to come from fish for people in the Pacific. This means that, on average, each person in the region should eat about 35 kilograms of fish per year.

Fish consumption in many PICTs already exceeds these recommendations (see Table 1). Fish provides 50–90 per cent of animal protein intake in rural areas, and 40–80 per cent in many urban centres. Most of the fish eaten by rural people comes from subsistence fishing and per capita consumption in rural areas often exceeds 50 kilograms of fish per year.

[1] Including the Universal Declaration of Human Rights, the International Covenant on Economic, Social and Cultural Rights, and the Convention on the Rights of the Child.

[2] Fish is used here in the broad sense to include fish and invertebrates.

TABLE 1. Percentage dietary animal protein derived from fish, percentage of food fish caught by subsistence fishing, and current annual per capita fish consumption in the Pacific. (Information derived mainly from national household income and expenditure surveys between 2001 and 2006; other members of SPC – American Samoa, CNMI, Guam, Marshall Islands, Pitcairn Islands, Tokelau – are not included because comparable data were not available.)

PICT	Animal protein (%)		Subsistence catch (%)		Per capita fish consumption (kg)	
	Rural	Urban	Rural	Urban	Rural	Urban
Melanesia						
Fiji			52	7	25	15
New Caledonia			91	42	55	11
Papua New Guinea			64	n/a	10	28
Solomon Islands	94	83	73	13	31	45
Vanuatu	60	43	60	17	21	19
Micronesia						
FSM	80	83	77	73	77	67
Kiribati	89	80	79	46	58	67
Nauru*	71	71	66	66	56	56
Palau	59	47	60	35	43	28
Polynesia						
Cook Islands	51	27	76	27	61	25
French Polynesia	71	57	78	60	90	52
Niue*			56	56	79	79
Samoa			47	21	98	46
Tonga*			37	37	20	20
Tuvalu	77	41	86	56	147	69
Wallis & Futuna*			86	86	74	74

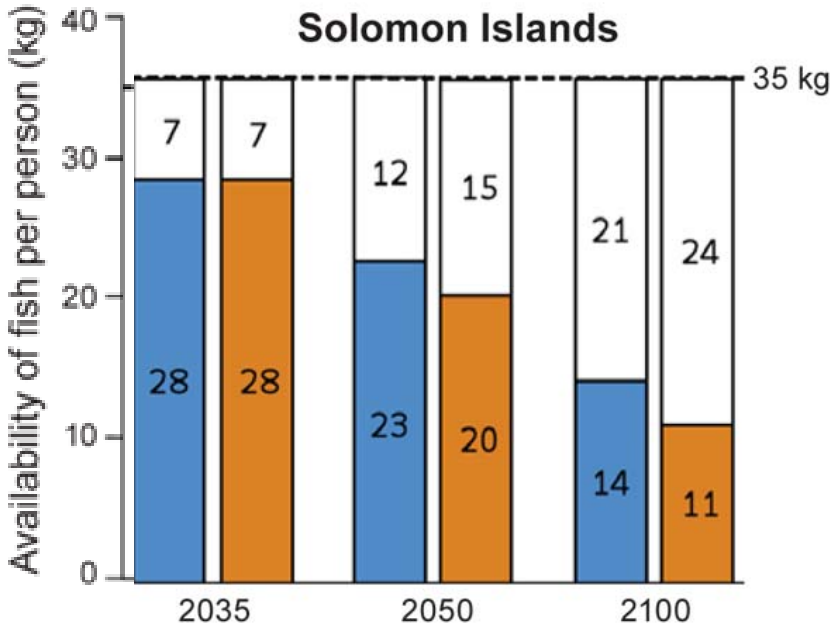
* Values are national averages (data not available for urban and rural areas).

Coastal fish available

PICT	Reef area (km^2)*	Estimated potential fish yield per km^2 per year (tonnes)	Population**			Fish available per person per year (kg)[a]			
			2035	2050	2100	B1/A2 2035	A2 2050	B1 2100	A2 2100
Micronesia									
FSM	15,074	45,222	105,300	109,300	109,300	418	352	352	307
Kiribati	4320	12,960	144,600	163,300	211,300	86[b]	65[b]	50[b]	42[b]
Polynesia									
French Polynesia	15,126	45,378	330,800	348,800	378,900	131	109	100	85[b]
Niue	56	168	1200	1300	1300	125	114	116	104
Tonga	5811	17,433	115,000	123,000	146,900	145	116	97	81
Tuvalu	3175	9525	12,800	13,900	18,500	711	570	428	362
Wallis and Futuna	932	2796	13,600	13,600	13,600	197	171	172	145

* Derived from Chapter 5; ** source: SPC Statistics for Development Programme (see also Appendix 12.3); a = includes invertebrates; b = PICTs where availability of reef-associated fish per person is less than current rates of traditional fish consumption.

Effects of popn. growth and climate change on availability of coastal fish for food security



Effects of population growth

Additional effects of reduced coastal fisheries production due to the A2 emissions scenario

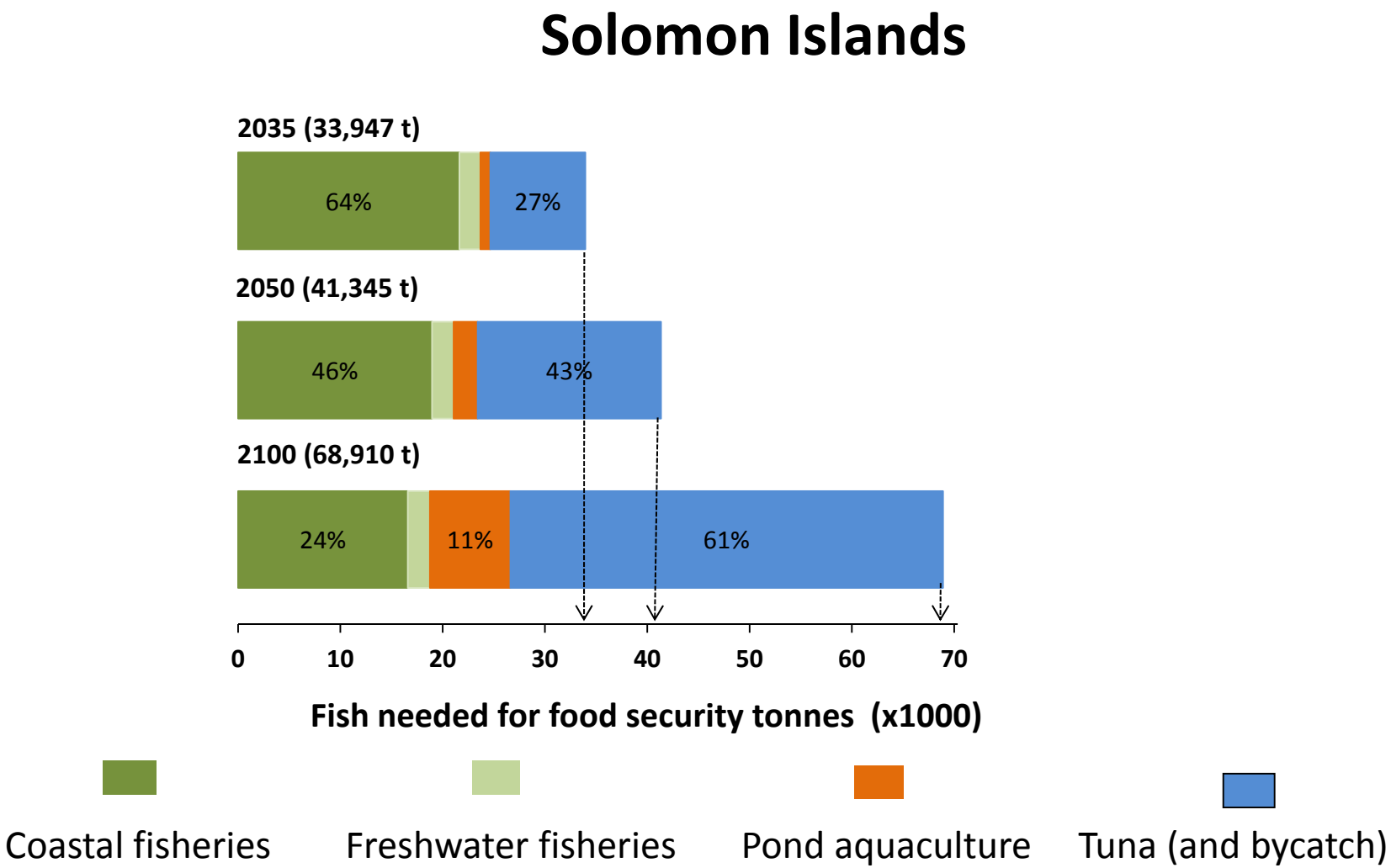
Gap in fish needed for food security

LDC	Gap in fish per person /year (kg)					
	2035		2050		2100	
	P	CC	P	CC	P	CC
Solomon Islands	7	7	12	15	21	24
Samoa	5	6	6	11	10	16
Vanuatu	25	25	27	28	29	30

Where will the fish come from?

- By increasing access of coastal communities to tuna

Only tuna can fill the gap



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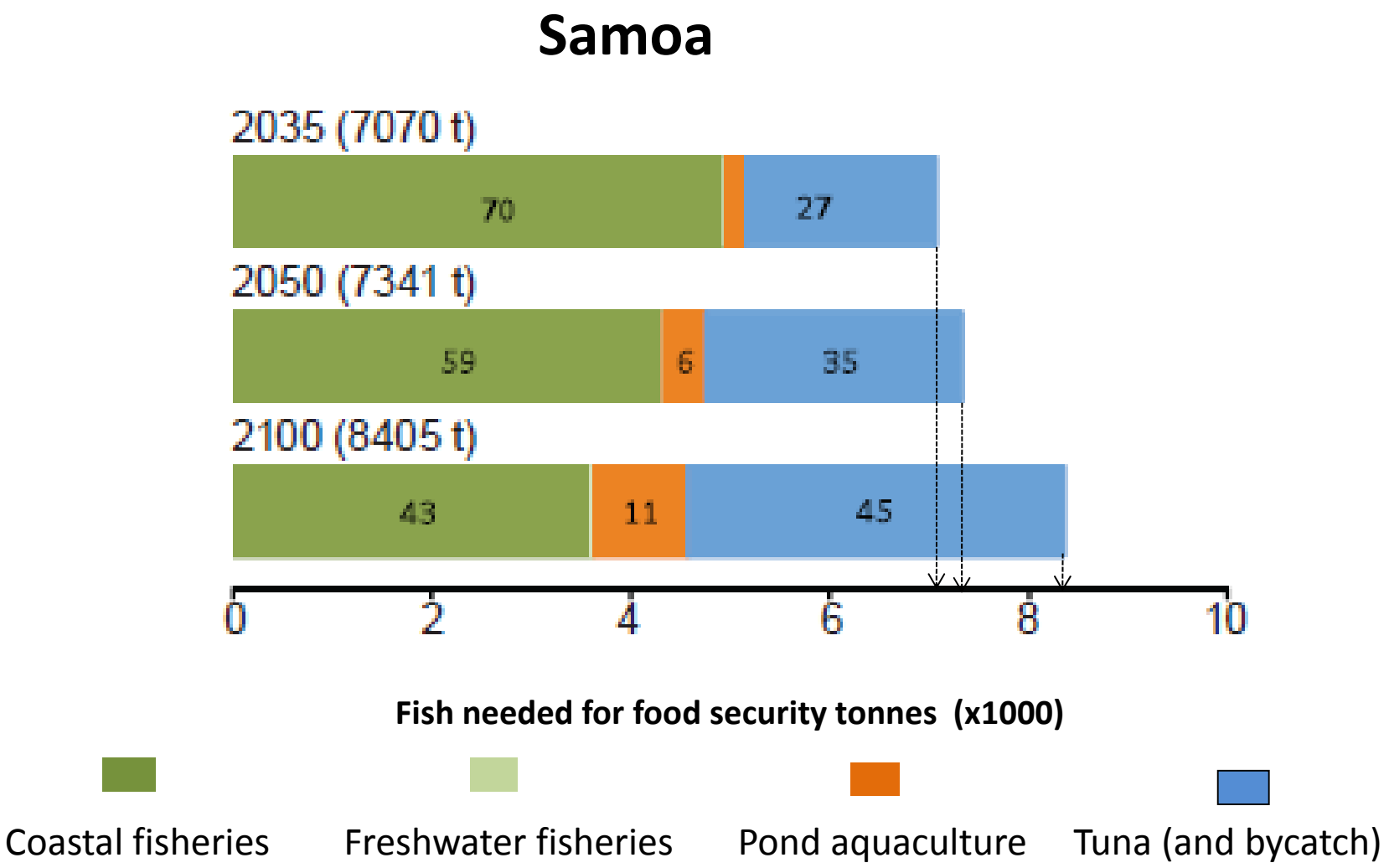

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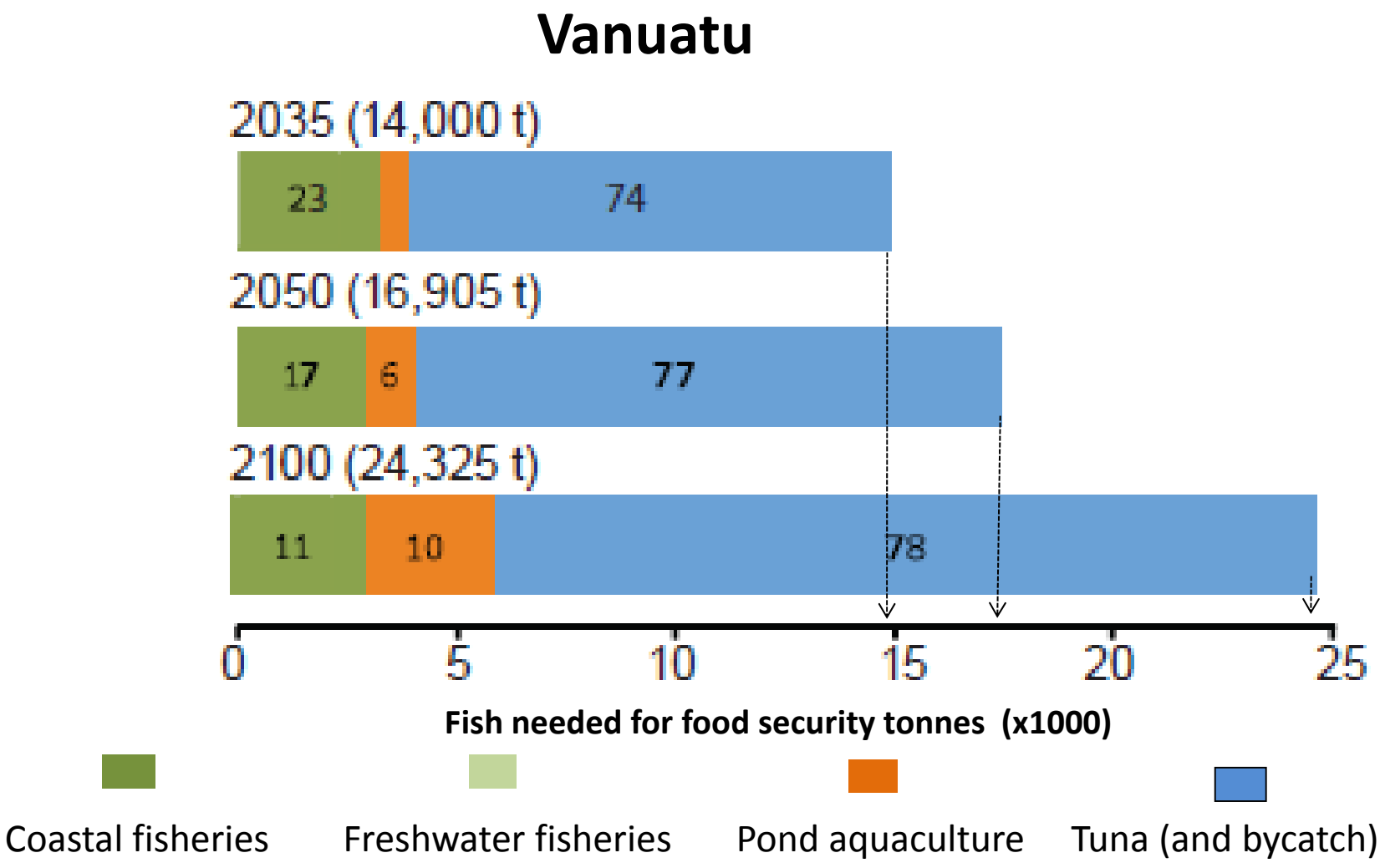
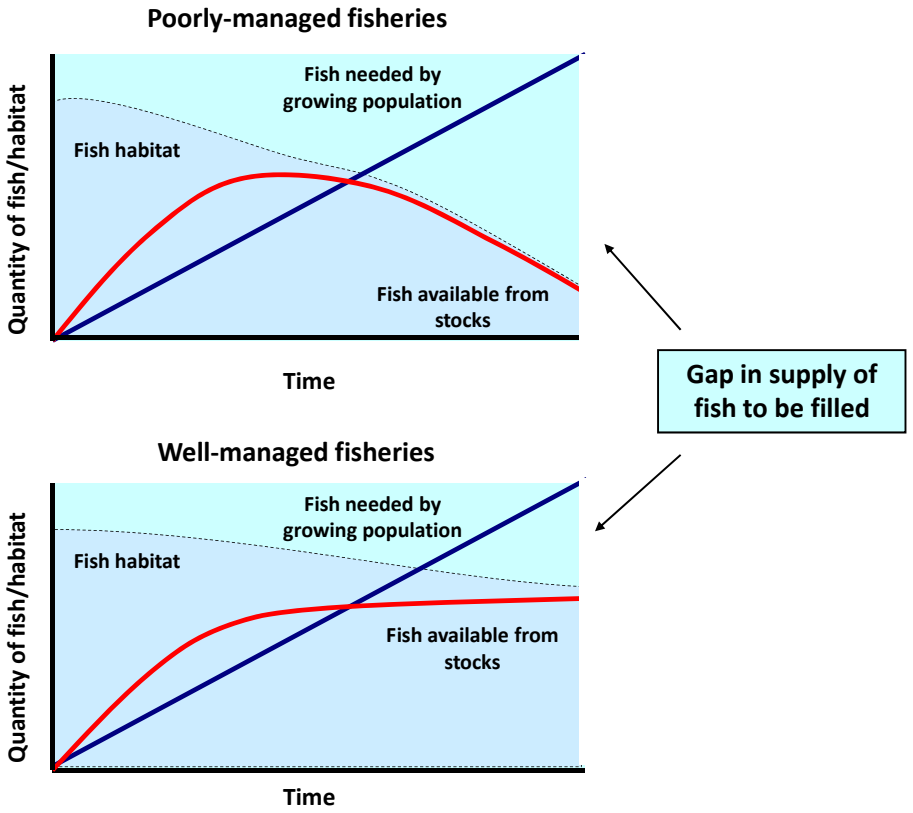


Adaptations (food security)

L-L	L-W
W-L	W-W

Restore and sustain fisheries and their habitats



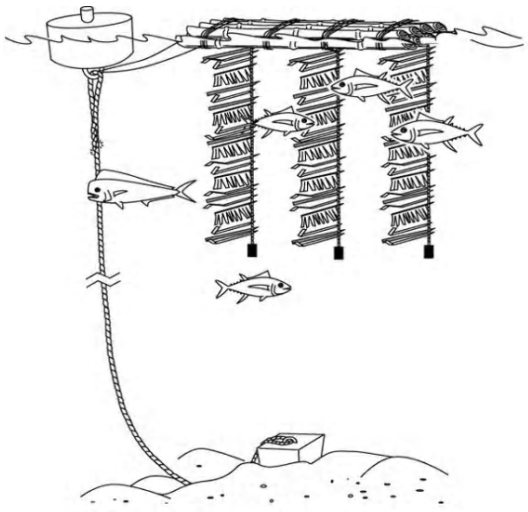
Key actions:

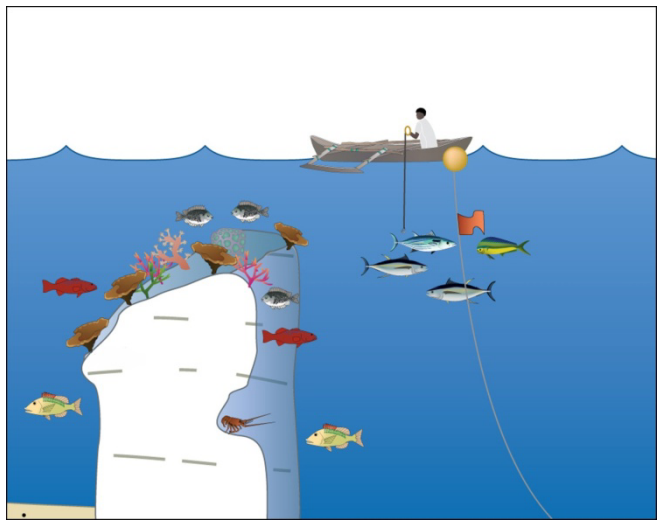
- **FAO Code of Conduct for Responsible Fisheries**
- **Ecosystem Approach Fisheries Management**

Adaptations (food security)

L-L	L-W
W-L	W-W

Increase access to tuna for subsistence fishers with low-cost, inshore Fish Aggregating Devices (FADs)





Adaptations (food security)

L-L	L-W
W-L	W-W

Store tuna and bycatch from industrial fleets and distribute to urban areas

Adaptations (food security)

L-L	L-W
W-L	W-W

Develop pond aquaculture

Summary

Economic development

- Kiribati and Tuvalu gain, Solomon Islands has losses but effects on GDP are small, Vanuatu and Samoa have potential to gain

Food security

- Effects of population growth over-ride effects of climate change
- Contribution of coastal fisheries will decrease, but gap can be filled mainly by tuna
- Pond aquaculture favoured by climate change

Summary

Adaptations

- Win-win adaptations available for economic development and food security
- Lose-win adaptations need to be implemented for coastal fisheries to reduce impacts of short-term drivers and build resilience to climate change

A strategic regional investment

- Improved tuna modelling!

Acknowledgements

Australian Government

AusAID