Calculating ‘vulnerability’ when resources are enhanced by climate change

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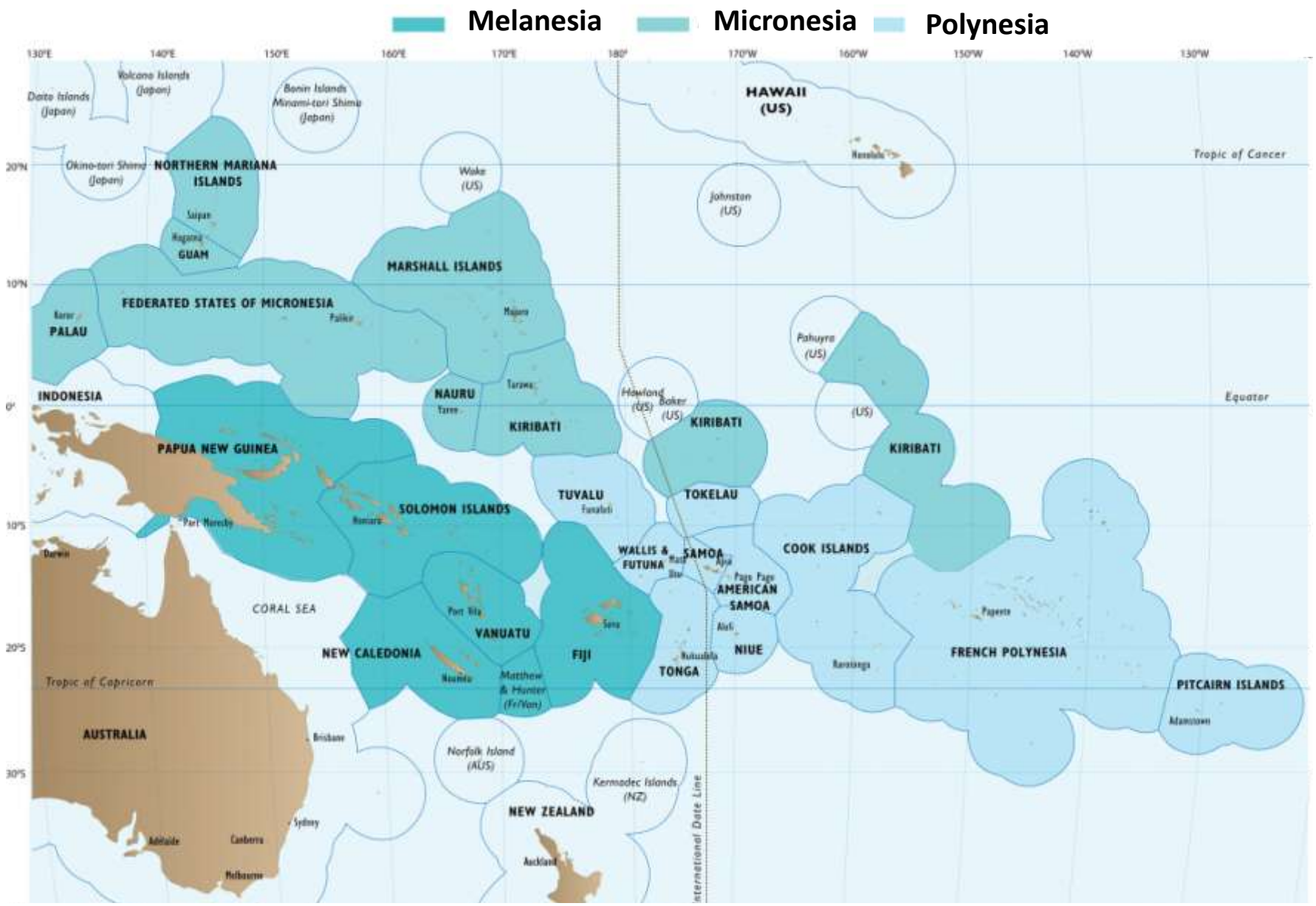
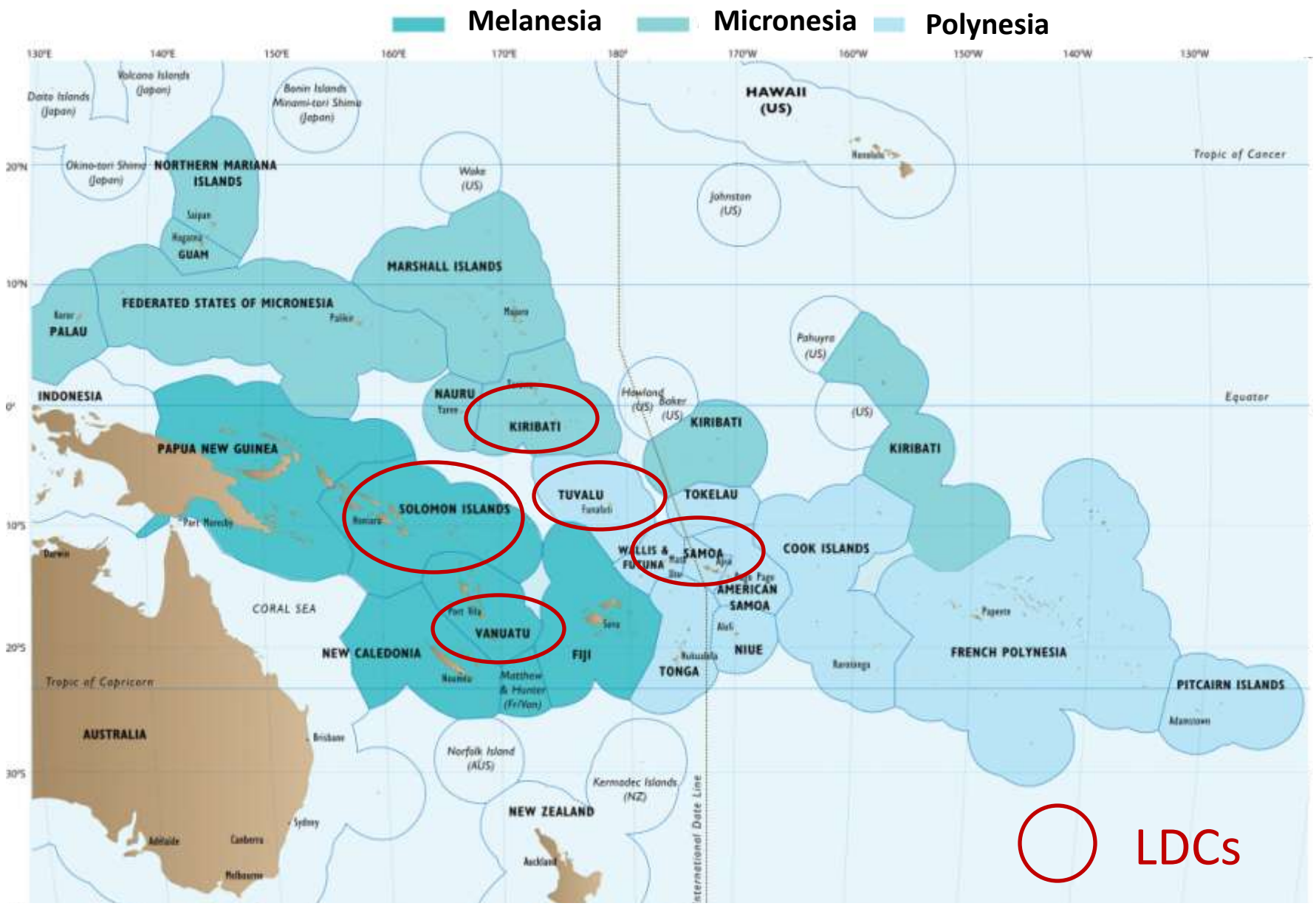
Outline

- Tropical Pacific vulnerability assessment
- Projected redistribution of tuna
- Changes to vulnerability index required to handle ‘winners’
- Language needed

Pacific Island countries and territories



Pacific Island countries and territories



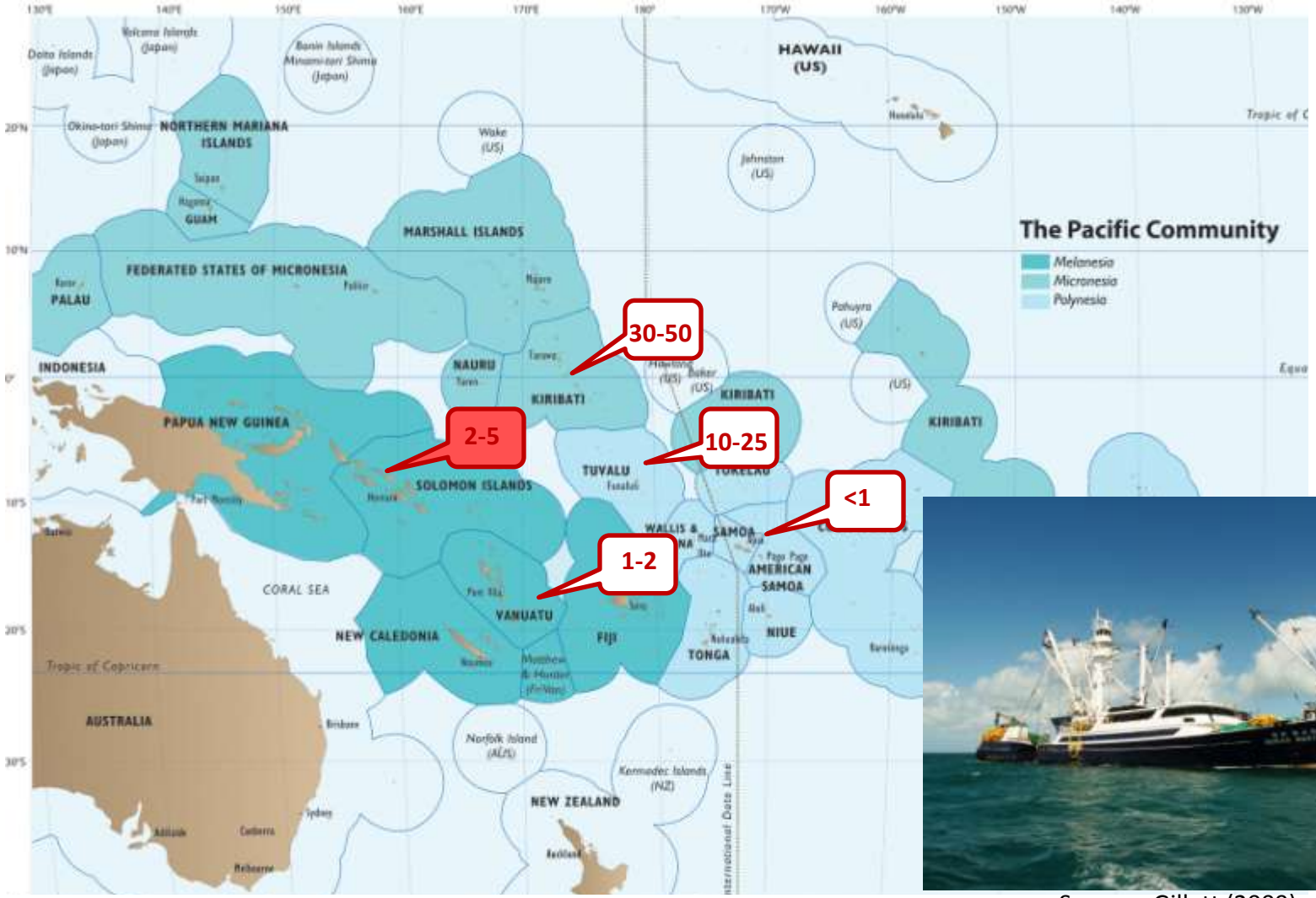
Source of benefits

Skipjack tuna

Catch in 2009 from Western and Central Pacific Ocean

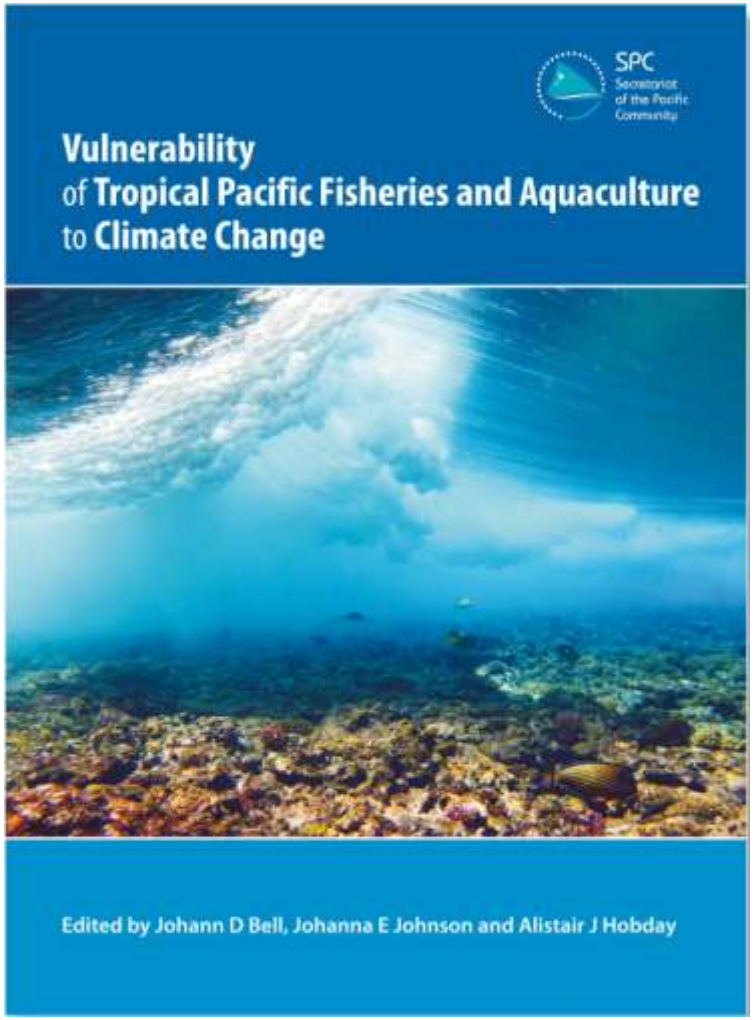
- 1.75 million tonnes
- ~ USD 2.2 billion

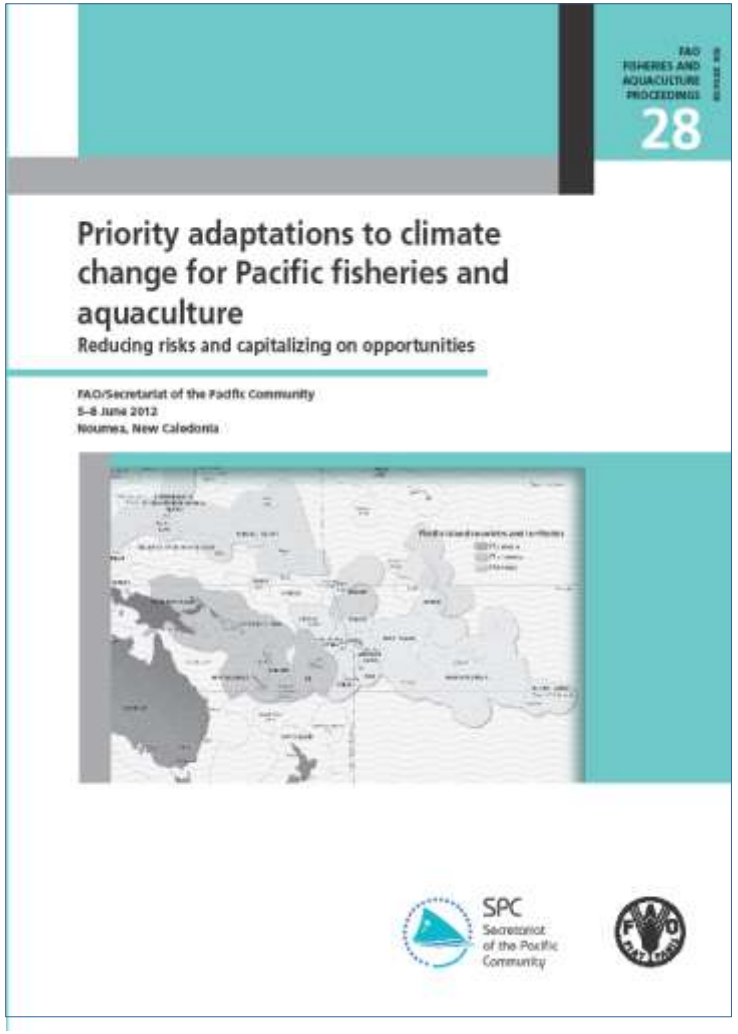
Contributions to government revenue (%) 1999-2008



Source: Gillett (2009)

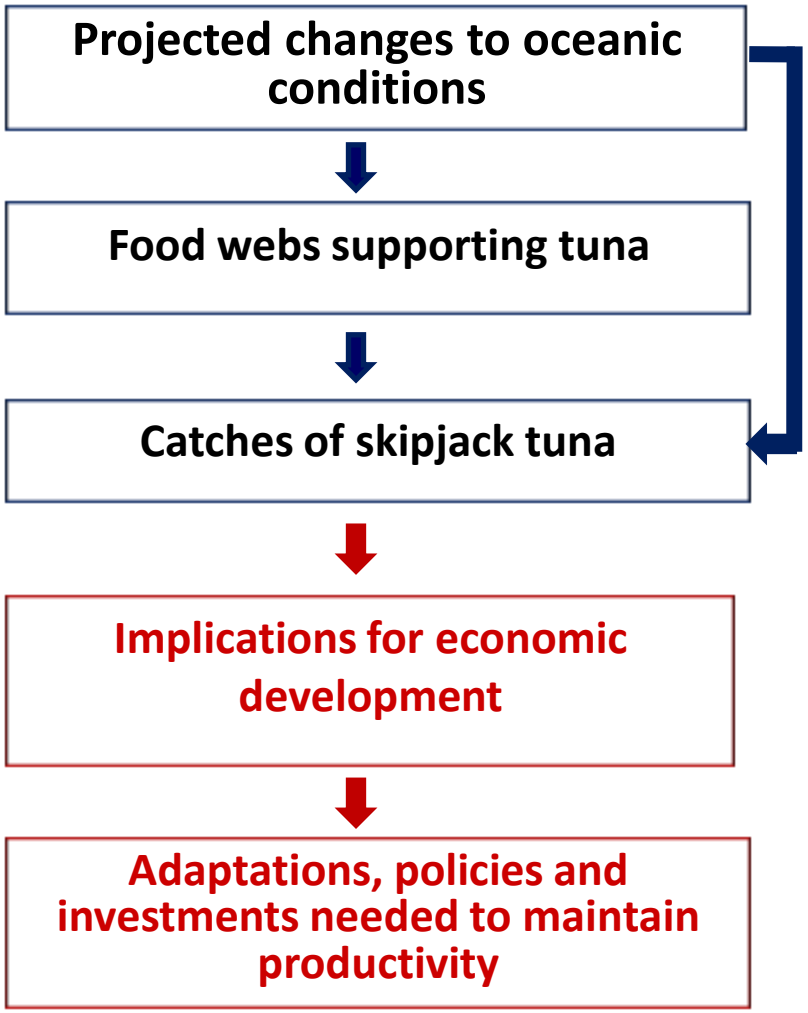
Vulnerability assessment





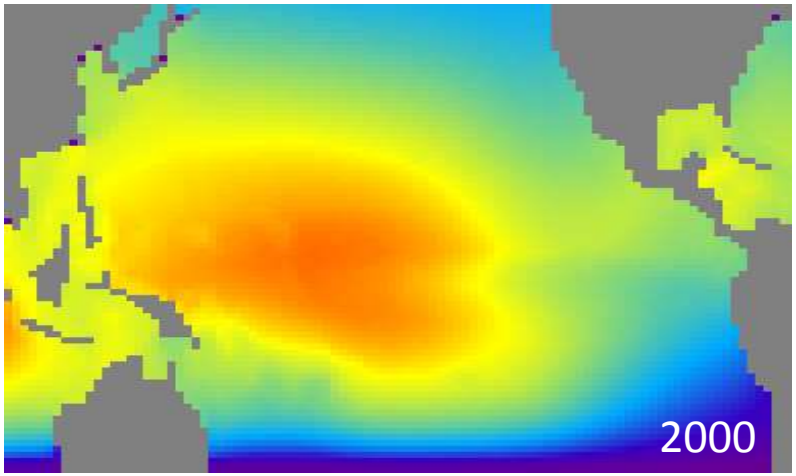
http://www.spc.int/climate-change/fisheries/assessment/

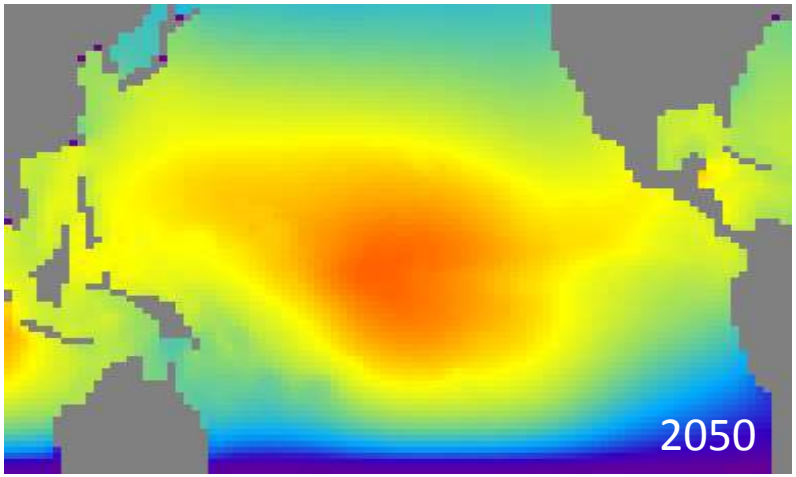
Approach used



Projected effects on skipjack tuna

A2 emissions scenario





Source: Lehodey et al. (2011)

Redistribution east due to:

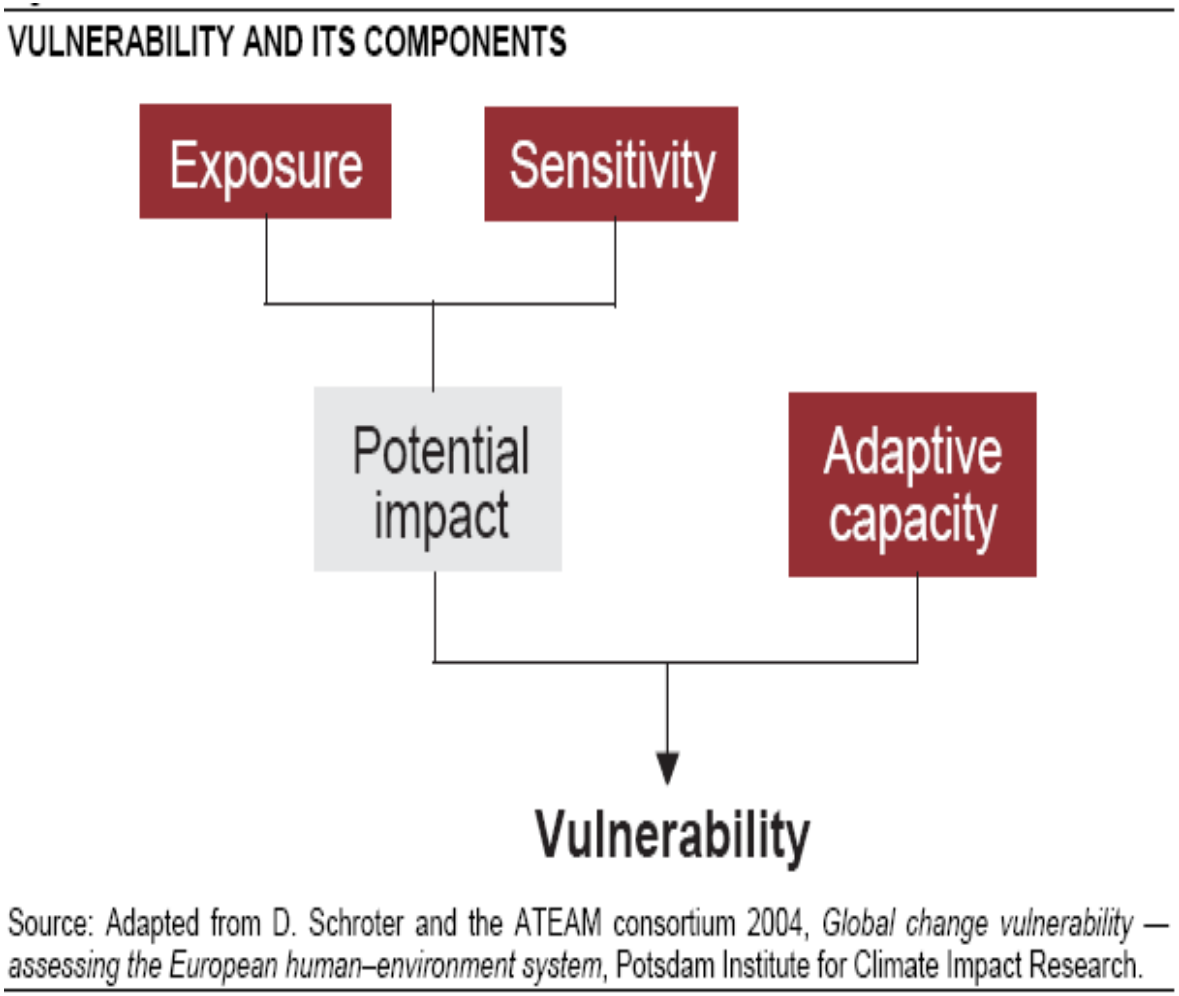
- Increases in sea surface temperature in eastern Pacific
- Shift of prime feeding areas to the east

Expected benefits or losses

PICTs	1999–2008		2035		2050		2100	
	L	U	L	U	L	U	L	U
Government revenue								
FSM	6	12	+1	+2	0	+1	-1	-2
Kiribati	30	50	+11	+18	+13	+21	+7	+12
Nauru	10	25	+2	+6	+2	+5	0	0
Palau	2.5	3.2	+0.2	+0.3	0	+0.1	-0.7	-0.9
Tokelau	2	15	+1	+9	+1	+10	+1	+9
Tuvalu	10	25	+4	+9	+4	+10	+2	+6
GDP								
American Samoa	20	25	+3	+6	+2	+4	-1	-2
Marshall Islands	10	25	+2	+6	+2	+6	+1	+2
PNG	1.5	4	0	+0.1	-0.2	-0.4	-0.4	-1.2
Solomon Islands	2	5	+0.1	+0.2	-0.1	-0.3	-0.3	-0.8

What is the relative ‘vulnerability’ of Pacific economies?

Vulnerability framework



Normal use of framework

- Additive approach

Potential impact = Exposure + Sensitivity (PI = E + S)

Vulnerability = potential impact + adaptive capacity (V= PI + AC)

Calculations for Pacific economies

- **Multiply E x S**

***Potential impact = Exposure x Sensitivity* (PI = E x S)**

- Exposure estimated from projected change in tuna catch
- Sensitivity estimated as average contribution to gov't revenue and GDP

- Multiplying E x S (1) recognises importance of contributions to economies of some PICTs, and (2) suppresses high scores for PICTs where tuna are projected to increase substantially, but where they contribute little to the economy.

Calculations for Pacific economies

***Vulnerability* = PI x adaptive capacity**

Adaptive capacity (AC) estimated from four indices – health, education, governance and the size of the economy

AC index used in two ways

1) In PICTs where contributions from tuna expected to <u>decrease</u>

Vulnerability **= PI x (1-AC)** ← Minimises vulnerability in countries with high adaptive capacity

Negative

2) In PICTs where contributions from tuna expected to <u>increase</u>

Vulnerability **= PI x AC** ← Maximises benefits in countries with high adaptive capacity

Positive

Comparative benefits & vulnerabilities

PICT	2035	2050	2100
PNG	+ Very low	- Very low	- Very low
Solomon Islands	+ Very low	- Very low	- Low
FSM	+ Low	+ Very low	- Low
Kiribati	+ Very high	+ Very high	+ Very high
Marshall Islands	+ Low	+ Low	+ Low
Nauru	+ Moderate	+ Moderate	- Very low
Palau	+ Very low	+ Very low	- Very low
Tokelau	+ High	+ High	+ Very high

(+) benefit, (-) vulnerability to negative economic impacts

Language

Is **vulnerability** the correct term when resources are enhanced by climate change?

Benefit is more appropriate but the same framework can be used to estimate relative benefits among countries