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Fisheries sector under climate change in the coral triangle countries of Pacific Islands: Current status and policy issues

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ABSTRACT

Pacific Island countries face food insecurity, limited availability of productive agricultural land, and deteriorating coastal and marine biodiversity where communities rely on these resources for food and economic sustainability. Climate change further impends these Pacific Island countries, jeopardizing land and aquatic ecosystems in addition to threatening the livelihoods and socioeconomic conditions of coastal communities. The national governments of Pacific Island countries have created a number of development policies and plans to enhance the economic conditions, safety assurance, environmental conservation and preservation and other critical requirements of the national populace. This first paper in this Special Section aims to present the economic contributions, types of fisheries and common fishing practices/gears, and the institutional set-up and the national development plans and policies related to the fisheries sector in four Pacific countries namely, Fiji, Solomon Islands, Vanuatu, and Timor-Leste. The paper discusses the common issues and the collective action surrounding the fisheries sector in these Pacific countries. The final section of the paper provides conclusions based on the findings of the four subsequent papers of this Special Section.

1. Introduction

The vulnerability of a country to climate change depends on its physical susceptibility to natural hazards and external shocks; and social, institutional and economic features. Vulnerability also tends to increase with relatively small geographic size; severity of food and water insecurity; limited opportunities for reaping the advantages of scale economies in production; geographic remoteness from markets of significant size; limited financial, technical and institutional capacities; dependence on food imports; relative degree of poverty; and relatively rapid rates of urbanization are factors on vulnerability [1]. Most, if not all, of these characteristics describe the Pacific Islands region, and consistent with the findings of the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR) [2] on vulnerability of Pacific Islands to climate change. The recent IPCC Fifth AR [3] described temperature increase at an average rate of between 0.1 °C and 0.2 °C per decade while large differences in sea level rise were observed in tropical Pacific during the 20th century. On the other hand, annual projected change for 2081–2100 (relative to 1986–2005) include average surface temperature increase ranged at 1.2–1.4 °C; average rainfall at 1–2%; and sea level rise at 0.5–0.6 m in north and south tropical Pacific Ocean using the intermediate low-emissions scenario. Furthermore, coral reef sensitivity to changes in climate conditions were identified around Micronesia, Mariana Islands and Papua New Guinea. Warming, ocean acidification, coral bleaching and sea level rise made the reefs in these areas more vulnerable to the physical impacts of climate change.

The tropical Pacific Ocean accommodates 7500 islands of which 500 are inhabited. The 22 Pacific Island countries and territories are grouped into three sub-regions according to ethnic origin, (a) Melanesia: Fiji, Papua New Guinea, Solomon Islands, New Caledonia, Timor-Leste, and Vanuatu; (b) Micronesia: Kiribati, Palau, Northern Marianas Islands, Federated States of Micronesia, Marshall Islands and Nauru; and (c) Polynesia: Samoa, Wallis and Futuna, Tokelau, American Samoa, Tonga, Cook Islands, Niue and Tuvalu [4]. The Melanesian group is also part of the coral triangle of Pacific Islands, while Timor-Leste whose inclusion in the Pacific Island region is underway [5], also falls under the coral triangle countries according to the Coral Triangle Knowledge Network [6]. This paper focuses on Fiji, Solomon Islands, Timor-Leste, and Vanuatu.

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Table 1
Fish production (mt) and value (US$) in three Pacific Island countries, 2007.

Types of fisheries	Fiji[a]		Solomon Islands[b]		Vanuatu[b]	
	Production (mt)	Value (US$ million)	Production (mt)	Value (US$ million)	Production (mt)	Value (US$ million)
Offshore						
Foreign-based	490	0.53	74,404	120.89	12,858	2.6
Locally-based	13,740	29.29	23,619	32.66	81,092	Not available
Coastal						
Commercial	9500	33.75	3250	3.31	538	2.18
Subsistence	7600	0.06	15,000	10.98	2830	5.74
Freshwater	4150	4.29	2000	1.46	80	0.17
Aquaculture	247	0.0017	165 mt; 8200 pieces (pearls, corals)	0.04	31 mt; 2500 pieces	0.39

[a] [18].
[b] [9].

Fish[1] is critically important to food security and nutrition in Pacific Islands [7–9]. But diets have also been changing in these countries, with increasing consumption of cheaper food imports such as canned meat and fish, white bread, soda and others instead of the local food—traditional root crops, vegetables, and fresh fish. This dietary change is relatively unhealthy and may be unsustainable given the rising food import prices and the negative impacts of the trend on local and rural producers and traders [10]. Greater consumption of fish is needed for improving population health in the region [11].

The fisheries[2] sector also plays a vital role in providing livelihood, income, and foreign exchange export in Pacific Island countries [9,12]. Climate change poses a threat to maintaining these benefits [13]. This Special Section of Marine Policy reports and discusses the economic impact of climate change adaptation strategies on the fisheries sector in four Pacific Island countries.

This paper aims to give an overview of the current status of the fisheries sector and national development plans and policies surrounding the sector in Fiji, Solomon Islands, Timor-Leste and Vanuatu, to set the stage for the four subsequent articles in this special section [14–17]. Specifically, this introductory paper will describe the (a) economic contributions; (b) common fishing gears and practices; and (c) institutional set-up and national development plans and policies affecting the fisheries sector per country. A summary of the collective issues, constraints and opportunities in the fisheries sector of the three Pacific countries and Timor-Leste is likewise provided and lastly, the conclusions including highlights of each of the subsequent papers in this Special Section.

2. Fiji

2.1. Economic contributions

The total water area and exclusive economic zone (EEZ) of Fiji is estimated at 1.29 million km^2 [4]. The fisheries sector contributes about 1.7% of the total gross domestic product (GDP) of Fiji in 2000–2008 [9]. Out of US$518 million total exports, about US$63.3 million (12%) can be attributed to fisheries in 2007 [18]. Of this 12% fisheries export, tuna industry accounts for 60% [18]. More than half (51%) of tuna export is transported to Japan and the United States while the rest (49%) is sold to Australia, People's Republic of China, New Zealand, and European Union [18]. Table 1 presents fish production and value by major categories in Fiji in 2007. Although aquaculture is still under development, it has significantly high value compared to the rest of other fisheries resources.

Fisheries boosts the food and nutrition security especially of the rural coastal communities, livelihood and income generation, rural development, and environmental preservation. In 2007, the sector provides employment to about 3.8% of economically active Fijian population [18] (Appendix Table A1).

2.2. Types of fisheries and common fishing practices/gears

Fisheries resources are classified as (a) offshore capture fisheries; (b) coastal or inshore capture fish; (c) freshwater or estuarine fisheries; and (d) aquaculture. Table 2 presents the common fishing gears and practices in Fiji in 2012. Women and children carry out fishing activities in coastal areas during low tide through reef gleaning, mainly targeting shellfish, sea cucumber, octopus, sea urchins, eels, and small fish.

Fish aggregating devices (FADs) were introduced by the Department of Fisheries (DOF) during the last 5 years in Fiji [26]. FADs use readily available flotation materials (e.g., bamboos and coconut leaves) that are easily deployed once constructed. Harvest of aquarium fish for commercial purposes applies specialized fishing gears. Issuance of fishing licenses is the tracking system used by DOF to keep an inventory of the gear operated by domestic and foreign vessels.

In 1976, DOF initiated culturing of Nile tilapia in Fiji [26]. Freshwater prawn, grass carp, and silver carp are other cultured species while milkfish, seaweed, and pearls are under development. Riverine stocking of tilapia was initially practiced in Tailevu and Rewa Delta but was discouraged by DOF due to biodiversity concerns [26].

2.3. Institutional set-up and national development plans and policies

DOF of Fiji is under the Ministry of Fisheries and Forests. It is responsible for the management of freshwater and marine resources with a vision of building fisheries as one of the main sectors in socioeconomic development and generation of income growth where resource owners are equitably remunerated [26]. DOF developed the 1988 Fisheries Act, amended as the 1991 Fisheries Act Decree; 2002 Fiji Tuna Development and Management Plan; 2005–2010 Fiji Freshwater Aquaculture Sector Plan and others. Marine protected areas (MPAs) are clearly defined geographical areas recognized, dedicated, and managed through legal or other effective means, to achieve long-term natural resource conservation and protection with associated ecosystem services and cultural values [27]. These are covered under the National Biodiversity Strategic Action Plan and Fisheries Act. However there are crucial gaps in legislation and policies that impede MPA establishment in other areas such as (1) lack of any comprehensive protected area management legislation that deters carrying out

[1] Fish is used here in the broad term that includes finfish and invertebrates.
[2] Fisheries is used here in broad sense to include capture fisheries and aquaculture.

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