ADB Fisheries and Climate Change[1]

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Preliminary assessments indicate that the oceanic, coastal, and freshwater fisheries and aquaculture operations of the Pacific will be equally subjected to the direct and indirect effects of climate change. Understanding the likely impacts of climate change will better allow all stakeholders to adjust—this is important given the central role of fisheries in the economies of many Pacific island countries.

Changes to the Distribution and Adundance of Tuna

Due to alternations in ocean temperatures and currents, and food chains in the open ocean, initial modeling indicates that the concentrations of skipjack and bigeye tuna are likely to be located further to the east than in the past,[2] making zones of some Pacific island countries more, or less, favorable for surface fishery for skipjack tuna. Reduced abundance of skipjack in Melanesia should have a far lower impact on their GDP in relative terms, but there will be substantial losses in real terms given the large quantities of tuna currently caught there. The viability of western Pacific canneries may be affected.

Significant changes can also be expected in the availability and relative abundance of (i) fish and invertebrates (including export products such as trochus and bêche de mer) that currently support coastal fisheries—due to degradation of coral reefs and seawater conditions from increasing temperature and gradual acidification of the ocean; and (ii) other habitats, such as mangroves and seagrass—due to increasing temperatures, sea level, storm intensity, and higher rainfalls increasing turbidity of coastal waters.

Changes to Coastal Fisheries Production

Vital to the subsistence living throughout the Pacific, one likely impact is on food security. If future production of fish from coral reefs and the other coastal habitats decreases, the gap in fish needed for food security will increase, placing more pressure on governments to allocate an increasing proportion of their tuna resources for local food security.

Changes to Freshwater Fisheries Production

Freshwater fisheries throughout the region are based largely on species that migrate between the sea and freshwater. The combination of rising sea levels and changes in rainfall and runoff is likely to affect habitats and fisheries in both estuarine and freshwater systems, impacting the movement of fish and affecting nursery ground function. The potential implications for fishery production, food security and livelihoods needs to be evaluated further.

Effects on Aquaculture

Rainfed pond aquaculture, such as tilapia, has potential to provide fish for future food security, with production likely to be practical and cost-effective. However, increased rainfall in low-lying areas raises the risk of losing fish from ponds during floods, invasion of ponds by unwanted species and damage to pond walls.

1 Gillett, R. 2009. Fisheries in the economies of the Pacific island countries and territories, ADB, Manila. Excerpt from the Executive Summary and Appendix 4 Preliminary Assessment of the Effects of Climate Change on Fisheries and Aquaculture in the Pacific with references to works of J. Bell, M. Batty, A. Ganachaud, P. Gehrke, A. Hobday, O. Hoegh-Guldberg, J.Johnson, R. Le Borgne, P. Lehodey, J. Lough, T.Pickering, M. Pratchett, M. Sheaves and M. Waycott. The preliminary assessments and recommended approaches are derived from early phases of a regional project to assess the vulnerability of fisheries and aquaculture in the Pacific to climate change coordinated by the Secretariat of the Pacific Community (SPC) and supported by the Australian Agency for International Development (AusAID) due for release. The views expressed in this book are those of the authors and do not necessarily reflect the views and policies of the Asian Development Bank (ADB) or its Board of Governors or the governments they represent. ADB does not guarantee the accuracy of the data included in this publication and accepts no responsibility for any consequence of their use.

2 The simulations have yet to be done for yellowfin and albacore tuna.

Aquaculture commodities such as pearl farming faces risks from increased acidification of the ocean, and farms could be forced to rely more heavily on hatcheries, resulting in increased production costs and lowered quality. This could significantly reduce profitability o f pearl farming.

Warmer water temperatures, increased acidification and more severe cyclones, will impact village-based coral and giant clam farmers, who will face the risk of increased losses due to bleaching, and loss of stock and risk to equipment from rougher seas conditions.

Adaptations to Maintain the Benefits of Fisheries and Aquaculture

- Diversification—the more options that industry and communities have to produce, process and distribute fish, the greater the chance that some of them may be favored, or not affected, by climate change.
- Given the likelihood of falling income from fisheries access in the Western Pacific, adding value to the fish catches will increase in importance, particularly through successful domestication of the industry. Thorough analyses to identify the most practical and profitable mix of domestication and access to distant water fishing nations' strategies will be required for the Eastern Pacific.
- In cases where it will remain difficult to diversify the production of fish, governments will need to place more emphasis on other aspects of the broader livelihood approaches required to build resilience to shortages of food e.g .development of "climate ready" crops and plant varieties to diversify local agricultural production systems.
- Development and uptake of methods to increase the shelf life of tuna, particularly in areas where tuna is projected to become more sporadic.

Gaps in Knowledge and Priority Activities

Investment in key activities to fill these knowledge gaps are:

- High-quality observation of surface weather for Pacific island countries and oceanographic conditions to detect the nature of climate change in the Pacific Ocean and its significance in the region's ecosystem.
- Downscaling of climate change and oceanographic modeling to the scales of islands to allow for rigorous assessment of local sensitivity and vulnerability.
- Improve modeling of the responses of tuna to climate change by incorporating projected fishing efforts and interactions between tuna species, as well as descriptions and long-term observations of food sources and linkages between food production and tuna abundance.
- Identify areas suitable to diversify coastal and/or freshwater fisheries production through the establishment of low-cost inshore fish aggregating devices and/or small pond aquaculture.
- Scaling up regional research facilities to support key experiments and fieldwork on coastal habitats and climate change. Research could include (i) evaluating dissolution of coral reefs due to decreasing pH; and assessing the effects of rising temperature and pH on reef species.
- Inventory of vegetated coastal habitats including their connectivity to coral reefs, environment threshold for growth and survival, and links to fisheries productivity.
- Research and modeling to assess (i) habitat and freshwater flow requirement with connectivity to sustain riverine and estuarine fisheries in Pacific island countries; and (ii) projected changes in area and availability of floodplain habitat for fisheries production and aquaculture.
- Assessment and monitoring of the size and composition of coastal and inland fishery landings across the region to assess changes in catch resulting from climate change and the success of adaptations to retain the benefits of fisheries.
- Investigation of the risk of increased incidence of pathogens for important aquaculture species, such as pearl oysters, shrimps and seaweed during climate change.

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