Priority Adaptations to Climate Change for Fisheries and Aquaculture in Vanuatu

Report based on consultations with stakeholders
Port Vila

30–31 May 2013

Table of Contents

Background

This document summarises the outputs from a workshop held on 30 and 31 May in Port Vila by the Vanuatu Fisheries Department, the Secretariat of the Pacific Community (SPC), SPC/GIZ-CCCPIR and AusAID. The workshop was designed to assist stakeholders in the fisheries and aquaculture sector to identify the best adaptation strategies and supporting policies for minimising the risks posed by climate change to the plans that Vanuatu has to maximise the sustainable benefits from the sector. These plans aim to (1) provide enough fish for food security, (2) optimise the number of livelihoods that can be based on fisheries and aquaculture, and (3) maximise the sustainable benefits from tuna for economic development. Adaptations were also identified to capitalise on the opportunities expected to eventuate from climate change.

The plans to ensure that fisheries and aquaculture contribute their full potential to food security are based around providing access to at least present-day average levels of fish consumption (20 kg per person per year) as the nation's population grows (Figure 1). However, measures needed to increase access to fish to provide up to 35 kg of fish per person each year, as recommended by SPC's Public Health Division (Figure 1), were also considered.

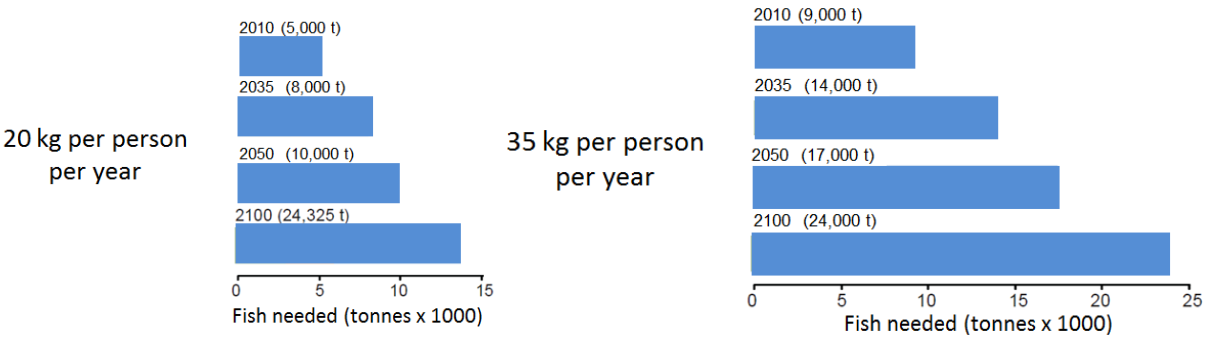

Figure 1. Quantity of fish needed to supply 20 kg and 35 kg of fish per person per year for Vanuatu in 2010, and the quantities needed by future populations in 2035, 2050 and 2100.

The plans to increase the economic benefits from tuna include completing onshore facilities for processing and exporting tuna, linking fishing licences for foreign vessels to onshore processing to maximise landings, and encouraging local participation in tuna fishing through joint ventures.

Wherever possible, the adaptations identified during the workshop were designed to address the 'drivers' and 'root causes' influencing the management of fisheries and aquaculture in the shorter term (e.g. population growth), and climate change in the longer term. Such measures are considered to be 'win-win' (W-W) adaptations. In some cases, 'lose-win' (L-W) adaptations were also recommended, i.e. adaptations involving costs in the shorter term to maintain any natural adaptive capacity of resources to cope with the changing climate.

The workshop also recognised that many of the adaptations to climate change are management actions that should already be in place to deliver sustainable benefits from the nation's fisheries and aquaculture resources. A prime example is integrated coastal zone management, commonly called the 'ridge to reef' approach. The need for ridge to reef actions to maintain coastal fisheries production was widely recognized by ni-Vanuatu stakeholders and should help build resilience of coral reefs, mangroves and seagrasses to climate change.

Many of the specific management measures are recommended to become a part of Vanuatu's National Environment Policy and the National Policy on Climate Change & Disaster Risk Reduction.

1. Adaptations for food security and livelihoods

The adaptations and suggested policies for maintaining the important role of fish[1] for food security (via subsistence fishing and small-scale commercial fishing) in Vanuatu centre on (1) minimising the size of the gap between the fish required for good nutrition and the fish available from coastal (and freshwater) fisheries through appropriate management of coastal (and freshwater) fish habitats and stocks; and (2) filling the gap by increasing access to tuna and boosting freshwater aquaculture. Different adaptations apply to rural and urban areas.

There is some overlap in adaptations for food security and livelihoods because livelihoods based on coastal fisheries and aquaculture also contribute to food security through provision of food for the population in general and through providing households with income to buy food. Adaptations to help maintain livelihoods based on other uses of coastal resources, e.g. through tourism and aquaculture of export commodities, are listed separately.

1.1. Adaptations to minimise the gap in fish for food security in rural areas

- Improved coordination, adoption and implementation of ICZM and catchment management principles (including adequate development buffer zones for all rivers and streams) among relevant government and customary authorities. Such action will reduce the negative effects of sedimentation and nutrients from agriculture, forestry and other development activities in rural areas (Fig. 2), and sewage in urban areas, on coastal (and freshwater) fish habitats (W-W).

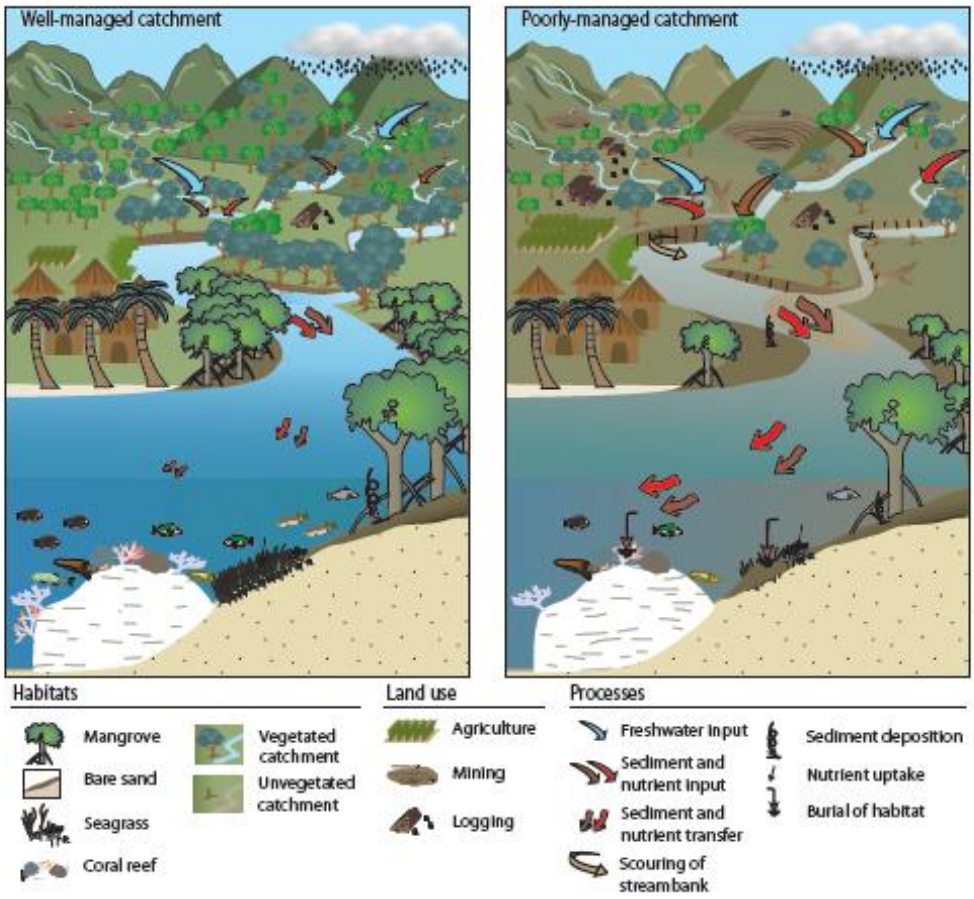

Figure 2. Differences in the quality of fish habitats under the influence of well-managed and poorly-managed catchments (source: Bell et al. 2011).

[1] Fish is defined here in the broad sense to mean finfish and shellfish.

- Promote cohesive governance at the community level to lay the foundation for committed, stable and widely inclusive sustainable use of coastal (and freshwater) fish habitats and fish stocks (W-W).

- Identify and enable local champions to assist communities to adapt to climate change.

- Expand community-based management based on the principles of 'primary fisheries management' (Cochrane et al. 2011) and an ecosystem approach (SPC 2010) to help (1) safeguard coral reef, mangrove and seagrass fish habitats; and (2) maintain the replenishment potential of targeted fish and invertebrate species. Such approaches include but should not be limited to community conservation areas and customary taboos. In particular, gear restrictions, size limits and closed seasons (especially for spawning aggregations) should also be applied (W-W).

- Manage uses of reefs when high sea surface temperatures are likely to cause coral bleaching by: providing access to bleaching warnings from VMGD (Fig. 3); using temporary 'taboo' closures; avoiding destructive activities (e.g. walking on reef, netting fish); installing boat moorings to protect sensitive reefs; prohibiting collection of coral; and providing shade over small but important reefs (e.g. at tourist resorts).

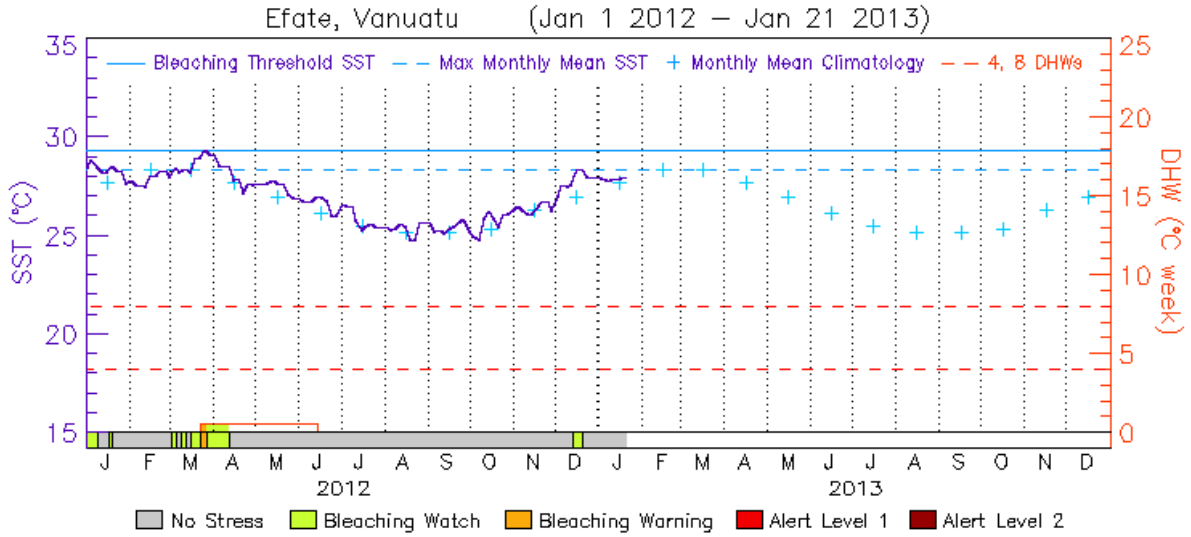

Figure 3. The threshold value for coral reef bleaching (solid light blue line) and observations of sea surface temperature (dark blue curve) for Efate's coral reefs relative to this 'bleaching threshold'. This information enables local marine managers (chiefs/village committees) to restrict activities affecting corals (e.g. mooring of boats, use of nets etc) during periods of high thermal stress (source: http://coralreefwatch.noaa.gov/satellite/vs/index.html).

- Monitor changes to reef composition to better understand effects of bleaching and reef recovery timeframes; and raise awareness about the causes and consequences of coral bleaching (GBRMPA 2007) (W-W).

- Enhance reef resilience by increasing the catch of herbivorous (piko) versus carnivorous (los) fish to take advantage of their expected increase in abundance, but retain enough piko on reefs, and other herbivores (e.g. sea urchins), to limit the overgrowth of corals by algae (W-W).

- Prevent physical damage (e.g. from boat anchors) to reefs, and nutrient inputs (e.g. from sewage systems and coastal vegetating clearing) to reefs, to limit the conditions for growth of the microalgae *Gambierdiscus* spp which cause ciguatera fish poisoning (W-W).

- Monitor coastal fish stocks using indicators suitable for multispecies fisheries (e.g. changes in species composition and average fish size) to evaluate the effectiveness of management strategies (W-W).

- Modify household income and expenditure surveys to measure changes in the main types of fish (e.g. tuna, reef fish) caught for subsistence by households, and bought and sold by households, in rural areas (W-W).

- Map the locations and areas of seagrass habitats across Vanuatu.

- Implement regular monitoring of coral reef, mangrove and seagrass areas by scientific, national government and local agencies.

- Prevent building infrastructure in low-lying areas that are suitable for shoreward migration of mangroves, and provide wide culverts beneath coastal roads to allow suitable areas for mangroves to be colonised as sea level rises (L-W).

- Provide incentives for communities to plant mangroves in suitable areas, and to maintain existing mangrove habitats (W-W).

- Harmonise and balance opportunities for any expansion of freshwater fish habitats due to changes in rainfall patterns and greater river flows with protection of agricultural land and infrastructure from inundation (L-W).

1.2. Adaptations to fill the gap in fish supplies in rural areas

- Because tuna and other large pelagic fish will need to provide most of the additional fish needed for food as rural populations grow (Fig. 4), and as coral reef fish production declines under climate change, inshore fish aggregating devices (FADs) (Fig. 5) will need to become part of the national infrastructure for food security. FADs will improve access for coastal subsistence and small-scale commercial fishers to these fish (SPC 2012). Development of the FAD infrastructure should be based on:

    - use of bathymetric maps, and local knowledge of tuna movements and eddies, to identify the best places for FADs around each of the main islands;
    - submerged designs to increase the working life of FADs by preventing damage from cyclones and storms, and passing vessels;
    - regular maintenance of FADs;
    - stockpiles of materials so that lost/damaged FADs can be replaced and repaired quickly; and
    - monitoring of catches around FADs to better inform local managers about the placement of FADs and numbers of FADs required (W-W).

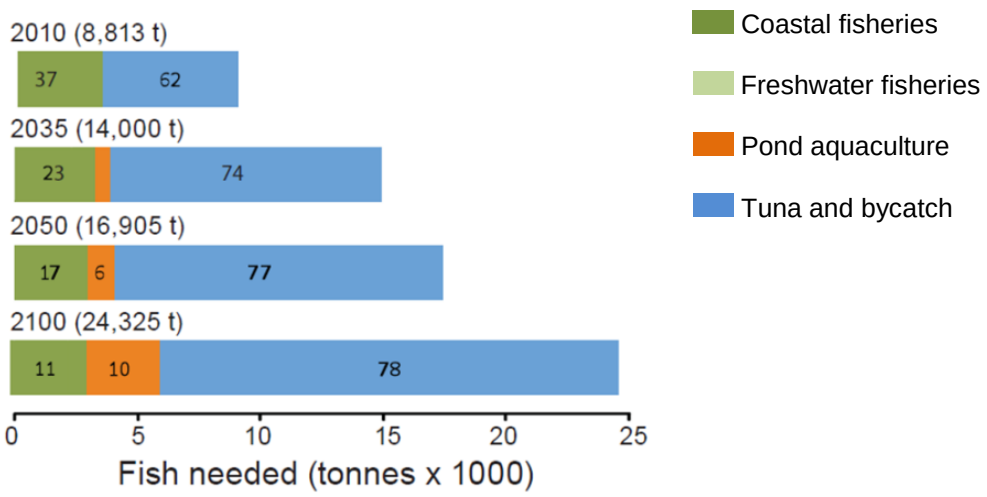

Figure 4. Percentage contributions of different sources of fish required to supply 35 kg of fish per person per year for Vanuatu in 2010, 2035, 2050 and 2100. Contributions from coastal fisheries are based on estimated sustainable production of 3 tonnes per km^2 of reef per year and have been adjusted for the projected effects of climate change (source: Bell et al. 2011).

Figure 5. Components of a Fish Aggregating Device (FAD) deployed by the Vanuatu Fisheries Department and the Nguna-Pele Marine & Land Protected Area Network to reduce fishing pressure on coral reefs in the area. Photos: C. Bartlett.

- Expand fisheries for small pelagic species (e.g. mankuru) (Fig. 6 and 7), including assessment of the potential for using low cost FADs in shallow coastal waters to assist subsistence and artisanal fishers to catch these fish.

Figure 6. Local fishermen with a catch of small pelagic fish. Photo: J. Rutledge.

- Improve post-harvest technology (smoking and drying) for fish (Fig. 7) caught around FADs and small pelagic fish. These improved methods will help increase the availability of fish for food security at times when it is not possible to fish, or when catches are low. Assess the application of solar technologies for drying fish (W-W).

Figure 7. Fishing for small pelagic fish, and smoking fish to extend the shelf-life of fish products. Photos: N. Behring and J. Carling.

- Identify sites and methods for tilapia farming, including backyard tilapia programs which help increase access to fish even in urban areas with little space (Fig. 8). Such methods may be favoured by the changing patterns of rainfall and warmer temperatures, but note sites where the risks of flooding would cause loss of fish from ponds should be excluded (W-W).

Figure 8. A tilapia pond on Santo and an example of a back-yard tilapia system being trialled by the Vanuatu Fisheries Department and the SPC-GIZ Climate Change Program in urban households in Port Vila. Photos: J. Rutledge and C. Bartlett.

- Train tilapia farmers in the best practices, site selection, pond construction, farm management, and small business skills (W-W).
- Develop an efficient system for maintaining genetically selected, fast-growing Nile tilapia, and for distributing them to all growing areas (W-W).
- Formulate diets for Nile tilapia based on local ingredients, including dried African snails and agricultural products.
- Harvest juvenile Mossabique tilapia from the wild and grow them in ponds for livestock feed.
- Assess the potential for integrated aquaculture-agriculture systems using animal waste to fertilize ponds, and aquaponics (W-W).
- Monitor incidence of ciguatera fish poisoning and develop access to other types of fish where this fish poisoning is common.
- Establish loan schemes to promote development of local enterprises based on fishing around FADs, post-harvest to extend shelf life of catches, and pond aquaculture. (W-W).

1.3. Adaptations for urban areas

- Identify measures to support enterprises to purchase bycatch (e.g. mahi mahi, rainbow runner) from fish landing and processing facilities in Port Vila, Luganville and other urban centres for local sale.
- Balance potential landings from industrial fleets with catches by local fishermen to minimise the effects on local jobs while ensuring sufficient fish availability for the growing population of Port Vila, Luganville and other urban centers (see specific recommendations from UNIDO/SPC/FFA study once finalised) (W-W).
- Assess how best to expand commercial tilapia farming (Fig. 9) to meet the demand in Port Vila and other urban areas (W-W).
- Construct a central fish markets in Port Vila, Luganville and other urban areas and implement minimum fish quality standards.

- Analyse chains for supplying fish to Port Vila, Luganville and other urban areas and reinforce the weak links.

- Implement marine spatial planning (similar to land use planning) to rationalise the use of coastal waters and maintain essential fish habitats.

Figure 9. Commercial tilapia farming near Port Vila. Photo: P. Ryan.

1.4. Adaptations for livelihoods

- Develop tourism based on coastal habitats and fisheries resources in places where live coral cover can be maintained (e.g. by moving colonies) as coral reefs degrade (W-W).

- Assess cyclone damage to reefs and rehabilitate reefs to whatever extent possible after cyclones, e.g. reposition overturned coral to fast-track reef recovery (W-W).

- Expand and support initiatives to (1) remove crown of thorns starfish when they threaten the attractiveness of reefs important to the tourist industry (or to supply food to local communities – see above), and (2) maintain any natural capacity of corals to adapt to higher sea surface temperatures (W-W).

- Replant coral species after coral bleaching events (Fig. 10) at the main locations visited by tourists (W-W).

- Identify microsites where farming of marine ornamental species (e.g. giant clams and hard corals) can continue as sea surface temperature and ocean acidification increase (W-W).

- Modify the structure of shrimp ponds so that they continue to drain completely as sea level rises (L-W).

Figure 10. Coral bleaching. Photo: G. Bell.

2. Suggested policies to support adaptations for food security and livelihoods

- Allocate a staff member from the Fisheries Department to (1) estimate the economic costs of priority adaptations, particularly national FAD infrastructure and small pond aquaculture programs; (2) prepare grant proposals for development partners for the financial and human resources required; and (3) co-ordinate the implementation of funded proposals.

- Allocate a staff member from the Vanuatu Meteorological & Geohazards Department to identify and develop climate and weather advisories, bulletins and outlooks to facilitate adaptation in Vanuatu's fisheries sector

- Strengthen cross-institutional governance to achieve the 'ridge to reef' approach to coastal management and sustainable use of all coastal fish habitats by: (i) building the capacity of management agencies to understand the threats posed by climate change; (ii) empowering communities to manage fish habitats cooperatively; and (iii) changing agriculture and forestry practices to prevent sedimentation and addition of nutrients to coastal waters.

- Minimise barriers to landward migration of mangroves and other coastal habitats during development of strategies to assist other sectors respond to climate change.

- Promote mangrove replanting programmes in suitable areas to meet the twin objectives of enhancing habitat for coastal fisheries and capturing carbon.

- Mandate the use of 'primary fisheries management' (Cochrane et al. 2011) and an ecosystem approach to fisheries for stocks of coastal fish and shellfish (SPC 2010) to maintain their potential for replenishment.

- Abide by the precautionary principle when making development/harvest/catch decisions affecting climate-vulnerable habitats, locations or species.

- Increase access to tuna for the food security of rural communities, e.g. by using some of the revenue generated from tuna fishing licences to install FADs for coastal communities, and by limiting how close to shore industrial vessels can fish.

- Promote the benefits of Nile tilapia farming for supplying fish to communities with poor access to other sources of animal protein but limit Nile tilapia farming to catchments where the

Mozambique tilapia is already established to reduce any possible effects of tilapia on freshwater biodiversity where these fish are not present.

- Facilitate training needed to operate profitable businesses based on small-scale tuna fisheries and pond aquaculture, and promote innovation networks to increase the uptake of efficient practices.

- Ensure household income and expenditure surveys are modified to assess the access to fish for food security and to assist adaptive management of the fisheries and aquaculture sector.

- Promote private sector investment in coastal tourism designed to accommodate climate change, particularly the projected changes in sea level, storm surge and changes to coral reefs and other coastal habitats.

- Strengthen national capacity to adopt and implement aquatic animal health and biosecurity measures, including monitoring, detecting and reporting aquatic animal diseases to prevent introduction of new pathogens.

- Promote widespread access to forecasts and outlooks of local weather, cyclone events and the onset of ENSO episodes.

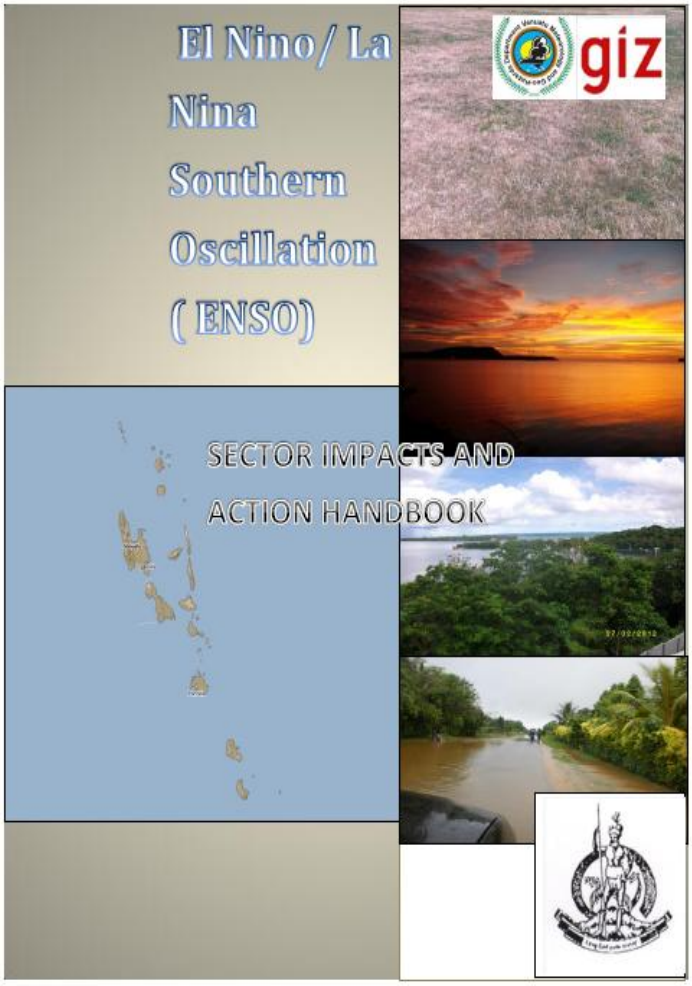

Figure 11. ENSO handbook developed to advise farmers on how to cope with and prepare for El Nino and La Nina events in Vanuatu.

3. Adaptations to maintain the contribution of tuna to economic development

The adaptations required to maximise the benefits from tuna fisheries for Vanuatu involve development of flexible management measures to ensure that the local benefits from tuna can be maintained in the long term as the abundance of tuna in the region regularly changes due to climatic variability (ENSO), and as the distribution of tuna moves progressively east under the changing climate. These adaptation actions include:

- Full implementation of any vessel day scheme (VDS) to manage the longline fishery for tuna.
- Continued conservation and management measures for all species of tuna to maintain stocks at healthy levels, which will make these valuable species more resilient to climate change (W-W).
- Energy efficiency programmes for Vanuatu-flagged vessels: Energy audits to identify how to reduce fuel use during fishing operations should assist national vessels to cope with rises in oil prices. Energy audits should also reduce the costs for Vanuatu's purse-seine vessels fishing outside the EEZ as the distribution of tuna shifts to the east (W-W).
- Environmentally-friendly fishing operations (e.g. using methods to reduce bycatch) to minimise the effects of existing fishing operations, and those projected to occur as tuna move east, on non-target species will help meet the requirements of certification schemes that assist Pacific nations to receive higher prices for their fish in overseas markets. Emissions of CO_2 from vessels and loining plants should also be minimized to reduce the carbon footprint of industrial fisheries (W-W).
- Re-assessment of safety-at-sea provisions/regulations/practices to ensure that vessels are able to cope with more severe weather and sea conditions (L-W).
- Consider sea-level rise and increased severity of cyclones when designing new facilities for fishing ports and processing plants, or upgrading existing facilities (L-W).

4. Suggested policies to support contributions of tuna to economic development

- Maintain transparent access agreements for foreign fishing fleets so that allocations under the VDS for the longline fishery are understood by all stakeholders; and strengthen national capacity to implement the VDS.
- Adjust the national tuna management plan and licensing conditions (if needed) to provide more flexible arrangements to acquire tuna needed for local processing operations.
- Support the inclusion of the implications of climate change in the future management objectives of the Western and Central Pacific Fisheries Commission.
- Require all commercial vessels fishing for tuna in Vanuatu's EEZ to provide operational-level catch and effort data to improve the models for estimating the redistribution of tuna stocks due to climate change.
- Use regional trade and preferential access agreements to market environmentally-friendly tuna products, and develop distribution channels that minimise CO_2 emissions.

References

Bell JD, Johnson JE and Hobday AJ (2011) *Vulnerability of Tropical Pacific Fisheries and Aquaculture to Climate Change.* Secretariat of the Pacific Community, Noumea, New Caledonia.

Cochrane KL, Andrew NL and Parma AM (2011) Primary fisheries management: A minimum requirement for provision of sustainable human benefits in small-scale fisheries. *Fish and Fisheries 12, 275-288.*

GBRMPA (2007*) Responding to Climate Change: A Workshop for Coral Reef Managers*, 10-14 December 2007. Great Barrier Reef Marine Park Authority, Townsville, Australia.

SPC (2010) *A Community-based Ecosystem Approach to Fisheries Management: Guidelines for Pacific Island Countries*. Secretariat of the Pacific Community, Noumea, New Caledonia, The Nature Conservancy, Brisbane, Australia, and the Food and Agriculture Organization of the United Nations, Rome, Italy.

SPC (2012) *Fish Aggregating Devices*. SPC Policy Brief 19/2012. Secretariat of the Pacific Community, Noumea, New Caledonia.