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**ECOSYSTEMS IMPROVED FOR
SUSTAINABLE FISHERIES**

ECOSYSTEMS IMPROVED FOR SUSTAINABLE FISHERIES (ECOFISH) Project

CLIMATE CHANGE AND SUSTAINABLE FISHERIES: GUIDING PRINCIPLES, POLICY RECOMMENDATIONS AND OPPORTUNITIES FOR ECOFISH TO BUILD ON REGIONAL EFFORTS IN THE CORAL TRIANGLE

ECOFISH Document No.: 13/2013

Version: Final

Implemented with:

Department of Agriculture-Bureau of Fisheries and Aquatic Resources
National Government Agencies
Local Government Units
Assisting Organizations

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30 September 2013

Ecosystems Improved for Sustainable Fisheries (ECOFISH) Project

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Abbreviations and Acronyms

ACCCOas	-	Adaptation to Climate Change in Coastal Areas
AMPA	-	Adapt Marine Protected Areas
BAR	-	Bureau of Agricultural Statistics
BFAR	-	Bureau of Fisheries and Aquatic Resources
CCA	-	Climate Change Adaptation
CRM	-	Coastal Resource Management
CTI-CFF	-	Coral Triangle Initiatives for Coral Reefs, Fisheries and Food Security
CTMPAS	-	Coral Triangle Marine Protected Areas System
DA	-	Department of Agriculture
DENR	-	Department of Environment and Natural Resources
DOST	-	Department of Science and Technology
EAFM	-	Ecosystems Approach for Fisheries Management
ECOFISH	-	Ecosystems Improved for Sustainable Fisheries
ERDB	-	Ecosystems Research and Development Bureau
FISH	-	Fisheries Improved for Sustainable Harvest
GCM	-	Growth Control Mechanism
ICSEA	-	Integrated Coastal Sensitivity, Exposure and Adaptive Capacity to Climate Change
ICM	-	Integrated Coastal Management
LGU	-	Local Government Units
MERF	-	Marine Environment Resource Foundation
MKBA	-	Marine Key Biodiversity Area
MPA	-	Marine Protected Areas
NCCC	-	National CTI Coordinating Committee
NAPC	-	National Anti-Poverty Council
NOAA	-	National Oceanic and Atmospheric Administration
NPOA	-	National Plan of Action
PAGASA	-	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PPP	-	Public Private Partnership
PRECIS	-	Providing Regional Climates for Impact Studies
RA	-	Republic Act
REAP	-	Region-Wide Early Action Plan
RPOA	-	Regional Plan of Action
RESILIENT	-	Remote Sensing Information for Living Environments and Nationwide Technology
USAID	-	United States Agency for International Development
VA	-	Vulnerability Assessment
VIP	-	Verde Island Passage

1. Introduction

The impacts of climate change can put development goals such as improving economic growth and conserving biodiversity at risk (USAID 2013). Sea surface temperature rise, ocean acidification, sea level rise, more intense cyclones and other climate change-related impacts increase the risks to coastal communities and the natural resources upon which they depend).

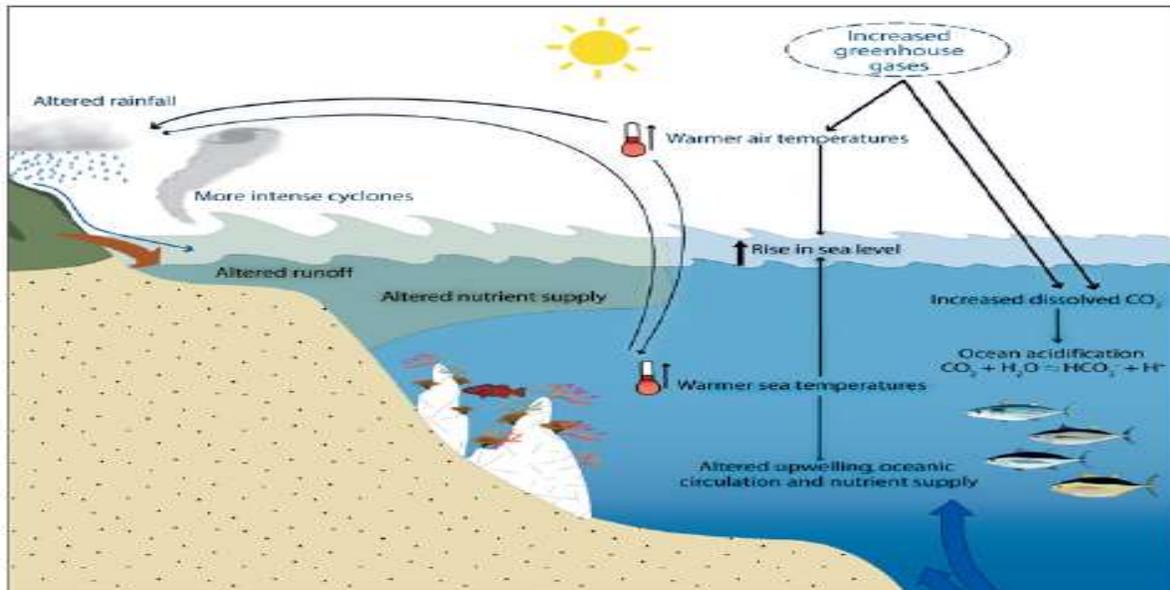


Figure 1: Generalized Effects of Increased Atmospheric CO₂ on Marine and Coastal Ecosystem in the Tropical Pacific (Bell et al. 2011)

Climate change projections adapted from the IPCC AR4 Report (IPCC 2007) and summarized for the Coral Triangle region by Heenan et al. (2013) include:

- Sea surface temperature in waters surrounding the Coral Triangle are warming and projected to increase by 1° to 4° C by 2100;
- Sea level is projected to rise 30 to 60 cm by 2100 and possibly greater than 1 m;
- Rainfall is projected to increase around the equatorial Pacific with increased likelihood of extreme rainfall and drought events;
- Tropical cyclones are expected to become more intense;
- Substantial changes in the Tropical Pacific are expected which will affect biological productivity.

These projections will have direct impacts on marine and coastal ecosystem structure, function, and services (Hoegh-Guldberg et al. 2009, Bell et al. 2011, and Heenan et al. 2013). Degraded coral reefs are likely to support different types of fish and lower yields of some species (Figure 2). Many coastal communities are already noticing impacts of climate change and variability, including the following:

- Health and safety concerns from severe storms and coastal inundation;
- Damage to coastal infrastructure from flooding, coastal erosion, and severe storms;
- Changes in fish species composition and distribution from changing oceanographic conditions;
- Habitat degradation associated coral bleaching from periods of increased sea surface temperature.

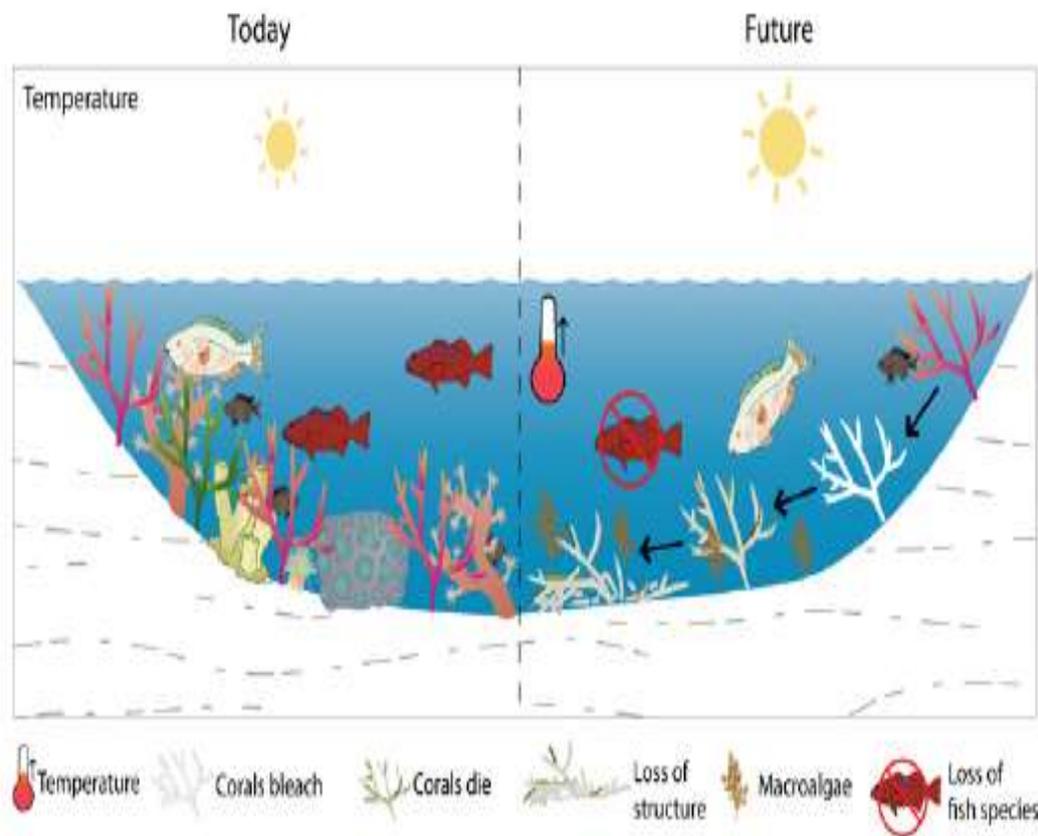


Figure 2. Projected Changes in Coral Reef Habitat and Fish Based on Increased SST and Ocean Acidification (Bell et al. 2011)

Reduced catches of reef-associated fish will widen the expected gap between the availability of fish and the protein needed by people for food security. What needs to be adapted is an ecosystem approach to adaptation that recognizes the direct link between social and ecological vulnerability in communities that are highly dependent on natural resources (Figure 3).

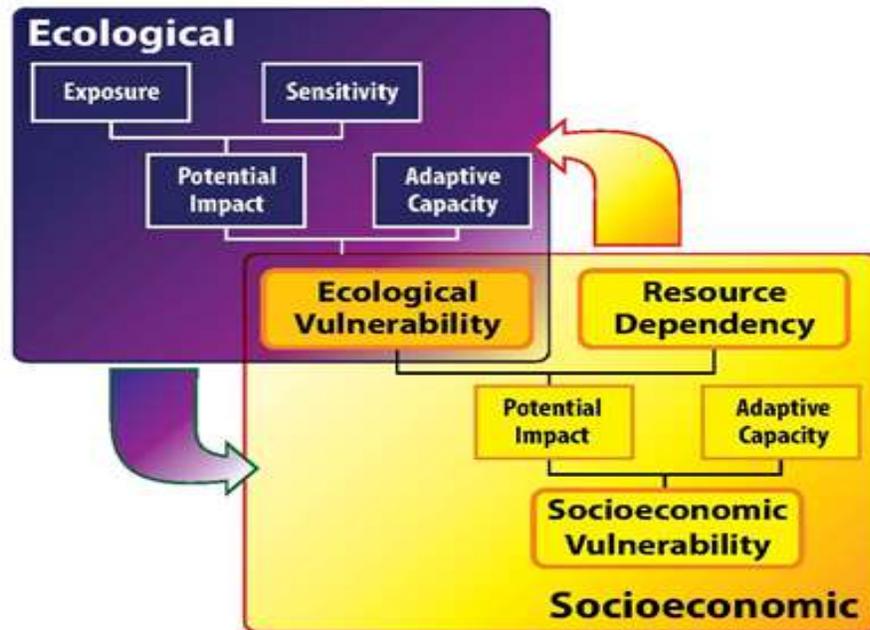


Figure 3. Link Between Social and Ecological Vulnerability in Communities Highly Dependent on Natural Resources (adapted from Marshall et al. 2010)

Guiding Principles for Applying the Climate Lens to Sustainable Fisheries

Managing fisheries sustainably ultimately depends on making sound decisions using the best available scientific data under conditions of considerable uncertainty. Climate change adds another dimension that must be considered in order to manage fisheries to achieve food security and ecosystem integrity objectives. Applying the climate change lens to fisheries management is necessary to ensure that management decisions are not undermined by the impacts of climate variability and climate change. The guiding principles below are intended to mainstream the consideration of climate change impacts into planning and decision-making processes from national to local levels.

- **Ask the climate question:** The impacts of climate change are being experienced by coastal communities and these impacts will continue in the future. We cannot use the past climate as a guide for the future in developing resource management policies and plans.

We must explicitly consider climate change to ensure that key vulnerabilities are not overlooked. Applying the climate lens may not be relevant to all fisheries management decisions. However, the question should be asked: What are the possible climate implications of (and climate impacts on) the proposed policy, regulation, or plan? Could proposed management measures result in maladaptation, that is, an action implemented to reduce vulnerability to climate change that impacts adversely on or increases the vulnerability of other systems, sectors, or social groups?

- **Identify and use appropriate climate information:** Climate-resilient fisheries planning and management requires using new information and working with different agencies not typically involved with managing fisheries and coastal resources. Information about current climate, past climate, and projected future climate is needed to understand the vulnerability of development interventions to climate stressors. This information needs to be communicated to stakeholders in developing coastal resource and fisheries management plans. Partnerships with such entities as the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), the Manila Observatory, and the US National Oceanic and Atmospheric Administration (NOAA), may be needed to identify climate information that is necessary to guide planning.
- **Assess social and ecological vulnerability of target resources to climate change:** An assessment of the climate change vulnerability of target resources, such as fishing infrastructure and assets, target fish species, and critical habitats, needs to be integrated into baseline assessment and resource management planning. Vulnerability assessment provides information on exposure, sensitivity, and adaptive capacity of municipal fisheries and communities dependent on them for food and livelihood. Vulnerability is defined as the degree to which a human or natural system is susceptible to or unable to cope with adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and the variation to which a system is exposed, its sensitivity, and its adaptive capacity (IPCC 2001). The system may be an ecological system such as a coral reef or a social system such as a community or economic activities. Ecological and socioeconomic vulnerability are interrelated because of the importance of ecosystem services to human well-being.

Framework for Policy Recommendations

This policy study provides guiding principles and policy recommendations for considering climate change as part of the ecosystem approach to fisheries management (EAFM), building on

the regional efforts of the Coral Triangle Initiative for Coral Reefs, Fisheries, and Food Security (CTI-CFF). Specific opportunities for supporting these recommendations are identified for the Ecosystems Improved for Sustainable Fisheries (ECOFISH) Project of the Philippines Bureau of Fisheries and Aquatic Resources (BFAR) with funding support from the United States Agency for International Development (USAID).

The Philippines is one of six Coral Triangle countries that committed to accelerate efforts to safeguard the coastal and marine resources and communities through the adoption of the CTI-CFF Regional Plan of Action (RPOA). The RPOA establishes regional goals, targets, and actions for CCA, EAFM, marine protected areas (MPA), threatened and endangered species, and seascapes. The Philippines National Plan of Action (NPOA) establishes national priorities in line with regional goals as part of CTI-CFF and local implementation in Marine Key Biodiversity Areas (MKBAs).

The importance of addressing the goal on climate change was reinforced through the development of the Region-wide Early Action Plan for Climate Change Adaptation for the Nearshore Marine and Coastal Environment and Small Island Ecosystems (REAP) (CTI-CFF 2011). The six Coral Triangle countries adopted the REAP as a guiding framework to achieve this goal. The REAP sets forth urgent and immediate actions for coastal communities that are to be taken across the Coral Triangle to build coastal community resilience to climate change (CTI-CFF 2011).

Regional and national plans and guidance developed as part of the CTI-CFF were reviewed to identify policy recommendations for climate change and sustainable fisheries. These documents are listed by theme in Table 1.

Table 1. Regional Plans and Guidance Developed as Part of the Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security

<p>Ecosystem-based Management</p> <ul style="list-style-type: none">• Regional Plan of Action (RPOA) (CTI-CFF 2009)• Toward ecosystem-based coastal area and fisheries management in the Coral Triangle: Integrated strategies and guidance (Flower et al., 2013)• Monitoring and Evaluation System Operations Manual. (CTI-CFF, in preparation by the M&E Working Group) <p>Marine Protected Areas</p> <ul style="list-style-type: none">• Designing marine protected areas to integrate fisheries, biodiversity, and climate change objectives in the Coral Triangle (Fernandes et al. 2012)• Designing marine protected area networks to achieve fisheries, biodiversity, and climate change objectives in tropical ecosystems: A practitioner guide. (Green et al. 2013)• Coral Triangle Marine Protected Area System Framework and Action Plan (CTI-CFF 2013) <p>Ecosystem Approach to Fisheries Management</p> <ul style="list-style-type: none">• Coral Triangle Regional Ecosystem Approach to Fisheries Management (EAFM) Guidelines. (Pomeroy et al., in preparation)
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2. Climate Change Scenario in the Philippines

The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) (2011) analyzed climate data from 1951-2009, and found that (based on 1971-2000 average as reference value):

- Annual mean temperature increased by 0.57 °C (Figure 4);
- Maximum and minimum temperatures increased by 0.35 °C and 0.94 °C, respectively;
- Strong multi-decadal variability in frequency of tropical cyclone occurrence/passage, but no indication of increase from an average of 20 tropical cyclones form and/or cross the country per year. However, there was a very slight increase in the number of tropical cyclones with maximum sustained winds of greater than 150kph and above (typhoon category) being exhibited during El Niño years; and,
- Significant increase in number of hot days but decrease of cool nights; extreme rainfall intensity and frequency patterns were not clear, both in magnitude (by what amounts) and direction (whether increasing or decreasing), with very little spatial coherence.

In the same study, PAGASA used PRECIS (Providing Regional Climates for Impact Studies) modeling to project temperature and rainfall scenarios in each region and climate type of the country under the high-medium- and low-range emission scenarios developed by the IPCC. General climate projections for 2020 and 2050 include:

- Annual mean temperatures in all areas in the country are expected to rise by 0.9°C to 1.1°C in 2020 and by 1.8°C to 2.2°C in 2050 (Figure 4);
- All seasonal mean temperatures will also have increases in the two time slices;
- There is a reduction in rainfall in most provinces during the summer season making the usually dry season drier, while rainfall increases are likely in most areas of Luzon and Visayas during the southwest monsoon making these seasons even wetter, and thus the likelihood of both droughts and floods in areas where these are projected;
- The northeast monsoon season rainfall is projected to increase, particularly for areas characterized by Type II climate with potential for flooding enhanced;
- During the southwest monsoon season, larger increases in rainfall is expected in provinces in Luzon (0.9% to 63%) and Visayas (2% to 22%) but generally decreasing trends in most of the provinces in Mindanao by 2050;
- Hot temperatures indicated by the number of days with maximum temperature exceeding 35°C will continue to become more frequent, the number of dry days (days with less than 2.5mm of rain) will increase in all parts of the country and heavy daily rainfall (exceeding 300mm) events will also continue to increase in number in Luzon and Visayas.

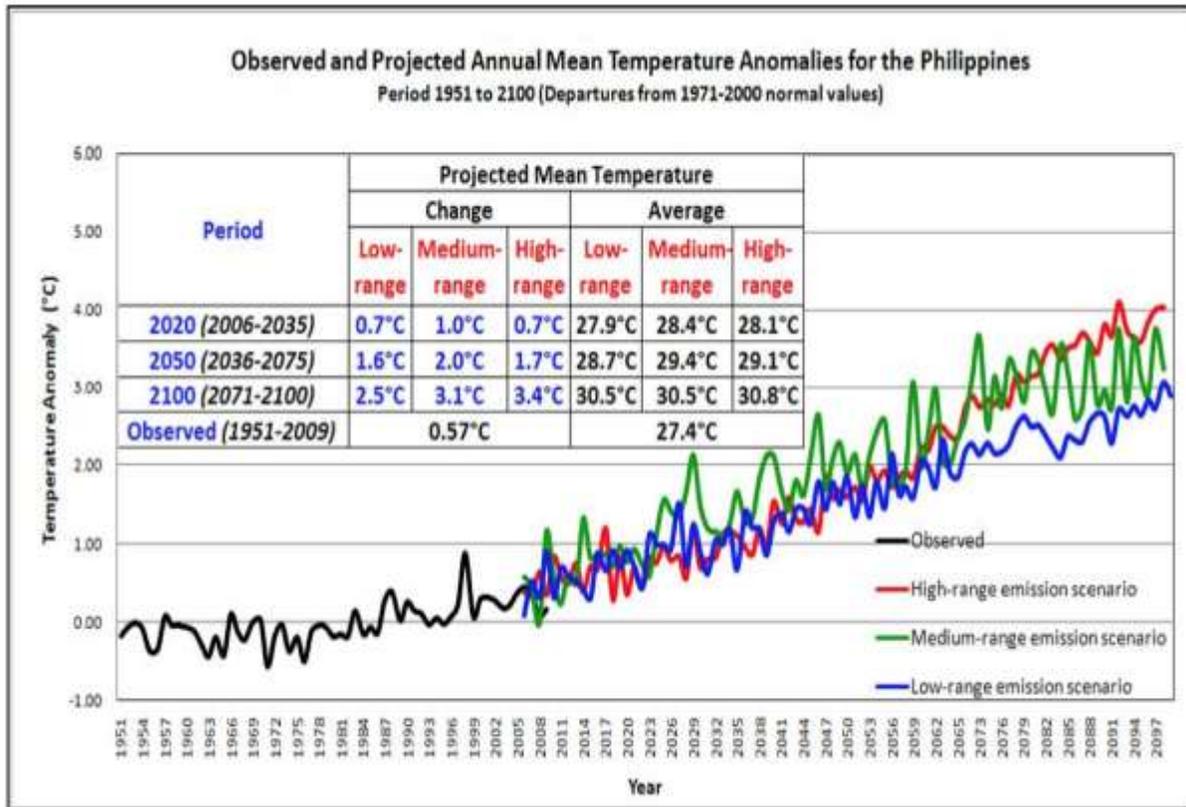


Figure 4. Observed and Projected Annual Mean Temperature Anomalies for the Philippines from 1951 to 2100 (PAGASA 2011)

The Philippines has been identified as the world’s 3rd most vulnerable country to disaster risks and natural hazards, and 6th in climate change vulnerability (World Bank 2012, and references therein). Global climate change is expected to bring significant adverse impacts to the country’s agricultural and fisheries productivity. Annual damage to agriculture from typhoons, floods, and droughts has reached PhP 12 billion, or 3% of total agriculture production; while during the 1998 to 1999 ENSO event, the live coral cover of the Philippines decreased by half, diminishing fisheries yield by more than PhP 7 billion (World Bank 2013, and reference therein). Warming oceans, sea level rise and ocean acidification have been associated with coral bleaching, changes in productivity, changes in plankton dynamics, alterations in seagrass and sea weed reproduction patterns, shoreline erosion and retreat, changes in trophic dynamics and aggravation of marine diseases (Capili et al. 2005). Global climate change also threatens the most vulnerable communities in the coastal areas and informal urban settlements. In the Philippines, storm surges are projected to affect about 14% of the total population and 42 % of the coastal population (Brecht et al. 2012).

The climate projections of PAGASA can only mean that impacts of climate change will become more severe in the coming decades. The adverse impacts may be aggravated by population growth and environmental degradation brought about by unsustainable development activities. Poor communities, mostly living in coastal areas, have few choices in enduring these impacts due to the lack of livelihoods or because of limited livelihood options, poor resource access, and landlessness (Butardo-Toribio et al. 2011).

Policy Response

The Philippines has made significant strides in responding to the challenges of climate change such that previously fragmented sectoral approaches are being guided towards a more comprehensive framework (Figure 5).

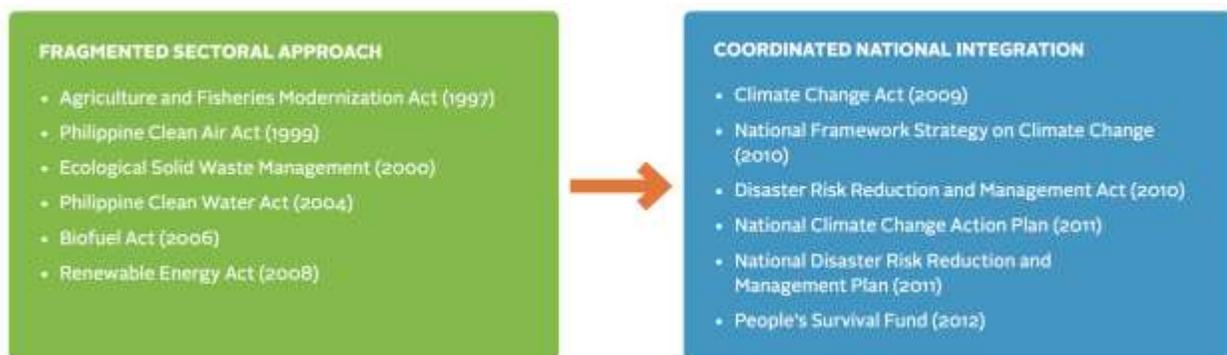


Figure 5. Policy Approach Taken by the Philippines to Address Climate Change (World Bank 2012)

In 2009, Congress passed the Climate Change Act (Republic Act No. 9729) creating the Climate Change Commission that was mandated with the formulation of national climate change strategies and plans. Headed by the President, the CCC provides the direction for all climate-related actions to be implemented by sectoral agencies. The national strategies and plans are anchored on adaptation and reducing risks from climate-related natural disasters. The National Disaster Risk Reduction and Management Act (Republic Act No. 10121), passed in 2010, complemented the Climate Change Act in institutionalizing disaster preparedness through strengthening local government capacity and providing budgetary support.

The National Climate Change Action Plan (2011-2028) identified seven priorities namely: (1) food security; (2) water sufficiency; (3) environmental and ecological stability; (4) human security; (5) sustainable energy; (6) climate-smart industries and services; and (7) knowledge and

capacity development. In the first five years, the Action Plan will focus on vulnerability assessment, demonstration of the ‘Eco-town’ concept, research and development for renewable energy and sustainable transport.

In 2012, Congress passed the People’s Survival Fund (Republic Act No. 10174), which provides incentives for local governments to conduct vulnerability assessment, climate policies and adaptation plans, and early actions to address persistent flooding, rising sea levels, and agricultural programs that are resilient to extreme temperatures and changing rainfall.

Coastal Resources and Fisheries

Scientific studies and policy approaches in the coastal sector have mostly focused on community adaptation to climate change impacts. In a literature review by Sajise et al. (2012), the coastal sector is cited as one of the sectors that needs more climate-related studies-as the current national literature on the impacts of climate change-related risks on coastal fisheries, inland fisheries, and aquaculture is not yet as extensive. However, there have been a remarkable increase in site-specific vulnerability assessments, such as in the Verde Island Passage (Boquiren et. al.2010) and documented examples in the Vulnerability Assessment Tools for Coastal Ecosystems guidebook (Geronimo et al. 2013). The State of the Coasts report of PhilReefs (2010) included climate change adaptation in documenting local government coastal and fisheries resources management actions. A number of programs focused on coastal CCA are currently being implemented, including:

- Adaptation to Climate Change in Coastal Areas or ACCCOast (funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) under its International Climate Initiative) supports the development of national climate change adaptation strategies and the implementation of selected measures to protect and increase the resiliency of the coastal environment and communities.
- The Ecosystems Research and Development Bureau (ERDB) is conducting the study on “Adaptation Strategies to Climate Change Impacts in Main Island Coastline and Small Island Foreshore Areas”, aiming to generate information on adaptation strategies in six project sites (3 main islands and 3 small islands) by the end of 2013. ERDB is also undertaking a “Vulnerability Assessment of Selected Watersheds and Coastal Areas in the Philippines to Climate Change”.
- The Department of Science and Technology – PCCAARRD is implementing “Remote Sensing Information for Living Environments and Nationwide Tools for Sentinel

Ecosystems in our Archipelagic Seas” (RESILIENT SEAS) under the “Integrated Coastal Sensitivity, Exposure, and Adaptive Capacity to Climate Change” (ICSEA Change) Project which is set to assist local coastal communities in determining their vulnerabilities to the impacts of climate change based on projected threats.

- Fulfilling the NCCAP Strategy at the field level, the Climate Change Commission is spearheading the Eco-town project, which aims to build the adaptive capacities of communities and ecosystems by making them ecologically stable and economically resilient through an ecosystem based approach. An ‘Eco-town’ is a ‘planning unit composed of municipalities or a group of municipalities located within and around boundaries of critical key biodiversity areas, which are at high risk to climate change’. Ten municipalities have been identified by the Commission where the concept will be tested: Del Carmen, Pilar San Benito, and San Isidro, Siargao Island; San Vicente, Palawan; and Borongon, Llorente, Can-avid, and Guiuan in the Province of Eastern Samar. The components of the project include natural resource assessment, vulnerability assessment, ENR accounting, adaptation measures, climate adaptation support, and finance schemes.
- The Bureau of Agricultural Research under the Department of Agriculture has delineated in their “Research and Development and Extension Agenda and Programs for 2011-2016” research components on fisheries and marine resources. Some of these are: (1) establishment of climate-change sensitive mariculture zoning system, (2) improved estimation of loss in fish production (both benthic and pelagic) due to climate change, (3) estimation of carrying capacity of seaweeds and other mariculture commodities to increased temperature, (4) monitoring of ocean acidification, salinity, and ocean color, (5) vulnerability mapping in coastal areas and assessment of marine resources/marine protected areas, and (6) changes in spatial distribution and migration patterns of fish over time.

A few studies look into the effects of climate change on coastal ecosystems and fisheries resources. However, there is more work needed to translate these studies into actions that factor climate change impacts into coastal and fisheries resources management. In 2011, the Bureau of Fisheries and Aquatic Resources adopted the “Plan of Action on Sustainable Fisheries for Food Security for ASEAN Region Towards 2020” as a guideline to develop programs, projects and activities in an inter-agency collaborative approach. The “Fisheries and Marine Management” standards in this plan have integrated climate change responses into the fisheries policy frameworks.

3. Policy Recommendations for Climate Change and Sustainable Fisheries

The overall objective of the ECOFISH Project is to conserve marine biodiversity by improving the management of coastal and marine resources and associated ecosystems that support local economies in eight MKBAs in the Philippines. The ECOFISH Project is intended to foster fishing sector reforms by applying an Ecosystem Approach to Fisheries Management (EAFM) in larger marine conservation areas involving clusters of Local Government Units (LGUs). ECOFISH will promote the growth and restore the profitability of fisheries through conservation of ecosystem health and effective management. The key expected results of the ECOFISH Project are: (1) a 10% increase in fish biomass and (2) a 10% increase in the number of people gaining employment or better employment from sustainable fisheries management in the eight MKBAs.

The growth, control, and maintenance (GCM) framework was developed as the core EAFM framework for sustainable fisheries during the precursor Fisheries Improved for Sustainable Harvests (FISH) Project. The GCM framework will continue to guide EAFM planning and implementation in ECOFISH; however, there is an opportunity to mainstream climate change into the framework to transform it into a “Climate Resilient GCM Framework” (Table 2).

Table 2. GCM and Climate-Resilient GCM Framework

Growth, Control and Maintenance Framework	Climate-Resilient GCM Framework
GROWTH: Mechanisms to enhance fishery production and marine ecosystem integrity	
<ul style="list-style-type: none"> • Establish networks of resilient MPAs for critical habitats and open water to protect spawning, migration routes, populations of mature fish, endangered species and other resources with no-take “sanctuaries” and management zones • Encourage environment-friendly economic development and revenue-generating mechanisms such as marine ecotourism and user-fee systems 	<ul style="list-style-type: none"> • Adopt principles for designing resilient MPA networks and incorporate Philippine MPAs into the Coral Triangle Marine Protected Areas System (CTMPAS) • Assess vulnerability of target fish species important to food security and livelihoods • Integrate climate change adaptation into a national poverty reduction strategy for municipal fishers that focuses on climate-resilient livelihood diversification

<p>CONTROL: Mechanisms to allocate access to fisheries and coastal resources</p>	
<ul style="list-style-type: none"> • Identify restrictions on fishing gears, fish size limits, fishing areas and seasons to achieve sustainable fishing based on the results of the baseline assessment, critical threats analysis, and stakeholder planning • Register fishers and issue licenses for fishing vessels and gears (municipal and commercial) based on estimated sustained yield of fish stocks • Establish licensing system supported by legislation for commercial fishing vessels to operate in areas where sustainable yields of fish stocks can be expected and regulated • Train coastal law enforcement units to enforce fishery laws and other coastal resource-related laws 	<ul style="list-style-type: none"> • Improve efficiency of fisheries law enforcement to ensure protection of climate refugia and vulnerable target fish species • Ensure safety of fishers, and protection of vessels and gears through early warning systems and hazard preparedness • Promote compliance with climate-smart regulatory measures through timely and effective information and education campaigns
<p>MAINTENANCE: Mechanisms to improve institutional capacity for fisheries and CRM</p>	
<ul style="list-style-type: none"> • Develop ecosystem-based fisheries management program to address critical threats to fisheries and other coastal resources • Cluster LGUs into viable fisheries and CRM units in association with inter-agency and multi-sectoral collaborative mechanisms for planning, implementation and enforcement • Assist stakeholders in integrating population and reproductive health programs in fisheries management • Identify appropriate and efficient market-based incentives for compliance and investments in sustainable fisheries • Promote public-private partnerships for fisheries management 	<ul style="list-style-type: none"> • Integrate consideration of climate change impacts into local EAFM policies and plans • Apply integrated strategies in MKBAs to move towards ecosystem-based management • Develop protocols to monitor and evaluate indicators for local CCA implementation • Develop climate smart PPPs to support sustainable fisheries

Recommendation 1. Adopt Principles for Designing Resilient MPA Networks and Incorporate Philippine MPAs into the Coral Triangle Marine Protected Areas System (CTMPAS)

Background

Well-designed and managed MPAs protect critical habitats necessary for sustainable fisheries and biodiversity conservation. The Philippines has led the establishment of MPAs in the Coral Triangle region. The third of five goals identified in the RPOA is “marine protected areas (MPAs) established and effectively managed,” and this goal has one target, “a region-wide Coral Triangle MPA System (CTMPAS) in place and fully functional.” This target calls for regional planning and action among the Coral Triangle countries and underscores the need to address at a regional level the various ecological, political and economic issues that impact the region’s vital marine resources. The vision of the CTMPAS is a system of prioritized individual MPAs and networks of MPAs that are connected, resilient, and sustainably financed, and designed in ways that generate significant incomes, livelihoods, and food security benefits for coastal communities; and conserve the region’s rich biological diversity.

Principles for resilient MPA network design were developed through a comprehensive review of literature and case studies as part of the US CTI Support Program (Table 3) (Fernandes et al. 2012).

Table 3. Principles for Resilient MPA Networks Designed to Achieve Fisheries, Biodiversity Conservation, and CCA objectives (Fernandes et al. 2012)

Principle 1. Prohibit destructive activities throughout the managed area
Principle 2. Represent 30 % (or at least 20 %) of each habitat within no-take areas
Principle 3. Replicate protection of habitats
Principles 4. Ensure that no-take areas include critical habitats
Principle 5. No-take areas, prohibitions on destructive fishing gear, other fishing gear and access limits should be in place for the long-term, preferably permanently
Principle 6. Create a multiple use marine protected area that is as large as possible
Principle 7. Apply minimum and a variety of sizes to protected areas within the network
Principle 8. Separate no-take areas by 1 to 20 km apart (with a mode of ~1 to 10 km). spacing of other long-term protected areas either not applicable OR same as for no-take areas
Principle 9. Include an additional 15% in shorter-term no-take protection within the network. for example, seasonal, rotational or other temporally variable zones
Principle 10. Have a mixture of protected area boundaries: both within habitats and at habitat edges
Principle 11. Have protected areas in more square or circular shapes
Principle 12. Minimize external threats
Principle 13. Include resilient sites in the network
Principle 14. Include special or unique sites in the network
Principle 15. Locate more protection upstream of currents

These 15 design principles were developed to support fisheries, biodiversity conservation, and climate change adaptation objectives. The principles for designing resilient MPA networks should be applied for the design of large National Integrated Protected Area System (NIPAS) MPAs as well as local MPA networks in the Philippines.

Recommendation

All Philippine MPAs should be incorporated into the CTMPAS. Key steps to achieve this would include:

- Get data in order on all MPAs for the CT Atlas so that at least all the Philippine MPAs are recognized in CTMPAS and can be counted as contributing nationally and regionally;
- Apply more consistently the MPA M&E system already being used in the Philippines (MEAT) so that all the MPAs would have a rating in the system and could qualify for categories 2, 3 or 4;

- Nominate the prime sites for Categories 2, 3 or 4 per the criteria in CTMPAS;
- Increase the area of critical habitat in MPAs and especially in no-take MPAs; and
- Apply the MPA Principles for design of the large NIPAS MPAs and local MPA networks.

ECOFISH Opportunities

ECOFISH should support BFAR to established and coordinate individual and networks of MPAs in the eight MKBAs. Establishment and strengthening of MPA networks is a key component of the GCM framework for EAFM used in ECOFISH. Biophysical baseline assessment, MPA effectiveness monitoring, and dispersal modeling will be used to identify new MPAs and strategies to strengthen existing MPAs within each MKBA. The principles for designing resilient MPA networks should be applied in MPAs in the eight MKBAs where ECOFISH is working.

The policy component of ECOFISH can provide a forum for BFAR, DENR, and academic institutions to review, refine, and adopt the resilient MPA network design principles for national implementation. ECOFISH will conduct a desktop review and GIS analysis of the existing MPAs in each MKBA to determine the degree to which the 15 principles are represented in each area. The review should begin with Lingayen Gulf, VIP, South Negros, and San Bernardino Strait MKBAs. The results of this review can then be integrated in the MERF Baseline Assessment and Modeling Plan for each MKBA. MERF is conducting baseline assessment for four MKBAS. MERF will also assist in the design of Marine Protected Area Networks at the selected MKBAs (Lingayen Gulf, VIP, South Negros, and San Bernardino Strait) through hydrodynamic studies and by modeling larval dispersal.

Recommendation 2. Assess Vulnerability of Target Fish Species Important to Food Security and Livelihoods

Background

Increased sea surface temperature and decreasing ocean pH will result in changes to oceanographic properties and processes and the distribution and reproduction of fish species. The RPOA, REAP-CCA, and NPOA call for the conduct of vulnerability assessments to determine impacts of climate change such as extreme weather events, sea level rise, flooding, storm surges on biodiversity, fisheries productivity, ecology of coastal and marine habitats and ecosystem services. Regional guidance for the Coral Triangle (US CTI Support Program 2013) and national tools (Geronimo et al. 2013) have been developed on conducting vulnerability assessments.

Recommendation

Fisheries management interventions such as gear restrictions and effort reduction or “right sizing” should consider climate change related impacts. Species-specific fisheries vulnerability assessments should be conducted to characterize climate change-related threats and adaptation options for species important to food security and livelihoods. Illustrative attributes of vulnerability of fisheries to climate change are shown in Table 4. A vulnerability assessment of target fish species would examine the ecological vulnerability as well as social vulnerability using the model presented in Figure 3.

ECOFISH Opportunities

ECOFISH should provide technical assistance to BFAR to identify target species and develop a methodology for the vulnerability assessment. Existing methodologies should be reviewed and refined to develop a vulnerability assessment method that can be used by ECOFISH and integrated as part of capacity building efforts for BFAR. NOAA is envisioned as an active partner in these assessments, providing valuable data and technical expertise in describing climate impacts and assessing fisheries vulnerability.

Table 4. Illustrative Vulnerability Attributes for a Fishery (Binder and Dalton 2011)

Exposure Attributes	Sensitivity Attributes	Adaptive Capacity Attributes
<ul style="list-style-type: none"> • Sea surface temperature • Ocean acidification • Ocean current changes • Changes in upwelling • Inter-annual and inter-decadal cycles • Sea level rise and wave height • Changes in storm intensity 	<ul style="list-style-type: none"> • Changes in plankton productivity • Changes in larval growth, development and survival • Changes in species range and distribution • Changes in predator dynamics • Changes in time and space of fish distribution • Changes in the availability of fish • Changes in fishing risks and practices • Impacts on coastal infrastructure 	<ul style="list-style-type: none"> • Stock status • Reproductive potential • Extent of overfishing • Species mobility • Species range • Pollution • Governance • Size of economy • Resource dependence • Alternative livelihoods • Location of fishery and fishing communities • Size of community • Coastal infrastructure placement and design • Vessel size • Ability to shift to alternate fisheries

Recommendation 3. Integrate Climate Change Adaptation Into a National Poverty Reduction Strategy for Municipal Fishers that Focuses on Climate-Resilient Livelihood

Background

A strategic opportunity to address social and ecological vulnerability to climate change in the fisheries sector is through the development of a national poverty reduction strategy for municipal fishers. Small-scale municipal fishers are among the poorest of the poor in the Philippines. These fishers are highly dependent on fisheries and other natural resources for food, livelihoods, and some basic needs such as fuel. The REAP-CCA and Philippines NPOA call for the identification, documentation, and implementation of immediate climate adaptation measures to respond to climate impacts (NPOA Goal 4, Target #2, Action 2) including establishing fisherfolk resettlement areas for those that are most at risk due to climate change, mainstreaming early warning systems for vulnerable coastal settlements, and providing alternative livelihood and enterprise development for populations most at risk due to climate change impacts.

Badjeck et al. (2010) identified adaptation strategies and responses to climate change that can increase livelihood resilience, including: (1) management approaches and policies that build the livelihood asset base, reducing vulnerability to multiple stressors, including climate change; (2) an understanding of current response mechanisms to climate variability and other shocks in order to inform planned adaptation; (3) a recognition of the opportunities that climate change could bring to the sector; (4) adaptive strategies designed with a multi-sector perspective; and (5) a recognition of the potential contribution of fisheries to mitigation efforts.

Recommendation

A poverty reduction strategy should be based on an assessment of social and ecological vulnerability to natural and climate change-related hazards as a basis for identifying poverty reduction measures for the municipal fisheries sector. Examples of potential adaptation actions to reduce the vulnerability and build resilience of municipal fishers may include:

- Manage municipal fisheries to maximize ecosystem services through EAFM;
- Relocate fishing communities outside hazard-prone areas;
- Design, site, and maintain fishing related-infrastructure to minimize climate impacts;
- Assess vulnerability of viable alternative livelihoods to make sure they are climate smart;
- Diversify the local economy with climate smart livelihoods to reduce dependence on fishing;
- Improve capacity of and access to markets, skills, health and other social services, education, and credit.

ECOFISH Opportunities

ECOFISH is currently conducting socio-economic surveys in selected sites to establish baselines on economic and livelihood conditions. ECOFISH could use the data to provide technical assistance to BFAR to input into an overall initiative of the National Anti-Poverty Commission (NAPC) to develop a poverty reduction strategy for municipal fishers. An assessment of social and ecological vulnerability to natural and climate-change related hazards should form the basis for identifying measures that address risks to climate change in the municipal fisheries sector.

Recommendation 4. Improve Efficiency of Fisheries Law Enforcement to Ensure Protection of Climate Refugia and Vulnerable Target Fish Species

Background

The FISH Project has shown that effective enforcement of fisheries laws significantly contributes to increase in productivity. Climate change can result in less productive stocks because of potential direct effects on reproductive processes, recruitment, survival and growth rates, or indirectly through impact of climate change on environmental conditions that support the fisheries. More effective law enforcement can increase recruitment and survival rates to compensate for the lower productivity.

BFAR reported a significant increase in sardine catch following the successful implementation of the closed seasons in Zamboanga and Visayan Sea.

Recommendation

Enforcement of regulations in no-take zones (MPAs) should be prioritized to increase recruitment and allow ecosystems affected by climate change, such as reefs suffering from bleaching, to recover. Given the scarcity of manpower and resources of law enforcement agencies and local governments devoted to protecting the coastal and fisheries resources from illegal activities, law enforcement strategies have to be strategic, and focused on preventive measures that address commission of the most destructive forms of illegal fishing. Enforcement should also focus on averting illegal activities that affect the livelihoods of poor, vulnerable fishers, such as the intrusion of commercial fishing vessels into municipal waters.

ECOFISH Opportunities

ECOFISH will continue to help build the capacity of local governments on fisheries law enforcement, through assistance in preparing strategic and integrated law enforcement plans for the 8 MKBAs. ECOFISH is also facilitating the participation of the PNP-Maritime Group, Philippine Coast Guard and Philippine Navy in coordinated enforcement activities especially in the MKBAs. ECOFISH is currently assisting the PNP-Maritime Group in designing and implementing its Adopt A Marine Protected Area Program.

Recommendation 6. Ensure Safety of Fishers, and Protection of Vessels and Gear through Early Warning Systems and Hazard Preparedness

Background

BFAR has prioritized fisherfolk registration through the National Program for Municipal Fisherfolk Registration (FishR) in order to have an accurate profile of the people that need assistance for livelihoods, as well as protection in case of typhoons and other calamities. Local governments now have the institutional and budgetary support for CCA under the new laws on Disaster Risk Reduction and Management and the People's Survival Fund. However, a study by WorldFish (2013) showed that the adaptation strategies adopted by local governments were mainly on preventive infrastructure such as seawalls, embankments and breakwaters, where in fact the main impact from climate-related hazards is on the livelihoods of coastal communities.

Recommendation

Where preventive infrastructure is needed and appropriate, it is better to adopt ecosystem-based measures such as mangrove reforestation or coral reef protection. Coral reef ecosystems have been shown to protect shores from high-energy waves associated with storms surges. Maintaining reef growth through minimizing destructive activities such as blast and poison fishing methods, pollution and siltation, is crucial to minimize the impacts of high-energy waves that may increase with climate change (Villanoy et al. 2012).

ECOFISH Opportunities

ECOFISH will generate baseline and monitoring data on the socio-economic conditions and livelihoods that will contribute to the assessment of climate change impacts on vulnerable coastal communities. Together with MERF and other partners, ECOFISH will support the conduct or

review of vulnerability assessment studies that will inform the preparation of appropriate adaptation measures.

Recommendation 6. Promote Compliance with Climate-Smart Regulatory Measures through Timely and Effective Information and Education Campaigns

Background

Because of the yearly occurrence of typhoons, floods and other natural calamities, local communities and local governments have high awareness of disaster risks, as well as basic measures to reduce risks and adapt to the inevitable impact of these disasters. However, there is low awareness of the connection between coastal and fisheries resources conservation and resilience to the adverse impacts of natural disasters. For example, blast fishing reduce corals to rubble which is ineffective as protection against storm surges compared to healthy corals.

Recommendation

BFAR and local governments should implement sustained information and education campaigns to emphasize the links between climate change and sustainable fisheries. The message should clearly relate coastal and fisheries conservation with resilient livelihoods. Local governments should translate the results of vulnerability assessments into simple actionable items that communities can undertake on their own or in coordination with the local authorities.

ECOFISH Opportunities

ECOFISH will include ecosystem-based climate change adaptation among the key messages in information and education campaigns. ECOFISH will also provide assistance to local governments to generate support for, and compliance with, climate-smart regulatory measures by an informed constituency.

Recommendation 7. Integrate Consideration of Climate Impacts Into Local EAFM Policies and Plans

Background

EAFM requires the inclusion in management of the interactions between: the fishery (the fish and the fishers); habitats (coral reefs, sea grass, mangroves), ecological, oceanographic, and environmental conditions that interact with the fisheries; and social, economic, and governance systems surrounding and affecting them (Pomeroy et al. 2013). Consideration of climate change impacts should be integrated into the EAFM planning process (Heenan et al. 2013). The NPOA calls for a review and update of all fisheries policies taking into consideration the Archipelagic Development Framework (ArcDev) and Integrated Coastal Management (ICM) to achieve EAFM.

Recommendation

Fisheries policies and plans at national and local levels should integrate consideration of climate change. Fisheries management planning for clusters of municipalities in the MKBAs provides an important opportunity to integrate climate change. Illustrative adaptation options for coastal communities and fisheries are provided in Appendix B of the LEAP Guide (US CTI Support Program 2013).

ECOFISH Opportunities

ECOFISH will conduct integrated coastal and fisheries management planning for clusters of municipalities in the MKBAs. These fisheries management plans for LGU alliances will define collaborative inter-LGU enforcement operations, comprehensive bay-wide fisheries zoning, and provide the mechanism to establish limits and controls to fishing effort. Vulnerability assessments should be conducted to support EAFM planning and identify adaptation options to support sustainable fisheries.

Recommendation 8. Apply Integrated Strategies in MKBAs to Move Towards Ecosystem-Based Management

Background

The CTI-CFF RPOA calls for the integrated application of activities that achieve its five goals through an ecosystem approach. The RPOA, in Section III: Commitments to Action, states, “Our countries will promote agreed approaches to managing marine and coastal ecosystems and resources, including the ecosystem approach and the precautionary principle” Philippine. The NPOA calls for integrated coastal management as the unifying framework for achieving the goals and targets set forth in the plan.

The US CTI Support Program, working with the Coral Triangle countries, developed a guide (Flower et. al, 2013) to help marine and coastal managers, conservation practitioners, local governments, communities, funders, economic investors, and other stakeholders identify integrated strategies that can be implemented in specified coastal areas (such as MKBAs through collaborative arrangements in defined coastal and marine areas of the Coral Triangle) to move toward ecosystem-based management. The integrated strategies for coastal areas and fisheries are listed in **Error! Reference source not found.**Table 5 and described in detail in Flower et al. (2013). These strategies were developed to support the achievement of biodiversity conservation, sustainable fisheries, and climate resilience outcomes in coastal areas. The guide also introduces a diagnostic tool (Figure 6) to enable a rapid assessment of the status of implementation of each strategy in a given coastal area.

Table 5. Integrated Strategies for Coastal Areas and Fisheries

- A. **Governance of management areas:** Manage coastal and marine areas based on ecological boundaries, resource use patterns, and governance jurisdictions
- B. **Fisheries managed for sustainability:** Manage multiple fisheries and their associated ecosystems for sustainable use and human benefit under an ecosystem approach to fisheries management (EAFM connectivity) through MPA networks and other means
- C. **Threatened species, critical species, and functional groups:** Protect and restore species and functional groups that maintain ecosystem integrity
- D. **Community and economic development:** Diversify and sustain coastal communities’ livelihoods
- E. **Watershed management:** Effectively manage watersheds and freshwater resources
- F. **Hazard risk reduction:** Reduce risk to communities from climate change and coastal hazards

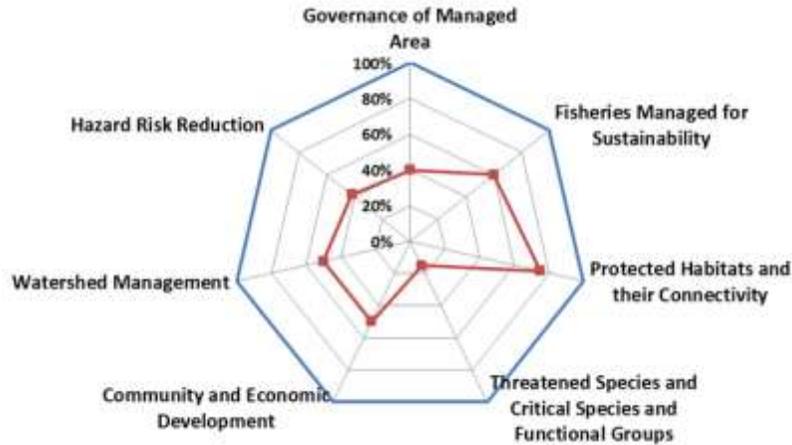


Figure 6. Integrated Strategies and Diagnostic Tool (Flower et al. 2013)

Recommendation

The integrated strategies and diagnostic tool can be applied in coastal areas to assess the status and progress toward ecosystem-based management and identify opportunities and partners to improve collaboration and leverage resources among various stakeholders. The Philippine National CTI Coordinating Committee (NCCC) could convene relevant national government agencies, nongovernmental organizations, and academic institutions to review and refine the integrated strategies and associated benchmarks in the Philippine context. The status of coastal municipalities applying these strategies in MKBAs could be assessed to provide a basis for programming of technical support and capacity building by national and local government and other assisting organizations.

ECOFISH Opportunities

ECOFISH can assist BFAR, a member of the NCCC, in bringing together national government agencies, nongovernmental organizations, and academic institutions to review and refine the integrated strategies and associated benchmarks in the Philippine context. ECOFISH can apply the diagnostic tool in MKBAs to assess the status and progress toward ecosystem-based management and identify opportunities and partners to improve collaboration and leverage resources among various stakeholders.

Recommendation 9. Develop Protocols to Monitor and Evaluate Indicators for Local CCA Implementation

Background

The Philippines has committed to monitor and evaluate progress against the goals and targets of the RPOA. The CTI Monitoring and Evaluation System includes indicators for each goal in the RPOA. The CTI Monitoring and Evaluation System Operations Manual is being finalized to provide a standardized approach to data collection and reporting. The indicators to monitoring progress in CCA at regional, national, and local level are:

- **Indicator 4.1.1:** Number of regional agreements/frameworks/plans (e.g. REAP) developed;
- **Indicator 4.1.2:** Number of national CCA policies (including national CCA plans and frameworks), laws and regulations on climate change adaptation proposed and adopted;
- **Indicator 4.1.3:** Percentage of local governments that have integrated climate adaptation into local governance (plans and actions);
- **Indicator 4.1.4:** Area of Mangroves (hectares).

Recommendation

All CTI-CFF indicators need to be monitored and reported as part of the CTI Monitoring and Evaluation System. Benchmarks are being used to monitor CCA progress at the local government level for Indicator 4.1.3 (Table 6). These benchmarks should be used to establish a baseline and monitor progress of coastal municipalities. The NCCC and the League of Municipalities of the Philippines should develop a protocol to collect and report the data needed to monitor progress for these indicators. A CCA baseline should be established for all coastal municipalities together with annual monitoring.

ECOFISH Opportunities

The ECOFISH Project can assist BFAR, the Department of Interior and Local Government (DILG), and the League of Municipalities of the Philippines in developing the protocol to collect and report data on indicator 4.1.3. ECOFISH can use the CCA benchmarks to establish a baseline for municipalities in the eight MKBAs and monitor progress over the life of the project.

Table 6. CCA Benchmarks for Local Government Included in the CTI Monitoring and Evaluation System (CTI-CFF 2013b)

Level 1 – Getting Started	Level 2 – Laying a Solid Foundation	Level 3 – Responding to Changing Conditions
<p>Objective: Awareness of climate hazards and vulnerability with early adaptation actions initiated</p>	<p>Objective: Climate adaptations integrated into plans and programs with regular funding allocated to sustain implementation of early adaptation actions with monitoring</p>	<p>Objective: Climate adaptation mainstreamed into policies, plans, programs, and decision-making processes across all sectors with monitoring, results, and positive returns</p>
<ul style="list-style-type: none"> <input type="checkbox"/> CCA planning team organized and trained to facilitate local early action planning <input type="checkbox"/> Community outreach on climate change issues and early actions conducted <input type="checkbox"/> Local climate vulnerability assessment (qualitative) conducted <input type="checkbox"/> Indicators (social and natural) of climate impacts and adaptation actions identified and baseline assessments conducted <input type="checkbox"/> Timeline for implementation of early adaptation actions developed <input type="checkbox"/> At least 2 early adaptation actions planned and initiated 	<ul style="list-style-type: none"> <input type="checkbox"/> Local partnerships established to support adaptation <input type="checkbox"/> Stakeholder outreach on local early adaptation plans and adaptations conducted <input type="checkbox"/> Local climate vulnerability assessment updated and refined (quantitative) <input type="checkbox"/> Early actions and timeline for implementation reviewed and updated <input type="checkbox"/> Local early actions incorporated into plans and programs <input type="checkbox"/> At least 4 early adaptation actions implemented with success <input type="checkbox"/> Monitoring of climate impacts and effectiveness of adaptation strategies conducted 	<ul style="list-style-type: none"> <input type="checkbox"/> National, regional, and international partnerships established to support long-term adaptation <input type="checkbox"/> CCA mainstreamed into policies, plans, and programs <input type="checkbox"/> At least 6 early adaptation actions implemented with success <input type="checkbox"/> Monitoring of climate impacts and effectiveness of adaptation strategies conducted to adapt and improve management

Recommendation 10. Develop Climate Smart PPPs to Support Sustainable Fisheries

Background

Public-private partnerships (PPP) are an important component of EAFM. The private sector creates demand for many types of seafood, which contributes significantly to the depletion of fisheries stocks and holds much of the potential for innovation and market transformation at the national and local levels. The private sector also has a key role to play in generating employment and economic opportunities, which enable fishers to move into alternative livelihood activities. The NPOA specifically calls out engagement with the private sector in improving disaster risk management and developing economic incentives for entities using climate-friendly technologies.

Recommendation

Climate change impacts should be considered to strengthen the mutual benefits achieved from the PPP. Depending on the type of PPP, these considerations may include the following:

- **Sustainable Fisheries Partnerships:** assess vulnerability to climate change in siting and design of fisheries-related infrastructure;
- **Enterprise Development Partnerships:** develop climate-smart livelihoods by assessing vulnerability as part of livelihood diversification;
- **Technology Partnerships:** consider technologies for early warning systems and emergency preparedness for fishers and rural coastal communities;
- **Credit-related Partnerships:** develop guidelines to assess and consider risks from climate change in providing access to credit; and
- **Ecotourism Partnerships:** consider climate impacts and identify adaptation actions for ecotourism industry.

Consideration of climate change needs to be incorporated early in the process. A first step is to integrate and apply climate-smart criteria into the PPP evaluation process. When appropriate, a vulnerability assessment can be a useful tool for identifying measures to create a climate-smart PPP.

ECOFISH Opportunities

Public-private partnerships (PPP) are an important maintenance mechanism of the GCM framework. ECOFISH will develop innovative partnerships with the private sector through PPPs to contribute to the overall objectives of the project. SSG Advisors, a subcontractor under ECOFISH, leads the PPP development component. Consideration of climate change needs to be incorporated into the PPP stage-gate approach, the process designed to make disciplined decisions about partnership development in line with ECOFISH goals and the broader GCM framework. A first step is to integrate and apply climate-smart criteria into the PPP prioritization process (Table 7). When appropriate, a vulnerability assessment can be a useful tool for identifying measures to create a climate smart PPP.

Table 7. Integrating Climate Smart Criteria into PPP Prioritization

Project Value
<ul style="list-style-type: none"> • Increased Scale refers to expanded impact as measured through a greater number of beneficiaries or extended geographic or sector reach achieved through the partnership • Improved Effectiveness denotes an improved technical approach, results, and/or program as a direct result of the private sector’s unique knowledge • Increased Efficiency implies a cost or time savings to the partnership effort simply as a result of private sector contributions • Increased Sustainability/Replication seeks to define whether activities or impacts of the partnership can continue after ECOFISH support for the partnership or project ends. Replication refers to how feasible it is for ECOFISH or its partners to reproduce a successful partnership activity in other contexts • Systemic Change refers to whether the partnership has the potential to make a substantial positive impact on a development challenge or an industry-wide bottleneck • Reduced Vulnerability refers to design and activities that lead to reduced exposure and sensitivity and increased adaptive capacity of fishery resources and coastal communities through private sector involvement
Business Value
<ul style="list-style-type: none"> • The partnership solves a key business challenge • The partnership creates an investment or expanded market opportunity • The partnership creates Corporate Social Responsibility (CSR) or image value for the company • The partnership improves Continuity of Operations by considering climate risks to the business and throughout the supply chain

4. Conclusion

The Philippines is among the most vulnerable countries in the world in terms of the adverse impacts of climate change and other natural disasters. Based on downscaling of climate models by PAGASA, the Philippines will continue to experience significant mean temperature rise in the next decades, which is associated with more severe and more frequent extreme weather events. In the past 5 years, the country has put together a comprehensive and integrated policy framework to meet the challenges of adapting to climate change. The policy framework is anchored on decentralized but coordinated execution of actions that will reduce disaster risks and increase resiliency of vulnerable ecosystems and communities.

Climate change adaptation of coastal communities has largely focused on infrastructure that would prevent damage to property and protect lives. However, the adaptation strategies must also focus on building resilient livelihoods, especially of the vulnerable communities that mostly live in the coastal zone. The livelihoods of coastal communities are directly or indirectly linked to coastal and fisheries resources. Protecting coastal ecosystems and fisheries is all the more urgent since these are highly sensitive to the effects of climate change such as sea level rise, increase in sea surface temperature, ocean acidification, and high energy storm surges.

The policy recommendations in this paper aim to strengthen the conservation of coastal ecosystems and fisheries in order to sustain livelihoods in the face of climate change. The recommendations enhance the Growth-Control-Maintenance (CGM) framework that has been proven to improve fisheries productivity and increase economic returns from fishing-dependent livelihoods.

The ECOFISH Project will provide assistance to national agencies and local government units in implementing these recommended actions in the eight MKBAs where it operates. Through coordination with BFAR, DENR, Climate Change Commission, academe and civil society, the experience of ECOFISH should be replicable in all areas of the country.

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