INTEGRATING MANGROVE ECOSYSTEMS APPROACHES TO INTEGRATED COASTAL MANAGEMENT

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1. Introduction

The Philippine context of integrating land and sea is imperative; considering the country's total land area of 298,170 km^2, its territorial sea (up to 12 km) of 679,800 km^2, and Exclusive Economic Zone of 2.2 million km^2. The Philippines is considered as the center of shore fish marine biodiversity. This is a great blessing, but also a profound responsibility. Vesting the Benham Rise to the Philippines is another milestone in our archipelago's history. The archipelago's coastal resources have been shown to have an annual national economic benefit of more than 140 billion pesos. In fact, a square kilometer of coral reef and mangrove, allows us to feed at least 400 people with 50 kg of fish per year. This tremendous bounty derived from coastal ecosystem services justifies the effort to maintain the habitats' biodiversity and health.

2. Threats of Coastal Ecosystems and Communities

The Philippine coastal area as well as its resources is being threatened by several issues (such as unregulated coastal development, overfishing, destructive fishing, sedimentation, and pollution among others) which are widespread all over in the country. However, gaps exist in understanding how to use this natural heritage wisely for sustainable development. This is a continuing challenge. For instance, the clarion call and alarm of runaway conversion of fishponds and prawn farms has reduced these mangrove areas from around 250,000 ha to now only less than 120,000 ha (Primavera 1997). This has resulted in grave consequences in capture fisheries and deterioration of adjacent habitats (Primavera 1997). In addition, unregulated and unplanned mariculture can result in degraded sediment and water quality. This is evidenced by black sulfidic, high organic rich sediments as compared to un-impacted (oxygenated) sediments (Santander et al., 2008). In fact, some avoidable costs, such as the fish kills in Bolinao, Pangasinan (estimated to have a fisheries loss of around 300 million pesos), has now experienced a recurring annual algal bloom and fish kill, even with the reduced number of fish cages. Thus, changes in the biodiversity features of its critical habitats, and its associated resources, will have profound effects on the income and investments of the local governments in the coastal zone. Increased densities of our coastal populations, the intensity of fishing pressure, and unwise coastal development (exacerbated by climate change impacts), makes coastal fishers—who are one of the poorest of the poor sectors of our country—one of the most vulnerable sectors to climate change.

3. Proposed Frameworks to Combat Threats

The understanding of the connectivity of the coral reefs, seagrass and mangroves is steadily unfolding. Studies have shown that the loss of one habitat, such as the mangrove, has profound implications on the adjacent habitats' productivity, fisheries availability, and other ecosystem services. Thus, it is important to ACT NOW so that we will be able to move two steps forward against one step back (**Fig. 20**). This should result in accelerating conservation and protection, and improved Integrated Coastal Management (ICM) in coastal areas by replicating management effectiveness through: (1) The 3 R's; Restoring, Resiliency, Representativeness; (2) establishing an enabling policy framework for marine spatial planning; and (3) improved social-ecological sustainable development through ICM. We have to ACT NOW, wherein our science and technology enhances wise adaptation for resilient systems, to improve our effectiveness. We should also ACT NOW to: Accelerate management effectiveness, continue connectivity functionality, reduce threats and disaster risks, sustain networks and achieve objectives, strengthen and capacitate organizations, and optimize win-win combinations through adaptive management; (**Fig. 21**).

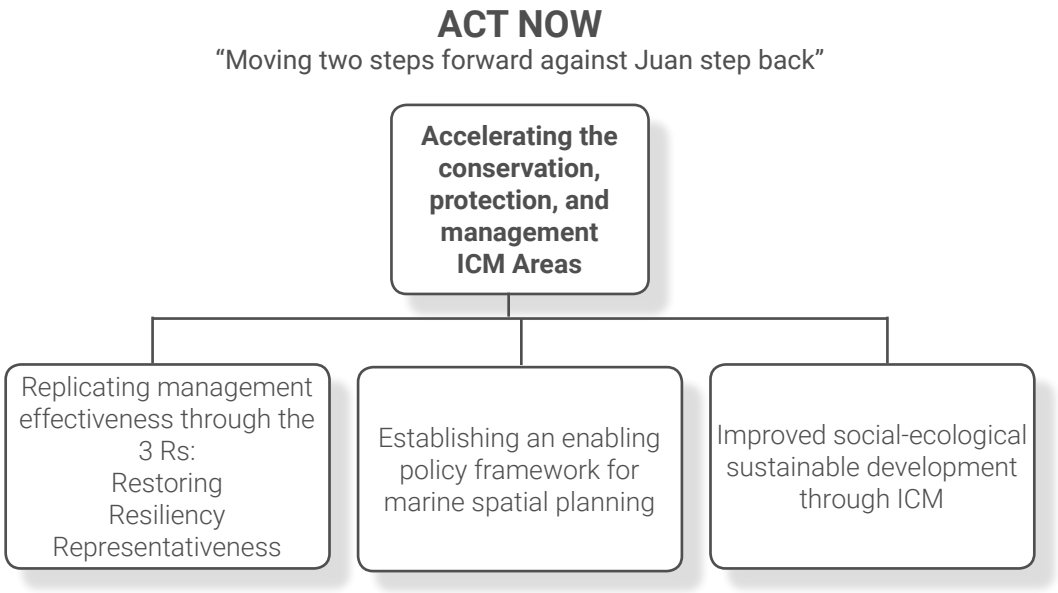

Figure 20. ACT NOW framework

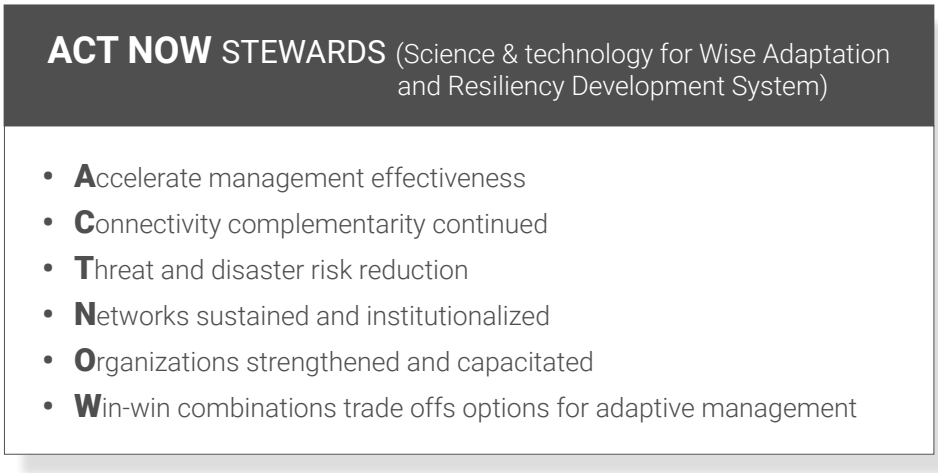

Figure 21. ACT NOW STEWARDS framework

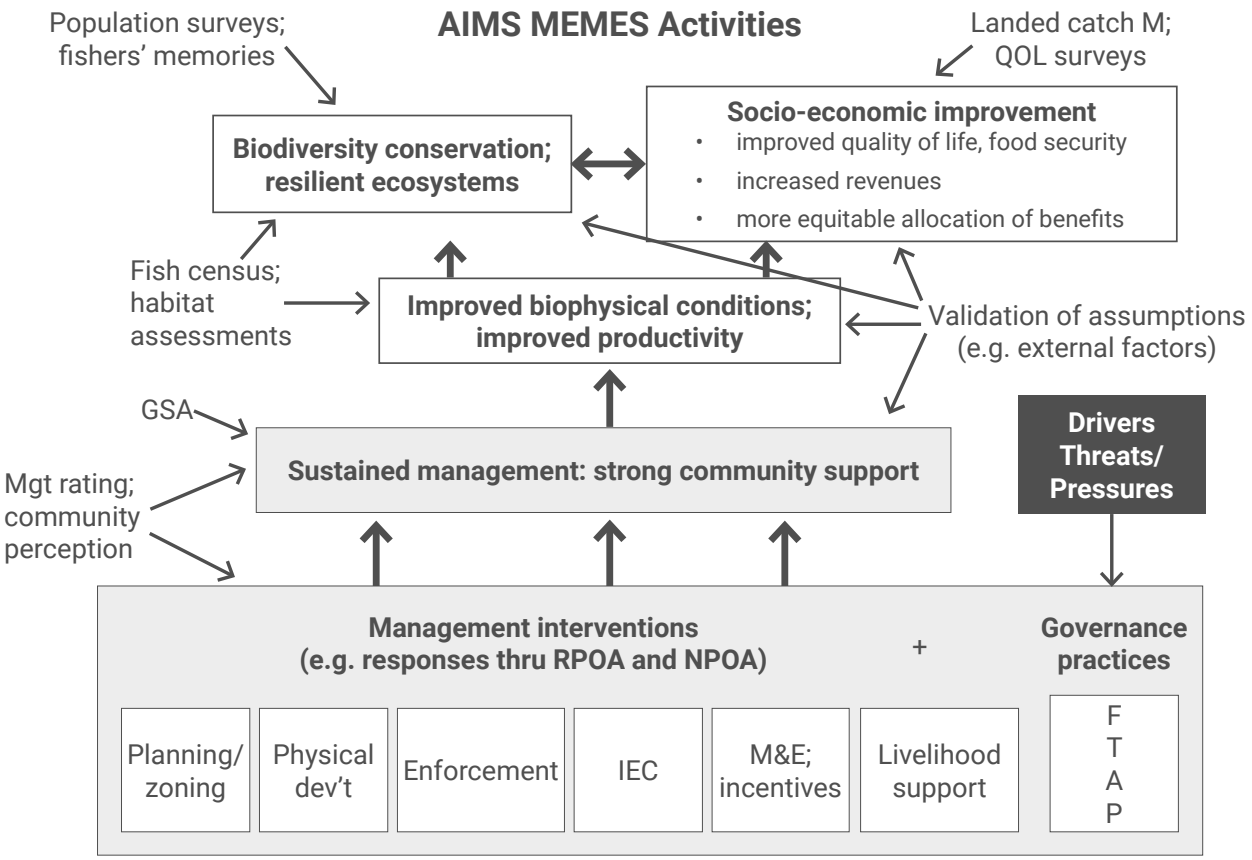

Figure 22. AIMS MEMES framework

"RESTORED" STRATEGIES

	Restoring resiliency through learning communities	Sustainable Philippine fisheries agenda	Maintaining coastal integrity and equitable access
R	Representative, replicated, resilient reserves	Reducing fishing mortality	Restoring coastal protection
E	Enhancing management effectiveness	Enhancing stock recovery	Effective erosion buffers
S	Sustaining healthy ecosystems	Sustainable fishieries use	Sustaining coastal integrity
T	Threat reduction in coastal ecosystems	Threat reduction to sustain fisheries with ecosystems capacity	Thresholds maintained within acceptable limits
O	Organizing knowledge based communities	Organizing fisher communities	Organizing a coast watch
R	Replenishing MPA networks for resilient reproduction and recruitment	Restoring resiliencyand connectivity	Reducing threats and sharing costs
E	Enhancing connectedness	EAFM development with equitability	Enhancing equitable access
D	Doing good governance	Diversifying livelihood options	Disaster risk reduction

Figure 23. RESTORED STRATEGIES framework

Mangrove adaptive management requires a MEMES approach, which calls for: (1) An Adaptive Integrated Management System (AIMS) and (2) An integrated trans-disciplinary learning, similar to the learning gene where mangroves have a regular monitoring system to adapt wisely to the rapidly changing times. Marine Protected Areas (MPAs) using the MPA management effectiveness assessment tool (MEAT) rating system, can also enhance its mangrove data inputs, as many of its present features are coral reef-based (**Fig. 22)**. Integrating the Suitability, Sensitivity, Susceptibility (SSS) analysis through the Integrated Coastal Climate Change Vulnerability Assessment, which is linked to the Governance Socio-ecological Integrated Systems (GSIS), allow for safety nets and investments (akin to an insurance policy system), to address Disaster Risk Reduction (DRR) and climate change impacts.

Our coastal ecosystems can act as sentinel ecosystems of our archipelagic seas, wherein we are able to gauge various threats from poor land use practices, siltation, nitrification and pollution. These monitoring activities can give us an indication of how well we are managing our environment. Response feedback mechanisms need to be put in place. These mechanisms are similar to those stipulated in the Philippine Marine Sanctuary Strategy (PhilMarSaSt), as incorporated in the Executive Order 533 (EO 533). EO 533 is still being discussed as the ICM bill in the senate and congress. Spatially explicit threat maps and analysis of threat reduction options need to be linked to their associated resources, their ecosystem services, and utility of stakeholders (e.g. value chain maps and socio-ecological network design). These long-term strategic action plans and tactical responses should look at various choices, decisions, and actions. These imperatives are necessary and need to be hastened, since if we do business as usual, it would take 100 years to fulfill our Convention on Biological Diversity (CBD) commitments. Thus, there is a need for accelerated areas of effective management to be covered and improved.

Fisheries monitoring across different habitats like seagrass and mangrove are currently inadequate; therefore, characterization of major fishing gears at various times of the year needs to be established. Designing MPA networks should integrate the extent of habitats, its quality and condition, and adjacency and connectedness, aside from understanding the source and sink. Understanding the quantity, like the extent of the habitats and their uses, help rationalize priority and consistent use within and among adjacent coastal zones. Note that in many areas, mangroves, seagrass and coral reefs require harmonization of use and non-use activities of multi-stakeholder user groups. In Bolinao, Pangasinan, one of the first coastal development plans had considerable technical inputs, but the challenges of good coastal governance can swamp some of these inputs.

The DRR and the short and long term effects of coastal climate change requires integrated tools in building back better for the future. Natural calamities (such as typhoons, storm surges and floods) are frequent occurrences in the Philippines. Understanding these events through observations and simulations will help in identifying vulnerable areas, and allow careful planning to mitigate impacts on resources and communities.

While models such as FISH BE allow for the communication of complex interactions of systems and issues to be addressed, integrating this into the planning and implementation of management would require: (1) Enhancing participatory decision making processes; (2) establishing a transparent mechanism for timely and accurate information; (3) designating clear and accountable management bodies; and (4) regular functions to address their legitimized objectives. The ReSilient Seas RESTORED strategies have put forward various processes and principles to address these objectives (**Fig. 23**). The local actions and strategies would need to be scaled up, so that from a "projectized" approach, scaling up mechanisms and sustainability measures will institutionalize activities. This is shown in examples of cost sharing schemes, which likewise redound to further fund leveraging.

4. Conclusion

The adaptive integrated management system shows that the actions for management interventions, as outlined in the national plan of action and regional plan of action in the Coral Triangle Initiative (CTI), contributes to reducing threats and pressures. It also shows whether the results would lead to improved biophysical conditions and socio-economic benefits. Our partnerships are also looking at opportunities to motivate and enable awareness towards accelerating and nurturing healthy social and ecological systems. Various incentives are underway to find synergies in MPA networks; examples include design and institutional partnerships such as the Para El MAR, or the linking of champions who have shown good practices. With time, the planning and implementation of effective sustainable management, will lead to its sustainable use and redound to sustainable benefits, and improved quality of life.

References

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