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Professionalizing Community-Based Coastal Resource Management (CRM) Services

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ABSTRACT

Philippine artisanal fisheries have historically been self-regulating, although concerns regarding sustainability have led to significant countrywide and international focus on national improvements in Coastal Resource Management (CRM). The process to professionalize CRM skills in the Philippines is outlined herein as a reflexive or solution-focused approach to mitigate fisherfolk poverty, enhance skills available to local government, manage the national heritage of marine resource extraction, and emerging food-security challenges of the growing population. Ongoing progressions are put in context with several decades of programmatic work through the lens of Ecohealth Action Research that has led to specific foundational outcomes. Emphasis is placed upon overcoming the historical disconnect between fisherfolk and government regarding; CRM program implementation, inclusive, participatory designs, and methodologies that lead to enhanced community-based skills and capacity. Collaborative approaches to developing adaptive co-management that include fisherfolk are directly linked to a government stakeholder analysis and roles under the Local Government Code (RA 7160). The projected *Green Jobs* are subsequently considered within the international Sustainable Development Goals.

1 Introduction

There is a growing global recognition that the future of the oceans and the sustainability of the marine environment are significantly dependent upon coastal activities and related fisheries (Blythe et al., 2020). This observation is particularly true for Southeast Asia, where most of the world's small-scale fisherfolk live. Thus, the goals of the United Nations Decade of Ocean Science and Sustainability, such as biodiversity restoration, community resilience to ocean hazards, and the development of skills and technology, are particularly relevant to Philippine fisherfolk communities and Asia in general (Rashid et al., 2020; Smith et al., 2021). The Philippines is arguably the most coastal fisheries-dependent country globally, with a reported per capita annual marine fish consumption climbing from 36 kg to 40 kg in the last two decades (Silvestre and Pauly, 2004; Lamarca, 2017). The Philippines is also recognized as a global marine biodiversity hotspot with a high concentration of species per unit area compared to many other places (Carpenter and Springer, 2005). However, local adaptive and skill-based management is required to stop the degradation of Philippine marine ecosystems and mitigate extreme poverty among fisherfolk (White, 2020). Certifiable training that results in paraprofessional skill capacity has the potential to optimize limited professional positions in areas such as marine spatial planning and integrated coastal management.

The country's territorial seas are divided into six distinct marine biogeographic regions: the West Philippine Sea, Sulu Sea, Visayan Sea, Celebes Sea, the North Philippine Sea, and the South Philippine Sea. Each biogeographic region contains distinct

assemblages of species and ecosystems (Ong et al., 2002). The need for professional analytical services includes bioregional consideration, particularly where pelagic fish stocks are shared (Watts et al., 2021). Being archipelagic, 70% of the country's total municipalities are coastal, deriving numerous benefits and opportunities from coastal and marine resources (Perez, 2011). Harvest practices need to be considered for ecological sustainability and optimization, with priority attention to areas of overharvesting. This focus could be part of a national contribution to the United Nations Decade on Ecosystem Restoration, emphasizing fish stocks. It has also been noted that the country's coastal and marine resources are biodiverse, providing employment to Filipino fisherfolk and serving as critical food resources to the nation (D'Armengol et al., 2018). However, fisherfolk continues to be amongst the poorest sectors of the Philippine society. Moreover, Philippine fisherfolk households have the highest rates of childhood stunting, underweight, and wasting malnutrition (Capanzana et al., 2018), emphasizing a need to consider coastal food systems and local intuitive or local reflexive solution-focused development skills. Recent work in Aurora Province has also exposed poverty indicators that include high levels of nutritional stunting and wasting in fisher communities aligned with maternal protein intake of less than 20% of recommended levels (World Health Organization, 2018). Unfortunately, there is a paucity of focused responses to the multiple marine-based problems in the Philippines due to a lack of coordinated and effective management leading to a continuous decline of coastal and marine resources posing threats to coastal fishers' livelihood and food security (Silvestre and Luna, 2004).

The protection of coral reefs is considered a national priority. However, Licuanan et al. (2019) reported that the Philippines' current average hard coral cover is only about 23%. There is a significant need for management skills to network coral reefs and other Marine Protected Areas (MPAs) to optimize ecological production over larger-scale ecosystems. The Local Government Code (LGC or Republic Act 7160) of 1991 has mandated municipalities to responsibly manage waters out to 15 km from the coastline, with the province ideally providing training and coordination. This devolution through the LGC signified mainstreaming of CRM in Local Government Unit (LGU) development plans through exclusive authority to grant fishery privileges in municipal waters. The amended Fisheries Code (RA 10654) strengthened the authority of municipalities/cities over municipal waters outlining the preferential rights of marginal fisherfolk and providing support for regulation and increased penalties for MPA infractions. However, there is still a significant gap in the capacity of LGUs to implement policies and programs for CRM and MPAs effectively. Provision and support to enabling conditions, such as skills development for staff for the required reflexive or adaptive management, should be part of the strategies and approaches for the LGUs to provide better essential services for CRM and MPAs. There is also a significant gap between the culture of fishing communities focused on subsistence and CRM governance activities that have limited the efficacy of programs (Bacalso et al., 2013), highlighting the need for a participatory approach (Aswani et al., 2018).

This paper outlines the participatory development of CRM skills certification for fisherfolk through the government-mandated Technical Education and Skills Development Authority (TESDA). A pilot program for community-based engagement of fisherfolk and LGUs are outlined for Aurora Province, which shares pelagic fish stocks with nine other provinces across the North Philippine Sea Marine Bioregion. A localized process previously developed to define CRM skills is considered in the following section as a foundation for the subsequent section on the cyclic development of the TESDA system. The skill outputs are then put into context with the role of CRM training within the Sustainable Development Goals (SDGs).

Localizing the Process for Coastal Resource Management (CRM) Skill Definition

For several decades, Philippine non-government organizations, academe, and government agencies have conducted fragmented and intermittent CRM trainings independently or collaboratively. Many who have been trained are fisherfolk leaders who can perform critical roles in assisting with implementing CRM programs. However, municipal offices are restricted from hiring non-certified individuals and often lack competent staff to implement complex socio-ecological CRM programs as outlined under their mandate. A questionnaire using a 5-point Likert scale survey on CRM knowledge and skills

(Kiambo et al., 2001) was administered to 20 personnel from the lead CRM implementers of the LGU (i.e., Municipal Agriculture Offices and Municipal Environment and Natural Resources Offices) in Aurora's seven coastline municipalities indicated: over half (55%) considered themselves as apprentices with some CRM knowledge and skills acquired through experience; 24% admitted they were beginners or recently heard of CRM and have modest expertise on the ground; 10% have very little to no CRM knowledge and skills nor any experience at all (Figure 1). Only 11% considered themselves skilled or able to use their knowledge and skills to perform duties and responsibilities with proficiency. No one among the respondents classified themselves as experts having the confidence and competence to mentor others on knowledge and skills for CRM effectively.

In 2020, the TESDA approved the national prioritization for developing Training Regulations on community-based CRM services, potentially providing a much-needed participatory mechanism for government and fishers to discuss/realign harvest principles and actions (Chuenpagdee & Jentoft, 2018). These developments will allow fishers with limited access to formal education to become paraprofessionals by completing nationally recognized training through the TESDA certification system. Paraprofessionals have specific skills and abilities to perform particular tasks to contribute to professional decisions and actions. The paraprofessional concept has been applied to fisherfolks providing Ecohealth services that benefit the environment and the people (Añabieza et al., 2010). The application of the TESDA community-based training regulations is a form of problem-based learning (Wiers et al., 2002) intended as a reflexive response to issues that subsequently result in positive change. This approach can uplift impoverished fisherfolk by providing opportunities to be gainfully employed and add skills to existing government-hired personnel. For example, NC III certification would focus on new employment for much-needed systematic settlement-based data collection. Existing government staff could be trained up to the diploma level to interpret assessments such as watershed roles in biodiversity. Although not all positions would be full-time, an initial labor market survey through TESDA has indicated that the availability of individuals with specific CRM skills would lead to at least tens of thousands of jobs nationally.

In 2005, the initial response of Aurora Province regarding the need to manage these critical resources generated a CRM curriculum that evolved through an international program sponsored by Volunteer Services Overseas. Those efforts focused primarily on identifying priority issues for training (Watts et al., 2010) but did not develop specific skill set objectives. TESDA is mandated to develop and certify specific skills within Training Regulations, which are optimal for filling the national CRM goals through what can be called problem-based learning, which specifically responds to needs (Wiers et al., 2002). TESDA has prioritized the development of CRM Training Regulations and skill-based curriculum under the Green Jobs Act (RA 10771) in collaboration with Daluhay and other national agencies to establish reflexive professional certification in support of marine sustainability

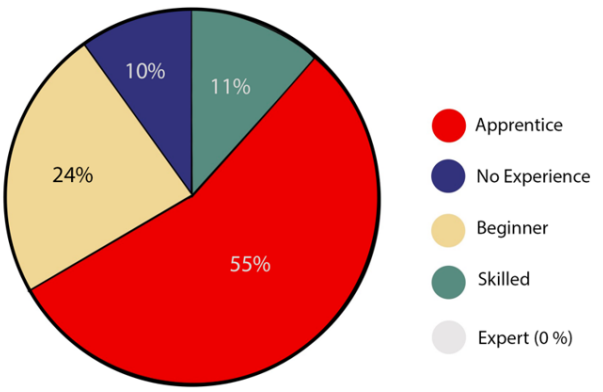

Figure 1. Aurora Province coastal resource management skills assessment done in collaboration with municipalities (Daluhay unpub. report, 2021)

and poverty mitigation. The Philippines requires standardized CRM skills and training to respond to marine sustainability, mitigate the declining biodiversity and define ocean economies that ensure livelihood security. Delivery of CRM is dependent on local government powers and responsibilities, which include planning, protection, legislation, regulation, revenue generation, enforcement, and inter-governmental relations. As noted earlier, the local government's capacity to implement CRM is minimal, with 89% of the technicians declaring they were beginners or apprentices and had little to no experience (Figure 1). This observation is especially relevant given the Supreme Court's Mandanas-Garcia ruling, which allocates additional funds to LGUs. The Department of Budget and Management, in its prescribed guidelines on the preparation of the 2022 annual budget, specifically mentioned that adequate funds would be allotted for the development and implementation of integrated coastal management (ICM) programs (Section 2.2.12 of the Local Budget Memorandum 82-2021), making this as part of the priority program of the LGUs (DBM, 2021). Hence, LGUs will significantly benefit from the CRM Training Regulations by the TESDA through capacity enhancement of their personnel who serve as front liners in the implementation of ICM programs at the local level.

A unique component of the current TESDA development is its use of Philippine social artistry or Siningbayan to help with significant communication challenges by addressing the disconnect between fisherfolk and CRM programming by creating non-written opportunities for cultural expression (Watts et al., 2010). Individual exercises such as mind maps, song, and visual arts facilitate fisher expression of local settlement integrity (values, culture, food security, etc.) that can help resolve resource-related contradictions. This approach, which can assist in conscientization or the development of management concepts, has been piloted with Aurora fisherfolk (Ayala et al., 2016) and can link harvest strategies to longer-term local desires for family, future generations, community integrity, and welfare. In developing CRM-Siningbayan as a community-based approach, facilitators also create opportunities to demonstrate respect for and engagement with local ecological knowledge. Cultural research in Aurora Province and across the North Philippine Sea bioregion showed the fisherfolk's potential and support for this pluralistic approach to knowledge (Watts et al., 2021). Fisherfolk knows species diversity, abundance, habitat quality, and changes in abundance that have not been recorded or applied by the government. This skill must occur in each settlement to capture local knowledge while strengthening their formal/informal locally determined People's Organizations (POs).

The TESDA program aims to target LGU personnel, youth, women, and other leaders from coastal fisherfolk communities who can be engaged in the implementation of CRM with pilot training and certification across the eight coastal-dependent municipalities of the province of Aurora. Over a development period of five years, the trained scholars will then be deployed for specific tasks in the coastal municipalities of the province to apply their newly acquired skills and knowledge to implement CRM effectively. These activities will subsequently define a standard two-year Diploma program and other national certification requirements. Institutionalization of CRM offices through skills delivery assignments will also be set up for the initiative's sustainability. This process has been initiated in collaboration with the provincial and municipal governments and national agencies. The enhanced CRM design will also provide the platform for the trained CRM scholars to be absorbed by the Local Government as regular or contractual employees focused on CRM work and seek ladderized training up to the Diploma level. Other private entities such as hotels and beach resorts in Aurora's growing coastal tourism industry can also benefit from the services of the graduates of this program. This design will be particularly essential in helping with coastal resource monitoring and assessment. The need for these is expected to increase with climate change issues and post-pandemic challenges.

Participatory Action Research and Learning Cycles in TESDA Development

The CRM Training Regulations developed through TESDA are community-based using learner-centered techniques such as social artistry – known in the Philippines as Siningbayan. The TESDA development process has a progression of National Certification (NC) levels that will serve as the basis for a competency-based curriculum and the determination of skill assessment tools. TESDA trainees will be able to apply the

knowledge and skills acquired from the training in their respective local communities to perform CRM services such as collecting basic data critical to formulation, implementation, and monitoring the progress of development plans and policies (e.g., resource assessments); facilitate community organizing, coordination, and development as well as developing effective communication strategies to build awareness. Efforts are moving forward to define the training within a bioregional framework encompassing shared pelagic fish stock considerations with the NGO Daluhay ~ Daloy ng Buhay Inc. as the proponent. Daluhay will pilot CRM certification based in Aurora Province through facilitation and coordination of CRM services across the coastal municipalities and be a catalyst for participatory work with fisherfolk organizations in coastal areas. Previously, a CRM certification process system was developed nationally to improve strategies and promote incentives for local governments to support ICM. This approach only considered budget allocation, the formulation of CRM-related organizations, and the development of management plans (White et al., 2006) and has not been applied to meet growing challenges such as monitoring, evaluating, and updating projects to be more relevant to current conditions. Forming certification for specific skills through TESDA will provide both expertise and information for adaptive management from the government and fishing communities. These changes will serve as a foundation for a reflexive response that can contribute to meeting the challenges associated with environmental sustainability, fisherfolk livelihoods, and national food security. The scale of the changes outlined herein requires a staged approach that builds upon accomplishments.

Action Research is an iterative development strategy that includes participation in management change and facilitated actions, learning, and assessment. Participatory Action Research and Learning (PARL) cycles can advance CRM through four stages: Plan–Do–Evaluate–Analyze (Watts and Pajaro, 2014). PARL is focused on obtaining a measurable change, and the cycles can be defined as annual or project-based. Each analysis leads to a new PARL planning stage. The initial application of progressive learning on Philippine CRM (Pajaro, 1994) combined with parallel Canadian approaches (Moffatt et al., 2011) led to the current concept of CRM-PARL for fisherfolk communities (Figure 2).

Previous CRM-PARL cycles in the Philippines established an alliance of fisherfolk MPA managers as Ecohealth paraprofessionals (Añabieza et al., 2010), identified sustainability learning topics (Watts et al., 2010), assessed bioregional stakeholders (Pajaro et al., 2013a), piloted women's leadership (Pajaro et al., 2013b), and evaluated social-artistry for fisherfolk involvement (Ayala et al., 2016). The global lack of mechanisms for government and fishers to discuss or realign harvest principles and actions (Chuenpagdee and Jentoft, 2018) can be addressed locally for the Philippines through this participatory approach. For example, in Casiguran, Aurora province, the multi-stakeholder technical working group (TWG) created through a

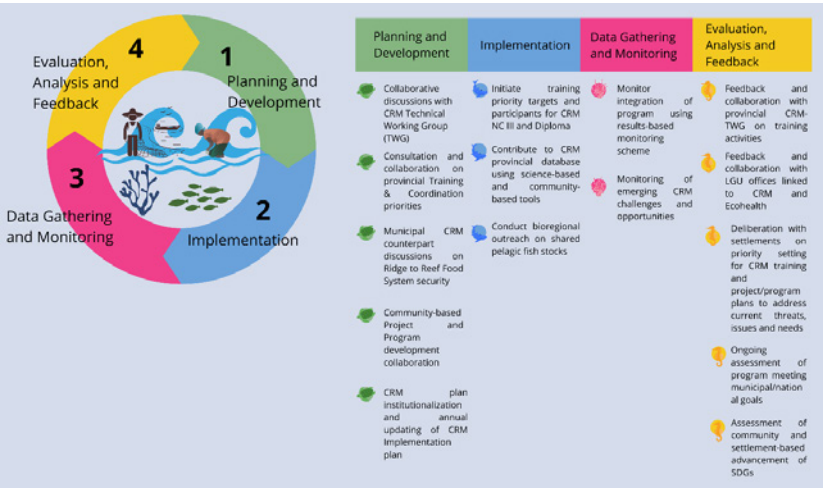

Figure 2. Participatory Action Research and Learning (PARL) cycle for municipal programming on Coastal Resource Management (CRM)

local executive order has formulated a CRM plan (Phase 1) that included defining the monitoring scheme and data collection based on the goals and target indicators. The Municipal Environment and Natural Resources Officer (MENRO) spearheaded implementation of the legislated CRM plan (Phase 2). During data gathering and monitoring (Phase 3), the MENRO mobilized his staff, fisherfolk leaders, and Bantay Dagat members and collaborated with other departments/agencies such as the Municipal Agriculture Office, Office of the Provincial Agriculture, and Daluhay for data processing and interpretation. After a year, the MENRO gave feedback to the TWG on the evaluation and analysis of how well the CRM goals were met (Phase 4). This practice became the basis for the TWG to update the CRM plan and recommend appropriate policies such as regulating the number of fish aggregating devices to be deployed and the establishment of additional MPAs. The various phases of individual PARL cycles can be smoothly implemented with a committed and experienced lead institution, in this instance, the LGU's MENRO, with a complementary staff and the full support of the Local Chief Executive (LCE). The same PARL cycle has been met with challenges in other municipalities where the MENRO has not been created, is understaffed, or is not a priority program of their LCEs. There is also a realization among CRM implementers that a province-wide and bioregion-wide consultation is necessary to address the deteriorating population of shared fish stock. Our experience with PARL indicated bottlenecks to progressive CRM-PARL cycles that are often attributed to funding limitations. Conversely, strategic fundraising has enabled progressions that have led to the current situation where national CRM-Siningbayan curriculum deployment can be piloted in Aurora Province.

A mixed-epistemology transdisciplinary Ecohealth process for progressive change, also referred to as problem-based learning (Wiers et al., 2002), has been initiated with the Agta Indigenous Communities. They plan to establish an intertidal maternal marine reserve, an area set aside where the Agta women can have priority use of their community-managed ancestral waters to address identified protein deficiency among mothers and children. However, the focus should not be on the problems but instead on a reflexive or solution-based (Singh et al., 2021) response to the Sustainable Development Goals (SDGs) and the unsustainable status of Philippine fisheries.

Based on the cycle outlined above, the first phase of the PARL cycle for the engagement of TESDA in the coastal challenges involved efforts to have that agency place a national priority on CRM. TESDA identified the Green Jobs Act (RA 10771) as an opportunity to expand the delivery of Technical Vocational Education and Training beyond its core activities based on the Sydney and Washington Accords developed for the field of Engineering. This PARL phase took five years to conclude as there were many different levels of pedagogical and administrative challenges that needed to be addressed for TESDA to move forward. Prioritization of CRM within the TESDA system was accomplished in December 2020. The prioritization process allowed for a Participatory Functional Analysis with relevant stakeholders from fisherfolk communities, national and local government agencies, and civil society groups. This prioritization led to two ongoing activities in the implementation of Phase 2 of the PARL cycle: the first activity focused on the Training Regulations from NC III upward, and the second activity aimed at identifying an LGU system and the resources to begin critical skill needs for the Diploma level and working with in-house LGU staff on upgrading their skills. Both of these PARL cycles are ongoing. The former is in the formalization stage, while the latter work with the LGU systems and is currently in the planning stages. The Prioritization Committee of the TESDA Board identified a need for a province to pilot CRM-Siningbayan and provided an opportunity for Aurora LGU to take a leadership role as one of the ten provinces that share the same fish stocks across the North Philippine Sea (NPS) marine bioregion. The NPS overlaps with the Fisheries Management Area 1 (FMA1), which is one of the 12 ecosystem-scale delineations of the Philippine waters by the Bureau of the Fisheries and Aquatic Resources based on considerations of stocks boundary, range, distribution, administrative divisions, and structure of fisheries (BFAR, 2019). About a dozen networks of MPAs covering approximately 1,175 hectares of either coral reef, seagrass, or mangrove ecosystems have been legislated in Aurora province (Daluhay unpub. report, 2021). Monitoring the MPAs' effectiveness has been a challenge mainly due to the shortage and lack of technical skills among LGU personnel.

The dominance of tuna or pelagic fish stocks in the Aurora harvest (Figure 3) highlights the need to develop mechanisms for shared resource management across the province, which in this case, also extends across the bioregion. For example, the North Philippine Sea Marine Bioregion network composed of LGU, civil society organization (CSO), and fisherfolk organization representatives have been created through the Marine Environment and Resources Foundation (MERF) initiative. In addition, Aurora is strengthening its social and ecological network of MPAs. The BFAR has also recently convened a multi-stakeholder TWG to formulate an ecosystem approach fisheries management plan for FMA1. Resource partitioning designs are pivotal to long-term food security and avoiding an open-access tragedy (Watts et al., 2021). Local biodiversity conservation enhancements for food security can emerge from the proposed TESDA program by focusing on ecological abundance and diversity through skills-based programs and broad participation, particularly within fisherfolk communities. The TESDA program aims to strategically enhance the capacity of the local government, fisherfolk POs, and other CSOs to become frontline stewards of socio-culturally and economically critical coastal resources. This approach will be conducted through the TESDA National Certification system to contribute to the economic recovery strategy of fisherfolk and community resiliency in terms of food security. Different levels of TESDA National Certifications are in the development process. They will be pilot-tested in the Aurora province through an NGO-LGU-fisherfolk partnership to capture the diverse needs of the province for a more holistic, inclusive, and effective implementation of CRM. The key areas of focus within specific levels of the National Certification for CRM-Siningbayan demonstrate the program's progressions (Table 1).

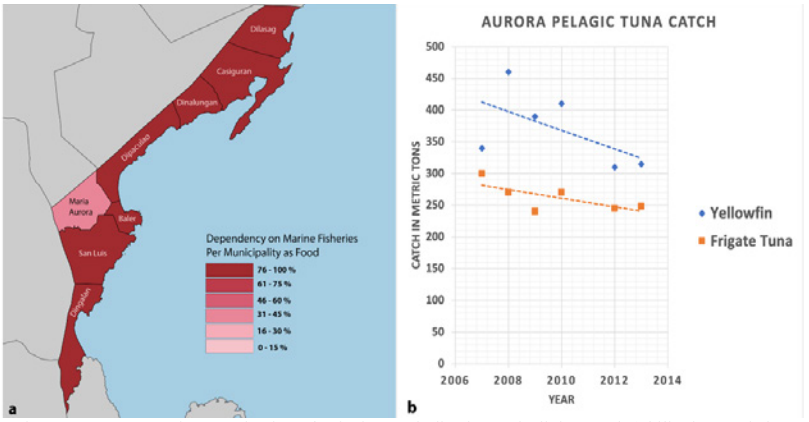

Figure 3. Aurora Province production of pelagic tuna indicating a declining catch (Philippine Statistics Authority, 2021)

Table 1. Key components of CRM-Siningbayan in Philippine Technical Education and Skills Development Authority (TESDA) programming (Daluhay unpub. report, 2021)

Finalized TESDA National Certification (NC) Training Regulations	**Knowledge and Skills Being Developed**
NC III CRM- Siningbayan Coastal Resources Data Collection Services	Community engagement and organizational development; Data gathering, resource assessment and data organization
NC III CRM-Siningbayan Coastal Resources Communication Development Services	Communication development; Communication, Education and Public Awareness
NC IV CRM-Siningbayan Coastal Resources Profiling and Networking Services	Supervision of Technician; Resource assessment, Prepare Coastal Environment Profile; Networking and Partnership
Proposed Additional TESDA National Certification (NC) Training Regulations	**Knowledge and Skills Being Developed**
NC III CRM-Siningbayan Fish Warden	CRM quick response and fishery law enforcement
NC IV CRM-Siningbayan Regulatory Officer	Fishery Law enforcement and CRM policy formulation and recommendation
Diploma CRM-Siningbayan Program Specialist	Integrated coastal resource management planning; Marine Spatial Planning: bioregional fisheries, stream and watershed assessment, maternal Ecohealth assessment and response, ecological disaster-risk mitigation, Siningbayan application

At the same time, a process is under development to target the provincial and municipal priority needs for CRM skills and training at the Diploma level. The pilot efforts for the CRM Diploma will be based on in-house government modular training and collaborative identification of priorities across the CRM spectrum, inclusive of human health priorities in fisher communities and the extension of disaster-risk mitigation to include ecological considerations.

Training Regulation Implementation and the Sustainable Development Goals

The global demand for an enhanced participatory education on CRM and coastal fisheries is well documented (Blythe et al., 2020; Singh et al., 2020; White, 2020; Eger et al., 2021; Watts et al., 2021). The creation of tens of thousands of potential jobs under the Green Jobs Act (RA 10771) can uplift the fisherfolk sector and directly contribute to the sustainability of the Philippine environment. This demand fits the culture of fisherfolk in Aurora and across the NPS bioregion because of the consensus for engagement through co-management (Watts et al., 2021). Although the Philippines is recognized globally for the resilience of its people in responding to a calamity, development efforts need to focus more on disaster-risk mitigation. Seasonal storms and food shortages have long been aspects of Filipino life. However, the path of development may have been impeded by the tendency of Filipinos to "make do and continue."

In 2015, all the Member States of the United Nations adopted the 17 Sustainable Development Goals (SDGs), which called for global action toward a better future for the people and the planet by 2030 and are anchored on the economic, social, and environmental pillars (UN, 2015). The SDGs consist of a broad range of development areas of focus that can be helpful. Still, only three of the 17 SDGs (i.e., Climate Action, Life Below Water, and Life on Land) are ecology-centered. At the same time, the rest are anthropocentric or human-centered, lacking a direct connection to the environment (see https://sdgs.un.org/goals). The pillars of sustainability can be balanced with a focus on a national socio-ecological priority for maternal (i.e., pregnant and lactating mothers) nutrition and biodiversity conservation. The nutritional status of mothers often relates to the bearing and nurturing, particularly crucial during the first 1,000 days of a child's life and which can affect the health of the next generations (Schwarzenberg et al., 2018). Nationally, child malnutrition is particularly prevalent in fisherfolk communities (Capanzana et al., 2018), directly linked to food insecurity in fishing communities. This foundational prioritization within the TESDA-CRM Siningbayan curriculum can be locally considered through the PARL cycles, where changes can be monitored. The jobs created through the CRM-Siningbayan can address national training and certification priorities identified by TESDA through support for the sustainability and restoration of biodiversity.

The Philippines is globally recognized as a biodiversity conservation hotspot(Posa, 2008). This recognition is significant when considering Aurora province, isolated from the rest of the country by the coastal mountains with the population dependent upon ridge-to-reef biodiversity for food security (Alejos et al., 2021). Instituting biodiversity restoration indices/plans for marine environments in Aurora have been designed (Raquino et al., 2015) with promising initial results. The jobs created through the TESDA-CRM scheme will address that gap in evaluating the effectiveness of coastal marine habitat restoration by training individuals who can monitor ecosystem sustainability and assist in planning restoration measures. Focus on positive change would emphasize the interactions of a diversity of species, including humans, linked to the entire ecosystem's health. This monitoring scheme can be implemented nationally through municipal and community-based CRM programming carried out by trained personnel. For example, given established manuals for stream and coastal resource assessments (Magbanua et al., 2013; DENR-BMB, 2019), jobs created would employ paraprofessionals using standardized data gathering techniques. These gathered TESDA-trained paraprofessionals would process critical data for more in-depth analysis, policy, and management actions by senior technicians. Regardless of economic status, all relevant stakeholder groups interested in CRM must be engaged in developing management and curriculum designs to optimize the user's knowledge and experiences. This engagement will be critical in defining informed solutions and formulating appropriate policies that meet their needs. There is also a need to include traditional knowledge in culture-based approaches to make the process more inclusive, actualize collaboration and respond

to the varying needs, capacities, and specific concerns of fisher men and women (Watts et al., 2021). For example, chronic and acute childhood malnutrition in fisherfolk communities requires a focus on maternal and child health that has been historically left to individual women working with scant resources. Although the CRM-Siningbayan program addresses most of the SDGs, emphasis is particularly given to jobs that will address poverty (SDG 1), hunger (SDG 2), good health and well-being (SDG 3 and gender equality (SDG 5); reduce inequalities (SDG 10), and improve biodiversity for Life below water (SDG 14) and on land (SDG15). Enhanced participatory engagement of the fisherfolk culture (Watts et al., 2021) and collaborative skill-based management efforts with LGUs through the TESDA-CRM paraprofessional development training program can potentially halt or reverse the decline of marine biodiversity uplift the impoverished fisherfolk sector.

4 Conclusion and Recommendations

Many earlier efforts in the Philippines have worked to address issues in CRM, as discussed previously. However, the TESDA NC Program will establish standardized competencies and build capacity among fisherfolk communities and the local governments to conduct data gathering, ecological profiling, communication planning, and networking. Aurora Province has already committed to supporting training people for this purpose, to gain specific skills not acquired by degree holders and be employed through the MAO or MENRO of the LGUs. This program also provides an opportunity to assist resort owners and other tourism or leisure-related operators in submitting and monitoring environmental compliance certificates. The pilot study is limited to one province with linkages to the other nine provinces of the North Philippine Sea bioregion or Fisheries Management Area 1 for consideration in managing shared pelagic stocks. Previous research and TESDA program development consultation meetings have indicated the national need to expand CRM programming across the Philippine archipelago. The pilot implementation will be designed to consider transferability to the national level by outlining bioregional or ecosystem-based approaches and local program caveats. Currently, finalized NCs are being prepared for local implementation. As part of this initiative, the national CRM and TESDA networks will be updated annually on the results and learnings from the pilot study.

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Statement of Conflict of Interest

The authors declare no conflict of interest.

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