# CURRENT STATUS/ROLE OF BIOPHYSICAL STUDIES IN INTEGRATED COASTAL MANAGEMENT SUSTAINABILITY IN SELECTED SITES IN NEGROS ORIENTAL AND SOGOD BAY, LEYTE PHILIPPINES

Roy Olsen D. De Leon

## ASTRACT

*Biophysical studies have become an integral part of the Integrated Coastal Management (ICM) process. Such studies in most cases take a significant portion of the ICM budget costing about 14 per cent of the year 1 budget per kilometer of coastline. Yet, a review of different Coastal Resource Management (CRM) resource profiles and plans, legislation developed in aid of CRM, and augmented by interviews of 30 key informants in selected sites reveals that the biophysical data generated are underutilized. A trace of the flow of information in the ICM process cycle further reveals that in most cases, the information stops in the planning stage. The low utilization of information can be attributed to problems in accessing the information, lack of perceived need for the information, or lack of technical know how in utilizing the information as well as updating the information.*

## Introduction

There is no question that current integrated coastal management (ICM) initiatives have been triggered by the biological and physical state of the coastal ecosystem. The decline in fisheries (Dalzell et al., 1987), mangrove (Biña et al., 1978), coral reef cover (Gomez et al., 1981), or the quality of our seas, for instance, has awakened the government, academe, non-governmental organizations, and people's organizations to formalize or forge their acts in mitigating the situation.

The biophysical data sets generated by scientific studies documenting the improvement on fisheries, as a result of the establishment of the pioneer marine sanctuaries in Sumilon and

Apo Islands in the Central Visayas (Alcala, 1981, 1988; White, 1988; Alcala and Russ, 1990), have greatly influenced the establishment of more than 500 marine sanctuaries (Alcala, 2001) all over the country.

Because of the importance of biophysical studies in ICM, and as advocated by ICM initiators, such studies have become an integral part of the ICM process. The pioneer community based resource management effort in Apo Island, Negros Oriental earlier on recognized the need to conduct an environmental survey to document the status of coral reefs, diversity, and abundance of reef fishes with the objective to evaluate reef quality as a result of the management efforts (Tiempo et al., 1986). The coastal management planning process now being adapted for Philippine local government units continues to include primary and secondary biophysical data sets to identify resource issues and earlier on establish the baseline information for evaluation of the management initiatives (Department of Environment and Natural Resources et al., 2000).

Biophysical studies in most cases take a significant portion of the ICM budget. The cost of resource and environmental profiling has been estimated at 25,333 PhP (50.00 PhP: 1 USD) or approximately 14 per cent of the year 1 budget per kilometer of coastline (Ablong et al., 2000). With the significant cost of conducting biophysical studies, evaluating the extent and impact of the studies and determining the issues associated with maximizing the use of the data sets are imperative.

This study adopts the concept of ICM sustainability embodied in GESAMP (1996). For a program to be considered sustainable, it must build on previous initiatives, complete the stages in the management cycle, and loop to a new generation program. The link and progression of programs should be clearly manifested and intentional. Completion of the cycle and the subsequent looping to the next generation program require benchmarks and updated information to feedback to the different stages in management. An evaluation of the Central Visayas Regional Project implemented

in 1984 to 1992 by the Silliman University Marine Laboratory (Calumpong, 1996) finds insufficiency in the baseline information leading to a difficulty in evaluating the results of the initiatives that can feedback to succeeding programs. The Coastal Resource Management Project (CRMP), a United States Agency for International Development (USAID) sponsored project, developed a monitoring and evaluation protocol for municipal coastal resource management (CRM) which included as key element an information management system. The system calls for an updated biophysical information and is deemed as benchmark for three levels of CRM, the third level indicating sustained implementation of the program (Courtney et al., 2002).

This study attempts to trace the impact of biophysical studies on the sustainability of ICM processes with emphasis on programs that aimed to develop and implement a coastal resource management plan at the municipal level. It intends to document the availability of data sets, the extent of use of the biophysical studies, the prevailing methods in gathering biophysical data, and the institutional capabilities/set-up in the conduct of the studies.

**Study Sites and ICM Programs in the Area**

For this study, ICM projects in Negros Oriental and Sogod, Southern Leyte have been considered for logistical reasons. These two sites, however, are deemed good cases because they illustrate the variations on the extent of use of the intensive technical biophysical studies and the contribution or impact of these on the sustainability of ICM initiatives.

**Negros Oriental.** Negros Oriental is located in the southeast coast of Negros Island, in Central Philippines. The province has a long history of ICM activities and is one of the few provinces in the Philippines that had institutionalized ICM activities with the creation of the Provincial Resource Management Office. Negros Oriental is the home of the pioneer program in community based resource management situated in Apo Island. The province

is also a learning site for the more recent Coastal Resource Management Project (CRMP) of the Department of Environment and Natural Resources and from 1984 to 1992 was the site of the Central Visayas Regional Project I. A technical (Calumpong et al., 1997) and community generated resource and ecological profile (Yambao et al., 2001) have been drafted for the implementation of CRM in selected sites in the province.

Prior to CRMP, various resource assessments have been conducted in several sites in Negros Oriental. These include assessments conducted by the Center for the Establishment of Marine Reserves in Negros Oriental (CEMRINO) with the purpose of establishing a network of marine reserves in the province. Silliman University Marine Laboratory conducted resource assessments in Bais Bay under the Coastal Living Resources Project and the Environmental Resource Management Project (Calumpong and Luchavez, 1997). The Office of the Department of Environment and Natural Resources in Region 7 conducted biophysical studies to support the establishment and likewise monitor the Coastal Environment Project sites in Negros Oriental.

To date, the Provincial Resource Management Division continues to conduct biophysical studies to assess the suitability of areas for the establishment of marine sanctuaries and evaluate the progress of management for the established sites. The Synergistic Management of Coastal Resource (SYMCOR) also conducted resource assessments specifically aimed at establishing more marine sanctuaries and managing mangrove resources in the province.

The study sites in Negros Oriental include the five municipalities (Manjuyod, Amlan, San Jose, Sibulan, Dauin) and three cities (Bais, Dumuguete, and Tanjay).

**Sogod Bay, Southern Leyte**. Sogod Bay is located in the southern coast Leyte. The bay was among the 12 priority bays identified by the Bureau of Fisheries and Aquatic Resources

of the Department of Agriculture's Fisheries Sector Program (FSP). Sogod Bay is currently the site of the Fisheries Resource Management Project (FRMP) (phase 2 of FSP). The FSP allowed the drafting of a technical resource and ecological profile for the bay (Calumpong et al., 1994). Currently the technical resource and ecological profile is being updated through the FRMP augmenting the community generated (Participatory Community Resource Assessment Profile) resource and environmental profile (BFAR Regional Office No. 8 and Municipality of Liloan, Southern Leyte, 2001;BFAR Regional Office No. 8 and Municipality of Malitbog, Southern Leyte, 2001).

This study considered the municipalities of Bontoc, Libagon, Liloan, Malitbog, Padre Burgos, San Francisco, Sogod, and Tomas Oppus in Sogod Bay.

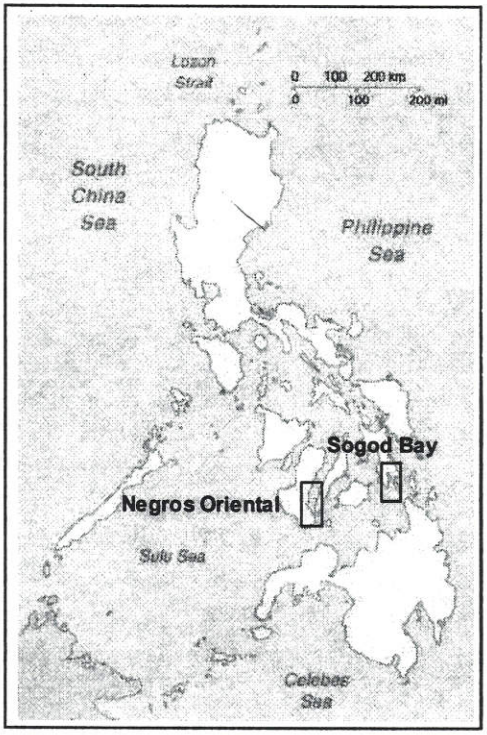


**Figure 1. Map of the Philippines showing study sites.** (modified from http://education.yahoo.com/reference/factbook/rp/map.html)

## Methodology

This study reviewed the different CRM resource profiles and plans of the study sites, legislation developed in aid of CRM, and the implemented programs. Document analysis was augmented by interviews of 30 key informants. The key informants included Municipal/City Planning and Development Officers; Municipal/City Agricultural Officers; and personnel both from local and regional offices of the Department of Environment and Natural Resources (DENR), and the Bureau of Fisheries and Aquatic Resources of the Department of Agriculture (DA-BFAR).

The coastal management planning process framework adapted for Philippine local government is used as a guide (Figure 2) in tracing the impact of biophysical studies on the sustainability of ICM. In principle, the biophysical data set should permeate all the 5 phases of the process.

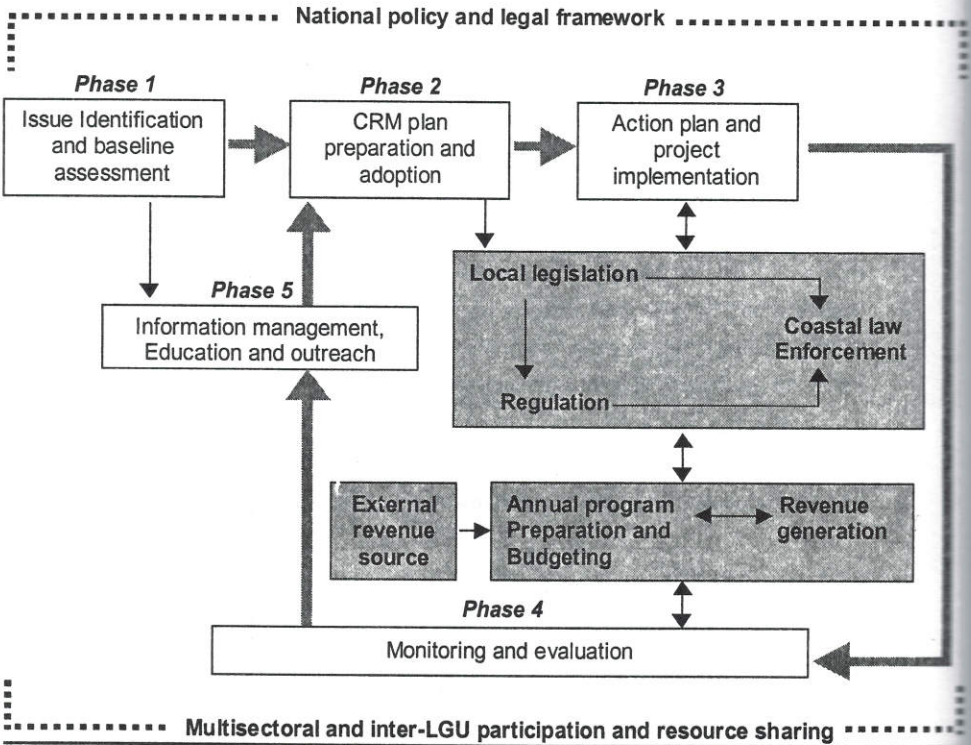


**Figure 2. The coastal management planning process being adapted for Philippine local government** (Department of Environment and Natural Resources et al., 2000a).

## Findings

**Biophysical Study Approaches.**

There are currently two approaches being used for biophysical assessments in support of coastal resource management. These are the Resource Ecological Assessment (REA) and the Participatory Community Resource Assessment (PCRA).

***Resource Ecological Assessment.*** REAs are detailed studies which include biological (species composition and diversity, extent and condition of coastal ecosystems, fish stock assessments, plankton composition, coliform bacterial contamination), and physico-chemical (nutrient analysis, sediment characteristics, hydrography) parameters. The reports or profiles generated are technical and quantitative in nature. REA is usually conducted by highly skilled technical persons mostly coming from the academe. Methodologies are generally based on English et al. (1994).

For CRMP Learning Sites in Negros Oriental, Silliman University Marine Laboratory (SUML) was contracted by the United States Agency for International Development (USAID) to establish baseline information and determine critical indicators for monitoring (Calumpong et al., 1997).

Likewise, SUML was contracted by DA-BFAR to conduct REA for Sogod Bay in Southern Leyte for the purpose of developing a management plan for the bay in order to regenerate coastal resources and rehabilitate the coastal environment, among other objectives (Calumpong et al., 1994). At present, SUML is conducting a Post REA activity to evaluate the impact of CRM initiatives in the bay as a result of FSP.

In areas where Local Government Units or National Government Agencies (DA-BFAR, DENR) have established marine protected areas (MPAs), an abbreviated REA specific to coral reef ecosystems are regularly done to monitor the progress of the MPAs.

***Participatory Community Resource Assessment.*** PCRA involves community participation with very minimal technical input and relatively minimal cost of assessment. This approach has been applied more recently to increase the participation of the community in the management process. Usually resources maps, transect, and trend diagrams are generated as a result of consensus among community participants (Walters et al., 1998).

PCRA activities in CRMP learning sites in Negros Oriental have been implemented by the Rotarian Martin "Ting" Matiao Foundation (TMF). Selected community members in each of the CRMP learning sites in Negros Oriental conducted their own PCRA with CRMP and TMF staff assistance and came up with their own municipal coastal environmental profile. The municipal profiles are summarized in Yambao et al. (2001).

More recently, prior to the Post REA activities in Sogod Bay, Southern Leyte, the Office of the DA-BFAR Region 8 conducted PCRA activities in sites identified for the implementation of FRMP.

**Extent of Use of the Biophysical Studies**

In general, the use of biophysical studies is minimal and limited to determining coastal zones (e.g. multiple use, rehabilitation, tourism zones) and baseline information. The extent of use or impact on CRM of each approach to data collection is rather difficult to ascertain. While two separate studies were actually made and two separate reports drafted, the PCRA report (Yambao et al., 2001) made reference in most cases to the REA report (Calumpong et al., 1997).

***Negros Oriental.*** The results of the PCRA and REA studies incorporated in the profiles of each of the learning sites are very much evident in each of the coastal resource management (CRM) plans such as those of the Municipal Government of Manjuyod,

(2001), the Municipal Government of San Jose, (2001), the City Government of Tanjay, (2001). In fact, the coastal environmental profile occupies a chapter in the management plans.

Interviews with City/Municipal Planning and Development Officers (C/MPDO) indicate that the profiles do aid the municipal administration in determining priority sites (short listing) for the implementation of management initiatives and the establishment of coastal zones. However, in the final determination of the sites, a detailed technical description of the resources and the boundaries of management areas is carried out by the Provincial Resource Management and Development Office (PRMDO). The findings of such studies are usually attached or referred to in the enactment of Ordinances which legalize the establishment of the marine reserves.

The Municipality of San Jose has enacted an Ordinance (Ordinance No. 1, Series of 2000) known as "Comprehensive Ordinance for Sustainable Management, Development, and Conservation of Coastal Resources of the Municipality of San Jose, Negros Oriental". This ordinance, which includes the establishment of coastal zones among others, makes reference to the coastal environment profile drafted (Yambao et al., 2001) for the municipality. In Bais City, the profile is now being used to guide the proponents of an ordinance to zone Bais Bay.

Interviews with the CPDOs of Bais and Tanjay Cities reveal that the profiles are used to determine mariculture and possible development sites. In Bais, sites for milkfish fish cage culture were determined using the profile. In Tanjay, investors and developers have requested copies of the profile to determine possible sites for investment and development purposes. An ordinance to control and manage the collection of fish fry in the coastal of waters Tanjay City was drafted based on the profile but because of some lobbying by some constituents, the ordinance was not passed.

During the conduct of this study, Bais Bay was affected by the red tide phenomenon. As mandated by its charter, the Bureau of Fisheries and Aquatic Resources Regional Office No. 7

(Regional Fisheries Laboratory) will have to conduct monitoring activities in the bay. The REA profile (Calumpong et al., 1997) served as baseline information to determine the normal plankton counts in the bay.

In Dumaguete City, opponents of the reclamation project used the biophysical data set, unsuccessfully, to convince the Philippine Ports Authority (PPA) and the City Administration to abandon their plan to reclaim a portion (1.3 ha) of the seas fronting Silliman University for a fast ferry terminal. In spite of the biophysical data set presented to them, the local office of the Department of Environment and Natural Resources, the Bureau of Fisheries and Aquatic Resources, and the Tourism Office all declared that there was nothing wrong with reclaiming the area, heedless of the consequent potential loss of 1.3 ha of fishing grounds and biodiversity rich habitat (Alcala, 2002). It took the National Historical Institute to finally convince the Regional office of the Environmental Management Bureau of DENR to require the PPA to conduct a full-blown Environmental Impact Assessment (Pal, 2002).

In aid of legislation to limit fish cage culture of milkfish (*Chanos chanos*), in Siyt Bay, Negros Oriental, SUML was requested to undertake a study (Calumpong, 1999) to determine the carrying capacity of the bay as there have been reports of alleged algal bloom and sediment accumulation. The study resulted in an ordinance stopping and monitoring any expansion of the fish cage operation, and imposing an annual environmental fee for every square meter of fish cage. In May 2002, a fish kill was experienced in the bay and the biophysical study was used as baseline information for an independent monitoring and evaluation by fish cage operators.

***Sogod Bay, Southern Leyte.*** In 1997, the Regional Development Council and the National Economic Development Authority of Region 8 (with funding from the USAID) commissioned the drafting of a Comprehensive Coastal Resource

Management Plan for the Eastern Visayas Region which included Sogod Bay (Mendoza, 1997). A review of the management plan made reference to and relied mostly for its baseline information on the FSP REA profile (Calumpong et al., 1994). There are, however, no reports whether the said plan was made available to the municipalities in Sogod Bay or if it is now being implemented in the area.

In the 8 municipalities surveyed, only the Municipalities of Malitbog and Liloan had CRM related plans (Municipal Government of Malitbog, 2000, Municipal Government of Liloan, 2001) that made reference to the biophysical studies. The Malitbog plan made reference to the FSP REA profile (Calumpong et al., 1994) while the Liloan plan was based on a more recent PCRA initiated by DA-BFAR Region 8. In addition to the establishment of marine sanctuaries or "parks", most of the activities focused on increasing fisheries production (e.g. fish pot making, seaweed production, promoting deep sea fishing, tilapia culture).

Access to information for all stakeholders is not certain. The interviews of key informants in the area further revealed that municipalities were never given copies of the FSP contracted REA for Sogod Bay. Copies of the recent DA-BFAR Region 8 PCRA profiles are yet to be made available to most of the municipalities and obviously cannot be referred to as yet. Changes in the local political administration as well as CRM related personnel has further distanced the link between FSP and current initiatives.

A good example of an outcome without the benefit of biophysical information is the mangrove reforestation initiative in the area. The FSP Profile for Sogod Bay (Calumpong et al., 1994) recorded that *Rhizophora* species is not the dominant species in the bay considering the rocky substrate and therefore when used as a reforestation species will most likely not survive. However, reforestation activities in the bay insisted on using *Rhizophora* species as a reforestation material and therefore performed poorly (0-25% survival rate). This is indicative of project implementation

and planning that does not take advantage of the benefit of biophysical data sets or consider the biophysical condition in the area.

Since the results of the FSP REA Profile for Sogod Bay were not made available to the municipalities, the biophysical study had very little impact on the establishment of marine sanctuaries as well as other management initiatives. Interviews reveal that the establishment of more recent marine sanctuaries was based on the recommendation of the DA-BFAR Region 8 divers who conducted another baseline study.

The FSP REA Profile is currently being used as baseline data to determine the current state of the resources and evaluate the impact of resource management initiatives on the bay since FSP. The results (Post REA) will be used to guide the implementation of FRMP initiatives on the bay.

## Biophysical Data Management

### *Negros Oriental*

Data sets generated for the CRMP have been published (Calumpong et al., 1997; Yambao et al., 2001) and are available at the Municipal Agricultural Office, Municipal Planning and Development Office of the learning sites. Copies are also available at the Provincial Resource Management Division Office (PRMDO). Although these are made available to the general public, only a few (the academe, media, non-governmental organizations) do request for the biophysical information.

The CRMP likewise developed the Municipal Coastal Database (MCD 2000) software (CRMP, 2000) to electronically house the information generated through the PCRA and the REA and other secondary information acquired in the development of the municipal profile. The MCD runs on Access Microsoft Software platform. The MCD also allows for the updating of information and report generation as well as minimal trend analysis.

Each learning site municipality was provided with the software and trained to use the software. This is available and could be accessed usually at the Municipal Planning and Development Office. The Provincial Municipal Coastal Database Center which is housed at the Provincial Resource Management Division Office (Figure 3) also needs to be upgraded.

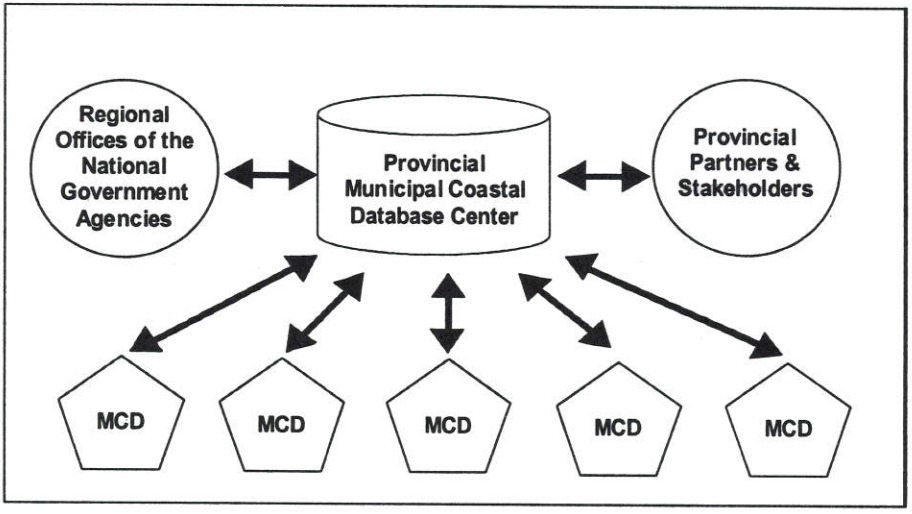


**Figure 3. Current flow and management of database between of local and regional levels.** (modified from DENR et al., 2001b)

Municipal planning and development officers as well as Municipal agricultural officers reveal that they have not updated the MCD since its release because of time constraint and lack of recent assessments. Despite their training, they are unable to update PCRA because of budgetary constraints as well as lack of technical expertise to supervise the activity. They are currently relying on the technical expertise from the PRMDO to monitor their marine sanctuaries. Most of the personnel involved in CRM are likewise overwhelmed by other assignments and therefore cannot update the information.

### *Sogod Bay, Southern Leyte*

Results of the FSP REA Reports are available only in limited printed form at the Regional Office of the DA-BFAR in Tacloban City and its national office in Manila, Philippines. Because of the limited copies, interested stakeholders find it difficult to get hold of copies of the reports.

With the DA-BFAR FRMP, although not completed as yet, there are indications that copies of the PCRA reports initiated by the project are now beginning to be available at the municipal level. At the same time, copies of the Post FSP REA surveys are also made available to the municipal project sites. There are plans to publish the said reports.

FRMP is currently developing a software, Philippine Fisheries System 2 (PhilFish2), to house the data generated by the project which include the Post REA and Socio Economic Assessments (SEA) results for Sogod Bay. The software utilizes Microsoft SQL platform. PhilFish2 is a national database linked to the municipal and regional fisheries management units via the internet facilities (Figure 4). The core of the system is on fisheries management but it also incorporates other biophysical parameters as well as socio-economic indicators.

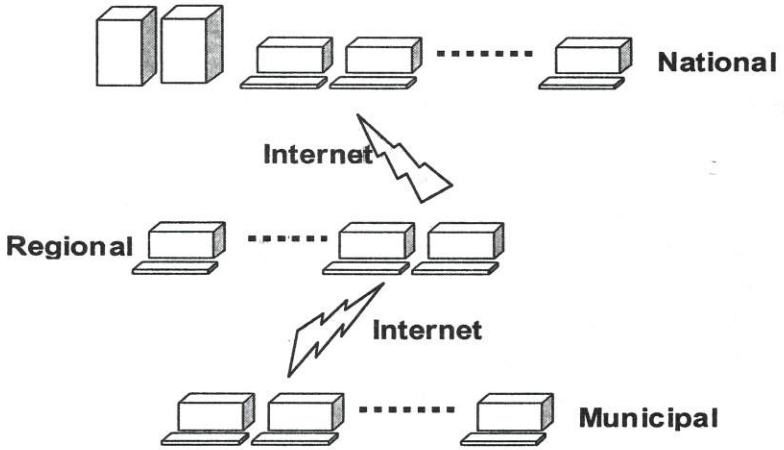


**Figure 4. Conceptual data and communication architecture of PhilFISH2** (modified from Gayanilo and Razon, 2001)

The management information system that FRMP is striving to develop is a laudable project if ever it gets to operate. It is envisioned to provide the technical information that is required for the management of the fisheries from different levels. BFAR has been mandated by the Philippine Fisheries Code (Republic Act 8550) to conduct fish stock assessments to determine the maximum sustainable yields of economically important species. With this system, fish stocks could better be monitored.

The system's future, however, is facing some difficulty. First, the software platform that is being used is expensive and not readily available. Interview with BFAR personnel who were trained in data management reveals that the software has not been installed in the computers distributed for that purpose. In addition, most of the municipalities do not have internet communication facilities. There were also some problems in the standardization of data sets considering that most of the Post REA activities have been conducted ahead of the system development and therefore may face some incompatibility.

## Conclusion and Recommendations

Biophysical data sets continue to be generated in support of ICM initiatives. They provide baseline information necessary to substantiate issues that will have to be addressed, as well as help prioritize specific initiatives.

However, the biophysical data generated are underutilized. Generally, the flow of information stops in the planning stage. This problem can be attributed to the difficulty in accessing the information, the lack of perceived need for the information, or the lack of technical know how in utilizing the information as well as in updating the information.

***Technical data sets continue to be needed.*** Although PCRA allows the community to participate in the generation of

the profile for a particular locality and therefore increases appreciation for the biophysical condition of the area, technical quantitative data sets are still needed.

If there are no secondary sources available, then it becomes imperative to conduct a REA in order to provide a complete baseline information. As experienced in Negros Oriental, legislation and the establishments of marine reserves are very much dependent on technical reports.

A data-based decision-making process should be inculcated. There are indications that the extent of use of the biophysical data is dependent on the need and demand for these. For instance, for a marine reserve to be established, a survey of the reef in terms of diversity and condition is needed as attachments to ordinances. Red tide monitoring is necessary to determine whether the fish ban is to be lifted.

Although extensive profiles have been generated, they remain dormant in the shelves if there is no perceived need and demand for them. This situation may be attributed to the absence of incentives for data-based decisions which will offset the cost of generating and updating biophysical information. For instance, the granting of permits by local government units to development projects at present is not tied to the Environmental Compliance Certificate requirement of the DENR through the Environmental Impact Statement System (Presidential Decree 1586). In most cases, if not questioned by stakeholders, the mayor's permit suffices and gives developers the nod to implement development. The use and demand for the biophysical data are reactive in nature rather than proactive. There is thus a need to advocate for an "informed" decision-making among local government units.

***Municipal personnel should be trained on how to use the data and update the information***. The extent of use of the biophysical data is also limited by the institutional arrangements. In most cases, there are no technically trained people in the local government who can effectively interpret the biophysical data set

and provide advice to the administrators. Most of the local government units rely on the PRMDO and the regional offices of national government agencies for technical support. Consequently, there is a need to strengthen the technical capabilities of the local government and perhaps hire a technical person to specifically address the needs of coastal resources. At present CRM activities are placed under the Municipal Agriculture Office which is already overwhelmed with land-based agricultural needs.

***Regularly updating and making accessible of biophysical data sets to the stakeholders.*** The publication of profiles and the establishment of the electronic municipal database is one factor that made efficient the access and retrieval of information.

The MCD developed by CRMP is a system that can address the basic database requirements. It uses a platform that is readily available to most computers. If regularly updated, its use can be sustained. However, the software is also limited and customized to CRMPs needs. As the information needs grow, it might be a worthwhile venture to invest in a more expanded information system. In developing the profiles, CRMP utilized the Geographical Information System (GIS) mapping tool. The maps generated by the system have sparked interest among local government heads for their coastal resources.

Attempts have been made earlier to develop a GIS for the province but these were not sustained due to budgetary constraint and the lack of need for it. At present, the region-based GIS is in Cebu City. As the need for CRM matures, the need for the system also grows and will soon require a locally-based institution to meet the demands in the future. Perhaps an academic based GIS can be established to serve the needs of the province, maximize its potential, and in the long run sustain its operation.

## Literature Cited

Ablong, W.R., R.O. de Leon, C.Y. Fontelo, and R.D. Montebon, 2000. Estimating the incremental cost of CRM as basic service of local government units in the Philippines, 7th Program and Policy Advocacy Group Forum, Silliman University, October 2000, Cebu City.

Alcala, A.C. 1981. Fish yield of coral reefs of Sumilon Island, central Philippines, NRCP Research Bulletin, 36:1-7.

Alcala, A.C. 1988. Effects of marine reserves on coral fish abundances and yields of Philippine coral reefs. Ambio, 17 (3): 194-199.

Alcala, A.C. 2001. Marine reserves in the Philippines: historical development, effects and influence on marine conservation policy, Bookmark, Makati City, Philippines, 115 p.

Alcala, A.C. 2002. Dumaguete pier, an environmentally critical area. Malaya, Philippines. May 2, 2002.

Alcala, A.C. and G.R. Russ. 1990. A direct test of the effects of protective management on abundance and yield of tropical marine resources. J. Cons. Int. Explor. Mer. 46:40-47.

Biña, R.T., R.S. Jara, E.N. Lorenzo and B.R. de Jesus, Jr. 1978. Mangrove inventory of the Philippines using LANDSAT multispectral data and image 100 system. NRMC Research Monograph No. 2. 8 p.

Bureau of Fisheries and Aquatic Resources. 2001. Participatory Community Resource Assessment Profile of Liloan, Southern Letye.

Bureau of Fisheries and Aquatic Resources. 2001. Participatory Community Resource Assessment Profile of Malitbog, Southern Letye.

Calumpong, H.P. (ed.) 1999. Assessing impacts of fish cages in Siyt (Siit) Bay, Negros Oriental. Silliman University Marine Laboratory and Coastal Resource Management Project, Dumaguete City, Philippines. 82 p.

Calumpong, H.P., J.S. Estacion, M.V. Lepiten, and C.E. Acedo (eds.) 1997. Status of the Coastal Resources of the Negros Learning Site (Manjuyod to Dauin), Silliman University Marine Laboratory and the Center of Excellence in Coastal Resources Management, Silliman University, Dumaguete City, Philippines, 196 p.

Calumpong, H.P. and J.A. Luchavez. 1997. Profile of the Bais Bay Basin, Silliman Journal, 37(3-4):1-27.

Calumpong, H.P. 1996. The Central Visayas Regional Project: Lessons learned. Tambuli 1:12-17.

Calumpong, H.P., L.J. Raymundo, E.P. Solis-Duran, M.N.R. Alava, and R.O. de Leon (eds.) 1994. Resource Ecological Assessment of Sogod Bay, Leyte, Philippines. Final Report Vol 3. Marine Laboratory, Silliman University, Dumaguete City, Philippines.

City Government of Tanjay. 2001. Coastal Resource Management Plan 2000-2004. City of Tanjay, Negros Oriental, Philippines.

CRMP (Coastal Resource Management Project) 2000. Municipal coastal database 2000 version 2.0. CRMP Document No. 18-CRM/2000, Cebu City, Philippines. 68 p.

Courtney, A.C., A.T. White, and E. Deguit. 2002. Building Philippine Local Government Capacity for Coastal Resource Management. Coastal Management. 30:27-45.

Dalzell, P., P. Corpuz, R. Ganaden, and D. Pauly. 1987. Estimation of maximum sustainable yield and economic reand from the Philippines small pelagic fisheries. Bureau of Fisheries and Aquatic Resources Tech. Pap. Ser. 10(3), 23 p. *In*: Department of Environment and Natural Resources, Bureau of Fisheries and Aquatic Resources of the Department of Agriculture, and Department of Interior and Local Government. 2001c. Philippine Coastal Management Guidebook No. 6: Managing Municipal Fisheries. Coastal Resource Management Project of the Department of Environment and Natural Resources, Cebu City Philippines, 122 p.

Department of Environment and Natural Resources, Bureau of Fisheries and Aquatic Resources of the Department of Agriculture, and Department of the Interior and Local Government. 2001a. Philippine Coastal Management Guidebook No. 1: Coastal Management Orientation and Overview. Coastal Resource Management Project of the Department of Environment and Natural Resources, Cebu City, Philippines, 58 p.

Department of Environment and Natural Resources, Bureau of Fisheries and Aquatic Resources of the Department of Agriculture, and Department of the Interior and Local Government. 2001b. Philippine Coastal Management Guidebook No. 3: Coastal Resource Management Planning. Coastal Resource Management Project of the Department of Environment and Natural Resources, Cebu City, Philippines, 94 p.

Department of Environment and Natural Resources, Bureau of Fisheries and Aquatic Resources of the Department of Agriculture, and Department of the Interior and Local Government. 2001c. Philippine Coastal Management Guidebook No. 6: Managing Municipal Fisheries Coastal Resource Management Project of the Department of Environment and Natural Resources, Cebu City, Philippines, 122 p.

English, S., C. Wilkinson, and V. Baker (eds.) 1994. Survey Manual for Tropical Marine Resources. Australian Institute of Marine Science, Townsville.

Gayanilo, F.C. Jr. and J.A. Razon III 2001. Getting Started with PhilFIS 2.

Data Management Center Doc. Ser. 1. Bureau of Fisheries and Aquatic Resources, Department of Agriculture, Quezon City, Philippines, 30 p. DRAFT COPY

GESAMP (IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection. 1996. The Contributions of Science to Integrated Coastal Management, GESAMP Reports and Studies, No. 61. 66 p.

Gomez, E.D., A.C. Alcala and A.C. San Diego. 1981. Status of Philippine Coral Reefs – 1981. In: Proceedings of the Fourth Internatial Coral Reef Symposium, Manila, 1981, Vol. 1:275-282.

Municipal Government of Liloan, 2001. Annual Investment Plan: 2001. Municipality of Liloan, Southern Leyte.

Municipal Government of Malitbog, 2000. Medium-term agriculture and fisheries modernization plan year 2000-2004. Municipality of Malitbog, Southern Leyte.

Municipal Government of Manjuyod. 2001. Coastal Resource Management Plan 2000-2004. Municipality of Manjuyod, Negros Oriental, Philippines.

Municipal Government of San Jose. 2001. Coastal Resource Mangement Plan 2001-2005. Municipality of San Jose, Negros Oriental, Philippines.

Municipal Government of San Jose Ordinance No. 1, series of 2001, Comprehensive Ordinance for Sustainable Management, Development, and Conservation of Coastal Resources of the Municipality of San Jose, Negros Oriental.

Pal, A. 2002. PPA asked to hold impact assessment. Visayan Daily Star, Philippines, March 20, 2002.

Walters, J.S., J. Maragos, S. Siar and A.T. White. 1998. Participatory coastal resource assessment: A handbook for community workers and coastal resource managers. Coastal Resource Management Project and Silliman University. Cebu City, Philippines. 113 p.

White, A.T. 1988. The effect of community-managed marine reserves in the Philippines on their associated coral reef fish populations. Asian Fisheries Science 2 (1988): 27-41.

White, A.T., E. Delfin, and F. Tiempo. 1986. The Marine Conservation and Development Program of Silliman University, Philippines. Trop. Coast. Area Manage. 1 (2): 1-4).

Yambao, A.C., A.T. White, W.E. Ablong, and M.R. Alcala. 2001. Coastal Environmental Profile of Negros Oriental, Philippines. Coastal Resource Management Project, Cebu City, Philippine, 107 p.