

2. MULTI-PARTNERSHIP MANGROVE REHABILITATION OF DASOL BAY STRATEGIES AND RESULTS

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The coastal waters and shoreline of Luzon Province, the Philippines, have not been spared the loss of large tracks of mangrove forest. A multi-partnership coastal resource management project was implemented in 2005 to mitigate further degradation of the ecosystem through rehabilitation of mangrove forests in the Dasol Bay area of Pangasinan in northern Luzon. This paper presents a snapshot of results from this continuing effort and expectations for future initiatives in the area. The work is supported by Tanggol Kalikasan (Defense of Nature), with special support from the mayor's office of the Dasol local government unit (LGU) including the Dasol municipal agriculture office, and Washington State University's Office of International Research and Development. The authors built on a coastal resources database generated from a project-supported rapid resource assessment of Dasol Bay. Educating stakeholders about mangrove rehabilitation has been found to have an early and encouraging impact. Institutionalization through use of a structure that involves the community, an NGO, a university and individuals has helped partners meet goals. Results point to early successes from increasing environmental awareness and encouraging local participation that subsequently (1) allows effective constituency-building; (2) eases the integration of technical experts into decision-making processes; (3) provides a mechanism to channel innovative ideas and technologies; and (4) promotes learning by seeing and doing. This paper describes how the design and implementation of the Dasol Bay project promotes adaptive resource management, improves opportunities for effective governance and generates greater public support for rehabilitation of the mangrove forest. The project's participatory community-based approach engages stakeholders in direct project implementation and leads to continuously increasing involvement by members of the community. Environmental awareness and local participation are hallmarks of this effort. Insights are provided into the future of the Multi-partnership Mangrove Rehabilitation of Dasol Bay Project (Dasol 1) and its sister project, Upland and Rural-Urban Ecosystem Management for Dasol Bay Project (Dasol 2), begun in 2006.

INTRODUCTION

The last two decades saw a massive conversion of mangrove swamps into fishpond areas in the Philippines. The Philippines has lost about 310,000 ha of mangrove forests (over 65%) over the last 70 years. Based on the 2000 study of Primavera, only 120,000 ha of mangroves were left at that time.

This mangrove ecosystem is among the major marine ecosystems that have suffered the earliest and greatest degradation in the Philippines due to ease of access and a long history of conversion to aquaculture ponds. Proximity to the community hastened the decline; overexploitation by coastal dwellers and conversion to aquaculture, the salt pond industry and settlements are key factors to the decline.

The mangrove ecosystem continues to be faced with a grave threat of extinction. Only a few studies have been made of the efforts to conserve this dynamic ecosystem. The mangrove forest in the northern part of Luzon particularly in Pangasinan is not spared. The presence of large track mangrove swamps along Lingayen Gulf and Dasol Bay provided an opportunity for fishpond construction that bolstered the Bangus or milk fish (*chanos*) industry in the province, making Pangasinan one of the major suppliers of bangus nationally.

Ironically, this development evolved into a major threat to the natural resource base in the area and eventually led to an economic downturn in the communities depending on the bay's resources. The harmful effects of continued destruction of mangrove forests include: decrease in nutrient export which affects organisms all the way up the food chain including human beings; decrease in the area available for protection and nursery grounds for seed fish needed for stocking fishponds and; decrease in the catch of other fishery sectors. These harmful effects are now being experienced by the 92% of the coastal population in Dasol Bay who are dependent on fishing for a livelihood. There is a continuing decline in fish catch by 23% from 4.7 metric tonnes in 1998 to 3.7 tonnes in 2001. The previously rich areas for collecting fish fry along Dasol Bay are now

unproductive, yielding smaller amounts and thereby increasing the time required for fisherfolk to generate a smaller catch (FPE, 2005).

Increasing numbers of squatters in coastal areas and proliferation of fish pens and cages and other fishing structures along the bay and river banks also contributed to the mangrove destruction. This important ecosystem is on the verge of being lost. Fishpens obstruct the normal flow and ebb of tidal water and navigation; the filtering function of the mangrove forest for waste coming from offshore communities is no longer effective resulting in siltation and poor water quality. Frequent fish kills have been experienced for the last few years which further aggravate the worsening economic condition of the people of Dasol Bay.

Recognition of these challenges led Tanggol Kalikasan Inc. (TK), the Foundation for the Philippine Environment (FPE) and Washington State University (WSU) to enter into an agreement to address coastal resource management issues in Dasol Bay. Financial support for the project was provided by Philip Morris International (PMI) for this project, as well as an uplands project. During the first year, a transfer of management responsibility took place between the Foundation for the Philippine Environment and TK. The transferred project management of the Dasol Bay Project to TK was strategic and supported an integrated approach to both Dasol Bay and the uplands in the local watershed. While this paper discusses the results associated with Dasol 1 'Multi-partnership Mangrove Rehabilitation of Dasol Bay', some implications are also drawn for the future activities undertaken as part of the Dasol 2 'Upland and Rural-Urban Ecosystems Management for Areas Surrounding Dasol Bay', on which TK and WSU also collaborate. The Dasol 2 project aims to establish one hundred twenty (120) ha protection forest in the upland areas of Dasol and Infanta neighbouring Dasol Bay. It also aims to facilitate effective solid-waste management efforts of Dasol and Infanta as mechanisms to support coastal resource management of Dasol Bay.

THE PROJECT AREA

The municipality of Dasol, 286 km northwest of Manila in western Pangasinan, is bounded by the municipality of Burgos to its north, Infanta to the south, and Mabini to the east, with a South China Sea coastline on the west. Dasol is a fourth class municipality¹ with a population of 25,381 people (Municipality of Dasol, 2007).

The municipality is well endowed with coastal and marine resources. Nine of the 18 barangays of the municipality are located along the coastal strip, and 55% of the municipal population depend on fisheries-related livelihoods (Municipality of Dasol, 2007). This makes coastal resource management an important aspect for welfare development of the people. The fisheries activities include aquaculture (fish pond and fish cage management), mariculture (seaweed farming) and fishing with the use of motorized and non-motorized boats. Aside from the fisheries sector, other agriculture-related livelihoods include salt making, fruit wine making, fish processing, wood/bamboo craft and bolo making (Municipality of Dasol, 2007).

When the project was implemented during the early months of 2005, the municipality of Dasol was busy preparing and finalizing its coastal resource management plan. It was timely for the project to be introduced into the municipality planning process. It complemented existing coastal resource management projects, an example being a seaweed farming project undertaken in selected coastal barangays of the municipality. Moreover, while the project was focused to the coastal waters of Dasol, it was also an opportunity to facilitate development of an integrated management mechanism because the Bay is being shared by three municipalities. It is worth noting that the nearby municipalities have local chief executives that are staunch supporters of environmental protection and management.

THE RAPID RESOURCE ASSESSMENT OF DASOL BAY

The last two decades saw some of the worse destruction to the environmental status of Dasol Bay, an observation reflected in a coastal rapid resource assessment carried out in 2006. In the late 70s, there were at least 88.4 ha of mangroves in Dasol. At the time the project commenced, only 20.4 ha of mangroves in scattered patches remained (Hayuma Foundation 2006). Eleven species of mangroves belonging to five families are found in Dasol, namely *Avicennia officinales*, *Avicennia lanata*, *Avicennia marina*, *Sonneratia alba*, *Nypa fruticans*, *Rhizophora apiculata*, *Rhizophora*

¹ Philippine municipalities are divided into revenue classes. A fourth class municipality has revenue of between 13 M and 21 M PhP.

mucronata, *Rhizophora stylosa*, *Ceriops tagal*, *Ceriops decandra* and *Terminalia catappa* (Tanggol Kalikasan, 2007).

Incidentally, the once abundant mangroves in Dasol used to maintain the municipality's reputation of being the source of crablets and fish fingerlings in western Pangasinan from which small business entrepreneurs obtained their supplies. Available data on fishpond owners in Dasol account to having 97 ha in the municipal waters of Dasol (BFAR 2005). A comparison of the location of these fishponds to the National Mapping and Resource Information Authority (NAMRIA) map indicating mangroves in Dasol, confirmed the people's observation that mangrove conversion to fishponds is indeed the culprit for mangrove depletion. Ironically, the remaining fishpond owners/operators, particularly in Dasol, now source their fingerlings from elsewhere. Today, the mangroves in Dasol Bay are categorized as heavily disturbed according to a study commissioned by TK in 2006 (Hayuman Foundation, 2006).

The seagrass ecosystem of Dasol is not spared from threats. The rapid resource assessment of Dasol Bay revealed that they range from slightly to highly disturbed. Eight species of seagrass are found in Dasol, mostly in Barangay Uli. Today, the seagrass ecosystem is being maximized as a dock area, gleaning area and culture site for seaweeds. Moreover, there are at least 14 species of fish in Dasol Bay and 34 species of live coral (Hayuma Foundation, 2006).

CONTINUOUS EDUCATION OF STAKEHOLDERS

Tanggol Kalikasan facilitated a number of stakeholder meetings as opposed to community organizing for faster achievement of desired results and to meet as many key stakeholders as possible in one seating. This allowed all the key players in the LGU to participate in a workshop where they defined the issues on mangroves and identified the strategies to address them. The role of TK was to facilitate that these issues and solutions will surface and will be documented and presented as an output of the stakeholders. This way, strategies to manage the project are owned by the people.

Educating stakeholders by way of community meetings and channelling environmental updates through the media have been very much a part of the agenda of TK during the early part of the project. A daily program on a local radio station was sponsored by the project which gave updates and environmental campaigns. Subsequently, the efforts of the project have been picked up by other media. Soon, local and national news started to be released highlighting the Dasol mangrove rehabilitation project. Community meetings for environmental education and discussions coupled with environmental education through media brought a multiplier effect on the number of interested stakeholders. The media coverage have given a boost to the community and inspired more people to participate in the project in terms of attending meetings and personal participation in mangrove planting and survey activities.

The active participation of the direct beneficiaries has been an inspiration to the project management team. The cooperation and eagerness of the community particularly the barangay officials have allowed for easier implementation of activities. Without the participation and reception of the local residents, this project would not have prospered the way it has.

INSTITUTIONALIZATION THROUGH COLLABORATION

While the project has emphasized a community-based management approach, a primary concern for TK is the institutionalization of a sustainability mechanism in preparation for the end portion of the project. As such the management of the project was drafted through a memorandum of agreement among the LGU and Tanggol Kalikasan emphasizing the role of the community in the management of the project.

The institutionalization process was conducted at three levels – barangay level, municipal level and inter-municipality level. Institutionalization in the barangay was done by assisting the barangay council through a capacity building seminar particularly on environmental governance. The barangay council was also assisted in drafting a barangay ordinance to use as basis for the protection of the mangroves. At the municipal level, project institutionalization was strengthened by gaining the financial commitment of the municipality. A resolution from the municipal council supported the implementation of the project. The municipality of Dasol as partner and beneficiary to this project committed to continue the efforts that were started by allocating support funds from its internal revenue allocation (IRA). Moreover, Amalbalan – the primary barangay chosen to

the reforestation area – has passed a resolution for an annual allocation of funds to support the management of the mangrove project. Local support has become a strong asset of the project.

Owing to the special characteristic of sharing a common bay among three municipalities, the formation of an integrated bay-wide management body was also facilitated by the project. This was actually in response to a clamour from the stakeholders, and TK took part by engaging the stakeholders into a process of forming the bay-wide management council. The council is in the process of being approved by the municipal councils of the LGUs surrounding Dasol Bay.

ENVIRONMENTAL AWARENESS AND LOCAL PARTICIPATION

Constituency Building

Constituency building is a TK strategy of building mass support for a particular course of action. The mass support is gathered from constituents and stakeholders who are engaged in an informed decision-making process to define their own direction setting. Effectively managing the process of constituency building encouraged local officials to be comfortable and interested in co-leading the implementation of the project. The local government code of the Philippines mandates all local government officials, particularly the barangay officials, to implement environmental laws. Unfortunately, the government does not provide enough capacity building training seminars to enrich the knowledge of the barangay councils to implement projects of this nature. Thus, the project made sure that the local government officials are seen as the leaders in the activity and as such engaged them through a constituency-building process to capacitate their ranks.

Easing the Integration of Technical Experts into Decision-making Processes

The project has welcomed technical experts to guide the team in actual mangrove management activities. TK's expertise on environmental governance was coupled by hiring a mangrove technical person and incorporating WSU's technical and academic expertise.

Providing a Mechanism to Channel Innovative Ideas and Technologies

The project has grown from using the mother document that TK received from FPE to using other innovative tools and strategies. Among these technologies are TK's own strategic program called the Mainstreaming Environmental Information Education Campaign (MEIEC) and capacity building through the Institute of Environmental Governance (IEG).

The MEIEC is TK's strategy of emphasizing the role of media in environmental governance. This strategy provides for wider reach of the project through media exposure. *Tanggol Kalikasan* has recently shifted its focus on delivering information from traditional means – including lectures, forums, training, discussions, pamphlets and leaflets – to using mainstream tri-media via print, internet, TV and radio shows. The shift resulted from the experience that traditional ways of conducting an information and education campaign (IEC) is costly, time-consuming and reaches only a limited audience, compared to tri-media which reaches millions of Filipinos locally and nationally at a lower cost but with more participation from media practitioners and volunteer POs, NGOs, students and other community members (*Tanggol Kalikasan* 2004).

On the other hand, the IEG is a training institute set up by TK all over the country. The institute is partnered by state universities and colleges. College and university professors who are experts in various academic fields are part of the faculty who conduct the training seminars for local government officials. It was designed to assist local government officials meet the powers and responsibilities on the environment mandated to them by the law (*Tanggol Kalikasan* 2004).

Promoting Learning by Seeing and Doing

The concept of learning by seeing involves the gathering of stakeholders and bringing them to a model site outside of their town so that they can see an actual case of mangrove management. This activity was conducted at the early stage of the project to answer queries and to allay apprehensions of the stakeholders. This was facilitated in an interactive manner with actual mangrove project managers and implementers in the municipality of Pagbilao, Quezon Province. This helped considerably in encouraging the project partners to accept the challenge of mangrove management and understand that they could implement the project. The site visit turned out to be appreciated by the stakeholders who immediately took actions upon their return to their respective towns. One of the distinct outputs of the trip was a set of work plans produced by each participating municipality. The work plans became the working document of the mangrove management plan being currently completed (*Tanggol Kalikasan* 2005).

DESIGN AND IMPLEMENTATION

As has been the case with many natural resource management projects, this project has encountered some challenges that had to be overcome. The most crucial was the very limited resources that the project management team had available. This spurred the team to action in leveraging other in-kind resources. The management team expects that the accomplishments will be built upon and continued by the local government unit which has adequate resources to continue the mangrove rehabilitation initiative. The project, which relies on a community-based approach, also requires the full participation of the local government units. This has been a collaboration much emphasized for future project sustainability.

Project duration

The project, which is a two-year mangrove rehabilitation initiative, primarily aims to restore the mangrove ecosystem in Dasol Bay, particularly in the municipality of Dasol. It has endeavored to establish institutions that will manage work which will need to continue after project funds have been exhausted, linking the project to an adaptive resource management approach in the watershed feeding Dasol Bay. This will assist in achieving the more holistic landscape system analysis for managing shared ecosystems.

The participatory, community-based approach

This approach engages stakeholders in direct project implementation. What the project has seen for the last one and a half years is the participation of the community in the activities. Tanggol Kalikasan maintains only one staff member coordinating the actual implementation of the activities and one project manager as an overseer; the willingness of the community to facilitate the work plans have tremendously contributed to the completion of deliverables. The approach leads to continuously increasing involvement by members of the community. What the project did not anticipate is the voluntary actions being done by the actual beneficiaries which are adding to the support of the implementation of the project. Voluntary actions come in the form of mangrove clean-up activities (conducted once a month) by residents of the barangay, participation in the information drive of the project and organizing themselves to form a core group of ready volunteers to support the project (Tanggol Kalikasan 2006).

Environmental awareness

Environmental awareness has been promoted through stakeholder meetings, education and media support. These activities have been designed to increase awareness and entice public participation as a strategy to sustain interest of the project beneficiaries and local partners. Media exposure through radio programs and other written articles published locally and nationally caught the attention of various Dasol-born individuals who are now residing outside of the municipality. Informing the public through the abovementioned environmental awareness strategies contributed to greater support from other concerned individuals.

Local participation

Getting support from various stakeholders was facilitated in this project. Engaging all possible stakeholders at the initial phase of the project has proven helpful in increasing partnership, coordination and engagement, not only from primary government agencies and local departments but from other private groups as well. A number of multi-stakeholders' meetings were conducted that gathered the following: community residents; barangay local government officials; municipal government officials; various municipal government departments (agriculture, planning and development and engineering); community organizations; provincial players particularly the Office of the Provincial Agriculture; media; the Philippine National Police; municipal council members; church representatives; teachers and other individuals.

Applied research

The project management team had to go through several site visits to make sure that site and species suitability are met. From the nine coastal barangays initially assessed, the team decided to focus its plantation on barangay Amalbalan as the area for planting the first 10 ha of mangroves. The species to be planted were identified as *Rhizophora mucronata* for mudflat areas, *Rhizophora apiculat* for riverine areas, *Rhizophora stylosa* for sandy loam areas, *Ceriops tagal* and *Bruguiera cylindrical* for the middle ward zone, and *Sonneratia alba* and *Sonneratia caseolaris* for the outer zone. The site and species identification were facilitated in various community meetings in

barangay Amalbalan. This was to make sure that the residents of barangay Amalbalan, which was initially assessed, understood the reasons for being chosen. Basically, it was explained that the project site met the minimum requirements for mangrove planting of the project and was the area with the least conflicting issues. The minimum requirements for the project site include: no existing fishpond lease agreement; community members keen on and interested in the project; and the project site is able to contribute to the existing livelihood activities of the people. From the site identification, the project assisted the partners in institutionalizing governance guidelines, the most basic of which was the passage of a barangay ordinance setting out the protection and management of the 10 ha mangrove plantation.

Effective adaptive resource management

It is evident that the project has been evolving in a progressive manner with the changes and developments that came out as results of the implementation of the project. The project follows a simple resource enhancement design coupled by strengthened or capacitated local institutions that continue to evolve and adapt to strategies relative to the results of the project.

Improved opportunities for effective governance

Local government units are mandated to implement all environmental laws. Using this as a framework, TK facilitated a needs assessment activity which brought out the need to capacitate the environmental governance of the local government officials starting at the barangay level. The training was instrumental in institutionalizing an integrated bay-wide management agreement from the three local chief executives after the realization of the people of a concerted effort towards environmental management.

Greater public support for rehabilitation of the mangrove forest

While the project did not manage to form a people's organization to eventually assist in managing the project, volunteers from the community are always active in participating to project activities. The project has contributed to local participation and interest to environmental awareness. The project's participation and community-based approaches have engaged stakeholders in direct project implementation. Local participation has continuously increased as community activities progressed. Some major changes worth noting are the increasing number of people participating in mangrove planting activities, greater community awareness of the importance of biodiversity. Reports from the community on their concern for the environment have been directed to the project, because they are aware that this project addresses environmental concerns.

UPLAND AND RURAL-URBAN ECOSYSTEM MANAGEMENT FOR THE DASOL BAY PROJECT

To complement the efforts being undertaken in Dasol Bay, an 'Upland and Rural-Urban Ecosystem Management for Dasol Bay Project' (Dasol 2) was introduced during the first year of the Dasol 1 project. The Dasol 2 project was developed to address the land-based impacts from activities including illegal logging and small-scale mining from the upland and rural-urban ecosystems surrounding Dasol Bay. The municipalities of Dasol and Infanta were the municipalities selected to facilitate the Dasol 2 project.

During the implementation of the Dasol 1 project, issues identified were low fish catch and low quality of fish species, and deteriorating water quality resulting in red tide and fish kills. These were all attributed to the activities in the upland areas surrounding Dasol Bay. Moreover, soil erosion due to mining of limestone and rock phosphate is also assessed a threat to the mangrove ecosystem (FPE 2005). The main sources of pollution in Dasol Bay include household garbage, pesticides and mine tailings from the long-closed operations of the Barlo Mines, all being land-based sources (Municipality of Dasol 2005).

The municipality of Dasol, in itself, manages a total of 7,335.5 ha of forestland, 11.98% (877.1 ha.) of which belong to forest production and 88.02% (6,456 ha) to protection forests. However, most forestland are being used for agricultural purposes and whatever is left of the protection forests is threatened by logging activities, both legal and illegal, and slash-and-burn farming (*kaingin*) (Tanggol Kalikasan 2005).

In the municipality of Infanta, residents collect forest products for firewood and charcoal-making and farmers resort to unregulated *kaingin* in isolated patches. These occur despite strict policies and rules issued by government authorities. These upland activities directly affect the coastal and marine environment. For example, the central part of Infanta is now subject to severe erosion due

to denudation of the public forests. Due to denudation resulting from indiscriminate logging operations in the past, built-up areas along the river embankments in barangays Bamban, Doliman, Potol, Nangalisan and Maya are constantly flooded during rainy seasons. Clearly, there is a need for upland resource rehabilitation and management to address the present problems in the uplands that also affect down-slope areas.

The issues above jump-started efforts to reforest 120 ha of upland areas and assist the two municipalities in their solid-waste management initiatives to support the Dasol 1 project. The Project seeks to address issues of terrestrial origin that negatively affect the bay and that thereby undermine the outcomes aimed at by coastal resource management (CRM) efforts. Dasol 2 aims to do this by putting mechanisms for forest and rural-urban ecosystem management in place. The project sites are the landlocked barangays of the municipalities of Dasol and Infanta.

EXPECTATIONS AND RESULTS

One and a half years after the project 'Multi-partnership mangrove rehabilitation of Dasol Bay' was initiated, a 20 ha mangrove protection area now covers a portion of the coastal waters of the municipality of Dasol. During this short period of time there have been other notable accomplishments, including:

- Development of base-line coastal and marine resources data.
- Strengthened LGU accountability for mangrove ecosystem management.
- An increase in community participation towards mangrove management.
- Formation of an integrated bay-wide management team.
- Capacity-building on environmental governance of key barangay officials from both upland and coastal barangays surrounding Dasol Bay.
- Facilitation of legislative support both at the barangay and municipal levels.
- Initial steps in the establishment of a 266 m² mangrove nursery.

These accomplishments, linkages and collaborative activities are being expanded and strengthened. Continuing progress of the project is credited much to the cooperation of the local government officials and residents of the project sites who have been receptive and supportive to the development of this project. The technical expertise of various agencies has generated resources that allow continuing adaptive resource management (ARM) practices to be introduced in the project area. Support of the communities and the ARM practices are among the key elements that have made the project achieve its deliverables so far.

The project now looks toward the last six months as a turn-over phase with the following actions taking place:

- Transfer the management plan to the Office of the Mayor through the Municipal Agriculture Office.
- Finalization of an integrated bay-wide agreement among local chief executives.
- Training of local law enforcement officers to enhance their skills in environmental law enforcement
- Monitoring of the implementation of work plans developed by each barangay from the environmental governance training activity.
- Continuing legal assistance to the community after project completion.

THE FUTURE OF THE DASOL BAY MANGROVE REHABILITATION EFFORT AND ITS CONTINUING SISTER PROJECT

Project management envisions a promising continuation, beyond 30 June 2007. The existing resources of the municipality and its citizens are the anchors for creating sustainable project results, including:

- A budget allocation from the municipal and barangay local government units for the Dasol 1 project which will continue to fund existing operations such as provision of gasoline for the project boat, allowance of mangrove caretakers and other regular monitoring activities among others.

- Continuing knowledge technology transfer, through coaching and training, to the local technical counterparts.
- Expanding stakeholders' support gained from previous meetings, environmental awareness efforts and constituency-building activities.
- Taking advantage of the presence of Tanggol Kalikasan during the remaining three and a half years of the Uplands project, by requesting ad hoc assistance when necessary.
- Continuing the use of technical assistance from the Institute of Environmental Governance based upon the monitoring and evaluation process outlined in the work plans submitted during the environmental governance training meeting in October 2006.
- Support for the effort of Tanggol Kalikasan and WSU to seek additional funds for support of the Dasol 1 and 2 project goals.

The Dasol 2 project will help grow the achievements of the Dasol 1 project. This will result from reduction of the negative externalities associated with deteriorating environmental stewardship of the uplands. Continued progress and expanded use of environmentally friendly practices and growing participation among community residents will be strengthened by the Dasol 2 project. Towards the end of the Uplands project, a selective resource assessment of Dasol Bay will be conducted to assess the impacts of both Dasol 1 and 2 projects on Dasol Bay.

HALLMARKS OF THE MULTI-PARTNERSHIP MANGROVE REHABILITATION PROJECT

In summary, the two-year project has achieved results in a very short period of time. Collaboration among stakeholders at the municipality level and citizens of the community provided this opportunity. Tanggol Kalikasan, the Foundation for the Philippines Environment and Washington State University were able to take advantage of this commitment by supporting stakeholders to act in accordance with their resource endowment. Hallmarks achieved include:

Increased environmental awareness

The project contributed to public awareness and support as seen in the quick response of the community whenever a call to regular activities such as mangrove sampling and mangrove clean-up are being organized.

Adaptive resource management and applied research

The Rapid Resource Assessment of Dasol Bay provided a valuable insight from which to prescribe possible technical solutions. From the evaluation of the current natural resource status of the bay and previous knowledge of existing biological systems native to the area, the location, species and methods for use by experts in managing resources in coastal areas was able to be generated and focused upon.

Local participation

One of the ultimate goals of the project is to encourage the local community to participate and become lifelong owners of this noble endeavour. The work has been undertaken with the active involvement of the people, their communities and their commitment to continue even after the current funding has been expended.

Policy advocacy

Institutionalizing sustainable environmental stewardship was one of the key focuses of TK when implementing the Dasol projects. Promoting legislative support on two levels – the barangay and the municipal levels – was part of this key. Having the host barangays draft their barangay ordinances was another major accomplishment that allowed legal instruments to support the project activities.

Integrated bay-wide adaptive resource management

While the project is focused in the municipality of Dasol, TK found that one significant output of the project is to facilitate an integrated bay-wide management of the coastal resources of the whole Dasol Bay. Dasol Bay, being a shared ecosystem, will be best managed if all three municipalities are enjoined to a common resource management strategy. The integrated bay-wide adaptive resource management will aid in achieving better management to the current resources. Thus the creation of Task Force Burgos, Infanta and Dasol (BIDA) which is an enforcement body to

protect the bay is a good starting point for an improved and integrated approach to resource management. The Multi-partnership Mangrove Rehabilitation of Dasol Bay has provided a foundation from which other coastal conservation efforts can be generated. Twenty hectares of specifically selected mangrove propagules were planted in the project area by stakeholders of the area. Municipal government support and participation by the community resulted in a 60% survival rate after one year. The Dasol Bay Municipal Government, Tanggol Kalikasan, Washington State University and the community stakeholders of Dasol Bay look forward to similar results in upcoming years.

REFERENCES

- (BFAR) Bureau of Fisheries and Aquatic Resources (2005), Dagupan City, Philippines, Inventory of Fishpond License Agreements, unpublished document.
- Foundation for the Philippine Environment (FPE) (2005), Quezon City, Philippines, Multi-Partnership Mangrove Rehabilitation Project Document, unpublished document.
- Hayuma Foundation and Tanggol Kalikasan (2006), Quezon City, Philippines, Rapid Resource Assessment of Dasol Bay, unpublished document.
- Municipality of Dasol (2005), Dasol, Philippines, Dasol Coastal Resource Management Plan (CRMP) 2005–2010, unpublished document.
- Municipality of Dasol (2007), Dasol, Philippines, Socio-Economic Profile of Dasol, unpublished document.
- National Mapping and Resource Information Authority (NAMRIA) (1960). Map of the Municipality of Dasol. Manila, Philippines.
- Primavera, J.H. (2000), Development and Conservation of Philippine Mangroves: Institutional Issues, <http://mangroveweb.seafdec.org.ph/html/fresourc.htm>, accessed 1 March 2007.
- Tanggol Kalikasan (2004), Institute of Environmental Governance (IEG): A Concept Paper, 2004, unpublished document, Quezon City, the Philippines.
- Tanggol Kalikasan (2004), Mainstreaming Environmental Information Education Campaign (MEIEC): A Concept Paper, 2004, unpublished document, Quezon City, the Philippines.
- Tanggol Kalikasan (2005), Dasol 1 Project Status Report, 1 September – 30 November 2005, unpublished document, Quezon City, the Philippines.
- Tanggol Kalikasan (2005), Dasol 2 Project Document, 2005, unpublished document, Quezon City, the Philippines.
- Tanggol Kalikasan (2006), Dasol 1 Project Status Report, 1 October – December 2006, unpublished document, Alaminos City, the Philippines.
- Tanggol Kalikasan (2007), Philippines, Project Report for February 2007, unpublished document, Alaminos City, the Philippines.