

# Chapter 9: Community-based Water Quality Monitoring: The *Tigbantay Wahig*<sup>1</sup> Experience<sup>1</sup>

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## Introduction and Objectives

This chapter will document the exciting development of a people's organization in Lantapan that is committed to protecting and restoring the water resources of their municipality. It will briefly place this development in the historical context of Philippine decentralization and the rise of environmentally-related nongovernmental groups, as well as the goals and cornerstones of the SANREM CRSP program. The groups' technical and social formation will be outlined, with a description of milestones, success stories and future directions. The

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<sup>1</sup> TIGBANTAY WAHIG is a term that in the Binukid dialect means "Water Watchers," the citizen volunteer, water quality monitors of Lantapan, Bukidnon, the Philippines.

This chapter is an expansion of a paper presented at the International Farming Systems Association Conference, SANREM CRSP Panel Presentation, Santiago, Chile (November 28, 2000) entitled, *Formation, Potential and Challenges of a Citizen Volunteer Water Quality Monitoring Group in Mindanao, Philippines*, by W. Deutsch and J. Orprecio. The water quality project described in this chapter was implemented through the International Center for Aquaculture and Aquatic Environments, Auburn University. Work plan partners included Heifer Project International/Philippines (co-principal investigator of the project), Central Mindanao University, the San Herminigildo Agro-Industrial School, Inc., the National Power Corporation and the Provincial Planning and Development Office of Bukidnon, and the University of the Philippines Los Baños. Most of the field work which led to the results presented was conducted by the Tigbantay Wahig, Inc. people's organization of Lantapan, Bukidnon, Philippines.

watershed-level research findings and applications of this project are featured in Part I, Chapter 7.

### **Historical Background: Public Participation in Philippine Water Issues**

In spite of the fact that the Philippines is water rich, with nearly 5,000 cubic meters per capita of renewable water resources, there is a national crisis regarding conservation of a dwindling supply of high quality water. This has led to recent presidential decrees and other legislative action at the federal level, including Senate Bill No. 1082 which is designed to institute "a comprehensive water development act thereby revising and consolidating all the laws governing the appropriation, utilization, exploitation, conservation, development and management of water resources, creating the National Water Commission" (Policy Forum 1997).

Water quality of both coastal marine and inland freshwater environments of the Philippines is threatened by soil erosion and sedimentation, excess nutrient runoff and bacterial contamination. These types of pollutants often come from broad areas of both rural and urban land (usually classified as polluted runoff or nonpoint source pollution). Although polluted runoff is the most common source of water degradation in the Philippines and worldwide, it is much more difficult to control than pollution from specific sources.

As in most parts of the developing world, there is a limit to what government can do to protect and conserve water because of a lack of personnel, equipment and finances. This is especially true in remote, rural areas, where rates of natural resource loss generally exceed local governments' attempts to remedy environmental problems. In particular, specific information of water conditions needed to establish management strategies is generally lacking.

Regardless of governmental resources, many of the current environmental problems are not solvable by government regulation alone. Citizens need to become aware of the issues and take an active part in finding solutions. They have the greatest vested interest in conserving local water supplies and a greater capacity than that of the government to measure conditions, identify specific problems and decide upon a proper course of action. Of pressing need are practical, environmental indicators that local communities can use to determine trends of their natural resources and evaluate the appropriateness of their collective actions.

## **Decentralization and Potential for Local Environmental Management and Policy**

A more complete description of Philippine decentralization and devolution of authority is presented in Part I of this monograph, however, a brief summation of the elements of that process that most apply to the development of environmentally-related people's organizations is presented here.

Since the era of President Ferdinand Marcos and the 1986 revolution, the Philippines has moved squarely in the direction of decentralized authority, including decentralized natural resource management. The "people power" democratization process saw the flourishing of nongovernmental organizations (NGOs) eager to play an active role in the country's development, and the Philippines now has one of the highest numbers of NGOs in the world. A recent evaluation of this transition (Jutkowitz *et al.* 1997) indicated that "...the Philippines has made significant progress in establishing legal guidelines for greater local government autonomy, for more responsive and accountable local government, and for broader participation by civil society at the local level."

The government reversed the centralized political power and governance primarily through the enactment of the Local Government Code in 1991. The code includes the following provisions (Jutkowitz *et al.* 1997):

1. devolves power and authority to deliver services to local government units and calls for health, agriculture, environment, infrastructure, and social welfare services to be run by *barangays* (municipal subunits),
2. provides for quarterly distribution of internal revenue allotments to local government units from national revenue collected, using a formula based on government level and population (such allotments may be used for natural resource management and protection),
3. mandates participation of government-accredited NGOs (nonprofit organizations) and peoples' organizations (community-based membership organizations) in local government council deliberations, and
4. authorizes local initiatives and referenda to allow registered voters to propose, enact, repeal, or amend ordinances directly at the local government level.

Continued decentralization of authority over the last 8-10 years has provided a foundation for community-based environmental management and policy. At the local level, municipal mayors are being mandated by federal and provincial governments to develop natural resource management plans that often need to address water issues. Although not always the case, many mayors and local government units are becoming more receptive to cost-effective ways they may obtain information to formulate municipal policies of environmental protection and restoration.

### **The Community-based, Water Quality Monitoring Project, 1994-2000**

A community-based environmental assessment of the Manupali River watershed in Central Mindanao, Philippines (Bukidnon Province) was begun in 1994. The objectives of this project were to facilitate the development of water quality and watershed assessments by local communities, and provide physicochemical data that would be used to improve water quality and policy. Such a participatory approach to natural resource management on a landscape scale, that involved researchers from various disciplines and partners from various governmental and nongovernmental sectors, was the goal of the greater SANREM Program.

The project had two research questions related to the above objectives:

- 1) What is the general physical, chemical and biological condition of water in the streams of the Municipality of Lantapan?
- 2) Can the local community of Lantapan form citizen monitoring teams to measure water conditions and conserve the aquatic resource?
  - a. Is there community-wide interest in becoming more aware of water issues and in forming monitoring teams?
  - b. What is the best way to train and equip citizens to collect meaningful data?
  - c. What is the most efficient way to sample and implement quality control measures so that the information is most usable for community education and problem-solving?
  - d. Would citizen water monitoring receive government support and become established or institutionalized in such a way that it makes a lasting impact?

## Approach and Methods

The participatory methods used were modelled after those developed in Alabama Water Watch, a citizen volunteer, water quality monitoring program that is now underway in the U.S. (Deutsch *et al.* 1998). Filipino partners on the SANREM work plan who were educators and community developers helped customize the workshops and sampling techniques to the local situation (Deutsch *et al.* 2000). Community participants primarily included farmers, teachers, members of certain women's organizations and some members of the local government unit.

### Formation of a Community-based, Water Monitoring Team

"Priming activities" led by NGO partners helped the community to understand and feel comfortable working with researchers. For example, a study tour was organized and led by a local educator and project partner to enable several local farmers to travel from their upland communities, through various portions of a large river valley, to the sea (some for the first time). This helped the farmers more clearly understand certain biophysical and social linkages between their land and downstream areas that researchers intended to study.

The indigenous people of the *Talaandig* tribe in Lantapan had distinct perceptions of environmental problems that were important to consider. The overarching worldview of the tribe was that spirits of water, air, forests and other natural and human phenomena were to be respected, and that lack of respect led to natural disasters. For example, one *Talaandig* man explained that a recent flash flood that killed a young girl of the tribe resulted from outsiders who came to the forest and were loud and irreverent. The view was that water came suddenly from the ground, independent of rainfall, as a judgment.

To help reconcile differing cultural views of environment, and raise awareness of the tribal way of life, the *Talaandig* leadership invited researchers and development workers to a several-hour "ritual of understanding" in the tribal center. Subsequently, researchers and community members interested in studying water quality and quantity obtained the permission of the tribe to enter and sample the water of the streams. Modern testing methods for determining water quality merged with an ancient, tribal spirituality of water and in one instance, a rice offering in a banana leaf was left to the water spirit by a *Talaandig* man who had just measured various chemical and biological parameters of a stream as part of the *Tigbantay Wahig* monitoring group.

Local citizens, including *Talaandig* and immigrant farmers, volunteered to receive training in water quality monitoring and principles of watershed management. The first workshop was conducted on July 4-7, 1994 and included techniques for simple physicochemical and biological tests of water. In the field portion of the workshop, volunteers and researchers began a systematic monitoring program of four subwatersheds, which included collecting data on water chemistry, bacteria, total suspended solids, stream discharge and soil export. Several other training workshops were conducted over the next six years, to introduce new parameters for monitoring, interpret results, and help new volunteers to begin monitoring.

The project researchers and volunteer water monitors selected 16 (later reduced to four) sampling sites on four main tributaries of the Manupali River. Sites were chosen that were generally accessible and representative of the diverse portions of the overall landscape, including subwatersheds of varying degrees of forest cover, agricultural land and population. The area of the subwatersheds ranged from about 2,400 to 10,000 ha.

A “menu” of possible water quality indicators was made available to the monitors in the workshops. These included the physicochemical parameters of temperature, pH, alkalinity, hardness, nitrates, phosphates, dissolved oxygen, turbidity and total suspended solids. Biological parameters included biotic indices of stream macro-invertebrates and measurements of *E. coli* and other coliform bacteria concentrations.

After several months of working together, the monitoring teams made suggestions for improving the project, including sampling site selection and use of the data collected in community outreach. Monitoring results were disseminated to community members, educators and local policy makers through oral presentations and written reports. After several months of involvement in the project, the core group of water monitors proceeded, in Filipino fashion, to form a people’s organization (the Tigbantay Wahig, Inc.) and incorporate as an officially recognized NGO in 1995.

## **Results and Discussion**

Monitoring has continued from 1994 to the present, with the analyses of thousands of samples and a general description of the physicochemical and biological features of the watershed. The primary indicators of watershed health and ecological sustainability derived from the research were described in Deutsch *et al.* (2000) and are summarized in Table 9.1.

**Table 9.1. Summary of community-based, water quality indicators.**

Issue/Problem	Indicator	Unit of Measure
General Memories, Experiences	Community Perceptions, Questionnaires/Surveys	Anecdotal, or Environmental Degradation
Soil Erosion	Suspended Soils in Water Soil Loss in Water	mg/l TSS; kg/ha soil export
Disrupted Stream Flow	Stream Discharge (monthly measurement); Flow Variability (comparisons: time, space)	cu. meters/second flow; coefficient of variation
Bacterial Contamination	Coliform Concentration	no. colonies/ml of water ( <i>E. coli</i> and other coliforms)

Research results have begun to have several applications, including:

- 1) Establishing a baseline of water quality conditions across the SANREM CRSP/Philippines study site that may be used to assess change over time and evaluate research goals of implementing sustainable practices for agriculture and environment.
- 2) Providing the Lantapan local government unit and citizens of Bukidnon with the techniques and information to establish and perpetuate a community-based water monitoring program. This information may pertain to public health (potable water supply and waterborne disease), sustainable agriculture (pesticide and soil loss from land to water) and economic development (multiple use of the aquatic resource).
- 3) Providing a model for other parts of the Philippines and other countries (including the U.S.) so that community-based environmental monitoring may be efficiently expanded and coordinated on local, national and global scales. This application of research results could greatly expand the audience/beneficiaries of the information.

The equipment and techniques used in this project provide the potential for collecting data that is adequate for describing and managing the aquatic resource. Although tests may not be sufficiently accurate for

certified laboratories or research chemists, the ranges of bias and precision are narrow enough to determine valid trends in water quality for several important parameters. This assumes that 1) the monitors are properly trained and are committed to maintaining quality, and 2) the equipment and reagents are properly cared for and regularly maintained according to established protocols.

After collecting and analyzing thousands of water samples, the citizen teams have developed a monitoring program that is beginning to increase public awareness and concern about water issues. Beyond the necessary awareness that a community and policy-makers need to undergo before lasting environmental protection takes place, specific information that monitors collect has direct relevancy to end-user problems.

For example, by sampling hourly through a rainfall event, citizen data on total suspended solids detected about a 1000-fold increase in eroded soil in a stream of Lantapan. With the skills to measure this dramatic rate and magnitude of soil loss, the monitors can now identify “hot spots” of soil erosion throughout the landscape. The community (possibly through SANREM work plans or the local government unit involvement) can then work toward remediation measures and continue monitoring streams to evaluate their effectiveness and success.

### **Key Training Activities and Group Milestones**

In addition to monitoring water quality and quantity on the major tributaries of the Manupali River in Lantapan, the *Tigbantay Wahig* has been involved with many other aspects of community development and environmentalism. A sample of such training workshops, meetings and field activities are listed below:

1. September 12-13, 1995: Leadership and Group Facilitating Skills, HPI Field Office, Lantapan, Bukidnon (18 participants). To increase participant’s understanding of the different roles people play in facilitating meetings and to highlight the importance of consensus building in directing and/or achieving the group’s goals and objectives.
2. April 11-12, 1996: Organizational Management and Effective Decision Making, Central Mindanao University, Musuan, Bukidnon (16 participants). To strengthen the group members’ capabilities in managing their own organization, in project planning and implementation. This training was facilitated by Mr. Ben Ramiso of the Muslim-Christian Agency for Rural Development or MuCARD.



3. July 1, 1996: Bookkeeping and Financial Management (Level 1), HPI Field Office, Lantapan Bukidnon (3 participants). To capacitate the group in managing their own funds.
4. September 24-25, 1996: Community Organizing Training, Balila Barangay Hall, Balila, Lantapan, Bukidnon (20 participants). To further enhance the group's capabilities in organizational management and project planning/implementation.
5. October 24-25, 1996: Pre-Membership Education & Basic Human Relations, Balila *Barangay* Hall, Balila, Lantapan, Bukidnon (26 participants). To accommodate expanded membership in the TW, especially participation of women, the training included group workshops such as: the 3 Good Qualities, Old/Young Lady, Communication, Conflict Resolution and Team Building.
6. May 6, 1997: 7S + R Training, Central Mindanao University, Musuan, Bukidnon, and the Balila *Barangay* Hall, Balila, Lantapan, Bukidnon (20 participants). To give the group the opportunity to develop their Vision, Mission and Objectives. The group's vision is "to build a strong and sustainable organization serving as a model for the benefit of the larger Lantapan community. Among the objectives they set were: 1) to raise awareness about the state of the Pulangi River and its tributaries, and conduct activities aimed at preserving its natural resources; 2) to continue the goals and objectives of the SANREM CRSP program towards sustainable agriculture. Also, a workshop objective was to form the Tigbantay Wahig structure which included the following committees: Project Committee, Outreach/Education Committee, Water Sampling Committee and Information Committee.
7. June 3, 1997: Aquaculture Exposure Trip, Mindanao State University/Naawan, Municipality of Naawan, Misamis Oriental and the Balila *Barangay* Hall, Balila, Lantapan, Bukidnon (30 participants). To learn more about fishpond management.
8. August 14-15, 1997: Stream Discharge Training (8 participants). To enable the members to learn the methods of calculating stream discharge for determining trends in water quantity and soil erosion.
9. January 12-14, 1999: Goat Production and Management Training (13 participants). To equip the members with knowledge in goat management, including animal health, breeding, stock selection and nutrition. HPI/Philippines Technical Officer, Ms. Jusa T. Banda, facilitated the training.
10. August 11-12, 1999: Cornerstone Value-based Planning and Management Training (5 participants; TW officers). To increase

the capacity for organizational management, planning and evaluation.

11. August 23-24, 1999: Aquaculture Management Training and Exposure, Lantapan, Bukidnon (26 participants). To increase the capacity to produce fish in farm ponds. The training was conducted by Prof. Danilo Vicente, Dean of the Aquaculture Department of Mindanao State University and Mr. Eugene Moleño (Aquaculture Technician).
12. September 1-3, 1999: Bukidnon Watershed Summit, Valencia, Bukidnon. A poster on Community-based Water Quality Monitoring was presented by Mr. Jun Magsacay (TW President), Janeth B. Labis and Mr. Jim L. Orprecio.
13. September 6-8, 1999: Tree Planting Activity. A total of 1,200 seedlings were planted along the Kulasihan River for stream bank restoration, erosion reduction and improvement of water quality.

## **Conclusions and Lessons Learned**

In spite of initial skepticism that rural communities would be unwilling or unable to consistently participate in an environmental monitoring project, the water monitoring team has collected a valuable data set. The water information was gathered prior to, during and after the El Niño phenomenon and is, therefore, an important and unique data set for upland tropical watersheds.

One of the main strengths in collaboration is that participatory research, extension of information and community action are occurring simultaneously. Instead of a traditional model of conducting the research in isolation from the local community, then trying to extend the significant findings to them through such things as technology transfer and the media, the citizens, community organizers and scientists learn together.

It has been difficult to translate the significant research findings of the project to policy and environmental improvements because of a variety of factors:

- a. The local government unit has undergone changes in key leadership and agendas.
- b. The “critical mass” of interested citizens and policy makers is still low, and there is considerable apathy in addressing environmental problems among the government and citizenry.

- c. Economic development, such as building new roads and bridges and attracting plantation-style agro-business has taken precedence over conservation, sustainable agriculture and natural resource management.
- d. There is a relatively small presence of the SANREM program in the community, and the program thus has reduced recognition as an important part of community development (compared with initial stages of the program). This relates, in part, to changing agendas of the U.S. Agency for International Development (primary funder of the SANREM CRSP), and the SANREM Management Entity.

### **Expansion of the *Tigbantay Wahig* Scope**

Although the impacts of the *Tigbantay Wahig's* work is yet to find its full potential in Lantapan, it continues to grow and has attracted considerable interest among other municipalities in the Philippines. Study tours of local government representatives from Sarangani Province (Southern Mindanao) led to the start of a similar, community-based water monitoring effort there. Importantly, this was done with the Sarangani government's initiative and financial resources. A similar program, requested by the Governor of Bohol, is scheduled to begin in early 2001.

The self-identified, future directions of the *Tigbantay Wahig* include:

1. group strengthening through organizational development trainings;
2. group expansion to accommodate interested community members;
3. tree planting activities along the four main rivers of Lantapan;
4. development of an Agro-Aqua-Forestry Project by fully establishing their current demonstration farm with the fish and goat project;
5. establishment of a *Tigbantay Wahig* Multi-Purpose Cooperative;
6. collaboration with other government agencies such as the Department of Environment and Natural Resources; and
7. continued water quality and quantity data collection.

### **Important Lessons**

1. Many citizens of the Philippines and the world have a keen interest in being part of environmental assessment as it pertains to their daily lives. Awareness of environmental issues is relatively high, even in remote rural areas.

2. The hands-on activities of environmental monitoring using simple equipment and techniques are a tremendous motivation for participation. Once the mystique of “only the professionals can do this” is removed in a workshop, citizens are usually eager to become involved. They take pride in knowing that the information they gather is really important and can improve the management of their land and water.
3. The type of information needed by policy makers for natural resource management planning should be science-based, but need not necessarily meet all the requirements of the scientific community with regard to precision and rigor. This is especially true in watersheds that are degrading rapidly, with irreversible consequences. In these situations, application of partly understood conservation practices, with full community involvement, may be far better than waiting for a “complete” scientific understanding.
4. The startup of a collaborative process in these projects was relatively slow and expensive, but initial results indicate that the potential for lasting benefits and project sustainability are much higher than if attempted by a community, NGO, university or government agency in isolation.

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