

# **Formation, Potential and Challenges of a Citizen Volunteer Water Quality Monitoring Group in Mindanao, Philippines**

by William G. Deutsch<sup>1</sup> and Jim L. Orprecio<sup>2</sup>

## **Introduction**

A community-based environmental assessment of the Manupali River watershed in central Mindanao, Philippines (Bukidnon Province) was begun in 1994 as part of the Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM CRSP).

There are three reasons why participatory research in water issues was needed in the Philippines in general and in Bukidnon specifically:

1. Both the quality and quantity of water resources in the Philippines is threatened, with evidence of degradation in both coastal marine and inland freshwater environments. At the national level, legislation is before the Philippine Congress that would give the President greater power regarding conservation of a dwindling supply of good quality water. Specific information about water conditions that can be used to establish management strategies are generally lacking.
2. There is a limit to what government can do to protect and conserve water because of a lack of trained personnel, equipment and finances. This is especially true in remote areas, such as Bukidnon. Even with the trend to decentralize power and manage natural resources locally, rates of natural resource loss generally exceed local government attempts to remedy environmental problems.

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Contact: Dr. William Deutsch, Alabama Water Watch, Program Manager, Department of Fisheries & Allied Aquacultures, 203 Swingle Hall, Auburn University, AL 36849, USA

<sup>1</sup>Principal Investigator, International Center for Aquaculture and Aquatic Environments, Auburn University, Alabama, U.S.A.

<sup>2</sup>Co-Principal Investigator, Heifer Project International, Muntinlupa, Philippines

3. Perhaps most importantly, many environmental problems cannot be solved by government regulation alone. Citizens need to be made aware of the issues and take an active part in finding solutions. They not only have the greatest vested interest in conserving local water supplies but also have the potential to far exceed the government's capacity to measure conditions, identify specific problems and decide upon a proper course of action.

## Objectives

The objectives of this work were to facilitate the development of water quality and watershed assessments by local communities, and to provide physicochemical data that could be used to improve water quality and to influence policy. Such a participatory approach to natural resource management on a landscape scale, which involved researchers from various disciplines and partners from various governmental and nongovernmental sectors, was the goal of the greater SANREM program.

This research posed the following questions related to the objectives above:

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 aquatic resources?
  - 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 has a lasting impact?

## Methods

The participatory methods used were modeled after those developed by Alabama Water Watch, a citizen volunteer, water quality monitoring program that is now underway in the United States. (Deutsch *et al.*, 1998). Filipino SANREM partners 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 local government representatives.

Local citizens volunteered to receive training in water quality monitoring and principles of watershed management. The volunteers initiated a systematic monitoring program for four subwatersheds. Water quality monitoring involved collecting data on water chemistry, bacteria, total suspended solids, stream discharge and soil export.

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 with varying degrees of forest cover, agricultural land and population. Each subwatershed ranged in size 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 ways to use collected data in community outreach efforts. The teams also formed a non-governmental organization (called the Tigbantay Wahig, Inc., meaning "Water Watchers") and registered with the Federal government.

Table 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)

## Results and Discussion

Water quality monitoring has continued from 1994 to the present, resulting in the analysis 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 1.

Research results have begun to have several applications, including:

1. Establishing a baseline of water quality conditions across the SANREM-Philippines study site that may be used to assess change over time and evaluate research goals of implementing sustainable practices for agriculture and the environment.
2. Providing the Lantapan local government 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 transport 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 environ-

mental monitoring may be efficiently expanded and coordinated on local, national and global scales. This application of research results could greatly expand the audience and 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 aquatic resources. 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 policymakers need 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-collected data on total suspended solids detected about a 1000-fold increase in eroded soil in a Lantapan stream. 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 or local government involvement) can then work toward remediation measures and continue monitoring streams to evaluate their effectiveness and success.

## **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 participatory research is that research, information exchange and community action are occurring simultaneously and that citizens, community organizers and scientists learn together.

This contrasts with traditional models where research is conducted in isolation from the local community and then the significant findings are extended to the community through mechanisms such as technology transfer and the media.

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

- a. The local government has undergone changes in key leadership and agendas.
- b. The critical mass of interested citizens and policymakers is still low. 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. The SANREM program has a relatively small presence in the community and thus has reduced recognition as an important part of community development. 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.

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 third program, requested by the Governor of Bohol, is scheduled to begin in early 2001.

Important lessons from this research include:

1. Many citizens in the Philippines and other parts of the world have a keen interest in being a part of environmental assessments that pertain 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 that “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 important and can improve the management of their land and water.
3. The type of information needed by policymakers 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 “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 is much higher than if attempted by a community, NGO, university or government agency in isolation.

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