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Role of Universities in Watershed and Reservoir Management under Changing Climate: The Case of Isabela State University (ISU), Philippines

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Abstract

The rapid denudation of forest resources and continuing settlement of the uplands have accelerated soil erosion and increased siltation of water bodies, dam structures, and irrigation canals; reducing the availability of freshwater supply, worsening flooding problems, and lowering the storage capacity and lifespan of water and irrigation infrastructure.

Further, the onset of climate change that will exacerbate the frequency and severity of typhoons and other hydrologic events indicate the need for adaptive strategies to minimize the potential negative impact on water supply and infrastructures. As apex institution of knowledge generation, ISU is at the forefront of mapping out and implementing integrated research and education program for watershed and reservoir management. ISU has recognized the threat brought about by climate-related disasters to sustainable development as well as the role of science and technology as front-line defense in coping with the negative impacts.

As a fitting response, the University has initiated innovative programs such as institutionalization of water resource center, mainstreaming of water-oriented climate change adaptation and disaster risk management as compulsory requirement in undergraduate and graduate curriculum and establishment of off-campus 'learning watershed laboratory' which serves as research venue for students and researchers.

The above initiatives created strategic avenues in implementing integrated approach in mainstreaming of watersheds, reservoir sedimentation and climate change issues in higher education institutions. The good practices presented are useful information and model for other institutions.

Keywords: learning watershed, water research center, reservoir management, Isabela state university

1 Introduction

Many universities across the world are mandated to advanced research and extension activities on topics related to watersheds, reservoirs and river management in relation to climate change, both in respect of mitigation, and adaptation. Yet, as shown by the latest 21st Conference of the Parties of the UN Convention on Climate Change (COP 21), held in Paris in December 2015, there is much room for improvements in the role played by universities in the negotiations and in influencing decision-making on a matter of such a global importance. There are unfortunately relatively few events where a multidisciplinary overview of university-based research efforts and projects can be show cased, and where researchers from across the spectrum of the natural and social sciences have had the opportunity to come together to discuss research methods, the results of empirical research or exchange ideas about on-going and future research initiatives. focusing on climate change mitigation and adaptation.

Institutions of higher learning such as the State Universities and Colleges in the Philippines are the ones in the best position to lead the conduct of research and development tasks because of a number of reasons. Among them are: 1) Scientists and faculty experts are in the academe; 2) Research is a priority program wherein every faculty and student is being called to be part of building up the body of knowledge; 3) Faculty teaching courses on forestry, environment science and related subjects can be equipped with updated knowledge and modern technologies that they can infuse in the learning system; 4) As part of their extension program could undertake community mobilization programs and environmental awareness campaigns; 5) link with various line agencies, local government units and private organizations to implement collaborative and multi-agency projects.

Living up to its name as a university for people and nature, the Isabela State University has embark on a guiding principle recognizing the threat brought about by climate-related disasters to sustainable development as well as the role of science and technology as front line defense in coping with the effect of climate change.(see Figure 1).

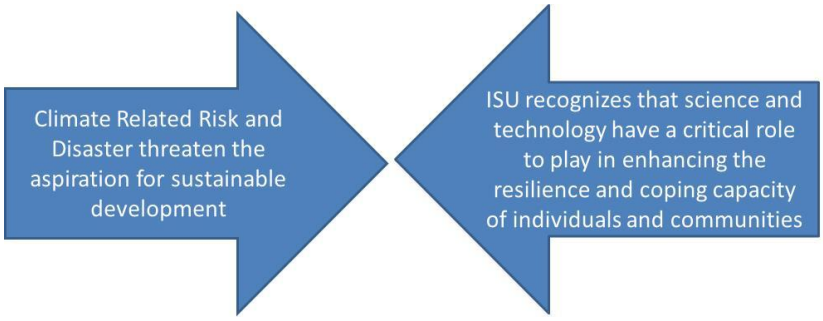

Figure 1. Guiding principle of ISU as University for People and Nature

ISU in recent years has been at the forefront of implementing various research, development and capacity building program on watershed, river basin in relation to climate change adaptation and disaster risk management in partnership with government and non-government agencies. ISU's primary role is to provide science and technology solutions to enhance resilience and coping capacity of individuals and communities.

This paper presents important lessons and good practices on watershed, reservoir and river management initiative by the Isabela State University through creative and innovative approaches. Over-all goal is to generate body of knowledge on matters of watershed, reservoir and river management as strategic platform for climate adaptation and mitigation; and develop model of good practices as input for policy formulation and template for replication and upscaling.

2 Approaches, Methods and Practices

A. Establishment of Water Research and Development Center

The Center was officially established at the Isabela State University on July 2017 by virtue of governing board approval with initial funding from the University. Overall aim is to establish and institutionalize a university-based water resource center and undertake R&D, Education and Capacity Building programs on water resources development, water environmental management, water related disaster risk reduction and institutional development in the water sector in the Cagayan Valley region.

Coverage of Its functions and activities are on the following areas:

a. The first set of functions pertains to the promotion and conduct of R&D;

b. The second set of functions relates to specific tasks in support of the current responsibilities of water –related agencies;

c. The third set of functions is in support of research and development, education, capacity building, planning and policy formulation.

Program Framework and components of the Center is organized in Figure 2.

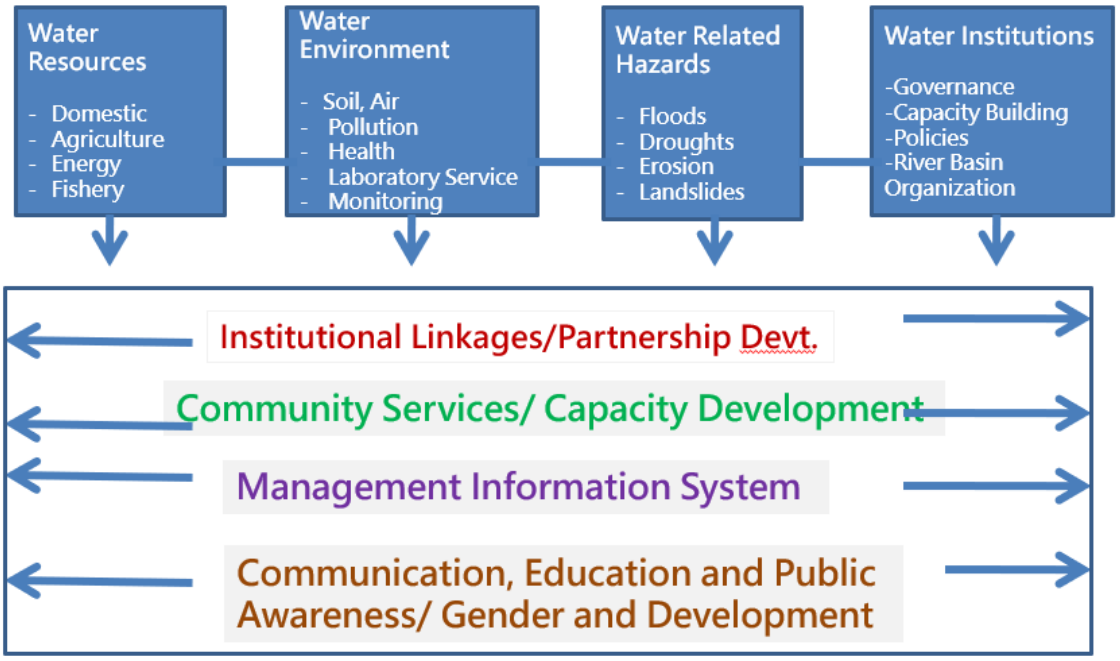

Figure 2. Program Framework of the Water Research and Development Center

B. Mainstreaming of River Basin Management and Climate Change Adaptation in the University Curriculum

The Philippine Government began to address these challenges at the national level through the Climate Change Act of 2009, which brought climate change adaptation into the mainstream of Philippine government policy. As a result of the Act, the Department of Education took steps to integrate climate change education into public school curricula, and disaster risk management was incorporated into school administration in the most vulnerable regions. Over time, these schools have increasingly mainstreamed disaster response education and preparedness activities, both independently and with support from outside organizations.

Along this backdrop, a standardized curriculum on river basin-oriented climate change and disaster education is deemed imperative for giving uniform knowledge about disaster reduction and climate change adaptation measures. The curriculum has the goal for students to know their lives and society in the context of natural resources management, climate change and disaster management. The mandatory course carries 2 units weight for all undergraduate courses and 3 units for all graduate programs.

C. Establishment of Learning Watershed as Innovative Platform for Adaptation and Mitigation Action Research

The impetus for Isabela State University to develop a learning watershed or take an active role in environmental protection and conservation comes from number of sources. First is because of its desire to live up to its name as University for People and Nature and as

a Research University. It was driven by pressure from the surrounding community to take an active, positive role as important institution in the community. Presence of faculty members seeking innovative strategy to improve their ability to engage students in learning is also a good reason. Further, a strong advocacy is in place for faculty and researchers toward more experiential learning to improve student academic and civic skills.

The Learning Watershed serves as venues for building up long series of empirical databases and the local knowledge through research and development on watershed, river management and ecosystem resources and services as influenced by human and natural factors and climate change through long term continuous monitoring and watershed studies.

The outputs of these researches are expected to help promote secured water supply for domestic, agriculture, energy and other uses, food security, enhance resilience and stability of ecosystems and local communities, promote more sustainable livelihoods, reduced risks due to climate change, and the reversal of pervasive watershed degradation in the country.

C1.Description of the Learning Watershed Study Site - The Abuan Watershed

Located in the province of Isabela, the Northern Sierra Madre Natural Park hosts the last remaining old-growth dipterocarp forests in the country. In its western buffer zone lies the Abuan watershed, a 63,754-hectare ecosystem that supports the livelihoods of some 2900 farming households (Figure 97). The higher catchment comprises 44,000 hectares (or 69%) of the Northern Sierra Madre Natural Park. The lower sub-catchments consist of farm lands, residual forests and brush lands with an area of 19,000 hectares (or 31%) of the watershed area. The watershed is named after the Abuan River, which, together with the smaller Bintacan River, drains into the Pinacanauan de Ilagan River, before merging with the Cagayan River.

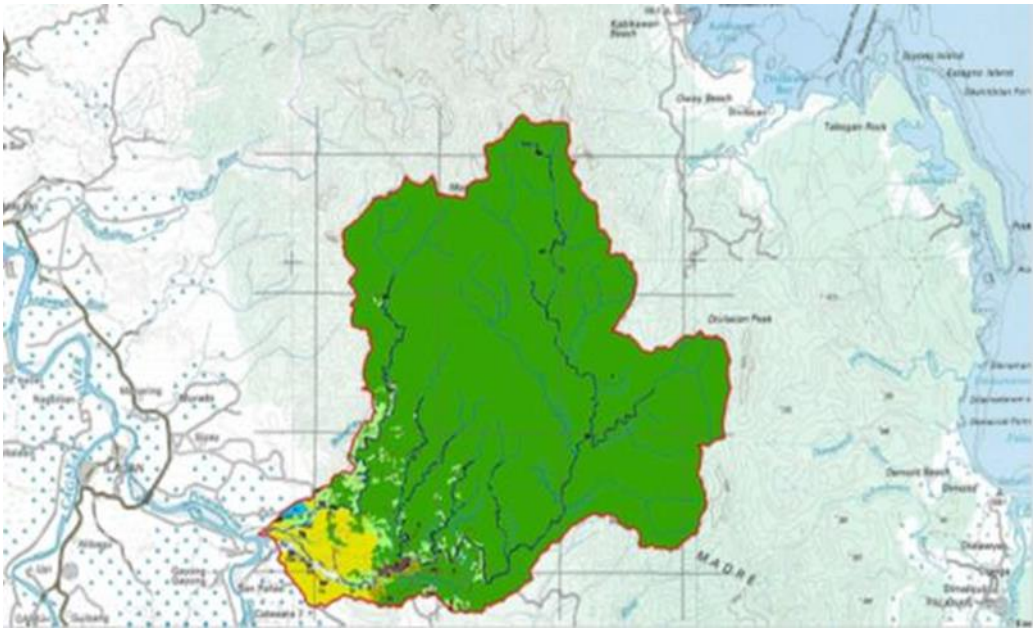

Figure 3. Map of the Abuan watershed, Ilagan Isabela, Philippines

The watershed is populated by about 3000 families, most are poor migrants of Ilocano, Ifugao, Ibanag and other ethnic origins. Majority are farmers who depend on yellow corn (sp. Zea mays L.), followed by white corn, upland rice, banana, ginger and fruits.

C2.Facilities in the Learning Watershed

a.Erosion Plots

Establishment of the erosion plots is an essential facility to assess the amount of soil erosion washed into the river, reservoirs and water bodies under various land use management conditions. Figure 4 shows the erosion plot located at Villa Imelda, Ilagan City, Isabela.

Figure 4. Erosion Plots at Barangay Villa Imelda

b.Biodiversity Plots

Measuring 2-hectares, biodiversity plot was established to inventory flora and fauna in the watershed as well as to determine its biodiversity index (FigureFigure 45). On-going studies are conducted by students and faculty researchers of Isabela State University and other institutions in the regions.

Figure 4. Biodiversity plot at BatongLabang, Ilagan Isabela

c.Weather and water quality monitoring stations of Abuan River

With funding from Worldwide Fund for Nature (WWF) Philippines, the project has installed automatic weather station, groundwater and river flow monitoring instruments (Figure 5) in various locations in the watershed.

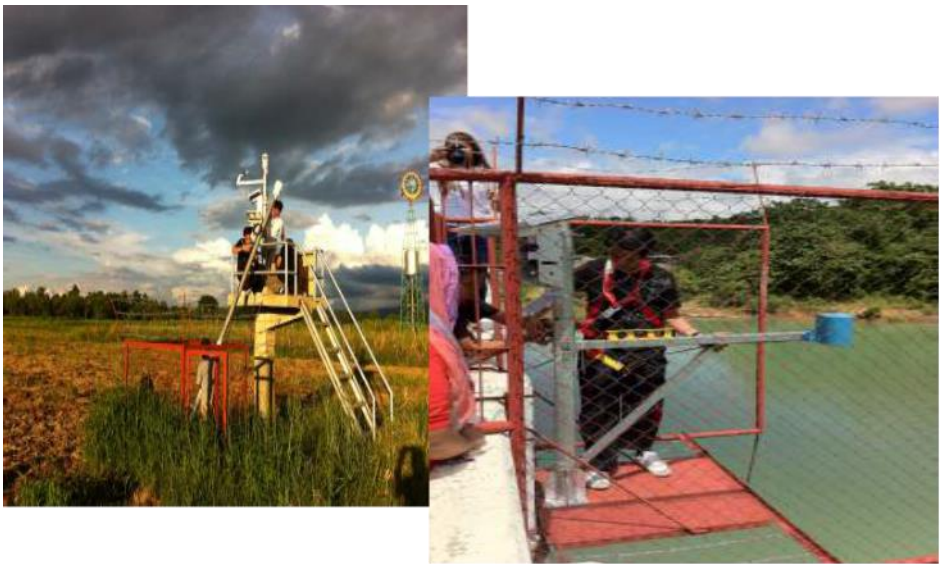

Figure 5. Instrumentations in Abuan Watershed

D.Activities and Plans: Education, Research, Partnership and Capacity Building

In line with this advocacy, the Isabela State University, being a premier State University in the region plays a vital role in spearheading projects that will effectively manage the natural resources in the region such as watersheds, reservoirs and river management. Integrating environmental awareness course in all academic programs is a timely and

appropriate strategy that can be implemented by the university. The learning watershed could serve as a laboratory for students in their agricultural engineering, environmental science and natural science subjects. Table shows the continuing activities of the University education, research and capacity building.

Table 1. Activities for Watershed Management

Program	**Planned Activities**
Education	➢ Strengthening Environmental Science curriculum with subject on watershed management ➢ Inclusion of topics on watershed management in syllabi of relevant subjects ➢ Preparation of Instructional materials ➢ Exchange of faculty and students to trainings and capacity building activities ➢ Strengthening of graduate programs on watershed and water resources management
Research	➢ Inclusion in the Research Agenda for faculty and student researches ➢ Promoting a research culture on climate change and disaster risk management ➢ Interagency partnerships on research endeavors ➢ Conduct of researches in watershed management and related fields ➢ Publication of completed studies ➢ Installation of necessary instrumentation and facilities for watershed management research and technology show case
Capacity Building	➢ Capacity building through regular drills in watershed management and disaster preparedness ➢ Promotion of proper watershed management through forms/print, broadcast and videos like comics, plays ➢ Conduct of stakeholder's forum ➢ Partnership building with local and international universities and other institutions

3 Conclusion

The Isabela State University as an institution of higher learning in the Philippines has initiated strategic avenues in implementing integrated approach in mainstreaming and upscaling initiatives to address climate change mitigation and adaptation issues. The good practices presented are useful information and model for other institutions.

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If there is more than two authors, the reference changes to Boes *et al.* (2002).

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