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INSTITUTIONAL PARTNERSHIPS FOR WATER ALLOCATION DECISIONS IN MULTI-USE WATER SYSTEMS: THE CASE OF LAKE BUHI

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ABSTRACT

Sustaining a water resource base which provides multiple services requires institutional innovation, particularly with the challenges posed by changing climate. The Buhi-Barit watershed where Lake Buhi is located manifests characteristics of marginal watershed areas in developing countries that are highly vulnerable to water stress due to both climate risks and human activities. Based on information generated from key informant interviews (KIIs) of stakeholder agencies, roundtable discussions, and workshops, this chapter discusses the policy and institutional setting governing the various uses of water in Lake Buhi. It examines the actors, processes, interests and interaction dynamic and presents how stakeholders improved coordination among institutions to adapt to climate-related risks in the context of competing uses of water. Allocation of water ideally depends on the water level of the lake which from month to month is affected by many inter-related factors. However, management of the lake has become a compromise between irrigation, hydro-electric power generation, the fishery sectors, and conservation/sustainability goals. As a response to this challenge, stakeholders agreed on the need to create an independent body in the form of a watershed management council to manage the lake and the watershed resources. For institutional innovation such as the watershed management council, institutional arrangements and coordination among government agencies is a big challenge. Because of the multiple uses of Lake Buhi and policy-related issues affecting the relationship of users within the Buhi-Barit watershed, a regular forum among the stakeholders could improve synergy among members.

Keywords: institutional innovation, watershed management council, policy and institutional setting

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I. The Multiple Uses of Lake Buhi

Sustaining a water resource base which provides multiple services requires institutional innovation, particularly with the challenges posed by changing climate. The case of Lake Buhi within the Buhi-Barit sub-watershed, part of the Bicol River Basin in the southern Luzon portion of the Philippines illustrates this perspective. The Buhi-Barit sub-watershed manifests characteristics of marginal watershed areas in developing countries that are highly vulnerable to water stress due to both climate risks and human activities. The basin has experienced extensive flooding due to tropical cyclones, storm surges, and accelerated sedimentation. Agriculture, being highly dependent on water, has been one of the most affected sectors in the region.

This chapter discusses the policy and institutional setting governing the various uses of water in Lake Buhi. It examines the actors, processes, interests and interaction dynamics. It presents how stakeholders improved coordination among institutions to adapt to climate-related risks in the context of competing uses of water.

Lake Buhi, with an area of 15,511 ha, serves as the main source of water in the Buhi-Barit sub-watershed. The various uses of the lake include hydropower generation; irrigation for the municipalities Buhi, Nabua, Iriga, Baao, Bula, Pili; fisheries; navigation; and other watershed services such as forestry and livelihood activities (Figure 1). According to the Mayor of Buhi, Lake Buhi at the foot of Mount Asog is home to the country's smallest commercial fish, *tabios* or *sinarapan* (*Mistichis luzonensis*).

Analysis was based on information generated from key informant interviews (KIIs) of stakeholder agencies, roundtable discussions, and workshops. Respondents were from the agriculture and irrigation sector, hydropower sector, fishery sector, and local government units. Information gathered relate to climate-related problems and their impacts; and the roles and responsibilities of stakeholder agencies. Reviews of various official reports and literature also supplemented the analysis.

II. Lake Buhi and Surrounding Watershed

The Buhi-Barit sub-watershed, also known as the Buhi-Barit Watershed Reservation where Lake Buhi is located, covers the municipality of Buhi and parts of Sangay and Iriga City in the province of Camarines Sur (Figure 2). Buhi has a total area of 24,665 ha (60,950 acres) wherein 18,378 ha (45,410 acres) are within the watershed declared as protected area. Other areas are devoted to agriculture, quarry and human

settlement. Population as of 2010 census totals 73,809 (National Census and Statistics Office 2010).

Figure 1. The multiple uses of Lake Buhi waters.

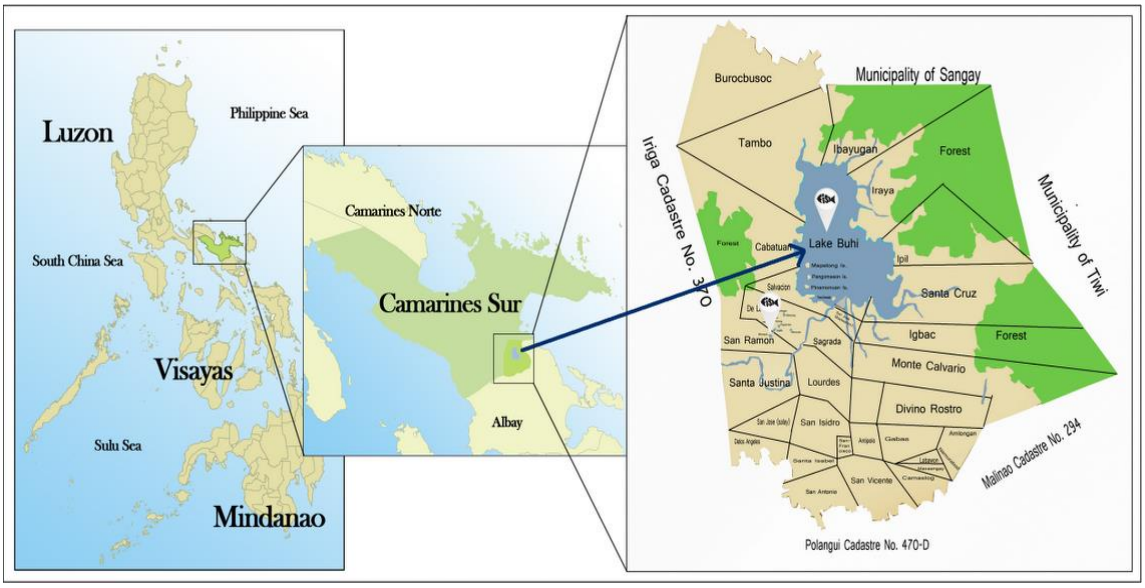

Figure 2. Lake Buhi and the Buhi-Barit watershed, Camarines Sur, Bicol Region, Philippines

Sources: Map of Buhi: http://buhi-sinarapan.blogspot.com/p/community-profile.html

The major climate hazards that have affected the area are dry spell and tropical cyclone/floods which stress water resources. The recurrent tropical cyclones or typhoons/floods, heavy or continuous rain had affected agricultural production and incomes. Based on reports obtained from the Camarines Sur provincial agricultural office, rice crop exposure to typhoon with 70-100 kph wind speed for 12 hours or less could reduce yield by 10-25% depending on growth stage. Complete submergence of rice lands in one to two days during the flowering/maturity stage could cause 15-30% damage. Flooding for seven days during panicle initiation/booting stage with farm completely submerged could cause up to 100% crop damage. Flooding and sedimentation also can clog irrigation canals, affecting irrigation water intakes.

Deforestation and poor agricultural practices in the catchment area have contributed to the sedimentation of the lake. Water hyacinth and algae and organic materials from aquaculture operation also have reduced storage capacity of the lake.

Weather changes were also reported to have resulted in massive fish kill in the lake. For instance, in September 1998, a long drought and week-long downpour, accompanied by strong southwest monsoon winds triggered upwelling of decomposing organic matter deposited in the lake. Soil erosion from adjacent agricultural land and denuded areas destroy feeding and spawning grounds of fishes as well.

III. Water Use and Allocation Issues

BAWP conducted a number of meetings, key informant interviews, workshops, trainings (on flood and drought management planning; policy analysis), and roundtable discussions (RTDs) at the municipal (*i.e.*, Buhi) and watershed levels (Buhi-Barit) to identify the water-related problems to be addressed and the corresponding solutions or actions; and how to come up with more scientific and better institutional arrangements for improved irrigation water management.

Allocation of water ideally depends on the water level of the lake which from month to month is affected by many inter-related factors. This includes rainfall, streamflow, inflow and outflow, erosion and siltation attributed not only to weather conditions but also to watershed conditions. However, over the years, management of the lake (and other lakes in the watershed) has become a compromise between irrigation, hydro-electric power generation, the fishery sectors, and conservation/sustainability goals. Decisions on water allocation to irrigation and power sectors and use of the lake for fisheries become more crucial in times of water shortage due to dry spell or drought.

The stakeholders of Lake Buhi cited problems of unregulated water inflow due to seasonality of lake level; and lake sedimentation due to both water-and land-based activities. The stakeholders agreed that these issues boil down to the overuse of Lake Buhi (Figure 3). They emphasized that bureaucracy indeed complicates the problem concerning the multiple uses of the lake. This is attributed not only to irrigation management but also to the management of the watershed. Solutions to deal with this go beyond the water user agencies and require a wider institutional coordination. This suggests that the problems concerning the lake have to be addressed from a watershed perspective.

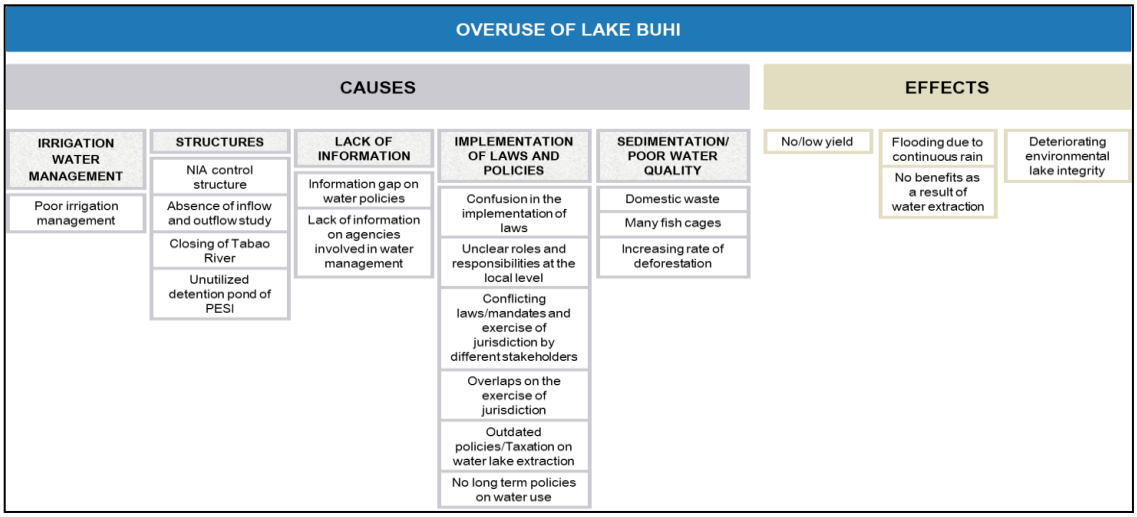

Figure 3**.** Problem tree analysis for Lake Buhi
Source: BAWP Round Table Discussion on Buhi-Barit Watershed, 2 August 2013, Buhi, Camarines Sur

Although the National Power Corporation – Buhi-Barit Watershed Area Team (NPC-BBWAT) has jurisdiction over the watershed and Lake Buhi, its capacity to manage is inadequate. It admits that it cannot singly perform the various watershed management functions due to its limited human resources. Its activities are limited to rehabilitation (tree planting, structural) and protection of watershed (*e.g.*, granting clearance for selective tree cutting, small quarrying, and resort operations). An NPC-BBWAT official even lamented the office is not involved in land use planning. The stakeholders also agreed on the need for the creation of an independent body to manage the lake and the watershed, (*i.e.*, watershed management council).

There was also a consensus that the risks posed by seasonal variability and changing climate may also necessitate an improved decision support system, *i.e.*, a science-based approach to arriving at decisions in allocating water to different users.

IV. Policy and Institutional Setting in the Watershed

There are policies specific to Lake Buhi and surrounding watershed, as well as to respond to watershed and environmental management. National and local government institutions have a mandate to conserve and protect natural resources (Figure 4).

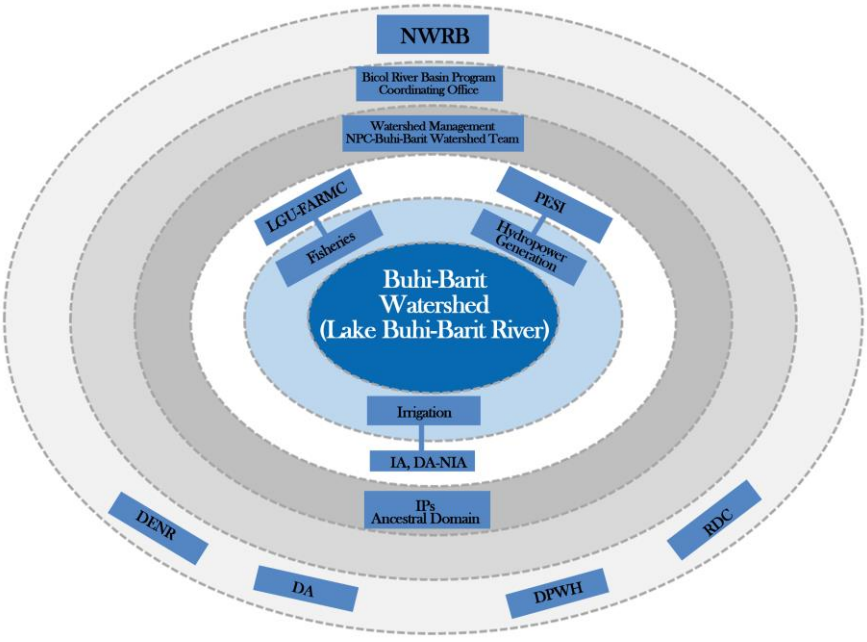

Figure 4. Buhi-Barit Watershed Institutional Landscape, Camarines Sur, Bicol Region, Philippines
Source: Elazegui, Rola & Allis, 2016

The major institutional users and stakeholders of Lake Buhi are the People Energy Services, Inc. (PESI) which is a private hydropower company; the National Irrigation Administration - Rinconada Integrated Irrigation System (NIA-RIIS), a government

irrigation agency serving five municipalities in the province of Camarines Sur; and the local government units (LGU) of Buhi and other municipalities in the watershed. PESI hydropower plant used to be the Lake Buhi-Barit hydroelectric plant that started operation in 1957 under NPC management. By the provision on privatization of the Electric Power Industry Reform Act (EPIRA) of 2004 (RA No. 9136), the hydropower plant was turned over to PESI in January 2005. PESI only performs power generation, with electric cooperatives off takers (buyers).

EO No. 224 of 1987 vested NPC the powers on management, protection, development and rehabilitation of watershed areas. These encompass jurisdiction, control and regulation including granting of permits as well as enforcing and administering forestry laws. NPC, having established priority rights over the use of Lake Buhi, allowed Rinconada Integrated Irrigation Systems (RIIS) to utilize water for irrigation. It has three river irrigation systems covering 5,000 ha. NIA and NPC forged a Memorandum of Agreement in 1989 governing the operation of the Lake Buhi irrigation control structure.

In compliance with the Water Code, NIA (issued in 1979) and PESI (1980) have a water permit and therefore, the right to extract water from Lake Buhi. Meanwhile, the Fisheries Code provides that the local government unit may use 10% of the lake surface area for aquaculture activities like fish pens, fish cages and fish traps. The Local Government Code of 1991 also mandates LGUs in enforcing rules and regulations relating to agriculture and fisheries. The *Sangguniang Bayan* (municipal council) of Buhi created the Lake Buhi Development Office for the management of Lake Buhi. The LGU monitors the water level, temperature, and water quality of the lake on a daily basis but DENR-EMB (which conducts water quality monitoring quarterly) validates the LGU data. In 2015, Lake Buhi was declared a Water Quality Management Area (WAQMA). Based on the Philippine Clean Water Act, DENR, through the Environmental Management Bureau (EMB), acts as the lead agency in the implementation of WAQMA in coordination with the LGU.

V. Towards an Integrated Watershed Management Framework

Based on the BAWP experience, technical assistance (*e.g.* capacity building) is crucial in initiating efforts towards solutions to problems and issues identified by the stakeholders themselves. Pinpointing the need for a creation of a management council, trainings and workshops provided learning opportunities for the stakeholders.

For creating an enabling policy environment for integrated water management (Figure 5), training on policy analysis improved knowledge of stakeholders and policymakers in reviewing policies related to performance of watershed-related functions. Participatory policy analysis also helped in examining and addressing conflicts or inconsistencies in policies towards an enabling policy environment for the Council. The participatory consultation showed that coordination among agencies is more crucial than inconsistency or conflict in policies. The initiative of the local government executive

proved effective in gathering stakeholder agencies to organize into a working group for the creation of the Watershed Management Council. Recognizing the institutional landscape concerning Lake Buhi and surrounding watershed, collaboration with regional/national government institutions that usually set policies on water and watershed management is vital, particularly in the integrated planning, development and management of the watershed. The role of the academe such as the CBSUA is also important.

Adoption of the decision support tool also requires an institutional "home" with resources to maintain, update and operate the system (including centralized access to necessary data). Training is necessary for the group (the regulators) who will use this science tool.

VI. Conclusion and Recommendations

Institutional innovation such as the formation of a watershed management council and adoption of decision support tool is a lengthy, iterative process. Linking science to decision making in climate change adaptation requires enormous awareness raising and capacity building efforts. There are also challenges arising from political commitment. This sometimes requires another round of discussion to introduce the project and pursue follow up activities. This calls for a quick response action to get things moving.

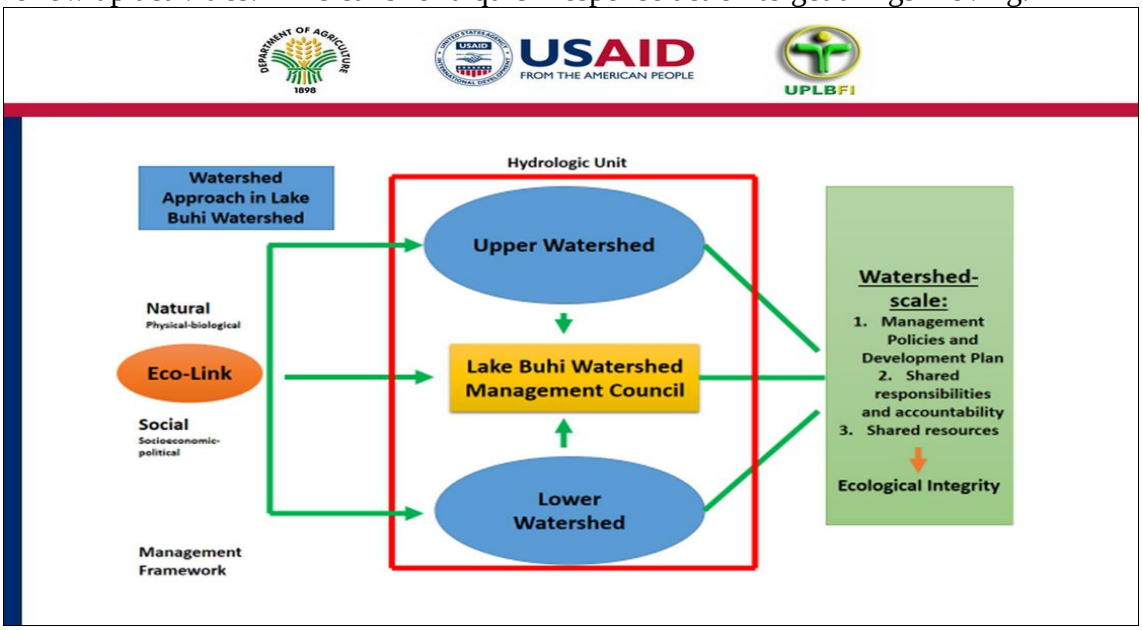

Figure 5. Buhi-Barit Watershed Management Framework drafted with the assistance of BAWP

Source: Estrella, A.B., 2016

Establishing partnership at the very start of the project facilitates linkage between research and policy formulation. With the limited technical capability of the LGUs, for

example, the academe (SUCs) should be tapped to sustain the innovation introduced by the project, (*e.g.* the adoption of decision support tools).

In state universities and agricultural colleges across the country, creation of water resource centers would be useful in water data generation and management to support national level policy formulation, for instance by the NIA, NWRB and other water-related agencies. A proposal on the establishment of a Water Resource Center for major SUCs in the country has been submitted to the Commission on Higher Education (David et al., 2014). This initiative can be followed up.

The adoption of decision support tools entails use of substantial information that should be fairly acceptable to all stakeholders. For instance, with the lake water level as yardstick in allocating water, informed decisions such as on the setting of rule curves, will need climate information (*e.g.* rainfall data and streamflow). This also suggests establishment of facilities and equipment such as rain gauges, flood warning device, and communication facilities.

For institutional innovation such as the watershed management council, institutional arrangements and coordination among government agencies is a big challenge. Because of the multiple uses of Lake Buhi and policy-related issues affecting the relationship of users within the Buhi-Barit watershed, a regular forum among the stakeholders could improve synergy among members.

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