

# Too Much or Too Little Water: Adaptation Pathways of Agusan Marsh Communities

Rosalinda C. Tomas, PhD<sup>1</sup>

Jessie B. Manuta, PhD<sup>2</sup>

Virgilio G. dela Rosa, MS<sup>3</sup>

---

<sup>1</sup> Director, Center for Social Development Research, Cor Jesu College, Digos City, Davao del Sur

<sup>2</sup> Vice President for Academic Affairs, Ateneo de Davao University, Davao City

<sup>3</sup> Faculty, Biology Department, Natural Science and Mathematics Division, Ateneo de Davao University, Davao City

---

## ABSTRACT

The study was undertaken to explore what measures the communities need to undertake to reduce their vulnerabilities and increase their capacities in the face of changing climate regimes. Focus was on the adaptive pathways of the Agusan marsh communities, particularly populated with indigenous peoples. In the face of critical water needs in the marshlands and the local context, emerging long-term adaptive strategies of the communities include (1) developing appropriate infrastructures for resource provisioning that can withstand the seasonal fluctuations and changing climate regimes in the region, and (2) developing a garbage disposal or sanitation system that is appropriate for perennially flooded or permanently floating communities.

Keywords: *adaptation, climate changes, marsh, vulnerabilities*

---

## INTRODUCTION

Water is the critical main resource of the Agusan Marsh communities in Mindanao, Southern Philippines, and the livelihood and lifeways of people living within the marsh have been adapted to the seasonal changes of the environment. Villarín's study (2006) on the changing

rainfall patterns in Southern Philippines since 1951 indicates that the rainfall of the northeast region of Mindanao has increased, while the rainfall of southern region of the island has been decreasing over the years. Too much water (catastrophic floods) and too little water (drought) are extreme events that undermine the livelihood, health and well being of Agusan Marsh communities.

Global warming is likely to cause additional changes in the landscape of Agusan Marsh. Regional assessments in the latest Intergovernmental Panel on Climate Change (IPCC) reports suggest likely increases in wet season precipitation (June-August) and decreases in dry season (December-February) (IPCC 2007a & b). Where drying trends are being experienced or anticipated, reducing flood peak-heights or durations can be very important to wetlands, fisheries and agricultural ecosystems. More intense rainfall events, for example, associated with more intense cyclones, increase flood peak-heights and durations causing damage to property and posing risks to life in flood plains. They also increase risks of flash floods and landslides in mountain areas. Sea-level rise exacerbates flood risks in low-lying deltas. Finally, warmer temperatures may interact with flood patterns to alter exposure to water-borne diseases and thus, alter risks of flood-related disasters.

With the changing rainfall patterns in Mindanao, too much water and the anticipated shifts of climate regimes brought about by changing climate, how do people cope and adapt in Agusan Marsh? Are there differences in the adaptation strategies between men and women? How are these reflected? What measures do the community need to undertake to reduce their vulnerabilities and increase their capacities in the face of changing climate regimes? These are the main questions posed in this study. In particular, the study investigates and focuses on the adaptive pathways of the Agusan Marsh communities relating this to resource management concerns.

## METHODS

### *Approach*

The research is primarily exploratory, descriptive and participatory in design. The study investigates the current experiences of selected communities regarding resource utilization and management, and links this with their adaptive strategies. Primary and secondary data were collected using different approaches.

Primary data were gathered using direct field observation, participatory gender analysis, community resource assessment, focused group discussions (FGDs) and key informant interviews (KIIs). Different FGD sessions were undertaken with women and men's groups while KIIs were conducted among selected community members and officials, leaders, workers and NGO personnel. For secondary data, review was undertaken looking at relevant information such as rainfall, flood occurrences, barangay/municipal socio-economic, health and population data. Further appraisals were made on each of the communities focusing on selected indicators of the community situation vis-à-vis livelihood and resource management including gender division of labor, decision-making practices as well as health concerns.

### **Study area**

The 110,069 ha Agusan Marsh is the catch basin of the Agusan River Basin.<sup>1</sup> Situated on Mindanao's eastern plain, the Agusan Marsh lies at the confluence of several of the Agusan River's tributaries, draining the Diwata mountain ranges of Agusan del Norte and Agusan del Sur in the east, the mountain ranges of Bukidnon in the west and the mountain ranges of Compostela Valley in the south and drained by the north-flowing Agusan River that empties into Butuan Bay (see Figure 1) (DENR, 2001). Hicks (2000) describes the marsh as a "*great maze of interconnecting rivers, channels and lakes, with a few river banks and islands rising above the water, some permanently, others submerged during rainy season*" (p. 135). Almost situated at the center of the province of Agusan del Sur, the marsh covers eight municipalities: Talacogon, San Francisco, La Paz, Rosario, Loreto, Bunawan, Veruela and Sta. Josefa.

Based on the 2000 census, a total of 21,568 households (117,683 individuals) depend on the viability of the Agusan Marsh. Majority of those living within and in the marsh peripheries are indigenous peoples from the Manobo ethnolinguistic group.

---

<sup>1</sup> The Agusan River basin holds 15 % of the freshwater supply with total land area of 12,000 kilometers and contains the country's third longest river. The River basin can be divided into three main sub-basins: the upper, middle and lower. The upper sub-basin holds the headwaters of the entire Agusan River basin; the middle sub-basin contains the Agusan Marsh; the lower sub-basin is the site of the largest city in the area—Butuan City (CARBDP-PMO, 2003).

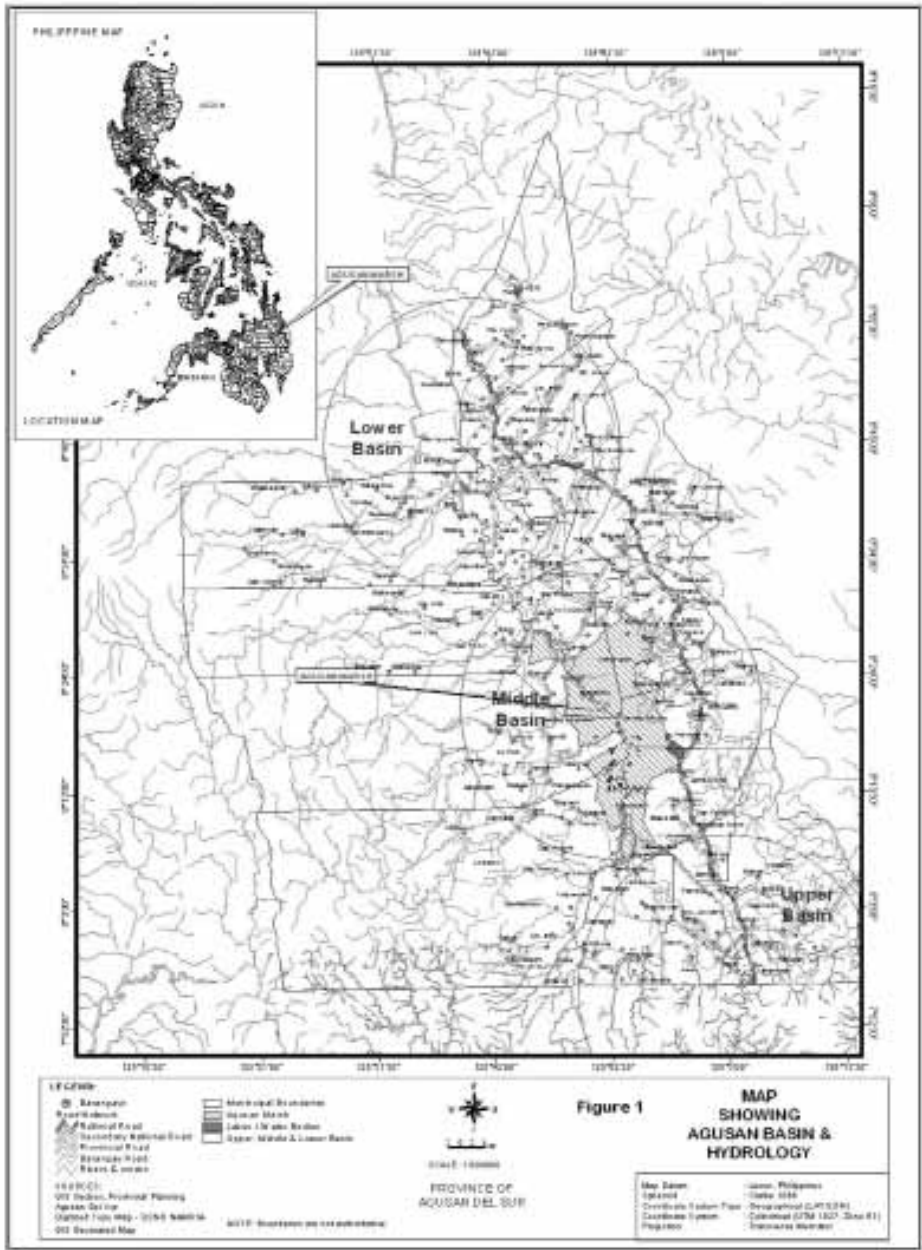


FIGURE 1. Map showing Agusan River Basin

### *Choice of focus area*

Considering that the marsh area is very extensive, two sites were purposively selected as focus research areas, namely: 1) Barangay Sabang Adgawan<sup>2</sup>, and 2) Lake Mambagongon<sup>3</sup> which is part of sitio Kiandag of the Barangay Poblacion. Both sites are located in the Municipality of La Paz, Province of Agusan del Sur.

The sites were chosen because they are part of Agusan Marsh's overall protected area, with Sabang Adgawan located in the buffer zone and Lake Mambagongon comprising the interior part of the protected area. While both communities are dependent on the marsh resources for their livelihood and survival, they also reflect some contrasts in terms of their location, area, population, livelihood and services. Lake Mambagongon is primarily a floating community all year through as residents live inside the lake on floating houses though water levels are low during the dry season. Sabang Adgawan becomes a floating barangay only during the rainy season that starts from December till March.

The Lake is approximately seven kilometers from sitio Kiandag (which is three kilometers away from the poblacion center) and can be reached through a two-hour walk during dry months or through boats (motorized or paddled) from Barangay Sabang Adgawan via Agusan River with approximate travel time of around 45 minutes to one hour during flood months. On the other hand, Sabang Adgawan is 15 kilometers from the poblacion of La Paz reached through rough roads via local motorcycles ("*habal-habal*") or pump boat from Talacogon via Agusan River. Approximate travel time on land starting from the Municipal poblacion is one hour while by boat is around two hours.

---

<sup>2</sup> Sabang Adgawan derived its name based on its location "sabang" which means junction of two rivers (Adgawan and Agusan) and the abundance in the area of the locally known "adgaw" tree species.

<sup>3</sup> Mambagongon is derived from the name of a local river. "Bagongon" is a Manobo term that means tail of a crocodile. The place was so-named because it used to be the habitat of crocodiles.

## RESULTS AND DISCUSSIONS

### The Marsh

#### *The flood plains*

As the catch basin of the Agusan River, Agusan Marsh has a distinct annual flooding cycle with maximum water level reached between October and February. Rainfall is relatively high in the basin and it is evenly distributed throughout the year. The average annual precipitation is 4,286 mm (DENR, 2001). Maximum rain period is observed from October to February and beginning in March, rainfall starts to decrease through the months of August to September. Annual evaporation rate is 1341 mm and the average annual temperature is 26°C. The low wind velocity due to the mountain range in the northeast and the relative high humidity decreases evaporation rate in the basin (Cotabato-Agusan River Basin Development Project-Project Management Office, 2003). During this time all of the floodplains are inundated. The minimum water level is reached around May with open water being confined to the floodplain and oxbow lakes and the water table measuring 10-30 cm below the soil surface over large areas of the marsh (DENR, 2001).

With about 59 lakes within, Agusan Marsh acts as the retarding basin for floodwaters that regularly inundate the Agusan valley during the northeast monsoon. The marsh has been identified to have a retarding effect on the river flow as most of the water are stored in this natural reservoir before flowing into the lower Agusan basin and finally, into Butuan Bay. It is observed that when Agusan Marsh is fully flooded, the waters from the tributaries are held back causing periodic flooding in the upstream region. CARBDP-PMO studies in 2003 indicated that the groundwater level in the Agusan Marsh is very shallow to as low as 10-30 cm below the soil surface. The study further suggested that Agusan Marsh is a natural recharge area for the coastal groundwater discharge in the lower Agusan River basin.

The Ramsar Convention Bureau declared Agusan Marsh as ecologically significant for internationally important wildlife species, particularly migratory bird species. The marsh serves as the resting area for bird species migrating from Russia and Siberia to Australia during winter in the northern hemisphere. Home to a complex of terrestrial, wetland and freshwater ecosystems harboring unique and pristine habitats, Agusan Marsh holds the last pristine sites of swamp forest in the country and holds unique flora and fauna (Ramsar Convention Bureau, 1999).

### ***Marsh as livelihood base with competing interests***

The marsh is a primary resource base of the communities living within and in its perimeters. The livelihood and lifeways of these communities have been adapted to the seasonal changes of the marsh. Pressures from population have resulted in increasing competition among different interest groups for access and control over diminishing, environmental resource base.

As a major area to source out livelihood, increasing human populations have moved in the marsh to live inside or within its peripheries either permanently or seasonally. With most of those depending on the marsh as marginal fishers and farmers, a number have devised ways to increase their productivity but at the expense of the marsh resources. Noteworthy is the use of electric fishing which is largely acknowledged as having reduced fish stocks and thus, affecting sustainability of fisheries in the marsh. Also, the conversion of the marshland perimeters into open, marginal agricultural land has been observed to have caused fragmentation of critical wildlife habitats. Even the introduction of exotic fish species, particularly the janitor fish, has affected the population of indigenous and endemic fish species. In general, too much pressure on the water-based resources diminishes the economic productivity of the whole ecosystem.

Livelihoods of the marsh communities are further affected by their improper liquid and solid waste disposal practices, especially the throwing of wastes directly into the rivers, lakes or creeks. While those on land practice open pit dumping or burning, the wastes are still carried away by the floodwater to the rivers during the flood season contributing to the pollution of the water ways or the degradation of environmental water quality. This poses a threat to the freshwater fish species and to human health.

### **Adaptive<sup>4</sup> and livelihood strategies of households**

Peoples' adaptive and livelihood strategies in Agusan Marsh depends on the seasonal flood cycle of the marsh, the natural resource stocks, their location vis-à-vis the marsh and occurrence of extreme events such as drought and catastrophic flooding (DENR, 2001). Table 1 shows types of population living within the marsh and their corresponding livelihood strategies.

---

<sup>4</sup> Adaptive strategies refers to applying a repertoire of practices adapted to local climatic and market conditions as a way of building the resilience of the stakeholders and the natural resource base (Moore, n.d.)



TABLE 1. *Livelihood Strategies in Lake Mambagongon and Sabang Adgawan*

Study Area	Lake Mambagongon	Sabang Adgawan
Location of Study Sites	The lake is part of Sitio Kiandag of Barangay Poblacion, Municipality of La Paz, Agusan del Sur.	One of the barangays of the Municipality of La Paz. Considered a buffer zone of the Agusan Marsh protected area
Types of Population	People in floating houses <sup>5</sup> who reside permanently in Agusan Marsh, mainly around the major rivers all year round.	People who live permanently on the periphery of the marsh and move into the marsh on daily basis. A floating barangay only during the rainy season (December-March)
Population		
Households	119	246
Individuals	624	1.202
Livelihood Strategies	Primarily Fishing	Mixed farming, fishing and other livelihood strategies

Sources: *Focus Group Discussions and DENR, 2001*

For both areas, highest rainfall occurrences are reported during the months of December, January and February. Dry months are experienced starting from March to July with the rest of the months unpredictable in terms of weather patterns. Because of the perennial flooding, houses are built of light materials designed with floaters made of bamboo poles and logs. Other houses in Sabang Adgawan do not have floaters but are built high above ground in preparation for the flooding period.

Flooding is an annual occurrence around the marsh barangays or communities. December to March are the flood months with waters reaching a high of six meters in Sabang Adgawan making it a floating barangay during this period while water depth in Mambagongon can reach more than 10 meters high during this same period. April to July is dry season while August to November are said to have unpredictable weather alternating between sunny and rainy. Most economic activities

<sup>5</sup>The floating houses consist of thatched timber or bamboo huts resting on a platform lashed to enormous logs. During the dry season, the houses may still float on the lakes, or they may be allowed to land high and dry on some of the riverbanks and islands (Hicks 2000:137)



are dependent on the seasonal patterns with overall living conditions adapted to the seasonal changes. Farming and fishing are the primary sources of livelihood for both communities, with more households in Mambagongon involved in fishing as many do not have farms to till.

A few households are engaged in selling (sari-sari stores), fish vending/trading, food processing and vending, and livestock raising (pigs, ducks and chickens). Others hire their services as seasonal laborers (farm workers, motor boat drivers, log towers, domestic helpers) depending on household needs at specific periods of time. Women are particularly active in seeking small-scale livelihood activities at different points in time (especially during crisis or difficult periods, that is, when the family is cash-strapped) in order to sustain their families.

### **Household coping strategies**

Coping mechanisms during extreme events such as the catastrophic flood in 1982 include kinship support and credit system, among others. But even during ordinary times because of poverty, the population faces crisis all year round. The first quarter of the year is marked by dwindling food supply as this is the flood season with households relying mostly on their small fish catch. By the second quarter, food is really scarce since household's financial resources have been depleted. They now depend on their fish catch in order to buy their food items for daily consumption. Also, this is the start of the planting season so money is further allotted for expenses related to land preparation. As the flood season and planting season are over, the next months are better since people look forward to the harvest seasons (August, November) and fish yield range from average to high depending on weather conditions.

The households spending and credit patterns are further connected to the season-based livelihoods they practice, as well as yearly community celebrations. Most spending is done during the planting months (March-April and August) and during feast days (August) as well as the Christmas and New Year (December-January). Another significant cost allotted by the households is for school expenses of their children. Hence, the opening and closing of classes in June and March, respectively, are periods when cash is most needed.

Dealing with crisis moments is not new to the households in the two communities. In fact, some residents commented that crisis does not bother them as much because it is already part of their lives.

Sometimes they can no longer define crisis vis-à-vis the hardships they continually experience living in the margins. Still they hope for better times and better opportunities to help improve their living conditions.

A number of survival strategies have been developed by the households to deal with difficult or crisis periods which are usually attached to the lack of cash and other resources to address their immediate (i.e., food, school and transport expenses) or emergency needs. Also included are their needs related to their livelihoods, particularly financing<sup>6</sup>. “Crisis” periods are connected with the seasonal changes; high water levels spell crisis as there is limited fish catch and no farming is done.

Women are recognized to be more “resourceful” in looking for means to help their families survive. They engage in different short-term income generating activities such as food selling or request for store credit to ensure meeting daily food needs. Others do laundry or get hired as domestic helpers for short periods of time. They move from one activity to another in response to needs and opportunities. A few of the men likewise look for other livelihood options (i.e., hired labor) in cases their main livelihoods are not sufficient to sustain their family needs.

Other commonly practiced strategy is the use of immediate social networks, particularly the family (both immediate and extended), to support the needs of the households. The first level is to seek the support of adult children (male or female, single or married) who have the possible means to provide for support, in kind or in cash. If children are unable, they go to other relatives and try to generate whatever limited support is available. It is acknowledged, however, that in most cases, their families are also experiencing the same difficulties being cash-strapped.

Beyond the family connections, a significant coping mechanism is the application for loans or credits from different sources, especially to answer their direct financing needs for their farming, fishing and other related livelihood activities. Households seek credit either from local traders/business persons from La Paz or where available, from local banks in the surrounding areas. Majority of those applying for short-term credit are women as men tend to “shy” away from

---

<sup>6</sup> Financing refers to the provision of financial capital to buy seeds, fertilizers and other agricultural inputs.

doing this although the decision to apply for credit is mostly a joint agreement between husband and wife as both will be responsible for the repayments. There are only a few cases when men directly apply for credit; some expressed this is done only when the wife is more afraid to avail of loans for fear of not being able to pay. A few households opt not to apply for loan as they are afraid to be in debt aside from not having the means to pay as they barely survive from day to day. In the study areas, a number of households in Barangay Sabang Adgawan have applied for short credit loans from the Rural Bank of Talacogon, Inc. (RBTI) more than those from Lake Mambagongon who mostly rely on kins for support.

### **Water and health: access, quality and supply**

Water is the critical main resource of the marsh communities as they depend on water for livelihood and for basic survival. A key problem is the availability of safe, drinking water in the absence of well-developed water systems in the communities, which affect health conditions. Most rely on rainwater or natural spring sources for drinking. In both areas, the limited rainwater collectors further affect their capacity to collect potable water. Moreover, the distance to potable water sources makes it an inaccessible resource for most households.

The usual women's tasks become more difficult with lack of safe, potable water or low water supply. It is difficult during dry periods as water levels are low. Likewise, during the flooded periods, rainwater is the main source of potable water as natural water sources are turbid as a result of heavy siltation and run-off from upstream and downstream. But with limited containers, households may experience water problems during the whole flood season.

The improper waste disposal in the area contributes to the pollution of water bodies. The degraded water quality adds to the problem of access to safe water with consequent effects on the health conditions of the community members. Water-related diseases, such as diarrhea, are prevalent. Children are the most susceptible. Their poor nutritional requirements add to their weak resistance against common disease. The water crisis, therefore, aggravates health problems with the immediate impact experienced by women as they are the recognized natural caretakers in their families. They are more disturbed and burdened when

sickness befalls the family as their poverty constrains their immediate access to medical and related support services. Moreover, health support is not immediately available considering limitations in public health resources while access to medicinal plants for immediate relief is difficult due to declining forest resources.

## CONCLUSION AND RECOMMENDATIONS

The study reveals that the livelihood and lifeways of people living within Agusan Marsh have been adapted to the seasonal changes of the marsh. The seasonal fluctuation of the quantity and quality of water as well as access of potable water are critical factors affecting livelihoods, health and overall well-being of the households.

Water remains as the critical main resource of the Agusan Marsh communities living within and in the peripheries of the marsh. Too much or too little water are extreme events that undermine their livelihood and also affect their health. Unavailability of safe, potable water aggravated by poor sanitation practices affects the health conditions of the communities. With no immediate facilities and mechanisms to seek for cleaner water, the community members' well being are at stake as they become prone to shifting climatic regimes and water-related health problems, with children as most susceptible. Sickness in the families entails additional costs that eat up the already limited income of the household. There are no immediate support mechanisms for health services with even access to local medicinal plants becoming limited as the forests are likewise exploited and diminished.

Based on the analysis of the context of the communities and the environment as well as suggestions that surfaced during the individual and group discussions, emerging long-term adaptive strategies of the communities are identified. Foremost is to find ways to improve the management of the water-based resources in the marsh leading to better productivity. Also, in the face of critical water needs in the marshlands, how can access and quality of water, and sanitation be improved? What appropriate infrastructures for resource provisioning such as water supply projects can be critically designed that can withstand the seasonal fluctuations and changing climate regimes in the region? In addition, what type of garbage disposal or sanitation system and practices can be designed, programmed and promoted that are appropriate for

perennially flooded or permanently floating communities? Better adaptive strategies have to explore critical resource management policies, and action mechanisms should be set in place together with communities to help improve the environmental quality of the ecosystem vis-à-vis the changing climate regimes so that it can continue to sustain the livelihoods of the Agusan marsh communities.

## REFERENCES

- CARBDPPMO.(2003). *Lower Agusan development project, stage I, phase II: Study on watershed management and FWS of the Agusan river basin*. [Final Report] Philippines: Department of Public Works and Highways.
- DENR. (2001). *Agusan marsh management plan*. Agusan del Sur, Philippines: Department of Environment and Natural Resources.
- Hicks, N. (2000). *The national parks and other wild places of the Philippines*. London: New Holland Publishers (UK) Ltd.
- IPCC 2007a. (2007). *Climate change 2007: The physical science basis*. Cambridge, UK: Cambridge University Press.
- IPCC 2007b. (2007). *Climate change 2007: Impacts, adaptation and vulnerability*. Cambridge, UK: Cambridge University Press.
- Ramsar Convention Bureau. (1999). *Information sheet on Ramsar wetlands*.
- Villarin, J.R. & Avila, F.B. (2006). Is Climate Changing in Mindanao? *Agham Mindanaw* 3:1-12.

