

# Assessment Of Water Resources Management of Indigenous People in Pampanga

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**Abstract:** - Limited human access to water makes well-managed water resources crucial. Indigenous people (IP) are prone to water scarcity. A shortage of water supplies mainly causes this obstacle; IP's practice techniques can also be a concern. This study assessed the indigenous people's water resources management in Pampanga, including the information about the water availability, practices in utilizing the water, resource sufficiency, and the actions taken by respective Local Government Units (LGU) in the management of water resources. Cross-sectional quantitative and qualitative methods were administered to evaluate the problem. Two communities with the highest population in Pampanga were chosen; one hundred forty-six (146) households in Barangay Nabuclod, Floridablanca, and one hundred sixty-nine (169) families in Barangay Camias, Porac were surveyed to represent two communities by non-probability convenience sampling. In each community, community leaders and the LGU officer-in-charge were also interviewed to determine the actions taken by the government. The findings showed that, one characteristic that affects the managerial practices of IPs is the low benefit from natural water resources, which leads to poor managing behavior. It was also determined that the knowledge about good water management is crucial; the lack of laws and regulations in their civilization contributes to the depletion of their natural resources. Seminars and training were also significant factors enabling IPs to be accountable for their help. The statistics suggested that infrastructure support is not particularly beneficial because a project will fail as long as the managerial behavior of IPs is insufficient. Overall, accessibility of the resources should be a top priority for them to learn how to improve and make a good management of water.

**Key Words:** *Indigenous People, Pampanga, water resources assessment, water resources management.*

## I. INTRODUCTION

Billions of people do not have access to clean drinking water, that is described as being available on-site, accessible when

needed, and free of pollutants [1]. Over the years, water availability has decreased. This dilemma is the result of growing water demand as a result of economic and population growth and decreased water availability as a result of the deterioration of the nation's forest watersheds [2].

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Water scarcity exists in some locations due to water availability restrictions, groundwater depletion, deterioration of freshwater supplies, and the rising expense of developing new water sources. Certain parts of the country suffer from severe water shortages. The situation is unlikely to improve without

concerted work on water management's supply and demand sides. When water is scarce, people are frequently forced to rely on potentially unsafe water sources [3].

Future water quality is one of the most serious environmental issues in the majority of Asian developing nations, such as the Philippines. Approximately one in ten people still lacks access to improved water sources [1]. The Philippines will have a "high" degree of water scarcity in 2040. Inadequate and erratic water supplies can have serious health effects in Metro Manila and adjacent rural areas [3]. Additionally, this will lead to a lack of basic hygiene, including the capacity to wash one's hands and clothes and the ability to guard against contracting illnesses transmitted by contaminated food and water.

Indigenous peoples face systemic discrimination and persistent exclusion from political and economic power in many parts of the world, resulting in ongoing marginalization. They are frequently marginalized, resulting in insufficient access to water and sanitation services and poor health outcomes [4].

The Aetas, one of the largest ethno linguistic groups in the Philippines in terms of population, are indigenous people who live in various mountainous areas throughout Luzon. Different health problems are primarily due to a lack of access to clean and safe drinking water. The most affected are the children who developed infections because of poor hygiene and sanitation due to the unavailability of potable water [5]

Proper assessment of their water resources management was required to investigate current and possible problems that may arise. So, an assessment was undertaken to address the issue of Aeta Communities in Pampanga on their water system. Two indigenous cultural groups were chosen from a thorough list of Pampanga municipalities that represented the IPs by the highest number of households. The Barangay Camias under the town of Porac, Pampanga, contains 896 families, and the town of Floridablanca includes 774 houses in Barangay Nabuclod.

This study determined the community's available water resources, their utilization, factors leading to water sufficiency, as well as the activities taken by the Local Government Unit in managing the community's water. This information will provide an excellent foundation for responsible agencies to implement policies and practices that will aid in devising a solution that includes providing equal access to water resources and better water resource management.

## II. METHODOLOGY

Data validation was essential to identify the IP communities in Pampanga to begin the assessment. The list of communities and their populations were formally sought at the Region III NCIP office. The requirements were handed on to the NCIP office for review and approval of the research study.

The study's objectives were addressed using cross-sectional quantitative and qualitative measures. A structured survey questionnaire was given to the three hundred fifteen (315) samples acquired from the Cochran formula. One hundred sixty-nine (169) were from Barangay Camias, while one hundred forty-six (146) were from Barangay Nabuclod; the following respondents were selected using a non-probability convenience sampling.

The questionnaire was divided into two (2) parts; the first was about the availability of water and the practices of the locals in its utilization, while the second was about the factors affecting the water sufficiency in their community. Multiple choices were provided in each question, and the respondents were asked to choose which applies to their household situations. The study instruments were submitted to the NCIP office for verification before face validation of respondents. Before the actual survey was conducted, the instruments were thoroughly validated by three professionals following face validation in each community

An open-ended interview was conducted with community leaders and the LGU officer-in-charge as part of the study's qualitative methodology. A different set of questions was provided for the two (2) participants; LGU officers-in-charge and community leaders. The questions vary on their position as a leader in the community and as an LGU officers. Before conducting the interview, the interviewees were given letters requesting permission to ask questions and availability on the scheduled date. Additionally, audiotapes and images were employed during the interview process.

Descriptive statistics were used to determine the frequency and percentage response distributions per question. The survey data were collated in preparation for descriptive statistics analysis. After identifying the tally of results per question, it was measured through frequency measures to represent the result through a value by the number of its occurrences.

Interviews with local government officials and community leaders were analyzed using thematic analysis. This approach is appropriate for identifying meaning patterns across data on acquired topics. The transcriptions were manually coded to generate codes as the first stage in identifying basic themes. These topics are examined and recognized before being included in the final report.

#### Validated Survey Questionnaire:

##### Part 1: Objective 1

###### 1.a Availability of water

- Q1. How many sources of water do you have?
- Q2. What type of source of water do you have?
- Q3. Does the water have a smell?
- Q4. What does the water taste?
- Q5. What does water look like?
- Q6. Is there anyone of you who got sick because of the water?
- Q6.1 If yes, what illness it is?

###### 1.b Practices

- Q7. Where do you usually use the water on your daily lives?
- Q8. Is the water source you use for drinking and cooking the same?
- Q8.1 If yes, what practice do you have to treat or filter the water you drink?
- Q8.2 If no, aside from that specific water source, where do you fetch the water?
- Q9. Who manages your water at home?
- Q10. Do the community use water for livelihood, occupation, and agriculture?
- Q10.1 If yes, what it is?
- Q10.2 If yes, where do you get your water?
- Q11. Do you save and use used water for other purposes?
- Q11.1 If yes, what used water is used again?
- Q12. Do you collect and store rainwater?
- Q13. Who is the head or the one who leads in managing water within the community?
- Q14. Do women in your community have the power to voice out their part in managing water?
- Q15. Is there somebody from LGU or Government who instructs how to manage the water within the community?
- Q15.1. If yes, what programs were implemented in the barangay?
- Q16. What are the rules and regulations needed to be followed in getting water?
- Q17. Are the people or the process systematic in fetching water within the community?

##### Part 2: Objective 2

###### 2.a Sufficiency

Q18. Does the amount of water you fetched enough for the family?

Q18.1. Why it is not enough?

###### 2.b Factors affecting the sufficiency

- Q19. From your house, how long does it take to get water?
- Q20. How many buckets of water do you usually fetch and consume in one day?
- Q21. In which month do you usually face water shortages?
- Q21.1 Do you still experience water crisis on rainy days?
- Q22. Do you buy or pay to have water?
- Q23. On fetching water, is there a limitation on how many buckets of water they can get per family?
- Q23.1 If yes, how many buckets of water are allowed to get?
- Q24. Is there a scheduled time when you are allowed to fetch water or not?
- Q24.1. If yes, what time is not allowed?
- Q24.2 Why is it not allowed to fetch water at that specific time?
- Q25. How many people live in your home?
- Q26. If the water supply is far from your house, is there someone
- Q27. Who usually fetches water?

#### Validated Interview Questions for LGU-officer-in-charge:

1. What is the role of Local Government Unit in managing water resources in Aeta Community in your area?
2. Is there any assistance being provided by the government to rehabilitate and offer adequate programs for the community to have access to clean water?
3. What is your role in maintaining the water resources well-organized and clean?
4. What guidelines do you implement that IPs should follow to ensure they don't get into trouble while getting or fetching water?
5. Identify the factors or problems with implementing sustainable water resources management in the community
6. In the community's current situation, is there enough water available for the people?
7. What plan or program do you want to provide and implement in the coming years?
8. How do you provide Aeta Groups with equal access to waters in accordance with their rights?
9. One of Integrated Water Resource Management's (IWRM) goals is to value the views of women about water management. Based on your initiatives, have indigenous women participated in implementing water management in their area?
10. What is the role of each woman and man in the implementation of sustainable water resources management?

What has been the result or impact of the participation of various community sectors in water management?

11. Regarding people with disabilities (PWDs) or the elderly (Senior Citizens) who have difficulty accessing and fetching water, how do you ensure they also have adequate access to water?

Validated Interview Questions for Community Leaders:

1. Do you know anything about the water programs implemented in your barangay?
2. In the situation of your community has, is the water resource enough for everyone who lives here?
3. What are the guidelines that individuals must follow in the barangay when fetching or obtaining water for proper management?
4. How do you value and conserve the community's available water resource?
5. Do you think the community's water management is well-organized and efficient? What do you believe should be valued more highly?
6. Do you make sure that everyone in the community including the elderly, children, and the sick has access to water? How?
7. How do the following perform their role in water management?
8. What do you think the cause of your community's lack of water resources is?

### III. RESULTS AND DISCUSSION

The quantitative data gathered are divided into two (2) parts represented as the objectives 1 and 2 of the study and are broken down into subcategories.

The first objective includes information about the availability of water resources in their community and their practices in utilizing these resources, which have been broken down into two (2) parts. These parts are questions related to determining (1.a) Availability of water resources and (1.b) Practices in utilizing water resources.

Table.1. presents the summary of the availability of water in the two Aeta Communities.

*Table 1: Summary of the Availability of Water*

Questions	Nabuclod	Camias
1. How many sources of water do you have?	1	1
2. What type of source of water do you have?	Water spring	Purchased water

3. Does the water have a smell?	None	None
4. What does the water taste?	None	None
5. What does water look like?	Clear	Clear
6. Is there anyone in your household who got sick because of the water? 6.1 If yes, what illness is it?	None Diarrhea; Abdominal Pain	None Diarrhea

In relation to the availability of water, the responses of the two communities are comparable. The majority of respondents from both communities rely on a single source of water; however, the sort of water resource on which they rely differs, as Barangay Nabuclod relies on spring water and Barangay Camias relies on purchased water. This indicates that a greater proportion of respondents in Camias are able to purchase water than respondents in Nabuclod, who rely on spring water for free. In both barangays, the water is described as odorless, tasteless, and transparent. In both communities, the majority of responses indicate that no one in the home became ill due to the water, and if they do, Nabuclod causes diarrhea and abdominal pain with the same number of responses, but only diarrhea in Camias. This indicates that because Nabuclod residents rely on spring water, they are more susceptible to infectious disease than Camias residents who purchase their water.

Table 2 presents the summary of household practices. In barangay Nabuclod, water is typically used for drinking, whereas in barangay Camias, water is mostly used for cooking. Other than the utilization of water, other responses are identical, such as the supply of water for drinking and cooking being the same in both villages. Both communities do not treat their water, since they drink it as it is. The mother manages the home water most of the time. Both communities have agricultural activity, such as farming, that requires water use, and their source of water for this work is rain water. Both Barangays Nabuclod and Camias recycle water and collect rainwater.

Table.2. Summary of Household Practices

Questions	Nabuclod	Camias
7. Where do you usually use the water in your daily living?	Drinking Water	Cooking

8. Is the water source you use for drinking and cooking the same?	Yes	Yes
8.1 If yes, what practice do you do to treat or filter the water you drink?	None	None
8.2 If no, aside from your specific source where do you fetch your drinking water?	Purchased Water	Purchased Water
9. Who manage your water at home?	Mother	Mother
10. Do you have occupation and agriculture works that requires the use of water?	Yes	Yes
10.1 If yes, what kind of work?	Farming	Farming
10.2 If yes, where do you get you water for the work?	Others (rain water)	Others (rain water)
11. Do you make use of used water for other purposes?	Yes	Yes
11.1 If yes, what used water is used again?	Used in washing dishes	Used in washing dishes
12. Do you collect or store rainwater?	Yes	Yes

Table 3 presents the summary of the Factors that Affects the Utilization of the Community. The water of both communities is controlled independently, women have a say, and there are no LGU or government directives about the management of their water. According to the residents of both settlements, they observe the same norms and regulations when getting water. Consequently, the community's water-gathering procedures and personnel are in order.

Table.3. Summary of the Factors that Affects the Utilization of the Community

Questions	Nabuclod	Camias
13. Who is the head or the one who leads in managing water within the community?	Individually	Individually
14. Do women in your community have the power to voice out their part in managing water?	Yes	Yes
15. Is there somebody from LGU or Government who instructs how to manage the water within the community?	No training	No training

15.1 If yes, what programs were implemented in the barangay?		
16. What are the rules and regulations needed to be followed in fetching water?	Others (Falling in line)	Others (Falling in line)
17. Are the people and process are in order in fetching water within the community?	Yes	Yes

The second objective of this study is to determine the conditions or factors affecting the sufficiency of water supply. This objective is broken down into two parts: questions related to (2.a) the sufficiency of water and (2.b) factors affecting the sufficiency of water.

Table 4 presents the summary of the sufficiency of water. It showed that a high percentage of Indigenous people in Pampanga experience insufficiency of water. According to the data gathered, there are three (3) main reasons why water supply is insufficient in their family: (1) they have too many members in their family, (2) there are too many household chores that need water, and (3) the water they fetch is limited.

Table.4. Summary of the Sufficiency of Water

Question	Nabuclod	Camias
18. Does the amount of water you fetched enough for the family?	No	No
18.1 Why it is not enough?	The water we fetch is limited and not enough for our everyday needs	There are plenty of household chores that need water, just like laundry and cleaning the house

Table 5 displays the statistics on the community's water resource sufficiency. According to the data collected, the primary water source was a spring/seep, which takes a long time to reach. It demonstrates that having water takes time for the Indigenous Peoples of Pampanga. The data recorded shows that a high percentage of the respondents say there is a water shortage in the summer season, which means that the season/climate affects the sufficiency of their water resources.

Table.5. Summary of the Factors Related to Water within the Community

Question	Nabuclod	Camias
19. From your house, how long does it take to get water?	2 – 3 hours	Less than or about an hour

20. How many buckets of water do you usually fetch and consume in one day?	1 up to 3 buckets	4 up to 6 buckets
21. In which month do you usually face water shortages? 21.1 Do you still experience water crisis on rainy season?	March, April and May No	March, April and May No
22. Do you buy or pay to have water?	No	Yes
23. On fetching water, is there a limitation on how many buckets of water you can get per family? 23.1 If yes, how many buckets of water are allowed to get?	No 1 up to 5 buckets	No 1 up to 5 buckets
24. Is there a scheduled time when you are allowed to fetch water or not? 24.1 If yes, what time is not allowed? 24.2 What's the reason why it is not allowed to fetch water at that specific time?	None 6pm to 6 am The water station is closed	None Every Sundays The water station is closed

Table 6 presents the summary of factors related to household. Regarding the household-related parameters, both communities have the similar response. There are between four and six people in their household, and their father fetches the majority of their water. This section only underscores that both communities struggle to provide an average of four to six people.

Table.6. Summary of Factors Related to Household

Question	Nabuclod	Camias
25. How many members who live in your household?	4 up to 6 persons	4 up to 6 persons
26. If the water supply is far from your house, is there someone who helps you fetch water?	Yes	Yes
27. Who usually fetches water?	Father	Father

The study's third goal was achieved through interviews with community leaders and LGU officers-in-charge in both villages, along with additional information received from residents during the survey. Thematic analysis was used to collect and analyze the information. Answers from the two sets of questions given to the LGU-officer-in-charge and community leaders were divided into themes and grouped it into (6) subcategories, with each category representing the elements that influence the LGU's and communities' water resource management decisions.

### 1. The State of Communities

According to the collected data, both villages are currently witnessing a severe water deficit. They have no access to safe and drinkable water other than water transported from the lowlands and their "water spring or seep," a tiny natural spring of fresh water.

### 2. The Support of Local Government Unit

According to the LGU officials interviewed from the two towns, they constantly put together water system assistance programs for each community. Despite water limitations in some areas, the officers said they did not stop conducting seminars and programs that teach IPs about safe water usage. Each LGUs top objective is to educate the residents on the significance of water to properly use their water resources.

### 3. Challenges of LGU in IP Communities

Both officers acknowledged the difficulties associated with conducting community programs. As much as the LGU desired to construct a water system for the IPs, the finances and method prevent it from providing each IP community with pure water. The greatest obstacle is the continual and ongoing task of training the IPs on how to care for their government- or NGO-supplied water resources. They are connecting the problems, stating that regardless of how hard they work, projects will fail, and communities will face water deficiency if they do not know how to value these resources.

### 4. Challenges of Communities

According to the natives, water is essential to existence. Therefore, lack of access to clean water is a grave concern that requires a prompt response. The following are the primary challenges that the communities are currently facing; (a) Insufficient access to safe and affordable water/insufficient water supply, (b) Drought, and (c) Lack of funds/support.

### 5. *Inclusivity of Water Resources*

Active community involvement has been a significant tenet of water resource management. Inclusion is not limited to gender equality. In addition, it also considers senior citizens and individuals with disabilities. Those with impairments and old age, according to locals, are the ones who suffered the most with their system. Some of them have family who could aid them with their needs, while others have only children who cannot yet obtain water independently. They have no choice except to purchase water; if they lack funds, they must conserve it until they can afford to buy another gallon.

### 6. *Sustainability of the Water Management Resources*

Maintenance is a factor that must be considered regularly to ensure the resources' long-term sustainability. Both LGUs have implemented tangible initiatives for the water management of IPs, and other sectors are collaborating to assure the long-term availability of water in the communities. Even though they are not achieving their water supply needs due to various causes (water quality, water scarcity, information gaps), their condition has a significant opportunity for improvement if the appropriate attention is given. Participation of the people is essential in developing a project or program to create a sense of ownership and produce accountability and effective system management during and after project implementation.

## IV. CONCLUSION AND RECOMMENDATION

The principal water source was discovered to be a water spring, a form of traditional supply of water that only produces water seeps. Although the water obtained has no unpleasant odor, taste, or look and has not caused illness in the occupants, it cannot be guaranteed to be safe and clean. It is the biggest issue both populations face; because of water scarcity, hygiene practices such as bathing, cleaning dishes, washing clothes, and even using the restroom are deemed less necessary. The health of those regarded crucial is also harmed, particularly children. Poor regulation execution is also a significant factor that must be addressed; because there are no laws to follow, the water resource is not adequately managed, allowing it to be polluted by waste. On the other hand, the lack of restrictions has a positive result in that instead of people becoming greedy with water, they help one another and ensure that everyone gets their fair amount.

It proved that the management and sustainability of these resources by IPs relies only on the availability of their water resources. It was revealed that the type of water resource had a substantial effect on the management of IPs over their

resources. Management of water resources should be a primary concern for both the local government and the community. The government must guide and educate the IP communities on the importance of all resources, regardless of size. Therefore, laws must be applied strictly, and protocols must be adhered to. Since IPs could not recognize the significance of their water resource due to their limited supply, they must first learn to value the few resources they do have. Additionally, the communities should be willing to adhere to the LGU's plan, regardless of whether the actions are tangible or intangible. In the absence of cooperation from the other party, neither party's proposal will be successful. For improved communication and more efficient resolution of the problem, both LGUs and IPs must work together.

Being innovative is necessary to avoid significant water management problems. If current course is continued, current prediction models may cease to function entirely. Governance and regulatory frameworks must be identified, developed, and then implemented that can steer toward a path of long-term, sustainable growth. This concept necessitates a governance structure with a greater scope that can aid in the resolution of persistent and recurring problems. Taking into account all aspects and governance measures, including technological challenges, scientific research, education, tradition, communication, and participation, water management can be improved for the most disadvantaged groups, especially indigenous people.

Based on the results and conclusions presented, the recommendations concerning the highest priority of water that the research within which the study is designed should reflect inter-disciplinary, broad systems supply, uncertainty, and adaptation of the IP communities of Pampanga for their water resources and the need for active cooperation. The following recommendations are divided into two (2) categories:

### 4.1 *For the IPC's Local Government Unit*

- To meet the community's water demand, conducting a feasibility study will be an appropriate answer for a better water distribution system.
- To provide a system of rules, regulations, and policies to the community as part of water management may alleviate water scarcity.
- All levels of government and non-governmental organizations (NGOs) should recognize the potential utility of water transfers as a means of reacting to

fluctuating needs for water resource use. In addition, they should encourage voluntary water transfers as part of plans for overall water allocation and management, subject to protocols designed to safeguard well-defined interests. Communities should focus on water conservation and protection of groundwater surface of water resources should be a top priority for a better health outcome of the locals.

#### 4.2 For the improvement of paper

- In order to improve the work, it would be beneficial to include potential solutions to the challenges highlighted, especially for the communities that were researched. More relevant studies are required to address the study's proposed remedy.
- Additionally, water testing can be conducted to ensure the safety of the water in the community or conduct day-to-day observations to assess the present situation in the community. The data in this study are taken at a certain time and does not ensure the exactness of the data in the future. Since the study is about a community that is constantly changing, future researchers must make sure that the data they use is up-to-date.
- The relationship between the management of IPs and accessibility to water resources must be taken into consideration. There is also a requirement for comparative research between two (2) seasons and the weather's impact on their water availability.

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