

## **Identifying Environmental Changes in Mt. Data Watershed, Bauko, Mt. Province, Northern Philippines: Implications to Sustainable Management**

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### ***Abstract***

*This study examined the environmental changes in Mt. Data watershed, Northern Philippines over the last 50 years and how such changes affected sustainable management. The site is a protected area and forms part of the Kabatangan Ancestral Domain, home of the Kankana-eyes.*

*Using an exploratory case study approach, the researcher conducted key informant interviews and validated findings with the community. Oral accounts revealed that the conditions of Mt. Data watershed have drastically changed over the last 50 years. The area was once thickly forested but today, forests have been converted into vegetable farms and only mere patches of forests remain. Alongside this changing land use, wildlife populations also declined. There has also been high influx of migrants.*

*As such, the indigenous knowledge systems and practices (IKSP) -- specifically those concerning wildlife species, which used to be indicator of environmental changes in the area -- are mostly confined to elders and have not been transferred to younger generations. One example is the Red-throated Pipit (*Anthus cervinus*) locally called "killing," a migratory bird that signifies the start of winter season in the area. Likewise, the observance of agricultural rituals has also been disregarded.*

*Although there is a collective consciousness of the IKSP's importance among the people, modernization has already set in. Thus, there is a danger that IKSP would be lost due to rapid environmental, social, economic, and political changes.*

*Today, although Mt. Data watershed is considered important by the residents, the resource has become a "tragic common" commodity due to commercial farming. There is a need to re-open the minds of both migrants and locals to make them recall the goodness of a sustainably managed watershed. Their IKSP, which adheres to the principles of sustainable development, should be revived and strengthened so that the once rich ecosystem may be restored.*

*Keywords: indigenous knowledge, protected area, sustainable management*

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## Introduction

A number of studies have already been conducted to find out how people relate with the environment. The end goal is to determine ways to help resource managers understand the important role of people's experiences and perceptions when establishing policies and practices related to natural resource management.

In the Philippines, the most biologically diverse areas are often occupied by indigenous peoples (IPs). Their indigenous knowledge systems and practices (IKSP) have enabled the IPs to tap their natural resources in a sustainable manner, and at the same time ensured that their lands are protected for many generations. The link between life and land is deep-rooted for IPs because it is where their culture, language, and traditions have evolved and developed. Their ancestral domain over these lands is crucial to their survival (Indigenous Perspectives Vol. 8 No. 1, 2006). The IKSP in Cordilleras, Northern Philippines is very diverse -- complementing the region's unique biological and physical resources. Local variation in terrain, elevation, climate, and hydrologic conditions has brought about a rich diversity in biological resources (Boquiren, 2003).

IKSP are the direct outcome of the IPs' responses to certain needs consisting of adaptive mechanisms which have allowed them to survive and thrive within their given socio-cultural and biophysical conditions. As keepers of traditional knowledge, IPs practice the sustainable use of resources. Conservation and equity seemed new concepts during the 1992 Rio Earth Summit but for IPs, these principles have been around for a long time (Malanes, 2006).

However, as landscapes change and people migrate and relocate, environmental perception and values can be affected (Lacerna, 1997). Alongside, these also change the environmental conditions of a certain area. "Human perceptions have far reaching consequences for definitions and uses of resource systems. 'Habitats' and 'resources' do not exist by themselves. They become so through human processes of perception, cognition, and action. Traditionally-derived perceptions and cultural orientations of people residing within and using a habitat determine the basic conditions of their work and their impact on their ecosystems" (Ferrer, 1992 as cited by Lacerna, 1997).

As such, this study examined the environmental changes of Mt. Data Watershed in Bauko, Mt. Province over the last 50 years and its implications to sustainable management. This study could generate information that will help in forming an effective conservation program in the area. Likewise, results of the study could lead to the enhancement of useful conservation practices and possible removal of harmful practices.

## **Methodology**

### ***Study Area***

This study focused on Mt. Data Watershed in Bauko, Mt. Province located at 16° 59' 0" N, 120° 52' 0"E. The watershed is classified as a pine forest under the premises of Mt. Data National Park (MDNP), a declared protected area (PA) by the Philippine Department of Environment and Natural Resources (DENR) and a key biodiversity site of the Cordillera Administrative Region (CAR), Northern Philippines. The watershed also forms part of the Kabatangan Ancestral Domain, located in the southern part of Bauko and home of the Kankana-eyes. Kabatangan is the Kankana-ey term for pine forested area.

### ***Research Design***

An exploratory case study approach was used to determine the past and present conditions of Mt. Data Watershed. This type of study is considered as a prelude to social research. The study employed the participatory rural appraisal (PRA) to gather pertinent data and documents. A site reconnaissance followed by a courtesy call was conducted in early January 2010 to determine how actual data gathering would proceed. The site reconnaissance helped determine the study's scope.

To draw out important events and other aspects of culture, key informants including Sangguniang Barangay representatives, Mt. Data Hotel workers, and elders were interviewed. Interviews were informal and conversational although questions were pre-determined. A group of *oblantes* (farm workers) were also interviewed to identify collective problems. Their stories and historical accounts were validated using available secondary data. During the key informant interviews, two local guides were employed since most residents do not speak Tagalog. Results of the study were then presented and validated with select residents of community.

## **Results and Discussions**

Environmental conditions of Mt. Data watershed have drastically changed over the last 50 years. What was once a sustainably managed watershed has now become a "tragic common" commodity. This is evidenced by losses in terms of forest cover as well as local extinction of wildlife. These negative changes in the environment can also be equated with the gradual erosion of IKSP in the area. The rich culture of the Cordillera region matches its rich biological resources. However, there is a danger that their IKSP would be lost due to rapid environmental, social, economic, and political changes.

Over time, the IPs have been replaced by migrants. Their IKSP were mostly confined to elders and have not been transferred to the younger generations. There used to be a Council of Elders but at present, the major decision-making body is the Sangguniang Barangay. Coupled with the development of farm-to-market roads and onset of modernization, Mt. Data watershed became more exposed resulting to further

conversion of its pine and mossy forests into vegetable farms, which serve as the residents' main source of income. Table 1 presents a comparison of the past and present conditions of Mt. Data Watershed.

Table 1. Comparison of the past and present conditions of Mt. Data Watershed

PARAMETER	PAST	PRESENT
Forest cover	The place was once thickly forested and served as hunting ground of IPs. Logging concessions started in 1946 while commercial farming was introduced by the Chinese merchants in the 1950s.	Grasslands are scattered throughout the area, mixed with remaining patches of pine forests.
Presence of wildlife	Diverse species of birds abound in the watershed. Large mammals were hunted by locals as food.	Few wildlife are found in the area. Some birds have already become locally extinct.
Protective functions of forest resources	Due to the area's mountainous terrain, the forests serve as protection against erosion.	The region was severely affected by Typhoons Ondoy and Pepeng in 2009 which resulted to massive erosion and flooding in downstream communities.
Demography	The expansion of Heald Logging Company's operation caused an increase in population with the continuous hiring of laborers.	There is a high influx of migrants in the area. Most IPs have migrated into La Trinidad and/or Baguio City.
Local controls	The Council of Elders is consulted when making community decisions.	Members of the Sangguniang Barangay serve as decision-makers in the barangay.
Agricultural practices	Indigenous practices are being employed.	Inorganic farming, which uses fertilizers and pesticides, is the more common practice. No fallow period is observed.

### **Forest Cover**

Mt. Data watershed was once thickly forested and a hunting ground of IPs and natives from other areas. In 1946, the logging concession of the Heald Lumber Company established the sawmill in nearby barangay (also called Mt. Data). This eventually led to the watershed's deforestation; conversion of remaining forests to commercial farms followed thereafter. The advent of commercial farming in the 1950s as introduced by Chinese merchants as well as the establishment of Mt. Data Hotel in 1960 further catalyzed forest cover loss. As a result, there are only few Kabatangan areas that remain to this day. Ocular observations conducted in 2010 verified the extent of forest cover loss particularly in Sitio Osok, Mt. Data; grasslands are scattered throughout the area or mixed with remaining forests.

### **Presence of Wildlife**

Since forests serve as habitat for wildlife, there are many adverse effects of forest denudation to them. Dwindling forest cover results to habitat loss and fragmentation. This eventually leads to decrease in species number and diversity and increase in number of tolerant species such as exotic rats and other fruit bats. Often, species response negatively when there are no habitable patches in the fragment. In the end, its population is likely lost and would find it hard to recover.

Aside from forest cover loss, wildlife mortality is also affected by the practices of locals in the domain. In Mt. Data, any form of wildlife is considered food by the locals regardless of its conservation status. The practice of consuming wildlife as food is common in most indigenous communities. However, with the continuous increase in population, the battle has become a “survival of the fittest” where people and wildlife compete.

Local frogs (tukak) called “bakbak” and “kadew” are eaten. Respondents claimed that the introduced giant marine toad (*Bufo marinus*), which they call bullfrog, is absent in the area. The reptile “banyas” or monitor lizard (*Varanus salvator*) is considered a viand while the house lizard (*Hemidactylus frenatus*) called “alutiit” is considered poisonous.

In terms of its avian populations, the Red-throated Pipit (*Anthus cervinus*) is a migratory bird which indicates a change of weather in the area. Respondents said that it is first seen during the last week of October or first week of November to signify the arrival of the last typhoon for the said year and marks the start of winter season. During its first sighting, the species lacks its red throat. The red spot signifies breeding. After two weeks or so, this becomes more prominent. Alongside the change in its color comes the opening of sunflowers.

The traditional practice called *ikik* is strictly prohibited by the Kabatangan Ancestral Domain Indigenous Peoples’ Organization (KADIPO). *Ikik* is done by lighting a tree during the night to attract and trap avian species. Trapped birds are either eaten or sold to pet traders. Elders reported that some avian species which were abundant before are no longer sighted and/or very scarce today. These include the Montane Racquet-Tail (*Prioniturus montanus*), Philippine Tailorbird (*Orthotomus chloronotus*), and White-cheeked Bullfinch (*Pyrrhula leucogenis*). Most species became locally extinct due to poaching and hunting.

On the other hand, *anop* is the practice of hunting mammals. Mt. Data watershed is almost devoid of mammalian populations which have been lost due to excessive hunting by the locals. Large mammals such as *bowet* (squirrels), *bango* (wild pigs), and *ugsa* (deer) are absent in Mt. Data watershed but are still present in nearby Mt. Kalawitan. Cloud rats which have been reported by Heaney and Balite in 2006 are also possibly very scarce or locally extinct since most respondents were unaware of their existence.

### ***Protective Functions of Forest Resources***

Despite its mountainous terrain, Mt. Data forests serve as protection of the locals from erosion. But with the loss of forest cover, the area became more prone to erosion especially when it is hit with strong typhoons. The next strike of a strong typhoon on Mt. Data can result to massive erosion and flooding downstream, with potentially severe damage (Heaney and Balite, 2006). In 2009, the Cordillera region was severely affected by Typhoons Ondoy and Pepeng. Since Mt. Data forms the headwaters of major rivers, these typhoons posed danger to many human populations. At the time of the study, the residents can still clearly remember the impact created by the said typhoons.

In terms of temperature, Mt. Data boasts of the so-called “Philippine winter.” Large portions of the area are covered with frost from the months of December to February. At present, however, there is thinning of ice. Frost is seen only in areas near water sources unlike before where it almost covers the entire highway. The thinning of ice coupled with the decrease in number of trees should have resulted to a warmer climate in Mt. Data. However, respondents claimed that it is colder today than before. Recorded temperature in Mt. Data Hotel is also lower than in recent years. These events could be early manifestations of climate change. However, further studies are still needed to validate this.

### ***Demography***

About 50 to 60 years ago, elders claimed that there were few inhabitants in the domain. As the Heald Logging Company in nearby barangay Mt. Data (aka Sawmill) expanded its operation in the early 1950s, population increased with the continuous hiring of laborers. Laborers are often migrants from nearby provinces. Alongside, commercial farming started to flourish. Over time, the IPs recognized the potential income that farming can bring. As such, they moved to La Trinidad and/or Baguio City where farm products are more profitable. Most opted to permanently settle there and returned to Sinto only during harvest time to gather their farm produce.

To date, residents near the watershed only hold tax declaration; no formal land titles are issued. Occupants are mostly migrants working in the farms since most IPs who have the tax declaration have migrated elsewhere. Tenurial arrangements for both indigenous communities and migrants can affect environmental protection initiatives. Without tenurial security, residents have fewer reasons to be effective stewards of resources.

### ***Local Organizations, Control, and Management***

The Sangguniang Barangay is a highly recognized authority by the people of Sinto. The barangay captain is important and influential in the community. Back in the old days, there was a Council of Elders but with modernization, barangay officials became the more active leaders in the community. Most political functions have been transferred to the local government. The elders can still be consulted by barangay officials on political matters affecting the community and are still regarded with high

respect.

### ***Barangay Ordinances***

There are a total of 20 barangay ordinances enacted by the Sangguniang Barangay of Sinto. From these, only four ordinances are related to watershed use and management (Table 2). However, these local policies are not necessarily aimed at watershed protection and conservation. Moreover, there are problems in terms of implementing existing ordinances and securing funds for employing forest guards. As such, domestic wastes are still dumped in the watershed. Since no forest guards are employed, monitoring is difficult. Likewise, it is easier for visitors to take samples of flora and other specimen from the area.

Table 2. Barangay ordinances related to watershed use and management

<b>ORDINANCE NO.</b>	<b>PROVISION</b>
08	Prohibiting person/s and vehicle/s to dump or dispose garbage along the road and any places especially on water sources such as rivers, drainage, canals within the vicinity of Barangay Sinto
09	Prohibiting the use of drinking water for watering garden plants in anytime of the year and prohibiting the use or preparation of chemical sprays near/around drinking community water sources
10	Prohibiting leakage of faucets that originates from the community water source
11	Prohibiting stray animals to roam in vegetable gardens, water sources, school perimeter, and barangay plaza

### ***Agriculture***

The people of Sinto highly depend on agriculture as their main source of livelihood. The weather in the area is conducive for vegetable farming. Among the top crops planted in the area are cabbage, potatoes, and carrots. According to the farm workers, cropping seasons are normally twice a year but when there is good irrigation, they can manage three or more planting seasons. This continuous cropping does not allow the soil to rest. Even more unfortunate, the more common practice in the area is inorganic farming.

The intensification of vegetable farming, with chemical inputs such as fertilizers, pesticides, fungicides and herbicides, as well as human waste, have introduced pollutants to the watershed that substantially lower the quality of drinking water for people in communities around Mt. Data and in downstream areas. The excessive use of inorganic farm inputs result to pollution and contamination of both soil and water. Another farm input frequently used is chicken dung. This could have been a better alternative; however, its strong foul odor poses possible adverse effects to human health.

At present, Sinto residents believe that farms should no longer be expanded because the watershed has already been encroached. Aside from occupying the land which should have been forest areas, farms and gardens are also competing for domestic water supply. The water supply for surrounding communities and the nearby Mt. Data Hotel comes from a series of small dams within the watershed. Continuous farm expansion along with the increasing number of watershed users contributes to insufficiency of water supply.

Mt. Data watershed is increasingly polluted by chicken dung, pesticides, fungicides, herbicides, and even human waste from field workers. Water in the dams has a layer of algae indicating eutrophic conditions brought by aforementioned pollutants. These pollutants can cause health risks to human populations downstream.

### ***Strengthening IKSP for Sustainably Managing Mt. Data Watershed***

Studying how people relate to environments such as forests means understanding how they experience these environments. In the past, the IPs in Mt. Data were able to practice sustainable use of resources. Having occupied biologically-diverse areas--their IK systems helped protect the ancestral domain and all resources therein for many years; their knowledge passed on from one generation to another.

However, with the influx of migrants, onset of economic development (i.e., building of farm-to-market roads, commercial farming), as well as tenurial arrangements and change in local controls, things started to change. The extraction of resources became unsustainable as population increased and the watershed became a "tragic common" commodity--with forests being converted into agricultural lands and vegetable farms.

Today, although there is recognition from both IPs and migrants about the watershed's importance and the immediate need to protect and rehabilitate it, survival comes first. What matters is that people are able to provide their families with basic needs--food, water, and shelter. Social research help reveal the ways in which people are experientially and emotionally related to the environment. These experiences of natural environments contribute to the quality of people's lives and are often, the root of many natural resource management issues. As such, there is a need to re-open the minds of both migrants and locals in Sinto and make them recall the importance of a sustainably managed Mt. Data watershed.

Over the last 50 years, changes in terms of economic activities and local controls have played a role in influencing local people's environmental perception. The people are always the *de facto* managers of the environment. The choice to cut down trees or to shoot the birds is always their decision to make. As such, it is important that people remain educated about the importance of environmental conservation.

A dearth of information on IKSP still exists in Bauko. Most of them are just hard to come by due to poor knowledge management. The needed information cannot be accessed readily. Collective knowledge should be purposively and efficiently used to solve societal problems. Their IKSP, which adheres to the principles of sustainable development should be revived and continuously strengthened so that the once rich ecosystem may be revived.

Likewise, the coldspots approach, which is slowly gaining popularity in terms of conservation planning, can be employed to rehabilitate the watershed. Unlike the PA system which focuses on areas with exceptional biodiversity, the cold spots approach focuses on areas where there are heavily degraded ecosystems and where people thrive. It zeroes in on ecosystem services derived by the people from a certain resource. In the case of Mt. Data watershed, the coldspots approach may be used to restore the degraded ecosystem while helping the people (both indigenous and migrants) see the benefits they get from the watershed. Given that people are properly educated, they are more likely to support and participate in conservation projects.

## **Conclusions**

Mt. Data watershed is an important resource for the Kabatangan Ancestral Domain residents--both indigenous and migrants--of Bauko, Mt. Province. However, the resource has become a “tragic common” commodity. Commercial farming is the principal cause of deforestation in the area. The whole Kabatangan forest, supposedly a forest reserve, has been converted into vegetable farms. Farmers use fertilizers and pesticides causing pollution and driving away wildlife. Agricultural diversification coupled with the development of farm-to-market roads, which aimed to improve the people’s quality of life, led to the depreciation of forest resources. Residents seemed to have forgotten the value of forest conservation and focused primarily on economic gains.

There is also a danger that IKSP would be lost due to rapid environmental, social, economic, and political changes. Over the years, the IPs have been replaced by migrants. Although there is a collective consciousness of the IKSP’s importance among the people, modernization has already set in. The residents of Bauko learned to adapt in order to become more competitive.

There is a proposal to disestablish Mt. Data National Park (MDNP) as a protected area (PA) since majority of the area have become residential. Given that the watershed is slowly losing its biodiversity, specifically its wildlife resources, disestablishing MDNP can lead to more disastrous consequences if no intervention will be done. Results of this study emphasize the great need to conserve Mt. Data and revive its goodness as remembered by the elders.

Poverty is a major issue that needs to be combated in many PAs. Since biologically diverse areas are often occupied by locals, and in the case of Mt. Data watershed, claimed as part of ancestral domain; the PA system seemingly failed to capture the public’s support.

The coldspots approach to conservation, which focuses on ecosystem services (provisioning, regulating, cultural nurturing and supporting) may be used to save the watershed from ultimate destruction. The approach prioritizes areas where there are many people and where there are heavily degraded ecosystems. As the people of Bauko see their reliance on the watershed for health and economic security, they will be more inclined to support and participate in conservation projects. In the long run, biodiversity will also be preserved but not at the expense of displacing the locals and/or migrants.

## **Recommendations**

- There should be an adequate accounting of ecological services provided by the watershed. An economic valuation study may be conducted to assess how people value the resources provided by Mt. Data watershed.
- The Philippine PA system needs to be reviewed. The coldspots approach and community-based natural resource management are slowly being recognized as possible ways to address drawbacks in the PA system.
- KADIPO and other concerned government agencies should put their best foot forward to advocate organic agriculture and gradually retreat back to indigenous methods of agriculture. Likewise, there is a need for proper documentation of IKSP in order to ensure that it will not be lost.
- There is a need for a strong environmental education framework in order to increase people's awareness on conservation -- especially among farm workers. Such initiatives should also have continuity and reflect realities as experienced by the local.

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