

# Water Rivers Run Dry: The Primary Rivers of Bukidnon, Dinagat and Biliran Islands Philippines

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## ABSTRACT

The study aimed to explore the experiences of the river settlers and the factors that influenced the main rivers' changes in Bukidnon, Dinagat, and Biliran Islands. Multiple case design was employed to determine the rivers commonalities and identified participants through purposive sampling. Based on the study, river settlers experienced belongingness and regret about the river changes through time. Moreover, the physio-chemical of rivers were affected by human-made activities and natural phenomena. It is recommended that river settlers, local government, and industries agree to conserve, preserve and protect rivers in the country.

## Keywords

Freshwater Preservation, Multiple Case Study, Aquatic Biology

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## Introduction

Early civilization started near water bodies and continue to develop ( Yilmaz & Peker, 2013 ). These bodies of water also get their names because of the people who settled in the area. Because water is the primary source of inhabitants in drinking water, cleaning, and other day-to-day needs. The global water reserve is around 1.4 billion km<sup>3</sup>, of which 97.5% is saltwater on the oceans, and the remaining 2.5% is fresh water present in the atmosphere, glaciers, and groundwater. The Earth is covered with water; however, only 0.74 is considered potable water ( Akin & Akin, 2007 ). Thus, the availability of potable water is limited around the world.

The Philippines is a tropical country and surrounded by seawater, and because of this, the country has two seasons, wet and dry. There are different freshwater bodies found in the country, like lakes, rivers, ponds, streams, and other water bodies. However, utilization of freshwater increased six-fold, and there are no equal opportunities for it ( Orhon, Sozen, Ustun, Gorgun, & Gul, 2002 ). The utilization of these freshwaters may benefit or destruct the environment. As posited by the Commission on the Arts and Humanities (2012), clean rivers are an everyday struggle today, and different organizations conducted activities to save the rivers.

Moreover, the Millennium Ecosystem Assessment (2005) pointed out that freshwater ecosystems are being overused, under-represented in protected areas, and having the highest portion of species threatened with extinction. While Dudgeon et al. ( 2006) and Vorosmarty et al. ( 2010 ) suggested that people are inextricably linked to freshwater ecosystems, and both people and nature benefit by managing risks to the health of these habitats. The study was conducted to determine the experiences and identify the factors observed related to the main rivers' changes in Bukidnon, Dinagat, and Biliran Islands.

## Objectives of the Study

The study aimed to explore the experiences of the people who lived near the main rivers in Bukidnon, Dinagat, and Biliran Islands. Specifically, it sought to answers the following questions:

1. What are their experiences living near riverside or area?
2. What are the factors they have observed related to the changes in the river?
3. How do they address the environmental changes of the river?
4. What could an environmental model be proposed related to the preservation and protection of rivers?

## Methodology

Multiple case study designs were used in the study because they sought to find commonalities of the country's rivers (Yin, 2003). Further, Baxter and Jack (2008) stated that the evidence generated from a multiple case study is robust and reliable which the researchers employed the design. Also, purposive sampling is used, and criteria were followed to identify them. Participants shall live near the rivers for almost fifteen years and above and have a residential or permanent structure. Interviews were conducted using a semi-constructed interview guide made by the researchers. In analyzing the data, thematic analysis (Braun & Clarke, 2006) was employed and Yildirim & Simsek (2011) for the validity of the result. To observe the implementation of the strict health protocol of the IATF, the researchers and participants wore face masks and face shields and observed social distancing.

## Results and Discussion

The experiences of the participants living near the riverside found out that they experience belongingness and regrets. Belongingness, as defined by Anant (1967), is the experience of personal involvement (in a system or environment) to the extent that the individual feels himself to be an integral part of the system. At the same time, regret is a more or less painful cognitive and emotional state of feeling sorry for misfortunes, limitations, losses, transgressions, shortcomings, or mistakes (1993).

### Theme 1: Belongingness

Akin and Akin (2007) pointed out that water has always been necessary for human beings to perform vital activities like nutrition, circulation, respiration, excretion, and reproduction. According to the participants, *"In our day-to-day living river has been part of our life because as I have told you before used for washing clothes, for the carabao to be pastured in the river during that the work. And also, for household consumption (PA1, p.1, L52-55)."* *"Maligo, manglaba. Magbalik-balik ug laba kay maoy sugo sa inahan, maglaba ngadto nya apila ug kaligo, mag-sakay-sakay sa kabaw, hapit mahumos... (Take a bath and washing clothes because that's our mother asked to do. Riding with the water buffalo, and sometimes we got nearly drowned) (PA2, p.4,*

*L.119-121)"*, *"Dinha mi magkuha sa among imnon, number 1 na siya nga imnunon namo, nga wala pang ang Naval Water District... (The main source of our potable water before the Naval Water District) (PA3, p.6, L.164-165)"*. People rely much on the river in their day-to-day living. Further, the river does not only the source of their potable water, and other participants also said it is also their source of income. They could get fishes, shrimps, and other freshwater organisms where they could sell and earn money from it. *"Kanang among baling 3 ra man ka-metros... makakuha na dayon ug tulo ka balde nga pasayan diha sa daplin ra sa suba... (Even if the net is only 3 meters... we could get three buckets of shrimp at the side of the river) (PD1)"*. *"Kung wala kay kwarta, maka-kwarta man ka kay manginhas, mamasol, mamaling... (If you do not have money, you can earn, because you can get seashells and catch fish... (PD2)"*. *"Daghan kuha sa isda ug pasayan maski munaog ra ka tungod sa balay... (We can get fishes and shrimps near our house... (PD4)"*. As cited by Akin et al. (2005), water is a living environment for living beings. The people living near the river consider the body of water as a living being because it houses various organisms. *"Kadtong may kabaw ko, didto nako ipa-inom ang kabaw, ipalunong... (The water buffalo drinks water in the river) (PB1, p.3, L.52-53)"*. *"Diha me naligo, lukso-lukso sa tulay inig baha, modagan mi sa ibabaw, sakay dayon mi sa balsa, paanod sab... (It is where I took a bath, jump over the bridge, and when there is a flood, I ran above, ride with the raft.) (PB3, p.3, L.61-63)"*. *"Malipayon mi nga nia mi diri sa kilid sa suba... (I am happy living near the riverside) (PB2, p.4, L.96-97)"*. The river is part of the lives of the people because of the resources it provides to them.

### Theme 2: Regret

Rivers have a significant influence on the lives of the people and are considered part of their lives. These rivers have been the source of potable water, sources of income, daily food consumption. However, as time passed and changes were made in the rivers' faces, people suddenly regrets what happened to the river. Some of the participants said, *"I could say in layman terms abused because way back then Anas River retain its grandeurs and beauty..." (PA1, p.3, L.91-93)*. *"Maayo gyud tong sa una, kay naa ang tanan.. (Better than*

before, because everything is there...) (PA2, p.5, L.140)". "Ang Anas karon, wala nay kuan, wa nay ayo... (The Anas River is not good anymore...) (PA3, p.6, L.180)". "Arang kahinlo sauna... (It was so clean before..) (PD1)". "Sa una, kakahuyan pa jud ning daplin sa suba... (The river before is covered with trees..) (PD2)". It could be pointed out that people have regrets about what happened to the river. They can still remember the grandeur and beauty of the river before and now. Like, "Sa una, tin-aw kaayu nang suba, laglom kaayu.. (The river before is clear and deep) (PD3)". "Sa una manglaba mi, karon dili na, maligo mi. Nawala na ang among balay kay gihimo dike... (Washing clothes and taking a bath, we do it in the river, but now, we don't have our house because of the flood control) (PB5, p.2, L.36-37)"do not unang panahon kong walay sud-an dagan lang mi, manguha ug isda... (If we don't have viand before, we just go to the river and catch fishes) (PB3do not, L.64-65)". "Pero wala nana karon. Nawala na.. (It doesn't exist anymore...) (PB1, p.4, L.93)". People keep reminiscing about does notiver and keep comparing the present situation. They prefer the river before because of the resources and their contribution to their life.

Rivers changed its physio-chemical features because of many factors. These factors were considered by the inhabitants of the area, namely: man-made activities and natural phenomena.

### Theme 1: Man-Made Activities

"Concessioners came in that river, in that area, the river changes a lot. It became wider, and it becomes a very shallow river, and there could be a time that there is no water during the dry season" (PA1, p.2-3, L.62-64)". "Daghan pa kaayo ug bakhaw, pero gika-ingin man sa mga tawo... (Mangroves were abundant before; however, it was gone because of "kaingin"... (PD1)". "Na-open na ang suba pagpanghimo ug fishpond nga maoy rason nganong medyo nahurot ang bakhaw... (Building fishponds affect the decrease of the mangroves...) (PD3)". Sinclair et al. (2017) pointed out that the reasons for the declining river health are a complex mix of geology, ecology, and changing patterns of human understanding and use. Rivers' physical and chemical properties might be changed because of human activities like building flood control, dams,

irrigations, ponds, and mining. Additionally, the living organisms thrive in the rivers and, along with it also affected and destroyed. "Ang mga maniit (crab fingerlings) dili man gyud na siya dapat kuhaon pero unsaon ta man ang tao sakyan man jud kung asa ang pangwarta... (Crab fingerlings should not be harvested however people harvest them to earn money..) (PD5)". "Adunay mga kahoy-kahoy sa kadaplinan, pikas kahoy, pikas kahoy, karon gisemento naman sa gobyerno, dako kayo kausuban... (There are trees before on the side of the river, but the side of the river was cemented..) (PB1, p.5, L.114-116)". "Kini nga suba samtang wala pa ang power/irrigation, lapad ni kaayo, nagamay dayon ang tubig pagkuha sa power... (The river was wide but turns narrow because of the power/irrigation...) (PB3, p.6, L.134-135)". "Gikabkab sa gobyerno paghimo sa dike... (Dredging activities to build flood control) (PB1, p.7, L.151-152)". As years passed by, the river was also affected by human activities. Dudgeon et al. (2006) supported the primary direct drivers of degradation and loss of riverine, including infrastructure development, land conversion, water withdrawal, pollution, overharvesting, and the overexploitation of freshwater species.

### Theme 2: Natural Phenomena

Participants stated that natural phenomena like typhoons, floods, and landslides were factors that changed the river. "Tungod sa kuan, kani-ang, sige ug bagyo... (Because of typhoon...) (PA3, p.6, L.169)". "Kung ting-ulan, mabanlas and lapok pa-ingon sa suba... (During the rainy season, sediments flow to the river...) (PD3)". "Naay kausaban sa suba tungod ra pod sa kinaiyahan. Kanang pag-landslide mao ne nga namabaw... (Landslide cause the shallowness of the river...) (PD4)". However, these natural phenomena are natural processes in many ecosystems and part of the cycle. Many freshwater ecosystems are adapted to variability in water volumes and timing of flows and require variability to thrive, such that regulated water bodies should not be managed with unnatural, permanent, or stable flows (Postel & Richter, 2003).

As mentioned earlier, most civilizations started along the river. People started settling down because of the resources they can get from the



river. However, the physical and chemical properties of these bodies of water changed over some time. Inhabitants tried to adjust for them to survive. “*The Naval Water District began to construct water systems along the area... (PA1, p.3, L.85-86)*”. “*Sa gripo nala, mao nala nay pag-asa ng gripo, kay maot na baya ang Anas River... (The faucet becomes the source of potable water...) (PA2, p.5, L. 133-134)*”. “*Nakigpag-coordinate among organisasyon didto sa munisipyo... (There is a coordination between the barangay and municipal officials...)* (PD3)”. Inhabitants agreed to the Local Government Unit (LGU) and other organizations to provide them the potable water. Likewise, the LGU provides livelihood programs to them. “*Kung wala nay makuha nga pasayan, mananom nalang mi... (We divert into farming...)* (PD1)”. “*Dunay mga tabang sa gobyerno sama anang crab farming... crab culture... (The government extends livelihood assistance like...)* (PD4)”. At the same time, others help in maintaining the cleanliness of the river. “*Ang mga basura namo... panigomon nako... (I keep my garbages...)* (PB2, p.9, L. 189-191)”. A profound change in the way people think about the river and its history is necessary if we hope to preserve and what remains of the old river and imagine a healthier future for the regulated river (Sinclair, Mudd, Dingle, & Hobley, 2017).

### Conclusion

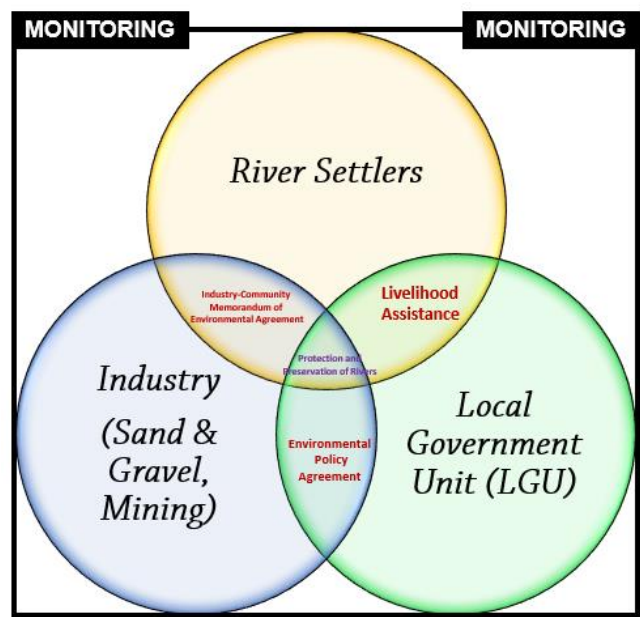
Based on the study results, it is concluded that rivers were part of human survival and part of their day-to-day living. The physio-chemical change of the river was affected by human-made activities and natural phenomena. Humans look for other ways to survive, for rivers alone cannot provide for their daily needs.

### Recommendation

It is recommended that LGU may intensify livelihood programs to the river settlers as an alternative financial source. Then, LGU and the industries (sand and gravel, mining, and others) are encouraged to have an environmental agreement about the protection and preservation of rivers. Further, industries and river settlers may sign a memorandum of environmental agreement related to protecting the river and other bodies of water.

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**Figure 1. Primary Rivers Protection and Conservation Model**

Human has the responsibility in protecting and conserving freshwater like rivers. The three players, namely: river settlers, LGU, and industry, shall work and do their responsibility on the river. LGU could give livelihood assistance to the settlers like farming, crab culture, farming, and others without sacrificing the river's health. In this way, settlers will not depend much on the river as their primary food and income source; LGU can craft an environmental policy agreement between the industries, and policies must be clearly stated and focus on protecting and preserving the river. Additionally, industries have an environmental agreement with the settlers or community. In this way, the settlers are also protected since they are the ones who will be affected when the river is not accessible anymore. All these processes are bound for constant monitoring by external agencies for continual improvement.