

Human Settlements Along Bago River: Their Socio-Economic Conditions and Activities

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Human settlements in four purposely chosen sections of Bago River were surveyed using questionnaires supplemented with focus group discussions. The economic benefits derived from the utilization of the river were given emphasis. Semi-permanent (45.49%) and lightly built houses (27.08%) in riverine communities are located in areas almost proximate to the easement. Fishing (81 or 29.24%) is a critically important occupation or source of income. The residents are highly dependent on the river for food, primarily fish (56.71%) and crustaceans (34.49%). Rice, corn, vegetables, bananas, and root crops are cultivated by the local inhabitants along the river bank.

A notably high number of households utilize river water for domestic uses (53.07% for laundry; 49.46% for bathing). Almost 60% of the respondents do not have toilets and dispose their excreta in sugar cane plantations, corn and rice fields, on river banks, and in the river itself while their garbage is dumped in open areas. The high (2,200 - >16,000,000 MPN/100 ml) coliform readings in all stations can be attributed to use of the river as dumping site of human, animal and agricultural wastes. The coliform analysis showed that there was fecal contamination of the river and that the water is therefore not safe for drinking.

KEYWORDS: Bago River, coliform, households, socio-economic conditions

INTRODUCTION

The use of river systems by humankind has changed over the course of human history. The earliest use was as areas for human settlements providing water for domestic consumption and irrigation for agriculture and for trade and commerce that linked these settlements to the source of goods coming in from various areas far and near (Dynesius & Nilsson, 1994). Because river systems originate from the hinterlands that are usually covered with forests as source of nutrients and are connected to oceans, many rivers serve as areas of organic production and thus became a source of food, primarily fish (Vannote, Minshall, Cummins, Sedell & Cushing, 1980). When human populations grew in size, the need for energy became important, and the potential of rivers to generate electricity was harnessed through the application of technology (Vörösmarty, Green, Salisbury, & Lammers, 2000). Large rivers are dammed for this purpose (Dynesius & Nilsson, 1994; Collier, Webb, & Schmidt, 2000). In the 20th century, scientists became worried about the rapid destruction of aquatic biodiversity, the increased frequency and magnitude of flooding, the erosion of uplands, the forest denudation in the watersheds, the increasing loss of resources from river systems, the deteriorating water quality of rivers due to pollution, among others, that reduced the value of rivers as one of the major components of the earth's biosphere (Collier et al., 2000). At present, river systems are also threatened by climate change that either reduces or increases to flooding proportions the volume of water (Hong, Kim, Chung & Pae, 1995; Vörösmarty et al., 2000).

This study was concerned with the Bago River System in Negros Occidental, Philippines. This river originates between the North Negros Forest Reserve and Mt. Canla-on, then snakes its way toward the west within the town of Don Salvador Benedicto, San Carlos City, Murcia town and in between Bago City and Pulupandan stretching about 76 km long and exiting to the Guimaras Strait. The river was studied using four purposely identified sampling stations. The upstream sampling site is in Barangay Kumaliskis, Don Salvador Benedicto (10° 31.760' N; 123° 12.854' E and 255 masl). The two midstream sampling sites were situated in Barangay Lopez Jaena, Murcia (10 33.450 N; 123 04.140 E and 93 masl) and in Barangay Damsite, Murcia (10 33.234 N; 123 02.143 E and 50 masl). The downstream sampling station in between Bago City and Pulupandan is around 2 km. from the estuary (10 31.204 N; 122 50.260 E and 8 masl).

The study looked into the social characteristics of the human settlements on both sides of the river as well as their economic activities and utilization of the river and its resources. The awareness of the community in terms of benefits from the river, the effects of day-to-day activities on the river and the conservation of the river were also assessed.

METHODS AND MATERIALS

The social and economic profile of the households residing within one kilometer radius from the midpoint of the river in each sampling station were looked into using the following indicators: educational attainment, religion, type of dwelling unit, ownership of the house, sources of water (for drinking, laundry, bathing, cooking), fuel for cooking, excreta disposal system, garbage disposal, lighting facilities, mode of transportation and communication, activities for relaxation, occupation, average monthly family income, average daily household expenditure, and food taken from the river and along the river bank.

A descriptive research design was used. Primary means of collecting data was a researcher-made survey questionnaire. Responses in the survey questionnaire were verified through interview and focused group discussion.

The sample size of 300 households was computed using Lynch's formula (Ardales, 2008). Respondents were equally distributed in the four sampling stations. Households closer to the river bank were purposely selected. In sampling stations 1 and 2, only one side of the river was surveyed because on the other side, the easement and one kilometer radius from the river bank that corresponded to the biological survey of flora and fauna were not inhabited. An attrition rate of 7.67% was encountered during the conduct of the survey, thus only a total of 277 households were surveyed.

Information collected pertained to the social and economic profile of the households as well as respondents' awareness of the benefits the river offers, the effects of day-to-day human activities on the river, and the various ways of conserving the river. Complementing the survey questionnaire was a checklist on the uses/ usefulness of the river.

The survey questionnaire was validated by a jury of experts using the guide set by Calmorin and Calmorin (2007, pp. 51-53),

Best and Kahn (2003, p.312) and Lawsche's Content Validity Ratio (Guion, n.d.). The validated survey questionnaire was pilot-tested for reliability among 30 residents of the neighboring Barangay Ubay in the Municipality of Pulupandan. Reliability Coefficient was determined using the Cronbach's Alpha (Trochim, 2006).

The socio-economic profile of the respondents was established using frequency and percentages. The extent of awareness on the benefits, uses, effects of day-to-day human activities on the river and conservation of the river were analyzed using the mean and standard deviation. Significance of the differences in the respondents' awareness on the benefits, uses, effects of day-to-day human activities on the river and conservation of the river were analyzed using one-way ANOVA (Larsen & Marx, 2006, p. 733; Walpole, 2002).

RESULTS AND DISCUSSION

Two hundred seventy-seven households were included in the survey. There were 41 respondents from Station 1 (Barangay Kumaliskis, Don Salvador Benedicto) and 46 from Station 2 in Barangay Lopez Jaena, Murcia. A total of 94 households were surveyed in Station 3—50 households from Barangay Damsite, Murcia and 44 from Barangay Bacong, Bago City. Ninety-six households were included in the study in Station 4—50 from Barangay Lag-asan, Bago City and 46 from Sitio Cavan, Barangay Tapong, Pulupandan, Negros Occidental.

Educational Attainment. The highest educational attainment of the majority of the husbands/fathers as well as wives/mothers was elementary graduate (49.46% and 42.24%, respectively). Similar findings were revealed in the study of Dusaran (2006) where members of fisherfolk association near a marine protected area were generally elementary educated, middle-aged, and married. The Country Profile of the Republic of the Philippines 2000 census also revealed that elementary schooling ranked first in terms of highest education attained by Filipinos (APCD, 2004, p.1). A similar profile was revealed in the survey of the National Commission on Indigenous Peoples in Region V where more than half (51.35%) of the household heads' educational attainment in Camarines Sur is elementary level (Grades 1-5). This simply indicates that the community near Bago River has a similar educational profile with Filipinos in other regions of the country.

Religion. Roman Catholic (86.64%) is the dominant religion of the residents in all four sampling areas, followed by Baptist (3.97%) and Evangelical Christians (3.97%). Other religions included Seventh Day Adventist, Iglesia ni Kristo and Dios Amahan (5.42%). Undeniably, the Philippines in general, and Negros Occidental in particular is predominantly Roman Catholic. A similar profile was established in a study on the Filipino Voter in the 2004 elections which pointed out that some 79% or majority were Roman Catholics, 2% belonged to the Iglesia ni Kristo, 5% to the different protestant denominations while 10% were Muslim. About 3% belonged to other religions such as the Mormons (IPER, 2005). In separate statistics, a published profile of Bukidnon revealed that more than three fourth (77.42%) of the population were Roman Catholics. However, it also appeared that other Christian groups have gained some ground in this Mindanao province with the second dominant religious group being the Seventh Day Adventist (4.02%), Baptists (3.47%) and other religious affiliations such as Iglesia Ni Cristo (1.59%) and Aglipay (1.51%) (PopCom, 2007).

Type of Dwelling Unit. Housing conditions in all the four sampling stations reflect the poverty of the inhabitants. Although there were no houses on stilts in the river, all households surveyed were built on the river bank or in the natural flood plain. Almost half (45.49%) of the respondents had semi-permanent type of houses. However, in Lagsan, Bago City (Station 4), more than half (57.29%) of the respondents had makeshift type of houses. As to ownership of the house, majority of the respondents owned their houses (78.34%), some rented their houses (13.72%), and some inherited (1.44%), loaned (2.17%) or shared houses with another family (4.33%). Households owned their semi-permanent houses. The same results were revealed in the study of Alvarez et al. (2008, unpub.) on Mangrove Development in Punta-Taytay where the majority of households living along the sea shore also owned their semi-permanent houses. Perez, Amadore and Feir (1999) established the economic profile of coastal household population and mentioned that lightly built houses in coastal communities are located in the areas most proximate to the shore; in some cases, they are built over the water itself. Shanties and houses on stilts are evident particularly in some areas of the provinces of Bulacan and Pampanga, usually along riverbanks. The settlements are usually congested and have small floor areas. Many of the houses have no sanitary facilities for the disposal of waste, which is indiscriminately dumped into the

waters.

Source of Day-to-Day Needs. Households sourced their drinking water mostly from the spring (51.62%). Other sources were the municipal water system (17.69%), wells (17.69%), and private water pumps, the river, or bottled water (12.99%). The river was the major source for laundry (53.07%) and bathing (49.46%). For these purposes, however, some households used wells, a spring, barangay pumps, and private pumps. Moreover, the majority of the respondents (30.69%) sourced water for cooking from the natural spring.

As to source of fuel, 96.55% of respondents used firewood for cooking. A very minimal percentage of respondents (3.45%) used liquefied petroleum gas (LPG), electricity, kerosene gas, and charcoal as fuel. A similar situation was found by Iglesias and Yu (2008) in their study of Marikina River where under normal times, the river was a health hazard for the locals who bathed and washed their clothes and dishes in the river. They could not have access to basic facilities such as potable water and sanitation because of their status as informal occupants of the land. Although Bago River water is no longer suited for domestic use as seen in the high coliform readings (classified as Class D based on DENR standards), a number of households continue to bathe and wash clothes in the river. The very high level of contamination in Station 4 may be influenced by the density of households near the river and the presence of piggeries along the river. In upper stations, sightings of folks bathing cattles and carabaos in the river are very common as these are done every day. Researchers also observed that a considerable number of households consider the river or its tributaries as areas to defecate. Iglesias and Yu (2008) support this with their statement on the importance of a river to the settlers on the river banks since they draw on the river for cooking, bathing and washing needs.

Excreta Disposal System. More than half (58.55%) of the respondents do not have toilets and dispose their human waste in sugar cane plantations, corn fields, on the river bank, in rice fields and in the river. Some respondents (14.55%) have a water-sealed toilet inside the house, a water-sealed toilet outside their house (16.36%), and some others (10.55%) have the antipolo type of human waste disposal outside of their house. No houses in the upper stations (SS1, SS3 and SS3) have in-door plumbing. People have the habit of defecating and urinating in the river. Similar activities are also done by informal

settlers who, according to Iglesias and Yu (2008), created makeshift toilets near the riverbanks or disposed of their wastes directly into the river. Perez, Amadore and Feir (1999) established the economic profile of a coastal household population and mentioned that shanties and houses on stilts are evident particularly in some areas of Bulacan and Pampanga usually along riverbanks. The settlements are usually congested and have small floor areas. Many of the houses have no sanitary facilities for the disposal of waste, which is indiscriminately dumped into the waters.

Garbage Disposal. Throwing or dumping the garbage in open areas is practiced by 57.76% of the respondents. Some respondents dispose them either by burning (32.13%), throwing them in the river (5.05%) or in a compost pit (5.05%). There are no closed waste water pipes in the houses. Researchers have observed that domestic effluents generated from bathing, laundry, cleaning, cooking, washing and other kitchen activities flow into the ground beneath the house and form pools of black and foul smelling water in pits. Chickens come and scrape these pits. Some houses dig long channels that flow to the river. This practice produced a large amount of organic waste with suspended solids and also contributed to the high coliform reading (Class D per DENR standards) in all stations. H. Rustamadji (n.d.) in his study reported that even though the river is not the proper place, human waste and garbage is still thrown into the river by squatters inhabiting the watershed area.

Lighting Facilities. Households used electricity (54.58%), kerosene (43.22%) and pressure lamp (2.20%) as their lighting facilities.

Economic Activities and Utilization of the River. Household heads in Station 1 predominantly work as farmers (92.68%), in Station 2 as laborers (62.29%), in Station 3 as carpenters (51.06%) and in Station 4 as fisherfolk/*bangkero* (76.60%). However, taking all stations collectively, the occupation of the household heads is ranked as follows: [1] laborer/carpenter, [2] farmer, [3] driver/welder/operator, [4] fisherfolk/*bangkero*, [5] security guard/barangay worker, and [6] fish vendor/micro-scale convenience store. Household heads (Dusaran, 2006) were generally middle aged males, married and elementary educated. Most of them considered fishing as their primary source of income. There is no real indication that the people are moving towards a non-fishery based economy. Their background makes it difficult for them

to expand into other sectors.

One hundred twelve (40.43%) of the heads of the 277 households worked as laborer/carpenter. This can be attributed to the results of respondents' highest educational attainment which is elementary level only. The occupation as laborer is oftentimes indicative of lack of either educational qualification or technical skills, although as carpenter, one may need some basic manual skills and this may be limited to making small nipa huts or wooden shanties in the locality.

Foods taken by the households from the river are ranked as follows: fish (rank 1, n=245), crustaceans (rank 2, n = 149) and vegetables (rank 3, n = 38). Moreover, food taken along the river bank included vegetables (rank 1, n = 183), bananas (rank 2, n = 116), sweet potatoes and cassava (rank 3, n = 78), corn (rank 4, n = 66) and rice (rank 5, n = 58). This indicates that most of the households source their food (primarily fish and crustaceans) and water from the river. This is supported by Oracion (2009) in his study entitled "Adaptation of Farm Households of Different Life Stages to River Flooding as Impact to Climate Change," stating that rivers are important to farm households as sources of water and food, and serve as means of transportation from upstream to the coastal areas particularly in marketing farm products. The study of Boissiere and Liswanti (2006) entitled "Biodiversity in a Batak Village of Palawan" revealed similar findings wherein the Bataks also looked for shells, fishes from the river and for young leaves of bago trees for their food. Moreover, they also get water from the river, for their daily needs and used firewood for cooking and as insect repellent.

Mode of Transportation. Most of the respondents indicated "walking" (66.79%) as their mode of transportation. Some respondents used modes of transportation available in the area: tricycle and/or *habal-habal* (23.10%), carabao and sled (9.03%) and horse, *balsa/banca* (1.08%). The researchers have not only observed but also used *balsa* (in SS1, SS2 and SS3) and motorized *banca* (in SS4) as means of transportation in crossing the river.

Mode of Communication. Cellular phones (54.51%) constitute the mode of communication of the majority of respondents. Letters (43.32%) ranked next and other modes (1.03%) of communication in the area included two-way radios. Because of proximity to the urban area, the households have gradually espoused the use of modern technology in communication. More than three fourths of the

households (at least one member) had cellular phones.

Activities for Relaxation. Among the noted relaxation activities were sleeping, playing with children, conversing with their neighbors, gardening, hanging around, and attending to animals. Majority of respondents indicated “sleeping” (79.78%) as their relaxation activity. Indicating “walking” as their mode of transportation, and sleeping as relaxation activity is an indication of households’ lack of financial capability to consider other modes of transportation such as tricycle/public/private utility vehicle and watching television/movies for relaxation.

Average Monthly Family Income. Respondents have a family income ranging from PhP500 to PhP3,000 per month. Majority of respondents (68.95%) have a family monthly income of PhP1,001—PhP2,000. Thirty respondents (10.83%) have a monthly income of P500—PhP1,000, 20 (7.22%) have monthly income of PhP 2,001—PhP3,000 while 36 (13.00%) have an income above PhP3,000.00 per month. A study conducted by Dusaran (2006) revealed that most household heads in a community of fishermen in a Marine Protected Area in the Visayas, Philippines considered fishing as their primary income source and have an average income of P2,773.39 per month. A publication of the FAO Document Repository cites a 2004 ADB report that stated that in 2004, the Philippines ranked 77th out of 173 countries in terms of human development and in terms of income, indicating that the country performed below satisfactory. Income growth lagged behind because of the country’s erratic growth and high poverty incidence.

Average Daily Household Expenses. The respondents’ household daily expenses range from less than PhP50 to more than PhP300. Of the 277 households, 75 (27.08%) spend less than PhP50 daily, 49 (17.69%) of the households have daily expenses between PhP51—PhP100, 37 (13.36%) spend between PhP101—PhP150, 59 (21.30%) spend between PhP151 to PhP200, 44 (15.88%) spend between PhP201—PhP250, 5 (1.80%) spend between PhP251—PhP300 and 8 (2.90%) has daily expenses above PhP300. Moreover, the daily miscellaneous expenses range from PhP1.00—above PhP50.

This condition is confirmed by the respondents’ monthly income which ranges from PhP 500 to PhP 3,000 only. Majority of the households have monthly income of PhP 1,000—PhP 2000 only, compared to the household daily expenses of PhP 51—PhP 100 plus

the daily miscellaneous expense of PhP 1—PhP 50. Obviously, the income is smaller than the expenses and therefore will indicate deficit spending. How do they cope with this? Getting food from the river and harvesting vegetables, root crops and fruits along the riverbank as well as getting firewood help them survive. Respondents shared in the focused group discussion and in interviews that fish and crustaceans taken from the river as well as root crops, fruits and vegetables taken along the river bank are sold in the nearby wet market or along the road/highway. The income generated from this activity is not reflected in the income (fixed income from gainful employment) they declared.

Awareness of the Residents on Benefits, Effects and Conservation of Bago River. Residents' over-all awareness on the benefits they can get from the river has a mean of $3.43+0.38$ (great extent). Exhibiting a low extent (mean = $2.17+0.85$) of awareness are residents from Station 4. Showing a very great extent of awareness (mean = $4.76+0.48$) are respondents from Station 1. The respondents' awareness on the benefits they can get from the river significantly varied when compared using one-way analysis of variance and yielded an F-value of 44.132 and p-value of 0.000. Using Scheffe's test, the significance at 0.05 level is between Station 1 and Station 3, Station 1 and Station 4, Station 2 and Station 4 and Station 3 and Station 4.

The awareness of the respondents on the effects of their livelihood activities is to a low extent (mean = $2.52+0.28$). Awareness of respondents from Station 1 is the highest with a mean of $3.86+0.86$ (great extent). Least aware are residents from Station 2 with a mean of $1.25+0.14$ (very low extent). The households' awareness on the effects of their livelihood activities on the river significantly vary when compared using one-way analysis of variance and yield an F-value of 34.315 with a p-value of 0.000. Post hoc test (Scheffe's test) showed that significance at 0.05 level was between Station 1 and Station 2, Station 1 and Station 3, Station 1 and Station 4, Station 2 and Station 3 and Station 2 and Station 4.

The residents in Station 1 have the highest awareness on the effects of their day-to-day living/activities on the river with a mean of $3.91+0.41$ (great extent) while Station 2 respondents showed the lowest awareness with a mean of $1.11+0.11$ (very low extent). The respondents' extent of awareness on the effect of their day-to-day living/activities significantly varied as supported by an F-value of 35.568 with a p-value of 0.000. Post hoc comparison proved that significance in the difference was between Station 1 and Station 2,

Station 1 and Station 3, Station 1 and Station 4, Station 2 and Station 3 and Station 2 and Station 4.

On the extent of awareness of the respondent with regard to conservation of the river, Station 1 showed the highest awareness with a mean of 4.64 ± 0.42 (very great extent) while Station 2 proved the lowest awareness as supported by the lowest mean of 3.33 ± 1.10 (moderate extent). Comparing the extent of their awareness using one-way ANOVA, an F-value of 9.341 with a p-value of 0.000 was arrived at which indicated that the extent of their awareness on the conservation of the river significantly varied. Multiple comparisons using Scheffe's test proved that the difference was between Station 1 and Station 2, Station 1 and Station 3 and Station 1 and Station 4.

Over-all, the residents' extent of awareness of the benefits from and influence on the river water system was moderate with a mean of 3.10 ± 1.99 . Highest mean was in Station 1 (4.36 ± 0.71 ; very great extent) and lowest in Station 2 (2.60 ± 1.41 = low extent). When compared using one-way ANOVA, the extent of their awareness significantly varied as proven by an F-value of 26.885 with a p-value of 0.000. Post hoc comparison showed the difference to be between Station 1 and Station 2, Station 1 and Station 3, Station 1 and Station 4, Station 2 and Station 3 and Station 3 and Station 4. It is interesting to note that inhabitants of Station 1 in Brgy. Kumaliskis, Don Salvador Benedicto consistently showed the greatest extent of awareness among the four sampling stations and Station 4 showed the opposite, consistently the lowest. This calls for appropriate action from all stakeholders concerned.

CONCLUSIONS AND RECOMMENDATIONS

Generally, the communities along Bago River are living below the poverty threshold. There is lack of access to basic services such as potable water, lighting and garbage collection. The latter influenced the households to dump domestic and agricultural wastes into the river. However, results reveal that the fishery resources in the river are still abundant. The economic value of the river is evidently seen in their high dependence on the river as a source of food and water. In addition, despite their high awareness on the importance of the river, ongoing degradation of the river's water quality is apparent. This suggests an urgent need to conserve the river.

Massive campaign should be undertaken by concerned organizations such as the DENR (Department of Environment and Natural Resources), DSWD (Department of Social Welfare and Development), LGUs (Local Government Units) and NGOs (Non-Government Organizations) at the Sitio/Purok level to increase environmental protection and conservation awareness. It is common knowledge that water pollution contributes to disease, so that the campaign should include proper disposal of garbage (both liquid and solid waste). Proper waste disposal and construction of sanitary toilet facilities should be jointly facilitated and monitored by the aforementioned agencies.

Alternative income sources for the community should be provided coupled with educational support (e.g. scholarship programs) to reduce fishing pressure on the river.

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