

Analysis of the Agua Dulce Artesian Well in Ormoc City Basis for Environmental Management

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ABSTRACT

The study analyzed the Agua Dulce Artesian Well in Ormoc City as basis for environmental management. The descriptive method of research was used in the study, utilizing survey, documentary analysis, interview and actual observation in the site of study to gather the data which were then analyzed and interpreted. The findings revealed that large volume of water was released in the Agua Dulce Artesian Well. But as to the amount of water utilized, only 15 percent of the total volume of water released daily was used by the people. A large volume of water in the Agua Dulce Artesian Well was wasted. The Agua Dulce Artesian Well was found negative of E. Coli, a bacteria indicating faecal contamination making it safe for human consumption. It was also learned that the Agua Dulce Artesian Well provided a means of livelihood to some residents in the area as “kabu” boys for the people who wanted to avail of their services in getting water in the Agua Dulce Well.

Keywords:

Environmental Management, Aqua dulce , Artesian Well, Microbial Analysis

Introduction

Water is essential to all forms of life. It covers 70 percent of Earth which makes Earth capable of supporting life. It is one of the most essential elements needed by the body. Because it is essential for food nutrient absorption, it helps maintain proper muscle tone, supplies cells with oxygen and nutrients to eliminate waste from the body and acts as a natural ventilation device.. It is not only biologically important to people but it is important as well to many of their activities such as transportation, habitat for aquatic resources, irrigation of crops, industrial and other purposes.

Although Earth is composed of a large percentage of water, 97 percent is salt water and only 3 percent is fresh water used for human consumption. Out of this 3 percent, 68.7 percent is frozen solid found in the polar ice caps and the remaining unfrozen freshwater is found mainly as groundwater (30.1%), with only a small fraction present above ground or in the air (0.9%) (United States Geological Survey, 2009). Because of such a proportion, only a limited portion of the Earth's water supply is usable for human use.. Armstrong (1996) reported that about .0007% is available for drinking hence, a need to conserve water.

The world's supply of clean, fresh water is steadily decreasing (Greenfacts.org. 2008). It confirmed and pointed out that water is becoming insufficient in some places thus its availability is a major social and economic concern. In 2007, an assessment of water management in agriculture was conducted in Sri Lanka to see if the planet has enough water to provide its increasing population with food. It evaluated the current global availability of water for farmland

and mapped out areas suffering from water scarcity. A fifth of the planet's population, more than 1.2 billion, has been found to live in areas of physical water scarcity, where there is insufficient water to satisfy all the demands. One third of the world's population, more than 2.3 billion people, does not have access to safe drinking water. It further shows that 1.6 billion people live in the areas experiencing economic water scarcity, where the lack of investment in water or insufficient human capacity make it impossible for authorities to satisfy the demand for water (Molden, D; 2007).

Añes (2008) pointed out that rapid increase in population, urbanization, and industrialization have likewise reduced not only that quantity but the quality of water. Extensive contamination of the receiving water bodies has been caused by the discharge of domestic and industrial waste water and agricultural runoff. In the form of raw water, detergents, fertilizers, heavy metals, petroleum materials, oils and even solid waste, this waste material is present. Water to fulfill all the demands. One third of the population of the planet. Each of these contaminants has a distinct harmful impact that affects human livelihoods and contributes to economic costs (WEPA). Other important factors, such as changes in the economy, the emergence of new technology, changes in the characteristics of watersheds and decisions on water management, are also important factors that cause increased demand for water.

Nine water-critical urbanized areas where water is consumed intensively have been listed in the Philippines by the National Water Regulatory Board (NWRB). Metro Manila, Cebu Metro, Davao, Baguio City, Angeles City, Bacolod City, Iloilo City, Cagayan de Oro City, and Zamboanga City are all included. Water suppliers in the Visayas faced supply difficulties in the summer of 2007 due to the drying up of water sources due to climate change. It was also noted that this situation is getting worse every year, due to the depletion of water supplies as part of global climate change due to the El Niño weather phenomenon (Tupas, 2007).

Although water resources become scarce in other countries and in some parts of the Philippines dry season, it is quite interesting to reveal as noted by the researchers that Ormoc City is blessed with abundant supply of water as evidenced by the existence of free-flowing wells in Ormoc City. Likewise, it would be easy for households to get water by just digging a few feet down the ground and water would be readily available to them.

The water supply of Ormoc City comes both from an underground water source and surface source water. Surface water comes from a mountain source in Ormoc, making it clean even when it reaches the reservoir. It only turns murky when the source is flooded. The water undergoes conventional and gas chlorination under the old system. However, at present a new system was installed and on the process of completion, following the standards of World Health Organization. The, first stage is the pre-chlorination followed by sedimentation. It goes to the filtration chamber then to the clear water tank before it reaches the reservoir where it undergoes gas chlorination (West Leyte Weekly Express, 2012).

Even if Ormoc City has a newly-installed water system and is on the last phase of completion, several flowing waters still exist in the city proper and is still utilized for drinking by the Ormocanons. One of these flowing wells is the Agua Dulce Artesian well located in Agua Dulce. This is an artesian well-constructed during the Spanish period. The artesian has two openings which discharge a strong flow of water. According to the "kabu" boys several Ormocanons as well as residents from nearby towns like Villaba, Merida flock to the area to fetch, water. The water does not have any unlikely taste and smell so people utilize them for drinking. It is also

observed about 50 "kabu" boys provide services to the people in getting water. Obviously, the artesian well continuously flow a large volume of wasted water into the canal.

Since water is not an infinite resource, there is a need to conserve this water resource. The intention of this study was to determine the volume of water discharged and utilized by the people. It is also noted that since the Artesian well is very near to residential houses, people thought that the sewerage system of the said residents might be contaminated which makes Agua Dulce water unfit to drink. It is then the contention of this research to determine if the water in Agua Dulce Deep. well is safe for drink.

Objectives of the Study

This study analyzed the Agua Dulce Artesian well.

Specifically, this answered the following sub-problems:

1. What is the volume of water in gallons released from the Agua Dulce Artesian well daily, monthly and yearly?
2. What is the extent of utilization of water in Agua Dulce daily, monthly and yearly?
3. What is the volume of unutilized and discarded waste, water daily, monthly and yearly?
4. What is the recent health status of the water in the Agua Dulce Artesian well?
5. How much is the income generated by the "kabu" boys in Agua Dulce Artesian well?

Materials and Methods of the Study

The descriptive type of research was used in this study using documentary analysis, interview and actual observation in the locale of the study.

To determine the volume of water that flows out of the Agua Dulce Artesian well, the researchers made an actual observation and recorded the time in seconds consumed to completely fill up a five (5) gallon container of water. The volume of water released in a day was computed by multiplying 86,400 seconds (constituting one day) with the number of gallons released per seconds. For the volume of water released in a month, the volume of water released in a day was multiplied by 30 days in a month. To determine the volume of water released a year, the volume of water released in a day was multiplied by 365 days in a year.

An interview on how much the "kabu" boys earn daily, monthly and yearly was conducted. Similarly, the volume of water consumed by the Ormocanons and residents from other places was also asked. However, the "kabu" boys could not categorically affirm the actual use. Hence, an actual observation of the number of gallons taken in two sets of period in the Artesian well was done starting 5:00 a.m. to 11:00 p.m. considering that this was the period of time where people regularly fetch water in Agua Dulce.

To determine the volume of unutilized and wasted water, a mathematical calculation was used: (Total volume of water released (day) average volume of water utilized (day)

To determine the quality of safety of water in Agua Dulce, a documentary analysis was used using the data on microbial analysis of water from the Environment of the Natural Resources of the LGU, Ormoc.

Finally, an interview was done to assess the total daily earnings of each "kabu" boy in Agua Dulce.

Results and Discussions of the Study

Table 1. Volume of Water Released in Agua Dulce deep well

Trials	First Opening (No. of seconds/ 5 gallons of water)	Second Opening (No. of seconds/ 5 gallons of water)
1	20.81	20.76
2	20.19	19.90
3	21.05	20.75
4	20.67	19.81
5	20.88	20.64
Average	20.72	20.37
Overall Average (2 openings/ 10 gallons)	20.55 seconds	

Table 1.shows the number of seconds it took to fill up 5 gallons container of water in each opening of the Agua Dulce Artesian well for five trials. As shown, the average time in seconds consumed to fill up 5 gallons of container of water in the first opening is 20.72 seconds while in the other opening it took about 20.37 seconds of the same volume of container. As revealed, one opening has a bit faster flowing water than the other. The average time consumed to fill up the two containers with a volume of 10 gallons (combined) was 20.55 seconds. This result indicates that Agua Dulce Artesian well provides abundant supply of water as it took more than a little quarter of a minute to fill up each 5 gallons of container of water. This just supports the claim of the Ormocanons that Ormoc is rich in water supply.

Table 2. Volume of Water Released in the Agua Dulce Well Per Unit of Time

Unit of Time	Volume of Water/Galloons
Daily	42, 044
Monthly (30 days)	1, 261, 320
Yearly (365 days)	15, 346, 060

As shown in Table 2, the volume of water released in the Agua Dulce water well daily is 42,044 gallons (calculated by multiplying 10 gallons of water/20.55 seconds with 86,400 seconds constituting one day). Computing this on a monthly basis, the volume of water released in a 30 day month period is 1, 261, 320 gallons. The volume of water

released in a year is 15,346,060 gallons. As indicated, a large volume of water is released in the Agua Dulce Artesian well which could be utilized not only for drinking purposes but for other domestic purposes.

Table 3. Volume of Water Utilized in Agua Dulce per Unit of Time

Observed Periods	Volume of Water Fetched from Agua Dulce(Gal)
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March 8, 2012 (5:00 AM to 11:00 PM)	5,835
March 9, 2012 (5:00 AM to 11:00 PM)	5,500
Mach 10, 2012 (5:00 AM to 11:00 PM)	7,010
April 1, 2012 (5:00 AM to 11:00 PM)	
April 2, 2012 (5:00 AM to 11:00 PM)	6,475
April 3, 2012 (5:00 AM to 11:00 PM)	
Average Volume of Utilized Water	6,490
Volume of water utilized monthly	194,700
Volume of water utilized yearly (365)	2,368,850

Table 3. Reveals the number of gallons fetched from Agua Dulce Artesian well taken last March and April, 2012 to provide a clear view as to how much volume of water was taken from the Artesian Well. As shown in the table, there was a variation in the volume of water fetched in Agua Dulce Artesian well per observation period. As revealed, there were times that more volume of water was taken from Agua Dulce Artesian well such as that last April 3, 2012, the volume taken was 7,560 gallons while last March 9, 2012, the volume of water taken was only 5,500 gallons. In April 3, a truck load of water was fetched coming from Villaba. On the average, the volume of water fetched was 6,490 gallons. Calculating the volume of water taken in a month, the average volume of water was multiplied by 30 days and the result indicated a utilized volume of 94,700 gallons. As to the volume of water utilized, the table indicates that a volume of 2,368,850 gallons are more or less fetched and used by the people.

Table 4. Volume of Water Utilized and Unutilized in Agua Dulce Per Unit Time

Per Unit of Time	Volume Released (Gallons)	Volume of Water Fetched in Agua Dulce (Gal)	Volume of Unutilized Water
Per day	42,044	6,490	35,554
Per month	1,261,320	194,700	1,066,620
Per yaer	15,346,060	2,368,850	12,917,210

Table 4. Presents the volume of water released in gallons per unit of time, as well as the volume of water utilized and unutilized. It reveals that in one day, the volume of water released is 42,044 gallons and the volume of water fetched or utilized by the people is 6,490, gallons: As to number of gallons unutilized, it is shown that 35,554 gallons is unutilized. It also shows, that in a monthly period, the volume of water released is 1,261,320 gallons but the volume utilized is only 194,700 gallons a difference of unutilized water of 1,066,620 gallons. In a year, it is shown that the volume of water released in Agua Dulce is 15,346,060 gallons but the volume utilized was 2,368,850 gallons. The difference noted for the unutilized water in a period of one year is 12,917,210 gallons

Table 5. Health Status of Agua Dulce Deep Well

Data Analyzed	Parameters	Results
Feb. 16, 2011	Total coliform	1.1
	(MPN Count)	MPL/ml
	E.coli detection Heterotropic	Absent
	Plate count	1.0

		CFU/ml
Feb 7, 2012	Total coliform (MPN Count) E.coli detection Heterotropic Plate count	≤1.1 CFU/ml Absent 1.0 EST, CFU/ml

Table 5.shows the result of the microbial analysis. Of the Agua Dulce Artesian well. As shown, in the two. period analysis taken in 2011 and 2012, Agua Dulce Artesian well was found negative of E. coli. This indicates that the Agua Dulce Artesian well is not contaminated with this pathogen hence the water is safe to drink and use for the people. E. coli is usually present and abundant in human and animal feces, in sewage and all natural waters and soils subject to faecal contamination. It can be deduced that Agua Dulce Artesian well is located in a busy residential place, its water is not contaminate from any sewage system nearby.

Reveals that a tremendous volume of water was unutilized in Agua Dulce Artesian well. This is disheartening considering that several areas in the world are experiencing water shortage yet in Ormoc City, the water is just allowed to flow freely.

Table 5. Income Generated by the “Kabu” Boys in Agua Dulce

Minimum Daily Income day per “Kabu” boy	Total Monthly Earning (30 days)	Yearly Earning
P200.00	P6,000.00	P72,000.00

Agua Dulce Artesian well has provided income to some residents of Agua dulce and Can-adieng. In an interview conducted, currently there are about 50 "kabu" boys providing services to the people by fetching water in the amount of P5.00 per 5 gallons of water. The amount that each can collect ranges from P200 - P300. The least amount they can collect is P200 pesos. Hence on a monthly basis, each "kabu" boy can earn as much as P6, 000.00. Summing this up, each could earn at least P72, 000.00. a year. According to them, they do not have other source of income except fetching water. The amount they earned has helped in their daily living.

Summary and Conclusion

Based on the findings of the study, it is therefore concluded that there is a tremendous volume of water released from Agua Dulce Artesian well with a volume of about 42,044 gallons daily, 1,261,320 gallons monthly and 15, 346,040 gallons yearly. On the average, the volume of water utilized by the people is 6,490 gallons in a day, 194,700 gallons in a month and 2,368,850 gallons a year. Comparing the volume of water released in a day and the volume of water utilized, a big volume of water is unutilized; 35,554 gallons in a day, 1,066,620 gallons in a month and 12,917,210 gallons in a year.

As to the result of the microbial analysis, it was found to be free from any contamination particularly E. coli hence safe for drinking. The Agua Dulce Artesian well is contributing income to some residents of Agua Dulce with each "kabu" boy fetcher earning a monthly amount of six thousand pesos with a total annual income of seventy two thousand.

Recommendation

1. There is an urgent need to conserve this water because as said water resource is not infinite resource, there will come a time that it will be totally used up if not properly taken care of.
2. The government' officials of Ormoc City have to do something either to conserve this water or to maximize the use of this resource.
3. The Barangay officials may construct a dam to contain the water and install pipes that would channel the water to nearby residents.
4. It could also be possible that a vacant public lot near the area maybe erected with a swimming pool and the supply of water may be taken from this Agua Dulce Artesian well. This could be an added income to the Barangay.

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