

Information Acquisition of Natural Water in Java, Indonesia

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Abstract: In this paper, we describe the procedure of information acquisition to obtain clear facts about the access and the quality of natural water in rural areas of Java.

The Autarcon GmbH, located in Kassel (Germany), invented a system for water disinfection for remote areas of developing regions, using solar technology and anodic oxidation. The realization of a market analyses shall give the required information about the land and people, as well as the water treatment in the country. For every research project, it is essential to get veridical facts to start work with a solid fundament. To ensure, that data package is correct, the best way is, to get the facts directly at the spring. In this case straight from the water tap, also we have to do this information acquisition in practice by our own is, cause there is no already existing information, which are useful to us.

The target of this excursion is getting an overview of the accessibility and the treatment of water in rural areas. Also there is a checklist of questions elaborated, which is needful for a market analysis followed. The samples of water from different places will be analyzed in special laboratories afterwards. During the journey, they will be stored in a cooler to make sure, that the bacteria's are not growing too fast, so that a proper result is not vulnerable. A special system for marking the samples and to locate them after removal is already prepared.

Keywords: research, information acquisition, drinking water, rural areas

1. Introduction

The most important thing, of starting a project like this, is to get an overview about the people, the culture and the landscape bevor starting to analyze a market. Especially Indonesia is marked for an incomparable grade of diversity. Whether it is the religion, the inhabitants or the circumstances they are living in. There is no way to generalize it. That is why we had to start at the root to get an insight in the way people are living and make a living. By seeing this, we were able to get information about the water treatment in rural areas as well as the access to water and electricity. Taking samples of water springs people used for drinking, was a good opportunity to get hard facts about the water quality in remote areas. In this way, we could be able to find solutions for the people, help them improving their living conditions.

2. Goals to be achieved

This paper is made to get a brief overview about what is happening in Indonesia, regarding to water quality and the way people in Java, Indonesia, treat water especially for drinking. Within this paper Author and Co-Authors expect to see real matters around the society in Java Island, Indonesia, by surveying directly at the site and talking face-to-face to the people. Water samples are also taken and being analyzed in a Laboratory to get detail information about the water composition. Author and Co-Authors also expect to get brief information about water supply in rural areas around Java Island. There are also some aspects those are going to be analyzed, such as psychological aspect, healthiness,

standard of living, people's interest in clean water, need for a SuMeWa-Setting and a possibility to install this setting around Java Island according to the needs of clean water.

3. Procedure followed to receive required information

We had to find the rural areas or the spot for taking the samples by using land maps. To get in touch with the people we often stopped at mini shops who sell water. Thereby we were able to get information by the owner. It took time for us to get close to local people because we haven't had any contact with them and they are strangers for us, vice versa. Therefore, using a glass of coffee was a brilliant idea to get closer with them at a certain amount of time. We directly visited them and talked face-to-face to ask what their problems, issues, suggestions and their real lifeare. We also explained them the project briefly and asked to take water samples and further details.

4. Procedure of taking water samples

We went to local people's houses in rural areas next to mountains, the sea, water springs and even cities, to take our water samples. Our method is quite simple regarding we copied the way, how local people do to take the water. We just sanitized the bottle cap from bacteria that might be there already, also the bottles we used have been new and sealed plastic bottles from a mineral water packaging. After we measured the temperature of the water and the pH-value we sealed the bottle with clean wrap and stored it in a container, where no UV-light could enter. Also we stored this container in cool areas, so the water did not get above 30°C.

We took the following parameters:

- Number of Sample
- Date
- Time
- pH Value (by using pH Paper)
- Region
- Detailed location / place
- Temperature of water
- Temperature of sites
- Humidity
- Description of sites
- Some additional notes

5. Analysis

5.1. Physiological Aspects

Most of the time within our research trip, we found out that people always tend to satisfy with what they have for "clean water", moreover if they have their own well at the home because they believe to never run out of water cause they could always dig deeper for more water. Yet, there are many of them get a service from PDAM which people just needed to pay the service fee every month and they get the water from PDAM. Even with this water source from the PDAM, people are still complaining on services regarding to the water quality.

5.2. Healthiness

There are also some issues regarding the healthiness of people when consuming their water from different types of sources, for instance we discovered that there are people that forced to buy packed drinking water for daily use, because there are some issues relating their health when consuming drinking water from the source. They tend to have a sore or even throat sickness, yet they already cooked the water. Based on our assumption people who experiencing sore throat is happened because even if they cook the water, they are still using dishes or cups, which are not in clean conditions or

sometimes they even store the cooked water in dirty bottles. That is how the bacteria's are able to grow again.

5.3. *Standard of Living*

From what we have experienced during our research, we have seen that people love to do their daily routines only based from what they have. They just happen to accept their life with given economic situation and they look and feel quite fine with it. It is also possible because they felt that their money is sufficient to fulfill their daily needs. They are not complaining, nor grumbling about their conditions, most of them are happy to live just as they are in their current state.

6. Findings

6.1. *Relation within social gap and water quality*

Based on our trip overview, we have several issues about social gap where the poorer people use different sources as drinking water than the richer people. Those are all varies by the price set at the market. The richer people tends to buy a brand name drinking water, unlikely the poorer because of low standard of living need to suffer themselves by using a refilled water which might not have standard that has been set for drinking water. The poorer also tends to use the water out of the well (which is ground water) or rain water to fulfill the needs of water. PDAM supplied most of the water.

6.2. *Water treatment in rural areas*

In rural areas the living standard of people is quite low, because of low income they get every month. But at some areas they have quite a good income to fulfill enough needs for their daily life. Most people buy water galloons from the distributors and they keep it at their house with closed seal. This is what most of people do, because it is very simple and they are also guaranteed to get drinkable water directly from the galloon. On the other hand, there are also several people who have lower income but still want to get a better life by getting clean water. That is why they are buying a galloon, which refilled with filtrated water by using a filtration machine. People who use galloon water or refilled water usually drink directly from a dispenser without cooking it first, but there are also some of them who are still cooking the water they get from the refilled galloon before they consume it.

Aside those two preferences, some people also use and consume PDAM water, which is offered by the government. The water obtained from PDAM will be boiled and consume later on. However, there are some issues regarding this PDAM water due to ages. There are also some issues about this PDAM water, considering PDAM has difficulties to maintain the whole system. There are some complains that PDAM water contains sedimentation of bacteria when it is cooked and leads to certain problem of stomach later on.

6.3. *Price analysis / other expenses*

Price is varies depends on where do they buy the water. As mentioned before there are several possibilities for people to obtain clean water specially for drinking. Mainly, PDAM supplies most of the water needs. PDAM also charge differently according to what level of society, the purpose of using water and how much water is consumed every month.

At the same time, the price for water galloon is also varies on the kind of brand. The range is from Rp 9,500 – Rp 18,000 per 19L galloon. Price for refilled water in a gallon is from Rp 4,000 until Rp 6,000 per 19L galloon. It depends on how much the distributor set the price to be sold to society. Another alternative is to buy a 600ml bottled water, which is cost from Rp 1,600 until Rp 10,000 per 600ml bottle.

Table 1: Pricing of PDAM water

NO	GOLONGAN PELANGGAN	TARIF PROGRESIF / m ³			
		0 - 10	11 - 20	21 - 30	>30
I	SOSIAL (S)				
1	Sosial Umum (S.1)	850	850	850	850
2	Sosial Khusus (S.2)	1.100	1.300	1.600	1.850
II	NON NIAGA				
1	Rumah Tangga I (R.1)	1.300	2.200	2.300	2.500
2	Rumah Tangga II (R.2)	1.700	2.500	2.900	3.050
3	Rumah Tangga III (R.3)	2.050	2.600	3.100	3.300
III	SEKOLAH/INSTANSI PEMERINTAH (P)				
1	Sekolah (P.1)	1.850	2.400	2.800	3.250
2	Instansi Pemerintah (P.2)	3.000	4.100	4.700	5.500
IV	NIAGA (N)				
1	Niaga Kecil (N.1)	3.000	4.100	4.850	5.600
2	Niaga Besar (N.2)	4.100	4.650	5.950	6.800
V	INDUSTRI (I)				
1	Industri Kecil (I.1)	4.300	4.750	6.150	6.800
2	Industri Besar (I.2)	4.550	5.100	6.400	7.400

Here are the price analyses for 30 days use of water, with assumption 1 galloon per 2 days for a family with 5 members.

Table 2: Price analyses for 30 days use of water

Day	Galloon Water (16,000 / galloon)	Refilled Water (4,000 /galloon)	PDAM	Bottled water
2	IDR 16.000	IDR 4.000	IDR 2.016	IDR 79.175
5	IDR 40.000	IDR 10.000	IDR 2.040	IDR 197.938
7	IDR 56.000	IDR 14.000	IDR 2.057	IDR 277.113
14	IDR 112.000	IDR 28.000	IDR 2.113	IDR 554.225
21	IDR 168.000	IDR 42.000	IDR 2.170	IDR 831.338
28	IDR 224.000	IDR 56.000	IDR 2.226	IDR 1.108.450
30	IDR 240.000	IDR 60.000	IDR 2.242	IDR 1.187.625

6.4. Recognized problems

Several problems recognized here are mainly because people are less educated about how to treat clean hygiene water and also drinking water and also about the benefits of it. Another problem issued here is difficulties to educate people to distinguish between clean hygiene water and clear water. It is difficult to inform them about which water is suitable to drink and which is not. Another problem is that people keep consuming water with a mindset boiling them is enough to kill all the bacteria and make it clean hygiene water.

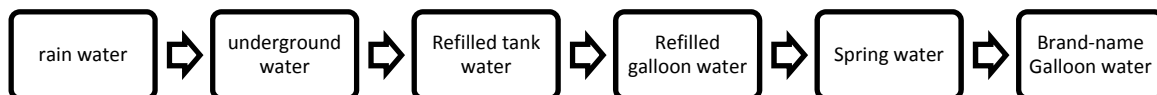
6.5. Condition of people in relation to water quality and electricity

Standard of living becomes a very significant variable to evaluate the real condition of people related to water quality and electricity. The condition of people, who has enough income to fulfill their needs are really good and not need to be worried. On the other hand, those who have very low income are

suffering when it comes to the water quality and electricity. It is very difficult for them to cover the cost of water, electricity and other issues. Water qualities also varies depends to the area. Some of them are already using Water Galloons to fulfill their need of water, but there are even some people, who only use rain water and cook it as daily needs. Electricity is also one of the issues while the growth of price is quite significant and not as high as the growth of salary. People are not interested and educated about how much water or electricity they use. They are only informed about how much they have to pay at the end of the month.

For water treatment, some of them also use tanks to store the water so they can later on be used for their daily life. They are also not so familiar with a sustainable energy such as solar power. On an islands, which is quite far from the main island, they are using a generator to get electricity, which they can only get at night.

Types of quality: Lowest to Highest



7. Results of water analysis

The results, we got from the laboratory after bringing the samples to them, show us, that the main problem of the water quality is neither the Iron nor the Arsenic. It is the *E.coli* and the Total Coliform which make the trouble for the people. Of course they can cook the water to make it drinkable but there are so many bacteria's around the kitchen and the facility, that they just start to grow if there is just one bacterial left. That is why it is not advisable to use system like reverse osmoses or UV-light to disinfect the water, because it is not sustainable. People like to store the water for a few days. This will take place in container or bottles which are just cleaned by tap-water and a brush. If there is the possibility to use chlorine, it would make the water lasting much longer in drinking water conditions.

8. Conclusions

While we were living in the most advance time still there are people with lack of resources to live in their own region, especially lack of the most important resource for living like clean water and we already met with those people during our excursion through Java Island. Sometimes their lack of main resources is not mainly because of factors that cause by human but Mother Nature also plays a part in this. No one can blame the season, let alone if long dry season come within the year it will automatically made many crops died within a month because water resources will also dried out from the heat, and not only crops that died people also suffered from the thirst while many water sources and well also will dried out. That is why we come to our concern in helping people that in lacked of water sources knowing that water is the most fundamental and main resource for human.

From two weeks of research that we conducted, we could learn about habit and how most people in Indonesia live through their daily life with just enough resources to continue it, even though just a few of them that we met but we could made an assumption that majority of people live in Indonesia's rural area are like those that we have already seen and experience during our excursion trip.

9. Recommendations

To address the problems in lack of clean water resources in rural area in Java government or if any available organization should install a device or system that can produce and generate clean water to every corner of Java Island. If it is capable it could also distribute clean water through all corners in Indonesia. Also to overcome problems that occurs when long dry season ruled over Indonesia and made many water sources dried out, respective government or another organization should regenerate existing waterworks such as water piping and main water dam to let water flowing smoothly to every people that needed it.

References

Helper tools for finding water sources through Java Island. Available: maps.google.com

Jurnal Lingkungan dan Bencana Geologi, Vol. 1 No. 3 December 2010: 131 – 149

Information regarding Regional Drinking Water Company (PDAM). Available:

<http://www.karanganyarkab.go.id/20140122/pdam-karanganyar/>