Study on the impact of the existence of drinking water plant on the water availability in Kebonpeuteuy village (study in Kebonpeuteuy village, regency of Cianjur)

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Abstract. Kebonpeuteuy Village is located at the foot of Mount Gede Pangrango. The existence of a Bottled Drinking Water Plant in this region raises a crucial issue dealing with the decrease of clean water supplies for the villagers, especially in hamlet 1. This study produces a number of confirmations: (1) during this time the distribution of the availability of clean water in this village has been ensured with a reservoirs system or water tanks and pipelines; (2) the existence of this plant does not have a direct influence on the sustainability of clean water availability in this village because the plant only takes ground water instead of surface water; (3) there is a significant change related to safeguarding the sustainability of the availability of clean water after the application of the recommendations from LKMM research, in the form of making water banks, planting trees along the watershed, making biopores and several other infiltration wells; and (4) related to the status of the operation of the drinking water business according to Islamic law, the drinking water plant only takes ground water from a depth of 60-90 meters and does not obstruct the rights of other parties who also want to access the groundwater source in other locations. For this result, it is recommended that the involvement of all village development stakeholders, including the educational institutions and drinking water plants to educate all the villagers to strengthen the independent mental attitudes, self-assessment capabilities and problem solving so that the availability of clean water can be carried out independently. Especially, the plant managers of the drinking water are required to increase transparency in the groundwater extraction process to settle the issue of the exploitation of surface water by the drinking water plant and to prevent the emergence of things considered counterproductive from the community.

1. Introduction
1.1. Background
Water is one necessity that need absolute fulfilment for the survival of life. Humans use water for various needs such as for drinking and for household activities, industry, agriculture and other things. Therefore, to maintain the continuity of social life, humans must maintain the availability of water.

The earth is composed of more water than land. Unfortunately, not all water can be used for life. From a total of 1.4 x 1018 tons of water available on earth, only 2.6% fresh water can be used by humans. The other 99.7% is salt water [5]. Humans use clean fresh water to fulfil their life needs. Water plays a role to arrange body cells, metabolic processes, an important compound in...
photosynthetic reactions and various other functions. Water is required to maintain the survival of every biotic aspect on earth. Therefore, the use of water requires a wise action to maintain its use [4].

One source of clean water that can be utilized in human life is groundwater. Groundwater is a water resource stored in the soil (aquifer) [7]. Its invisible existence is because it is in the ground so that people are less aware of its availability. Unlike surface water, whose existence is visible so that its quantity and quality can be observed easily. For example, during the dry season, the condition of the dry river and the decreasing water quality which is increasingly cloudy and dirty is immediately visible. This condition makes people more alert by taking various measures to prevent water shortages and control pollution. This contrasts with the groundwater whose availability is invisible, or whose reduction is unknown. This condition makes many parties exploit the groundwater in large-scale, without realizing the risks that could potentially damage the balance of aquifers and ultimately threaten the sustainability of water availability for life.

Kebonpeuteuy village is a village located at the foot of Mount Gede Pangrango. This area is a forest conservation area so that the availability of clean water in fact somewhat guaranteed. Even so, some areas of the Kebonpeuteuy Village are still experiencing difficulties to obtain clean water, especially in the hamlet 1 area, as the area directly adjacent to the Protected Forest. The condition gets worse by the existence of a drinking water plant PT Tirta Investama Aqua Cianjur which was established in 2011 in this region. The existence of the plant along with its relationship with the availability of clean water in Kebonpeuteuy Village is one of the important issues emerged in social mapping research when Insantama Senior High School’s program, Intermediate Leadership and Management Training (LKMM) was held in 2015 and 2016.

The emergence of this issue, during LKMM’s research still encourages the researchers to examine the problems. This study was carried out both in terms of current availability related to distribution problems and the continuity of clean water availability related to the presence of a drinking water plant in the region.

1.2 Research Questions
Research questions to be discussed in this study are: (1) What are the patterns to distribute the availability of clean water in Kebonpeuteuy Village? (2) What are the influences from the existence of a drinking water plant on the sustainability of clean water availability in Kebonpeuteuy Village? (3) What are the changes of condition in the village regarding the continuity of the availability of clean water after the application of recommendations from LKMM research in 2015 and 2016? (4) What is the legal operational status of drinking water business according to the Islamic law?

1.3. Aims
The aims of this study are: (1) To know the distribution of clean water availability in Kebonpeuteuy Village. (2) To know the influences from the existence of a drinking water plant on the sustainability of clean water availability in Kebonpeuteuy Village. (3) To know the changes of condition in the village regarding the continuity of the availability of clean water after the application of recommendations from LKMM research in 2015 and 2016. (4) To know the legal operational status of drinking water business.

1.4. Outputs
Outputs to be produced in this study are: (1) Knowing the conditions of clean water availability distribution in Kebonpeuteuy Village; (2) Knowing the influences from the existence of a drinking water plant on the sustainability of clean water availability in Kebonpeuteuy Village; (3) Knowing the changes of condition in the village regarding the continuity of the availability of clean water after the application of recommendations from LKMM research in 2015 and 2016; (4) Knowing the legal operational status of drinking water business according to the Islamic law.
1.5. Outcome
The expected outcome of this research is the maintenance of the availability of clean water in Kebonpeuteuy Village.

1.6. Benefits
The expected benefits from this study are: (1) The benefit for stakeholders of Kebonpeuteuy Village (the government and the residents) is the realization of the independence of the village to fulfill the needs of clean water. (2) The benefit for researchers is to get direct learning about the application of leadership and management functions, namely problem solving for rural communities as the goal to organize the activities of LKMM Insantama Senior High School Bogor. (3) The benefit for the drinking water plant is to get actual information related to the issues that can be used as material for evaluation and decision making for the Corporate Social Responsibility (CSR) program.

2. Methods
2.1. Operational Definitions Used in This Study
2.1.1. Differences between Groundwater and Surface Water [1]. Surface water is the water in rivers, lakes, reservoirs, swamps and other water bodies, which do not infiltrate underground. Around 60% of the water entering the river comes from rain, melting ice/snow, while the rest comes from the groundwater. Groundwater is water found in underground water flow. Groundwater movement is very slow, whose current velocity ranges from $10^{-3}$ to $10^{-1}$ m/s and is influenced by porosity, permeability of the soil layer, and water replenishment.

2.1.2. Groundwater Conservation [2]. Water resources conservation and preservation activities are: to maintain the function of water absorption and water catchment; to control the water source user; to replenish water source; to arrange sanitation infrastructure and facilities; to protect water sources in development and land use activities from water sources; to control land management in upstream areas; to arrange water source boundary areas; to rehabilitate forest and land; to preserve protected forests, nature reserve, and conservation areas.

2.1.3. Corporate Social Responsibility (CSR) [2]. Corporate Social Responsibility (CSR) is one of the medium for companies, especially those businesses related to natural resources, to balance their economic benefits with their contribution to the community, social, and environmental economies to realize sustainable development.

2.1.4. SWOT analysis as an analysis tool for social mapping and regional development [3]. SWOT Analysis (Strength-Weakness-Opportunity-Threat) is an analysis instrument of internal and external environmental conditions of organizations that have been widely known to map the current position of an organization. ‘S’ (Strength) or strength factors are resources, skills, or other advantages relative to the competitors and the market needs of an organization. On the contrary, ‘W’ (weakness) or weakness factors are limitations or lacks of resources, skills, and capabilities that seriously inhibits the effective performance of an organization. ‘O’ (Opportunity) or opportunity factors are important situations beneficial in the organizational environment. Meanwhile, ‘T’ (Threat) or challenge factors are important situations not profitable in the organizational environment.

2.2. Research Form
This research is in the form of qualitative (applied) nature of application (applied), carried out in a case study and with interview techniques, face-to-face interview, and observations. The research rules are limited to SWOT factor items (Strength, Weakness, Opportunity and Threat), especially on the issues that are subject to discussion and also with purposive sampling approaches and descriptive analysis method. Based on this approach and method, the research is conducted on the respondents.
who are categorized as experts, both because of their position or authority, knowledge, and experience, so that the respondents master the questions being asked. All respondents are representatives of all elements of stakeholders in the availability of clean water in the village.

The study was conducted in Kebonpeuteuy Village, Gekbrong District, Cianjur Regency. The Primary data from the field was collected on June 28th, 2019. The research was divided into several stages, namely preparation stage, primary and secondary data collection, data processing, writing and finalizing the report. The data collected for this study is from primary and secondary data. The primary data are obtained through questionnaires, interviews, and observations. Filling out questionnaires was carried out on community members randomly. In-depth interviews were conducted with local community leaders. Observations are made to see the condition of the surrounding community. While the secondary data are obtained through literature studies from various previous studies.

The population in this study is all residents of Kebonpeuteuy Village, hamlet 1 to hamlet 7. The sample taken is from expert respondents, namely the representation of stakeholders who master the questions being asked. They are the Village Secretary representing the village government, the Chairman of Hipoci (Cianjur Organic Farmers Association) representing the community of land and water user farmer community, The Chairman of the Water Bank Manager (a large catchment area built by the drinking water plant through a CSR program) representing the community of water user family, Head Village of hamlet 1 representing the village government at hamlets level, which has limited water supply problems and also the nearest to the drinking water plant, and the CSR Manager representing the drinking water plant.

3. Results and Discussions
3.1. General Condition
Kebonpeuteuy village is one of the 8 villages in Gekbrong District in Cianjur Regency. Kebonpeuteuy Village consists of 7 hamlets and 4 small villages. Kebonpeuteuy village is one of a conservation village models. It is one of the villages of choice for universities to carry out the Student Community Service Program. In addition, the Village of Kebonpeuteuy is a village built by the CSR programs of the drinking water plant which is part of this research in the area.

The geographical condition of Kebonpeuteuy Village is located at an altitude of 850 m above sea level. This area has a high rainfall of 350 - 3500 m³/ha. Around 7,472 inhabitants live in the villages covering an area of 1,018,250 hectares. Most residents work as farmers and farm laborers. The forest area in Kebonpeuteuy is 199 hectares, while the village land is only 141 hectares. The northern part of Kebonpeuteuy Village is bordered by Mekar Wangi Village, and the southern part is bordered with Gekbrong Village. Whereas the western region of Kebonpeuteuy Village is directly adjacent to TNGGP Forest (Gunung Gede Pangrango National Park) and its eastern part bordered with Songgom Village.

3.2. Availability of Water as an Important Issue in the Results of SWOT Analysis
From the data that has been processed qualitatively, according to the SWOT analysis criteria, 6 (six) are potentially categorized as Strengths, 9 (nine) are potentially categorized as Weaknesses, 4 (four) are potentially categorized as Opportunities while 3 (three) are potentially categorized as Threats.

The issue of water availability arises as an important issue in the results of the SWOT analysis, namely on the internal factor (Strength) and the weakness internal factor (Weakness). The strength internal factor reads: “SDF (Physical Resources). It has an adequate source of water for the development of food crops, plantations, fisheries and livestock”. The weakness internal factor reads: “SDF (Physical Resources) of clean water distribution is still lacking”. Thus, this village actually has the potential for adequate water resources, but still faces the problem of limited distribution of clean water facilities.

During the in-depth interview, one of the factors that contributed to the emergence of the two statements above was the issue of clean water availability. Based on the information obtained in this village, especially in its upper area (hamlet 1), had experienced a water crisis (drought) since 2006. Drought occurred, especially during the dry season. The solution for villagers (residents of hamlet 1)
was by taking water from the upstream river or from Curug Goong (a waterfall nearby). Time to time, this issue grew bigger after the establishment of PT Tirta Investama drinking water plant in 2011 located in Gekbrong Village, which borders with Kebonpeuteuy Village. Taking a land area of about 12 hectares, this plant is only 2 km from hamlet 1 of Kebonpeuteuy Village.

The growing issue of the existence of this plant affects the availability of water in hamlet 1. The plant even takes water from the water source of Curug Goong, which is 6 km from the plant. As an important issue, this must be taken seriously so that it does not disturb the lives of the villagers by causing counterproductive things to the village development.

3.3. Distribution of Clean Water Supply in Kebonpeuteuy Village

The progress has been felt by the villagers since the activities of LKMM during 2015 and 2016. For example, one of the CSR programs of the drinking water plant is to design pipelines flowing from Curug Goong on Mount Gede Pangrango to a 3000-liter tank which is then divided into several 200-liter water tanks spread throughout hamlet 1. But once, there was an incident where one of the 200-liter water tanks disappeared from its place. There were also several instances where the villagers connect pipes that were not supposed to be there. In addition, there were leaks from a few pipes due to plastic materials and a number of other technical problems considering the terrain is indeed a mountainous area. At the bottom of the village, the water is more adequate, even the Village Secretary said that there were no issues about water dryness in the area. The villagers usually use wells or other water sources such as rivers and ponds and no villagers use the PDAM (State Tap-Water Company). [8] studied the potential supply of the springs in Cidahu District. This study was aimed at achieving 3 objectives, namely mapping the location and capacity of the Cidahu sub-district water from the inventory information, which review the variations from the data of fairy long recordings of time series of the Cidahu sub-district, and make spatial maps and cross-section geology of the springs of Cidahu District to identify the catchment areas.

So, it is confirmed that this village does have the potential for adequate water resources in the form of water sources from waterfalls for upper parts of the village and wells and other water sources for the lower part of the village, but they still face the problems of limited water distribution facilities. So far, the means of distribution are water systems or water tanks and pipelines which technically have limited coverage and maintenance which should involve the active roles and the independence of the villagers.

3.4. The Influence of the Existence of Drinking Water Plants on the Sustainability of Clean Water Availability in Kebonpeuteuy Village

The results of a social study from the activities of LKMM Insantama Senior Highschool in 2016 concluded that people must be conscious about the continuity of groundwater availability for the future due to the activities of water resources exploitation carried out by the drinking water plant in the area, even though the water taken is groundwater from the depth of 60-90 meters below the ground and not surface water. There are also reports that after the existence of the drinking water plant, namely in the Pasirmunding area (hamlet 1), the farmers could no longer farm because the fields dried up. In the past, the area around the drinking water plant, namely in Gekbrong Village, villagers only dug 12 m deep wells (before 2011) and now (2019), around 20 m deep.

It can be concluded from the interviews that all respondents answered the same that is until today, this only becomes of concern for the villagers. Water dryness has occurred since 2006 or five years before the drinking water plant was established. The CSR Manager respondents added that the factory only took groundwater, not surface water. Groundwater does not affect the availability of water for surrounding villagers. In the Hydro Isotope Study carried out by the team of University of Pajajaran (2011), it was also stated that the age of water taken from artesian soil (groundwater) for this plant is around 2.000 years. The pathway of groundwater infiltration with surface water is also different. Compared to [6], this study examines the impact of the exploitation of the drinking water plant on the environment and residents around the plant in Sukabumi Regency. This study aims to
obtain an initial description of the impact of water exploitation by AQUA DRINKING WATER in Sukabumi District and produce recommendations for further research and advocacy programs.

Thus, it is confirmed that plant activities to extract the groundwater does not affect the availability of water for the villages who uses surface water. It is just that it must be anticipated, because the increasing activities of surface water usage along with the increasing activities in development can accelerate surface water shortage. Therefore, the village stakeholders, both the village government, the residents and the drinking water plant must coordinate the activities so that the issues can be settled and also to anticipate the lack of surface water in line with the increasing activities in the development.

3.5. The Availability of Clean Water
Based on the results of social research from LKMM Insantama Senior High School in 2015 and 2016, it is recommended to maximize the community programs to overcome a number of problems faced by the village by taking advantages of the opportunities (according to the results of the 2015 and 2016 SWOT analysis). In the form of socio-cultural conditions, Kebonpeutey Village has become a destination village for the implementation of Community Service Program in a number of higher institutions and socio-economic sectors due to the existence of the CSR program for the drinking water plant. [1] observed the sustainability of clean water availability in Kebonpeutey Village, Gekbrong District, Cianjur Regency. This study aims to determine the distribution of the availability of clean water and the influence of the existence of a drinking water plant on the sustainability of clean water availability in Kebonpeutey Village.

In general, the involvement of the Community Service Program is directed to provide learning and foster self-assessment and problem-solving skills independently to all village stakeholders. While the CSR program is directed to provide technical facilitation of problem-solving on the infrastructure facilities together with its independent maintenance.

Regarding the issue and expectation of the sustainability of clean water availability, it is recommended to maximize the existence of CSR programs to facilitate clean water distribution infrastructure facilities and independent maintenance from a number of water sources, both natural sources especially from Curug Goong and artificial sources in the form of infiltration ponds, especially in hamlet 1 area. In addition, it improves conservation programs in the upstream areas of the river along the watershed. Conservation programs are important for long-term maintenance of natural water sources.

From the answers of all respondents which are reinforced by the observation results, it was confirmed that the Water Bank (infiltration ponds) of 10 x 12 m with a depth of 1.5 m has been effective since April 2019 built in September 2018 in collaboration with the expert team from Pajajaran University, Bandung. This infiltration pond becomes an artificial water source that can channel clean water to the villagers’ homes and at the same time can absorb the water back into the soil. Occupying waqf land (charity land) from the residents, this catchment pool is able to provide clean water for the mosques in hamlet 1 area, more than 40 houses of around 60 families and at the same time become water recreation facilities for the local residents. In addition, efforts have also been made to continue planting trees along the watershed, making bio-pores and a number of other infiltration wells.

Thus, significant changes have been confirmed regarding the efforts to maintain the continuity of clean water availability for villagers, especially in the hamlet 1 area that is prone to drought if the dry season comes. This is also in accordance with the recommendations of the results of social research from LKMM Insantama Senior Highschool in 2015 and 2016. However, the intensive efforts still need to be carried out to involve all village development stakeholders to provide counseling for all villagers related to strengthen the independent mental attitudes, self-assessment abilities and problem solving so that the sustainability of clean water availability can be carried out independently.

3.6. Legal status of Implementing Drinking Water Business [4]
Water whose source is contained in the earth crust, no one can claim it as his own unless he works to access it, digs to find the source and makes it ready for use. When someone opens this source with
work and excavation, he is entitled to the spring he finds. However, the inventor of the water only has the main priority, if he is sufficient in his needs, then he has no right to prohibit other people from using the water.

Thus, the keyword is the right of access to water resources. In general, because water is classified as public ownership, the control of water resources must not eliminate the right of others to access it. Therefore, the existence of a drinking water plant is in fact done by taking the groundwater from the depth of 60-90 meters and cannot hamper the rights of other parties who also want to access the groundwater source in other locations. Moreover, what is being done by the drinking water plant is selling the water it gets in special packaging.

In addition to not closing the access rights of other parties, the existence of the plant should also be able to provide more benefits to the surrounding environment, not only in the form of materials but also in the form of non-material namely in the form of learning and empowerment of the surrounding community. Community empowerment programs through CSR policies, facilitation of making artificial water sources such as water banks, soil conservation efforts through tree planting along the watershed, making biopores and a number of other infiltration wells such as those which have already been done and are more continuously carried out by the drinking water plant to the community. The provision of benefits is also an implementation of blessing, namely ‘ziyadatul khair’ or increasing goodness from day to day.

4. Conclusion and Recommendation
Kebonpeuteuy Village does have the potential for adequate water resources in the form of water sources from waterfalls for upper villages and wells and other water sources for the lower villages, but the village still faces the problem of limited water distribution facilities. So far, the means of distribution have been the water systems or water tanks and pipelines which technically have limited coverage and maintenance, and which should have involved the active role and the independence of the villagers.

Plant activities to extract the groundwater do not affect the availability of water taken from surface water for the village. It’s just that, it must be anticipated, because the activity of surface water usage that is increasing along with the increase in development activities can accelerate and increase the shortage of surface water. Therefore, the village stakeholders, both the village governments, the residents and the drinking water plant, are recommended to do something coordinated so that the issue can be settled and anticipate an increase in the lack of surface water in line with the increase in development activities.

The significant changes related to efforts to maintain the continuity of clean water availability for villagers is confirmed, especially in hamlet 1 area that is prone to drought when the dry season come. This is also in accordance with the recommendations of the results of social research from LKMM Insantama Senior Highschool in 2015 and 2016. Therefore, it is recommended that intensive efforts be made to involve all village development stakeholders, including the educational institutions implementing Community Service Program and drinking water plant to provide counseling for all villagers related to strengthening independent mental attitudes, self-assessment capabilities and problem solving so that the sustainability of clean water availability can be done independently.

The existence of a drinking water plant is in fact done by taking groundwater from the depth of 60-90 meters and cannot hamper the rights of other parties who also want to access the groundwater source in other locations. Moreover, what is being done by the drinking water plant is selling the water it gets in special packaging. In addition, not to close the access rights of other parties, the existence of the plant should also be able to provide more benefits to the surrounding environment, not only in the form of material but also in the form of non-material namely the counselling and the empowerment of the surrounding community. Community empowerment programs through CSR policies, facilitation of making artificial water sources such as water banks, soil conservation efforts through tree planting along the watershed, making bio-pores and a number of other infiltration wells such as those have
already been done and continuously carried out by the drinking water plant should give more benefits for the community. Therefore, it is recommended for the manager of the drinking water plant to increase transparency in the process of extracting ground water so that the issue of exploitation of water by the drinking water plant is settled and prevents the emergence of counterproductive things from the community.

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