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Article

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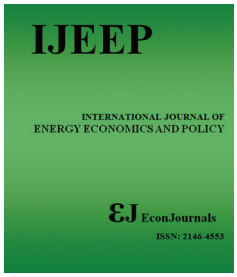

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Community Participation on the Self Help Group of Methane Gas (Biogas) Management as Renewable Energy in Indonesia

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ABSTRACT

This study focuses on social capital as an opportunity for community engagement in the management of methane gas (biogas) as renewable energy, which the Self Help Group carries out on the final disposal site in Supit Urang. Methane gas generated from well-managed sites can provide positive advantages that can be used as an energy source (specially for cooking) for the local community as a replacement for LPG. Community participation in biogas management from methane gasses may improve public welfare, particularly in landfill capture and distribution. The Social Networks Analysis shall be used to determine the Rate of Participation (RoP), density and centrality of group involvement. The findings of the RoP study suggest that the concentration of participant affiliation to organizations influences the low level of participation. Density analysis reveals that when the respondent follows more than one organizations and entities, network density value is high, so the respondents can be more interlinked. Centrality analysis shows that measuring degree centrality by UCINET reveals that six respondents have the same high value and the same low central value. The median centrality is 0.58, reflecting the value of respondents and organizations.

Keywords: Social Capital, Biogas (methane gas), Self Help Group, Social Network Analysis (SNA), RoP, Density, Centrality
JEL Classifications: A13, C89, Q15, R14

1. INTRODUCTION

Growing population, urban activities and settlements are the main producers of waste in cities (Sudiro et al., 2016). Municipal waste in the form of household waste and industrial waste causes air, soil and water contamination if it is not properly handled (Aguilar-Virgen et al., 2013). Municipal waste management is usually collected by TPS (Temporary Shelter) and then sent to TPA (Final Disposal Site). Huge amounts of waste disposed of in landfills (TPA) have the capacity to release methane gas (CH4) which can increase greenhouse gas emissions and lead to global warming (Koderi et al., 2018; Lee et al., 2017). In general, more than 70% of waste in developing countries consists of easily biodegradable materials (Ramachandra et al., 2018) and, if not properly handled, has the potential to cause methane gas explosions in waste piles (Armi and Mandasari, 2017). Methane gas levels in the air, if they exceed 5-15%, can cause explosions and fires at landfill sites (Ratih et al., 2015).

Methane and greenhouse gas management efforts in sites of waste are generally carried out in two ways, namely through the reduction of the source organic waste (composting) and through the management of emissions from sites of deposit (Hermawati et al., 2015). Methane gas treatment is carried out at the landfill by heat and energy flaring or usage. The method of combustion of methane gas (flam mating gas) is useful to neutralize methane gas into a lower carbon dioxide gas. The carbon dioxide gas that is emitted is absorbed by the plants in the deposit and by the plants that act as a buffer zone for the deposit.

Methane gas may be used for the good of the local society by a facility fitted with a methane gas capture system (Hakim et al.,

2019). TPAs with methane capture systems are typically TPAs with sanitary or controlled deposit systems (Egun et al., 2016). Methane gas is one of the biogas components produced by methane and biogas bacteria from the anaerobic fermentation process to break down organic waste, thereby creating methane gas that is capable of generating heat energy (Salamah et al., 2014). Methane burns in biogas comparatively cleaner than fossil fuels such as coal, providing more energy with decreased emissions of carbon dioxide. Alternatively, Methane gas may be used to replace GLP gas (Armi and Mandasari, 2017), power plants and energy sources (Lee et al., 2017; Mboowa et al., 2017).

Indonesia as a developing country also faces difficulties in urban waste management, particularly methane gas energy management in waste disposal sites (Salamah et al., 2014). If used, the capacity for methane gas is considerably high, it would have a beneficial effect on the reduction of air methane gas which will minimize public energy demand for everyday usage. In order to ensure its sustainability, community participation in the management of renewable energy is necessary (Stuckey, 1986). Public engagement would be stronger if it is carried out independently, not by associations. One of the current methane gas distribution schemes is an NGO (KSM).

A Community Self-Help Group (SHG) is a group of people who volunteer in a unifying connection to the same goal, desires and needs to ensure that the group has the same objectives to accomplish (Hajaroh and Mulyono, 2012; Marhalim, 2015). SHG has independent and social properties, is established and dissolved based on collective agreements, so that among other entities, it is non-partisan and independent. Other research suggests that the KSM is often referred to as a self-help group (SHG), which is an informal organization or group of people who volunteer for social and economic purposes.

SHG plays an important role in economic growth, as SHG is an opportunity for people with reduced capital to generate new jobs, increase the people's economy and reduce community unemployment (Nugroho et al., 2012). This is in line with the empowerment theory, where the strongest communities are those that come from community needs and expertise, controlled and built through existing resources in the community (Hajaroh and Mulyono, 2012). The overarching purpose of SHG creation is to establish self-help groups that can solve problems individually and accomplish objectives by collective action. (Petunjuk Teknis Pengembangan Kelompok Swadaya Masyarakat [KSM]., 2012).

There are three SHGs in the Greater Malang region, which manage three landfills with methane gas plants (TPA Supit Urang, TPA Talangagung and TPA Paras). Of the three TPAs, however, only TPA Paras and TPA Supit Urang continue to have separate methane gas network management parties. In the meantime, the TPA Talangagung management committee has been inactive since 2014. Preliminary results of the survey found problems with TPA Supit Urang methane gas management, where an internally occurring dispute culminated in a division within the SHG. Moreover, there is no financial accountability, and the greenhouse gas situation that always dies leads people to stop using methane gas. At the onset of the socialization of the gas usage scheme, the residents' excitement was very strong. At the beginning of its program implementation, the population registered reached 510 families (UPT TPA Supit Urang, 2012 data collection results), then it decreased to 408 families in 2014 (Qodriyatun, 2014). In January 2018 it was confirmed that there were 130 families of methane gas users consisting of RT 5 and RT 10 residents (interview results). It is anticipated that the gradual decrease in the number of consumers would lead to the end of the use of methane gas.

Community participation in Biogas management is a means of involvement in the development of infrastructure. Implementation of community-based infrastructure will improve the effectiveness of growth, and participation is a source of social capital to be built for growth (Kusumastuti, 2016). Social capital improves the efficiency of infrastructure management, demonstrated by strong networks, expectations and motivation to meet common objectives (Syahli and Sekarningrum, 2017). One type of social capital, namely bonding, has been demonstrated as the power to generate rural communities' adaptive capacity in the management of infrastructure in the form of cooperation, involvement, technology usage, shared care and capacity to mobilize collective resources (Kusumastuti, 2016).

SNA (Social Network Analysis) is used in this research to map and quantify the relationships and knowledge existing between individuals or within groups or institutions (Bralić, 2017). The objective of social network analysis is not only to chart, measure and understand the network structure between actors (Moore et al., 2011) and to explain the impacts of connections on each actor (Grunspan et al., 2014). The extent of society involvement, network density and centrality of the network can be seen through SNA (Antoniadis and Charmantzi, 2016). SNA research was used to assess group engagement in the sustainable clean water management of one of the community-based studies (Alfiah et al., 2018). Meanwhile, additional study using SNA also aims at evaluating the rate of participation of Horizon 2020 countries (Bralić, 2017). The results indicate that countries with high centrality have the capacity to manage and quickly form alliances in order to regulate the flow of knowledge and resources.

The use of SNA can also be extended to the social capital typologies of an organization or company, such as in social capital research for a company of banana chip industrial contractors (Ville, 2013; Wijaya et al., 2018). The results showed a bridging social capital typology for the entrepreneur group, where this form has a positive effect on industrial development because it offers good networking skills. It can be inferred that social network analysis will assess the degree of group engagement, identify the main stakeholders in the network and evaluate the type of social capital network type. The scientists therefore used SNA because the social capital of the group using methane gas was evaluated in this study to determine participation level, network density and centrality in order to find the relevant typology.

The social capital typology demonstrates patterns of group involvement and affects a community's resource management capacity. Social capital resources are social institutions in a society,

be it an organisation, a place to live, or a working atmosphere that can promote its members' goals (Reimer et al., 2008; Villalonga-Olives and Kawachi, 2015). A pattern of connections between societal groups (Coleman, 1990) shapes the social framework such that collective involvement in institutions can establish a social network in that framework. Community involvement in organisations impacts social networks. The bigger the social network, the greater the access to social capital services and vice versa where the size of the social network is determined by the number of members of the community (Barliana and Cahyani, 2015).

2. DATA COLLECTION METHOD

The research site for this study was carried out in TPA Supit Urang (Kelurahan Mulyorejo) in order to know the social capital of the group involved in KSM methane gas management. The basis for the study is the existence of a TPA with a methanol gas network, the presence of a self-help group which manages networks and methane gas distribution, a waste management facility and the capacity of the TPA. TPA Supit Urang is situated to the west part of the village of Mulyorejo (Figure 1) and is directly adjacent to the district of Malang Regency, the district of Wagir. The administrative limits of the village of Mulyorejo are:

North side: Bandulan village - District of Sukun
East side: Bandungrejosari village, Sukun District
South: Sidorahayu village, District of Wagir.

2.1. Data Collection

Data were obtained using a questionnaire-based interview methodology. - Respondent was asked about the engagement in the current institutions and the shape of the local community. Density and centrality were measured using UCINET 6,528. In addition, the RoP is determined on the basis of data on the participation of respondents in the group activities of each village institution. The RoP calculation is based on the division between the complete diagonal matrix and the number of respondents. The size of the diagonal matrix is the total number of groups/ institutions in which the respondent participates, while the number of respondents is the number of respondents who use methane gas in the study field.

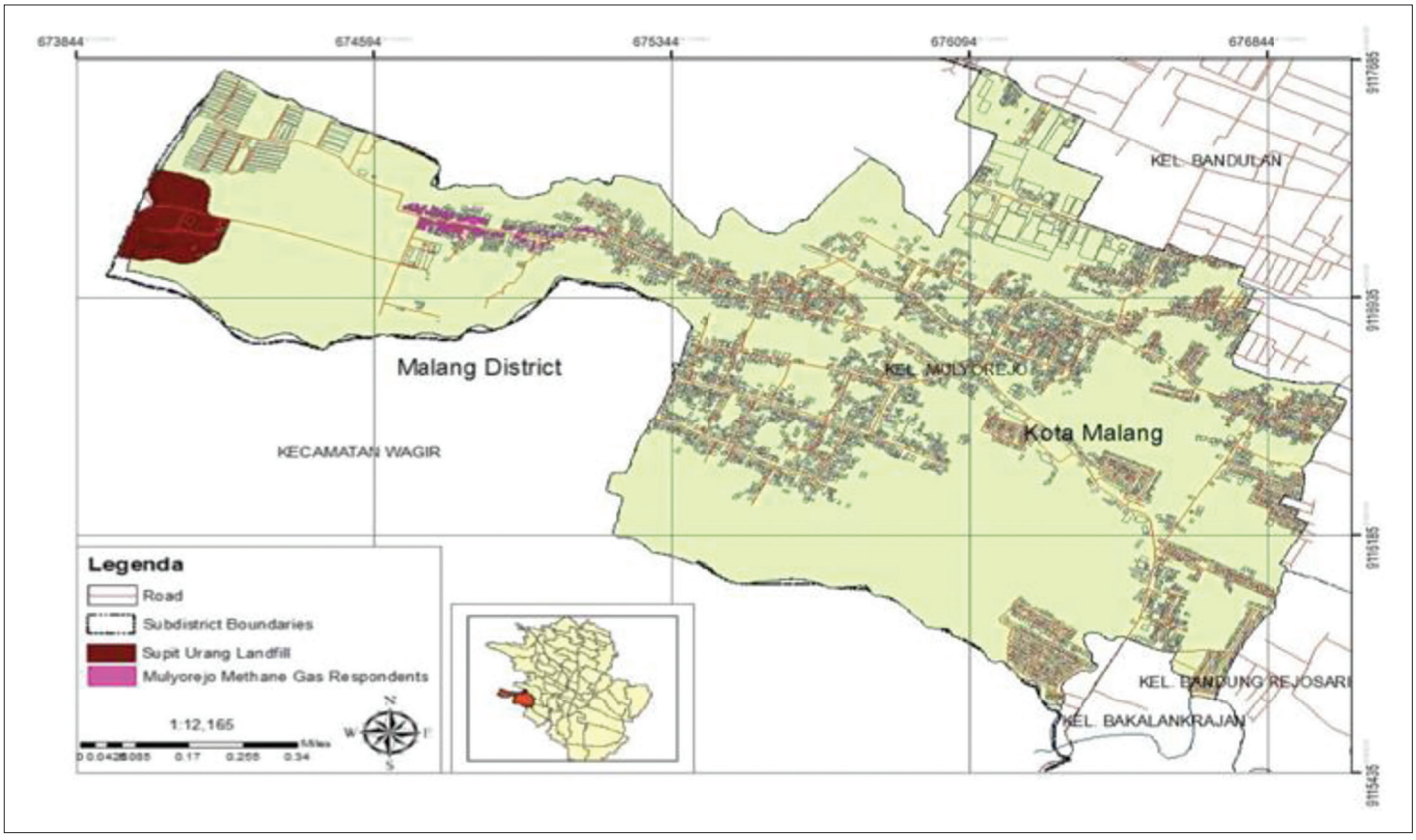
2.2. Population and Sample

The study included all methane gas users in Mulyorejo Village, Malang City. The number of respondents in the Mulyorejo Village was 73. The sampling technique used was a proportional random sampling method. Research has been performed in areas with homogeneous respondents; thus, the sampling methodology uses the Slovin method (Sugiyono, 2016). Table 1 is the research variables for this research.

2.3. Analysis Technique

Social network analysis (SNA) are the methods of analysis used. The SNA research methodology is used to analyze the community's social capital with methane gas management.

Figure 1: The research location (The village of Mulyorejo)



3. RESULTS AND DISCUSSION

3.1. General Characteristics

TPA Supit Urang is the only TPA in Malang City located in Mulyorejo Village, Sukun District. The Supit Urang TPA has an area of 32 hectares, but currently only 16 hectares is being used as a garbage dump. The waste produced by TPA Supit Urang reached an average of 381,63 tons per day in 2018. Trends in the amount of incoming waste continued to rise from 2016 to 2018, but the growth in the volume of waste from 2017 to 2018 grew rapidly from 268,84 tons to 381,63 tons per day in 2018 (Figure 2).

If methane gas is not properly treated, the gas build-up trapped in the waste heap will lead to an explosion. In 2012, the DKP of Malang City initiated a policy to use TPA methane gas to protect the atmosphere. The usage is made by channelling methane gas to residents around the site as a replacement for LPG cooking fuel. People with access to the methane gas network are those who live at the site up to 1 km^2. The decision is based on the fact that the TPA's inhabitants are the most affected by the TPA, such as the effects of the scent of garbage, the waste spread in waste litter trucks littering the village roads and the slum stigma afflicting people living around the TPA. After the individuals with right of access to gas were established, the Bina Mandiri Community Self-Help Group (SHG), initiated by the DLH Malang Area, created. SHG Bina Mandiri is a self-help organization developed to allow the community to manage the network and distribution of methane gas independently. The management is established by discussions between the DKP of Malang City, Supit Urang TPA officials and local officials.

Table 1: Research variables

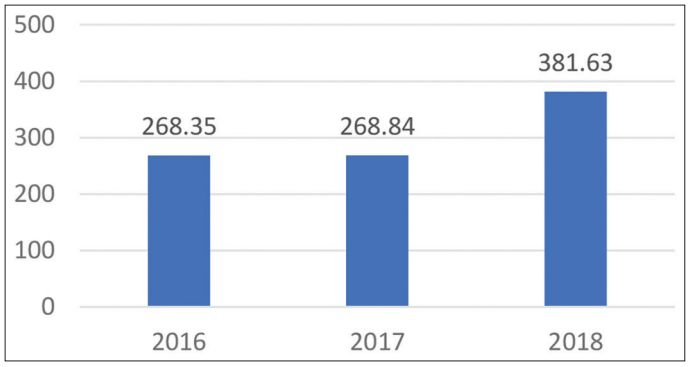
Objectives	Variables	Sub variables	Sources
Social capital	RoP	Actors Institutions Number Respondents	(Wasserman and Faust, 1994) (Ari, 2011)
	Density	Affiliated members Connection	
	Centra-lity	Degree centrality Betweenness centrality Closeness centrality	

Table 2: The Number of Biogas Users in 2012-2019

No.	Areas/RT	Users in 2012	Users in 2019
1.	RT 10	39	39
2.	RT 5	93	91
3.	RT 7	72	0
4.	RT 4	120	0
5.	RT 3	186	0

Sources: UPT TPA Supit Urang, 2019

Figure 2: Average volume of incoming waste per day (Ton) 2016-2018



Sources: UPT TPA Supit Urang, 2019

3.2. The Users

The growth of the users from the initial launch (2012) of the network to 2019 can be seen in Table 2. In 2019, the number of methane gas users was 130 households, comprising Neighbourhood Association (RT) 5 and RT 10.

The decline in biogas users is attributed to the reduction in bogas volume due to the existence of many community members who have more than one gas pipe connection. In the original agreement, only one methane gas pipe and one changed stove were attached to each household. Many communities however have more than one gas pipeline, so the supply of gas cannot reach all methane gas consumers. RT 7, RT 4 and RT 3 are the farthest places from the gas centre (TPA), so the gas cannot hit RT 7, RT 4 and RT 3 residents if so many people use gas together. In 2014, methane gas in RT 7, RT 4 and RT 3 did not reach its inhabitants, as the blower was damaged due to a lack of maintenance at the time of the construction. While the blower has been removed, the gas volume in the gas pit has decreased to prevent gas supplies for residents in RT 7, RT 4, and RT 3 and they agreed not to use methane gas in 2014.

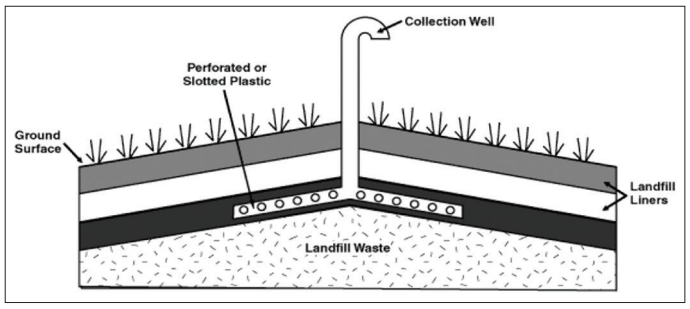
3.3. Capture and Distribution System of Biogas

3.3.1. Capturing system of biogas in TPA

The methane gas collection system is performed using the passive gas collection process. The waste piles on the edge of the ridge are dug with a scraper up to 1-2 m depth, then the tube are planted horizontally after the tube has been previously drilled so that gas may penetrate the tube (Figure 3). The planting pipe is then horizontally connected using a PVC wire.

TPA Supit Urang has hilly contours, so the gas well is purposely put on the waste pile cliffs (Figure 4), in order not to fill gas pipes with fresh garbage and to push them over by trucks. It also aims to promote the maintenance and control of gas tube damage. The collected methane gas contains water so the KSM management and TPA officers make a separate water disposal pipeline (Figure 4a and b). The water coming out should be drawn into the leachate treatment tank, but that is not because a long pipe is required. Every

Figure 3: Schematic of methane gas capture with passive gas collection system method



Sources: www.atsdr.cdc.gov

morning the drain tube is operated to extract the accumulated water. The Supit Urang TPA has a flaring device and a leachate treatment bath in Figure 5. Ideally, methane gas from gas fields is shipped to a flammable system until it's delivered to the homes of the residents. The aim is to avoid methane gas that is delivered to residents from being blended with waste leachate so that the main pipeline in residential areas is not encroached. However, the combustion method or flaring method is not used in Supit Urang TPA, as the mechanism is not working correctly. Methane from gas wells is passed directly to residents without burning. Instead, the community manager took turns to open the pipe deck containing the gas well leachate each day.

Based on the study, one methane gas well at TPA Supit Urang will produce methane gas for consumption by community members (130 households) for two years. If it is more than two years, the gas produced decreases so that the gas in the community is minimal, and even the gas in some houses cannot ignite. The houses nearest to the TPA can still be illuminated. This situation, of course, varies according to the number of users and the conditions of the waste in the TPA for each area or TPA. The design of a new gas well must also take into consideration the state of the waste, whether or not the waste contains gas. Wet waste is one of the measures of waste that has generated methane. The best time to construct a new well is therefore during the rainy season as the amount of gas in the garbage pile rises in the rainy season. During the rainy season, abandoned gas wells can also generate new gas. During the dry season, the TPA and KSM administrators turn the waste pile into water, which then becomes an active gas well to hold the waste moist.

3.3.2. Distribution system of biogas in TPA

The distribution method is done by moving gas from the gas center (TPA) with a blower to the residential area. The actually used blower is just one blower. The higher location of the TPA than the town encourages the flow of gas into the lower villages. Meanwhile, the dim size of the pipe is used for delivery of gas. It is not planting the gas pipeline, but built alongside the drainage channel for ease of maintenance (Figure 6).

Figure 4: Capturing system of biogas (a) well gas (b) distribution pipe

Figure 5: Flaring and leachate water treatment pool

Figure 6 indicates that the main pipe linking TPA to homes is built in conjunction with the drainage channel by using 3⁄4 dim pipe. The relation between the main pipe and the houses of the residents is smaller. SHG and residents obtained funding from the government in the form of PVC pipes and stoves at the start of the project. Pipeline help is only accessible from the TPA and along the village roads. In order to deliver to the houses of people, people have to pay their own prices. The methane gas stove has a special iron shape, some of them like a tube and some just display the frame (Figure 7a).

The gas given to the stove has a valve that can be opened and closed, and the valve is opened when it is used to cook. At the outset, a large fire blinking red turns blue like LPG gas, after which it turns blue (Figure 7b). The change of colour is induced by the water content of the gas so that the fire colour turns red. If the gas burns, the flames are blue. Based on interview results with TPA officials and the environment, methane gas heat is much more reliable and blue. Moreover, methane gas fire produces heat that is often warmer than LPG gas in general so that food cooks faster.

3.4. Characteristics of Respondents

At present, SHG Bina Mandiri has 130 families of methane gas consumers. Based on the sample estimates, 74 households were studied. The characteristics of the respondents to methane gas can be seen on the basis of the respondents' class, lifestyle, income and age.

3.4.1. Characteristics of respondents based on education level

The educational level of the SHG Bina Mandiri population with methane gas varies from school to graduate level. Figure 8 shows the proportion of the community's education level.

Figure 6: Connection of methane gas pipelines

Figure 7: (a and b) Special stove for methane gas

It is known from Figure 8 that 51% of KSM Bina Mandiri respondents are primary school graduates. The second high school graduates are 19 percent, while the elementary school graduates are 18%. The number of graduates, S1, is just 1 % of the total number of respondents. Furthermore, the number of respondents who were not educated was very high, namely 7% or 5. Respondents who are not educated are elderly people 70-83 years old, but they are not educated. Seen from national education standards (Law No. 20 of 2003), 70% of Kelurahan Mulyorejo respondents are 9 years old, while 18% have secondary education. Just 4% of participants pursue higher education from a diploma to a bachelor's degree.

3.4.2. Characteristics of respondents by livelihood

The low level of education affects the form of life of the group. In Mulyorejo Village, the livelihood forms of respondents who use methane gas consist of factory workers, farmers, traders, civil servants, TNI and POLRI workers, farm workers and casual daily workers.

Figure 9 indicates that 60 percent of Bina Mandiri SHG members work around Malang Raya as Farmers. In the meantime, 12% or 9 people work as casual regular employees and self-employed. The proportion of those who work as TNI / POLRI among other types of work, which is only 1%, has the smallest score. The elderly are 3% of respondents who do not work.

Figure 8: Education level of biogas users

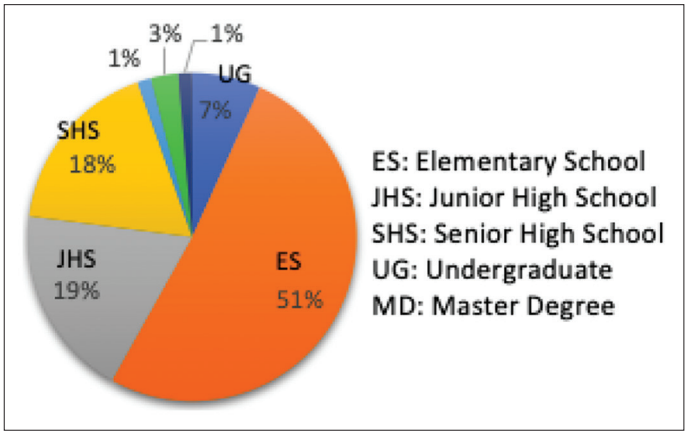
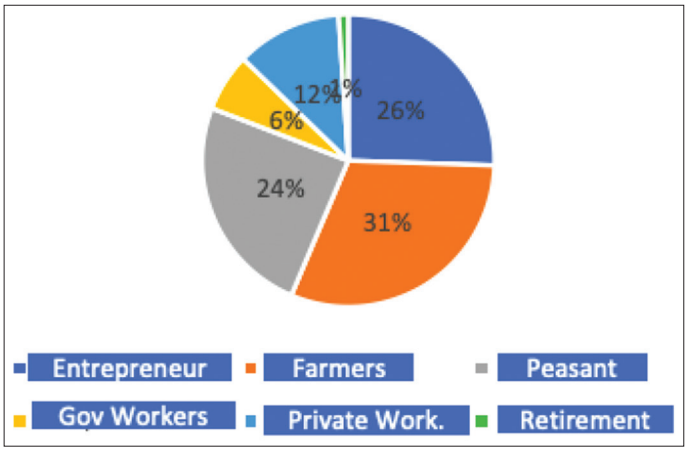


Figure 9: Livelihood



3.4.3. Characteristics of respondents by income

The income-based response characteristics are divided into two categories, namely those below the UMR and the Malang UMR. The UMR of Malang City is estimated to be IDR 2,272,167 in 2018.

In the Figure 10, shows that 43% or 32 respondents have revenue higher than RMW. Respondents with earnings above the RMW are people in permanent employment such as civil servants, military/ police and those who serve as private employees with junior high or secondary education. Meanwhile, 57% or 42 respondents had a lower income than the RMW. Many with the highest wages below RMW (19%) serve as private primary school employees.

3.4.4. Characteristics of respondents by ages

The age-based characteristics of SHG Bina Mandiri respondents are divided into two groups, namely productive age or workforce respondents and non-productive age respondents or non-worker respondents. According to BPS Malang, the workforce is between 15 and 64 years of age, while non-worker residents are between 15 and 64 years of age.

It is known from Figure 11 that 93% or 69 respondents using methane gas was efficient in age at KSM Bina Mandiri. Just 7%

Figure 10: Percentage of respondents' income level SHG Bina Mandiri (RMW = Regional Minimum Wages)

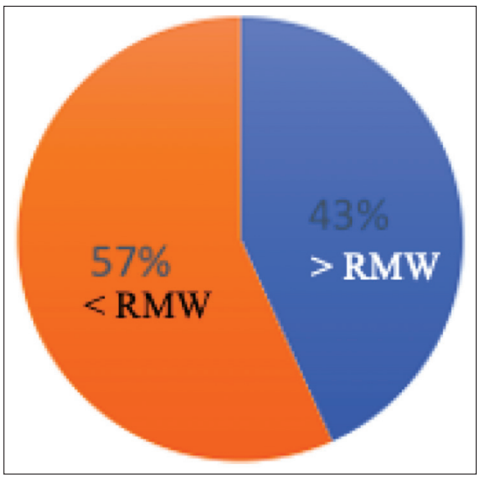
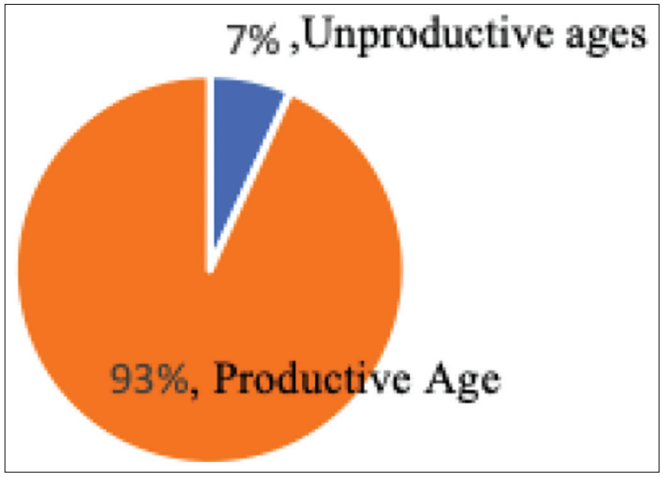


Figure 11: Percentage of productive and non-productive age of respondents at SGH Bina Mandiri



or five of the respondents were over 64 years of age. However, 3 non-productive age respondents still work and support the family economy, while the remaining 2 are no longer able to work because they are over 70 years of age.

3.5. Institutional Characteristics

Types of organizations that are followed by the methane gas community in the Mulyorejo Village include the HIPPAM Tirta Sari Group, the Mahardika Youth Association, the PKK, the Takmir Ibnu Fattah Mosque, the Tahlilan, the Recitation and the Arisan groups.

3.5.1. The Tirta Sari HIPPAM community

The Tirta Sari HIPPAM Community is a group of water users in RW 5, Mulyorejo Village. This group was founded in 2014 as part of the PUPR program for Malang City to provide clean water for middle and lower income earners (MBRs). Currently, the number of users of HIPPAM Tirta Sari RW 5 exceeds 300 individuals, consisting of RT 4, RT 5, RT 7 and RT 10. The Tirta Sari HIPPAM Group has undergone a change in management due to lack of accountability of the funds. The new management framework was founded in 2017.

The organizational structure of the Tirta Sari HIPPAM is relatively basic. In the previous century, the management of the HIPPAM consisted only of the chairman and the treasurer, while the responsibilities of the secretary were at the same time with the treasurer. This is not much different from the current organizational structure, where the Treasurer still holds the position of Secretary. However, what separates the old system from the new structure is the supervisory role of the organization. The supervisor is responsible for overseeing the operation of the company and ensuring accountability in financial statements. Financial results are submitted on a monthly basis to the supervisor, namely Mr. Sariman, who is head of RT 5. The price for Tirta Sari HIPPAM is IDR 1000 for 1 m^3. The use of cash is usually used to pay for electricity, the repair of pipes and water pumps, water taps and the purchase of water meters.

3.5.2. Youth organization (Karang Taruna) Mahardika

Karang Taruna (Youth Organiszation) Mahardika is a social organization for youth active in the social sector in particular. Karang Taruna is a platform for young people to build social consciousness and collective responsibility. The institution's domain is the RW, namely RW 5 in Kelurahan Mulyorejo. About 2000, the Karang Taruna group was created. There are active members and passive members in the Karang Taruna party. At the moment, Karang Taruna Mahardika's active members are members of the board, while passive members can be defined as non-permanent members as all RW 5 young people and girls between 11 and 45 years. Non-permanent participants are typically interested only if social events are carried out within the framework of RW 5. The Karang Taruna Group's management term is normally adjusted every 5 years. Structure of the management company for 2019.

The Mahardika Youth Organization has a strong legal basis based on Regulation No: 77/HUK/2010 of the Minister of Social Affairs on the Youth Organization Basic Guidelines. The guidelines govern the roles and responsibilities of youth groups to grow younger generations and social events in the city. The number of activities organized by the Mahardika Youth Group in the number of an organizing competition on 17 August, organizing religious holidays, social gatherings and fundraisers for disaster victims and taking an active part in some of the events of the community held in RW 5.

3.5.3. Family welfare and empowerment groups (PKK/FWEG)

The PKK is a community organization whose function is to support the village government to enhance and improve the well-being of the family. The PKK group in which the community of Bina Mandiri methane gas users took part was an entity at RW level, namely RW 5. Every two weeks, PKK events take place. The place where the activities take place will be rotated by the Member who wins the Arisan lottery in each home. Popular activities in PKK include arisan, savings and loans, POSYANDU and education on health. There are also external events, such as displays or presentations of kitchen utensils, appliances and selling household requirements.

The organizational structure of the PKK RW 5 party consists of a chairman, secretary and treasurer. The leader of the group has the responsibility to coordinate, guide, and make decisions on what has been deliberated. The secretary shall handle the correspondence records or send arisan invitations. While the treasurer handles finances and currency, keeps books and reports to members in-meeting and handles savings and loans.

3.5.4. The Ibn fattah mosque takmir study group

After the beginning of the Ibnu Fattah Mosque, the recitation community Takmir Mosque was founded in 2012. The Ibnu Fattah Mosque is itself situated in RT 7, so most of its members are RT 7, RT 4, RT 5, and RT 10 locals. The recitation of the Takmir Mosque consists of a Chief, Secretary, Treasurer and a Committee for Cleaning or Marbot. mosque. mosque.

Ustad Siyadi, the head of Takmir, also serves as imam of the mosque, leads the Takmir recitation, organizes and welcomes Friday preachers, and organizes Islamic festivities. The secretary is responsible for handling archives and communications, welcoming them. The treasurer is responsible for regularly reporting cash, monitoring cash inflows and outflows and handling infaq money on a monthly basis. Apart from the governor, secretary and treasurer, the mosque is also kept clean by marbots. The regular activities of the Takmir of the Ibnu Fattah Mosque are held every Thursday night with Friday prayers and Tahlilan. In addition to being packed with prayer, the Tahlian practices are packed with lectures. Readers also come from outside or are themselves packed with Ustad Siyadi. Takmir activities include the organisation of religion events on Islamic holidays such as the birthday of Prophet Muhammad, commemorating the Islamic New Year and praying with Eid al-Adha, slaughter of sacrificial animals, as well as distribution of zakat. Right before al-Fitr's Eid.

3.5.5. Tahlilan group

The Tahlilan group is a religious community followed only by men, whose reach includes only RT 5 and RT 10 citizens. This group

is a non-formal organisation since the organizational structure is not transparent. Pak Miskan is the main figure in this party, so the community sees him as the leader of the Tahlilan. Tahlilan is held in turn in people's homes every Thursday night. The goal of forming a Tahlilan group is to improve ties between residents and fathers in particular. Fathers seldom socialize because they work hard. In addition, the Tahlilan activities have become a habit for Muslims every Thursday night, especially in rural areas and in areas where the peace of the people is preserved.

3.5.6. Arisan group

Arisan groups are classified in non-formal groups since they are not specifically structured. The members of this group are just RT 5 and RT 10 participants. Its function is nearly the same as the PKK, but is more familiar. Moreover, this arisan practice should be a forum for socialization in order to preserve the unity of the people. RT 5 and RT 10 have close relations and harmony, since RT 10 is practically a fraction of RT 5. The only committee is Ms. Lumadinoto who serves as the President and Trustee of the Arisan.

3.5.7. The recitation

The Recitation group in Mulyorejo Village, which was attended by respondents using methane gas, was a religious activity attended by RT 5 and RT 10 people. The goal of forming a recitation group was to develop friendship and gain religious knowledge. In this recitation party, there is no full organizational structure. The new position of Chairman of Recitation is Mrs. Supini, who is the wife of the RT 5 President. The recitation event takes place once a week on Saturday or Sunday afternoons. The mode of regular prayer activities is normally in the form of Shalawatan, reading the Koran and lectures given at home. At times religious holidays such as the birthday of the Prophet and the recitation of the Islamic New Year take place officially and freely at the RT 5 musola. Members and young children may engage in the recitation.

3.6. Social Capital Analysis

An analysis of social capital can be rendered using the techniques of social network analysis or social network analysis (SNA). In this study the social network review explores all methane gas users' social networks in the village of Mulyorejo. The results would assess the community's social capital using methane gas as calculated by the degree of engagement, age, and centrality.

3.6.1. An analysis rate of participation (RoP)

The participatory rate (participation level) is determined in the study based upon the involvement in the institutions of Mulyorejo village of community respondents using methane gas. Respondents joining an organization are required to communicate with other group members. Therefore, interviewees who are following institutions are deemed to be able to access information quicker and more than those who are not following institutions at all. The more institutions you join, the more information/knowledge you acquire. In the village of Mulyorejo, the following types of organizations are the HIPPAM Tirta Sari community, the Mahardika Youth Association, the PKK, the Takmir recitation of the Mosque of the Ibnu Fattah and the Arisan groups.

Figure 12 indicates the number of people who participated in Kelurahan Mulyorejo institutions. The most active organisations were the arisan group of 47 people, the recitation group of 36 people, and the HIPPAM group of 29 people. The Karang Taruna and PKK groups were the two least followed by respondents using methane gas. Both are RW organizations so as not to include many of the RT 5 and RT 10 citizens. The recitation and arisan institutions are highly attended by women, particularly housewives.

Figure 13 shows respondents' gender-based involvement in institutions in Kelurahan Mulyorejo. In general, recitation, arisan and PKK are the institutions which are followed by female respondents. Meanwhile, HIPPAM, Pengajian takmir and tahlilan are institutions which are followed by male respondents, while both men and women can be followed by the Karang Taruna institution. Women's activities in Kelurahan Mulyorejo institutions seem to dominate two institutions, namely arisan (47 respondents) and recitation (36 respondents). Though there is very little participation in the PKK and in youth organizations, 4 people participate in the PKK and 1 in the youth organization. The PKK and Karang Taruna are RW institutions, so there are not many RT 5 and 10 members. They are RW institutions. In Kelurahan Mulyorejo, the involvement of male respondents seems to be distributed through HIPPAM, youth organisations, Takmir recitations, and Tahlilán. The KK considers the presence of HIPPAM members, therefore the HIPPAM members were men as heads of the family in this report. That is why HIPPAM has a very high number of male respondents.

Figure 12: Respondents participation in institutions

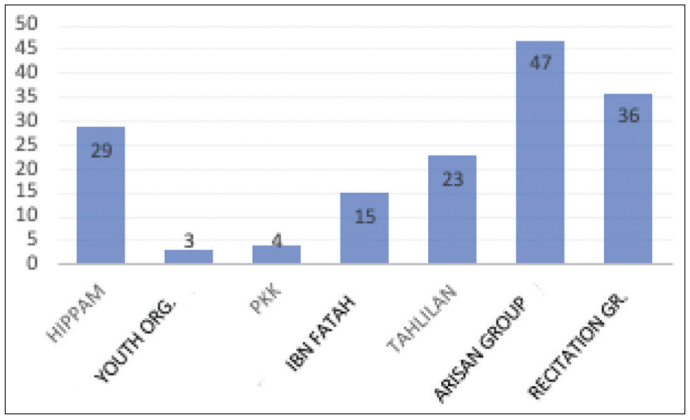
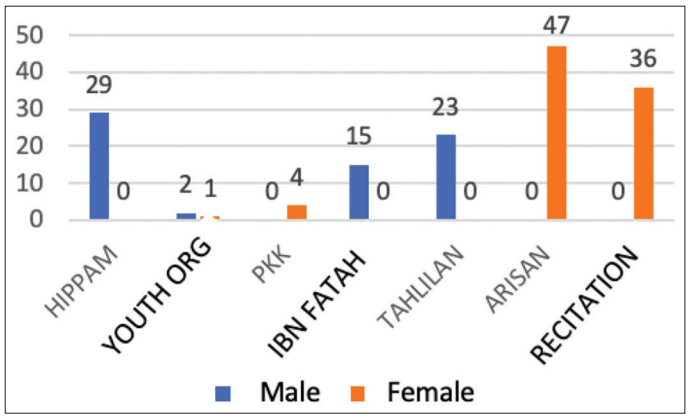


Figure 13: Participation of respondents in institutions based on gender



The degree of participation is determined by dividing the total of the diagonal matrix with the numbness of the respondents. The total number of diagonal matrixes is the total number of institutions attending respondents and the number of respondents using methane gas in Mulyorejo Village is the number of respondents. In addition, the value of the participating rate of the respondent was divided into three groups, namely low, medium and high. The categorisation of the levels of participation seeks to promote the degree of involvement of respondents by using a set of values based on the number of institutions (Alfiah et al., 2018). In addition, the number of institutions is divided into three by low, medium and high categories. The Kelurahan Mulyorejo is followed by 7 institutions where the minimum/lower limit value is 0 while the upper limit value is 0.The low category value is thus 0–0.233, the moderate category is 2.34. −4.67, and 4.68–7 strong grade. Table 3 displays the effects of measuring the level of participation in Kelurahan Mulyorejo for respondents.

The level of group engagement in Kelurahan Mulyorejo is 2.09 or in the low category, based on estimates. The low level of group involvement is attributed to the active participation of 33.33% of respondents in one institution and 37.33% in two institutions. More than half (70.66%) of the methane gas users surveyed were in one or two organizations, on average. The survey results indicate that the majority of respondents with affiliations in institutions were arisans (29.93%) and reciting (21.65%). In the meantime, the HIPPAM institution had 18.47% of the interrelated respondents. Youth organizations had 1.91%, the PKK institutions were 2.54%, Tahlian institutions were 14.64% and Takmir had 9.55%. The low participation of interviewees is due to the participation of respondents from seven established institutions in institutions clustered in Arisan and recitation institutions. In Kelurahan Mulyorejo, the concentration of respondents is indirectly related to institution form and gender.

The percentage of respondents participation in Kelurahan Mulyorejo institutions, where 56% are female and the remaining 44% are male. The participation of male respondents is lower than female respondents because male respondents are not involved in engaging in institutions. The presence of women respondents in institutions in Kelurahan Mulyorejo focuses on arisan and recitation institutions (56% of respondents), where the two are special institutions for women in the RT sector. One reason for the high participation of women in organizations is that most of the respondents surveyed were PKKs, which gives them more independence than men. In addition, activities like arisan and reciting are the place for socializing, gathering and building relationships with neighbours. Therefore, the women's excitement is strong. This has also contributed to a concentration in the membership of respondents in women-only institutions and a higher degree of participation than in institutions followed by men. Meanwhile female participation is just 2.54% for RW-level institutions, PKK, and Karang Taruna is 1.9%, suggesting that women have been unable to participate in higher-level institutions. The limited participation of women in RW institutions is because an institution like the PKK exists at RT level, namely Arisan. As a result, there is a reluctance to engage in similar events, such that at the RW level only a few people can join the PKK. It can thus be inferred that the low level of Kelurahan Mulyorejo participation is affected by the concentration of respondents' affiliation to institutions of recitation and arisan, a shortage of active male respondents in institutions, and the shortage of respondents in higher institutions (RW or Kelurahan).

3.6.2. Density analysis

Density analysis findings show the relationship depth between interviewees within a group or network. It is also possible to see that the proportion of respondents who share membership of each of the same organizations can be seen on the basis of the density analysis findings. The density value has a range from 0 to 1, while the closer to the 1 is the higher the density of the interviewee in a sample. In other words, organizations' members are more intertwined. The density value is also classified into three categories: low, medium and high. The range of the density rating is derived from the maximum density score, 1 by three levels, high, medium, low (Alfiah et al., 2018).

Density measurements were carried out using program UCINET 6.528. Based on the measurement results (Table 4), in Kelurahan Mulyorejo the density value of methane gas users is 0.654, indicating it is in the modest band. The medium density value for respondents can be determined by the number of interviewees associated with the same organization, i.e., arisan, recitation and Islamic organisation. At present, there are still relatively few respondents involved in three or more organizations, 29.33%. Thus, the network density value will be in the high category when the respondent follows more organizations, so the respondents can be more associated with each other. It is therefore easier to relay information to the public if the density is high.

3.6.3. Centrality analysis

By using a central analysis the key figure in an organization may be identified. Core actors play an important role in channelling information from outside the community, in particular government information concerning the interests of methane gas. In this research, the central analysis can be calculated by the value of central grade, central focus and central closeness using UCINET software. - stage of central analysis will be divided into three groups or categories: high centrality, a medium centrality and low centrality, the degree centrality, and proximity centrality. The central value is between 0 and 1 as shown in Table 5.

In calculating centrality, if respondents are not related, they must be separated, particularly in calculating the centrality

Table 3: Results of participation levels

Value range	Category	Value of participation level
0–2.33	Low	2,09
2.34–4.67	Medium	
4.68–7	High	

Table 4: Density value categories

Value range	Category	Value of density
0-0.333	Low	
0.334-0.667	Medium	0,654
0.668-1	High	

of closeness. In the study of the centrality of proximity, only respondents connected to the network are used. Meanwhile, the measure does not include alienated respondents who do not obey institutions. On the other hand, in measuring degree centrality and centrality, all respondents used are study interviewed without excluding individual interviewees. In this analysis, no individual respondents were present, so all centrality calculations used the same respondents. A description of the results of the centrality analysis measurement is shown in Table 6.

Based on Table 6, the results of the centrality analysis calculations, it is known that the approximation value of each central degree, the central emphasis, and the centrality of closeness are determined. In the degree central importance, 22.67% of respondents are in the low category, 58.67% in the middle category and 18.67% in the high category. Meanwhile, the measured value of proximity centrality indicates that only two levels, low and high, exist.

A total of 22.67% were in the medium category, while 77.33% were in the strong category. The centrality of closeness tests the distance between actors and other actors in a network. If an actor has a small distance from other actors, he may be called the middle. The high value of the centrality of the proximity indicates the proximity of each participant in the network. The number of actors with a high value of closeness demonstrates that the provision of information in the group network can be rendered easily and efficiently using methane gas in Kelurahan Mulyorejo. Nearness of the Mulyorejo Village respondents is of great importance, indicating that the proximity of the respondents using methane gas on the network is rated as fine. This is because many actors in the same organization have ties to each other and have the majority of respondents, including arisan, recitation and HIPPAM. Furthermore, the relationship between the neighbors among the respondents to the Mulyorejo Village is well known based on the results of field observations and interviews.

Table 6 shows that the importance of central betwenness in Kelurahan Mulyorejo is divided into two categories: low and medium. The low category respondents were 84%, while the medium category respondents were 16%. The low value of the central location of Betwennes among those using methane gas in Kelurahan Mulyorejo suggests that the network does not include respondents. This means that interviewees are linked. Although 70% of respondents are affiliated with only one and two types of institutions, respondents who attend just a single institution or two are affiliated with both of the same institutions based on the field survey. These institutions include HIPPAM, recitation of the Takmir Mosque, tahlilan, arisan and recitation. Thus, respondents may still be related, even if they are members of just one and two types of organizations. This also reduces the betwenness value in Kelurahan Mulyorejo, as the interviewees are linked.

The findings of the centrality analysis can be illustrated with a netdraw diagram that indicates the central importance of the interviewee. Symbols in the form of circles/points are depicted as the respondents in the netdraw diagram. The greater the symbol size belonging to the respondent, the higher the centrality degree. A red circle symbol represents respondents with the highest centrality rating. Meanwhile, a blue circle symbolizes other respondents with smaller scores (Figure 14). The network of respondents in Mulyorejo Village shows that everyone is linked to each other in the network as shown in Figure 13. This related pattern promotes collaboration and cooperation in methane gas management.

The results of the degree centrality calculation via UCINET show that six respondents have the same high value and the same low central importance value. This means that no respondents serve as main actors. Respondents will become integral to the network if, among other things, one or two people have the greatest score. The relationship that is seen in the two-fashion centralitarian approach is not only actors with actors but also actors with institutions since institutions can play a central role in the network as well (Wasserman and Faust, 1994).

Figure 12 is a two-mode centrality matrix structure that involves actors and entities within the same matrix. Then use UCINET software to measure the centrality level. The two-mode centrality value will be divided into three categories, i.e. low category 0-0.333, medium category 0.334-0.666 and high category 0.667-1, in the two-mode centrality calculation (Ari, 2011). Table 7 displays the results of the two-mode central calculation for Mulyorejo Village.

Table 5: Categories of centrality values

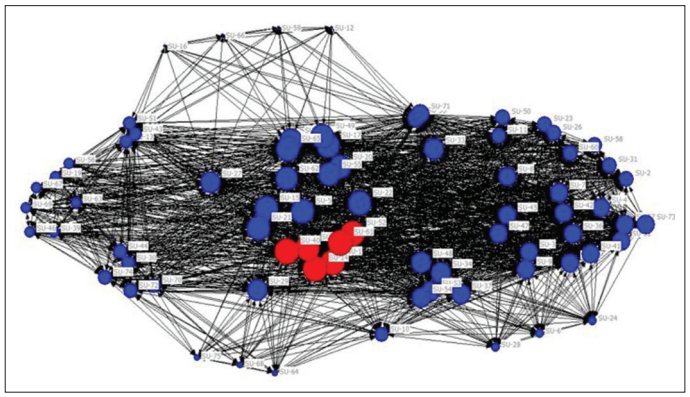
Value range	Category
0-0.333	Low
0.334-0.667	Medium
0.668-1	High

Sources: (Ari, 2011)

Table 6: Results of calculation of the centrality analysis

Statistics	Degree centrality	Betwenness centrality	Closeness centrality
Mean	0.48	0.12	0.76
Min	0.14	0.00	0.54
Max	0.70	0.47	0.95
Std. Dev.	0.15	0.15	0.11
Variance	2.29	2.36	1.30
Level of Centrality			
Low 0-0.333	22,67	84	0
Medium 0.334-0.666	58,67	16	22.67
High 0.667-1	18,67	0	77.33

Figure 14: Net draw of respondents



In Table 7, the maximum centrality value is shown to be 0.58. This significance indicates that respondents and organizations are of high importance. Based on the centrality level ranking, it is understood that the low category respondents were 97.34%, the moderate category was 1.34%, with the high category respondents being 1.34%. In this equation, it can be shown that the central actor in the network is the Arisan entity, that is the one with the highest central value.

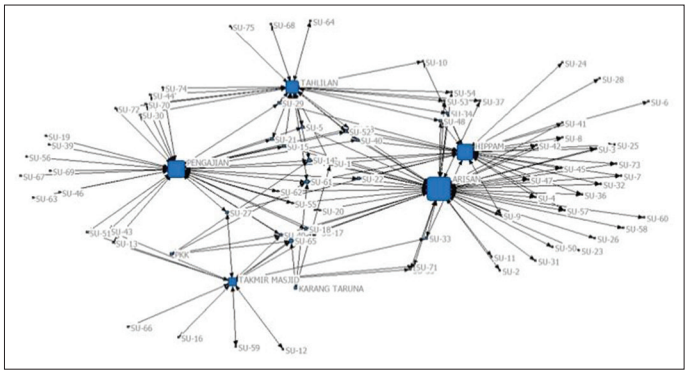
It shows that the most affiliated institutions with respondents tend to be key players in Arisan institutions (Figure 15). This indicates that a broad number of respondents can be met by the arisan institution, so that representatives can share the information easily and effectively in the institution. This institution was a key institution due to the vast number of respondents who participated in arisan institutions. In the growth of the society, institutions play an important role. It is also the capital of the Kelurahan Mulyorejo methane gas network. It is known that the degree of group engagement in the network is poor, on the basis of results of social network research. The respondents to the methane gas appeared to abandon methane gas control to the party committee alone. The history of the large population with low education (51% of primary school graduate) and lower middle income (56.76% below the UMR) affected the organizational operation of the respondent and the ability to set up a methane gas network. It can be said that the methane-gas group manages on the basis of existing routes, but it is still the government that is able to construct a gas network. The group which uses methane gas therefore has a high density when viewed from its location or altitude. This is influenced by the local community's features, those of the neighbourhood in which they live, particularly though they are in urban areas.

The residential similarity forms a natural connection between people in the long term. This was also the case with the Mulyorejo Village respondents. Respondents who live in the neighborhood of

Table 7: Results of the calculation of two-mode degree centrality

Statistics	Nilai degree centrality
Min	00.1
Max	0.58
Level of centrality	
Low 0-0.333	97.34
Medium 0.334-0.666	1.34
High 0.667-1	1.34

Figure 15: Net draw two-mode degree centrality



TPA Supit Urang live in good family relationships with the families for some time. The presence of family relations and living in the same location are similar to social capital characteristics. Social capital and social capital tend to be closed where connections, kindergartens, trust bonds, mutual value bonds and feelings of the same fate form the basis of the community's glue. The similarity in living in the vicinity of the TPA Supit Urang makes respondents solid, in particular because the TPA has the biggest effect. In Mulyorejo Village, respondents who use methane gas are included in the people who have income below the RMW (regional minimum wages) based on their social history. The study site is called a slum and scavenger spot. In addition to that, arisan and recitation classes were the organizations that were followed by the most respondents. Both institutions are non-formal institutions and thus the knowledge available is minimal. This affects came from Kelurahan Mulyorejo's typology of social capital.

4. CONCLUSION

Based on the study, one methane gas well at TPA Supit Urang will produce methane gas for consumption by community members (130 households) for 2 years. If it is more than 2 years, the gas produced decreases so that the gas in the community is minimal, and even the gas in some houses cannot ignite. The houses nearest to the TPA can still be illuminated. This situation, of course, varies according to the number of users and the conditions of the waste in the TPA for each area or TPA.

The following conclusions are drawn based on the results of the analysis carried out on the relationship between social capital and community participation in management of biogas distribution:

- The level of group engagement in Kelurahan Mulyorejo is 2.09 or in the low category. The low category of participation is due to the participation of respondents from seven established institutions in institutions clustered in Arisan and recitation institutions. In Kelurahan Mulyorejo, the concentration of respondents is indirectly related to institution form and gender
- The centrality of closeness tests the distance between actors and other actors in a network is in medium and high. The high value of the centrality of the proximity indicates the proximity of each participant in the network. The number of actors with a high value of closeness demonstrates that the provision of information in the group network can be rendered easily and efficiently using methane gas in Kelurahan Mulyorejo. Nearness of the Mulyorejo Village respondents is of great importance, indicating that the proximity of the respondents using methane gas on the network is rated as fine. This is because many actors in the same organization have ties to each other and have the majority of respondents, including arisan, recitation and HIPPAM. Furthermore, the relationship between the neighbors among the respondents to the Mulyorejo Village is well known based on the results of field observations and interviews
- The findings of the centrality analysis can be illustrated with a netdraw diagram that indicates the central importance of the interviewee. This significance indicates that respondents and organizations are of high importance. Based on the

centrality level ranking, it is understood that the low category respondents were 97.34%, the moderate category was 1.34%, with the high category respondents being 1.34%. In this equation, it can be shown that the central actor in the network is the Arisan entity, that is the one with the highest central value.

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