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The Practice of Community-Based Water Resource Management in Rural Indonesia

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***Abstract**: Although The government has issued various regulations and models of water resources governance at the local level, community-based water resources governance is needed in responding to challenges in water resource management. This paper discusses the case of water resources management in Srogol village (Cigombong sub-district, Bogor district) which applies a community-based water resources governance model known as Janggol. Culturally, Janggol has been deeply rooted in the social system in the Bogor area. Janggol in the upstream Cisadane watershed was appointed in 2018 to manage the water supplied to the community from the Ciwaluh spring. However, in practice the community-based management that is implemented is often wrong in its function and creates other quite complex problems. This research aims to analyze why the implementation of community-based water resource management in Srogol village is not optimal and what efforts must be made to encourage sustainable natural resource management using the concept of Community-based natural resource management. This research uses a qualitative approach, by extracting data using an interview process to predetermined stakeholders. Based on the research results, the water management carried out by Janggol is not optimal due to the lack of adaptation of managers in water management, the lack of community participation in water management, and the lack of knowledge of Janggol in providing services as an institution.*
***Keywords**: community-based natural resource management; water management; sustainable resource management; local institution.*

Introduction

The implementation of Water Resources Management takes various forms in different conditions. This does not necessarily indicate that water resources are the main object of all things, but many aspects that come into contact with human life are dependent on water. There is an argument that states that the scale develops linearly along with the progress of the human way of life (technology, markets, etc.) in this case is the use of water (Cosgrove & Loucks, 2015). There is also an argument that

states specifically that an ecosystem of human activities at a time has derivatives of different water needs in each unit (Qian, 2016). The diversity of water use, both based on the type of water use and the time phase of water use, turns out to have an impact on the limited water resources to be used adequately by humans (UNU-INWEH, 2013), starting from the calculation that 2.5% of the water available on earth is clean water that can be consumed by humans compared to the growth in the number of water users in the form of 400% of the manufacturing sector and 130% of the housing sector in the world.

The situation of limited water in general (without participating in the phenomenon of disputes over water resources) is generally referred to as a water crisis. The water crisis is quite prominent, not only because the quantity of water is always decreasing due to the growth in the number of users, but rather it refers to how the increase in water users is accompanied by patterns of growth or water use patterns in various parts of society (Bakker & Van Brakel, 2012; Grey & Sadoff, 2007; Rosegrant *et al*., 2009). Accompanied by this fact, various probabilities of the situation of water access for humans can be seen if the user units and water use patterns are increasingly diverse. These probabilities also raise important derived points related to how the actual form of water management is to deal with the case of the water crisis that occurs in the form of (Patrick *et al*., 2014), how to manage and control limited water resources (Lieberherr & Ingold, 2019), measures of justice for water supply to diverse communities (Wade, 2018), attention to water use management on aspects of social justice (due to the diversity of water users) and the environment (which is the provider of water resources) (McLean, 2007).

The various links that arise between the diversity of quantities and patterns of use as well as the limited quantity of water generally converge on the management aspect which is finally responded by the international and regional communities through various methods, considering that water management is nothing but a set component of social, economic, political systems, as well as administrative functions used to develop and manage water resources and carry out water distribution at each level of the community (Lukenga, 2015). The description of global water management was initially carried out in the City of Dublin, Ireland in 1992 which agreed on the points of participatory global community in water management (Kasbohm *et al*., 2009), and then continued on the standardization of water management principles through the IWRM document where water users were asked to be aware of the context of water use globally (Benson *et al*., 2015).

However, the IWRM concept itself has received a lot of criticism from environmental academics because of the emergence of various things that were not considered by the previous water management principles (for example: rampant water privatization) and the inequality of access that occurred (Rouillard *et al*., 2014). The criticism of the emphasis on global water management principles eventually led to an alternative

idea that emphasized how communities affected by diverse water use patterns were given the trust by local authorities to explore water management issues, carry out redistribution of water management, and balance the environmental situation based on consensus with the inclusive society (phillpa M Brock, 2020).

The alternative idea is standardized on one of the concepts referred to as Community Based Natural Resource Management (CBNRM). Initially, CBNRM itself was used as a strategy for the community and global stakeholders in order to develop the livelihoods of rural communities living side by side with certain natural resources (forest, water, land, etc) (Pailler *et al*., 2015). This is shown through its main realization which puts forward a conservation strategy that includes synergies between human development and environmental development that aims to create win-win situations between humans and nature (Adams & Hulme, 2001), that are complemented by the involvement of a formal or informal entity that is authorized to manage inclusively (Haller *et al*., 2018), and based on the emergence of various grassroots interventions that can be justified through the main objective of developing a more proportional and optimal management capacity to support a variety of resource users (Dean, 1999).

In practice, CBNRM, which is a bottom-up conservation method in the South African context, has been implemented through the Wildlife Industries New Development for All (WINDFALL) and Communal Areas Management Program for Indigenous Resources (CAMPFIRE) programs that implement community-based conservation in the context of natural resources (such as water and faunal diversity) and in 2018 became a significant resource management tool in South Africa and several other countries such as Botswana and Cameroon (Gruber, 2010; Nepal & Saarinen, 2016; Tantoh & Simatele, 2017). This concept is also used by Australia with the designation of aboriginal tribes as stewards of coastal rock conservation (Allan Dale, Karen Vella, Sarah Ryan, Kathleen Broderick, Rosmary HIll, Ruth Potts, 2020), and by Indonesia by handing over the responsibility for managing water resources in the karst area to the local community (LIPI, 2019). Therefore, in CBNRM, what is certain to be found is the existence of formal/informal managers who are inclusively legitimized to carry out their managerial functions comprehensively and optimally for various needs.

The conceptual presentation and empirical implementation above show that CBNRM itself can be used as an argumentative tool regarding the urgency of a local community-based natural resource management approach through local knowledge and capabilities (Fabricus *et al*., 2013). CBNRM is also used as a community-based resource management methodology itself (Landon, 1998; Uphoff, 1998). This description emphasizes that conceptually community-based resource management can be considered more because of the local community factor who has authentic knowledge and is more qualified to understand the problem of the natural resources availability and their relationship with humans who use them (Fabricus *et al*., 2013). This is supported by an argument that confirms an understanding of various resource users'

affordability to their resources (Campbell & Vainio-Mattila, 2003; Gruber, 2010; Ostrom, 2015). In the aspect of resource management, the main idea is how the interests of several resource users are aligned in order to achieve a fair distribution through institutions agreed upon by grassroots communities and resource users in an inclusive manner (Ronald A. Heifetz and Marty Linsky, 2003), rational and open participation of local communities (Campbell & Vainio-Mattila, 2003), implications measurement of managing resource users (J brown, N Mitchell, 2005), strengthening local capabilities in continuing management (Newson & Chalk, 2004), inter-agency engagement-based resource dispute resolution efforts (Meinzen-Dick & Knox, 1999), and institutional strengthening of resource managers (Scheberle, 2000). In this study, the narrative of the results of the analysis will lead to how the CBNRM concept is used as a conceptual tool to examine one of the resource management actions carried out by local communities.

In contrast to other studies described previously, research conducted in the context of the implementation of CBNRM does not only lead to the context of local communities and the legitimacy of trust in the community. This research is more directed at communities that are specifically side by side with certain resources as a whole (from village government to village residents). This research is also directed not to the context of CBNRM which has been recognized by the government centrally, but to non-formal and formal community initiatives in water resource management.

This study focuses not only on how to control community management in the water supply facility procurement program. This study also did not measure long- or short-term achievements in water resource management. In this study, community-based problems do not only lead to a community approach, but also lead to community-based management.

The object of research in this paper is a collection of local individuals in a village who are trusted by the community as managers of water resources that are limited to one spring, namely the Ciwaluh spring. In the context of the use of water resources, Srogol Village (one of the villages in Cigombong District, Bogor Regency) has two patterns of accessing clean water facilities, namely through access to groundwater drilling carried out by 9 neighborhood association (RT) in 4 citizens association (RW) and accessing gravitational water through pipes facilities that carried out by 6 RT in 2 RW. The village area location at the foot of Mount Gede Pangrango allows the village community to access clean water facilities through the gravity pipe method from Ciwaluh springs originating from the Cisadane watershed. This method was also used by two other geographically adjoining villages, namely Pasirbuncir Village (Caringin District, Bogor Regency) in the north and Watesjaya Village (Cigombong District, Bogor Regency). Several community areas from these two villages also use the same water resources as 2 citizen associations (RW) in Srogol Village, namely 1 citizen associations in Pasirbuncir (which is named Lengkong hamlet) and 1 citizen associations in

Watesjaya (which is also named Lengkong hamlet).

The beginning of enabling access to water resources for local communities is through the presence of a Corporate Social Responsibility (CSR) assistance called Yasmina in 2004 through the installation of a 54 Kilometers long pipe from Ciwaluh Springs located in Ciwaluh Hamlet in Watesjaya Village to RT 16 RW 04 Pangrakan Hamlet in Srogol Village. The use of springs outside Srogol by Yasmina facilities is considered urgent by Yasmina itself because 2 RWs (namely Sungapan-Srogol-Pangrakan Village) still use surface water resources that cross Srogol village (namely the Cisadane-Srogol river which empties into Ciwaluh Lake). The people in the two RWs used the surface water for all activities related to water (consumption, washing clothes, even toilet use). The pipe installation was carried out collaboratively between CSR Yasmina and the residents of 2 RWs who were the target recipients of clean water facilities. After 2005 (after the pipe installation process was completed) the pipe management was handed over by CSR Yasmina to a pipe facility management entity which is often referred to as Janggol. Janggol is a local name in the Srogol community for those who are often seen routinely taking care of the management and maintenance of pipe facilities from the Ciwaluh spring to RT 16 of Pangrakan Hamlet.

In 2017, several complaints emerged from a group of housewives from Srogol Village who revealed that the water that should have flowed to the household pipe (which rested on the main pipe connected to Ciwaluh) was no longer reaching the houses in Sungapan, Srogol,and Pangrakan Hamlets. Finally, several RW level officers in Srogol Hamlet responded to the complaint by conducting a search on the pipe facilities used by 2 RWs to the Ciwaluh area. The search group found that the cause of the lack of water discharge that appeared in the 2 RW settlements in Srogol Village was because the pipe facilities used by the Srogol community were also used by the people of Lengkong Hamlet in Pasirbuncir Village.

The clean water using pattern for the Lengkong Hamlet community from the pipe used by the Srogol Village community is carried out through the application of the pipe injection method, namely the formation of a branch pipe from one larger pipe. Based on the investigation, it was found that there were 8 pipe catchment points (where pipe branches were collected at one point to drain water from the initial pipe to the pipe branches to households) that had been injected in the Lengkong Hamlet area and each pipe injection supplies water for 10-15 houses in Lengkong Hamlet. After learning this, the investigators chose to be the mediator between the two village governments (Srogol and Pasirbuncir) and discuss it together to find a solution. The discussion led to the statement that Janggol of Desa Srogol is the party that legitimizes water injection for the Lengkong community by paying a certain fee for the injection activity implementation. This has reduced the flow of water that reaches the Srogol community for houses in 2 RWs. As a consequence of resolving the injection problem, in 2018 the janggol which was proven to legitimize the injection was replaced with a new janggol consisting of RW representatives and several community members who carried out a search for water shortages in 2 RWs of

Srogol Village caused by the said water injection.

The urgency of research on community-based water management carried out in Srogol Village, provides an overview of the conditions faced by local communities, especially villages. Currently, Indonesia is facing the industrial era 5.0, but small problems such as water management faced by local communities still occur and cannot be resolved by the government. It is the duty of the state together with the community to solve the problems of equitable development that occur especially in rural areas.

Methods

The focus group discussion and narrative interview in Stugol Village, Cigombong Sub-District, Bogor District, were used to write the paper. The rationale for the chosen areas is to discribe how water managed by community in the chosen areas. The explanation is expected to deliver describe some conditions into the varying ways in which community-based on water are represented rural area in Indonesia.

The approach is a primary qualitative research and analysis of village documents as secondary data. the findings of other research. This is to confer rigor on the qualitative analysis This research utilizes qualitative data from focus group discussions combining narrative interviews with stakeholders of the srogol village. The analysis of the data is combined with participatory observation, policy documents, and transcripts of audio recordings from the narrative interviews as well as detailed field notes from all data gathering activities. In dealing with the audio transcript, the research applies deductive qualitative analysis.

Conducting interviews in the field as well as tracing pipe objects and their distribution in water user community areas. This allows researcher to be able to map the pattern of water services and facilities managed by the water resource managers in question. This mapping is accompanied by tracing the routine activities of village water managers (Janggol) and accompanied by methods of coexistence with water managers with the aim of understanding their perspectives related to inclusive resource management and environmental care through participatory observation mechanisms (Raco, 2010). In addition to tracing the routines of water managers, an in-depth study was also carried out on the responses from several informants (Creswell, 2007) who understood the problems of water management in Srogol Village and their impact on the community directly. Other informants are categorized into two groups, namely the government apparatus group and the community group as the recipients of the water management impact.

The secondary data collection is done through the collection of documents from the village and related district agencies as a supporter of the analytical action. Secondary data is also complemented by several documentation of the village water managers (Janggol) performance which proves the history of community-based water management since the pipe installation in the Ciwaluh spring. Through the results of observations, interviews, and secondary

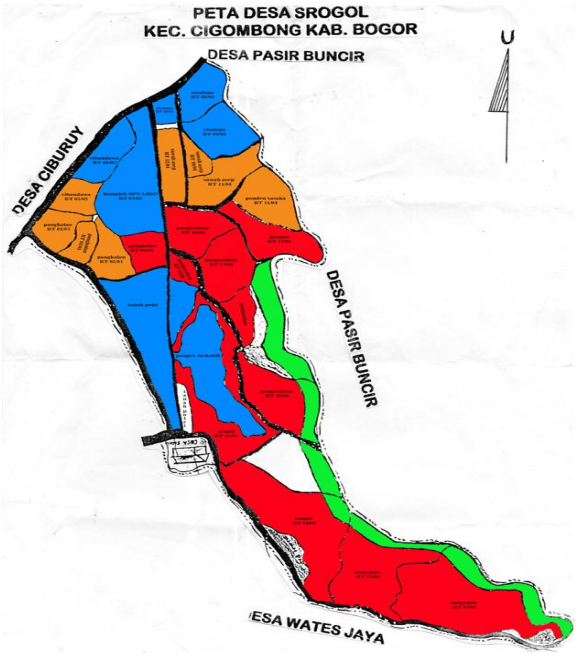
data analysis accumulation, data presentation can be carried out after data reduction and re-verification have been carried out to parties involved in observation and interviews.

Results and Discussion

Adaptation Aspect in Water Management

As a result of the various water user entities, there are several significant impacts on the amount of water flowing into houses. Although there is no general measure of the average holding capacity of each house in the two RTs, at least there is a measure that can be used as a reference for the water demand distribution in the house holding tanks through the hours when the water flows to the house reservoirs.

Figure 1: Water vulnerability mapping in Srogol Village (blue=safe, orange=moderate, Red=critical)



Source: obtained from the research results.

The water distribution is divided by calculating 8 hours per block of water user areas (Srogol, Sungapan,and Lengkong Hamlets) which both use water from Ciwaluh. Based on the data from the RPJMDES in Srogol Village for the year 2020-2026, it was found that 36% of the residents of Srogol Village work as domestic workers (dominated by housewives). From this, the Janggols are expected to be able to carry out communication in accordance with the language logic of the housewives. In addition, Janggol's water management services should be in accordance with the needs of housewives in the two blocks. The need for harmonization between the implementation of services in accordance with the expectations of service recipients can lead to achievements in the form of solving problems that occur in services so that the resolution of these problems can be mitigated in the eye of CBNRM (Ronald A. Heifetz and Marty Linsky, 2003). The relationship between these two aspects conceptually can also open up opportunities so that the costs used in solving service barriers can be reduced or even can be resolved through other alternative solutions that are more suitable from the CBNRM point of view (Olsson *et al*., 2004).

However, this adaptive leadership aspect needs to be encouraged by egalitarian communication between resource managers and resource users (Dekker *et al*., 2020), because this has an impact on how the implementation of providing proportional resources to different user needs to be categorized in the context of economic capacity. According to CBNRM, adaptive management must pay attention to economic and political factors in managing community-based resources. This needs to

be brought into attention as a first step to anticipate dependency problems that hinder the implementation of an inclusive situation (Nandigama, 2012). In this context, economics and politics are interpreted as how access to resources in different groups of people affects different resource management actions as a result (Nandigama, 2012).

Historically, the implementation of water management by the Janggols before 2018 was considered less adaptive to the needs of housewives in the village with communication patterns that ignored their needs for water. Because it depends on a fee-based water supply service that is paid by parties interested in using Ciwaluh's water source from pipes, Janggol's perspective before the 2018 period was not based on the number of household water needs and which community components would be most affected if access to water resources was blocked. This results in housewives who are unable to express various aspirations related to water management that is not harmonious in providing adequate resources.

This affects the implementation of water supply aspects in the next period, namely the 2018 Janggol period which does not have any equipment that can be used as an example in the implementation of clean water supply. In this context, the form of reciprocal relationships in the aspect of adaptive leadership between managers and resource users is an important element in the context of implementing CBNRM, especially when talking about the form of applying adaptation efforts in meeting varied resource needs. On the other hand, if this is not implemented, there is a possibility that management will lead to exclusive resource management (Dressler *et al*., 2010). There is an argument that emphasizes that CBNRM is not only about participation. The said argument also emphasizes the need for harmonization between resource users based on the principle of rationality in the use of resources (Dekker *et al*., 2020). The exclusive management situation in the Janggol management period before 2018 in fact made the successor management not accustomed to being communicative in understanding the water supply needs required by housewives from 3 areas, and only performs its main function, which is to keep the pipes well-maintained.

Participation and Supervision Aspects in Community-Based Water Management in Srogol Village

Based on the discussion on the adaptability of the Janggols in 2018 who do not have any tools in order to adapt to the proportionality of the housewives needs as the dominant user of water resources, there are several impacts that affect the understanding of water resource users on the technical performance of the field in the form of pipe maintenance carried out in Srogol Village. For resource management problems, because there is no harmonization mechanism between resource managers and users, the impact that occurs is the closing of information and empathy door between two parties related to the same resource. Although there are functions that are carried out routinely and based on the principle that water can be distributed well to all water users by Janggol in 2018, they assume that

the user only needs to get water, without further discussion of its use. This is driven by complaints and thoughts from users who try to express their opinions to immediately replace Janggol members who are considered less aspirational in understanding the problem of accessing water resources. Their opinion is based on uneven and irregular water distribution pattern in the previous period of Janggol, users have the assumption that the Janggols in the new period of 2018 only care about money and will provide access to clean water to those who pay, as did the Janggols in the previous period, with the only difference is that the water must be distributed evenly, no one can get more water than the other.

This influences the aspect of participation in community-based management. In the perspective of CBNRM, the aspect of understanding the social and material context by the resource manager will greatly influence the pattern of resource provision as a result of the realization of optimal community-based resource management (" The Will to Improve: Governmentality, Development, and the Practice of Politics by Tania Murray Li ," 2009). However, what is more important is the awareness that understanding the social and material aspects allows resource managers to be able to understand and formulate appropriate actions in order to develop service patterns (Campbell & Vainio-Mattila, 2003). In this case, resource users not only convey aspirations and reactions which will later be responded to by the manager, but they are also required to take more initiative in supporting community-based management so that they can produce innovations in resource development patterns. Furthermore, the impact of understanding social and material aspects should be able to support the management to encourage more optimal community participation. This participation is not only in terms of resource management, but also in nature conservation. In addition, understanding these two aspects is expected to be able to garner their support in creating proportionality and sustainability of resource availability (Gruber, 2010).

This principle does not occur in Srogol Village because the resource manager (Janggol) does not even open access to information for village government institutions that seek to continue to pay attention to water supply and its management patterns. The findings in the 2020-2026 RPJMDES and the Srogol Village Profile also do not show the existence of pipe facilities and the implementation of water resource management related to the existence of the water pipe. The absence of information in the two primary village documents is caused by the village government inability know what objects need to be reported and the purpose of recording these facilities. Ignorance of the recording importance can actually be traced easily from the perspective of Janggol 2018 which has a stigma that the village government never cares about them (the village government who did not immediately grant Janggol's request to move the pipeline flow so that it did not pass through Lengkong Hamlet which was proven to have cut water flow was a strong reason for this). The application of this stigma in fact has an impact on the inability of village officials to organize an inclusive dialogue space to discuss clean

water, because the village government does not know where to start the discussion. The lack of community participation found in the water management in Srogol Village is carried out by a group of people who independently carry out water management appointed by the community. This appointment is a form of public legitimacy, although in practice this informal institution becomes too strong as a water manager without a balancing role from the community and village officials. So that the community does not want to be involved in water management participation, but the community is afraid to get involved because the water manager consists of village elites who have the power to make decisions without the need for community involvement.

In the aspect of participation contained in the CBNRM perspective, although participation in the composition of rational management ideas will not be fully present, there is at least one forum that can accommodate the interests related to the use of resources by various parties known to the resources managers. This is useful so that the understanding of the social and material aspects that support the implementation of community-based resource management can lead to a better direction.

Management and Strengthening of Resource Manager Capabilities

The absence of principles and the implementation of supervision based on the absence of a participatory forum has resulted in obstacles to sustainable resource management that have continued to hit the Janggols from the 2018 period. Support for resource management is slack, and various obstacles are not regarded as a significant threat to resource management implementation. This happened to the Janggols in the 2018 period who often had to use their personal money to repair the pipe connection facilities from the main pipe which were often damaged due to being run over by passing vehicles or even damaged due to frequent natural disasters. They also have to jointly collect personal funds to carry out routine water pipe maintenance because many of the water users fail to pay a fee of IDR 15,000 per month for every household. Janggol's suboptimal ability to carry out technical operations actually weakens the possibility of community-based resource management sustainability, because it is driven by the lack of material readiness to support the implementation of resource management.

In the aspect of Real Impact in CBNRM, the implementation of resource management can be considered proportional if all users objectively describe their needs for resources. In addition, the implementation of management is also considered proportional if resource users have a supportive role that is commensurate with the quantity and quality of the resources used (Newson & Chalk, 2004). In this case, the participation does not only come from the community, but also from experts or parties who have more knowledge and can support actions that are more likely to assist resource management. However, this requires material and conceptual readiness from resource managers in order to optimize the proportional

distribution of resources. Management can become even more complicated if caught in a situation where users have the perspective that management does not have different implications from the previous situation or even harms users. In the Janggol 2018 period case, management that is increasingly not optimal and is always based on a voluntary nature and not based on the principle of professionalism or proportionality is the reason why local community-based resource management is underappreciated in a supportive manner.

Aspects of Dispute Resolution and Institutionalization

In 2021, Janggol 2018 period often received offers from the village government to immediately form a formal institution to manage resources. This is so that Janggol 2018 will immediately start the stage of establishing Community-Based Water Supply and Sanitation Program (PAMSIMAS). This offer from the government leads to a push for Janggol 2018 period to implement a system of calculating the cost of using water to be per cubic meter and requiring payment for those who use the water. However, the next thing that needs to be concerned is the issue of which area gets water first from the Ciwaluh pipeline and the possible quantity of water that will flow from Ciwaluh to Pangrakan (if possible). If examined geographically, it is very possible that the people of Srogol, Sungapan, and Pangrakan will still lack water supply. This is because the Lengkong area also uses the same water resources not only for domestic needs but as well for business and social purposes (paid vehicle washing facilities, supplying water to mosques and Islamic boarding schools). Therefore, attention to community-based resource management can not only be strengthened through strengthening formalities, but also strengthening the management component entity itself and reading variations in the use of natural resources (Armitage, 2005).

Conclusion

The management pattern implemented in this rural area has differences, first in the environmental aspect (resources) not owned by individuals, regional or private companies which are used as economic goods, where the problems that arise tend to be people's accessibility to water. The availability of these resources does not belong to anyone, and can be used by anyone, but with a note of the need for systems and institutions in managing resources, in order to maintain sustainability and avoid the emergence of stowaways (free riders) in resources. Second, in the community aspect, water resources are a primary need where the main problem that arises is the uneven accessibility in rural areas, in accessing water using the institutional framework of values and norms of local wisdom, this is evidenced by the flexibility of the regulatory framework that is formed based on values and norms of community culture. The third, institutional aspects, the pattern found in water management in Srogol Village is carried out by a group of people who independently carry out water management appointed by the community. This appointment is a form of public legitimacy, although in practice this informal institution becomes too strong as a water manager without a balancing role

from the community and village officials. The pattern of management institutions in Srogol Village is very strong because apart from the absence of a balancing role, because the members who become janggol are local elites who have power and their presence is feared by the community.

The results of the research that have been described in the previous section, show that the condition of water management in Srogol Village by Janggol has been running but not yet optimal. As a form of good management, it is important to activate community participation through involvement in the planning, implementation and evaluation stages of water management in Srogol Village.

Janggol has a dominant role, so this needs to be balanced with the role of other entities to establish an accountability and transparent system so that the public can monitor the performance of janggol.

Water management in rural areas can run optimally by establishing partnerships and collaboration with other stakeholders in the community. This partnership in management will be able to harmonize the development and sustainability of the community's quality of life.

Implications for the development of the paradigm of public administration, looking at the relationship between the paradigm of Public Administration in environmental studies. Considering that the scientific paradigm of Public Administration seeks to examine the study of public policy, this research seeks to make policy makers in the future able to examine the social and environmental conditions that occur in society so that the output of decisions that are formed is in accordance with the conditions of solving the problems faced. Then this research becomes a stimulus for new ideas in the paradigm of public administration in seeing development in local communities, through new studies such as administration and development governance. Institutions that cannot be considered functional in their implementation.

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