



The Role of Social Capital in the Circular Economy of Water Management: A Case Study

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Abstract

A circular economy prioritizing resource efficiency has now begun to be applied in various sectors, including water management. With a qualitative approach, this study analyzes the role of social capitals in the circular economy of water management by taking a case study of infiltration wells development in Kelurahan Randuacir, Salatiga City, Central Java. The study results show that developing infiltration wells with various social capitals embedded in them can potentially support the circular economy of water management by replenishing groundwater to overcome the clean water crisis. It can be identified that the development involves networks, norms, and trust. Meanwhile, relationally between actors, it is found that there are bonding, bridging, and linking social capitals. Furthermore, the Urban-Village Fund policy has encouraged community participation in constructing infiltration wells. In the future, the role of the network from private sector needs to be increased in the success of water management.

Keywords: Social Capital; Circular Economy; Water Management; Infiltration Wells

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Introduction

The environmental crisis caused by humans' excessive use of natural resources reinforces the importance of the circular economy practice. A circular economy refers to an economic model based on the reuse and efficiency of resources, a sharing economy, and a closed circle (Jørgensen et al., 2018). This model is an alternative to the linear economic model, which tends to take, create, and dispose of resources. This economic model is believed to be a potential solution to the resource crisis because of its emphasis on the principle of efficiency, namely through behavior that is more aware of resource reuse, better waste management design, and respect for the social, economic, and natural environment (Sariatli, 2017). Thus, when practiced well, a circular economy will generate economic opportunities and provide benefits to society and the environment (Cheshire & Cheshire, 2019).

One of the challenges in today's environmental problems is the clean water crisis, thus shifting from a linear economy to a circular economy in water management is crucial; it is as a goodness with no challenging to achieve various economic and social goals. In this case, a circular economy will encourage water resources in loops that will enable water

conservation (Sauvé et al., 2021). Furthermore, one of the main characteristics of a circular economy of water management is a restorative and regenerative economy, meaning that any water resource used must be restored (Leyva-Díaz et al., 2021). Therefore, water management that emphasizes the principle of a circular economy will not let the water go to waste and reuse it in various ways.

Rainwater harvesting is one way to practice a circular economy in water management (Richards et al., 2021). This method will reduce the potential costs that can be incurred due to the use of water resources that tend to be linear so that water is immediately wasted. By using rainwater catchment systems in urban areas, for example, the costs that can arise from flooding can be reduced, water demand can be reduced, production costs can be reduced, aquifers can be refilled, and wastewater treatment can be improved (Espíndola et al., 2018).

Meanwhile, social capital has a significant role in water governance (Kobayashi, 2014; Mirzaei et al., 2020). Pierre Bourdieu (1986) in (Whiteley, 2015) defines social capital as some actual and virtual resources obtained by individuals or groups because they have a durable network of institutional relationships that more or less know and recognize each other. How social capital plays a role in water management is important to note because water resources are socially embedded where individuals are bound together in situations of risk and uncertainty in overcoming resource scarcity (Esterhuysen, 2012). The study conducted by (Mirzaei et al., 2020), taking a case study in Mazandaran Province, Iran, shows the role of social capital in community-based water management in which the most important component of social capital for community-based water management is conflict resolution. Another study on the role of social capital in water management was conducted by (Yudiatmaja et al., 2020) in two areas in the Riau Archipelago. This study shows that local community social capital, such as norms, beliefs, beliefs/religions, and gotong-royong play an important role in the water resources management process. Similar to the (Mirzaei et al., 2020), this study does not focus on water management by harvesting rainwater through infiltration wells.

Germundsson and Gernandt (2019) have discussed the role of social capital in a circular economy. However, their research was only conducted in the context of companies or businesses and not in community water management. Nevertheless, they discussed how the dimensions of social capital play an essential role for companies in practicing this economic model, among others, by reducing the waste generated by the production process and its products. Meanwhile, studies (Esterhuysen, 2012) have explored how social capital plays an important role in rainwater harvesting. However, the research uses a case study on rainwater harvesting to increase agricultural production, not on people who experience water shortages and harvest rainwater intending to increase groundwater reserves so that the benefits are obtained in the long term. Therefore, Esterhuysen's research has not specifically discussed the important relationship of social capital to build a circular economy of water management.

Based on this background, this study aims to describe and analyze how social capital is utilized in the circular economy of water management. Therefore, this study aims to answer how social capital plays a role in community efforts in Kelurahan (urban-village) of Randuacir to build a water cycle in a closed circle. In academic terms, this research is expected to contribute to the development of social sciences, especially knowledge about the circular economy in water management. Meanwhile, in practical terms, this research is expected to be a material consideration for policymakers in managing water resources and overcoming clean water crisis.

Research Method

This study uses a descriptive qualitative type of research with a case study approach. The method used in this research is phenomenology, namely by describing the social phenomenon of the role of social capital in the circular economy of water management through rainwater harvesting as the object of research. The research was conducted from November 2021 to February 2022 in an urban-village, namely Kelurahan Randuacir, Argomulyo Sub-District, Salatiga City, Central Java. The research location was chosen purposively because Randuacir has started the practice of harvesting rainwater through the construction of infiltration wells in 2019. The data used in this study were primary data and secondary data. Primary data is obtained directly from the first source by interview or observation. At the same time, secondary data was obtained, among others, from various relevant literature, Randuacir Village Profile, plans and documents related to the construction of infiltration wells, and research results from the Indonesia Urban Water, Sanitation and Hygiene (IUWASH) with the support of an international donor agency, the United States Agency for International Development (USAID) in collaboration with PDAM (the Regional Drinking Water Company) of Salatiga City.

Semi-structured interviews were conducted with nine key informants consisting of the former Head of Kelurahan Randuacir, the current and former Head of the Economic and Development Section of Randuacir, Chair and a member of the Village Community Empowerment Institute (LPMK) Randuacir, former staff of IUWASH – USAID, environmental activists from local Civil Society Organizations (CSOs) in Salatiga City. Data obtained from interviews and observations were recorded in field notes. Some of the interviews were recorded, and a transcription process was carried out to write more comprehensive field notes. Some field notes were edited so that some sentences that were not standardized or in Javanese were changed. The data obtained were analyzed using Interpretative Phenomenological Analysis (IPA) (Smith & Osborn, 2008).

Results and Discussion

Randuacir is one of the kelurahan (urban-villages) in Argmulyo Sub-District, Salatiga City, Central Java Province, with approximately +387.69 Ha. Randuacir has six hamlets consisting of the hamlets of Salam, Tetep, Randuacir, Sugihwaras, Ploso and Kembang. Compared to other urban areas in Salatiga, which have an average altitude of 500 meters above sea level, the Randuacir area has a higher altitude of around 600-800 meters above sea level with an air temperature of 22-28 degrees Celsius. The rainfall in Randuacir is around 2000-3500 mm/year. To get clean water, most of the residents of Randuacir rely on groundwater by making wells in each of their homes.

Randuacir often experiences a shortage of clean water. Especially during the dry season, namely from August to December, the residents' wells do not produce sufficient clean water. In terms of biophysical conditions, this area is a water catchment area for water sources in Salatiga, such as the Kalitaman spring. However, the PDAM of Salatiga has not been able to serve the people of Randuacir because of its relatively high geographical location. For this reason, there are at least three hamlet areas in this sub-district that need clean water assistance during the dry season, namely Ploso, Tetep, and Kembangsari.

Randuacir has begun to practice water management by harvesting rainwater through infiltration wells. This development is a follow-up to the recommendation of IUWASH-USAID, which has conducted a study on spring vulnerability in Salatiga City. The research team, among other things, suggested the construction of 300 infiltration wells in Salatiga area to conserve and increase the flow of spring water in Salatiga and its surroundings (USAID IUWASH, 2019). More specifically, the Randuacir area is one of the water catchment areas in Salatiga, so it is necessary to build infiltration wells, among others, to increase its groundwater reserves.

The infiltration wells in Randuacir have been developed since 2018 until now (2022). In 2018, the initiation and construction of the infiltration well were carried out by the Local Government of Salatiga together with IUWASH using the Additional General Allocation Fund (DAUT). Then in 2019, the construction only used funds sourced from IUWASH - USAID. By 2020, IUWASH was not longer directly involved in constructing infiltration wells, and after the policy on Dana Kelurahan (Urban-Village Fund) is implemented, the construction of around 55 infiltration wells was based on the proposal of the community. In 2021, the development continued using Dana Kelurahan by adding 98 infiltration wells. In the future, for 2022, the Local Government of Randuacir has provided a budget plan of 45 million rupiahs for the construction of 20 infiltration wells.

Social Capital in the Construction of Infiltration Wells in Randuacir

Social capital is a prerequisite for good governance and economic development as stated by Robert Putnam in (Syahra, 2003). The three main social capitals that are preconditions in democratic life are networks, trust, and norms, where (1) The network will facilitate communication and interaction that can encourage trust between individuals or groups; (2) High trust will have a positive impact on a better cooperative relationship; (3) The norms that are believed and implemented together will support better cooperation. Meanwhile (Woolcock & Narayan, 2000) describe that social capital can be bonding, bridging, and linking based on the connection relationship between actors. Bonding social capital refers to connections among people with similar characteristics. Meanwhile, bridging social capital tends to unite people from various social groups. While linking social capital tends to be related to connections with people who have power, such as political or financial influence. The following is a description of the social capital in the construction of infiltration wells in Randuacir, Salatiga:

Networks. Infiltration wells in Randuacir, Salatiga do not involve a complicated network. Still, the existing network is at the micro, meso, and macro levels where the networks at the three levels have the potential to contribute to solving a social problem (van Wijk et al., 2019). At the micro-

level, we can find that local Civil Society Organizations (CSOs) have a role in water conservation. They are not directly involved in constructing infiltration wells in Salatiga in general or in Randuacir in particular. However, it is important to note that water does not recognize administrative boundaries but Hydro-geographical boundaries and hydrological principles (Dukhovny et al., 2009). Water flow has a relationship from one region to another, including upstream and downstream matters. Some of these CSOs carry out environmental campaigns, such as that of Komunitas Tanam Untuk Kehidupan (the Community of Planting for Life /TUK), and some others have planted trees on the slopes of Mount Merbabu, which is a water catchment area for Salatiga City. What they are doing is supporting water harvesting in Salatiga.

Corporate Social Responsibility (CSR) from the private sector can significantly impact development including in environmental conservation (Subarkah et al., 2019). Unfortunately, the private sector as a potential organization that should support the infiltration well program in Randuacir has not participated in the success of this program. For example, one of the Foreign Investment Companies, the largest shoe factory in Salatiga, has been established in the Randuacir since 2016. Its existence has opened up wider job opportunities for the people of Salatiga City and its surroundings. However, the construction of factories with relatively large complexes has further reduced the land surface that can absorb water. The Head of the Economic Section for the Development of Randuacir said that in 2020 some residents complained of standing water on the highway and roads in Randuacir after the factory was established. The company provides other CSR programs, but has never supported programs related to water management.

At the meso level, inter-village linkages and cooperation have built a separate network that has contributed to the success of the infiltration well program in Randuacir. For example, Patemon Village, in Semarang Regency, which borders Randuacir, since 2014 has started implementing the infiltration well program. Community leaders in Patemon, initiated the infiltration well in Patemon supported by the Patemon Village Government, IUWASH USAID, and a CSO - the Qaryah Thayyibah Farmers Association (SPPQT), that provided funding and facilitated the construction. In addition, a community leader from Patemon shared his knowledge and experiences on infiltration wells to the people of Randuacir. One of the activities involving Patemon as a speaker in Randuacir was attended by various elements, including the community, representatives of the Salatiga City government, and local CSOs in Salatiga. The success of Patemon in building infiltration wells has provided its own inspiration for Randuacir to run the same program.

Meanwhile, USAID's IUWASH intervention is crucial in this infiltration well program at the macro level. IUWASH, funded by USAID, propagates discourse and knowledge that infiltration wells are a potential strategy for storing groundwater. Thus, they planned to build 920 infiltration wells in Semarang Regency and Salatiga City to restore around 600 million water per year (USAID, 2015). As a basis, IUWASH conducted a preliminary assessment in the Salatiga area and its surroundings, the results of which provided recommendations on the infiltration well program. In addition, some IUWASH socializations have been carried out several times in Salatiga. For example, one socialization involved the Argomulyo Sub-District government by inviting LPMK representatives and health cadres from the kelurahan level. The head of Randuacir LPMK admitted that he became more aware of the importance of infiltration wells; thus, the socialization of IUWASH had changed the public discourse about saving water through infiltration wells. In addition, socialization also involves networking in the academic realm; in this case, Islamic-State University (IAIN) Salatiga is one of the universities that supports and implements the infiltration well program in its campus.

Policy Rules. The policy rules that drastically change how the infiltration well program in Randuacir is carried out are regulations relating to the distribution of Dana Kelurahan (Urban-Village Funds). The distribution of the funds is regulated in Law No.23 of 2014 concerning Regional Government, specifically Article 230 that Regency/City Governments are obliged to provide budget allocations in the APBD (Local Government Budget) to develop local facilities and infrastructure and community empowerment at the kelurahan level. In more detail, the rules regarding the distribution of Dana Kelurahan are regulated in Government Regulation No. 17 of 2018 concerning Districts, where the urban-village budget in urban areas is a minimum of 5% of the APBD after deducting the Specific Allocation Fund (DAK).

The existence of the Urban-Village Fund distribution has encouraged increased community participation in the infiltration well program. Previously, the construction of infiltration wells was mostly managed directly by the Local Government of Randuacir and IUWASH. After the Village Fund was established, the community can propose the construction of infiltration wells. Since 2020, Rancuacir Urban-Village Office has offered to the community to propose various infrastructure and community empowerment programs. At the RT (neighborhood) level, residents who are willing or

proposed to procure infiltration wells at their land locations are then registered. Then at the RW (community association) level, the list of residents is selected by prioritizing those who need it more. Together with other proposals, this proposal is discussed in the Urban-Village Development Planning Meeting (Musrenbangkel) for approval by Urban-Village Office. If approved, LPMK will manage the infiltration well project.

Trust. The construction of infiltration wells in Randuacir also involves trust, especially between the community and the Urban-Village Government. Trust is built formally through a statement letter. Those whose land location has received an infiltration well construction project are asked to sign a statement. The statement contains two important things, first, regarding the willingness of the residents to provide a point in the location of their land to build infiltration wells. Second, they must state that they are willing to maintain infiltration wells built on their land site by cleaning the wells from dirt that enters along with rainwater. The statement was signed on paper and legally recognized together. Willingness to sign the letter can indicate that the community believes that the construction of infiltration wells on their land can change water availability, even though they do not know the exact impact in the short term.

In addition, trust is also given to members of LPMK who manage Urban-Village Funds for development projects at the kelurahan level. LPMK members are citizens trusted to be community representatives. They are appointed through a development planning meeting at the kelurahan level. The Urban-Village Government distributes funds so that LPMK members use these funds to implement the infiltration well project. They determine which builders are appointed to make infiltration wells and spend funds on building materials needed.

Typology of Social Capital in Infiltration Well Development

Randuacir has biophysical conditions that make some the residents experience a lack of clean water during the dry season. This experience leads to continued uncertainty if no action is taken to manage water. This is exacerbated by the increasing size of the area that has decreased water infiltration, including the construction of a shoe factory in that area. The same experience becomes the social capital that binds them to agree with the construction of infiltration wells. This was conveyed by the Head of LPMK Randuacir that there were no people who refused the construction of the infiltration well program because they felt they needed it in the hope of increasing groundwater savings so that it was easier for people to get clean water.

In terms of networking at the meso level, the relationship with Patemon Village also shows the characteristics of bonding social capital. Patemon Village, which has successfully implemented the construction of infiltration wells in the Semarang Regency area, basically has almost the same experience as Randuacir in the lack of clean water during the dry season. In Patemon, the Village Government has even passed village regulations governing water management, especially the construction of infiltration wells. This was stated by the leadership of an environmental NGO in Salatiga and LPMK in Randuacir. Thus, the success of the residents of Patemon Village is an inspiration for Randuacir to build infiltration wells.

The idea and construction of infiltration wells in Randuacir have been able to bridge various social groups, especially between the Government, the Community, Academic Institutions, and CSOs. This can be seen from the various activities and programs carried out by these actors to support water management. For example, in the socialization of infiltration wells in Randuacir, the participants came from various government and non-government organizations. The same is the case with the meeting on infiltration wells at the IAIN Salatiga Campus, which also involved the community, the international NGO IUWASH USAID, local CSOs, the government, PDAM Salatiga City, and academic institutions.

Meanwhile, the leadership in Randuacir can link structural relations between actors in the construction of this infiltration well. For example, the Head of Kelurahan for the 2020-2021 period, Ponco Margono, ensures that the government continues to support the infiltration well program proposed by the community. During his administration term in Randuacir, he made sure that there were tens of millions of funds sourced from the Urban-Village Fund to be allocated for the construction of infiltration wells in Randuacir. This kind of leadership increases the certainty of a more sustainable program.

The Role of Social Capital in the Circular Economy of Water Management

Social capital plays a crucial role in development interventions, especially water management. This study indicates that social capital has a role in water management through infiltration wells in

Kelurahan Randuacir which is in line with several previous studies. Related to network social capital for instance, (Esterhuysen, 2012) proves that social networks are crucial in water management, especially in agriculture in planning and implementing production-increasing initiatives. Meanwhile, research results by (Aida, 2019) show that social capital in the form of trust will encourage the satisfaction of water users. Upstream farmers who trust downstream farmers are more likely to be satisfied with their water use. In addition, a previous study by (Hileman et al., 2016) showed that a low level of trust in shared water management is one of the things that trigger conflict among water users. Moreover, related to social capital norms, research by (Yudiatmaja et al., 2020) have suggested that the norms prevailing in the community in the study area can influence the water management process. Therefore, the finding of this study have confirmed previous studies' result.

Regarding the relationship between actors in water management, the results of this study indicate that the same experience in terms of lack of clean water has bound the community in Randuacir Village to have the same goal, namely to increase groundwater reserves through the construction of infiltration wells. This is in line with the results of a study by (Yoder & Roy Chowdhury, 2018) showing that bonding social capital among farmers encourages them to improve water management arrangements through a sense of shared responsibility; while bridging social capital helps legitimize new management efforts, agreed water quality targets encourage farmers to take advantage of various forms of social capital. Meanwhile, the infiltration well program in Randuacir has been able to bridge various organizations, both government and non-government based, to support the infiltration well program. Meanwhile, (López-Gunn, 2012) shows that the role of the leader will be able to become a linking social capital that can connect and create various types of social capital. This is the same as what happened in Randuacir, where the leader ensures the sustainability of the infiltration well program through funding sourced from the Urban-Village Fund.

In water management, the circular economy will provide an important opportunity to increase the effectiveness and efficiency of its management (Leyva-Díaz et al., 2021). Like other resources, water is generally viewed in a linear perspective where a take-use-discharge strategy is very commonly adopted in the water sector. Meanwhile, in a circular economy, water management better aligns the human water cycle with the natural water cycle through several steps. According to (Tahir et al., 2019), the steps are as follows: (1) Avoid use – by considering goods and services and reducing ineffective actions; (2) reduce use, namely by encouraging continuous improvement through efficient use of water and better allocation and management of resources; (3) Reuse – seek every opportunity to reuse water in a flow of operations (closed-loop) and for external applications in the surrounding environment or community; (4) Recycle – i.e., in internal operations and/or for external applications; (5) Replenish – i.e., efficiently and effectively restore water in the basin.

Thus, it is clear that the infiltration well program in Randuacir shows how circular economy practices in water, especially replenishing groundwater reserves. This infiltration well is a form of rainwater harvesting that collects rainwater runoff from catchment areas as a water supply (Yulistyorini, 2011). In general, there are two ways of harvesting rainwater, namely, surface run-off harvesting and rooftop rainwater harvesting. This study in Randuacir shows that the type of rainwater harvesting carried out is surface runoff harvesting, which can increase groundwater reserves, thereby reducing the clean water crisis. Rainwater harvesting is a promising way to augment scarce surface and underground water resources in areas where existing water supply systems are inadequate to meet water demand (Aladenola & Adebayo, 2010). Some residents of Randuacir Village said that after the infiltration wells program, the water shortage in the following years are not as the dry season in previous years because their wells can still produce water.

This study finds that the existing social capital has succeeded in the circular economic practice of water management through infiltration wells. Unfortunately, the limitation in this study is that it is not yet known the level of each role of social capital in the infiltration well program. Knowledge of the level of social capital in an intervention program will show which social capital needs to be optimized so that the program can be more successful. Research by (Diana, 2021), for example, with a quantitative approach, researchers can find out whether social capital has a low, moderate, or high role. Therefore, in the future, there needs to be research with a quantitative approach that explores the extent of the role of social capital in the circular economy of water management through infiltration wells.

Conclusions

Kelurahan Randuacir, Salatiga City, has practiced a circular economy of water management through infiltration wells. Previously, some areas of this village experienced a shortage of clean water

during the dry season. Infiltration wells have been proven to increase clean water reserves for the community. Meanwhile, the construction of infiltration wells cannot be separated from the existence of social capital either owned or built during the construction of infiltration wells. It can be identified that these social capitals are in the form of networks, norms, and trust that enable the infiltration well program in Randuacir to be more successful. Meanwhile, social capital has been binding, bridging, and linking related to relations between actors. Furthermore, the policy on Urban-Village Fund (Dana Kelurahan) has encouraged the community's participation in infiltration well development. It is important to note that the private sector has a very potent role in the success of the infiltration well program. However, in the infiltration well program in Randuacir, no private sector is involved.

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