Water Supply Management System And Social Capital

Volume 3

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Chapter 9

Sustainability Factors of Community Rural Water Supply (Case: Ciburial Village)

Sri Maryati, Juliana Lestari

9.1 Introduction

Community water supply system is water supply systems that serve water supply for a group of community. Such system are emerging in Indonesia, both in urban and rural areas. The existence of this system is generally based on the limitations of public water supply supplied by the government. Community water supply becomes an important alternative for areas which are not served by public water provision. Although such system has better impact to environmental and economic condition compared to individual water supply, the management of such system is not easy due to the higher complexity, both from the physical infrastructure and management aspect.

One of the obstacles in the community water supply system is the problem of sustainability. Not all of the built system are sustained. Sustainability in this context is defined as a service that can functioned properly and the quality is always increase from time to time. It is therefore, identification of factors influencing sustainability of water supply system is very important to be explored.

According to the results of monitoring and evaluating of community water supply from the Public Works Department Kabupaten Bandung in 2007, community water supply in Ciburial Village is one of sustainable system. This research is aimed to explore key success factors in Ciburial Village that influence the sustainability of the system.

9.2 Factors Influencing Sustainability of Water Supply System

There are several definitions of sustainability of services, including water supply. Wegelin-Shuringa (1998) states that sustainability defines as follows:

- A service can be called sustainable if it can be functioned properly and can be used, and may provide the required results, i.e. the quality, quantity, convenience, service level, continuity, affordability, efficiency, equity, reliability, and health.
- Successfully used in a fairly long period.
- No negative impact on the environment.
- Maintenance and operation costs can always be covered by consumer contributions, or innovative financial mechanisms.
- It manages in institutional management, such as community development, the use of a gender perspective, cooperation with local governments, private sector involvement of both
- formal and informal.
- It has support from outside sources for technical and training side.

Hodkins dan Kusumahadi (1993) states that sustainability relates to the following factors:

- Environmental sustainability
- Institutional performance
- Imperishable of needs fulfillment
- Perspective of the system and long-term life time

Brike and Bredero (2003) said that a service is sustainable when :

- It functions properly and is used.
- It provides the services for which it was planned, including: delivering the required quantity and quality of water; providing easy access to the service; providing service continuity and reliability; providing health and economic benefits; and in the case of sanitation, providing adequate sanitation access.
- It functions over a prolonged period of time, according to the designed life-cycle of the equipment.
- The management of the service involves the community (or the community itself manages the system); adopts a perspective that is sensitive to gender issues; establishes partnerships with local authorities; and involves the private sector as required.
- Its operation, maintenance, rehabilitation, replacement and administrative cost share covered at local level through user fees, or through alternative sustainable financial mechanisms.

- It can be operated and maintained at the local level with limited, but feasible, external support (e.g. technical assistance, training and monitoring).

- It has no harmful effects on the environment.

Brike and Bredero (2003) assert that Sustainability relies mainly on four interrelated factors i) **technical**; ii) **community**; iii) **environmental**; and iv) **the legal and institutional framework**. Each factor can be divided into some aspects. Technical factor consists of technology selection, complexity of the technology, the technical capacity of the system to respond to demand and provide the desired service level, the technical skills needed to operate and maintain the system, the availability, accessibility and cost of spare parts and the overall costs of O&M.

Community factors consist of the demand or perceived need for an improved service, the feeling of ownership, community participation in all project phases, including planning, designing, constructing and managing the services, and in the operation & maintenance of the services, community members should also be involved in generating demand for improved services, the capacity and willingness to pay, management through a locally organized and recognized group, the financial and administrative capacity of management, the technical skills to operate and maintain the service, implement preventive maintenance activities, and perform minor and major repairs are all present in the community, socio-cultural aspects related to water and individual, domestic and collective behavior regarding the links between health, water, hygiene and sanitation.

Environmental factors consist of the quality of the water source (this will determine whether the water needs to be treated, and will influence the technology choice), adequate protection of the water source/point, the quantity of water and continuity of supply and the impact of wastewater or excreta disposal on the environment. Environmental factor have a important relation with hygiene and sanitation practice, because the poor hygiene or inadequate access to sanitation facilities can jeopardize health benefits gained from improving access to water supply.

Factor of legal and institutional frameworks have included policies and strategies that supports sustainability. Communication between central and local levels of government, and the development agencies, will help to coordinate activities and implement policies. Non-governmental organizations (NGOs) are valuable counterparts in many planning and implementation activities. Public/private partnerships may also play an important role in operation and maintenance. Participation of the private sector may range from simple maintenance tasks, to the operation, maintenance and management of the entire system under well-regulated and controlled concession contracts.

Wegelin-Shuringa (1998), assert that community management model is a trend that can encourage rural and peri-urban area for managing water supply provision in their community with supporting from government. Wagelin-Shuringa (1998) added a new factor "financial" as a requirement for sustainable community water supply. Based on Wagelin-Shuringa (1998), factors that influence sustainability community water supply are social factor, technical factor, environmenta factor, fnancial factors and institutional factor.

In order to measure the level of sustainability of certain services, sustainability indicators are developed. As mentioned above, Brike and Bredero (2003) defined four factors influencing sustainability of water supply, they are technical, community, environmental, and legal and institutional framework. Wegelin-Shuringa (1998) classified the indicators into social, technical, and environmental aspects, whereas Van der Berg (2002) classified the indicators into operational, social, financial, and institutional aspects. Social indicator relates to ability and willingness to pay of community, environmental indicator relates to conservation, technical indicator relates to technology choice, institutional indicator relates to technical standard, and financial indicator relates to community contribution in investment.

Based on the literature mentioned above, in this study factors influencing sustainability of water supply is classified as community, technical, economy, environmental, legal framework and institutional factors. Each factor has several sub factors as can be seen in the Table 9.1.

Table 9.1 Factors and Sub Factors Influencing Sustainability of Water Supply System

No	Factors	Sub Factors
1	Community	Community participation, human resource development, willingness and ability to pay, ability to manage organization
2	Technical	Level of Service, Operation and Maintenance
3	Economy	Water reuse, physical network
4	Environmental	Water resource quality, continuity, and water resource conservation
5	Legal Framework and Institutional	Clear legal framework, Government-Private Role

Source: Wegelin-Shuringa (1998), Wydick (2008), Van der Berg (2002), Brike and Bredero (2003)

9.3 Community Water Supply in Ciburial Village

In this study, system in Ciburial Village is choosen as case study. The system is located in Ciburial Village, Kabupaten Bandung. The village has border with Kecamatan Lembang, Kelurahan Dago, Kelurahan Cigadung, and Mekar Saluyu and Cimenyan Village. The location of case study area can be seen from Figure 9.1.

Water supply system in Ciburial Village was developed in 1998 by local government and community. The system was started to be operated in 1999. Before the existence of the system, community used springs as source of drinking water. To get water from this spring, sometimes people have to queue, started from early morning. This is because the limitation of the springs while there are too many people use the springs. Because the

location of the springs is far enough from the settlement and the topography is not flat, then people usually only lift water to their homes for drinking and cooking, while for other purposes, they fulfill their needs nearby the springs. Based on this difficult condition, the villagers took the initiative to build communal water supply in Ciburial village. As a first step, the villagers, especially in RT (Rukun Tetangga = Neighbourhood Cluster) 5 and RT 7) submitted the development proposal to Department of Public Works of West Java Province. The system was planned to serve the entire Ciburial Village.Very coincidentally, some of the villagers are expert in water supply engineering and they care about the difficulties of the villagers in term of water supply. The system was actually planned by the experts in this village. The plan was also disseminated to the wider community so that people know and can support its development. Each of the RT often makes meetings with the RT members since sometimes there are different opinion from the members regarding the development of the system. The contradiction in the community is due to the doubt of the community regarding the sustainability of the system. The community woried that they will not get drinking water that connected to their house. For this reason, the head of RT active in conducting a meeting and explain the prospects of the system.

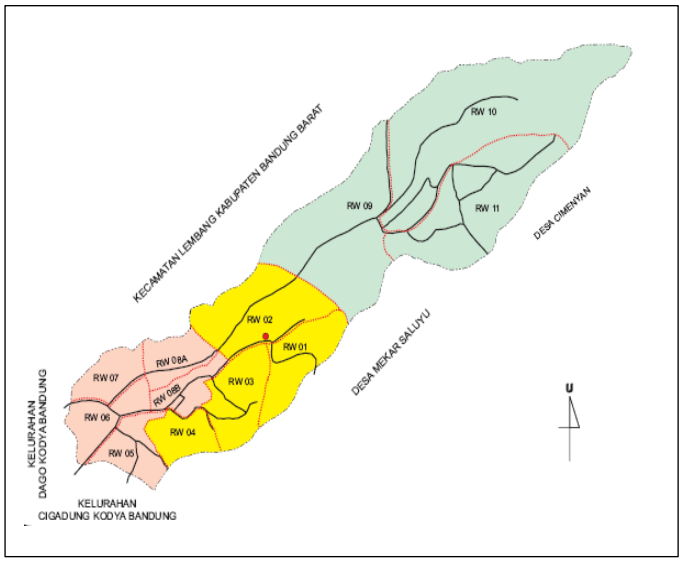

Figure 9.1 Ciburial Village
(Source: Ciburial Village Official Office, 2011)

With the help of the senior citizen, the community finally understand the program and plan. They understand the purpose and prospects of this program. After receiving positive response from the community, then to increase the sense of belonging of the community to the system, community was encouraged to be involved in surveys which aimed to collect data regarding the plan and network system. Once the plan is completed, the proposal submitted to the Public Work Departement of West Java Province. Since the topography of Ciburial Village is not flat, the installation of the network was very expensive. The cost was obstacle for the Public Works Department to development the system, but they realize the development of

the system is very important to the community. Of the total fund required as much as IDR 1.000.000.000, West Java Provincial Government is only able to provide funds as much as IDR 157.000.000. Considering there were so many shortages of funds, then the community leaders and village officials took the initiative to maximize community participation in fundraising. Very coincidence, in this area there are a lot of newcomers from high level income. The newcomers themselves have an organization so called Paguyuban Warga Pakar. Once the funds collected, it added to the fund from the West Java Province and development of the system began. While the development was implemented, the RT Leader continues to do fundraising in some meetings. RT Leader proposed to the community that for people who would subscribe to house connection has to provide the fund for connection by their own. However, many people objected the proposal because it is still doubtful whether the system can reach their respective house. Then the leader of the RT convinced that the community will get the benefits from household connection.

The develoment of the system was done step by step due to the lack of fund and finally finished in 1999 and immediately can be operated. Seeing the construction progress and evidence that water can reach the house, then people become convinced that the water will flow into their respective homes. Thus they are willing to pay for household connection.

The development of the system also involved villagers who has material store. They provided the system of installments to pay the necessary building materials for the construction of this system. This installment may be paid after the operation of the system taken from household connection fees and sales of drinking water. Communities that participate to build the system also got wage and lunch from the fund.

The main pipe which lies alongside the main street of this village was not installed underground, in order to show to the community the development of the system every day. Because of the seriousness and transparency of the use of funds in the development of the system, the consumers of the system increased.

Because the system has to be managed seriously in order to remain sustainable, Ciburial Village issued a decree forming Ciburial BPABDC (Clean Water Management Agency of Village Ciburial). This Agency is responsible for the management of the system. In performing its duties, BPABDC have its own office and management. In this office the payment of water bills paid by the society based on water meter record.

BPABDC members are citizens of rural communities who have the expertise and capabilities in their respective fields. Staff of the technical, financial and management of BPABDC routinely included in the training conducted by the Department of Public Works. BPABDC organizational structure consists of a chairman, secretary, treasurer, technical, and cashier. Members of BPABDC is a native village, this is intended to allow the public to directly participate and finally the have high sense of belonging of their system.

The amount of water tariff to be paid based on water meter records. Water meter installed at each customer's house. Through water meter BPABDC can control or monitor the leakage or the suitability of water usage and costs paid. Tariff structure in the village consist of three classification based on economic ability of customers. Determination of the classification was based on the survey with criteria agreed by Village Government. Customer group A is high income level, B is midlle income level, and C is low income level. Customer group A is a category of customers that will provide cross-subsidy

for the customer group C. While group B customers are customers who pay in accordance with the price of production. But, in fact, customers who need the subsidy is the largest amount of community, that is nearly 75% of total customers and only 15% of the customer is in category A. While the class B customers account for about 10% of total customers.

The amount of tariff is determined based on the agreement with the villagers by taking into account the economic levels of residents. Connection installation costs also vary according to customer classification. These costs are also increase from year to year, as shown in Table 9.2.

Table 9.2 Installation Cost and Water Tariff in 1999

Item	Class A	Class B	Class C
Installation Cost	Rp 3.000.000	Rp 2.000.000	Rp 500.000
Water Tariff			
- 0-25 m3	Rp 500/m3	Rp 500/m3	Rp 250/m3
- >25 m3	Rp 1000/m3	Rp 1000/m3	Rp 750/m3

Source: BPABDC, 2010

BPABDC applied progressive tariff system. It is intended for more efficient use of water because of limitation of water source in this village. Up to now, BPABDC has managed the benefit and develop their business. This profit is used for operational costs and maintenance (OM) and the salaries of its employees. In addition, the advantage of BPABDC is also use for scholarships. Some benefit of BPABDC is also used as cash income for the village of Ciburial.

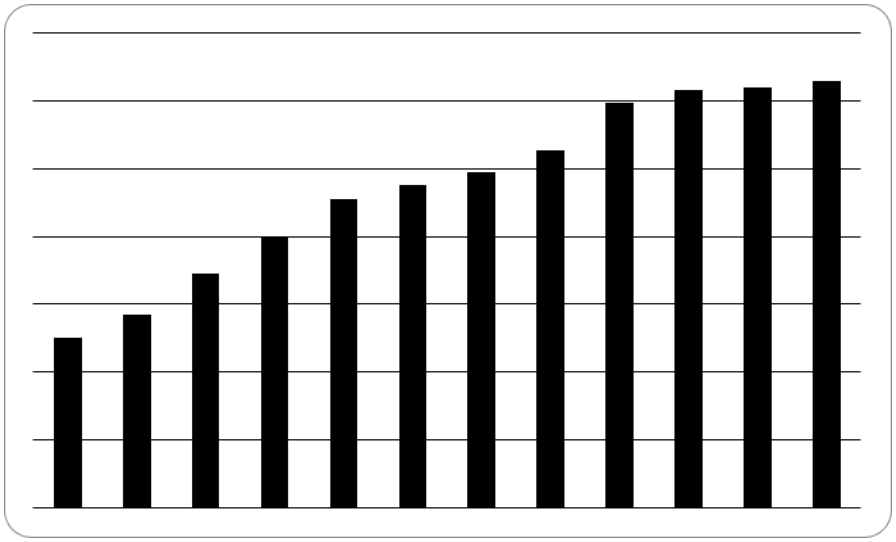

Figure 9.2 Number of Customers of Ciburial System
(Source: BPABDC, 2010)

The number of customers of the system has increased each year, at the beginning of first operation (1999), the number of customers were only 250 household, but by 2010 has increased to 630 customers, as shown in Figure 9.2. In addition to household, consumers of the system are also village offices, health centers, and schools.

Because the number of customers continues to increase, then BPABDC are seeking to increase the water discharge capacity. Nowadays the source of water used is from the spring Seke Gede inside Forest Park Djuanda (THR Djuanda). In order to use this spring, it need a fairly strict licensing procedures. This is because the function of forest park Djuanda as a protected area and conservation. The use of water resources of this region must obtain official permission from the Forestry Department of Bandung Regency.

After meeting all the specified procedures, ultimately Seke Gede can be used as a source of water for the villagers of Ciburial. In 1999, the flow of water that can be drawn from Seke Gede is about 12 liters/sec, but over time, discharge of water that can be used at this time began to decrease.

Actually, there are 2 springs that used as source of water in the village. Another one is Seke Kecubung located still adjacent to the Seke Gede and included in the Forest Park Djuanda as well. The discharge from Seke Kecubung is very small. The total discharge used by the system is around 9 liters/sec.

9.4 Results and Discussion

This study used pairwise comparison as an aproach, which is the assessment process or judgment and not a determination of preference. Determination of the respondents used the method of purposive sampling that is the method of choosing samples with certain consideration, such as expert in certain field. Respondents used in this study as many as 15 people who know the development and management of the Ciburial System from the beginning until now. The expert respondents were divided into 4 groups: respondents from consultant, respondents from bureaucracy, respondents from the village, respondents of BPABDC.

Table 9.3 Weight and Rank of Sustainability Factors

No	Factors	Weight	Rank
1	Community	0.55	1
2	Technical	0.13	3
3	Economy	0.05	5
4	Environmental	0.17	2
5	Legal Framework and Institutional	0.09	4

Based on the results of weighting factors that affect sustainability of the system by using AHP, it can be concluded that the most important factor is community factor (0.55), the second is environmental factor (0.17), the third is technical factor (0.13), while the fourth is legal framework and institutional factors (0.09) and the lowest rankings are occupied by economic factors (0.05) as can be seen from Table 9.3.

The results suggest that community participation is indeed the most decisive factor in the sustainability of the system. The village of Ciburial since the beginning has a high participation in terms of funds, manpower, materials, thoughts and so forth. Human resources possessed by the village who also care about this village and often contribute thoughts/ideas or funds to the problems faced by community, including provision of clean water also influence the level of participation. There is a transfer of knowledge from expert to the community.

Environmental factors occupy second position in which the respondents argue that conservation is very important to maintain quality and quantity of water so water can flow continuously to the customer. Respondents think, if there is no water then the system will fail. Forms of water conservation is the purchase of tree seedlings and participate in plantings in the area of Forest Park Djuanda.

The technical factor is also important. The operator always monitor the physical condition of the system. If there is any damage, operators directly report to their supervisor.

Legal framework and institutional is the fourth factor. Respondent argued that the regulations regarding tariffs and executive decree provides certainty in carrying out the system.

The last factor is economic factor. Economic factors occupy the last priority which determines the sustainability of system because there are rarely any people who reuse water that has been their used.

The results of sub factors weighting showed that community participation is the most important factors, followed by human resource development. These two sub factors are part of community factor. Community participation has the highest global weight and the weight is far from other sub factors. The global weight of community participation is 0.3260 whereas the second highest is 0.0860. This fact showed that community participation is the most important factor influencing the sustainability of rural water supply in Ciburial Village. Tabel 9.4 shows the global weight and rank of each sub factors.

Table 9.4 Weight and Rank of Sustainability Sub-Factors

Sub Factors	**Factors**	**Global Weight**	**Rank**
Community Participation	Community	0.3260	1
Human Resource Development	Community	0.0860	2
Willingness and	Community	0.0712	4

Sub Factors	Factors	Global Weight	Rank
Ability to Pay			
Ability to Manage Organization	Community	0.0701	5
Level of Service	Technical	0.0638	8
Operation and Maintenance	Technical	0.0657	6
Water Reuse	Economy	0.0375	10
Physical Network	Economy	0.0149	13
Water Resource Quality	Environmental	0.0653	7
Continuity	Environmental	0.0850	3
Water Resource Conservation	Environmental	0.0211	12
Clear Legal Framework	Legal Framework and Institutional	0.0366	11
Government-Private Role	Legal Framework and Institutional	0.0567	9

9.5. Conclusion

Sustainability of rural water supply in Ciburial Village is determined mainly by community factor, which consists of community participation, human resource development, willingness and ability to pay, and ability to manage organization. Although the development and operation of the system get support from government, the contribution of community is very high. Community participation is the most important sub factors and it is actually very dominant sub factor. Community participation in this community is influenced by leadership.

The development of Ciburial system give an example that some obstacles can be overcome with community factors, including financial limitation. This conclusion is casuistic and maybe cannot be applied in other locations with different conditions.

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