

OP.UM-02

SUSTAINABILITY OF WATER SUPPLY SYSTEMS FOR POOR COMMUNITIES

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Abstract

Experiences in the third world countries showed that the failures of water supply developments were caused by less community participation and less acceptability to the new technologies. In era after 2000, the Government of Indonesia had been carrying out water supply development, particularly for rural poor communities. To improve water services in the future, sustainability of the services is very important. Sustainability is indicated by three indicators, i.e. customer satisfaction, financial benefit, and possibility of system improvement. Some factors that influence sustainability of water supply system have been studied. The study was carried out in several locations of water supply systems in East Java - Indonesia, especially in the rural areas of Brantas River Basin. The study used methodology of quantitative and qualitative research with case study and survey approaches. The study was carried out by distributing questionnaires to find the perceptions of communities and water committee regarding to the technical, financial, social, and institutional aspects in the water supply system. The result of the research shows that sustainability of rural water system is affected dominantly by technology selection, institutional ability, and community participation. The result of the research may also be used as recommendation to formulate strategy of rural water supply development.

Keywords: *sustainability, water supply, poor communities, Brantas River Basin*

Introduction

Development of water supply in Indonesia refers to the seventh goal of Millennium Development Goals (MDGs). In water supply context, the MDGs has target of halving, by 2015, the proportion of people without access to safe drinking water and basic sanitation facilities. To achieve the target, the Government of Indonesia had been carrying out water supply development, particularly for poor communities. To improve water services in the future, sustainability of water supply system is an important factor. Sustainability is indicated by three indicators, i.e. customer satisfaction, financial benefit, and possibility of

system improvement. The government must reflect on its experience in era 1970 – 2000, where many water supply developments in Indonesia were not successful.

Some factors that influence sustainability of water supply system were studied. Recent researches related to the sustainability of water supply system were conducted by Kaliba (2002) and Musonda (2004). Both researches were carried out in Africa to identify factors that contribute to sustainability of rural water supply facilities. Kaliba (2002) found a strong correlation between community participation and management with sustainability. Musonda (2004) showed that factors which contribute to achieve sustainability were effective community organization, capabilities of communities to operate and manage facilities, abilities of communities to increase tariff to purchase spare parts, and good support to improve the services in village level. Masduqi *et al.* (2007) showed that pipeline network condition was affected by project funding and poverty.

Based on the background above, a study to find significant factors that influence sustainability of water supply system was conducted in East Java, Indonesia. The research was carried out in several locations of water supply systems, especially in the rural areas of Brantas River Basin (BRB). Area of the BRB is 11,800 km², covers nine regencies and six municipalities. In the BRB, 360 rural water supply systems had been constructed. Problem of the systems is un-sustainability in some villages.

Methods and overview of case study

The research used methodology of quantitative and qualitative research with case study and survey approaches. Case study was conducted in 24 villages in nine regencies of East Java Province. The villages and regencies are illustrated on Figure 1. In this case study, data of technical planning, management, community characteristic, reliability of system, and sustainability of system were collected. Based on hypothesis of the research, independent variables of the research are technical planning, management, and community characteristic, while dependent variables are reliability of system and sustainability of system. Relation between of them is presented on Figure 2. These variables are unobservable variables, which are indicated by three or more indicators. Indicators are an observable variables.

The data were collected by observation, interview, and documentation techniques. The observation was conducted to obtain condition of water supply facilities. The interview involved 24 water committees and 360 water users with questionnaires as instrument to find perceptions of communities and water committee. Documentation technique was conducted to obtain document of villages profile, water supply design, financial reports, and institution profile. All data were analyzed by sorting, coding, scoring, and structural equation modeling. This model found the relation between some factors and sustainability of water supply system.

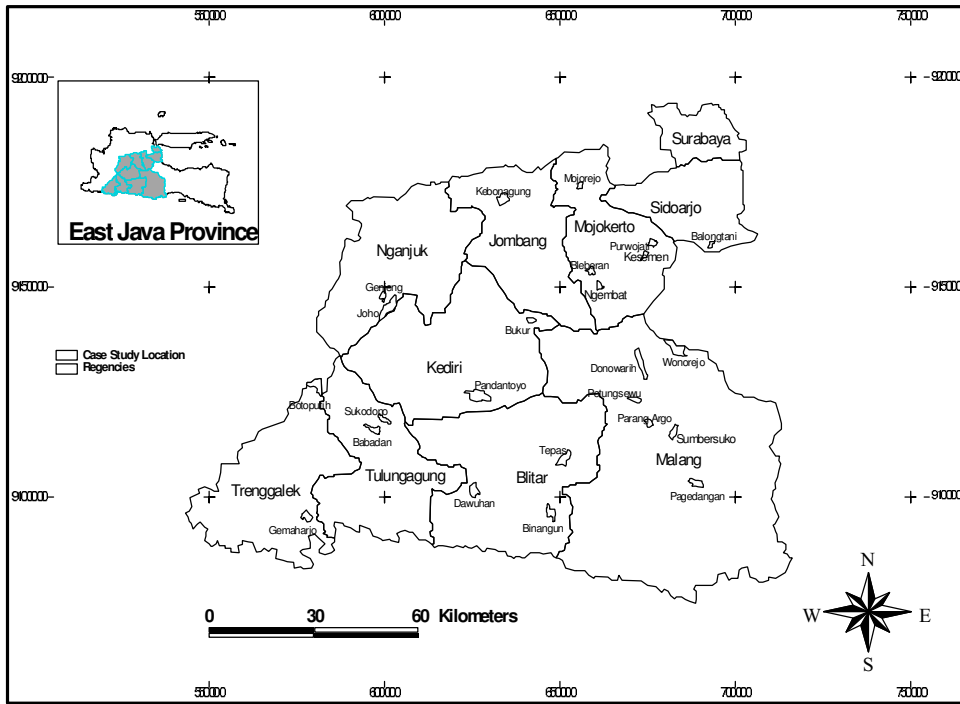


Fig. 1. Map of case study area

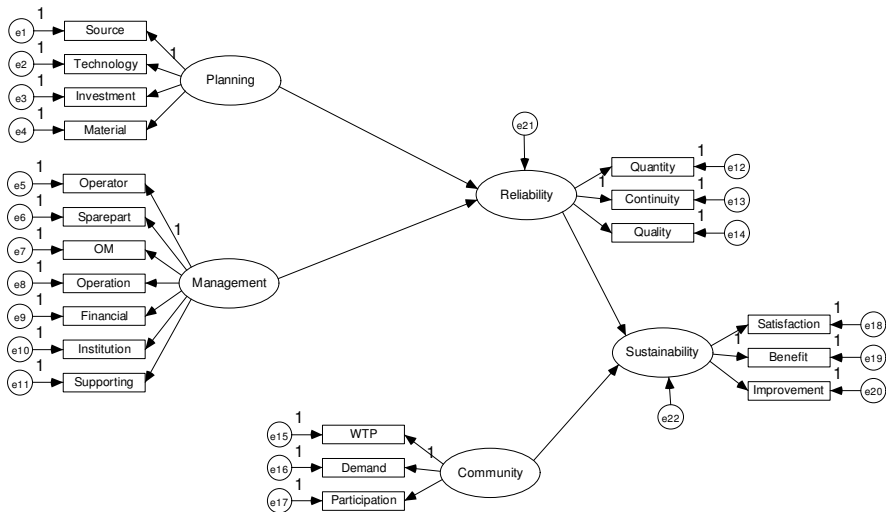


Fig. 2. Relation among variables of research

Result and discussion

The data show that most of villages have water supply systems that subsidized by government or donor. Water supply system in this context is water supply with pipeline system. The pipeline network in rural areas uses simple network and uses gravity flow or pumping system, depending on each village condition of water sources and topography. Conditions of water quality generally are good and drinkable. Conditions of communities economic and culture are relatively homogenous. Most of respondent are poor with average income about Rp 500,000 per household per month.

Then, based on the collected and analyzed data, relation between some variables as presented on Figure 2 is confirmed. Sustainability was affected by reliability and community, while reliability was affected by technical planning and management. This relation was gotten from a model using structural equation modeling. This model shows the estimation of regression weight (Table 1), which indicates effect the weight of a variable to another.

Variable of technical planning is indicated by water sources availability, technology selection, investment cost, and availability of material. The model shows that technology selection is the most representative indicator for variable of technical planning with regression weight 13.776. Variable of management is indicated by operator existence and capability, spare part, O/M cost, simplicity of operation, financial management, institutional ability, and external supporting. The most representative indicator for management is institutional ability with regression weight 1.281. Variable of community is indicated by willingness to pay, demand responsive, and participation community. Most representative indicator is community participation with regression weight 0.526.

Table 1. Estimation of regression weight of variables inter relations

Relations			Regression weight	Relations			Regression weight
Reliability	<---	Planning	0.048	Financial	<---	Management	0.315
Reliability	<---	Management	0.065	Institution	<---	Management	1.281
Sustainability	<---	Reliability	1.335	Supporting	<---	Management	0.227
Sustainability	<---	Community	0.232	Demand	<---	Community	0.165
Technology	<---	Planning	13.776	WTP	<---	Community	-0.746
Source	<---	Planning	0.000	Participation	<---	Community	0.526
Investment	<---	Planning	-0.034	Continuity	<---	Reliability	0.603
Material	<---	Planning	0.011	Quality	<---	Reliability	0.285
Sparepart	<---	Management	0.237	Quantity	<---	Reliability	0.595
Operator	<---	Management	0.321	Benefit	<---	Sustainability	0.378
OM	<---	Management	-0.299	Improvement	<---	Sustainability	0.526
Operation	<---	Management	-0.304	Satisfaction	<---	Sustainability	0.387

Based on the representative indicators above, it is concluded that technology selection, institutional ability, and community participation are dominant variables that affect sustainability of rural water supply system. This result confirms the previous research (Carter *et.al.*, 1999; Brikké & Bredero, 2003; Lenton & Wright, 2004). Carter *et.al.*, (1999) and Brikké & Bredero (2003) stated that the failures of water supply developments in the third world countries were caused by less community participation and less acceptability to the new technologies. Lenton & Wright (2004) identified some constraints of success of water supply development, i.e. political (water supply and sanitation sector not become a priority yet), financial (poverty), institutional (dysfunction of existing institution), and technical factors (dispersed rural settlement or dense urban community and climate factor, i.e. floods or droughts).

Conclusion

Sustainability of rural water supply systems is indicated by three indicators, i.e. customer satisfaction, financial benefit, and possibility of system improvement. The sustainability is affected significantly by technology selection, institutional ability, and community participation. Based on the result of the research, it is recommended that strategy of water supply development must consider technical and non-technical aspects.

References

- Brikké, F. and M. Bredero, 2003, *Linking Technology Choice with Operation and Maintenance in the Context of Community Water Supply and Sanitation*, A Reference Document for Planners and Project Staff, WHO and IRC Water and Sanitation Centre, Geneva.
- Carter, R. C., S. F. Tyrrel, and P. Howsam, 1999, "Impact and Sustainability of Community Water Supply and Sanitation Programmes In Developing Countries", *J. of the Chartered Institution of Wat. and Env. Manag.*, Vol 13, pp 292-296.
- Kaliba, A.R.M., 2002, *Participatory Evaluation of Community-Based Water and Sanitation Programs: The Case of Central Tanzania*, Dissertation, Department of Agricultural Economics, Kansas State University, Manhattan.
- Lenton, R. and A. Wright, 2004, *Achieving the Millennium Development Goals for Water and Sanitation: What Will It Take?* Interim Full Report, Task Force on Water and Sanitation Millennium Project.
- Masduqi, A., N. Endah, E. S. Soedjono, and W. Hadi, 2007, "Achievement of Rural Water Supply Services According to the Millennium Development Goals – Case Study in the Brantas River Basin", *Jurnal Purifikasi*, Vol. 8 No. 2, pp 115-120.
- Musonda, K., 2004, *Issue Regarding Sustainability of Rural Water Supply in Zambia*, Master Thesis, The University of South Africa.