



The Comparison of Institutional Model in Water Management Board - A Case Study of Management on Polder Drainage System in Semarang, Indonesia

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Abstract: Semarang is one of the cities in Indonesia which has a flood problem. Changes in land use, high rainfall intensity and erosion and sedimentation in river channels are the cause of flooding. Flood control has been attempted, such as the optimization of the drainage system. This study aims to obtain an appropriate institutional model for managing the drainage system. Research data obtained through literature and interviews with related parties in drainage management. There are three institutional models of drainage management systems that have been applied in Semarang, namely the government-based institutional model, the community-based institutional model, and the stakeholder-based institutional model. A total of 24 respondents from the elements of the city government, business people and the community were asked to assess the institutional model for drainage system management. The institutional model is analyzed in five aspects, namely technical, institutional, legal, financial, and community participation. Based on the results of the study, the most appropriate institutional model is the stakeholder-based institutional model. This institutional model has the advantage of involving many parties such as the government; communities and entrepreneurs, problems with the drainage system can be dealt with faster; have a legal umbrella that is protected by the government; and sources of funding for operational drainage systems can come from government and non-government.

Keywords: drainage system, institutional model, management

1. Introduction

Drainage problems in coastal cities are generally more complicated than urban drainage problems in general. Semarang is a city located in the northern coastal region of Java, Indonesia. Many factors influence and are considered in drainage planning, including increased discharge, narrowing and shallowing, channel reclamation, subsidence, liquid and solid waste (garbage) and Tide (Adi & Wahyudi, 2015b). The current drainage system has become one of the most important urban infrastructure. Management quality of a city is reflected in the quality of the drainage system in the city. Poor drainage system causes waterlogging and flooding in various places so the environment becomes dirty and

a. Minor Urban Drainage

Minor urban drainage is a network of drainage systems that serve a certain city areas such as residential complexes, commercial areas, offices and industrial estates, markets and tourist areas. This system serves an area of approximately 10 hectares. Management of the local drainage system is the responsibility of the community, the developer or agency in each region (see Figure 2 and 3).

b. Major Urban Drainage

Major urban drainage is a network system drainage structurally composed of the primary channels that accommodate the flow of secondary channels.

Secondary channels to accommodate the flow of the tertiary channels. Tertiary channels to accommodate the flow of Flow Regions respectively. Local drainage network can directly stream flow channel to the primary, secondary and tertiary (see Figure 2 and 3).

c. Flood Control

Flood control is an attempt to control runoff in rivers and other bodies of water in order not to overflow and inundate limpas or urban areas. Flood control is the responsibility of the provincial government or the central government. Construction or building water on flood control systems such as :

- Embankment
- Building
- Gate
- Flood Channel Way

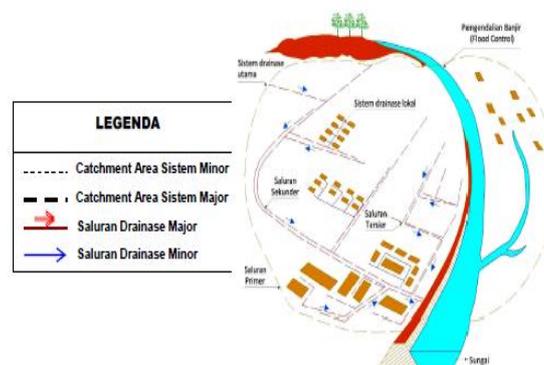


Fig. 2 - General Lay-out of Urban Drainage System

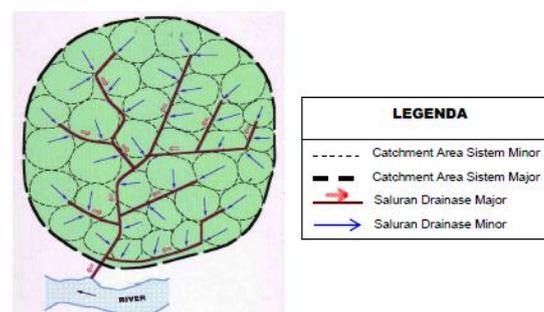


Fig. 3 - Schematic lay-out from minor and mayor in urban drainage system

Cities are centers of human activity, the center of manufacturers, trade centers, as well as consumer centers. In urban areas, many people live so there are many public facilities, transportation, communication and so on. Drainage channels in urban areas receiving not only rain, but also waste water household and industrial waste as well as possible. Source main cause drainage problems is the increase / growth of the population. Increasing the number of residents is always followed by an increase in urban infrastructure such as housing, transportation, clean water, education infrastructure, and others. In addition, the increase in population is always followed by an increase in waste, both liquid and solid waste (garbage) (Adi & Wahyudi, 2015b).

Housing and settlement development is very rapid often less controllable and not in accordance with the Spatial Planning and the concept of sustainable development, resulting in much lower areas that originally served as a retarding

pond and riverbanks inhabited by residents. This condition eventually increase the volume of surface water entering into drainage channels and rivers (Wisnarini & Ningsih, 2010).

The things mentioned above impact drainage in low ability drain region, and the low capacity of the entire infrastructure of flood control (rivers, polder-polder, pumps, water gates) to drain water into the sea. In general, the constraints encountered in handling drainage, among others, the declining attention manager of development in the field of drainage, especially on operational issues and maintenance, mindset and public awareness is low will the environment clean and healthy and weak institutions managing infrastructure and drainage facilities and the inability to draw up the necessary program (Muttaqin, 2007).

2.3 Drainage System

Drainage is the technical term for the act of handling excess water caused by rain, seepage, excess irrigation water, as well as household waste water, by means of drain, drain, discard, absorb, as well as other businesses, with the ultimate goal to restore or improve function region. In general, the drainage system is a series of waterworks which serves to reduce or remove excess water from an area (Tanudjaya, 2008).

Drainage can also be interpreted as an attempt to control the quality of groundwater in relation to salinity. Functionally, difficult to separate clearly between drainage and flood control systems. Puddle incurred in connection with the flow in the drainage channel due to local rain hampered get into the trunk or to the river, often also referred to flooding. Distinguishing inundation due to the overflow of the river with local rain puddles due to substandard flowing into the river, often have difficulty (S.I Wahyudi, 2018).

Currently, drainage systems has become one of the most important urban infrastructure. Management quality of a city is reflected in the quality of the drainage system in the city. The drainage system is not good cause waterlogging in various places so the environment becomes dirty and slovenly, become mosquito breeding and the source of the disease, which in turn not only lowers the quality of the environment and public health, but can also interfere with the activities of transport, economy and others (Adi & Wahyudi, 2018). To ensure the sustainability of the drainage system, we need a system of drainage management that involves all stakeholders, including the people who reside in it. The purpose of all the steps in the management of drainage is the creation of a condition that is ideal drainage management implementation, synergistic, unified and harmonious.

2.4 Drainage Problems

The main cause drainage problems are increasing population. Urbanization taking place in almost all major cities in Indonesia has increased the burden becomes heavier urban areas. The increase of population is always followed by an increase in urban infrastructure such as housing, transportation, clean water, education infrastructure, and others. In addition, the increase in population is always followed by an increase in waste, both liquid and solid waste (garbage) (Asrasal, Wahyudi, Adi, & Heikoop, 2018). The need for land for settlement and economic activity will increase resulting in a change in land use resulting in an increase in surface runoff and flood peak discharge. The amount of surface runoff is determined by the pattern of land use, which is expressed in a flow coefficient that varies between 0.10 (flat forest) to 0.95 (pavement). This shows that the transfer function of forest land into the pavement could increase flood peak discharge up to 9.5 times, and this has resulted in the existing drainage infrastructure be unable to accommodate the increased discharge (Slamet Imam Wahyudi et al., 2017).

Poor waste management contribute to the acceleration of the silting / narrowing of the canal and the river, so the ability to drain the water from rivers and drainage channels to be reduced. The land use change from forest (open area) into the region woke up (trading area, settlements, roads, etc.) also lead to increased erosion. Materials eroded, carried along into the river channel and thus contributed to the silting and narrowing (S.I Wahyudi, 2018).

Therefore, any development of the city should be followed by evaluation and improvement of the system as a whole, not only on the location of the development, but also around the affected area. For example, the development of a residential area in the upper reaches of the drainage system, the drainage planning is not only done in the settlement area, but the downstream drainage system should also be evaluated or redesigned if necessary. If this is not done, then the developers involved should be able to ensure that water from developed areas did not change from before and after development. Another way that can be taken is the developer must provide an artificial recharge in the development area (Adi & Wahyudi, 2015b).

2.5 Drainage Management

Handling the drainage needs to pay attention to the urban drainage function as an urban infrastructure based on the environmentally friendly drainage concept. In contrast to the old paradigm that principle drain rainwater runoff into receiving water bodies as soon as possible, but the principle that the rainwater that falls on hold once so much more that seep into the soil through the building infiltration artificial / natural like swimming reservoir, reservoir field, wells infiltration, structuring landscape and others. It aims to cut off the peak of the flooding that occurred so that the dimensions of the channel is more economical, can also help increase the sources of raw water. Handling drainage

should also wear a systems approach, not partial, technical parameters specified local natural factors (Adi & Wahyudi, 2015a).

Improved drainage problems in the district / city requires institutional capacity responsible for the drainage field. Institutional capacity building includes an increase in the field of planning and coordination, operation and maintenance, implementation and control (Wahyudi, Overgaauw, Schipper, Persoon, & Adi, 2015).

The establishment of institutional drainage system should be based on aspects of drainage management (institutional, legal, financial, community participation, and technical) (Fajar B. Wicaksono, 2016) as illustrated in Fig.4.

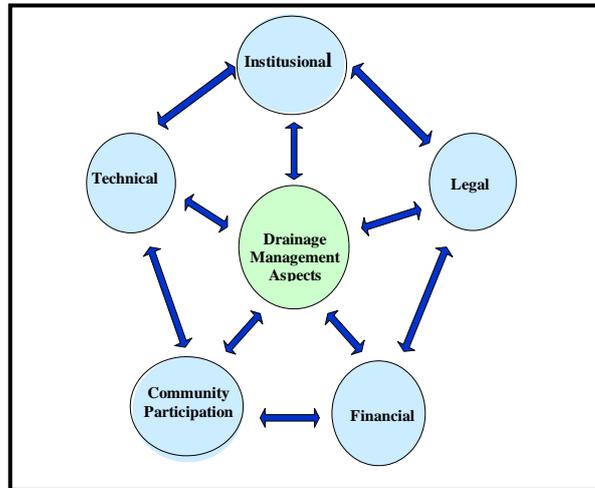


Fig.4 - Drainage Management Aspects

2.6 Organization in Drainage System Management

Development agency or institution is a perspective of social change is planned and constructed. Development agency regarding innovations which implies a qualitative change in the norms, the patterns of behavior, in personal relationships, and relationships of the group, in a new perception of the goals and methods. Institution building is not associated with the repetition of patterns that already exist, with marginal deviations from past practices, or with slight improvements in efficiency alone. The dominant central theme in the development of the agency or institution is innovation (Adi & Wahyudi, 2015b).

The purpose of all the steps in the management of drainage is the creation of a condition that is ideal drainage management implementation, synergistic, unified and harmonious. Which is expected to create synergy in the context of regions, sectors and generations, that's the essence of which is contained in the management of drainage, including drainage system applied in the management of Semarang. An understanding of this objective, both philosophically and empirically to be able to animate every step of activities of any organizations, groups, and individuals included in the group of stakeholders. If these prerequisites be met, then surely all hope of hanging will be accomplished more effectively and efficiently (Ham et al., 2015).

2.7 Strategy in Drainage Management

The strategy in the management of drainage is needed to support the achievement of development goals drainage through plans, programs and implementation of an integrated, efficient and effective (Harahap, n.d.). Strategies are needed to support the management of drainage are as follows :

1. Optimization of the existing drainage system, rehabilitation / maintenance, development and construction of new
2. Development of the legislation on the organization of the management of urban drainage.
3. Increased institutional capacity and quality of human resources in the management of drainage.
4. Development of urban drainage management system followed by an increase in financing of the management of urban drainage.

2.8 Institutional Development

Institutional development is a perspective of social change planned and nurtured. Development agencies regarding innovations which implies a qualitative change in the norms, the patterns of behavior, the relationships of individual and group relations, the new perception of the goals and methods. Institution building is not associated with repeated patterns that already exist, with marginal deviations from the practices of the past, or with slight improvements in efficiency alone. The main theme of which is dominant in institutional development is innovation. The objective is to build institutional development organizations viable and effective build support-support-completeness and comprehensiveness in its environment (Wismarini & Ningsih, 2010).

Development agencies can be defined as the planning, structuring, and the guidance of new organizations or rearranged that (a) realize the changes in values, functions, technologies, physical, and / or social, (b) establish, develop, and protect normative relationships and patterns of new actions, and (c) the support and completeness in the environment. Concepts that became the model is summarized in Fig.5.

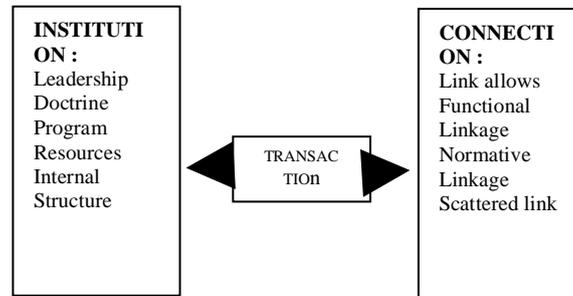


Fig. 5 - Institutional Development Model

3. Research Method

This research methods consists of a literature study, field visits, organized discussions, surveys and interviews are performed. Object interviews are parties related to the management of drainage in Semarang, including the government. In depth interviews to respondent purpose to obtain input on the implementation of three institutional models in the management of drainage systems, respondent were also asked to provide an assessment of the most appropriate institutional model to be applied in Semarang. There are 24 respondents who have assessed the institutional model of drainage system management. The composition of respondents are central government (3 persons), Semarang municipality (3 respondents), entrepreneurs (3 respondents), communities (15 respondents).

4. Result and Discussion

4.1 Drainage Management Problem in Semarang

Drainage management in Semarang is still not optimal, it can be seen from many areas are still flooded. Here are the results of analysis of Semarang drainage management issues in terms of 5 drainage management aspects, namely: technical, institutional, legal, financial and community participation.

a) Technical Aspect

Drainage management in Semarang was still under construction. Some drainage network of primary, complementary buildings and infrastructure facilities are still in the implementation of development activities.

b) Institutional Aspect

Drainage management in Semarang on institutional aspects of less than optimal, because it is handled by the department with a number of personnel were very inadequate. Personnel quality who specialize in the management of the water system, still less competent. The educational level largely equivalent undergraduate degree, whose understanding in water management problem is still lack. Personnel placement pattern in which the bureaucrats will periodically occur mutation also become a problem, because the replacement personnel have to adapt, so it takes time and a different level of understanding.

c) Legal Aspect

Regulation drainage management in Semarang still refers to the regulation mayor and the mayor's decree. Current conditions with drainage management issues are increasingly complex, rule-level operational basis mayor and the mayor's decree is still less binding, especially from the legal and political aspects. Drainage management handled only by the government (public and private not involved), and the model of reward and punishment has not been applied.

d) Financial Aspect

In the handling of drainage management in Semarang, budget constraints are also a major problem. Budgetary resources from the government are not enough to deal with drainage problems. Therefore, financing the drainage management should not only come from the government, the concept of the drainage fee needs to be applied so that the obligation in financing not only from government funds, but also of employers and society.

e) Community participation

Community participation is significant importance in the success of the development. Likewise in the management of drainage in the city, community involvement right from the beginning to the end is needed (Muttuqin, 2006). Currently, drainage management is still handled by the government, from the planning, implementation, operations and maintenance, as well as a good evaluation of the network of primary, secondary and tertiary. But in fact, the management of drainage have not shown optimal results. Community involvement in all phases on drainage management is important to apply. So the community has the responsibility and awareness of the importance of managing the drainage system properly.

4.2 Organizational Structure of Institutional Model

In general, there are three (3) types of institutional model of drainage system management in Indonesia, namely the institutional model of government based, institutional model of community based and institutional model of stakeholder based

4.2.1 Institutional Model of Government-based

In this model, as the executor is the Regional Technical Implementation Unit (RITU). RITU an organizational unit that is independent performing technical tasks of operational and technical support tasks from their parent organizations.

The operational technical task is the duty to carry out technical activities that are directly related to public services, while supporting technical task is the duty to carry out technical activities in principle, in order to facilitate the task of its parent organization.

Fig.6 shows a model of organizational structure refers to the Regional Implementation Technical Unit (RITU).

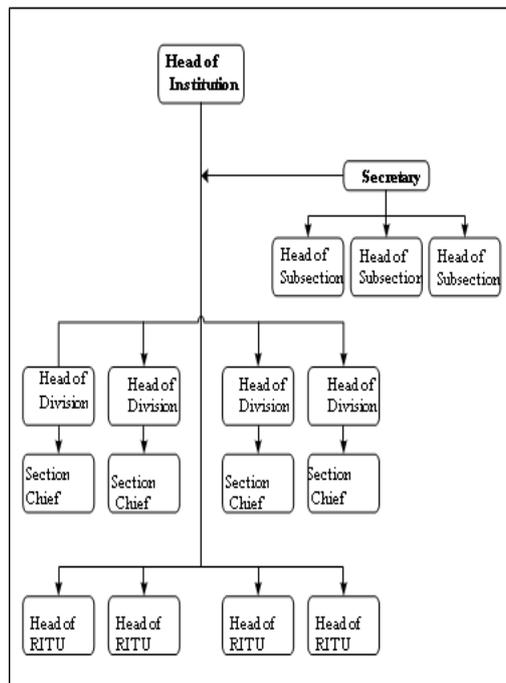


Fig.6 - Organizational Structure of Institutional Model of Government-based

4.2.2 Institutional Model of Community-based

In institutional model of community-based, the form of organization is the Non-Governmental Group (NGG). NGG is a form of organization that relies on community participation. Community empowerment is considered very strategic as input in achieving the independence of the community. The approach taken in this institutional model, is to empower communities to manage infrastructure environment.

Based development, NGG activity has diverse roles in the implementation process of development, especially how NGG cooperating with the government. There are at least three roles that can be performed by NGG in assisting the management of the infrastructure, which is a pioneer in the model of community-based management, as a facilitator and catalyst to facilitate and accelerate the process of cooperation with and among various other development actors, as well as agents of advocacy on public policy in favor on society. Fig.7 shows a model of organizational structure in the form of Non-Governmental Group (NGG).

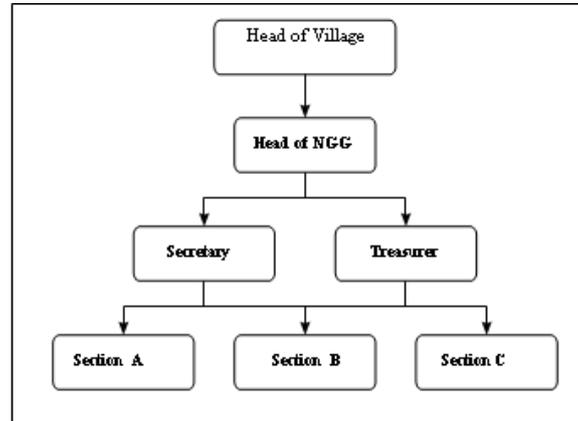


Fig.7 - Organizational Structure of Institutional Model of Community-based

4.2.3 Institutional Model of Stakeholders-based

Institutional model based on stakeholders, is a form of incorporation of the organizational structure RITU and NGG. In the structure of this organization, a lot of parties could be involved, such as government, entrepreneurs, professionals, communities and employers. Figure 8 shows a chart of the organizational structure refer to stakeholders.

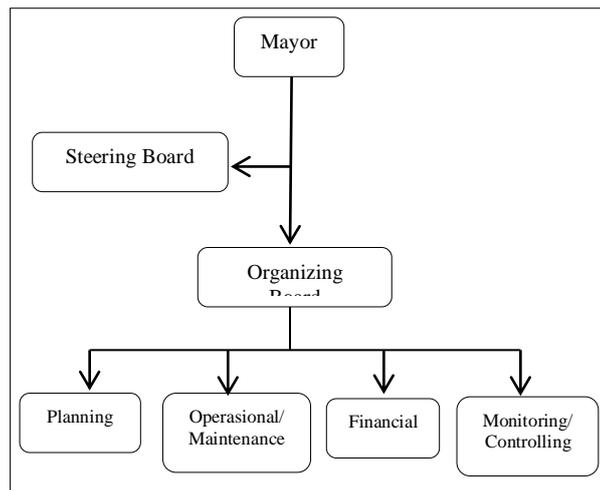


Fig.8 - Organizational Structure of Institutional Model of Stakeholders-based

4.3 Comparison of Institutional Model Based Government, Community and Stakeholders

There are three (3) types of institutional models applied in the management of drainage in Semarang are institutional model of government-based, institutional model of community-based, and institutional model of stakeholders-based. The result of comparison of institutional models that analyzed in the drainage management aspects, can be seen in Table1.

Table 1 - Comparison of Institutional Model Based Government, Community and Stakeholders

Aspect	Institutional Model of Government-based	Institutional Model of Community-based	Institutional Model of Stakeholders-based
Technical	There is a limited number of personel, so as not optimal technical operations	All operations are taken care of by the community itself	Technically operations to perform all operations can be handled more quickly because it consists of personnel who are reliable and professional
Intitution	Board consists of government employees where frequent mutation / rolling servants, so that handling is less than the maximum if incompetent personnel in the field	All handled by the communities institutions	Institutional members consist of governments, civil society, experts and businessmen
Legal	The legality of the legal form of the Decree of the relevant department. The process of institutional formation is faster because it is still in the office environment, but the rules are only binding in the relevant department.	The legality of the law was limited to the village level so that the legal force level with the regulations issued by the village	Legality level legal regulations issued by the city / county can even be to the Regional Regulation.
Financial	Financing only comes from government	Financing is only sourced from the communities only.	Sources of funding can be sourced from anywhere such government budget, grants, and also from non-governmental
Community Participation	Community is not involved in the management of the drainage system.	Community without the help of other elements fully involved in the management of the drainage system.	Communities and other elements can participate in the management of drainage

The result of respondent assessment to the institutional model of drainage system management in Semarang, can be seen in Fig. 9.

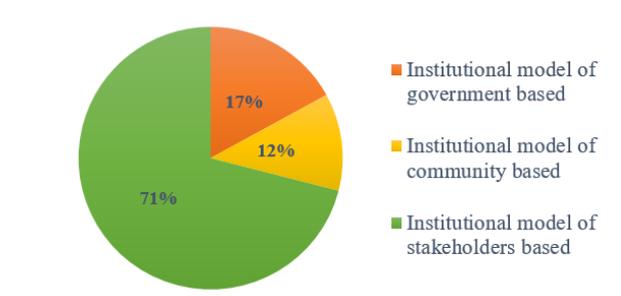


Fig. 9 -. Institutional model based on assessment of respondent

Based on the assessment of respondent, the institutional model sequence in the management of drainage systems suitable for Semarang is institutional model of stakeholder-based (71%), institutional model of government-based

(17%) and institutional model of community-based (12%). Assessment of respondents is given by considering the advantages and disadvantages of each institutional model. Institutional model of stakeholders-based is the most appropriate institutional model to be implemented in the management of drainage system management in Semarang.

Institutional model of stakeholders-based has the advantage in the technical aspects such as to conduct drainage system maintenance can be handled more quickly because it consists of personnel who are reliable and professional. The advantage in institutional aspect, the member in this institutional model involved many persons such as government, civil society, experts and businessmen. The advantage in the legal aspects, all regulations related with this institutional model, issued by the city government. It is mean the regulation has a strong impact to be implemented (Imam Wahyudi et al., 2017). The advantages of the financing aspects, financing of the drainage system can be sourced from anywhere such as central government, municipalities, grants, and also from non-governmental. The advantages in aspects of community participation, along with the other elements, the community can play an active role in the management of the drainage system.

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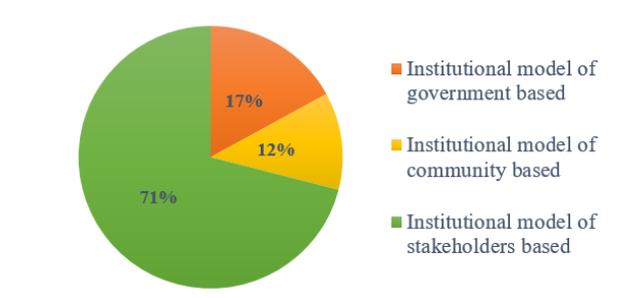


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5. Conclusion

Following conclusions are described from this research study:

- a. There are three institutional models in the management of drainage, has been applied to the drainage system in Semarang, that are institutional model of government-based, institutional model of community-based and institutional model of stakeholders-based.
- b. Based on the management problem analyzed of the drainage system management in Semarang and assessment of respondent, the most appropriate institutional model is institutional model of stakeholders-based.

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