Community Institution in Managing Floods and Tidal Drainage Infrastructure in Panggung Lor Sub-District, Semarang City, Indonesia

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Abstract. In general, the government's provision of public infrastructure is carried out because it is part of the government's obligation to provide public services. However, several cases show that an institution formed by the community manages the public infrastructure. One of them is the Panggung Lor Floods and Tidal Empowerment Management Association which is known as P5L (Paguyuban Pemberdayaan Penanggulangan Air Pasang Panggung Lor). The institution was created by residents of the Panggung Lor Sub-District in North Semarang District, Semarang City, Indonesia, to overcome and prevent floods and big tidal problems in the sub-district area. Since it was formed in 2000 until now, the institution has succeeded in overcoming its problems. This article examines the research results on P5L as an institution developed by the community to manage a public infrastructure that the government usually manages. Qualitative research is used to carry out the institutional analysis framework developed by Wageningen University and Research. This study indicates that since its establishment until now, P5L has been able to carry out the mandate given by residents of the Panggung Lor Sub-District and foster a sense of security against floods and high tides. The reason is that P5L can show good performance in 4 aspects, mainly that it can boost public confidence that the institution can manage the drainage system built on a community basis; However, initially, it was an independent institution formed and supported by the community currently it has become a partner of the government in managing parts of the urban drainage system; its services can create a residential environment that is free from floods and high tide and in green and clean conditions; as well as the supervision of its works is carried out directly by the community, as part of maintaining the trust given to the institution. For the institution's existence to continue, the mandate given by the community must be upheld.

Keywords: environment, floods, infrastructure

1. Introduction
Cities have become places where the majority of the world's population resides so that it has become the most crowded and busy part of the world for the interactions of most of the world's people. In other words, cities play essential roles as the center of various activities in their country, mainly social and economic activities [1]. To carry out this role, the city must have complete and well-functioning public infrastructures that can support various activities and improve its residents' living and welfare [2].

In general, the provision of public infrastructure is part of the government's obligation. The government provides a particular sizeable budget for carrying out that, which has been seen as an investment for encouraging the development of social and economic activities. It will be returned in
government revenues in taxes, levies, and other conditions [3]. To manage it, the government established a unique institution, usually called a public infrastructure institution [4].

However, in some cases, the provision of public infrastructure is managed by an institution formed by the community [5, 6, 7]. One example is the Panggung Lor Pumping and Environmental Management Association, often called P5L (Paguyuban Pemberdayaan Pompanisasi dan Pengelolaan Lingkungan Panggung Lor), which manages floods and tidal drainage system in Panggung Lor Sub-District in Semarang City, Indonesia, which is located in the northern coastal area of the city (see Figure 1), covering an area of approximately 123, 47 ha, which is vulnerable to floods and high tidal.

![Figure 1. Location of Panggung Lor Sub-District.](image)

The Panggung Lor Sub-District drainage system was built due to flood problems and the infiltration of high tidal into the area. Since being formed by residents in 2000 until now, P5L has overcome the issues that have plagued the area since 1996. At the time of formation, the residents thought that Semarang City Government was too slow to respond and resolve the problems. The drainage system has been integrated with the urban drainage system built by Semarang City Government. Nevertheless, the residents still entrust the drainage management to P5L because it can make sense of security against the threat of floods and high tidal.

In 2021, P5L faced a lawsuit for disbandment from one of its members, a resident of the Panggung Lor Sub-District [9]. He reasoned that the association no longer played a role in the drainage system because Semarang City Government had handled it through the construction of the urban drainage system built around the Panggung Lor Sub-District. P5L rejected the resident’s demand for the disbandment because the sub-district was still vulnerable to floods and high tidal, so a drainage system managed by an institution based on community empowerment was still needed.

This article is the result of research that examines P5L in managing floods and tidal drainage systems formed by the residents of the Panggung Lor Sub-District. This study intends to answer the research question of how P5L works in the drainage system based on community support. This study explores the reasons that affect the institution’s workings so that the community still maintains its existence.

The study of P5L intends to understand how the interactions between actors of the institution carry out their roles and functions so that it can survive in providing prevention services from floods and high tidal in the Panggung Lor Sub-District since its formation in 2000, until now. Understanding is needed to explain how the institution can survive and still obtain the trust and ongoing support from the community. This explanation helps develop strategies to strengthen P5L sustainability.
2. Research Methods
This study uses the method of institutional analysis framework developed by Wageningen University and Research [8], which was developed based on Woodhill [10], which views that institution is not just an organization but contains a framework of beliefs and values for mutual understanding, formal and informal rules of the game, organizational arrangements, regular patterns of behavior of the actors included in the institution. By understanding it, a strategy for institutional strengthening can be formulated from the aspects of an organization, resources, services, and cooperation or partnership networks. Institutional strengthening will encourage the actors to increase interaction and productivity to improve their welfare.

Woodhill [10] made a framework for studying an institution to understand an institution. It is based on four institutional domains—meaning, association, control, and action—connected to the structure of social interaction. It demonstrates the importance of outlining a set of factors that interact to shape the behavior of actors. However, in this study, the diagram needs to be modified by adding the summary that shows the results of the study of the interrelationships of the factors. The summary becomes the input for recommendations for the organizational development of the object of the study. The modified framework of Woodhill [10] can be seen in Figure 2.

![Figure 2. The modified framework for exploring the complexity of institutions [10]](image_url)

This study uses a qualitative research approach that utilizes descriptive data in written or spoken words from actors related to P5L. Qualitative research helps describe phenomena, social dynamics, attitudes, beliefs, and perceptions of P5L actors, especially on the various underlying meanings, organizations, and institutional networks; various activities that become duties and obligations; and supervision of P5L. Data in the field was obtained through field observation in the Panggung Lor Sub-District environment and the work of P5L officers; and the interviews with key informants such as the head of P5L, the head of the sub-district government, 5 community leaders, and 10 residents in the sub-district.

3. Results
This research examines how P5L institutions can survive in providing settlement and prevention services for floods and tidal waves in the Panggung Lor Sub-District area from their formation in 2000 until now, more than 20 years. The following is a study of P5L institutions based on the institutional analysis framework developed by Wageningen University and Research, which views it from four conditions.

3.1. Meaning
The P5L formation was motivated by the failure of the residents of Panggung Lor Sub-District to overcome floods and high tidal surging their residential which was carried out partially by each
individual and sub-neighborhood group. Based on this experience, they believe that solving these problems must be done by forming P5L, as the only institution that has the task of overcoming the issues comprehensively and integrated.

By carrying out this trust, P5L has succeeded in overcoming floods and high tides in Panggung Lor Sub-District. The essential benefits that emerged from this success were economic value, remarkably increasing land prices and economic productivities; social values, particularly strengthening social bonds of citizens and increasing social capital; and environmental value, mainly accomplishing a greener, cleaner and healthier environment.

This success has strengthened public confidence in the performance of P5L so that they continue to maintain the institution’s existence, even though Semarang City Government has built the West Flood Canal Drainage System to overcome floods and high tidal in the North Semarang District. P5L has become a security guarantee for the community to prevent any incursion of floods and high tides to their settlements.

3.2. Associations
P5L is an institution formed by the community to manage floods and tidal drainage systems in the Panggung Lor Sub-District. It means that the institution manages a public infrastructure that the government usually manages. At first, P5L was an independent institution that represented the residents of Panggung Lor Sub-District in managing the drainage system in their area. However, since 2017, through Decree Number: 004/KEP/LPMK-PL/III/2017, it is under the Panggung Lor Sub-District Community Empowerment Institution (Lembaga Pengembangan Masyarakat Perkotaan-LPMK). It means it has become the partner of the Panggung Lor Sub-District Government.

The mainboard of P5L is led by a chairman, consisting of the vice-chairman, secretary, and treasurer. It has day-to-day officers to carry out its practical duties: maintaining and operating pump machines, drainage canals, and solid waste disposal. The chairman is directly elected and appointed by representatives of all Panggung Lor residents in a regular five-year meeting, which is attended by the North Semarang District Head, Panggung Lor Sub-District Head and their staff, neighborhood leaders, both neighborhood associations (Rukun Warga-RW) and neighborhood units (Rukun Tetangga-RT), and community leaders.

P5L builds cooperation networks with various parties to carry out its duties, including Semarang City Government, particularly The Public Infrastructure Agency, which manages the city drainage system within the Panggung Lor Sub-District area.

3.3. Actions
The P5L management has two primary duties by the mandate given by the Panggung Lor Sub-District residents. The first duty is to operate and maintain pump machines. The second duty is to maintain and repair the system and physical drainage canals for draining rainwater and tidal water to the rivers around Panggung Lor Sub-District.

The main result of P5L activities is the avoidance of residential areas of Panggung Lor Sub-District from flooding and high tidal. To achieve that main result, P5L officers check and maintain pump machines, cleaning and repairing damaged water canals. They always ensure that the existing pump machines and canals can work adequately to discharge rainwater and tidal water from the canals to the rivers around the area, both in rainy and dry seasons throughout the year.

In addition, P5L has duties to manage administration and finances. The administrative burden is setting and recording the daily activities of the institution. Meanwhile, the financial responsibility is to collect monthly fees for all families of the Panggung Lor Sub-District and use the contributions to carry out its operational duties, pay workers’ salaries, and maintain the drainage infrastructure. The administrative and financial records are reported as part of the P5L’s performance at regular meetings.
3.4. Control

P5L carries out its duties based on the mandate and policies given by the residents of the Panggung Lor Sub-District. To carry out these mandates and procedures, the P5L Management prepares an implementation strategy. Residents supervise the implementation of the orders and policies given in several ways.

The first is by observing the day-to-day performance of P5L officers. Through these observations, residents can find out whether the work of officers has gone well by agreed standards and procedures. If there is a violation, residents can immediately warn the officer concerned or convey it through the board at the P5L office at the Panggung Lor Sub-District office. The second is through supervision at a regular meeting, both one and five-year meetings. This supervision takes the form of an evaluation of the P5L’s work in a meeting attended by residents who are represented by leaders and community leaders consisting of the North Semarang District Head, Panggung Lor Sub-District Head and their staff, environmental leaders, both neighborhood associations (Rukun Warga-RW) and neighborhood units (Rukun Tetangga-RT), and community leaders. The last is supervision through emergency meetings held due to dissatisfaction with the P5L’s work, mainly when it can’t cope with floods and high tidal.

Associated with the institutional study framework developed by Wageningen University and Research [8], the results of the above analysis can be drawn as shown in Figure 3.

**Figure 3.** The institutional framework of P5L
Based on the discussion of the five, it can be summarized that the belief and mandate of the residents of Panggung Lor Sub-District are that they need an integrated and resident-based organization, namely P5L, to be the driving force for the formation of P5L and supervision of their activities. P5L is accepted by the Semarang City Government by integrating P5L with LPMK Panggung Lor Village so that it becomes part of the urban institutions in the flood and tide management system of Semarang City.

4. Conclusions
This study shows that P5L has demonstrated its ability to uphold the trust given by residents of the Panggung Lor Sub-District to carry out the mandate given to the institution. P5L has succeeded in solving the problems of floods and high tides. In subsequent developments to date, P5L has convinced residents that they can provide guarantees in preventing floods and high tidal in their residential areas.

Initially, P5L was formed as an independent institution fully responsible to the community. As time goes by, P5L has recently merged into part of the Panggung Lor Sub-District Community Empowerment Institution, known as LPMK, which is an institution formed by the community and has become a partner of the sub-district government in carrying out participatory development. Nevertheless, P5L activities remain under the direction of the community and are responsible to the community, both directly to the community and through LPMK.

For the existence of P5L to continue, the trust and mandate of the residents given to the institution must continue to be translated in the form of maintaining the results of their performance. In addition, P5L must remain part of LPMK. It remains a partner of the Panggung Lor Sub-District Government and the Semarang City Government in general in managing the drainage Panggung Lor Sub-District. In other words, the flood and tidal water drainage system built by the community in Panggung Lor Sub-District will be part of the urban drainage system of Semarang City.

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Acknowledgments
The authors would like to thank the Faculty of Engineering, Diponegoro University, for this research's financial assistance. The author also expresses his gratitude to the P5L management, Panggung Lor Sub-District officials, and residents for the information provided.