

Assessing The Succes of Flood and Tidal Flood Control Infrastructure Program in Semarang: A Community Perspective

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Abstract

This research aims to assess the success of the flood and tidal flood control infrastructure program in Semarang City based on the perspective of the affected community. The assessment is based on five criteria namely effectiveness, sustainability, responsiveness, alignment with planning, and community involvement. This research uses a quantitative approach. Data was collected through a questionnaire survey of 200 affected communities. A number of samples were collected with stratified sampling techniques based on each drainage system coverage area in Semarang City. The scoring analysis technique was used to assess the program's success. The result of this study indicates that the development of flood and tidal flood control infrastructure in Semarang City is considered largely unsuccessful with four criteria considered less successful and one unsuccessful. These results highlight the need for improvements in program implementation. This study can be used as a reference for the Semarang City Government to improve the flood and tidal flood control infrastructure development program.

Keywords: Tidal Flood; Effectiveness; Sustainability; Resposiveness; Community Involvement

Introduction

Based on geographical aspects, coastal areas are vulnerable to various types of natural disasters and environmental changes (Yuliasuti et al., 2023). Tidal flooding is a threat to coastal areas in Indonesia (Harini et al., 2017). In anticipating this, a planning role is needed in managing regional potential and disaster mitigation. In general, it is stated that urban centers tend to prioritize defensive measures, such as the construction of embankments and dams as effective short-term solutions (Alshaikh et al., 2023). Semarang City is one of the coastal areas in Indonesia that has the potential for flooding and tidal flooding.

This has been happening for more than thirty years in Semarang City. This condition can be associated with several factors that cause flooding and tidal flooding in Semarang City, such as full moon tides, high rainfall, changes in land use, land subsidence, land consolidation, and clogged drainage due to garbage (Egaputra et al., 2022; Zulfan, 2024). The flood and tidal flood have had a significant impact on the residential environment such as severely disrupted community access, both economic/social losses, damage to building facilities and infrastructure, and increasingly damaged physical environment (Maharlika et al., 2020).

In facing this potential disaster, the community implements a series of adaptations, such as raising the height of the house, making embankments in front of the house, installing nets, etc (Aksa and Afrian, 2022; Hariniet al., 2017). In addition to adapting, the community also provides several forms of support in maintaining the sustainability of government-led mitigation efforts such as financial support, labor, education between communities, supervision of infrastructure development and maintenance and the addition of green open spaces Nugraheni and Suyatna (2020) although not all of them are

carried out optimally by all communities (Wiratuningsih et al., 2018). In facing the threat of flooding and tidal flooding, the Semarang City Government has certainly carried out various mitigation efforts. Based on Semarang City Regional Regulation Number 7 of 2014 concerning the Semarang City Drainage System Master Plan 2011-2031, these mitigation efforts include the construction of reservoirs, drainage systems, pumping stations, sea walls, retention ponds, road elevations, and cleaning of drainage channels.

In the flood and tidal flood management efforts in Semarang City, there have been many studies that have tried to examine this (Erlani and Nugrahandika, 2019; Nurhayati and Subekti, 2022). There have also been studies that evaluate flood and tidal flood management efforts in Semarang City based on the government's perspective (Hakam, 2018; Rahma, 2024). The study revealed that there were several problems that caused the suboptimal handling efforts, such as limited channel capacity (Akbar et al., 2024) and suboptimal land subsidence, as well as inadequate infrastructure conditions. Although many mitigation efforts have been made, Semarang City cannot yet be said to be Resilient in dealing with tidal floods (Erlani and Nugrahandika, 2019).

In creating a resilient Semarang City in dealing with tidal floods, Erlani (2019) emphasized the importance of continuous synergy between the government and the community. However, major problems are still found in the practice of mitigation efforts in Indonesia, particularly the reliance on a top-down approach (Nurhidayah and McIlgorm, 2019). Another problem in the implementation of government-led mitigation projects is the lack involvement of disaster-affected communities in decision-making so that mitigation projects cannot always accommodate the real community problems.

This is necessary considering the urgency of the community as one of the main figures in mitigation efforts. Their involvement and innovative thinking are needed in forming a strong framework for flood and tidal flood disaster mitigation (Wiguna and Subiyakto, 2024). Thus, this study aims to assess the success of flood and tidal control programs in Semarang City based on community perspectives. There are several criteria that can be used to assess the success of flood and tidal flood control infrastructure programs that have been mentioned in several previous literatures. These criteria may include impacts, sustainability, responsiveness, community involvement, and suitability with the program plan (Hallegatte et al., 2013; Nusholichah et al., 2019).

In the impact criteria, the success of the program can be seen based on social, economic, and physical aspects. In the sustainability criteria, the success of the program can be assessed from the usefulness of the program, and the self-reliance that is raised in maintaining its outcomes. In the responsiveness criteria, the success of the program can be assessed from its suitability for affected groups and the support and feedback mechanism between stakeholders (Few et al., 2007). In these criteria, the role of local and regional governments and other stakeholders in initiating and collaborating becomes crucial to support the success of flood and rob management (Marfai and King, 2008). Multilevel and multi-actor flood management is needed to support the success of flood and rob management (Plummer et al., 2018).

The existence of this government can influence the community to participate in mitigation programs Buchori et al., (2022) supported by effective communication and socialization (Brilly and Polic, 2005). In the criteria for community involvement, the success of the program can be assessed from community involvement in each phase of development (Lengkey et al., 2020; Ramadhan and Erawati, 2019; Subhan et al., 2012). In this case, community social capital is a key factor in planning mitigation actions (Rudiarto et al., 2020). The government needs to identify the adaptive capacity of the community as a key issue in effective disaster reduction (Marfai and King, 2008). In addition, the government also needs to invest in education programs to maintain the

sustainability of flood and rob mitigation efforts. In the criteria of alignment with the plan, the success of the program can be assessed from the timeliness of implementation, budget suitability, and quality produced by the program (Wulandari et al., 2014).

Methods

This study was conducted in Semarang City using a quantitative approach. The data used are primary data collected through a questionnaire survey of 200 residents affected by flooding and tidal inundation (rob) in Semarang City, distributed across four drainage system areas, the Mangkang System, West Semarang System, Central Semarang System, and East Semarang System. Sampling was carried out using a stratified sampling technique, taking into account the extent of inundation in each drainage system area. The analysis method used in this study is scoring analysis. The process begins with respondents' assessments of five criteria for the success of flood and tidal inundation control infrastructure development in Semarang City, using a Likert scale. The second step is calculating the average response score for each indicator and criterion. The next step is determining the success assessment intervals. The final step involves classifying and interpreting the success scores obtained.

Results and Discussion

In the context of flood and tidal flood management in Semarang City, it was found that most of the community actually knew about the infrastructure development by the city government. The infrastructure development known to the community includes, road elevation, water channels, pumps, embankments, and retention ponds. In general, the community considered the performance of these infrastructures to be less successful in handling floods and tidal floods in Semarang City. Based on Figure 1, it can be seen that embankments are infrastructure that residents perceive to have a fairly high level of success compared to other infrastructures. These results are in line with previous research which states that urban centers tend to prioritize defensive measures such as embankments and dams which, although effective in the short term, often ignore broader environmental implications (Alshaikh et al., 2023).

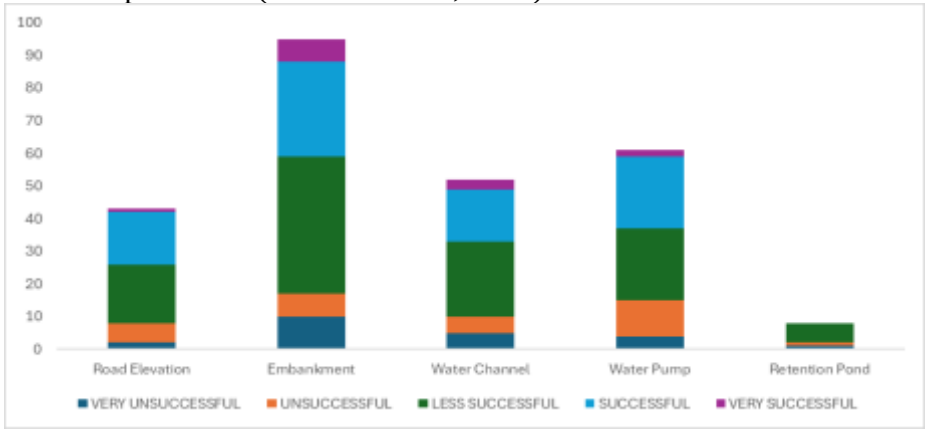


Figure 1. Types of Infrastructure Recognized and Assessed By The Community (Source: Data Processing, 2025)

Based on figure 1, it can be seen that 60% of the total 17% of respondents who knew about the road elevation, considered the infrastructure to be less successful. In this case, the road elevation has caused its own problems for residential areas. This condition may be due to the elevated road, which has positioned the surrounding residential areas at a lower relative elevation. Thus, if there is a tidal flood or the rainy season arrives, water will flow more easily into residential areas. This finding is in line with similar research conducted in Pekalongan (Putri et al., 2024).

Likewise, the construction of water channels was considered less successful by 63% of the total 20% of respondents who knew about this infrastructure development. This could be due to the water channel not being wide enough to hold a certain quantity of water. In addition, residents considered the cause of the less successful performance of the water channel could be caused by the river shallowing and the presence of garbage blockages at several points. This is in line with previous research that in order to increase the effectiveness of flood and tidal flood control, it is still necessary to rebuild and deepen small channels to increase the capacity of these channels (Akbar et al., 2024).

On the other hand, the construction of pump infrastructure is assessed differently by the residents of Semarang City. In this case, 61% of the total 24% of respondents who knew about the construction of pump infrastructure, assessed the performance of the water pump infrastructure as less successful in overcoming flood disasters. This condition could be the result of a high volume of water discharge and a lack of adequate pumping capacity. The reservoir pond infrastructure is the infrastructure that is least known by respondents.

This infrastructure is considered inadequate and unsuccessful by the respondents because the lack of number and the width of the infrastructure, making its capacity less than optimal. Based on these findings, it can be concluded that the flood and rob control infrastructure that has been built by the Semarang City Government has not yet provided optimal results. The assessment of the community on the success of flood and tidal flood control infrastructure development based on the five criteria used in this study has a final score of 82.19. This score is categorized as less successful. The detailed calculation results of this final score can be seen in Table 1 and can be explained further in each of the following criteria.

Table 1. Calculation Results of the Success Score of Flood Control Infrastructure Development in Semarang City

Criteria	Score	Category
Effectiveness	25.92	Less Successful
Sustainability	14.68	Successful
Responsiveness	19.60	Less Successful
Alignment with Planning	9.56	Less Successful
Community Involvement	12.43	Unsuccessful
Total	82.19	Less Successful

Source: Analysis Result, 2025

1. Effectiveness of The Flood and Tidal Flood Control Infrastructure Development Program in Semarang City

Based on the effectiveness criteria, it can be shown that this criterion has an average score of 25.92 out of a total value of 40.00. Based on Table 2, the assessment score indicates that the flood and rob infrastructure development program in Semarang City is categorized as less successful.

Table 2. The Effectiveness Criteria Assessment Result in the Flood Control Infrastructure Development Program in Semarang City

Indicator	Average Score	Percentage
The living environment has improved after the infrastructure development program	3.22	12%
Housing conditions have improved after infrastructure development	3.28	13%

The ability to meet basic needs (food, clothing, electricity, drinking water, and clean water) has increased after the program	3.12	12%
Education quality has improved after the program	3.20	12%
Health quality has improved after the program	3.76	14%
Income has increased after the program	2.87	11%
Disaster-related losses have decreased after the program		3.34
Disaster occurrence intensity has decreased after the program	3.13	12%
Total	25.92	100%

Source: Analysis Result, 2025

In this context, residents of Semarang City perceive that the flood and tidal flood infrastructure development initiatives implemented to date have not resulted in sufficiently good improvements to environmental and residential conditions. This assessment is supported by more than 50% of respondents who disagree with the statement. Floods that still occur in residential areas still leave an impact of damage to residents' homes. The damage and losses experienced by this community can be seen in figure 2.

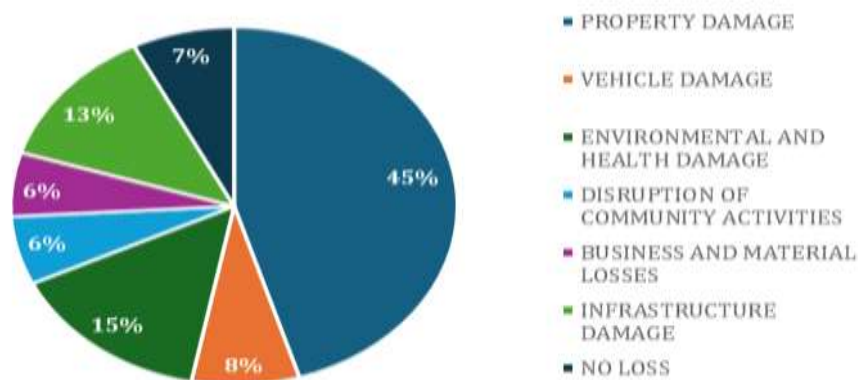


Figure 2. Types of Community Losses Due to Flooding And Tidal Flooding
(Source: Data Processing, 2025)

On the other hand, as many as 66% of respondents still have difficulty in meeting basic needs such as clothing, food, and clean water, which are caused directly or indirectly by floods and tidal floods. This can be caused because floods and tidal floods have damaged roads, making it difficult for people to do activities such as working. This is in line with previous research which stated that floods and tidal floods have caused community activities and access to be severely disrupted (Lisdiyono et al., 2022). Even so, school activities can still take place. As many as 55% of respondents admitted that school activities can still run and there is no disruption to the learning process.

In the health quality indicator, 68% of respondents agreed that health quality improved after the flood and tidal flood control infrastructure development program. The remaining 32% of respondents still experience health problems due to floods and tidal floods such as dengue fever (DBD) and itching. Another loss experienced by the community due to floods and tidal floods is reduced income. After the flood and tidal flood control infrastructure development program, 63% of respondents assessed that there was no increase in income obtained.

In this condition, their income decreased because floods and tidal floods had disrupted the work activities of the population. This is especially felt by traders who can

experience a decrease in turnover because the place to sell is inundated by floods. Other losses also experienced by residents due to floods and robs are losses of electronic goods/household appliances, property damage, damage to vehicle engines, and damage to infrastructure. This is in line with previous research which explains that rob floods have caused losses to the physical, economic, cultural, health, education and environment of the community (Murtiaji et al., 2023).

2. Sustainability of the Flood and Tidal Flood Control Infrastructure Development Program in Semarang City

The sustainability criteria have an average score of 12.48 out of a total value of 20.00. Based on Table 3, This assessment score indicates that the infrastructure development program is less successful.

Table 3. The Sustainability Criteria Assessment Result in the Flood Control Infrastructure Development Program in Semarang City

Indicator	Average Score	Percentage
The community contributes to infrastructure maintenance after the program	3.00	25%
The community contributes to self-managing infrastructure after the program	3.09	25%
The community receives long-term benefits from the implemented program	2.39	23%
The local government is involved in the program implementation process	4.00	27%
Total	12.48	100%

Source: Analysis Result, 2025

In maintaining the sustainability of this flood control development program, 59% of the community agreed to contribute to infrastructure maintenance. However, the community contribution is still limited to maintaining the cleanliness of the infrastructure. This finding is in line with previous research related to community adaptation efforts, although in the context of this research, not all adaptation efforts were carried out optimally (Harini et al., 2017; Harini, Susilo, Sarastika, Supriyati, Satriagasa and Ariani, 2027). Based on these conditions, it is in line with previous research that in the context of Semarang City, strengthening community social capital is still needed as a key factor in planning future mitigation actions (Brilly and Polic, 2005; Harini et al., 2017; Rudiarto et al., 2020). In this case, the city government needs to identify the adaptive capacity of the community as a key issue in effective disaster reduction as explained in previous research (Marfai and King, 2008). In addition to community contributions, the role of local governments such as the head of neighborhood and the head of urban villages, are considered to have good involvement in this program. This finding is in line with previous studies that underline the importance of the government's role in taking initiatives to reduce the risk of flooding and rob (Wiguna and Subiyakto, 2024).

However, based on this study, their role has not been significant in influencing the community to be involved in development. This condition is certainly different from that expressed in previous studies where the local government can influence the community to participate in mitigation programs (Buchori et al., 2022). In this case, as many as 57% of the community admitted that they had not received long-term benefits from the flood and rob control infrastructure development program. This condition may be attributed to the ongoing nature of the floods, which have not yet produced a significant impact.

In handling floods and rob in the city of Semarang, initiation and collaboration between the community and local government institutions such as urban village and neighborhoods as well as other related stakeholders are still needed to increase resilience in mitigation efforts as mentioned in previous studies (Marfai and King, 2008; Murtiaji et al., 2023; Maharlika et al., 2020; Yuliastuti et al., 2023). In addition, reflecting on the results of this study, the city of Semarang also needs to integrate efforts to develop flood and rob control infrastructure with community education programs that aim to increase their capacity in maintaining the sustainability of the program (Brilly and Polic, 2005; Wiguna and Subiyakto, 2024). Effective socialization, especially in terms of inviting and increasing public awareness to protect and maintain flood and tidal flood control programs that have been completed, is also needed to increase the success of flood and tidal flood control as mentioned in previous research (Akbar et al., 2024; Sofyan, 2019).

3. Responsiveness of the Flood and Tidal Flood Control Infrastructure Development Program in Semarang City

Based on the results of the analysis that has been carried out on the responsiveness criteria, it can be shown that this criterion has an average score of 19.60 out of a total value of 30.00. The results shown in Table 4 indicate that the flood and rob control infrastructure development program in Semarang City is classified as less successful.

Table 4. The Responsiveness Criteria Assessment Result in the Flood Control Infrastructure Development Program in Semarang City

Indicator	Average Score	Percentage
The flood control infrastructure development/maintenance program aligns with community preferences	2.99	15%
The flood control infrastructure development/maintenance program meets community needs	3.16	16%
The development/maintenance program is considered effective in addressing local issues	3.11	16%
The community supports the existence of the disaster control infrastructure development/maintenance program	4.34	22%
The community provides criticism/suggestions to program implementers	2.79	14%
Implementers provide feedback to the community	3.22	16%
Total	19.60	100%

Source: Analysis Result, 2025

As many as 69% of respondents considered that the construction and maintenance of flood and tidal flood control infrastructure is still not in accordance with the preferences of the affected population. Based on this study, the community stated that the development is still not in accordance with their preferences, such as the construction of embankments that are not high enough. In addition, the problem of river silting was not resolved first. As a result, the river continues to overflow during heavy rain and causes flooding.

On the other hand, 58% of respondents also considered that the flood and tidal flood control infrastructure development and maintenance program is still not in accordance with the needs of the community. Therefore, it is not surprising that the majority of respondents considered that the problems caused by floods and tidal floods

have not been resolved properly by the Semarang City Government. To overcome the problem of flooding and tidal flooding, 92% of residents admitted to supporting the infrastructure development program by the Semarang City Government. Community support include participating in socialization and maintaining the cleanliness of rivers and drainage. This is in line with previous research (Wiratuningsih et al., 2018). However, only 30% of respondents have expressed support through criticism and suggestions during the ongoing development process.

The community expressed their confusion and ignorance in conveying criticism and suggestions during the infrastructure development process. Therefore, 61% of respondents felt that they did not receive feedback from the government. This condition can certainly affect the level of community involvement as explained in previous research (Buchori et al., 2022). This can be caused by consistent communication between the government and the community which can increase community involvement in mitigation programs. Description of the image/ graph is placed under the picture/ graph, while the title of the table is placed on it. The title begins with a capital letter.

4. Alignment of The Flood and Tidal Flood Control Infrastructure Development Program in Semarang City with Planning

In the criteria of alignment with the planning, the results of which are shown in Table 5, it can be shown that this criterion has an average score of 9.56 out of a total value of 15.00. Based on Table 6 indicates that this criterion is included in the less successful category.

Table 5. The Assessment Result of the Alignment with the Plan Criteria in the Flood Control Infrastructure Development Program in Semarang City.

Indicator	Average Score	Percentage
The community assesses that the disaster control infrastructure development/maintenance has been implemented on time according to the plan and realization	3.48	36%
The development/implementation of disaster control infrastructure aligns with the budget plan (RAB)	3.10	32%
The community considers that the program has met the expected quality	2.98	31%
Total	9.56	100%

Source: Analysis Result, 2025

In the criteria of alignment with the planning in the flood and rob control infrastructure development program, residents perceive it in a balanced way. Based on the timeliness between the plan and the realization of development, this is perceived positively by 54% of resident respondents. Based on the conformity of development with the Budget Plan (RAB), this is also perceived positively by 52% of resident respondents. However, these results cannot fully reflect the success of this indicator.

This is because residents do not know the detailed plan related to scheduling, work specifications, or budget used in the construction of flood and rob control infrastructure in Semarang City. This condition reflects that in the implementation of the flood and rob control infrastructure development program in Semarang City, the role of the government still dominates. This is in line with previous research which states that the government often uses a top-down approach in mitigation projects (Buchori et al., 2022).

5. Community Involvement of the Flood and Tidal Flood Control Infrastructure Development Program in Semarang City

In the criteria of community involvement, the results of which can be seen in Table 6, it can be shown that this criterion has an average score of 12.43 out of a total value of 30.00. These results indicate that this criterion is included in the unsuccessful category.

Table 6. The Community Involvement Criteria Assessment Result in the Flood Control Infrastructure Development Program in Semarang City.

Indicator	Average Score	Percentage
The community is involved in the planning stage (musrenbang, discussions)	2.22	18%
The community is involved in the program implementation stage	2.05	16%
The community is involved in the evaluation/supervision stage	1.82	15%
The community participates by contributing ideas/suggestions	2.18	18%
The community participates through labor/skills	2.10	17%
The community participates through donations/assets	2.06	17%
Total	12.43	100%

Source: Analysis Result, 2025

Based on these criteria, it can be seen that residents affected by floods and tidal flooding are less involved in the planning, implementation, and evaluation stages of infrastructure development programs such as through musrenbang and deliberations. This finding is in line with previous research in Pekalongan City which stated a lack of community involvement at each stage of development (Yahya and Putri, 2025). In this case, as many as 84% of respondents admitted that they had never been involved in the planning stage such as providing opinions during musrenbang. This could be due to the busyness of the community.

However, the community can still convey their aspirations through the local neighbourhood. The low level of community involvement in the program could be caused by the fact that most people do not want to be involved in the implementation stage of the development program. Some other people admitted that they were not involved because they felt that it had been done by the contractor who carried out the development project. This condition can indirectly be a reason for the low sustainability of the flood and tidal flood control infrastructure development program.

This is in line with previous research which stated that community involvement is needed in forming a strong framework for flood and tidal flood disaster mitigation (Marfai and King, 2008; Wiguna and Subiyakto, 2024). In this case, innovative thinking, community involvement, and adaptability are very important (Alshaikh et al., 2023). In this case, the community admitted that at the implementation stage, this was entirely carried out by the local government. They feel that they do not have authority in both the implementation and supervision stages.

This is in line with previous research which states that the greater the sense of community ownership of the mitigation program, the greater their contribution in maintaining the sustainability of the program (Buchori et al., 2022). There needs to be a multi-level and multi-actor flood management as mentioned in previous research Plummer et al., (2018) where the local government needs to outline the possibility of cooperation and coordination in dealing with flooding and rob (Marfai and King, 2008). However, a small number of residents can be found who also donate food and drinks to

workers during the infrastructure development process. This finding is a reflection that is different from previous research which showed success in community involvement (Nugraheni and Suyatna, 2020). This involvement is manifested in various forms such as money, labor, education between communities, supervision of infrastructure development and the addition of green open spaces.

Conclusion

The development of flood and tidal flood control infrastructure in Semarang City is considered less successful based on the perspective of the affected community. This assessment is reviewed from four criteria that indicate a less successful value and one criterion that indicates an unsuccessful value. Theoretically, this study emphasizes the importance of a bottom-up approach in disaster mitigation projects. Practically, this study can be a recommendation for the Semarang City Government to improve the effectiveness of flood and tidal flood control programs through the integration of long-term infrastructure program plans, increasing program transparency, increasing community involvement, and increasing community capacity in self-reliance. Further research is needed to develop strategies for involving the community and other local actors in increasing the success of flood and tidal flood control infrastructure development programs in Semarang City.

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