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Sustainability Impact Assessment of Jatigede Dam in Sumedang Regency, West Java

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Abstract

The construction of the Jatigede Dam in Sumedang Regency plays a strategic role in water resource management for irrigation, flood control, raw water supply, hydroelectric power generation (PLTA), and tourism. However, the benefits of the Jatigede Dam have yet to be fully realized by the community, such as the suboptimal tourism infrastructure and the inefficient operation of the hydroelectric power plant. The research method used is mixed, integrating qualitative analysis. A sustainability impact assessment approach was employed to assess the impact of the Jatigede Dam, focusing on providing an analytical basis for problem-framing. The research findings indicate that the Jatigede Dam holds excellent potential for water resource management, irrigation, flood control, tourism, and hydroelectric power generation. Still, its utilization has yet to be fully optimized. Maximizing this potential through appropriate strategies, enhancing collaboration among stakeholders to create synergy, and optimizing the dam's functions by managing water inflow and outflow effectively is crucial.

Keywords:

sustainability impact assessment; problem structuring analysis; Jatigede DAM

Introduction

The construction of dams plays a vital role in water resources management in several countries, as they serve as critical water storage facilities to address seasonal variability in water supply (Owusu, 2021). Water availability is essential in life, as is agricultural irrigation, industrial needs, and domestic consumption (Gao, 2021). In many countries, especially those with long dry seasons or erratic rainfall, dams support water security and avoid drought crises. In addition to water storage, it also functions as flood control. As climate change affects the frequency and intensity of flood disasters, the ability of dams to retain and regulate water flow is critical. Many urban and agricultural areas vulnerable to flooding now rely on dam infrastructure to protect assets and people's lives.

The construction of dams contributes significantly to renewable energy production through hydropower plants to support the increasing electricity demand. Developing hydropower as an integral part of the national energy strategy to achieve renewable energy targets is essential. In the agricultural sector, dams are vital for irrigation (Elsayed, 2020). Many

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agricultural countries rely on dam-regulated irrigation systems to ensure a steady water supply. Not only does it increase agricultural productivity, but it also helps achieve food security (Yin, 2021). In addition to providing water and energy, dam construction projects often create many jobs during the construction and operation phases. Sustainable management of dams can ensure that ecological benefits are achieved alongside economic and social benefits. The existence of dams is also an effort to develop a tourism sector that can contribute to local income.

Indonesia, an archipelago with high rainfall, has several dams scattered in various regions. Currently, more than 230 dams operate throughout Indonesia. Dams are essential in water resources management, agricultural irrigation, flood control, and hydropower generation. The existence of these dams is vital in supporting water and energy security in Indonesia. In addition, dams play an essential role in adapting to changing rainfall patterns and the increasing frequency of natural disasters. Dams designed for operational flexibility can be adapted to handle extreme climatic conditions, be it prolonged droughts or significant floods, helping to increase communities' resilience to climate change's impacts. (Basheer, 2023)

The Directorate General of Water Resources, an organizational unit of the Ministry of PUPR, is tasked with formulating and implementing water resource management policies by the provisions of Permen No. 13/PRT/M/2020. Organizing infrastructure development that supports sustainable water resources management includes dams. Equally important, dam construction must also consider social and environmental impacts. Community relocation, habitat loss, and ecosystem changes must be carefully managed. Therefore, community participation and comprehensive environmental impact assessments must be an integral part of the planning and implementation of dam projects. Through a holistic and sustainable approach, dams can provide maximum benefits to society and the environment.

Since 2014, the construction of dams began to be prioritized after being designated as a national strategic project; dams have become state property included in the use status determination cluster and are considered unimportant. There are always direct and indirect social, environmental, and even economic impacts. (Jeuland, 2020) Dam assets are expected to create irrigation security and flood control, encourage tourism potential, develop hydropower energy, promote the opening of new jobs, and others (Arif, 2022). The importance of seeing social, economic, and environmental impacts through the measurement of state property is based on the minister of finance's lack of regulation. 349 / KM.6 / 2018 concerning Procedures for Implementing Performance Evaluation of State-Owned Entities.

To assess an impact, it is essential to measure policy performance holistically. Dam development in Indonesia is related to the formation of social capital in the long term. Dam

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development sometimes causes short-term social distortions, but in the long term, the distortions will be reduced through social adaptation and result in the formation of new social capital. Utilization of assets (state property) of dams, such as developing the tourism sector for community cultural empowerment, providing raw water and irrigation in the region, flood control, and hydropower generation.

Until now, the construction of dams in several provinces continues; the largest dam in Indonesia is located in West Java Province, namely the Jatiluhur dam, which was built in 1957, and the Jatigede dam, which operated on August 31, 2015. These dams have multifunctional benefits, not only providing water for irrigation, the tourism sector, flood control, raw water, and electricity generation through hydroelectric power plants. One of the dam projects currently under development is the Jatigede Dam in West Java. They are projected to irrigate thousands of hectares of agricultural land and provide raw water for several areas besides the Sumedang Regency. This demonstrates the government's commitment to improving water resources infrastructure.

The idea of the Jatigede Dam construction was first initiated in 1963 through the Presidential Regulation. It became the initial gate for accelerating the construction of the Jatigede Dam, which took a long time to build and was only operational on August 31, 2015. The challenges in the construction of the Jatigede dam are many, starting from land acquisition for inefficient development and changing the local ecosystem for a long time, which costs much budget. Therefore, it is essential to analyze impacts comprehensively to be an integral part of planning and implementation.

Jatigede development has yet to significantly benefit the community or region (Salleh, 2023). In agriculture, irrigation has not been maximized because the water discharge from the river flow is relatively tiny and unbalanced between *inflow* and *outflow*. Jatigede Dam hydropower plant has been unable to operate efficiently, considering that the progress is only at the Performace Test and Reliability Run stages of unit 1 and unit 2; this stage is the final stage before obtaining a Certificate of Operation (SLO). The tourist area around the Jatigede Dam is quite large and has enough potential to be developed. Still, it has yet to be maximally felt for the community's economic development and regional income due to poor road access. The target for 2024 is good access to the tourist area with budget support from the local government of Sumedang Regency and BBWS Cimanuk-Cisanggarung Kamenterian PUPR.

The development of Jatigede Dam continues to be carried out so that it has many benefits beyond its function in water management and hydropower so that the Sumedang Regency government develop the tourism sector. Many facilities have been deliberately built to support

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the tourism sector and help promote it; some tourist destinations are created through cooperation with third parties in tourism development to attract local and foreign tourists to visit. Promotion is carried out through official government *digital platforms*, private social media, and several significant *events explicitly organized* by the local government. The challenge for tourist areas around the Jatigede Dam is not only road access but the attractiveness of tourists to tourist areas, so there are still very few visits to tourism at the Jatigede Dam.

Only a few studies have analyzed the potential of Jatigede Dam through appropriate strategies and increased *stakeholder* involvement to build synergy. Furthermore, the technical and management factors hindering hydropower operations must be considered using the right approach. In addition, it is essential to see a significant contribution through an in-depth study of the dam's function, which has yet to be effective due to the imbalance between water *inflow* and *outflow* and the consequences of not fulfilling irrigation and raw water supply.

The Jatigede dam development policy has many obstacles, so the benefits of the dam have not been felt optimally; this is closely related to the importance of determining instruments in designing a policy so that it can calculate costs and time with the benefits obtained in implementing the policy. Policies will be easy to evaluate whether they are productive or counter-productive for the public interest. The number of policies aimed at the community's needs is the opposite and can burden the community; the importance of instruments in developing several effective, credible, and responsive public interest-oriented policies. This research analyzes the Jatigede Dam's impact on Sumedang Regency through a *sustainability impact assessment* approach.

Methods

The research focuses on assessing the impact of the Jatigede Dam construction using a structured research method to analyze its impact comprehensively. Based on the scope of the study, methods approach was adopted by integrating qualitative analysis. It aimed to provide an in-depth assessment of the economic, social, and environmental impacts of the Jatigede Dam on the community. Primary data collection comprised structured questionnaires, in-depth interviews, and field observations. Et al.et al.(John W. Creswell, 2019) Secondary data will be collected through document reviews of official reports and academic studies on the Jatigede dam by contextualizing the impact and using statistical data through comparative analysis of trends before and after dam construction to see economic, social, and environmental shifts.

Sampling in this study used purposive sampling to target stakeholders (BAPPPEDA physical section, Public Works and Spatial Planning Office, Disparbudpora, PLN, private parties

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involved, Jatigede sub-district, and Tourism Village). Sampling was also conducted randomly among the community and visitors to find their perspectives and support research data. Data Qualitative analysis through content analysis to help understand unquantifiable impacts such as social cohesion and community resilience, in addition to thematic analysis by categorizing and interpreting qualitative data, focusing on community challenges, resilience strategies, and the long-term sustainability of tourism development. (Huberman, 1992).

Results and Discussion

The existence of the Jatigede dam, whose benefits have yet to be maximally felt, is essential to be analyzed in depth by looking empirically related to the impact in terms of costs and benefits. Assessing the effects of the Jatigede dam through quantitative and qualitative analysis is essential to evaluate the advantages and disadvantages of a policy using instruments for quality improvement. The impact assessment approach or impact analysis of development is a method to analyze whether a policy carried out by the government has a negative impact. Et al. et al.(Rotmans, J., R. Kemp, and M.B.A, 2001) The impact assessment approach will likely find solutions or other alternatives without making a new regulation. Jatigede Dam has yet to achieve the policy objectives' target, so the sustainability impact assessment method is used. (De, Ridder, 2005) The focus of the study is analyzing the direct and indirect causes of the Jatigede dam problem in Sumedang Regency**,** West Java, the involvement of the parties (behavior and motivation) towards the Jatiugede dam in Sumedang Regency, West Java, stakeholder involvement in providing views on the problems faced and the impact on society.

Table 1.

The Role of Tools in Sustainability Assessment

<table>
<tr><th></th><th>Phase I
Problem analysis</th><th>Phase II
Finding options</th><th>Phase III
Analysis</th><th>Phase IV
Follow-up</th></tr>
<tr><td>Participatory tools</td><td>Problem framing (mobilising and integrating know-ledge and values)</td><td>Supporting scenario building</td><td>Providing the context for and improve robustness of MCA, CBA and CEA</td><td>Evaluating the assessment process</td></tr>
<tr><td>Scenario tools</td><td>Providing the future perspectives to problem framing</td><td>Visioning futures, finding options and setting objectives</td><td>Providing references for the application of analytical tools</td><td>–</td></tr>
<tr><td>Multi-criteria analysis tools (MCA)</td><td>–</td><td>Definition of criteria</td><td>Comparing different alternatives</td><td>–</td></tr>
<tr><td>Cost-benefit analysis (CBA) and cost-effectiveness analysis (CEA) tools</td><td rowspan="3">Providing the analytical basis for problem-framing</td><td rowspan="3">Supporting objective setting</td><td rowspan="3">Full analytical characterisation of options to enable comparison</td><td rowspan="3">Ex-post assessment</td></tr>
<tr><td>Accounting tools, physical analysis tools and indicator sets</td></tr>
<tr><td>Model tools</td></tr>
</table>

Source: De Ridder, 2025

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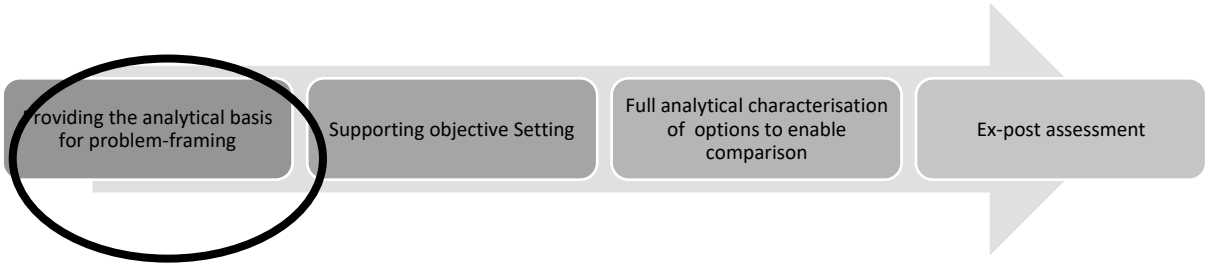
An integrated assessment approach that leads to a series of four sequential generic phases, rapid assessments, a reasonably simple policy process, and a complex and long-lasting transition process, the approach used is *cost-benefit analysis (CBA).* This study focuses on phase 1 analysis by recognizing the problems that occur at the Jatigede dam to consider the best options for solving the issues that are being faced through the following stages:

Figure 1.

Stages of *cost-benefit analysis (CBA)*



The problem was analyzed using the "5 Whys" technique to identify the root cause of the failure to function optimally. (William N., 2018) The following is an overview of the problem of the Jatigede dam not functioning optimally, including:

1. Why the Jatigede dam has not been fully developed so that it has not reached the potential that can be used to support economic, social, and environmental aspects;
2. Why has the infrastructure and operational system not been optimized so that there are technical problems and non-optimal coordination between stakeholders in the management of the Jatigede dam function;
3. Why the lack of coordination and unresolved technical problems result in a lack of a comprehensive management strategy;
4. Why is there no management strategy carried out starting from the planning and implementation stages;
5. Why does the development implementation not fully consider the long-term needs and investment in sustainable development programs?

Scope of the Jatigede Dam Problem in Sumedang Regency, West Java

The construction of the Jatigede dam is considered very important to be carried out immediately because it has implications for the economic development of the community; the first time it was carried out by the Sumedang Regency government, namely the establishment of a tourist area around the Jatigede dam. Although the primary goal of development is for hydropower plants with a capacity of 110 MW, flood control and irrigation facilities for the range and raw water covering an area of 90,000 hectares for downstream areas covering Sumedang,

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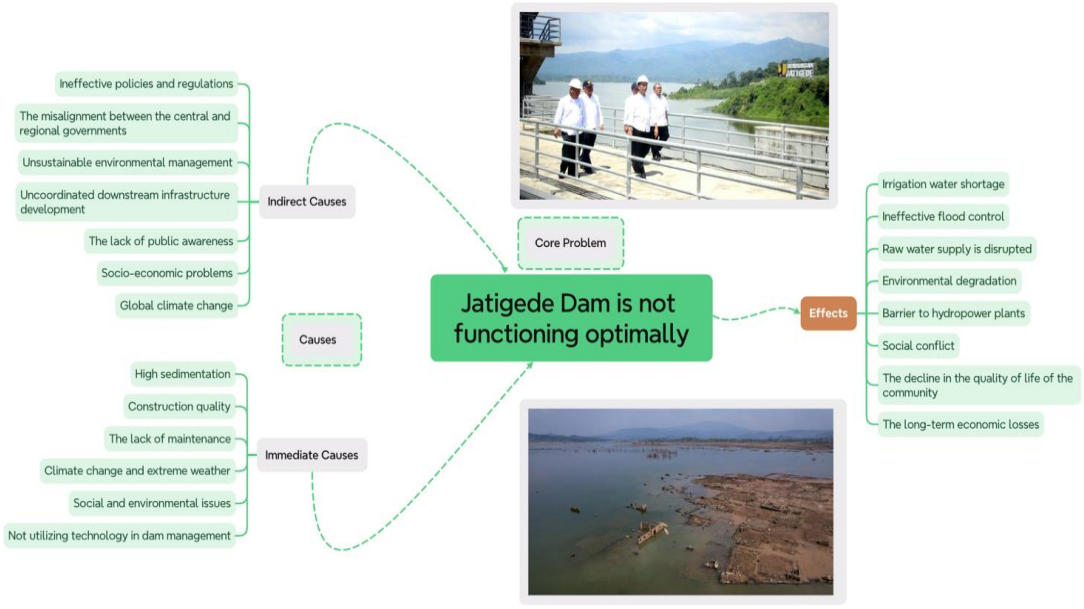
Majalengka, Cirebon, and Indramayu Regencies. The government must ensure that the negative impact is minimized and that the wider community can benefit from it.(Tsikalakis, 2023). The Jatigede Dam is crucial in water resource management, irrigation, flood control, and power generation. Even the Jatigede dam by the local government is used as a mainstay in the tourism sector. Various challenges must be faced through good planning and management; dams can continue to benefit the community and economic development (Hongsuwan, 2022). The government's commitment to the construction of the Jatigede dam is to realize the strategic plan. Still, its growth could have been more optimal due to several problems.

Figure 2.

Problem Tree of Jatigede Bedungan Hypothesis, Sumedang Regency



The main problem faced around the Jatigede dam in Sumedang Regency is the lack of optimal dam function the purpose of the Jatigede dam; water discharge during the dry season affects the dam, the non-functioning of irrigation and raw water providers; another obstacle is the lack of attraction of tourist areas around the dam, which causes the number of visitors to be low. Supporting infrastructure such as road access could have been more optimal, making it challenging to develop the tourism sector, which is expected to be the driving force of the regional economy.

The involvement of local governments through Disparbudpora and Tourism Villages has yet to be clearly established, so the governance needed to develop tourist areas has yet to be formed. Another challenge is the inefficient operation of hydropower plants, which have only recently entered the performance test stage. This hinders the achievement of the full benefits of the dam, both in terms of energy and tourism. There is a need for more structured efforts to

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increase tourism attractiveness and involve more stakeholders in the area's management to ensure more significant benefits for local communities.

Quantification of Economic, Social, and Environmental Impacts of Jatigede Dam in Sumedang Regency, West Java

The Jatigede Dam in Sumedang Regency is expected to have significant economic, social, and environmental impacts. The government has attempted to develop a tourist area around the dam to increase regional income and create jobs. However, the local community's economic impact could be more minimal due to the limitations of tourism infrastructure, the lack of visitors, and the non-optimal operation of the hydropower plant. Significant financial contributions are still expected, especially with better development of tourist areas and supporting infrastructure.

The social impact of the Jatigede dam is expected to create new social capital through community adaptation and local empowerment, mainly through the tourism sector. Environmentally, the dam positively impacts flood control and water conservation, but it also causes changes to regional ecosystems. (Galitskova, 2021) Therefore, sustainable environmental management is needed to ensure that the benefits of the dam not only provide positive economic and social impacts but also maintain the balance of the surrounding ecosystem. (Let, 2023) The importance of knowing the impact of a policy on the community and the surrounding environment of a policy as a form of assessing the level of effectiveness of a policy also helps in the evaluation process of a policy to be taken into consideration in making decisions carried out as a form of follow-up.

Sumedang Regency has tried to build several supporting facilities to attract tourists through its spatial and architectural layout, hoping that tourists will be interested and enjoy the stunning view from the top of the dam. Tourism attraction has not been significant in attracting visitors from various regions, so it has not provided substantial economic benefits for local communities; residents have not utilized tourist areas for economic activities such as selling, building travel businesses, hotels, or other business units. Revenue from tourism that goes to regional income or village income cannot be used to support the maintenance and management of dams so that the programs carried out are sustainable in the long term. Visitors come to tourist areas only on holidays such as holidays, school holidays even though every year, the income from the tourism sector in Sumedang Regency has increased and exceeded the target in 2022 the target of 25.700 billion was realized at 26.971 billion; in 2023, The target of 29.841 billion was realized 33.322 billion and in 2024 had a target of 33.861 billion. The addition of regional income from

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the tourism sector is from more than just the tourist area around the Jatigede dam; it is also from other tourist areas built due to the tourist village program.

Through events such as indigenous arts festivals that aim to attract visitors and create a lively and fun atmosphere, reinforcing the image of the dam as a vibrant tourist area, the dam has become a popular destination for tourists. (Bernardo, 2022). It is hoped that, like world-renowned dams, tourism around dams can also increase people's awareness and appreciation of the importance of water and environmental conservation—(Saha, 2024). Through educational programs and interpretive activities, visitors can learn about the importance of dams in water resource management, flood protection, and hydroelectric energy production, thereby encouraging more environmentally responsible actions among tourists and the wider community. The festival events do not significantly influence the attraction of tourists visiting the Jatigede dam area; local people and visitors only come when the event occurs. Dam assets are also sometimes disruptive, which has implications for government policy by maximizing the positive side and mitigating the risk of adverse impacts. It is essential to create governance planning and policy supervision of the Jatigede dam, which is oriented towards the principle of sustainability to ensure relevant development strategies so that the existence of the dam functions appropriately to support the purpose of the dam's existence.

Conclusion

The impact of the Jatigede Dam construction in Sumedang Regency shows that Jatigede Dam has excellent potential in water resources management, irrigation, flood control, and hydropower generation. However, the benefits have yet to be optimally felt by the surrounding community. The main challenges include inadequate infrastructure, low tourist attraction, and inefficient hydropower operations. Policy recommendations for optimizing the benefits of Jatigede Dam are as follows: The government needs to improve coordination between related agencies, such as the Public Works Office, Tourism Office, and PLN, and involve the private sector in tourism development and supporting infrastructure. Improving road access to tourist areas, developing attractive tourism facilities, and accelerating hydropower operations should be a priority to maximize economic impact. In addition, active participation of local communities needs to be encouraged through tourism-based economic empowerment programs and sustainable environmental management to maintain the balance of the ecosystem around the dam.

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