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Critical Factors in the Preparation Stage to Achieve the Sustainability of Irrigation PPP Projects in Indonesia: a Qualitative Study

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ABSTRACT

Public-Private Partnership (PPP) schemes have emerged as strategic mechanisms for addressing infrastructure financing gaps in developing countries, particularly in the water resources sector, where funding constraints significantly limit service delivery. This study aims to identify the critical success factors (CSF) in the preparation stage of PPP projects in the water resources sector in Indonesia, by integrating a sustainability perspective. The problem addressed is the low effectiveness of PPP project preparation, which leads to implementation delays, as well as the lack of studies that adopt a sustainability approach and involve multiple stakeholders. This study employs a qualitative approach through a case study on the Komering Irrigation PPP Project. Data were collected through semi-structured interviews with seven informants from the public, private, and community sectors, then analyzed using thematic analysis techniques. The results of the study identified 19 CSF indicators grouped into six main categories: economic and financial viability, balance of risk allocation, policy and regulation, institutional and managerial capacity, stakeholder involvement and support, and technical scope. Most CSFs identified are closely related to the economic and social dimensions of sustainability. These findings demonstrate the importance of a tripartite approach and the Triple Bottom Line principle in designing PPP project preparation strategies that are adaptive to sustainability challenges. This study contributes both theoretically and practically to the development of sustainable PPPs, although it is limited to the actors directly involved in the project. Further studies are suggested to expand the scope of actors and contexts to make the results more comprehensive and applicable.

KEYWORDS Critical Success Factors, Indonesia, PPP, Triple Bottom Line

INTRODUCTION

The Public-Private Partnership (PPP) has become a strategic approach widely adopted by developing countries to accelerate the provision of public services through long-term collaboration between the public and private sectors (Dithebe et al., 2019; Ibrahimi, 2023). In Indonesia, PPP is seen as a solution to the funding

constraints in infrastructure development, particularly water resource infrastructure, which plays a vital role in supporting community welfare (Surachman et al., 2020). The implementation of this scheme aims not only to build physical infrastructure, but also to improve service quality, economic efficiency, as well as realize (Ibrahimi, 2023)

Within the framework of the 2045 Vision, the transformation of water resources management has become one of the strategic agenda to support the achievement of national priority programs, particularly food, energy, and water self-sufficiency (Ministry of National Development Planning/National Development Planning Agency, 2024). However, to realize these program, the capacity of the state budget is only able to meet around 67% of the total annual average needs (Ministry of Public Works, 2024). Thus, there is a funding gap that needs to be overcome through innovative and sustainable financing. In this context, PPP is an alternative mechanism that allows for the involvement of the private sector in financing and infrastructure management more efficiently through proportionate risk-sharing schemes (Ameyaw et al., 2017; Shah et al., 2024).

PPP for the water resources sector in Indonesia can be implemented for the provision of dam, irrigation, and electricity infrastructure. However, in practice, project realization often does not proceed as planned. A concrete example is the Komering Irrigation PPP Project. Based on the PPP Book 2023 published by the Ministry of National Development Planning/ National Development Planning Agency, this project is scheduled to enter the transaction stage in the third quarter of 2023, but until the end of 2024 it remains in the preparation stage. According to the Directorate General of Public Works Infrastructure Financing, the project is facing complex issues in the preparation stage, resulting in delays in implementation.

According to the Directorate General of Public Works Infrastructure Financing, the project is facing complex issues in the preparation stage, resulting in implementation delays. Empirical data from the Ministry of Public Works (2024) indicates that approximately 40% of PPP water resource projects in Indonesia experience delays exceeding 12 months during the preparation phase, primarily due to incomplete feasibility studies, prolonged Value for Money evaluations, and inadequate community engagement processes. Of the 15 irrigation PPP projects initiated between 2015 and 2023, only 3 projects successfully progressed to the transaction stage within the planned timeframe, while the remaining projects encountered extended preparation periods averaging 2.5 years beyond initial projections.

These issues align with what was conveyed by Mudi (2017), that inadequate PPP preparation can lead to implementation failure. During the preparation stage, one of the main challenges is balancing the needs of stakeholders in determining

the feasibility of the project and value for money (Ng et al., 2012a). This challenge is increasingly complex with the limited capacity of the public sector to manage PPP projects effectively (Hai et al., 2022).

On the other hand, PPP play an important role in achieving the Sustainable Development Goals (SDGs), especially SDG 17 on partnerships for development (Marx, 2019). By adopting the Triple Bottom Line principle which encompasses economic, social, and environmental aspects, PPPs are expected to create sustainable benefits for all parties, namely the government, the private sector, and the community. (Du et al., 2018; Ng et al., 2012). Therefore, identifying critical success factors at the project preparation stage is important to optimize PPP project performance and ensure the effective achievement of sustainability goals from the outset (Li et al., 2020; Dithebe et al., 2019).

Previous studies have identified critical success factors (CSF) in PPP projects, but significant research gaps persist. First, the majority of existing CSF studies focus predominantly on the contract implementation and operational stages rather than the preparation phase, which is critical for determining project feasibility and long-term sustainability (Ng et al., 2012). Second, most research adopts a bilateral perspective examining only government and private sector viewpoints, thereby excluding the beneficiary community whose participation is essential for social sustainability (Aljaber et al, 2024). Third, quantitative methodologies dominate CSF exploration in PPP literature, limiting the depth of contextual understanding regarding the complex stakeholder dynamics and institutional challenges that characterize the preparation stage (Fathi, 2024). Fourth, while sustainability principles are increasingly recognized as fundamental to PPP success, empirical research explicitly integrating the Triple Bottom Line framework into CSF identification at the preparation stage remains scarce, particularly in developing country contexts (Cheng et al., 2021; He et al., 2020). These gaps are particularly pronounced in the water resources sector, where technical complexity, environmental sensitivity, and community dependence create unique sustainability challenges. Therefore, this study aims to fill this gap by identifying CSF at the stage of preparing PPP projects in the water resources sector based on sustainability principles, through a qualitative approach and involving three perspectives: the public, private sectors, and communities as the end users of the project.

This study employs the Komering Irrigation PPP Project as a case study, providing empirical insights into the preparation stage dynamics of a major water resource infrastructure initiative. The research makes several significant contributions. Theoretically, it extends the CSF literature by adopting an integrated Triple Bottom Line framework that comprehensively addresses economic, social, and environmental dimensions of sustainability from the outset of project preparation. Methodologically, it pioneers a tripartite stakeholder approach that

incorporates community perspectives alongside traditional public and private sector viewpoints, enriching understanding of multi-stakeholder dynamics in PPP preparation. Practically, the findings offer actionable guidance for policymakers, project planners, and implementing agencies in designing preparation strategies that proactively address sustainability challenges, potentially reducing project delays and enhancing implementation effectiveness. For the water resources sector specifically, this research provides evidence-based recommendations for structuring preparation processes that balance technical feasibility, economic viability, social acceptability, and environmental responsibility—critical considerations for achieving sustainable irrigation development outcomes in developing country contexts.

RESEARCH METHOD

This study was carried out by qualitative method using a case study on the Komering Irrigation PPP Project. The case study approach can contribute to the development of the theory, by generating in-depth contextual insights and a holistic view of the success of PPP projects based on a sustainability perspective (Aljaber et al., 2024).

In this study, a semi-structured interview method was used. The main theme in the interview were obtained from a literature review and focused on understanding stakeholder's perceptions of CSF in the PPP preparation stage. The main questions covered the identification of success factors in the project preparation stage, the dynamics and challenges encountered during the process, and the extent to which sustainability aspects had been considered in existing practices.

The interview participants in this study include the main stakeholders in the Komering Irrigation PPP Project, namely: (1) the Government Contracting Agency, (2) the private sector as the business entity initiating the project, and (3) the community as the beneficiary of the project. The criteria for selecting informants include willingness to participate, level of experience in the project, position in their respective organizations, and role in the Komering Irrigation PPP Project. The list of interview informants can be seen in Table 1 below.

Table 1. Interview Informant Profile

Sector	Informant (code)	Position	Organisasi
Government	P1	Head of Preparation Team of Water Resource Investment	Ministry of Public Works
	P2	Head of Operations and Maintenance	Ministry of Public Works
Private	S1	Vice President	Construction Companies
	S2	General Manager	Construction Companies

Sector	Informant (code)	Position	Organisasi
Community	M1	Section Head	Irrigation Commission
	M2	Head	Farmer Group
	M3	Head	Farmer Group

Seven informants from three sectors have participated in the interviews. The interviews were conducted in various ways to suit the informant's preferences, namely face-to-face interviews, telephone interviews, and teleconference. Data obtained from interviews were analyzed using Thematic Analysis. The method includes identifying and analyzing patterns in the form of themes in the data (Braun & Clarke, 2006). The stages of data analysis follow the guidance of three stages from Miles et al. (2014), namely data condensation, data display, and conclusion drawing/verification.

RESULTS AND DISCUSSION

Overview of the Komering Irrigation PPP Project

The Komering Irrigation PPP Project is an unsolicited PPP project that located in East Ogan Komering Ulu Regency, Ogan Komering Ilir Regency and Lampung Province. The Government Contracting Agency (GCA) for this project is the Ministry of Public Works. This project also supports the government's target in accordance with the 2025-2029 National Medium-Term Development Plan (RPJMN), namely achieving self-sufficiency in food, energy, and water through quick wins in increasing agricultural land productivity with village, regional, and national food barns.

The form of cooperation used in this project is Design, Revitalization, Finance, Maintenance, Transfer (DRFMT). The scope of work in this project includes rehabilitation of the functional irrigation network covering 59,158 hectares, the construction of maintenance facilities by implementing the modernization of the irrigation system, and maintenance of the entire irrigation network covering an area of 67,648 hectares. The concession period of this project is 16 years, with 3 years allocated for rehabilitation and 13 years for maintenance. This project's investment return scheme uses Avalability Payment paid by GCA during the maintenance period. The project also uses government guarantees provided by Indonesia Infrastructure Guarantee Fund (IIGF) to enhance bankability and attract investor interest.

Critical Success Factors Analysis

Based on a literature review, six main categories of CSF that are commonly found in PPP projects have been identified. Then, based on the results of interviews with seven informants, 19 CSF indicators have been identified to complement the

six CSF categories. Each identified CSF has been evaluated for its relevance to a sustainability perspective, which encompasses the three main dimensions of the Triple Bottom Line approach, namely economic, social, and environmental aspects. A summary of the CSF identified in the interview can be seen in Table 3 below.

Table 1. CSF at the PPP Preparation Stage Based on a Sustainability Perspective

Main Category of CSF	Indicators	Sustainability Dimension
Economic and Financial Feasibility	Sufficient Fiscal Capacity for Availability Payments	Economics
	Compatibility between cost and project design	Economics
	Bankability	Economics
	Project Financial Feasibility	Economics
Risk Allocation Balance	Financial and Operational Risk Management	Economics
	Clear and Reasonable Service Criteria	Economics
Policies and Regulations	Legal Certainty and Supporting Regulatory Framework	Social
	Policy Harmonization	Social
	Compliance with Government Programs	Social
Institutional and Managerial Capacity	Adequate Public Competence and Experience	Social
	Institutional Capacity in Collaboration and Communication	Social
	Good Governance	Social
	Leadership Commitment	Social
Stakeholder Involvement and Support	Alignment of Stakeholder Interests	Social
	Involvement and Empowerment of Local Communities	Social
	Proactive and Adaptive Communication with the Community	Social
Technical Scope	Clear Scope of Contracts	Economics
	Quality and Availability of Data	Environment
	Workability	Environment

Based on the analysis of 19 CSF indicators that contributing the success of the PPP preparation stage, the majority of CSF identified are closely related to economic and social sustainability aspects. The following is an explanation of each CSF category:

Economic and Financial Feasibility

One of the key elements that influenced the success of the Komering Irrigation PPP project is the government's fiscal capacity to guarantee the Availability Payment. The interviews showed that this fiscal capacity is not only the basis for guaranteeing the continuity of payments, but also influences the quality of services

and infrastructure that will be handed back to the GCA at the end of the concession period. P1 and S1 said:

> "The Komering Irrigation PPP project uses the Availability Payment as the payment mechanism. The government must commit to the AP which will be paid after the construction period is completed. Then regarding technical criteria, business entities hope to use the best quality, but must be supported by sufficient fiscal capacity." (synthesis of statement from P1 and S1)

These findings are in line with research by Suhendra & Satrio (2020) dan He et al. (2020) that government fiscal pressures can impact infrastructure quality and project cash flow sustainability, ultimately affecting the achievement of project service sustainability.

Furthermore, the success of a project is also highly dependent on the alignment between the project design and its cost estimates. In the PPP project for the Komering Irrigation, there were challenges in aligning the design with technical standards and the latest prices, resulting in delays in the preparation of the Feasibility Study. S2 emphasized that:

> "To find a fair agreement, where the level of service is maintained, the scope is met, performance can also be achieved. So it needs design and construction with a certain value. In addition, in order to produce optimal costs so as to produce good quality, the most effective work method approach must be used. One of them is to considering the use of local raw materials."

Research from Ng et al. (2012) and Elserougy et al. (2024) supports these findings, stating that mismatches between design and cost are a common cause of cost overruns in infrastructure projects.

The third indicator is the level of project bankability, which refers to the project's ability to attract funding from financial institutions. In the Komering Irrigation PPP project, the initiating business entity stated that the government guarantee through IIGF provides more confidence for potential lenders regarding financial risks. S1 and S2 said:

> "In terms of demand risk it is quite attractive for business entities because there is a government guarantee from IIGF that will guarantee the risk of the government defaul on AP. This is a form of financial support to increase confidence on the banking side." (synthesis of statement from S1 and S2)

Research by Mankewu & Awuzie (2023) confirms that bankability is an important indicator to attract the interest of investors and financial institutions. In addition to a good cash flow, the existence of a well-managed risk allocation is also a key consideration for funding institutions (Delmon, 2012).

Finally, the overall financial feasibility of the project is the basis for investment decisions. S1 and S2 highlight that in the Komering Irrigation PPP project, this feasibility is calculated comprehensively which includes estimating construction costs, maintenance cost, projected income from government payments, and quantifying all risks, which are then presented in a financial model to produce project feasibility indicators. Financial unfeasibility can lower private interest and increase the risk of projects failing to obtain financing, making careful financial planning a prerequisite for the success and sustainability of PPP projects (Mankewu & Awuzie, 2023).

Risk Allocation Balance

The balance of risk allocation is one of the crucial factors in the preparation stage of the PPP project. One of the main indicators is financial and operational risk management, where all informants from the government and private sectors emphasize the importance of fair risk sharing. S2 stated:

> "The PPP project is in the spirit of balanced, fair, and realistic risk sharing. Therefore, all risks should not be shifted to the business entity."

This is in line with Osei-Kyei & Chan (2021), who emphasize that the government's tendency to shift all risks to the private sector can reduce investment interest and hinder the sustainability of projects.

Then, in the case of the Komering Irrigation PPP Project, the S1 said that the risk of *cost overrun* is the main concern that can have implications for the smooth cash flow of business entities. In addition, M2 added that there are operational risks due to the limited capacity of the local workforce to be involved and design decisions that only consider initial cost efficiency, so there is a risk of causing high operational costs in the future. These findings are in line with the literature that emphasizes the importance of identifying and allocating risk from an early stage. Dithebe et al. (2019), highlight that an adequate project feasibility study before the start of implementation is essential to appropriately identify risks, as well as establish the roles and responsibilities of each party.

The second indicator is clear and reasonable service criteria through a Service Level Agreement (SLA) mechanism. P2 emphasized the importance of a detailed SLA that includes consequences for service failures. However, business entities also highlight that performance indicators should reflect their actual controls. S2 said:

> "The AP payment deduction will be linked to the service performance index, we must ensure that AP payments are not cut excessively, which is actually not the domain of the business entity,"

The World Bank (2016) recommends KPIs that are not only realistic, but also take into account the perception of beneficiaries, to ensure efficiency in the provision of sustainable irrigation.

Policies and Regulations

In the preparation stage of the Komering Irrigation PPP project, legal certainty and supporting regulations are one of the important key factors for success. Based on the results of the interviews, P1 and S1 showed that policies and regulations, especially Law No. 17 of 2019 on Water Resources are the main obstacles in the implementation of PPP in the water resources sector, which in the end cannot support a conducive investment climate in the water resources sector.

> "Regulations, especially Article 57 of the Water Resources Law, are considered not yet investment-friendly and not in accordance with market conditions. Therefore, policy adjustments are needed so that the water resources sector is more attractive to business entities and so that this project runs quickly." (synthesis of statement from P1 and S1)

To address this legal uncertainty, P1 and S1 agreed that the PPP project in the water resources sector require a written legal framework as a form of formal legal basis for PPP project implementation. Additionally, S1 also collaborates with various parties to meet legal compliance in the implementation of the project, as outlined below:

> "In terms of compliance with the regulation, we are collaborating with several parties who have the potential to help. For example, we work together to ask for legal opinions from JAMDATUN, assistance from BPKP, and audits by BPK."

In addition to legal certainty, policy harmonization is also an important factor that affects the effectiveness of project preparation. This harmonization refers to the alignment of regulations at various levels of government and the sectors involved. S1 and P2 highlighted that:

> "Regulations greatly affect the preparation of this project. It would be better if regulations on water resources projects were align, but now there are still many conflicting policies. So if there are weak rules below, they must refer to higher regulations" (synthesis of statement from S1 and P2)

Inconsistencies in policies and regulations have the potential to cause ambiguity and uncertainty that can hinder the progress of projects. In practice, the implementation of PPP in the water resources sector is faced with cross-sectoral regulations that have not been fully integrated.

Furthermore, alignment with government programs is also an important factor in ensuring the sustainability of PPP projects. P1 and S1 provided information that the Komering Irrigation PPP Project is in accordance with the current government

program, by supporting Asta Cita related to Food, Energy, and Water Self-Sufficiency as stated in the 2025-2029 National Medium-Term Development Plan (RPJMN).

The lack of clarity of this regulation affects the long-term sustainability of public services, considering that the PPP scheme carries a whole life cycle approach from the design stage to infrastructure maintenance. This is in line with the view of He et al. (2020), that social sustainability in PPP depends on the quality of public services throughout the project lifecycle. Furthermore, World Economic Forum (2013) states that the legal feasibility of irrigation PPP projects is highly dependent on the coherence of various legal and regulatory aspects. In the context of sustainability, policy harmonization supports bureaucratic efficiency and acceleration of public services, thereby strengthening the overall social impact and sustainability of the project. Additionally, the integration of projects with national development priorities is important for the project to gain consistent political support in the long term (Yescombe & Farquharson, 2018).

Institutional and Managerial Capacity

Institutional and managerial capacity plays an important role in ensuring the effectiveness of the preparation of PPP projects. One of the fundamental aspects is the adequate competence and experience of the government. From the interviews, it was found that gaps in technical understanding were a real obstacle in the decision-making process. P1 and S1 revealed the importance of equality of knowledge in the communication and decision-making process, especially the understanding related to the PPP scheme.

> "Communication is going well, but there is a gap in knowledge. Technical staff are still accustomed to conventional schemes, so their understanding of PPP schemes is still limited." (synthesis of statement from P1 and S1)

Therefore, improving human resource capacity through training and involvement of external consultants is an urgent need to bridge this gap. This is in line with the view of He et al. (2020) that emphasizes the importance of team optimization and the adoption of managerial experience from the private sector to increase the effectiveness of PPP projects.

Furthermore, the success of the PPP project in Komering Irrigation is also highly determined by the institutional capacity to coordinate and communicate. The preparation of the project involves two main units within the Ministry of Public Works, namely the Directorate General of Infrastructure Financing and the Directorate General of Water Resources. These two units hold their respective roles in accordance with the delegation regulated through the Decree of the Minister of Public Works. P1 emphasized:

> "The active role of all parties is very necessary, so that this project can implement. Because there is already a Ministerial Decree on the Delegation of Authority, the responsibilities of each party as stipulated therein must be complied with. If we work together from the beginning, there won't be any problems."

The commitment to build this synergy is also echoed by the business entity. The S1 stated the importance of continuous coordination and the involvement of strategic partners to strengthen cross-sector communication in resolving problems that arise at the project preparation stage. These findings have reflected the principles of New Public Management by Hood (1991), which prioritizes the need for coordination across organizational units to create efficiency and synergy of work. Open and participatory communication has proven to be one of the determinants of the success of the implementation of PPP projects (He et al., 2020).

Good governance aspects are also required in the project preparation stage to ensure clarity on the structure, roles, and responsibilities of each party involved. The P2 expressed the concerns of the existing operations and maintenance officers at the Komering Irrigation Project regarding the sustainability of their role in the implementation of PPP, so that clear role sharing rules are needed from the initial stage. On the other side of governance, S1 and S2 informants conveyed the importance of applying Environmental, Social, and Governance (ESG) principles and collaborative governance to maintain accountability and sustainability of projects. This view is in line with Kumar et al. (2025), which emphasizes that collaborative governance strengthens the effectiveness and relevance of PPP projects.

Finally, informants from the government and the private sector agreed that the sustainability of the preparation of the Komering Irrigation PPP Project is influenced by the level of commitment and continuity of high-level officials in the relevant organizational units. P1 and P2 said that the change of leadership has consequences for the technical assessment of the project and can affect the priority of project completion. Although political dynamics are inevitable, stakeholders must have the ability to adapt to these changes, as stated by the S1. Consistent political and leadership support is indispensable to maintain the direction and focus of the project. These findings are in line with Ahmadi et al. (2024) and Shah et al. (2024), which emphasizes that government commitment and stable political conditions are prerequisites for building trust and maintaining the sustainability of PPP projects.

1. Stakeholder Involvement and Support

The success of the preparation stage of the Komering Irrigation PPP Project is highly dependent on the alignment of interests between stakeholders, which include the government, business entities, and beneficiary communities. In practice, there

is a discrepancies between the expectations of the community, especially regarding the scope of irrigation services, the fiscal capacity and technical feasibility of the project. In terms of business entities, S1 and S2 said that there is a dilemma between providing high-quality services but with limited coverage or lowering quality to reach all areas, both of which carry social or financial risks. One of the initiatives taken is to conduct outreach to communicate these limitations to the community. This approach is in line with the recommendations from World Economic Forum (2013), which emphasize the importance of balancing expectations between stakeholders by proactively engaging them to avoid social resistance and support the successful implementation of sustainable PPP projects.

The active involvement of local communities and community empowerment are also crucial elements in the preparation stage to ensure the sustainability of the irrigation sector PPP project. The Komering Irrigation PPP project has engaged the community through public consultation, but sustainable empowerment, such as training and capacity building, still needs to be strengthened. P2 emphasized the importance of the role of field officers and farmers:

> "Officers in the field, both operation and maintenance officers and farmers have experienced a lot of turnover and they are the ones who have contributed the most. Therefore, their sustainability must be considered, one of which is by increasing capabilities through capacity building."

On the other hand, S1 informants from private entities recognized the importance of empowering local workers to strengthen social support. This was reinforced by community perspective. M1, M2, and M3 informant emphasized that the involvement of farmer group organizations throughout the project cycle is considered to increase a sense of belonging, which then has an impact on improving the quality of infrastructure. These findings are in line with the statement of Shah et al. (2024) that public participation in PPP projects strengthens partnerships and improves social sustainability and service quality.

Finally, proactive and adaptive communication plays an important role in building trust and managing community expectations during the preparation stage of the Komering Irrigation PPP project. This includes disseminating project information, absorbing aspirations, and clarifying impacts that may arise during implementation. S1 conveyed challenges and strategies in communication:

> "We need more effort to explain the scheme of this project, because people have different levels of literacy. The approach to the community also needs to be improved through socialization and deliberation, to hear their responses that can be used as material for improving the feasibility study."

From the community side, M1 informant emphasized the importance of repeated communication and the formation of special teams as a liaison between the community and project implementers. This practice is in line with the recommendations of He et al. (2020), which emphasizes the need for communication and cooperation between stakeholders in supporting the efficiency and sustainability of projects. Good communication is not just about conveying information, but also listening and adapting projects to the real needs of the community (Yescombe & Farquharson, 2018).

2. Technical Scope

A clear scope of PPP contract is a fundamental prerequisite in ensuring the success of PPP projects. In the context of the Komering Irrigation PPP, the negotiation process of the technical scope takes a long time due to regulatory constraints, especially restrictions on the elements of operation and maintenance in Law No. 17 of 2019. The S1 informant revealed that this resulted in a change in the contract scheme from DBFOMT to DRFMT. The S2 added that clarity of scope from the beginning can avoid potential disputes during implementation. These findings are in line with the view Yescombe & Farquharson (2018), that the determination of the scope of the project needs to consider key risks, such as regulatory constraints from the planning stage that may affect the achievement of the required objectives.

The quality and availability of technical data is also a crucial aspect in compiling the Feasibility Study. The P1 highlighted that the data collected by the initiator is not always representative, so it can pose a risk to cost estimates and design. Then, from the private side, the S1 conveyed the obstacle:

> "In the preparation of the feasibility study, it will be faster and more accurate if the data is available. However, when the consultant team went to the field, the data was not 100% complete."

To overcome this, the S2 informant emphasized the need for innovation in technical approaches through the use of digital technology. This information is in line with the World Economic Forum (2013) guideline, that the use of high-quality data supports more accurate and efficient decision-making.

Then, the workability factor is a concern for the private sector. The S2 informant stated that workability is understood as the ability of the project to be realized technically in the field, taking into account existing conditions, location accessibility, availability of materials, and potential impacts on existing irrigation services during the construction period. The statement is in line with Mankewu & Awuzie (2023)and World Bank (2016), which states that technical design must be able to be implemented in the field in order for the project to be technically feasible and sustainable.

CONCLUSION

This study highlights the importance of the Public-Private Partnership (PPP) preparation stage as a critical early phase for determining project feasibility, structure, and sustainability, with a focus on identifying critical success factors (CSFs) from a sustainability perspective. Through in-depth interviews with public, private, and community stakeholders involved in a water resources sector PPP project, 19 CSF indicators were identified and grouped into six categories, underscoring the value of a tripartite approach and the Triple Bottom Line principle in guiding sustainability-oriented PPP development. The findings provide strategic insights for multiple stakeholders but are limited by a narrow informant base that excludes planning, guarantor, and banking institutions, thereby restricting the analysis of broader policy and financing dimensions. Future research should involve a wider range of strategic stakeholders and expand case scope to enhance generalizability and applicability of the results.

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