Available *online* at: http://journal.unj.ac.id

Jurnal Pensil | Pendidikan Teknik Sipil

Journal homepage: http://journal.unj.ac.id/unj/index.php/jpensil/index

FINANCIAL CRITICAL SUCCESS FACTOR OF PSN SPAM PROJECT MANAGEMENT, REGIONAL JATILUHUR PHASE 1

Andre Tampubolon[1*], *Darmawan Pontan*[2]
[1,2] Master of Civil Engineering Study Program, Faculty of Civil Engineering and Planning, Universitas Trisakti
Jalan Kyai Tapa No. 1 Grogol Jakarta Barat, 11440, Indonesia
[*1]andretampubolon38@gmail.com, [2]darmawan@trisakti.ac.id

P-ISSN: 2301-8437
E-ISSN: 2623-1085

ARTICLE HISTORY
Accepted:
26 Oktober 2025
Revision:
26 Januari 2026
Published:
31 Januari 2026

ARTICLE DOI:
10.21009/jpensil.v15i1.61352

Abstract

Research analyzing Non-Technical Critical Success Factors, especially those related to finance, has not been widely conducted in the field of construction management in developing countries such as Indonesia. This study aims to describe the financial critical success factors of the Jatiluhur Regional SPAM PSN Project Management Phase 1 and to analyze which factors are most dominant. The current study only focuses on the financial aspects of the project CSFs, namely Project Related Factors, Business and Work Environment Related Factors, Client Related Factors, and Project Management Factors. Primary research data were collected through an AHP questionnaire distributed to 5 key informants. The results of the analysis of the financial critical success factors of the Jatiluhur Regional SPAM PSN Project Management Phase 1 show that project-related factors have the highest weight (0.588), followed by client-related factors (0.175), the next factor is project management factors (0.133), land transfer pricing (0.070), and finally business and work environment-related factors. The results of the weighting analysis of the financial critical success factor sub-factors of the Jatiluhur Regional SPAM PSN Project Management Phase 1 showed that the project capital composition sub-factor ranked first in terms of overall importance of the CSF sub-factors of the Jatiluhur Regional SPAM PSN Project Management Phase 1, with a weighting of 0.270 (27%).

Keywords: Critical Success Factor, Financial, AHP, PSN SPAM, Project Management

Introduction

A construction project is an activity that produces a product in the form of construction results, with quality, cost, and efficiency of the product formation process considered. (Laia & Susetyo, 2024; Winoto et al., 2023). The construction industry is an important sector in a country's economy because infrastructure and property development can increase economic growth, create jobs, and improve the quality of life.

One form of government efforts to overcome the infrastructure deficit and the decline in investment during the 2008–2012 global crisis is the National Strategic Project (PSN), which was launched in 2016 (Limanseto, 2023). This is still relevant to research because the PSN SPAM project is still running to date. The National Strategic Project (PSN) itself consists of 15 sectors, including drinking water and wastewater treatment or drinking water infrastructure, which is one of the important sectors in development, whose implementation is in accordance with the Regulation of the Minister of Health of the Republic of Indonesia Number 492 / MENKES / PER / IV / 2020.

This project is the National Strategic Project for Drinking Water Supply Systems (PSN SPAM), which currently consists of 9 projects, one of which is the Jatiluhur Regional 1 SPAM PSN, the only inter-provincial SPAM project. This results in a more complex institutional system that can hinder or slow the project's implementation. (Yahya, 2020). Therefore, this study will focus on analyzing the Jatiluhur I Regional SPAM PSN, which covers Bekasi City, Bekasi Regency, Karawang Regency, and DKI Jakarta.

The Jatiluhur I Regional SPAM Project has entered the commercial operational phase. This project is targeted for completion and operation on December 18, 2024. This project aims to provide drinking water for residents of Jakarta, Bekasi, and Karawang. The Construction Phase of the Jatiluhur I Regional SPAM began on January 19, 2022, with a capacity of 4,750 liters/second. The investment amount is IDR 1.7 trillion, with a 30-year Cooperation period (2.5 years of construction and 27.5 years of operation). The objective of the Jatiluhur I Regional SPAM project is to increase access to clean drinking water and reduce groundwater extraction, added PT Wika Tirta Jaya Jatiluhur (Bappenas, 2025).

A performance of the successful construction project can be reflected in prompt completion of the work agreed by owner and contractor executed (Ihsan, 2023). As previously explained, a project considers quality, cost, and time throughout its process. Therefore, the success of a project can be judged by the accuracy of the implementation of these three aspects (Silalahi et al., 2023). However, the financial aspect is often the primary factor considered in a project because the success of a construction contractor depends heavily on specific requirements and the availability of sufficient funds to realize the planned project (Gundes et al., 2019).

*Critical Success F*actors (CSFs) in project construction are caused by technical and non-technical factors. Technical failure is caused by deviations in the implementation process that do not meet the agreed technical specifications (A. I. Maghsoodi & Khalilzadeh, 2018; Tripathi & Jha, 2018). Meanwhile, non-technical factors are caused by the incompetence of the business entity, workforce, and unprofessional management governance among the parties involved in the construction project (Nurlia et al., 2023).

Research that analyzes *Non-Technical Critical Success Factors,* especially those related to finance, have not been widely studied, for example, research by Gunduz & Almuajebh (2020) identifying technical and non-technical CSFs that contribute to project success based on seven categories, namely project-related factors, business and work environment-related factors, client-related factors, project management factors, design team-related factors, contractor-related factors, and project manager-related factors. The results of the study indicate that most of the significant factors are financial issues (Financial payment mechanisms, adequacy of project funds/resources), administrative aspects (Client/client representative influence, availability of experienced managers and skilled workforce), and authority approval mechanisms (legal approval environment).

Another study conducted by Datta et al. (2023) the CSF on construction projects can be divided into five groups of factors: financial management, monitoring and feedback, competency management, communication and coordination management, and risk management. However, stakeholder opinions indicate that the application of modern tools and techniques can help avoid critical situations in the construction industry. Based on expert and stakeholder assessments, the top five critical factors—technical factors such as cost overruns, traffic congestion, low barriers, late payment for completed work, and owner financial problems—showed higher RII values.

Rehan et al. (2024) analyzed non-technical factors of project success for leadership and communication behavioral practices that influence project success during Covid 19. The results of the analysis show that there are four key factors of project success: (1) Relationship Management, (2) Leading by Example, (3) Self-Management, and (4) Effective Communication, along with seventeen "behavioral practice attributes" that have a positive and significant impact on project success and emphasize inclusivity, building relationships, objectivity of self-feedback, sharing information, resolving disputes collaboratively, and controlling emotions that have a significant impact on project success.

Gundes et al. (2019), in their systematic bibliometric analysis of 259 studies related to construction finance, they conducted a systematic bibliometric analysis to identify research trends, critical topics, and the performance of journals and authors. The results showed that the category of "financial health", particularly a group of studies aimed at monitoring and assessing the financial performance of construction organizations for broader strategic issues, has dominated construction finance research. However, the category of "identifying capital structure, determinants, and financing instruments" in particular has received less and only recent attention from academics, even though capital structure decisions based on company- and country-specific determinants are crucial in preventing company failure.

The literature reviewed above indicates that research on construction project success has predominantly emphasized technical and managerial factors, such as project implementation quality, cost control, and timeliness. While several studies (Gunduz & Almuajebh, 2020; Datta et al., 2023; Rehan et al., 2024) have expanded the discussion to include non-technical determinants—particularly leadership behavior, communication, and competency management—financial aspects remain underexplored within the context of project success factors. Previous studies consistently identify financing mechanisms, the adequacy of project funds, and client payment processes as significant contributors to project outcomes, yet systematic analyses of how these financial dimensions interact with other organizational and institutional dynamics in complex, multi-stakeholder projects remain limited.

The novelty of this research lies in its focus on non-technical financial critical success factors within a National Strategic Project (PSN) framework, specifically the Jatiluhur I Regional SPAM project, which involves multi-provincial coordination and public-private cooperation. Unlike earlier studies that treat financial factors as part of broader project management themes, this study positions financial governance, institutional arrangements, and funding mechanisms as central analytical variables influencing project performance. By integrating financial management perspectives with policy and institutional considerations, this research offers new insights into how financial factors sustain or hinder large-scale infrastructure projects in Indonesia's strategic program context, advancing theory and offering practical relevance for future project governance and investment policy.

This study will examine *the financial critical success factors* of the PSN project from the perspective of *Project-Related Factors, Business- and Work-Environment-Related Factors, Client-Related Factors,* and *Project Management Factors* as the dimensions used by Gunduz & Almuajebh (2020). Based on this background, this study takes the title "Financial Critical Success Factor of Psn Spam Project Management, Regional Jatiluhur Phase 1". The analysis conducted will focus on the critical success factors of the project's success from both actors and stakeholders. Thus, through this study

it is expected to show technical and non-technical obstacles related to the success factors of the Jatiluhur Regional SPAM PSN project Phase 1.

Based on the description above, this study aims to describe *the financial critical success factors* of the Jatiluhur Regional SPAM PSN Project Management Phase 1 and analyze which *financial critical success factors* of the Jatiluhur Regional SPAM PSN Project Management Phase 1 are the most dominant. Through these objectives, it is hoped that this research can bring benefits to various fields such as the development of science, technology development, and for the community. From the perspective of scientific development, the results of this study can contribute to the development of project management science, especially in terms of handling non-technical factors for the success of strategic infrastructure projects. The findings of this study can enrich the theoretical understanding of non-technical factors that influence the success of complex infrastructure project management.

Research Methods

The research adopts a quantitative, descriptive–analytical design because it measures the relative importance (weights) of predefined financial CSF dimensions and sub-factors using numeric pairwise comparison scales. Primary data are obtained from structured AHP questionnaires distributed to five key informants (project owner, regulators, and contractor) within the Jatiluhur I Regional SPAM PSN area, and then processed statistically (weighting, consistency ratio) using Expert Choice software. The hierarchy of factors (Project-Related, Business and Work Environment-Related, Client-Related, Project Management Factors, plus specific financial sub-factors) is constructed from prior CSF literature and refined through expert input, making the overall procedure deductive and quantitatively oriented

The research location is within the Jatiluhur I Regional SPAM National Water Supply System (PSN) area, which covers DKI Jakarta, Bekasi City, Karawang Regency, and Bekasi Regency. Observations focused on *the financial critical success factors* of the PSN project, including *Project-Related Factors, Business- and Work-Environment-Related Factors, Client-Related Factors,* and *Project Management Factors.* Main CSF categories (Project-Related, Business/Work Environment-Related, Client-Related, Project Management Factors) were systematically derived from Gunduz & Almuajebh (2020), adapted to financial non-technical aspects via literature review. Sub-factors (e.g., project capital composition, Indonesian economic conditions) emerged from expert interviews and validation, adding context-specific elements like land transfer licensing and complex permitting flows. This hybrid approach—literature synthesis plus informant triangulation—ensures relevance, face validity, and alignment with PSN SPAM complexities, mirroring CSF prioritization in Indonesian PPP water projects. All indicators passed pairwise consistency checks (CR $\leq$0.09 across hierarchies), confirming

This research is using primary data, primary data is a source of data that is obtained directly from the source to answer research problems (Sugiyono, 2019). Primary data for this study were collected through questionnaires and observations. The questionnaires were in the form of *pairwise comparisons of financial CSFs* from research sources, namely contractors and agencies directly involved in the Jatiluhur I Regional SPAM PSN. This method was carried out by collecting documentation on the development of the Jatiluhur I Regional SPAM PSN during the study. Based on the questionnaire data, the weighting of each factor was calculated using the AHP (Analytical Hierarchy Process) method, which is a decision support method. The most important element in AHP is the functional hierarchy, with its primary input being human perception. With a hierarchy, a complex and unstructured problem is broken down into groups and organized into a hierarchical form (Marsono, 2020).

AHP relies on expert judgments rather than large-scale surveys, prioritizing depth of expertise over sample quantity. Studies confirm that 4-5 purposively selected key informants suffice for reliable AHP results in construction contexts, as seen in BIM performance metrics research (minimum 4 experts) and broader reviews noting small samples enable high consistency

ratios (CR < 0.10). In this study, five informants were selected via purposive sampling for their direct involvement: project owners (procurement/QAQC manager, supervisor), regulators (Bekasi City Highways Head, Transportation Section Head), and contractors, ensuring diverse stakeholder perspectives on the Jatiluhur I SPAM PSN's financial CSFs. The aggregate pairwise comparisons yielded a global CR of 0.06 (<0.10 threshold), validating judgment consistency per Saaty's guidelines. The research method flow chart is described as follows:

Figure 1. Research Flow Chart

Research Results and Discussion

The first step in the Expert Choice method is constructing a model from the literature and previous research by soliciting the opinions of experts who served as informants in the study. The informants in this study consisted of five individuals considered experts and specialists in the research problem. The backgrounds of the informants in this study are as follows:

Table 1. Informant Characteristic

Informant Number	Code	Position	Informant Background
Informant 1	ANT	Project owner	Works as a procurement engineering and QA/QC manager
Informant 2	GLG	Project owner	Works as a supervisor
Informant 3	IDI	Regulator	Head of the Bekasi City Highways Division
Informant 4	TGH	Regulator	Head of Section of the Bekasi City Transportation Agency
Informant 5	ISH	Contractor	Project Implementer

Based on a literature review and interviews with informants, a model was created using Expert Choice software. The resulting model is as follows:

Table 2. Factor and Sub-Factor Source

Factor	**Sub Factor**	**Source**
Project-Related Factors	Project scale	Literature Review
	Project payment scheme	
	Project Capital Composition	
	Approval of Payment of Performance Bonus	
Business-and Work-Environment-Related Factors	Condition of the Indonesian economy	Literature Review
	Government regulatory support	
	Fluctuations in bank interest rates & rupiah exchange rates	
	Complex Licensing Flow	
Client-Related Factors	Financial condition of the project owner	Literature Review
	Project owner financing scheme	
	Payment mechanism from the project owner	
	Client's Approval of Payment for Performance	
Project Management Factors	Project financing arrangements	Literature Review
	Project Resource Allocation	
	Project financing accountability organizational structure	
	Vendor Appointment Decision from the Board of Directors	
Other Factor	Land Transfer Pricing	Interview

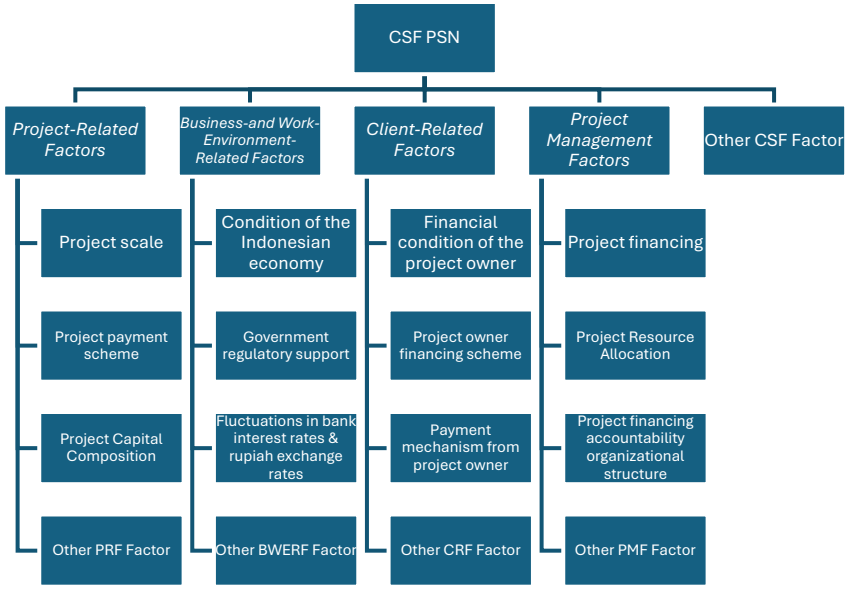

Figure 1. CSF Framework 1 of the Jatiluhur Regional SPAM PSN Phase 1

The AHP research model above the PSN CSF factors, namely Project-Related Factors, Business- and Work-Environment-Related Factors, Client-Related Factors, and Project Management Factors, were obtained from previous research. *Other factors* according to research informants with the most answers are *Land transfer licensing* (CSF). The Jatiluhur I Regional SPAM PSN spans multiple provinces (DKI Jakarta, Bekasi City/Regency, Karawang Regency), making land acquisition highly complex due to inter-agency coordination, ownership disputes, and regulatory approvals. Informants—representing project owners (procurement/QAQC manager, supervisor), regulators (Bekasi Highways Head, Transportation Section Head), and contractors—highlighted it as a top non-technical barrier beyond standard literature categories, linking delays to financial impacts like cost overruns and financing hold-ups. In pairwise comparisons, it earned a dedicated weight of 0.070 (fourth overall), with informants rating it moderately high against other factors (e.g., 0.333-0.34 vs. Project-Related Factors), underscoring its perceived financial criticality in multi-stakeholder PSN projects.

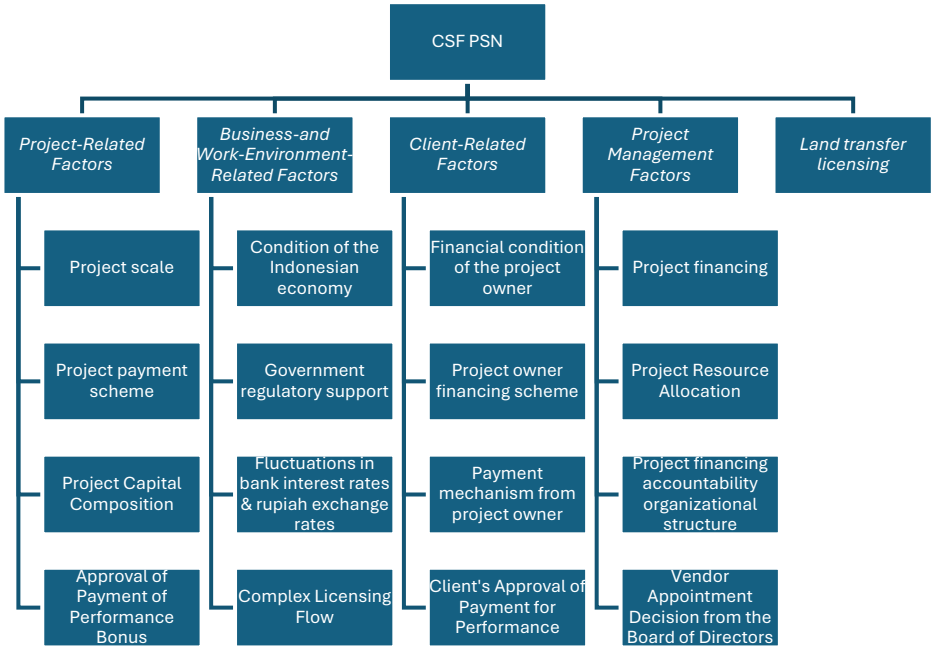

Figure 2. CSF Framework of Jatiluhur Regional SPAM PSN Phase 1

Approval of Payment from Performance Bonus (PRF), Complex Licensing Flow (BWERF), Approval of Payment from Client for Performance (CRF), and Vendor Appointment Decision from the Board of Directors (PMF). The summary of the answers from all research informants is as follows:

Table 1. Summary of Research Informants' AHP Questionnaire Answers

Factor		Informant					Average Score	End of Rounding
		1	2	3	4	5		
Section 1 CSF Aspects								
Project-Related Factors	*Business-and Work-Environment-Related Factors*	9	9	9	9	9	9.00	9
Project-Related Factors	*Client-Related Factors*	6	5	6	7	6	5.97	6
Project-Related Factors	*Project Management Factors*	7	6	7	8	7	6.97	7
Business-and Work-Environment-Related Factors	*Client-Related Factors*	7	6	7	8	7	6.97	7
Business-and Work-Environment-Related Factors	*Project Management Factors*	0.143	0.125	0.143	0.167	0.143	0.14	0.143
Client-Related Factors	*Project Management Factors*	0.250	0.200	0.250	0.333	0.250	0.25	0.250
Land licensing transfer	*Project-Related Factors*	0.333	0.250	0.333	0.500	0.333	0.34	0.333
Land licensing transfer	*Business-and Work-Environment-Related Factors*	1	0.500	1	2	1	1.00	1
Land licensing transfer	*Client-Related Factors*	4	3	4	5	4	3.95	4
Land licensing transfer	*Project Management Factors*	2	1	2	3	2	1.89	2
Section 2 Project-Related Factors								
Project scale	*Project payment scheme*	1	0.500	1	2	1	1.00	1
Project scale	*Project Capital Composition*	0.333	0.250	0.333	0.500	0.333	0.34	0.333
Project scale	*Approval of Payment of Performance Bonus*	2	1	2	3	2	1.89	2
Project payment scheme	*Project Capital Composition*	0.5	0.333	0.5	1	0.5	0.53	0.5
Project payment scheme	*Approval of Payment of Performance Bonus*	2	1	2	3	2	1.89	2
Project Capital Composition	*Approval of Payment of Performance Bonus*	3	2	3	4	3	2.93	3
Section 3 Business-and Work-Environment-Related Factors								
Condition of the Indonesian economy	Government regulatory support	2	1	2	3	2	1.89	2

Factor		Informant					Average Score	End of Rounding
		1	2	3	4	5		
Condition of the Indonesian economy	- Fluctuations in bank interest rates & rupiah exchange rates	7	6	7	8	7	6.97	7
Condition of the Indonesian economy	- Complex Licensing Flow	6	5	6	7	6	5.97	6
Government regulatory support	- Fluctuations in bank interest rates & rupiah exchange rates	6	5	6	7	6	5.97	6
Government regulatory support	- Complex Licensing Flow	1	0.5	1	2	1	1.00	1
Fluctuations in bank interest rates & rupiah exchange rates	- Complex Licensing Flow	0.333	0.25	0.333	0.5	0.333	0.34	0.333
Section 4 Client-Related Factors								
Financial condition of the project owner	- Project owner financing scheme	9	9	9	9	9	9.00	9
Financial condition of the project owner	- Payment mechanism from project owner	9	9	9	9	9	9.00	9
Financial condition of the project owner	- Client's Approval of Payment for Performance	9	9	9	9	9	9.00	9
Project owner financing scheme	- Payment mechanism from project owner	3	2	3	4	3	2.93	3
Project owner financing scheme	- Client's Approval of Payment for Performance	4	3	4	5	4	3.95	4
Payment mechanism from project owner	- Client's Approval of Payment for Performance	1	0.5	1	2	1	1.00	1
Section 5 Project Management Factors								
Project financing arrangements	- Project Resource Allocation	1	0.5	1	2	1	1.00	1
Project financing arrangements	- Project financing accountability organizational structure	8	7	8	9	9	8.16	8
Project financing arrangements	- Vendor Appointment Decision from the Board of Directors	7	6	7	8	7	6.971	7
Project Resource Allocation	- Project financing accountability	0.2	0.167	0.2	0.25	0.2	0.202	0.2

Factor		Informant					Average Score	End of Rounding
		1	2	3	4	5		
	organizational structure							
Project Resource - Allocation	Vendor Appointment Decision from the Board of Directors	0.2	0.167	0.2	0.25	0.2	0.202	0.2
Project financing - accountability organizational structure	Vendor Appointment Decision from the Board of Directors	6	5	6	7	6	5.966	6

The rounded average score is then entered into the Expert Choice software for further analysis.

AHP Analysis on CSF PSN SPAM Regional Jatiluhur Phase 1

The research informants' assessment of the level of importance of each main factor of the CSF PSN SPAM Regional Jatiluhur Phase 1 in the questionnaire was then further processed using Expert Choice and the following results were obtained:

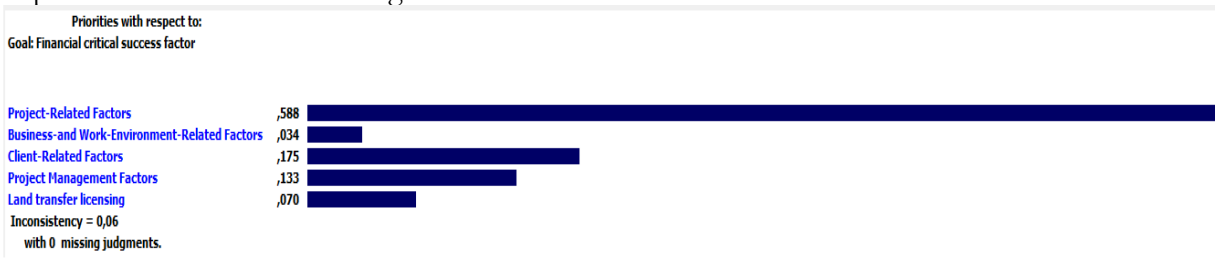

Figure 3. Results of the CSF analysis of the Jatiluhur Regional SPAM PSN Phase 1 (Researcher,2025)

Figure 3. Shows that project related factors have the highest weight (0.588), followed by client related factors (0.175), the next factor is project management factor (0.133), land transfer pricing (0.070) and finally business and work environment related factors.

The inconsistency value in AHP refers to the Consistency Ratio (CR), which is calculated to measure the extent to which subjective judgments in pairwise comparisons deviate from logical consistency (Diwandari et al., 2023). CR is obtained by dividing the Consistency Index (CI)—computed from the principal eigenvalue of the comparison matrix—by the Random Index (RI), which represents the expected inconsistency of a randomly generated matrix of the same order (Yin, 2013).

Many recent studies adopting Saaty's original guideline treat a CR threshold of 0.10 as the upper bound of acceptable inconsistency, meaning that judgments with CR ≤ 0.10 are considered sufficiently coherent for decision making (Frish et al., 2025). When CR exceeds this 0.10 threshold, researchers generally recommend revising the pairwise comparisons to reduce inconsistency and improve the robustness of the resulting priorities (Saaty, 2003). In this study, the calculated inconsistency value (CR) is 0.06, which falls within the commonly accepted range (CR ≤ 0.10), so the pairwise comparison judgments and the derived priority weights can be regarded as adequately consistent (Nazri et al., 2016)

AHP Analysis on Project-Related Factors of Jatiluhur Regional SPAM PSN Phase 1

The research informants' assessment of the level of importance of each main factor of the Project-Related Factors of the Jatiluhur Regional SPAM PSN Phase 1 in the questionnaire was then further processed using Expert Choice and the following results were obtained:

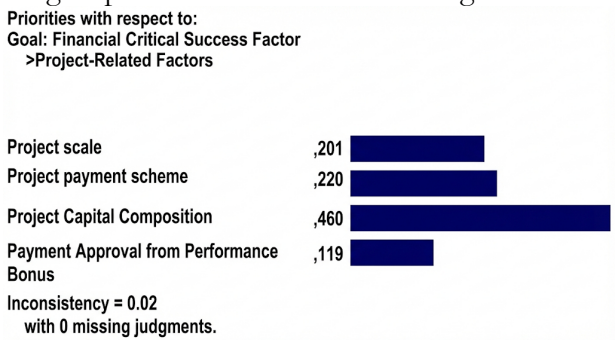

Figure 4. Results of the analysis of Project-Related Factors for the Jatiluhur Regional SPAM PSN Phase 1 (Researcher, 2025)

Research informants' assessments of the importance of each key project factor were analyzed using the Analytic Hierarchy Process (AHP) method and processed with supporting software to generate priority weights for each factor (Belay et al., 2022; Rashid et al., 2026). The analysis showed that the project's capital composition factor received the highest weighting of 0.460, thus being interpreted as the most influential factor in project success (Quang Vinh et al., 2025). The project payment scheme factor received a weighting of 0.220 and was next in importance in the priority structure, consistent with findings from other AHP studies that emphasize the role of payment mechanisms in project performance (Laininen & Hämäläinen, 2003).

Project scale received a weighting of 0.201, indicating a moderate contribution to the assessed financial objectives, while performance bonus payment approval received the lowest weighting of 0.070, thus being viewed as an additional supporting factor (Belay et al., 2022). The calculation consistency ratio (CR) of 0.02 was well below the 0.10 threshold commonly used in AHP literature, so the resulting pairwise comparison matrix and weightings were deemed consistent and acceptable for decision-making (Rashid et al., 2026).

AHP Analysis on Business and Work Environment Related Factors of Jatiluhur Regional SPAM PSN Phase 1

The research informants' assessment of the level of importance of each main factor of the Business and Work Environment related factor of the Jatiluhur Regional SPAM PSN Phase 1 in the questionnaire was then further processed using Expert Choice and the following results were obtained:

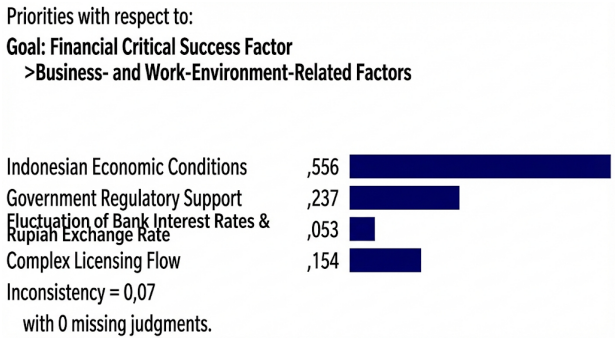

Figure 5. Results of the analysis of Business and Work Environment related factors for the Jatiluhur Regional SPAM PSN Phase 1 (Researcher, 2025)

Indonesia's economic conditions are ranked as the most important business and working environment factor determining the success of the Jatiluhur Regional SPAM PSN (SPAM) Project (PSN) Phase 1, followed by government regulatory support, licensing complexity, and interest rate and exchange rate fluctuations, with an acceptable level of inconsistency in the AHP calculations (Oxford Economic, 2025). The AHP weighting results indicate that the stability of Indonesia's economic growth, inflation, and investment climate contribute most to the success of drinking water infrastructure projects because they influence service demand, customer ability to pay, and private investor interest. Recent research on infrastructure projects and PPPs confirms that a stable macroeconomic environment is a key prerequisite for the sustainability of long-term contracts and the financial viability of drinking water projects in developing countries (Auliya et al., 2023).

The second-largest weighting points to the importance of government policy and regulatory support, including clarity around PPP schemes, tariff certainty, and contractual guarantees for businesses. Recent studies emphasize that a consistent, pro-investment regulatory framework strengthens private-sector confidence, accelerates financial closing, and reduces the risk of policy changes during the project life cycle (Adiyanti & Fathurrahman, 2021). The next factor is the complexity of the licensing process, including land acquisition, permits for raw water use, and environmental approvals, which often lead to schedule delays and cost increases. Recent literature on post-pandemic infrastructure projects indicates that simplifying licensing procedures and inter-agency coordination are critical success factors for accelerating the implementation of PPP-based drinking water projects (Rahman, 2024).

Fluctuations in bank interest rates and the rupiah exchange rate received the lowest weighting, but remain relevant because they affect financing costs, tariff structures, and the project's ability to meet long-term debt obligations. Several infrastructure finance studies have found that interest rate and exchange rate volatility can be controlled through appropriate contract design, such as tariff adjustment mechanisms, hedging, and government guarantees for some macroeconomic risks. (Yurdakul et al., 2022). An inconsistency value of 0.07 indicates that the informants' assessments are within acceptable consistency limits for AHP analysis, so the resulting factor priorities are considered sufficiently reliable as a basis for decision-making. Recent AHP research on infrastructure projects also uses a threshold of around 0.1 and confirms that values below this threshold indicate a stable respondent preference structure for formulating risk management strategies and project policies (Rolionoa et al., 2025; Sumaryana et al., 2025).

AHP Analysis on Client Related Factors of PSN SPAM Regional Jatiluhur Phase 1

The research informants' assessment of the level of importance of each main client-related factor of the Jatiluhur Regional SPAM PSN Phase 1 in the questionnaire was then further processed using Expert Choice and the following results were obtained:

Figure 6. Results of client-related factor analysis for PSN SPAM Regional Jatiluhur Phase 1 (Researcher, 2025)

AHP analysis shows that the client-related factors most crucial to the financial success of the Jatiluhur Regional SPAM PSN (SPAM) Phase 1 are the project owner's financial condition,

followed by the owner's financing scheme, payment mechanism, and performance-based payment agreement, with inconsistencies still within acceptable limits. The highest weighting of the project owner's financial condition indicates that the client's liquidity capacity, solvency, and financial track record are key prerequisites for the feasibility of project financing and PPP-based projects (Jokar et al., 2020). A recent study on drinking water PPPs also confirmed that the weak financial position of local governments or regionally-owned enterprises (BUMD) often triggers the risk of default, late payment of obligations, and declining service quality, thus investors and financial institutions place significant emphasis on assessing the client's financial health (Marin, 2009).

The financing scheme used by the project owner—for example, a combination of the state budget (APBN/APBD), availability payments, loans, and guarantee support—is crucial because it influences the project's bankability and the distribution of risk between the client and the business entity (Syugiarto, 2024). Recent literature shows that a clear and predictable financing scheme increases creditor confidence, accelerates financial closing, and reduces the likelihood of contract renegotiation midway (Addo, 2025). The next important consideration is the project owner's payment mechanism, which includes the payment schedule, calculation basis, and certainty of funding sources, which are key determinants of the stability of a business entity's cash flow (Syugiarto, 2024). Recent PPP studies show that transparent payment schemes tied to performance indicators reduce revenue risk, increase clarity for lenders, and help maintain debt service adequacy ratios at required levels (Surachman et al., 2020).

The client's payment approval factor for project performance, although the least weighted, remains crucial because it is linked to governance, monitoring systems, and the speed of the performance verification process, which directly impact payment smoothness (Auliya et al., 2023). Recent articles emphasize that objective and standardized performance assessment mechanisms—for example, through water service indicators and independent audits—can minimize disputes between clients and business entities and ensure the sustainability of long-term partnerships (Marin, 2009). The inconsistency value of 0.08 is below the 0.10 threshold commonly used in AHP-based studies, thus the informants' preference structure is considered consistent enough to be used as a basis for prioritizing client-related factors (Ally et al., 2025; Rolionoa et al., 2025). Recent research on determining PPP success and risk factors also uses a similar threshold and states that an inconsistency value below this threshold indicates sufficient expert judgment reliability to support strategic decision-making in infrastructure projects. (Tahir et al., 2024).

AHP Analysis on Project Management Factors of Jatiluhur Regional SPAM PSN Phase 1

The research informants' assessment of the level of importance of each factor in the Jatiluhur Regional SPAM PSN project management Phase 1 in the questionnaire was then further processed using Expert Choice and the following results were obtained:

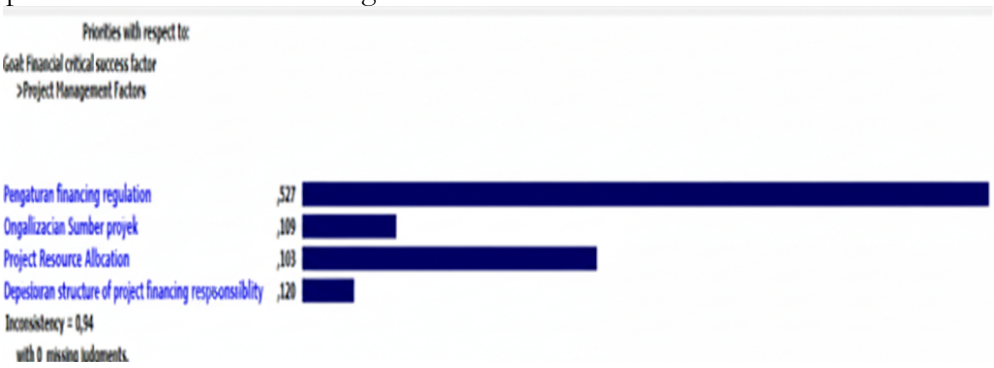

Figure 7. Results of project management factor analysis for the Jatiluhur Regional SPAM PSN Phase 1 (Researcher, 2025)

The AHP results indicate that the project financing arrangement factor received the highest weighting within the Jatiluhur Regional SPAM PSN (SPAM) project management factor group for PSN Phase 1, followed by the organizational structure for financing accountability, vendor appointment decisions by the board of directors, and finally, project resource allocation, with an inconsistency ratio still within acceptable limits. The highest weighting for project financing arrangements indicates that the design of the financing structure, including the composition of equity, debt, and government support, is a key foundation for the sustainability of high-risk infrastructure projects (Belay et al., 2022). Recent studies have shown that clear financing arrangements aligned with the project's cash flow profile can reduce capital costs and minimize (Naumenkova et al., 2020).

An organizational structure for financing accountability with clear lines of authority and transparent reporting mechanisms is the second most important factor because it influences coordination between stakeholders and the speed of financial decision-making (Getawa Ayalew et al., 2024). Project management literature confirms that establishing clear roles for finance, procurement, and technical units within the project structure helps reduce conflict, moral hazard risks, and implementation delays (Adiyanti & Fathurrahman, 2021). The vendor appointment decision by the board of directors is the next most important factor, as the quality of contractor, consultant, and supplier selection significantly determines the project's cost, quality, and time performance (Gunduz & Almuajebh, 2020). Recent studies on contractor selection indicate that criteria such as technical competence, managerial capacity, and financial strength should be prioritized in the evaluation process to minimize the risk of delays, claims, and service failures (Razi et al., 2020).

Project resource allocation—including labor, equipment, and operational budget—receives the lowest weighting, but still contributes to implementation success because it is directly linked to productivity and continuity of work in the field (Getawa Ayalew et al., 2024). AHP research on EPC and public construction project cost management shows that proper scheduling and resource allocation reduces waste, avoids critical delays, and strengthens the project's ability to stay within planned cost limits (ingle et al., 2025). An inconsistency value of 0.94 (or 0.094 when normalized) indicates a relatively high level of inconsistency, but is still acceptable if it falls below the 0.10 threshold commonly used in AHP studies for infrastructure projects (Saaty, 2003). Recent research on the application of AHP and fuzzy AHP to quality management and project success confirms that as long as the inconsistency ratio is controlled below this threshold, the resulting priority weights can still be used as a basis for strategic decision-making, with the caveat that expert judgment on the most conflicting pairs of criteria is necessary (Rashid et al., 2026).

AHP analysis on the overall CSF of the Jatiluhur Regional SPAM PSN Phase 1

The overall analysis was conducted not only on the main factors but also on the sub-factors of each main factor. The results of the analysis are as follows:

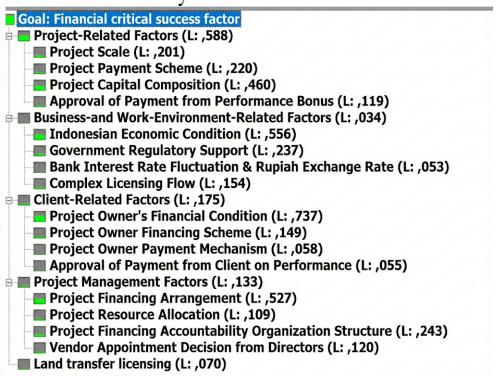

Figure 8. Results Recap of AHP analysis on the CSF of the Jatiluhur Regional SPAM PSN Phase 1 (Researcher, 2025)

The next analysis was to synthesize the calculations from all existing sub-factors to determine their priority level of importance according to the research informants. The results are as follows:

Figure 9. Results Syntesis of AHP analysis on the CSF sub-factors of the Jatiluhur Regional SPAM PSN Phase 1 (Researcher, 2025)

The CSF sub-factors in Figure 9 were then ranked. The results are as follows:

Table 2. Ranking of CSF Sub Factors

Financial aspects critical success facts	**Indicator**	**Weight**	**Rank**
Project-Related Factors	The size of the project scale	0.188	3
	Project payment scheme	0.129	4
	Project capital composition	0.270	1
	Approval of payment and performance bonus	0.070	6
Business-and Work-Environment-Related Factors	Condition of the Indonesian economy	0.190	2
	Government regulatory support	0.008	14
	Fluctuations in bank interest rates & rupiah exchange rates	0.002	16
	Complex Licensing Flow	0.005	15
Client-Related Factors	Financial condition of the project owner	0.129	4
	Financing scheme offered by the project owner	0.026	9
	Payment mechanism from project owner	0.010	12
	Determination of Payment from Client for Performance	0.010	12
Project Management Factors	Project financing arrangements	0.070	6
	Project Resource Allocation	0.015	11
	Project financing accountability organizational structure	0.032	8
	Vendor appointment decision from the board of directors	0.016	10

Source: (Researcher, 2025)

Table 2 shows that the project's capital composition, ranked first with a weighting of 0.270, reflects the informants' emphasis on a funding structure capable of maintaining profitability and sustainable cash flows throughout the project's lifespan. Main factors from AHP analysis show Business-and Work-Environment-Related Factors as lowest priority overall, implying informants view them as less differentiating for success compared to project intrinsics like funding. Its sub-indicator "Condition of the Indonesian economy" still secures 2nd place overall (0.190 weight), highlighting macroeconomic stability's outsized role despite the category's low aggregate. Other sub-indicators (e.g., Government regulatory support at 0.008, rank 14) drag the category down

This contrast means the category ranks low among the main factors because most sub-indicators (licensing flow, interest fluctuations) have low weights (0.002–0.008), which are seen as mitigable via PSN policies. However, its strongest indicator punches above its weight, ranking 2nd globally, signaling that while business environment risks are acknowledged, national economic conditions uniquely drive investor confidence and demand for Indonesian infrastructure PPPs. Prioritizing macro-stability within this underweighted group thus amplifies project viability without overhauling the full category.

This aligns with the literature, which considers capital structure decisions as a key CSF for high-risk infrastructure projects (Naumenkova et al., 2020; Oxford Economics, 2025). Indonesia's economic condition, ranked second with a weighting of 0.190, confirms the findings of PPP macroeconomic studies that stable growth, inflation, and the country's fiscal capacity are prerequisites for private investment in large-scale water supply and sanitation projects (Rahman, 2024; Yurdakul et al., 2022).

The large project scale, with a weighting of 0.188, and the project payment scheme and the project owner's financial condition, each with a weighting of 0.129, indicate that the investment size and return pattern must be analyzed through a rigorous financial feasibility study using NPV, IRR, ROI, and payback period indicators, as emphasized in business feasibility literature. (Gundes et al., 2019). The presence of Approval of Payment and Performance Bonus factors and various financing arrangements (project financing arrangements, financing schemes, accountability structures, and vendor appointments) with medium to low weights indicates that contract governance, partner selection, and incentive design are seen as important enablers, although not as dominant as aspects of capital structure and macroeconomic context, which is in line with CSF findings on drinking water PPP projects and other construction projects that place financial and macroenvironmental factors as the main determinants before managerial and contractual factors. (Adiyanti & Fathurrahman, 2021; Gunduz & Almuajebh, 2020; Surachman et al., 2020).

The very small weight placed on government regulatory support, complex licensing processes, and fluctuations in interest rates and the rupiah exchange rate (≤0.008) does not imply that these factors are unimportant. Rather, it can be interpreted as an assumption that macroeconomic and regulatory risks have been partially "internalized" through the National Strategic Project (PSN) policy and the national PPP framework, as highlighted in the Jatiluhur infrastructure and SPAM policy study, which emphasized the central government's role in reducing licensing barriers and providing fiscal guarantees. (Limanseto, 2023; Yahya, 2020). This weighting pattern is consistent with the definition of CSFs as key areas that, if well managed, significantly increase the chances of project success. In the context of the Jatiluhur Regional SPAM Phase 1 project, project-related factors—particularly capital composition, investment scale, and national economic conditions—are the main pillars of financial success, compared to client factors, project management, and the narrow business environment. (Belay et al., 2022; Maghsoodi & Khalilzadeh, 2018).

These findings offer actionable insights for similar infrastructure projects, particularly PPP-based water supply systems in Indonesia. By prioritizing capital composition and macroeconomic stability over less influential business environment factors, project teams can streamline decision-making, allocate resources to high-impact financial structures, and mitigate risks through targeted policy advocacy. This approach enhances financial viability, accelerates implementation, and

supports sustainable outcomes across other PSN initiatives, such as regional SPAM expansions or inter-provincial utilities.

Conclusion

The results of the analysis of *the financial critical success factor* description of the Jatiluhur Regional PSN SPAM Project Management Phase 1 show that project related factors have the highest weight (0.588), followed by client related factors (0.175), the next factor is the project management factor (0.133), land transfer pricing (0.070) and the last is business and work environment related factors. The ranking of the weight of the sub-factors of *the financial critical success factor* of the Jatiluhur Regional PSN SPAM Project Management Phase 1, which is the most dominant, shows that the sub-factor of the project capital composition ranks first in the level of importance of the CSF sub-factors of the Jatiluhur Regional PSN PAM System Phase 1 as a whole, with a weight of 0.270 (27%).

Future research could use other methods to examine the results of different methods. It is also hoped that in future research, the informants can be added and refined. The informants can also be reviewed, and those with greater expertise in PSN SPAM can be sought. Future research could include variables from expert interviews conducted using the Delphi method.

References

Addo, K. A. (2025). *Demand for Guarantees and Investments in Africa Infrastructure*. University of Reading.

Adiyanti, N. P., & Fathurrahman, R. (2021). Assessing Critical Success Factors for PPP Water Project in Indonesia: Lessons from West Semarang. *Policy & Governance Review*, *5*(2), 164. https://doi.org/10.30589/pgr.v5i2.372

Ally, O. J., Kulindwa, Y. J., & Mataba, L. (2025). Financial technology and credit risk management: the case of non-performing loans in Tanzanian banks. *Cogent Economics & Finance*, *13*(1). https://doi.org/10.1080/23322039.2025.2459188

Auliya, R. R., Nurkholis, N., & Sabirin, M. T. (2023). Public-private partnership water supply project in Indonesia. *International Journal of Business, Economics & Management*, *6*(2), 214–222. https://doi.org/10.21744/ijbem.v6n2.2150

Bappenas (2025) *Public Private Partnership 2025: Infrastructure Project Plan in Indonesia*, Jakarta: Bappenas Republik Indonesia

Belay, S., Goedert, J., Woldesenbet, A., & Rokooei, S. (2022). AHP based multi criteria decision analysis of success factors to enhance decision making in infrastructure construction projects. *Cogent Engineering*, *9*(1). https://doi.org/10.1080/23311916.2022.2043996

Datta, S. D., Sobuz, Md. H. R., Nafe Assafi, M., Sutan, N. M., Islam, Md. N., Mannan, M. B., Akid, A. S. M., & Hasan, N. Md. S. (2023). Critical project management success factors analysis for the construction industry of Bangladesh. *International Journal of Building Pathology and Adaptation*. https://doi.org/10.1108/IJBPA-01-2022-0006

Diwandari, S., Sela, E. I., Syahputra, B. E., Parama, N. A., & Septiarini, A. (2023). The Utility of Decision Tree and Analytics Hierarchy Process in Prioritizing of Social Aid Distribution due to Covid-19 Pandemic in Indonesia. *Journal of ICT Research and Applications*, *17*(1), 82–98. https://doi.org/10.5614/itbj.ict.res.appl.2023.17.1.6

Frish, S., Talmor, I., Hadar, O., Shoshany, M., & Shapira, A. (2025). Enhancing consistency of AHP-based expert judgements: A new approach and its implementation in an interactive tool. *MethodsX*, *14*, 103341. https://doi.org/10.1016/j.mex.2025.103341

Getawa Ayalew, G., Admasu Alemneh, L., & Melkamu Ayalew, G. (2024). Exploring fuzzy AHP approaches for quality management control practices in public building construction projects. *Cogent Engineering*, *11*(1). https://doi.org/10.1080/23311916.2024.2326765

Gundes, S., Atakul, N., & Buyukyoran, F. (2019). Financial issues in construction companies: bibliometric analysis and trends. *Canadian Journal of Civil Engineering*, *46*(4), 329–337. https://doi.org/10.1139/cjce-2018-0249

Gunduz, M., & Almuajebh, M. (2020). Critical Success Factors for Sustainable Construction Project Management. *Sustainability*, *12*(5), 1990. https://doi.org/10.3390/su12051990

Ihsan. (2023). The Analysis Of The Effect Of Indirect Costs On The Performance Of Construction Project Implementation. *Jurnal PenSil*, *12*(1), 100–119. https://doi.org/10.21009/jpensil.v12i1.30978

ingle, P. V., Adamu, M., Raut, A., Alyaseen, A., & Ahmed, O. S. (2025). A multi-criteria decision analytics approach for project delivery system selection in housing projects. *Decision Analytics Journal*, *17*, 100651. https://doi.org/10.1016/j.dajour.2025.100651

Jokar, E., Nejad, A., & Lork, A. (2020). Risk prioritization and selection of contractor participating in Public-Private Partnership (PPP) infrastructure project using Hybrid Fuzzy AHP and Fuzzy TOPSIS (Case Study: Saveh-Salafchegan Freeway Project). *Journal of Construction Engineering, Management & Innovation*, *3*(1), 1–16. https://doi.org/10.31462/jcemi.2020.01001016

Laia, V. A., & Susetyo, B. (2024). Analysis Of The Influence Of Internal Factors On Project Performance In Low-Rise Commercial Building Construction Projects In Tangerang. *Jurnal PenSil*, *13*(2), 233–243. https://doi.org/10.21009/jpensil.v13i2.44021

Laininen, P., & Hämäläinen, R. P. (2003). Analyzing AHP-matrices by regression. *European Journal of Operational Research*, *148*(3), 514–524. https://doi.org/10.1016/S0377-2217(02)00430-7

Limanseto, H. (2023). Libatkan Seluruh Pemangku Kepentingan, Pemerintah Wujudkan Proyek Strategis Nasional yang Miliki Manfaat Besar dan Berdampak Luas. In *Siaran Pers Kementerian Koordinator Bidang Perekonomian Republik Indonesia HM.4.6/380/SET.M.EKON.3/10/2023*.

Maghsoodi, A. I., & Khalilzadeh, M. (2018). Identification and Evaluation of Construction Projects' Critical Success Factors Employing Fuzzy-TOPSIS Approach. *KSCE Journal of Civil Engineering*, *22*(5), 1593–1605. https://doi.org/10.1007/s12205-017-1970-2

Marin, P. (2009). *Public-Private Partnerships for Urban Water Utilities*. The World Bank. https://doi.org/10.1596/978-0-8213-7956-1

Marsono. (2020). *Pengunakaan Metode Analytical Hierarchy Process (AHP) dalam Penelitian*. In Media.

Naumenkova, S., Tishchenko, I., Mishchenko, S., Mishchenko, V., & Ivanov, V. (2020). Assessment and mitigation of credit risks in project financing. *Banks and Bank Systems*, *15*(1), 72–84. https://doi.org/10.21511/bbs.15(1).2020.08

Nazri, E. M., Balhuwaisl, M., & Kasim, M. M. (2016). A Pre-Evaluation Step towards a Guaranteed Consistent AHP-Based Pairwise Comparison. *Journal of Advanced Research in Social and Behavioural Sciences*, *4*(1), 73–80.

Nurlia, R., Yureana, W., & Putri, A. (2023). Study of factors affecting construction quality, cost, and time in building project using analytical hierarchy process (AHP). *E3S Web of Conferences*, *429*, 01008. https://doi.org/10.1051/e3sconf/202342901008

Oxford Economic. (2025). *Building Indonesia's future: Unblocking the pipeline of infrastructure projects*.

Quang Vinh, N., Viet Thai, N., & Thi Hoang Ha, T. (2025). A hybrid fuzzy AHP-ANN approach

for evaluating simulation models in tourism training. *Cogent Social Sciences*, *11*(1). https://doi.org/10.1080/23311886.2025.2556471

Rahman, H. Z. (2024). Risk assessment of public-private partnership water projects in Indonesia. *Journal of Infrastructure, Policy and Development*, *8*(10), 6657. https://doi.org/10.24294/jipd.v8i10.6657

Rashid, M., Abdalla, S. B., Yahia, M. W., Sukkar, A. W., Mushtaha, E., & Husein, L. M. (2026). Reassessing design priorities: Critical success factors (CSFs) and the disconnect between building design assumptions and project delivery. *Results in Engineering*, *29*, 108573. https://doi.org/10.1016/j.rineng.2025.108573

Razi, P. Z., Ramli, N. I., Ali, M. I., & Ramadhansyah, P. J. (2020). Selection of Contractor by Using Analytical Hierarchy Process (AHP). *IOP Conference Series: Materials Science and Engineering*, *712*(1), 012014. https://doi.org/10.1088/1757-899X/712/1/012014

Rehan, A., Thorpe, D., & Heravi, A. (2024). Project success factors for leadership practices and communication: challenges in the construction sector. *International Journal of Managing Projects in Business*, *17*(3), 562–590. https://doi.org/10.1108/IJMPB-12-2023-0279

Rolionoa, C. A., Maulanaa, M. A., & Savitri, Y. R. (2025). Analytic Hierarchy Process as a Determinant of Irrigation Allocation Priorities with e-Paksi Parameters. *Journal of Civil Engineering* , *40*(1).

Saaty, T. L. (2003). Decision-making with the AHP: Why is the principal eigenvector necessary. *European Journal of Operational Research*, *145*(1), 85–91. https://doi.org/10.1016/S0377-2217(02)00227-8

Silalahi, Y. I., Masthura, L., & Fahriana, N. (2023). Analisis Faktor - Faktor Penentu Keberhasilan Proyek Konstruksi Berdasarkan Mutu, Biaya dan Waktu. *Jurnal Komposit*, *7*(2), 233–240. https://doi.org/10.32832/komposit.v7i2.14240

Sugiyono. (2019). *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Alfabeta.

Sumaryana, A., Miftah, A. Z., Widianingsih, I., & Karlina, N. (2025). Turning over a new leaf: Post-Covid infrastructure development planning and financing strategies in the organizational environment of Bandung City. *Regional Science Policy & Practice*, *17*(3), 100170. https://doi.org/10.1016/j.rspp.2024.100170

Surachman, E. N., Handayani, D., Suhendra, M., & Prabowo, S. (2020). Critical Success Factors on PPP Water Project in a Developing Country: Evidence from Indonesia. *The Journal of Asian Finance, Economics and Business*, *7*(10), 1071–1080. https://doi.org/10.13106/jafeb.2020.vol7.no10.1071

Syugiarto, S. (2024). Availability Payment Based Public Private Partnerships In Indonesia. *PARADIGMA : Jurnal Administrasi Publik*, *3*(1), 52–60. https://doi.org/10.55100/paradigma.v3i1.63

Tahir, J., Atkinson, M., Tian, Z., Kassem, M., Ahmad, R., & Martinez, P. (2024). A critical analysis of public private partnership model in energy from waste projects. *Sustainable Futures*, *8*, 100240. https://doi.org/10.1016/j.sftr.2024.100240

Tripathi, K. K., & Jha, K. N. (2018). Determining Success Factors for a Construction Organization: A Structural Equation Modeling Approach. *Journal of Management in Engineering*, *34*(1). https://doi.org/10.1061/(ASCE)ME.1943-5479.0000569

Winoto, M. C., Guwinarto, K., & Limanto, S. (2023). Faktor Penyebab Dan Dampak Keterlambatan Pelaksanaan Proyek Konstruksi Menurut Kontraktor Terhadap Indikator

Performa Proyek. *Jurnal Dimensi Pratama Tenik Sipil*, *12*(1), 56–63.

Yahya, W. (2020). *Pemetaan Persoalan Pada Tata Kelola Pelaksanaan Proyek Kerjasama Pemerintah dan Badan Usaha (KPBU) SPAM Regional Jatiluhur Tahap I* [Thesis]. InstituteTeknologi Bandung.

Yin, Q. (2013). An AHP model for the evaluation of college experimental teaching quality. *Journal of Technology and Science Education*, *3*(2). https://doi.org/10.3926/jotse.66

Yurdakul, H., Kamaşak, R., & Yazar Öztürk, T. (2022). Macroeconomic drivers of Public Private Partnership (PPP) projects in low income and developing countries: A panel data analysis. *Borsa Istanbul Review*, *22*(1), 37–46. https://doi.org/10.1016/j.bir.2021.01.002