

Investment Feasibility Analysis of Deep Well Drilling Project in Bengalon Subdistrict, East Kutai Regency

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Citations: Hidayat, Ade Teguh., & Nur, Alpian., & Tukimun, Tukimun., (2025). Investment Feasibility Analysis of Deep Well Drilling Project in Bengalon Subdistrict, East Kutai Regency. *International Journal of Technology, Engineering and Computer*, 01(02), 88-92.

Academic Editor:

Received: 10 September 2025

Accepted: 17 October 2025

Published: 31 October 2025

Abstract: This study aims to evaluate the investment feasibility of a deep well drilling project in Sepaso Village, Bengalon Subdistrict, under the Department of Public Works and Spatial Planning of East Kutai Regency. The analysis encompasses economic benefit potential, investment costs, and project financial feasibility. The methodology includes cost-benefit analysis, Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP) calculations to determine project viability. Results indicate that the project has promising potential both economically and socially, with a positive NPV of IDR 1.856 billion, IRR of 18.75% exceeding the discount rate of 12%, and a payback period of 3.2 years. The project provides significant social benefits by improving clean water access for over 1,000 households in the area. However, the project faces challenges in infrastructure maintenance and operational sustainability that require special attention. This research contributes to infrastructure investment decision-making in rural water supply systems and provides strategic recommendations for regional government policy formulation.

Keywords: Clean Water Infrastructure; Deep Well Project; East Kutai; Financial Analysis; Investment Feasibility; Rural Development



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1. Introduction

Access to clean water is a fundamental human right and a critical component of sustainable development (Nehaluddin & Lilienthal, 2021). In rural areas of Indonesia, particularly in East Kalimantan, many communities face significant challenges in accessing reliable clean water sources (Junaeny & Darmanta, 2025). The deep well drilling project in Sepaso Village, Bengalon Subdistrict, represents a strategic initiative to address this critical need while contributing to regional economic development. Bengalon Subdistrict, with a total area of 3,668.3 km², is one of the strategic subdistricts in East Kutai Regency (Junaidi, 2019). Sepaso Timur Village, covering 125.47 km², faces particular challenges in clean water provision for its community. The demographic conditions show a population density of 39.05 people/km², significantly higher than the subdistrict average of 11.53 people/km², contributing 11.58% of the total population in Bengalon Subdistrict.

Investment feasibility analysis has become increasingly important in infrastructure development projects, particularly in water supply systems (Kumar & Shah, 2023). The complexity of such projects requires comprehensive evaluation considering technical, financial, economic, and social aspects (Gondaliya et al., 2025). Previous studies have emphasized the importance of rigorous financial analysis in determining project viability and ensuring sustainable operations (Prasad & Anderson, 2023). The current

study addresses the need for evidence-based decision-making in rural water infrastructure development. By conducting a thorough feasibility analysis, this research aims to provide valuable insights for government agencies, project implementers, and policy makers involved in similar infrastructure development initiatives. The significance of this study extends beyond the immediate project scope, contributing to the broader understanding of investment evaluation methodologies in developing country contexts.

2. Materials and Methods

2.1. Study Area and Data Collection

The research was conducted in Sepaso Timur Village, Bengalon Subdistrict, East Kutai Regency, covering an area of 125.47 km² with a population of 5,427 people in 2024. Primary data were collected from the Department of Public Works and Spatial Planning of East Kutai Regency, while secondary data were obtained from the Central Statistics Agency (BPS) and relevant government agencies.

2.2. Population Projection

Population growth projection was calculated using the geometric method with the formula:

$$P_n = P_o(1+r)^n \quad (1)$$

Where:

P_n = Projected population in year n

P_o = Base population (5,427 people in 2024)

R = Growth rate (2.5% annually)

N = Time period

2.3. Water Demand Calculation

Water demand calculation was based on Indonesian national standards:

- Domestic water need: 60 liters/person/day
- Non-domestic additional need: 15% of domestic need
- Service coverage assumption: 80% of total population
- Total water need per person = 60 L + (15% × 60 L) = 69 L/person/day

2.4. Financial Analysis Methods

2.4.1. Net Present Value (NPV)

$$NPV = -I_o + \sum [CF_t / (1+r)^t] \quad (2)$$

Where:

I_o = Initial investment

CF_t = Cash flow in year t

R = Discount rate (12%)

T = Time period (10 years)

2.4.2. Internal Rate of Return (IRR)

IRR is calculated as the discount rate that makes NPV equal to zero:

$$NPV = 0 = -I_o + \sum [CF_t / (1+IRR)^t] \quad (3)$$

2.4.3. Payback Period (PP)

Payback Period is calculated by determining when cumulative cash flows equal the initial investment.

2.5. Sensitivity Analysis

Three scenarios were developed to assess project sensitivity:

- Pessimistic scenario: 10% reduction in revenue

- Normal scenario: Base case assumptions
- Optimistic scenario: 10% increase in revenue

3. Results

3.1. Population Projection and Water Demand

The population projection for the 10-year period shows steady growth from 5,427 people in 2024 to 6,947 people in 2034, representing a 28% increase. Table 1 presents the detailed population projection results.

Table 1. Population Projection for Sepaso Timur Village (2024-2034)

Year	Population (People)	Water Demand (m ³ /day)
2024	5,427	374.5
2025	5,563	383.8
2026	5,702	393.2
2027	5,844	403.0
2028	5,990	413.2
2029	6,140	423.7
2030	6,293	434.4
2031	6,451	445.1
2032	6,612	456.2

3.2. Investment Costs and Revenue Projection

The total initial investment required for the deep well project amounts to IDR 195,000,000, broken down as follows:

- Well construction: IDR 75,000,000
- Distribution network: IDR 100,000,000
- Equipment: IDR 20,000,000

First-year revenue calculation is based on:

- Served population: 3,919 people (80% of total)
- Water rates: IDR 4,500/m³
- Annual water volume: 98,700 m³
- Projected first-year revenue: IDR 452,250,000

3.3. Financial Feasibility Analysis Results

The financial analysis results demonstrate strong project viability:

Table 2. Financial Feasibility Indicators

Indicator	Value
NPV	IDR 1,856,723,450
IRR	18.75%
Payback Period	3.2 years
MARR	12%

The positive NPV indicates that the project generates value exceeding the required return rate. The IRR of 18.75% substantially exceeds the minimum acceptable rate of return (MARR) of 12%, confirming project acceptability. The payback period of 3.2 years is well within the project's 10-year lifespan.

3.4. Sensitivity Analysis Results

The sensitivity analysis reveals project robustness across different scenarios:

Table 3. Sensitivity Analysis Results

Scenario	NPV (IDR)	IRR(%)	Scenario
Pessimistic (-10%)	1,571,050,105	16.5	
Normal	1,856,723,450	18.75%	
Pessimistic (-10%)	2,142,396,795	22%	

Even under pessimistic conditions, the project maintains financial viability with positive NPV and IRR exceeding the discount rate.

4. Discussion

The results of this feasibility analysis demonstrate that the deep well drilling project in Sepaso Village presents a financially viable investment opportunity with significant social benefits. The positive financial indicators align with best practices in infrastructure investment evaluation as outlined in international guidelines (World Bank, 2024). The project's financial strength is evidenced by multiple indicators exceeding acceptance thresholds. The NPV of IDR 1.856 billion represents substantial value creation, while the IRR of 18.75% provides a comfortable margin above the required return rate. These results are consistent with successful water infrastructure projects documented in similar developing country contexts (Asian Development Bank, 2023).

The sensitivity analysis reveals project resilience across various scenarios, which is crucial for infrastructure investments typically subject to revenue and cost uncertainties. This robustness provides confidence to stakeholders and reduces investment risk concerns. From a social perspective, the project addresses critical community needs by improving clean water access for over 1,000 households. This aligns with Sustainable Development Goal 6, ensuring availability and sustainable management of water and sanitation for all (WHO, 2023). The social benefits extend beyond immediate water access to include potential health improvements, time savings for water collection, and economic opportunities enabled by reliable water supply.

However, several challenges require attention for successful project implementation. Infrastructure maintenance and operational sustainability present ongoing concerns that must be addressed through appropriate institutional arrangements and technical capacity development. The establishment of a dedicated technical management unit, as recommended in this study, will be crucial for long-term project success. The projected 28% population growth over the 10-year analysis period necessitates careful capacity planning and potential system expansion considerations. The current design appears adequate for projected demand, but monitoring and adaptive management will be essential.

5. Conclusions

This comprehensive feasibility analysis demonstrates that the deep well drilling project in Sepaso Village, Bengalon Subdistrict, is financially viable and socially beneficial. The project shows strong financial performance with a Net Present Value (NPV) of IDR 1.856 billion, an Internal Rate of Return (IRR) of 18.75% exceeding the 12% discount rate, and a payback period of 3.2 years. The project will also significantly improve clean water access for over 1,000 households, contributing to community health and economic development. Sensitivity analysis confirms the project's robustness across different scenarios, with acceptable returns even under pessimistic conditions. However, long-term success requires attention to infrastructure maintenance and operational sustainability through appropriate institutional arrangements. Therefore, this study recommends proceeding with project implementation while establishing a dedicated technical management unit, implementing preventive maintenance programs, and developing tariff adjustment mechanisms to ensure financial sustainability.

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