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# Financial Feasibility Analysis in the Implementation of Modular Houses for Subsidized Housing Projects

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**A B S T R A C T**

*The housing crisis in Indonesia, especially for low-income communities (MBR), demands innovative solutions to address a backlog of over 12 million housing units. This study evaluates the financial feasibility of modular housing in subsidized housing projects using analyses of Return on Investment (ROI), Net Present Value (NPV), Internal Rate of Return (IRR), payback period, and market analysis based on demographic data and consumer preferences. The findings reveal that subsidized modular housing projects can offer competitive returns with an ROI of 150%, a positive NPV of IDR 5.45 billion, and an IRR of 34.12%. The project's payback period is estimated at 2.6 years, significantly faster than conventional construction methods. Market analysis indicates high demand for modular housing units among MBR segments, underscoring the project's relevance. The study also highlights cost-efficiency, with construction expenses reduced by up to 28.4% compared to traditional methods. The research concludes that modular housing is not only financially viable but also addresses MBR socio-economic needs through sustainable design. Strategic recommendations are provided for the government and developers to optimize modular technology as a long-term solution to Indonesia's housing crisis.*

**A R T I C L E I N F O**

## 1. INTRODUCTION

The housing crisis is one of the biggest social challenges facing many developing countries, including Indonesia. High rates of urbanization, rapid population growth, and income disparity have driven the need for adequate housing, especially for low-income communities (MBR) (Obermayr et al., n.d.; Utari, n.d.). According to a report from the Central Statistics Agency (BPS) and the Ministry of Public Works and Public Housing (PUPR), the housing backlog in Indonesia has reached more than 12 million units (Kimhur, 2024), With the majority of demand coming from the low-income segment. In this situation, the government attempts to meet demand through subsidized housing programs, but budget constraints, the inefficiency of conventional construction methods, and high costs are often the main obstacles (Jiang et al., 2023). Amidst this complexity, modular homes have emerged as a promising innovation in answering housing needs with time and cost efficiency (Golić et al., 2023; Jaiyeoba & Asojo, n.d.; Utari, n.d.).

Modular homes, built using prefabricated technology, offer a new approach to housing delivery. This technology allows home components to be manufactured in a factory, reducing on-site construction time by up to 50%, research shows (Chippagiri et al., 2022; Guo et al., 2023; Romero Quidel et al., 2023). In addition, this method is considered more cost-effective because it minimizes material waste and labor use (Minunno et al., 2018). However, despite the great potential of modular housing, its application in subsidized housing projects in Indonesia remains limited. Previous studies have focused more on technical efficiency and environmental sustainability, as demonstrated in research by (Minunno et al., 2018), which discusses the carbon emission reduction impact of modular construction. Unfortunately, the financial dimension, particularly in the context of subsidized housing for low-income people, has not been explored in depth (Bello et al., 2023; Hamza et al., 2023; Pervez et al., 2022).

This research gap becomes even more apparent when considering the specific needs of low-income families (MBR). As a group with limited purchasing power, low-income families (MBR) require housing models that are not only affordable but also supported by relevant subsidy schemes. However, research examining the financial feasibility of modular homes for subsidized housing remains very limited. Most previous studies, such as those conducted by (Bello et al., 2023; Huang et al., 2023; Romero Quidel et al., 2023), focused on the middle and upper market, assuming that modular homes have a larger profit margin in this segment. Another study by (Abdel Gelil Mohamed & Abo Eldardaa Mahmoud, 2023; Gualandri & Kuzior, 2023; Xing et al., 2023) show While the financial feasibility of modular housing relies heavily on economies of scale and mass production efficiency, it does not provide an empirical analysis of how this technology can be adapted to meet the needs of the low-income market in developing countries like Indonesia.

This study aims to fill this gap by focusing on the financial feasibility analysis of modular housing in the context of subsidized housing for low-income families in Indonesia. This study aims to evaluate the extent to which modular housing can produce a financially viable housing model, considering factors such as construction costs, construction time, and affordable selling prices (Dong et al., 2023). By providing an in-depth analysis of potential ROI, NPV, IRR, and market analysis, this study offers a comprehensive approach that is not only conceptual but also applicable. This research contribution is expected to provide strategic recommendations for policymakers and developers in providing efficient, innovative, and sustainable subsidized housing solutions for low-income families (MBR) in Indonesia (Budi Setiawan et al., 2022; Jiang et al., 2023; Lee et al., 2023; Rassanjani et al., 2023).

## 2. ANALYSIS METHOD

This study uses analytical methods to evaluate the financial feasibility of implementing modular housing in subsidized housing projects for low-income communities (MBR) in Indonesia. The analysis is conducted by calculating key indicators such as Return on Investment (ROI), Net Present Value (NPV), Internal Rate of Return (IRR), and payback period to assess project profitability and risk. Secondary data from government reports, academic publications, and the modular industry are used to calculate construction cost components, cash flow projections, and affordable housing prices. Furthermore, a market analysis is conducted to evaluate potential demand and public perception of subsidized modular housing based on demographic data, income levels, and consumer preferences. This approach provides a holistic evaluation that generates data-driven strategic recommendations for developers and policymakers.
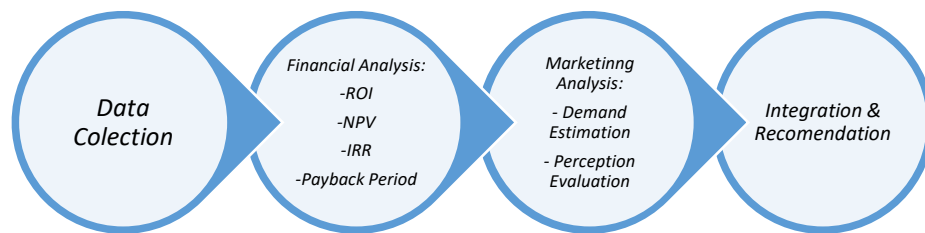


(Research Method Diagram, Source: Author 2024)

This diagram illustrates the research flow, starting from data collection, financial analysis, market analysis, to the stage of integrating results and preparing recommendations.

## 3. RESULTS AND DISCUSSION

The planned housing development is located on Jl. Kedung Arum-Cilaja, Cilaja, Kramatmulya District, Kuningan Regency, West Java 45553.



(Bird Eye Views Image, Source: Author 2024)

(Siteplan Drawing, Source: Author 2024)

The residential area is 27,760m2 with a KDB (Basic Building Coefficient) of 60% : 40%. It is planned to build a subsidized housing area using modular houses, a plot area of 60m2 with dimensions of 6 (six) x 10 (ten), the number of effective plots is 275 units and the number of floors is 1 (one) floor.

(Construction Method Image, Source: Author 2024)
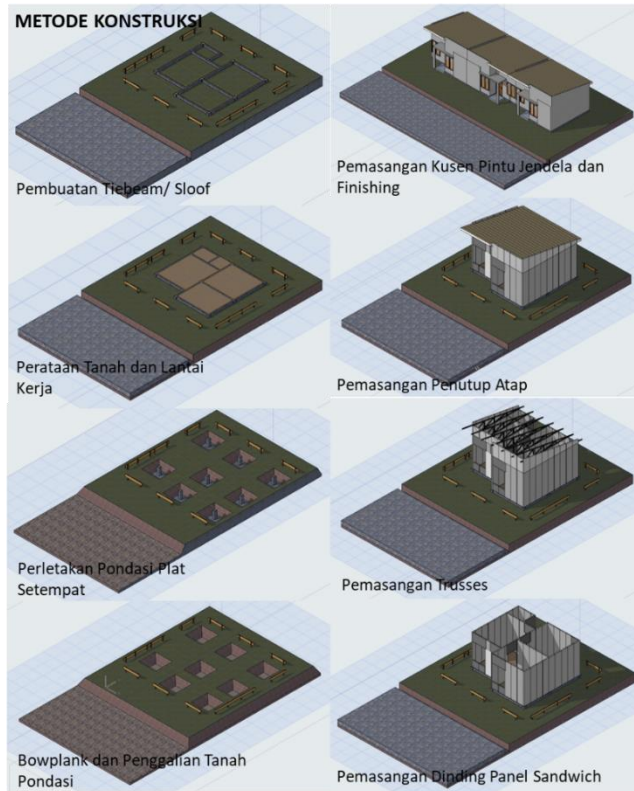
Design concept with a creative approach:

1. Idea: A house built using a modular manufacturing system, with components assembled on-site.
2. Design: A prototype house is designed to meet market and occupant needs.
3. Materials: Selection of materials for modular homes for efficiency and effectiveness.
4. Construction: Fabrication, Modularity, Rapid Installation, Lifting Equipment, Finishing Work, Lightweight Materials, Quality Control, Construction Management



(Modular Home Exterior Image, Source: Author 2024)

## 3.1.    RESEARCH RESULT

### 3.1.1.    Financial Analysis Results

- **Project Cost Estimate:**
  Calculate the total cost to build a modular home, including the cost of materials, labor, equipment, and other costs directly related to construction.

Modular House RAB Table

### REKAP RAB UNIT RUMAH MODULAR

| NO | URAIAN PEKERJAAN | VOL | SAT | HARGA | JUMLAH |
|---|---|---|---|---|---|
| 1 | PEK. PERSIAPAN | 1.00 | ls | 3,500,000.00 | 3,500,000.00 |
| 2 | PEK. GALIAN & TIMBUNAN TANAH | 1.00 | ls | 1,000,000.00 | 1,000,000.00 |
| 3 | PEK. PONDASI PRA CETAK MODULAR | 1.00 | ls | 4,500,000.00 | 4,500,000.00 |
| 4 | PEK. SLOOF PRA CETAK MODULAR | 1.00 | ls | 2,750,000.00 | 2,750,000.00 |
| 5 | PEK. DINDING PANEL MODULAR | 1.00 | ls | 23,250,000.00 | 23,250,000.00 |
| 6 | PEK. RANGKA DAN PENUTUP ATAP MODULAR | 1.00 | ls | 12,000,000.00 | 12,000,000.00 |
| 7 | PEK. PLAFON | 1.00 | ls | 4,500,000.00 | 4,500,000.00 |
| 8 | PEK. KERAMIK LANTAI DAN DINDING | 1.00 | ls | 4,000,000.00 | 4,000,000.00 |
| 9 | PEK. PINTU DAN JENDELA | 1.00 | ls | 7,500,000.00 | 7,500,000.00 |
| 10 | PEK. MEP DAN SANITARY | 1.00 | ls | 2,000,000.00 | 2,000,000.00 |
| | | | | | 65,000,000.00 |
| | Waktu Pengerjaan / Unit Rumah Modular | 21.00 | hari | | |

Analysis of the Modular Housing Construction Method Approach to build 275 units requires the following time:

1 unit: 21 days

1 worker group: 4 people/day

If 275 modular housing units take 5,775 days and 10 worker groups work together, the total time required is 577.5 days, or 19.25 months, or 1.6 years.

Modular Housing Project Expenditure Table

### PENGELUARAN PROYEK PERUMAHAN MODULAR

| NO | URAIAN PEKERJAAN | VOL | SAT | HARGA | JUMLAH |
|---|---|---|---|---|---|
| 1 | PENDIRIAN PERSEROAN TERBATAS | 1.00 | ls | 24,000,000.00 | 24,000,000.00 |
| 2 | TANAH | 27,760.00 | m2 | 328,593.59 | 9,121,758,000.00 |
| 3 | PERIZINAN - PEMERINTAH | 1.00 | ls | 795,200,000.00 | 795,200,000.00 |
| 4 | LEGALITAS TANAH - BPN | 1.00 | ls | 676,600,000.00 | 676,600,000.00 |
| 5 | PENYIAPAN KAWASAN | 27,760.00 | m2 | 50,923.09 | 1,413,625,000.00 |
| 6 | PEMBANGUNAN PRA SARANA, SARANA & UTILITAS | 27,760.00 | m2 | 63,285.93 | 1,756,817,500.00 |
| 7 | PEMBANGUNAN UNIT | 275.00 | unit | 65,000,000.00 | 17,875,000,000.00 |
| 8 | DOKUMEN PENDUKUNG | 1.00 | ls | 115,900,000.00 | 115,900,000.00 |
| 9 | MARKETING | 1.00 | ls | 1,700,720,200.00 | 1,700,720,200.00 |
| 10 | PENJUALAN KAVLING KELEBIHAN TANAH (KLT) | 1.00 | ls | 3,584,350,000.00 | 3,584,350,000.00 |
| 11 | CAPITAL EXPENDITURE (CAPEX) | 1.00 | ls | 227,200,000.00 | 227,200,000.00 |
| 12 | OPERATIONAL EXPENDITURE (OPEX) | 24.00 | Bln | 45,783,333.33 | 1,098,800,000.00 |
| 13 | PAJAK & RETRIBUSI | 1.00 | ls | 540,016,062.50 | 540,016,062.50 |
| 14 | KREDIT PERBANKAN | - | ls | | - |
| | | | | | 38,929,986,762.50 |

### PEMASUKAN PROYEK PERUMAHAN MODULAR

| NO | URAIAN PEKERJAAN | VOL | SAT | HARGA | JUMLAH |
|---|---|---|---|---|---|
| 1 | PENCAIRAN PLAFON KPR BANK | 275.00 | unit | 156,380,000.00 | 43,004,500,000.00 |
| 2 | PENCAIRAN SUBSIDI BANTUAN UANG MUKA (SBUM) | 275.00 | unit | 4,000,000.00 | 1,100,000,000.00 |
| 3 | PENERIMAAN SETORAN KONSUMEN (PROMO TERIMA KUNCI INCL. BOOKING FEE) | 275.00 | unit | 5,000,000.00 | 1,375,000,000.00 |
| 4 | PENJUALAN KAVLING KELEBIHAN TANAH (KLT) | - | /m2 | 1,500,000.00 | - |
| 5 | PENERIMAAN BIAYA KAVLING HOOK | 77.00 | unit | 2,500,000.00 | 192,500,000.00 |
| | | | | | - |
| | | | | | 45,672,000,000.00 |

Based on the table above, the modular housing project's revenue is IDR 45,672,000,000, with project expenses of IDR 38,929,986,762.

The project's profit is IDR 6,742,013,237 (Six Billion Seven Hundred Forty-Two Million Rupiah). The investment capital for this modular housing project is IDR 5 billion.

- **Return on Investment (ROI):**
  Research shows that subsidized modular housing projects have a potential ROI of 150%, reflecting investment efficiency. This figure is compared with conventional projects to assess the advantages of modular housing in terms of budget management.

- **Net Present Value (NPV) and Internal Rate of Return (IRR):**
  The NPV calculation shows a positive value of IDR 5,449,300,110, with an IRR exceeding the cost of capital by 34.12%. This indicates that the project is financially viable in the long term, and the IRR is significantly higher than the discount rate (8%), indicating that the project is highly profitable..

- **Payback Period:**
  The project payback period is estimated at around 2.6 years, which indicates a faster return on initial investment compared to conventional housing projects and the initial investment can be returned in less than 3 years, which is a fast payback period.

- **Break Even Point (BEP): 42 unit (rounded up)**
  The project requires the sale of 42 housing units to break even.

### 3.1.2. Market Analysis Results

- Potential Market Demand :
  Based on demographic data and income levels, it is estimated that there is significant annual demand for subsidized modular housing units from the low-income segment in certain urban areas. This finding supports the development of projects at a scale appropriate to market needs.

## 3.2 Discussion

### 3.2.1. Financial Feasibility Analysis

The findings indicate that subsidized modular housing projects offer competitive benefits, with ROI, NPV, and IRR above the average for conventional projects. Lower construction cost efficiency of up to 28.4% compared to traditional methods is a key factor supporting this feasibility. This discussion also covers the challenges of managing modular material logistics to maintain budget efficiency.

Modular Housing Project Income Table

| DESKRIPSI | RUMAH KONVENSIONAL | RUMAH INSTAN MODULAR | SELISIH | (%) | KETERANGAN |
|---|---|---|---|---|---|
| WAKTU | 56 hari Kerja | 21 hari Kerja | - 35 hari Kerja | 62,5% | Lebih Cepat ✓ |
| BIAYA MATERIAL | Rp. 14.576.000,- | Rp. 21.885.000,- | + Rp. 7.309.000,- | 33,39% | Lebih Mahal 🚫 |
| BIAYA TENAGA KERJA | Rp. 33.600.000,- | Rp. 12.600.000,- | - Rp. 21.000.000,- | 62,5% | Lebih Murah ✓ |
| **BIAYA MTRL & TK** | **Rp. 48.176.000,-** | **Rp. 34.485.000,-** | **- Rp. 13.691.000,-** | **28,4%** | **Lebih Murah** ✓ |

### 3.2.2.  Market Potential Analysis

Significant market demand reflects the high demand for affordable, adequate, subsidized housing among low-income families. Positive public perception demonstrates the potential for modular housing technology acceptance, which can be maximized through public education and the enhancement of modular designs to suit local needs.

### 3.2.3.  Financial and Market Integration in Project Implementation

The combination of financial and market analysis results suggests that modular housing can be a solution that is not only economically viable but also meets social needs. This discussion highlights the importance of collaboration between developers, the government, and the community to create policies that support the widespread deployment of subsidized modular housing.

## CONCLUSION

The research results show that the subsidized modular housing project is financially feasible and socially beneficial. With a total project profit of IDR 6.74 billion, a high ROI of 150%, a positive NPV of over IDR 5.44 billion, and an IRR exceeding the cost of capital by 34.12%, the project demonstrates strong investment potential. The payback period of 2.6 years and a BEP of 42 units further confirm its economic viability and faster capital recovery compared to conventional housing projects.

Market analysis indicates significant demand for affordable housing among low-income families, supported by positive public perception of modular technology. The integration of financial feasibility and market potential highlights modular housing as a cost-efficient solution that addresses both economic and social needs. Success will depend on effective coordination between developers, government, and communities to optimize policy support, logistics management, and public acceptance of modular housing technology.

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