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Original Article

Examining the Economic Feasibility of Severely Damaged Abandoned Construction Projects: A Cost Continuation Ratio Approach

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Abstract: Abandoned construction projects represent a persistent challenge in the construction sector, particularly for government-funded infrastructure, as prolonged inactivity often leads to structural deterioration and financial inefficiency. This study aims to evaluate the economic feasibility of continuing an abandoned reinforced concrete building project that has remained inactive for approximately ten years and has experienced severe structural failure exceeding 50%. The research employs a quantitative technical–economic evaluation approach using the Cost Continuation Ratio (CCR), which compares the total cost required to continue the project, including remaining construction works, structural repair and strengthening, and failure-related costs, with the replacement cost of constructing a new building with equivalent specifications. Structural condition assessment results indicate significant deterioration in primary structural elements, with an average failure rate of 56% across columns, beams, and slabs. Cost analysis shows that the total continuation cost is Rp 32,000,000,000, while the estimated replacement cost of a new building is Rp 55,000,000,000. The resulting CCR value of 0.58 places the project in the conditional feasibility category, indicating that continued project implementation may still be economically viable but involves substantial technical and financial risks. The study concludes that the CCR provides a practical, transparent decision-support tool for evaluating abandoned construction projects and can assist policymakers and project managers in making rational go/no-go decisions about project continuation.

Keywords: Abandoned Construction Projects; Cost Continuation Ratio; Economic Feasibility; Structural Deterioration; Construction Project Management.

1. Introduction

Abandoned construction projects pose a persistent challenge in the global construction industry, particularly in large-scale public infrastructure projects. Governments invest significant financial resources

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in construction projects to improve public services, expand infrastructure capacity, and stimulate economic growth. However, many of these projects experience interruptions or complete abandonment before completion. Such situations often arise due to financial instability, policy changes, delays in land acquisition, contractual disputes, weak project management practices, and poor contractor performance (Clough et al., 2015). As a consequence, unfinished buildings and infrastructure frequently remain unused for extended periods, leading to inefficient allocation of public funds and reduced societal benefits. The issue of abandoned construction projects has attracted increasing attention across academic research and professional practice due to its broad economic, environmental, and social implications. Studies have shown that abandoned projects not only represent financial losses but also contribute to urban degradation, safety risks, and environmental inefficiencies.

Yusoff et al. (2023) highlighted that abandoned construction projects are among the most common problems affecting the construction industry, particularly in developing countries. Their research identified several difficulties associated with reviving abandoned projects, including material deterioration, structural damage, architectural defects, safety concerns, internal project management issues, and mechanical system failures. These challenges demonstrate that the recovery of abandoned projects requires careful technical and managerial considerations, particularly when structural damage has progressed significantly over time. The physical condition of buildings deteriorates rapidly when construction activities are halted for prolonged periods without adequate maintenance. Environmental factors, such as moisture infiltration, temperature fluctuations, and corrosion, can significantly degrade structural materials. According to Nowogońska (2020), abandoning renovation or maintenance activities accelerates the deterioration of building elements and can ultimately threaten the structure's stability. Prolonged neglect may result in progressive damage to structural components and, in severe cases, the complete loss of structural integrity. For industrial or public buildings that remain unused for long periods, the lack of maintenance management and technical monitoring often leads to significant structural degradation and increased restoration costs.

In many cases, abandoned construction projects remain idle for extended periods, sometimes for more than a decade. When a construction project is abandoned for 10 years or more, the structural condition of the unfinished building may deteriorate substantially. Continuous exposure to environmental conditions without protective measures can cause concrete degradation, reinforcement corrosion, surface damage, and structural weakening. In difficult situations, more than half of the primary structural components, such as columns, beams, and slabs, may experience structural failure or deterioration that no longer satisfies the original design requirements. This level of structural damage significantly complicates the decision-making process on whether to continue, rehabilitate, or demolish and rebuild the project.

The decision to continue or terminate severely damaged abandoned construction projects presents a complex challenge for policymakers, engineers, and project managers. On one hand, continuing a stalled project may be considered a rational strategy to avoid wasting previous investments and to ensure that long-delayed public facilities eventually serve their intended purpose. On the other hand, extensive structural deterioration introduces substantial technical uncertainty, safety risks, and high rehabilitation costs. As Dell'Isola (2017) emphasized in value engineering studies, decision-making in construction projects often requires careful evaluation of both functional performance and cost efficiency to ensure that investments generate optimal value. However, in practice, decisions regarding abandoned projects are frequently influenced by subjective judgments, political pressures, or incomplete financial analysis rather than systematic technical and economic assessments. Economic feasibility assessment plays a crucial role in determining whether abandoned construction projects should be continued or replaced. Several studies have proposed different analytical frameworks to support feasibility evaluations in construction and redevelopment projects. Kern and Zuliani da Silva (2025), for example, developed the System of Rehabilitation Assessment and Cost Comparative (SARC) to evaluate the cost efficiency of rehabilitating abandoned buildings compared with constructing new ones. Their findings suggest that rehabilitation can often provide significant financial and environmental advantages, especially when the existing structure remains in relatively stable condition. However, the feasibility of rehabilitation becomes more uncertain when structural deterioration is severe or when repair costs approach the cost of constructing a new building.

Another important approach to economic evaluation in construction projects is life-cycle costing (LCC), which considers the total cost of a building over its operational lifespan. Calabrò et al. (2024) emphasized that life cycle costing can provide valuable insights into the long-term economic feasibility of restoration projects, particularly for historic buildings and complex structures. Nevertheless, LCC analysis often requires extensive data and detailed technical assessments, which may not always be available during the early decision-making stage of abandoned projects. As a result, project stakeholders may face difficulties in conducting comprehensive financial evaluations when structural conditions are uncertain and detailed technical information is limited. In addition to cost-estimation challenges, construction projects are increasingly characterized by high levels of uncertainty and complex stakeholder dynamics. Modern project management approaches, such as Lean Project Management, aim to improve coordination and reduce inefficiencies in complex infrastructure projects. Akter (2025) highlighted that lean management techniques—such as value stream mapping, collaborative planning, and just-in-time resource allocation—can significantly improve project performance and reduce waste. However, these management approaches are most effective when applied during active project execution. For abandoned projects with severe structural damage, the primary challenge is often determining whether the project should continue at all, rather than optimizing ongoing construction processes.

Financial evaluation techniques such as Net Present Value (NPV) analysis are also widely used to assess construction project feasibility. Kasprowicz et al. (2023) proposed a randomized NPV method that incorporates uncertainty and probabilistic risk factors into construction investment decisions. By simulating different implementation scenarios, the method enables decision-makers to estimate expected project profitability under varying conditions. While such probabilistic models provide valuable insights into financial risks, they typically require detailed financial projections and operational assumptions that may be difficult to establish in the early stages of abandoned project assessment. Beyond economic considerations, sustainability has become an increasingly important factor in redevelopment and rehabilitation decisions. Research on ecological restoration and urban redevelopment emphasizes that abandoned or degraded infrastructure can potentially be transformed into valuable assets when properly managed. Dong et al. (2024), for example, demonstrated how cost–benefit analysis can guide the prioritization of ecological restoration projects in abandoned mining areas by balancing environmental benefits and financial constraints. Similarly, Magdziarczyk et al. (2024) showed that integrating renewable energy systems into abandoned mining infrastructure can significantly reduce operational costs and support circular economy principles. These studies show that abandoned infrastructure need not always be considered a liability; in some cases, it can offer opportunities for sustainable redevelopment and resource optimization.

Urban regeneration research also emphasizes the importance of reliable financial evaluation models when redeveloping abandoned or underutilized sites. Tajani et al. (2023) proposed a modified break-even analysis model for evaluating brownfield redevelopment investments. Their study demonstrated that traditional financial models often fail to capture complex market dynamics, such as property oversupply and declining prices. By incorporating more realistic revenue assumptions, their model provides improved support for investment decisions in urban regeneration projects. These findings further underscore the importance of adopting practical, transparent economic evaluation methods when assessing the feasibility of redevelopment or project continuation. Despite the availability of various financial and technical assessment frameworks, decision-making regarding severely damaged abandoned construction projects remains highly challenging. Many existing evaluation methods are either too technically complex or require extensive data that may not be available during the early stages of project assessment. Technical structural assessments alone cannot determine whether continuing a project is economically reasonable, while comprehensive financial models may be too complicated for rapid decision-making. As Fuller and Petersen (1996) noted in life-cycle costing studies, decision-support tools must balance analytical rigor with practical usability to effectively support project planning and management.

Therefore, there is a need for a simple, transparent economic indicator to support early-stage decision-making for abandoned construction projects with severe structural deterioration. Such an indicator should enable policymakers, engineers, and project managers to quickly determine whether continuing a project is economically justified relative to demolition and reconstruction alternatives. To address this need, the present study uses the Cost Continuation Ratio (CCR) as a practical economic indicator to evaluate the feasibility of continuing abandoned construction projects. The Cost Continuation Ratio compares the total cost required to continue a stalled construction project, including repair, strengthening, partial demolition, and failure-related costs, with the replacement cost of constructing a new building with equivalent functionality and specifications. By expressing these costs as a ratio, the CCR provides a clear, objective indicator for evaluating whether a project is economically viable. This approach is particularly relevant for government-owned buildings that have been abandoned for long periods and have experienced severe structural damage. By focusing on the application of the Cost Continuation Ratio, this study aims to contribute to the development of a practical decision-support framework for evaluating abandoned construction projects. The proposed approach offers a transparent and technically defensible method for assessing whether continuing a severely damaged project is economically justified, thereby supporting more rational and accountable decision-making in public infrastructure management.

2. Literature Review

Abandoned and deteriorated construction projects represent a significant challenge for the construction industry, urban development, and sustainable economic growth. Such projects often result in financial losses, inefficient resource allocation, and negative social and environmental consequences. Understanding the causes, impacts, and potential recovery strategies for abandoned projects is therefore essential to improving the feasibility of construction projects and decision-making processes. Previous studies have examined this issue from various perspectives, including project management challenges, building degradation, cost estimation methods, economic feasibility evaluation, and sustainability considerations. One of the primary concerns in abandoned construction projects is the complexity involved in reviving stalled developments. According to Yusoff et al. (2023), abandoned construction projects are a recurring issue in the construction sector, particularly in developing countries, where project planning, financial instability, and management inefficiencies contribute to project discontinuation. Their study identified several major difficulties in reviving abandoned projects, including structural damage, material deterioration, architectural defects, safety issues, internal management challenges, and mechanical system failures. These problems highlight that project revival requires not only technical repair but also strategic planning and financial evaluation to ensure the project's continued feasibility.

The consequences of neglecting building maintenance and renovation further emphasize the importance of early intervention in construction projects. Nowogońska (2020) demonstrated that abandoning renovation works accelerates structural degradation and increases the risk of building failure. The study emphasized that prolonged neglect could lead to progressive deterioration of structural components and, in extreme cases, complete destruction of the building. This finding suggests that delayed decision-making in construction rehabilitation may significantly increase restoration costs and technical complexity. Therefore, evaluating the feasibility of continuing the project at an early stage is a critical factor in preventing further losses. In response to increasing complexity in construction projects, modern project management approaches have been proposed to improve efficiency and coordination among stakeholders. Akter (2025) highlighted the potential of Lean Project Management (LPM) in addressing inefficiencies in civil engineering projects. By emphasizing waste reduction, value optimization, and collaborative planning, lean management techniques such as value stream mapping and the Last Planner System can enhance project performance. The integration of digital technologies such as Building Information Modeling (BIM), artificial intelligence, and multi-criteria decision analysis can further support decision-making among multiple stakeholders. These approaches suggest that effective project recovery strategies must incorporate not only financial evaluation but also efficient management frameworks that reduce uncertainty and improve coordination among project participants.

Economic feasibility analysis plays a central role in determining whether abandoned or deteriorated buildings should be rehabilitated or replaced. Kern and Zuliani da Silva (2025) developed the System of Rehabilitation Assessment and Cost Comparative (SARC) to support decision-making in building rehabilitation projects. Their framework evaluates the physical condition of abandoned buildings and compares the cost of rehabilitation with the cost of constructing new buildings. The findings demonstrate that rehabilitation can often provide substantial financial and environmental advantages, with significantly lower costs and reduced construction waste compared to new construction. Such results highlight the importance of systematic cost-evaluation methods for determining the most economically viable recovery strategies. Similarly, Calabrò et al. (2024) emphasized the role of Life Cycle Costing (LCC) in evaluating restoration projects, particularly for historic buildings. Their research indicated that many traditional cost estimation tools fail to deliver reliable results during the early feasibility stage due to limited information about structural conditions. Integrating structural monitoring technologies, such as automated monitoring systems and drone-based inspections, can improve cost estimation accuracy and better identify structural risks. This approach suggests that combining technical monitoring with financial evaluation methods can significantly enhance feasibility assessment in rehabilitation projects.

Financial evaluation techniques are also crucial for assessing the efficiency and risk associated with construction investments. Kasprowicz et al. (2023) proposed a randomized method for estimating the Net Present Value (NPV) of construction projects. Unlike traditional deterministic models, their method incorporates probabilistic analysis to simulate uncertain project conditions. By estimating expected revenue, costs, and profit under varying scenarios, the model provides a more realistic assessment of project profitability. This probabilistic approach enables decision-makers to assess the risks of continuing the project and determine whether the expected financial returns justify further investment. In addition to economic considerations, sustainability has become an important factor in evaluating redevelopment and restoration projects. Dong et al. (2024) demonstrated how cost–benefit analysis can be applied to prioritize ecological restoration of abandoned lands. Their integrated framework combined ecosystem service evaluation, spatial analysis, and financial cost estimation to identify restoration priorities under limited financial resources. The study illustrates that economic feasibility assessment must increasingly consider environmental benefits and long-term sustainability impacts when allocating resources for rehabilitation projects.

The concept of sustainable redevelopment is also reflected in research on the revitalization of post-industrial infrastructure. Magdziarczyk et al. (2024) explored the use of renewable energy technologies in abandoned mining infrastructure to reduce operational costs and carbon emissions. By integrating photovoltaic systems and hydrogen energy storage, abandoned facilities can be transformed into sustainable energy systems that support circular economy principles. This perspective highlights that redevelopment projects may generate additional economic value when environmental and energy innovations are incorporated into rehabilitation strategies. Furthermore, urban regeneration studies emphasize the importance of accurate financial models for redevelopment initiatives. Tajani et al. (2023) proposed an evaluation model based on a modified break-even analysis to assess the financial feasibility of brownfield redevelopment projects. Unlike traditional break-even models that assume linear revenue growth, their framework accounts for non-linear market conditions such as property oversupply and declining unit prices. By incorporating realistic market dynamics into feasibility analysis, the model enables investors and policymakers to make more reliable decisions regarding redevelopment investments.

Thus, the existing literature demonstrates that evaluating the feasibility of abandoned or deteriorated construction projects requires a comprehensive approach that integrates technical, financial, and sustainability considerations. Studies on project recovery highlight the challenges posed by structural degradation and management complexity, while economic evaluation models emphasize the importance of cost estimation, life-cycle analysis, and risk assessment. At the same time, sustainability-oriented research shows that rehabilitation projects can generate environmental and social benefits when supported by innovative technologies and strategic planning. Despite these advances, there remains a need for practical, efficient evaluation methods to support early-stage decision-making for severely damaged abandoned construction projects. Many existing models focus on either technical assessment or financial evaluation separately, creating a gap in integrated feasibility frameworks. Therefore, developing a method, such as the Cost Continuation Ratio, to assess whether project continuation is economically justified may improve investment decisions and minimize financial losses from abandoned construction projects.

3. Materials and Methods

This study adopts a quantitative technical–economic evaluation approach to assess the feasibility of continuing an abandoned government building project that has remained inactive for approximately ten years and has experienced structural failure exceeding 50%. The proposed methodology is intended to support early-stage decision-making, particularly when policymakers and project managers must determine whether an abandoned project should be continued, rehabilitated, or replaced. The analysis focuses primarily on economic feasibility, using a comparative cost framework to determine whether completing the existing structure is more cost-effective than constructing a new building.

3.1. Study Object and Structural Condition

The object of this study is an abandoned reinforced concrete government building that has experienced significant structural deterioration due to prolonged inactivity. Based on structural inspection reports and technical assessments, more than half of the primary structural components—namely columns, beams, and slabs—are categorized as structurally failed or severely damaged. Structural failure in this context refers to a condition in which structural elements no longer satisfy minimum safety or performance requirements and therefore require major repair, strengthening, or partial demolition before further construction activities can proceed. The structural condition assessment used in this study is derived from field inspection reports conducted by technical experts. These assessments evaluate visible deterioration, structural integrity, material degradation, and load-bearing capacity of the structural elements. The classification of structural failure is based on engineering judgment and standard construction evaluation practices. However, this research does not involve detailed structural redesign, finite element modeling, or advanced structural simulation, as the objective is to provide a practical economic evaluation tool rather than a comprehensive structural engineering analysis.

3.2. Data Collection

The cost analysis relies on several sources of construction cost data. These include:

1. Technical inspection and condition assessment reports, which identify damaged structural components and the required rehabilitation measures.
2. Repair and strengthening cost estimates, prepared based on engineering recommendations for restoring structural safety.
3. Contractor unit price analyses, which provide cost estimates for construction activities such as concrete repair, structural strengthening, demolition, and finishing works.
4. Standard construction cost references, including national construction cost databases and published cost guidelines for new building construction.

All cost data collected from these sources were normalized to the same base year and currency unit to ensure comparability and consistency in the economic analysis. Cost normalization was performed by adjusting historical price data using standard construction cost indices to reflect current market conditions.

3.3. Economic Feasibility Evaluation

The economic feasibility of continuing the abandoned construction project is evaluated using the Cost Continuation Ratio (CCR). This indicator compares the total cost required to continue and complete the existing project with the replacement cost of constructing a new building with equivalent function, capacity, and performance standards. The CCR provides a simplified yet transparent economic indicator that can help decision-makers determine whether continuing the project is financially reasonable. A higher CCR value indicates that the cost of continuing the abandoned project approaches or exceeds the cost of building a new structure, suggesting that reconstruction may be a more economically viable option. The CCR is calculated using the following equation:

$$CCR = \frac{C_L + C_P + C_F}{C_B} \tag{1}$$

where:
C_L = Continuation cost, representing the cost required to complete the remaining construction work (currency unit).
C_P = Repair and structural strengthening cost, including all required rehabilitation activities to restore structural safety (currency unit).
C_F = Failure-related cost, which includes expenses associated with partial demolition, rework, material waste, debris removal, and contingency allowances for structural uncertainties (currency unit).
C_B = Replacement cost, defined as the estimated cost of constructing a new building with equivalent function, design specifications, and construction standards (currency unit).

3.4. Interpretation of the Cost Continuation Ratio

The CCR serves as a decision-support indicator for evaluating the economic feasibility of continuing an abandoned project. When the CCR value is relatively low, continuing the existing structure may be economically justified because the required rehabilitation and completion costs remain significantly lower than the cost of constructing a new building. Conversely, when the CCR approaches or exceeds unity, the economic advantage of continuing the existing project diminishes, indicating that demolition and reconstruction may represent a more rational investment decision. The use of the CCR in this study provides a practical and transparent economic assessment framework that can be applied during the preliminary evaluation stage of abandoned construction projects. By focusing on key cost components and avoiding complex financial modeling, the method allows decision-makers to rapidly evaluate economic feasibility while maintaining a reasonable level of analytical rigor. The analysis procedure involves several steps, including identifying damaged structural elements, estimating the continuation cost, repair and strengthening cost, and failure-related cost, as well as determining the replacement cost of constructing a new building. Subsequently, the Cost Continuation Ratio (CCR) is calculated, and the economic feasibility of continuing the project is assessed based on the criteria presented in Table 1. This approach provides a transparent, systematic, and technically defensible framework for evaluating abandoned construction projects that have experienced significant structural deterioration.

Table 1. Cost Component Classification

Cost Component	Description
C_L	Cost required to complete the remaining construction activities, including structural works, architectural works, and basic building utility systems.
C_P	Cost of structural repair and strengthening measures necessary to restore structural integrity, including techniques such as jacketing, grouting, and replacement of damaged elements.
C_F	Failure-related costs associated with structural deterioration, including partial demolition, reconstruction of failed elements, material waste, debris removal, and risk contingency allowances.
C_B	Total replacement cost of constructing a new building with equivalent functional requirements, design specifications, and construction standards.

The calculated CCR value is subsequently compared with predefined feasibility thresholds specifically developed for projects experiencing severe structural failure (greater than 50%). These thresholds serve as decision-support criteria to facilitate objective go/no-go determinations regarding the continuation of the abandoned project (see Table 2 and Figure 1).

Table 2. Feasibility Criteria Based on CCR

CCR Value	Economic Interpretation
CCR ≤ 0.50	The project continuation is economically feasible. The total continuation cost remains significantly lower than the replacement cost of constructing a new building.
0.50 < CCR ≤ 0.65	The project is conditionally feasible but involves significant economic and technical risks. Detailed technical assessment and careful cost control are required before continuation.
CCR > 0.65	Continuing the project is not economically feasible. Demolition and reconstruction are likely to be more economically rational options.

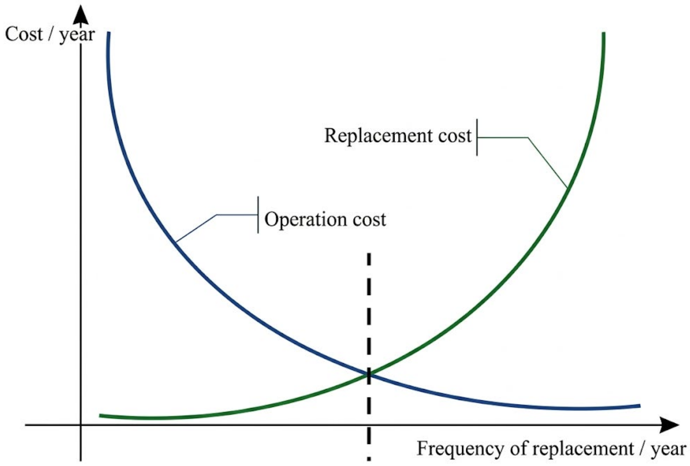

Figure 1. Core Theory Diagram

4. Results

The structural condition assessment indicates that the abandoned building has undergone severe structural deterioration, with the proportion of failed structural elements exceeding 50%. Based on visual inspections and technical evaluation reports, a considerable number of the primary load-bearing components no longer satisfy the minimum structural safety and performance requirements. Significant damage was identified in key structural elements, including columns, beams, and slabs. Consequently, substantial rehabilitation measures, such as structural repairs, strengthening interventions, and partial demolition of damaged components, would be required before construction activities could be safely resumed. Table 3 presents the detailed extent of structural failure observed in the building's main structural elements.

Table 3. Extent of Structural Failure

Structural Element	Proportion of Failed Elements (%)	Structural Condition
Columns	55	Major structural failure
Beams	60	Major structural failure
Slabs	52	Major structural failure
Average	56	Severe structural deterioration

Table 3 presents the extent of structural failure observed in the abandoned building project based on the technical inspection and structural condition assessment. The evaluation focuses on the primary load-bearing elements of the reinforced concrete structure, namely columns, beams, and slabs. These structural components are critical for maintaining the stability, load distribution, and overall integrity of the building. The assessment results indicate that a substantial proportion of these elements have deteriorated significantly after approximately 10 years of abandonment without maintenance or structural protection. The results show that 55% of the columns are classified as failed elements. Columns function as the primary vertical load-bearing members in reinforced concrete structures, transferring loads from beams and slabs to the foundation. Structural failure in more than half of the columns indicates serious concerns regarding the building's capacity to safely support loads. Damage observed in the columns may include concrete cracking, reinforcement corrosion, spalling, and loss of cross-sectional capacity. Such conditions typically require extensive structural rehabilitation measures, including concrete jacketing, reinforcement replacement, or partial reconstruction of affected components.

The assessment also reveals that 60% of the beams have experienced structural failure, representing the highest level of damage among the evaluated elements. Beams are essential horizontal structural members that transfer loads from slabs to columns. When beams deteriorate significantly, the structural system may lose its ability to distribute loads effectively, increasing the risk of localized collapse or progressive structural failure. The high percentage of beam failure suggests that the building has been exposed to long-term environmental degradation and possibly inadequate construction protection during the period of abandonment. Similarly, the inspection indicates that 52% of the slabs have failed or are severely deteriorated. Structural slabs support floor loads and transfer them to the supporting beams. Damage to slabs may involve cracking, surface degradation, reinforcement exposure, or reduced structural stiffness. When more than half of the slab elements require repair or replacement, the overall structural rehabilitation process becomes significantly more complex and costly. In many cases, slab failure also necessitates strengthening or replacement of the associated beam and column connections to restore structural continuity. The average proportion of failed structural elements is 56%, indicating that more than half of the building's primary load-bearing components have experienced structural failure. According to common structural condition classification standards, failure exceeding 50% of the major structural elements can be categorized as severe structural deterioration. This classification implies that the structure cannot be safely used or completed without substantial repair, strengthening, and partial demolition of damaged components.

From a project feasibility perspective, this level of structural damage has important economic implications. Severe structural deterioration significantly increases the cost of rehabilitation due to the need for extensive repair works, strengthening interventions, and the removal of structurally compromised elements. In addition, high levels of structural failure introduce uncertainty about the reliability of the remaining structural components, which may require additional testing, monitoring, and contingency allowances during continued project execution. Therefore, the structural condition presented in Table 3 provides a critical technical basis for the subsequent economic feasibility analysis. The high proportion of failed structural elements justifies including significant repair, strengthening, and failure-related costs in the Cost Continuation Ratio (CCR) evaluation. By quantifying the extent of structural deterioration, the study establishes a clear foundation for determining whether continuing the abandoned construction project is economically feasible when compared with constructing a new building with equivalent functional specifications.

Table 4. Cost Component Breakdown

Cost Component	Description	Estimated Cost (Rp)
C_L	Cost required to complete the remaining construction works	18,500,000,000
C_P	Cost of structural repair and strengthening of damaged elements	9,200,000,000
C_F	Failure-related costs, including partial demolition, rework, and material waste	4,300,000,000
Total Continuation Cost (C_T)	$C_L + C_P + C_F$	32,000,000,000
(C_B)	The estimated cost of constructing a new building with equivalent specifications	55,000,000,000

Table 4 presents the breakdown of cost components used to evaluate the economic feasibility of continuing the abandoned construction project. The cost analysis includes three primary components required to resume and complete the project, namely the remaining construction cost (C_L), the structural repair and strengthening cost (C_P), and the failure-related cost (C_F). These components are aggregated to determine the total continuation cost (C_T), which is then compared with the estimated replacement cost of constructing a new building (C_B). This comparative framework provides the basis for calculating the Cost

Continuation Ratio (CCR) and assessing whether continuing the project is economically viable. The first component (CL) represents the cost to complete the remaining construction works and is estimated at Rp 18,500,000,000. This cost includes all unfinished construction activities that would normally be required if the project had progressed according to its original schedule. These activities typically involve completing structural works that have not yet been executed, architectural finishing works, and installing essential building utilities such as electrical systems, plumbing, and basic mechanical components. Although these works represent standard construction tasks, the delay and abandonment of the project may introduce additional logistical and coordination challenges when construction resumes.

The second cost component (C_P) represents the cost of structural repair and strengthening, estimated at Rp 9,200,000,000. This cost arises from the severe structural deterioration identified during the structural condition assessment. Repair and strengthening activities are necessary to restore the building's structural integrity and safety before any further construction can proceed. Typical rehabilitation measures may include concrete repair, replacement of reinforcement, structural jacketing of columns and beams, epoxy injection for crack repair, and other strengthening techniques to improve load-bearing capacity. Because more than half of the primary structural elements have experienced significant damage, these repair activities constitute a substantial portion of the total continuation cost. The third component (C_F) refers to failure-related costs, which are estimated at Rp 4,300,000,000. These costs are associated with the consequences of structural deterioration and include partial demolition of severely damaged components, removal of unusable materials, reconstruction of failed elements, and management of construction waste.

In addition, this component includes contingency allowances to account for uncertainties that may arise during rehabilitation, such as hidden structural defects or additional material degradation discovered during the repair process. Failure-related costs are particularly relevant in abandoned projects because prolonged exposure to environmental conditions often results in unpredictable levels of structural damage. By combining the three cost components (CL, CP, and CF), the total continuation cost (C_T) is calculated as Rp 32,000,000,000. This value represents the estimated financial investment required to resume construction, rehabilitate the damaged structural elements, and complete the building in accordance with its original functional specifications. For comparison purposes, the replacement cost (C_B), which represents the estimated cost of constructing a new building with equivalent functional and technical specifications, is estimated at Rp 55,000,000,000. This cost reflects the full construction cost of a new structure that meets current design standards, construction practices, and performance requirements. The replacement cost includes all necessary construction activities, from foundation work to final architectural finishes and the installation of building systems.

The comparison between the total continuation cost (C_T) and the replacement cost (C_B) forms the basis for evaluating the economic feasibility of continuing the abandoned project. If the continuation cost remains significantly lower than the replacement cost, completing the existing structure may represent a more economically rational decision. However, if the continuation cost approaches or exceeds the cost of constructing a new building, demolition and reconstruction may provide a more efficient long-term solution. Therefore, the cost component breakdown presented in Table 4 provides a critical input for the subsequent calculation of the Cost Continuation Ratio (CCR), which serves as the primary economic indicator used in this study to support objective decision-making regarding the continuation of abandoned construction projects. The economic feasibility of continuing the abandoned construction project was evaluated using the Cost Continuation Ratio (CCR). This ratio compares the total cost required to continue and complete the abandoned project with the estimated cost of constructing a new building with equivalent functional specifications. The CCR is calculated using the following equation:

$$CCR = \frac{C_L + C_P + C_F}{C_B}$$

where:
C_L = cost required to complete the remaining construction works,
C_P = cost of structural repair and strengthening,
C_F = failure-related costs, including demolition, rework, and material waste,
C_B = replacement cost of constructing a new building with equivalent specifications.

Based on the cost estimates presented in Table 4, the CCR value is calculated as follows:

$$CCR = \frac{32,000,000,000}{55,000,000,000}$$

$$CCR = 0.58$$

The calculated CCR value of 0.58 indicates that the total cost to continue and rehabilitate the abandoned building is approximately 58% of the cost to construct a new building with equivalent functional specifications. This value is subsequently used to determine the project's economic feasibility classification based on predefined CCR thresholds.

Table 5. Feasibility Classification Based on Cost Continuation Ratio (CCR)

CCR Value	Feasibility Classification
CCR ≤ 0.50	Economically feasible to continue the project
CCR = 0.58	Conditionally feasible with high economic and technical risk
CCR > 0.65	Not economically feasible; demolition and reconstruction are recommended

Table 5 presents the feasibility classification of the abandoned construction project based on the calculated Cost Continuation Ratio (CCR). The CCR is used as a decision-support indicator to determine whether continuing an abandoned project is economically justified relative to constructing a new building with equivalent functional specifications. The classification thresholds shown in the table provide a structured framework for interpreting CCR values and guiding project continuation decisions. The first classification category is defined by CCR ≤ 0.50, indicating that the project's continuation is economically feasible. In this situation, the total cost required to repair, rehabilitate, and complete the abandoned structure remains substantially lower than the cost of constructing a new building. When the CCR falls within this range, continuing the existing project is generally considered the most rational economic option. Rehabilitation and completion of the structure would allow the previously invested resources to be utilized effectively while minimizing additional financial expenditures. Projects within this category typically involve moderate structural damage that can be repaired without requiring extensive demolition or major structural replacement.

The second category represents the conditional feasibility range, where the CCR falls between 0.50 and 0.65. In this study, the calculated CCR value is 0.58, placing the project within this intermediate category. A CCR value in this range suggests that continuing the project may still be economically possible; however, the decision involves significant economic and technical risk. The relatively high continuation cost indicates that repair, strengthening, and failure-related costs constitute a substantial share of a new building's replacement cost. As a result, project continuation should only be considered after careful technical evaluation and cost control measures. Additional structural inspections, risk assessments, and cost verification procedures may be required to ensure that the continuation strategy remains economically justifiable. Furthermore, project managers must consider potential uncertainties, such as hidden structural damage, additional rehabilitation requirements, and fluctuations in construction costs, which could increase the total continuation cost during project execution. The final classification category is defined by CCR > 0.65, indicating that the project's continuation is not economically feasible. When the CCR exceeds this threshold, the cost to repair and complete the abandoned structure approaches, or even exceeds, the cost of constructing a new building. In such cases, continuing the existing project would not represent an efficient use of financial resources. Instead, demolition of the deteriorated structure and the construction of a new building are typically considered the more rational economic option. Rebuilding may improve structural reliability, ensure compliance with updated construction standards, and potentially lower long-term maintenance costs.

The CCR value of 0.58 obtained in this study suggests that the abandoned building project lies within the conditional feasibility zone. Although the continuation cost remains lower than the replacement cost, the margin between the two costs is relatively narrow. This situation indicates that the economic advantage of continuing the existing structure is limited and that the decision should be approached with caution. From a policy and investment perspective, the CCR result highlights the importance of conducting additional technical evaluations and financial risk assessments before proceeding with project continuation. Overall, the feasibility classification presented in Table 5 demonstrates the usefulness of the Cost Continuation Ratio as a practical decision-making tool for evaluating abandoned construction projects with severe structural deterioration. By providing clear thresholds for interpreting economic feasibility, the CCR framework helps decision-makers balance technical considerations, financial constraints, and investment risks when determining whether a stalled construction project should be continued or replaced.

5. Discussion

The findings of this study demonstrate that the evaluated abandoned government construction project has experienced severe structural deterioration, with an average structural failure rate of 56% across major load-bearing elements. Despite this significant structural damage, the economic evaluation based on the Cost Continuation Ratio (CCR) yielded a value of 0.58, placing the project within the conditional feasibility range. This result suggests that continuing the project may still be economically viable, although the decision involves considerable financial and technical risk. The discussion of these findings is presented in relation to existing research on abandoned construction projects, economic feasibility assessment, and rehabilitation strategies. The structural condition results support previous studies indicating that prolonged abandonment of construction projects significantly accelerates structural degradation. As demonstrated by Nowogońska (2020), neglecting maintenance and repair activities can lead to progressive deterioration of structural elements, ultimately threatening the structural stability and safety of buildings. The present study confirms this observation, as more than half of the structural components—including columns, beams, and slabs—were found to require major repair or strengthening. This level of deterioration is consistent with the consequences of long-term exposure to environmental conditions without maintenance, which often results in concrete cracking, reinforcement corrosion, and loss of structural capacity.

The complexity of reviving abandoned construction projects highlighted in this study also aligns with the findings of Yusoff et al. (2023), who identified multiple technical and managerial challenges in project recovery. Their research emphasized that structural damage, material deterioration, safety concerns, and internal project management issues often complicate the restart of abandoned projects. Similarly, the present study demonstrates that structural failure exceeding 50% significantly increases the cost of rehabilitation and introduces uncertainty regarding the reliability of the remaining structural components. These factors contribute to the high economic and technical risk associated with continuing severely deteriorated projects.

From an economic perspective, the CCR result of 0.58 indicates that the total continuation cost represents approximately 58% of the replacement cost of constructing a new building. This finding suggests that the project's continuation may still offer financial advantages over demolition and reconstruction. Similar conclusions have been reported in studies examining the economic feasibility of building rehabilitation. Kern and Zuliani da Silva (2025) demonstrated that rehabilitating abandoned buildings can often be significantly more cost-efficient than constructing new buildings, particularly when structural elements remain partially usable. Their research found that rehabilitation costs may be substantially lower than new construction costs while also reducing construction waste and environmental impacts.

However, the results also indicate that the economic advantage of continuing the project is relatively limited because the continuation cost approaches a substantial proportion of the replacement cost. This finding highlights the importance of careful financial evaluation before deciding to proceed with project continuation. Tajani et al. (2023) emphasized that redevelopment projects often involve complex financial dynamics and that traditional economic evaluation models must consider realistic cost and revenue conditions when assessing project feasibility. In the case examined in this study, the CCR value falling within the conditional feasibility range suggests that continuation decisions should be supported by detailed technical and financial verification to avoid unexpected cost escalation.

The economic analysis conducted in this research also supports the broader view that systematic cost-evaluation tools are essential for construction decision-making. Dell'Isola (2017) emphasized that value engineering approaches in construction projects require careful analysis of both costs and functional performance to ensure optimal investment decisions. Similarly, Clough et al. (2015) highlighted that inadequate cost planning and project management are among the key factors contributing to construction project failure and abandonment. By introducing a simplified economic indicator such as the CCR, the present study contributes a practical tool that can assist decision-makers in evaluating the financial implications of continuing abandoned projects.

Another important consideration highlighted by this study is the role of uncertainty in the feasibility assessment of construction projects. Kasprowicz et al. (2023) argued that traditional financial evaluation methods often fail to capture the uncertainties associated with construction projects. Their randomized Net Present Value (NPV) method demonstrated that probabilistic evaluation approaches can provide more realistic assessments of project efficiency. While the CCR approach used in this study does not incorporate probabilistic modeling, it still offers a practical preliminary indicator that can guide early-stage decisions before more complex financial analysis is conducted.

Beyond economic considerations, sustainability and resource efficiency are increasingly recognized as important factors in evaluating rehabilitation and redevelopment projects. Dong et al. (2024) demonstrated that cost–benefit analysis frameworks can help prioritize restoration activities for abandoned sites while balancing environmental and economic objectives. Similarly, Magdziarczyk et al. (2024) highlighted the potential to revitalize abandoned infrastructure through innovative solutions that integrate renewable energy systems and circular-economy principles. In the context of the present study, continuing the abandoned construction project may also help reduce construction waste and minimize the environmental impacts associated with demolition and new construction.

The use of life-cycle cost considerations also provides valuable insights into the long-term implications of project continuation. Fuller and Petersen (1996) emphasized that life cycle costing is an important tool for assessing the overall economic performance of construction projects. However, life cycle cost analysis often requires extensive data and complex modeling, which may not be available during early-stage decision-making for abandoned projects. Similarly, Calabrò et al. (2024) highlighted that accurate cost estimation during the feasibility phase is challenging due to limited structural information and uncertainty regarding structural degradation. In this context, the CCR provides a simpler alternative that allows decision-makers to perform a preliminary economic assessment before undertaking more detailed financial evaluations.

Thus, this study's findings demonstrate that the Cost Continuation Ratio can serve as a practical and transparent indicator for evaluating the economic feasibility of abandoned construction projects. By comparing continuation and replacement costs, the CCR provides a clear basis for determining whether a project's continuation is economically justified. The case analyzed in this study indicates that even projects with severe structural damage may remain economically viable under certain conditions, though such decisions should be supported by careful risk management and technical verification. From a broader perspective, the study highlights the importance of integrating structural condition assessment, cost analysis, and economic feasibility evaluation when addressing abandoned construction projects. The CCR framework proposed in this research contributes to the development of practical decision-support tools that can assist policymakers, engineers, and project managers in determining the most appropriate strategy for managing stalled construction projects. Future research may further enhance this framework by incorporating risk analysis, probabilistic cost modeling, and sustainability assessment to provide a more comprehensive evaluation of recovery strategies for abandoned construction projects.

6. Conclusions

This study evaluated the economic feasibility of continuing an abandoned government construction project that has experienced severe structural deterioration after approximately ten years of inactivity. The analysis focused on the building's structural condition and the comparative cost evaluation of continuing the project and reconstructing it. The structural assessment revealed that the building has undergone significant deterioration, with an average failure rate of 56% across major structural elements, including columns, beams, and slabs. Such a level of structural damage indicates severe structural deterioration and requires substantial repair, strengthening, and partial demolition before the project can be safely resumed. Using the Cost Continuation Ratio (CCR) as the primary economic evaluation indicator, the study calculated a CCR value of 0.58, indicating that the total cost required to continue and rehabilitate the existing structure represents approximately 58% of the estimated replacement cost of constructing a new building with equivalent functional specifications. According to the feasibility classification framework used in this study, this value places the project within the conditional feasibility category, meaning that continuing the project may still be economically viable but involves considerable technical and financial risks. Therefore, project continuation should only be considered if appropriate risk management strategies, detailed structural verification, and strict cost control measures are implemented.

The findings of this research contribute to the theoretical development of economic feasibility assessment methods for abandoned construction projects. While many previous studies have focused primarily on structural evaluation or comprehensive life-cycle cost analysis, this study demonstrates the usefulness of a simplified economic indicator that integrates key cost components associated with project continuation. The proposed CCR framework provides a transparent and practical decision-support tool that can assist policymakers, engineers, and project managers in evaluating whether an abandoned project should be continued or replaced. From a theoretical perspective, this approach contributes to the broader field of construction management by introducing a cost-based feasibility indicator that supports early-stage decision-making under conditions of structural uncertainty. From a practical perspective, the study also offers important implications for public infrastructure management and policy formulation. Government-funded construction projects often involve substantial public investment, and abandoned projects can result in significant financial losses and underutilized infrastructure assets. The CCR framework provides a practical method for evaluating the economic viability of completing stalled projects and can help public authorities make more accountable, transparent decisions about project continuation or reconstruction. By applying such systematic evaluation methods, governments can reduce the risk of inefficient resource allocation and improve the management of public construction investments.

Despite its contributions, this study has several limitations that should be acknowledged. First, the analysis is based on a single case study, which may limit the generalizability of the findings to other construction projects with different structural conditions or cost structures. Second, the CCR model focuses primarily on direct construction and rehabilitation costs and does not incorporate broader economic considerations such as long-term operational costs, environmental impacts, or social benefits associated with project completion. Third, the analysis does not include probabilistic risk modeling or sensitivity analysis, which could provide deeper insights into cost uncertainties and potential cost escalation during rehabilitation works. Future research may expand on this study's findings by applying the CCR framework to multiple case studies across different project types and geographical contexts. Further studies could also integrate risk analysis, life-cycle cost evaluation, and sustainability assessment into the CCR framework to provide a more comprehensive decision-support tool for abandoned construction project management. By integrating technical, economic, and sustainability considerations, future research can help develop more effective strategies to address the growing global challenge of abandoned infrastructure projects.

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