EVALUATION OF CONTRACTOR SELECTION CRITERIA USING THE ANALYTICAL HIERARCHY PROCESS (AHP) METHOD

(Case Study of Breakwater Construction at PP Pasar Seluma, South Seluma District, Seluma Regency, Bengkulu Province)

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Abstract

The selection of contractors in public infrastructure projects plays a crucial role in determining project success, particularly in complex and high-risk projects such as breakwater construction in coastal areas. This study aims to identify relevant criteria and establish the priority order of these criteria in the contractor selection process using the Analytical Hierarchy Process (AHP) method. A quantitative approach was applied, involving nine expert respondents consisting of government officials, consultants, and project executors selected through purposive sampling. Data were collected through expert interviews, literature review, and pairwise comparison questionnaires, then analyzed using the AHP method by calculating weights, eigenvectors, and the consistency ratio (CR). The results indicate four main relevant criteria: technical capability, managerial capability, financial capability, and reputation and legality. Among these, technical capability has the highest weight of 40.4%, followed by managerial capability (38.1%), financial capability (27.0%), and reputation and legality (24.1%). All assessments are consistent with a CR value of less than 0.1. These findings suggest that contractor selection should not be solely price-oriented but must also consider technical quality and overall organizational capacity to ensure the success of strategic projects in coastal areas.

Keywords: Contractor Selection, AHP Method, Breakwater Project, Coastal Infrastructure

INTRODUCTION

Sustainable development has become a global agenda embodied in the Sustainable Development Goals (SDGs), an international agreement consisting of 17 goals and 169 targets to be achieved by 2030. The objectives of the SDGs include poverty eradication, reducing inequality, protecting the environment, and enhancing overall well-being. The Government of Indonesia, through Presidential Regulation No. 59 of 2017, demonstrates its commitment to implementing the SDGs in a participatory manner, involving various stakeholders such as government, academia, the private sector, and civil society (Sustainable Development Goals, 2017).

One of the key aspects in supporting the achievement of the SDGs is the development of resilient and sustainable infrastructure. This aligns with Goal 9 of the SDGs, which emphasizes the importance of building reliable infrastructure, supporting inclusive and sustainable industrialization, and fostering innovation. Furthermore, infrastructure also contributes to achieving Goal 11 (sustainable cities and communities) and Goal 13 (climate action). In coastal areas, the construction of breakwaters not only ensures physical stability but also supports marine ecosystem protection (Goal 14), safeguards local economic activities (Goal 8), and promotes project governance that is transparent and accountable (Goal 16).

Within this context, breakwater construction becomes one of the most critical forms of coastal infrastructure, as it functions to protect shorelines from erosion and abrasion while safeguarding ports and settlements from damage caused by ocean waves. The existence of such infrastructure guarantees the safety and long-term sustainability of coastal communities' socio-economic activities.

The phenomenon observed in the breakwater construction project at Pasar Seluma, Seluma Regency, Bengkulu Province, reflects the complexity of infrastructure development challenges in coastal regions that have high economic potential but are geographically and ecologically vulnerable. Pasar Seluma is a vital hub, functioning as a distribution center and local port that supports community trade and fisheries. However, this potential faces serious threats from natural factors, particularly high wave intensity and ongoing coastal abrasion. Damage to piers, small ports, and disrupted sea transportation routes have caused significant barriers to the distribution of goods and fishery products. Moreover, abrasion increasingly threatens residential areas, raising concerns over community safety and long-term settlement sustainability.

This situation illustrates a coastal infrastructure crisis requiring immediate and strategic intervention. Therefore, the construction of breakwaters is a crucial effort, not only as a disaster mitigation measure but also as a foundation for sustaining the socio-economic well-being of coastal communities. The project is expected to create a protective zone for essential community activities, such as fish trading, agricultural goods handling, and interregional distribution. Moreover, it supports regional development agendas based on principles of sustainability, resilience, and competitiveness.

However, the implementation of such infrastructure projects also faces another critical issue: the challenge of contractor selection. In practice, procurement processes are often conducted subjectively through direct appointment without technical competency-based selection, prioritization of the lowest bid without regard to quality, and strong personal relationships between providers and project owners. These practices risk reducing construction quality and shortening infrastructure lifespan. Consequently, projects intended as long-term strategic investments often result in suboptimal outcomes and additional maintenance or rehabilitation costs.

Thus, the breakwater project at Pasar Seluma highlights multidimensional challenges: the technical need to protect coastal areas, the economic interests of local communities, and weaknesses in public procurement systems. Therefore, evaluating contractor selection objectively and based on measurable criteria is essential to ensure functional, technical, and social sustainability.

To address these issues, a systematic and objective contractor selection evaluation method is needed, grounded in relevant criteria. The Analytical Hierarchy Process (AHP) is considered a suitable alternative because it enables weighting of multiple decision-making factors. AHP is particularly applicable in best-value procurement systems, as it proportionally considers technical, managerial, and non-price aspects (Palaneeswaran & Kumaraswamy, 2010). Suliantoro (2008) also emphasizes that AHP can provide significant and project-specific evaluations of service providers. Nevertheless, in practice, many regional procurement systems rarely apply such structured weighting methodologies, resulting in subjective and less accountable decisions.

Several studies have examined the application of AHP in contractor selection. Budiharjo (2014) at PT. DSS Serang found that quality was the dominant factor (0.539), while Pedro Sandika and Rurry Patradhiani (2019) identified price as the highest criterion (0.419) in a bridge construction project in Karangan Village. In the upstream oil and gas sector, Rifki Kurniawan et al. (2017) applied the Delphi-AHP method and highlighted the importance of safety and delivery in chemical projects. Meanwhile, Hendro et al. (2009) developed a computerized AHP-based system to evaluate contractors based on quality and quantity, and Lawalata & Almada (2018) showed the importance of technical, socio-environmental, and cost aspects in power plant rental services in Ambon.

Despite these contributions, most studies focus on large-scale private sector projects or general infrastructure, rather than coastal infrastructure in underdeveloped or disaster-prone regions like Seluma Regency. Furthermore, few studies emphasize AHP application in local government contexts, where technical capacity and human resources are limited.

Based on this background, the researcher adopts the title “Evaluation of Contractor Selection Criteria Using the Analytical Hierarchy Process (AHP): A Case Study of Breakwater Construction at PP Pasar Seluma.”he objective is to design a systematic, transparent, and criteria-based decision-making system to produce accurate contractor selection and improve overall construction project quality.

RESEARCH QUESTIONS:

1. What are the relevant criteria in selecting contractors specialized in breakwater construction for the Breakwater Project at PP

Pasar Seluma, South Seluma District, Seluma Regency, Bengkulu Province?
2. What is the priority order of contractor selection criteria in breakwater construction projects based on the Analytical Hierarchy Process (AHP) method?

LITERATURE REVIEW

Construction Projects
A project can be defined as a form of collaboration involving various resources such as labor, building materials, equipment, and costs, all managed within a specific organizational system (Hasmarita, 2023). According to the Indonesian Dictionary (KBBI), construction refers to the form or structure of a building, such as houses, bridges, and other types of structures. Construction projects can also be understood as activities implemented within a specific timeframe, carried out only once, and determined by project complexity, scale, and supporting factors (Ervianto, 2023).
Each construction project has objectives and expectations to achieve, but implementation often encounters challenges. These challenges are known as the “triple constraint,” which includes three critical aspects: quality, time, and cost (Ervianto, 2023).

Construction Management
Construction management is the discipline of studying and practicing managerial and technological aspects of the construction industry. Many scholars argue that construction management is a business asset of consulting firms to provide guidance in development projects (Samhis Setiawan, 2021).
According to Abrar (2021), construction management can be defined as a group of stakeholders performing managerial functions in the project implementation phase. Its main objective is to ensure that the construction process adheres to established technical standards and specifications. To achieve this, three key aspects must be considered: work quality, cost efficiency, and timeliness.

Contractors
A contractor is an individual or entity that undertakes work and executes it in accordance with predetermined costs, design drawings, regulations, and stipulated requirements (Ervianto, 2023).
A breakwater, also known as a wave barrier, is an infrastructure built to absorb wave energy and reduce its impact. Breakwaters are used to control coastal abrasion and calm waves in harbors, enabling ships to dock more easily and safely. Breakwaters can be classified into two types: shore-connected breakwaters and offshore breakwaters. The first type is widely used to protect harbors, while the latter is employed for shoreline erosion protection.

RESEARCH METHODOLOGY

This study focuses on evaluating contractor selection for the breakwater construction project at PP Pasar Seluma using the Analytical Hierarchy Process (AHP). The project was executed by CV. Daya Cipta Karima with a contract value of IDR 3.12 billion and supervised by CV. Dhazyma Putra Bintang with a supervision fee of IDR 225 million.
The research employed a quantitative descriptive-evaluative approach. Data were collected through literature review, observation, interviews, and questionnaires developed based on Saaty’s 1–9 scale. The study population included stakeholders involved in construction procurement, with purposive sampling used to select nine respondents consisting of consultants, project supervisors, construction managers, and experienced contractors.
Research variables were identified through stakeholder interviews, providing insights into relevant criteria for contractor selection. Data analysis was conducted using the AHP method, which included: hierarchy structuring, pairwise comparisons among criteria, calculation of priority weights (eigenvectors), consistency testing (Consistency Ratio ≤ 0.1), and synthesis to determine the best contractor alternative.

RESEARCH RESULTS

Project Overview
The breakwater construction project at Seluma Market, Seluma Regency, Bengkulu Province, is a strategic program of the Bengkulu Provincial Maritime Affairs and Fisheries Agency. This project aims to protect the coastline from the threat of abrasion and high waves originating from the Indian Ocean, while also maintaining the economic sustainability of the local community, particularly fishermen and traders who depend on the marine and fisheries sector for their livelihoods.
Seluma Market plays a vital role as a center for seafood distribution and coastal trade, making the presence of coastal protection infrastructure crucial. This project is expected to protect the coastal ecosystem and strengthen the local economy.

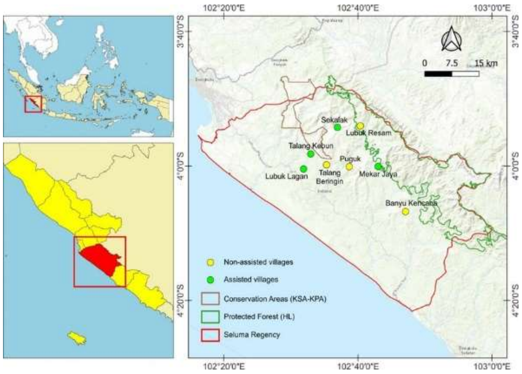

Figure 1 Project Location Map The project is located in the coastal area of Pasar Seluma, which geographically:

- Directly borders the Indian Ocean to the west.

- Adjacent to residential areas in the Lubuk Lagan, Talang Kebun, and Sekalak areas.

- Easy access due to its location on the main distribution route in the coastal area of Seluma Regency.

With its strategic location, yet prone to disasters, the construction of this breakwater is expected to reduce the risk of coastal damage, protect coastal infrastructure, and strengthen the region's resilience to climate change and natural disasters.

Identification of Criteria and Sub-Criteria

The identification of criteria and sub-criteria for contractor evaluation for the Pasar Seluma breakwater construction project was carried out through two main approaches: a literature review and expert interviews. The goal was to ensure that the selected criteria had a strong theoretical basis and were relevant to field conditions.

1. Literature Review

The literature review was conducted by reviewing regulations, project management books, and research journals related to contractor selection. Some of the primary sources used were:

a. Regulation of the Minister of Public Works and Public Housing No. 14 of 2020 concerning Standards and Guidelines for Construction Services Procurement, which stipulates that contractor selection must consider technical, financial, and legal compliance aspects.

b. PMBOK (Project Management Body of Knowledge) 6th Edition, which discusses the importance of procurement management and stakeholder management for project success.

Several research journals include:Patel et al. (2020) – *Contractor Selection Using AHP*, IRJET.

a. Kurniawan (2022) – Contractor Performance Evaluation Using AHP in Malang City, Garuda Ristekbrin.

b. Nurhalimah (2021) – Contractor Selection Using AHP, Jember University Repository.

1. Expert Interviews

Interviews were conducted with nine expert respondents directly involved in the project, consisting of:

- 2 supervising consultants.

- 1 planning consultant.

- 3 contractors.

- 3 from the Maritime Affairs and Fisheries Agency.

By combining interviews and literature, the four main criteria used in the AHP are:

Table 1. Criteria and Subcriteria for Breakwater Project Contractor Evaluation

No	Criteria	Subcriteria
1	Technical Skills Managerial Skills	Experience with similar projects
		Mastery of work methods
		Equipment availability
2	Financial Skills	Time management
		Team coordination
		Documentation and reporting
3	Reputation and Legality Technical Skills	Ability to provide initial capital
		Financial track record
		Tax compliance
4	Managerial Skills	Certifications (ISO, K3)
		Legal compliance
		Reputation of previous projects

Determining the Assessment Weighting for the Main Criteria.

After establishing the four main criteria for evaluating contractors in the breakwater construction project at the Pasar Seluma PP, the next step was to determine the assessment weighting for each criterion. This process was conducted using the Analytical Hierarchy Process (AHP) method through a questionnaire completed by expert respondents who had previously been interviewed.

Table 2: Summary of Respondents' Perceptions Regarding the **"Main Criteria"**

	RESPONDENT PERCEPTION					
	A: B	A: C	A:D	B:C	B:D	C:D
R1	1.00	0.33	1.00	1.00	2.00	2.00
R2	1.00	1.00	1.00	1.00	1.00	1.00
R3	0.50	0.50	2.00	0.33	0.33	2.00
R4	3.00	2.00	4.00	1.00	2.00	0.50
R5	1.00	0.50	1.00	3.00	0.33	1.00
R6	1.00	1.00	1.00	1.00	1.00	1.00
R7	1.00	1.00	1.00	1.00	1.00	1.00
R8	1.00	1.00	1.00	1.00	1.00	1.00
R9	2.00	2.00	2.00	5.00	3.00	3.00

Source: Data Processing Results by the Author, 2025

Description:

A : B = Comparison of Technical Capability to Managerial Capability

A : C = Comparison of Technical Capability to Financial Capability

A : D = Comparison of Technical Capability to Reputation and Legality

B : C = Comparison of Managerial Capability to Financial Capability

B : D = Comparison of Managerial Capability to Reputation and Legality

C : D = Comparison of Financial Capability to Reputation and Legality

Respondent 1's Perception:

The A : B rating is given a scale of 1, meaning Technical Capability is equally important to Managerial Capability.

A:C is scored on a 1/3 scale, meaning Financial Capability is more important than Technical Capability.

The initial matrix is as follows:

Table 3: Vector Eigenvalues

	A	**B**	**C**	**D**	number of rows	Wi	eigen vector
A	1,00	1,28	1,04	1,56	2,06	1,20	0,30
B	0,78	1,00	1,59	1,30	1,62	1,13	0,28
C	0,96	0,63	1,00	1,39	0,84	0,96	0,24
D	0,64	0,77	0,72	1,00	0,36	0,77	0,19
∑					4,87	4,06	1,00

Source: Data Processing Results by the Author, 2025

The Consistency Index (CI) is calculated as follows, where n represents the size of the matrix:

$CI = \frac{\lambda_{\text{max}} - n}{n - 1} = \frac{4.05 - 4}{4 - 1} = 0.01633$

Next, the Consistency Ratio (CR) is calculated as follows. For n = 4, the Random Index (RI) = 0.9:

$CR = \frac{CI}{RI} = \frac{0.01633}{0.9} = 0.018$

Since the Consistency Ratio (CR) value is less than 0.1, or equivalently less than 10%, the result meets the consistency requirement, which stipulates that CR must be below 0.1 (10%). Therefore, the respondents' assessments are considered logically consistent and acceptable.

The weights of the elements are obtained from the eigenvector values, expressed as percentages, as presented in the following table:

Table 4. Weighting and Priority Ranking of Criteria

Criteria	**Weight**	**Order of Priority**
Technical Capability	0,30	1
Managerial Capability	0,28	2
Financial Capability	0,24	3
Reputation and Legality	0,19	4
Number	**1,00**	**-**

Source: Data Processing Results by the Author, 2025

From the table above, the weights of each criterion using the AHP method yield the following evaluation formula (Y):

Y = (0.30 × Technical Capability) + (0.28 × Managerial Capability) + (0.24 × Financial Capability) + (0.19 × Reputation and Legality)

The weighting of contractor selection criteria for the breakwater project at PP Pasar Seluma using the AHP method shows that **Technical Capability is the top priority (30%)**, followed by Managerial Capability (28%), Financial Capability (24%), and Reputation and Legality (19%). These results emphasize that the success of the project greatly depends on technical expertise, sound management, financial support, and the contractor's credibility.

Ranking of Aspects in Each Criteria

Weighting of Technical Competency Sub-Criteria

Based on calculations using the Analytical Hierarchy Process (AHP) method, the weighting of each sub-criterion in the Technical Competency aspect is obtained through eigenvector values expressed as percentages, as shown in Table 5. The sub-criteria analyzed include:

Table 5: Weighting and Priority Order of Technical Competency Sub-Criteria

Criteria	Weight	Order of Priority
Experience in similar projects	0.404	**1**
Mastery of work methods	0.295	**3**
Equipment availability	0.301	**2**

Source: Data Processing Results by the Author, 2025

The results of the sub-criteria weighting on the Technical Capability aspect show that experience with similar projects is the most dominant factor with a weight of 0.404 (40.4%), indicating the importance of the contractor's track record in similar projects to ensure the success of the breakwater implementation. Equipment availability ranks second with a weight of 0.301 (30.1%), because adequate equipment, such as barges, cranes, and armor stone installation tools, greatly determine the effectiveness of the work. Meanwhile, mastery of work methods has a weight of 0.295 (29.5%), which although the lowest, is still important because it affects the quality of results and work safety.

Managerial Ability Sub-Criteria Assessment Weighting

The element weights in the Managerial Ability aspect are obtained from the eigenvector values processed using the Analytical Hierarchy Process (AHP) method, which are then expressed as percentages, as shown in the following table:

Table 6: Weighting and Priority Order of Managerial Ability Sub-Criteria

Criteria	Bobot	Urutan Prioritas
Time management	0.381	**1**
Team coordination	0.378	**2**
Documentation and reporting	0.241	**3**

Source: Data Processing Results by the Author, 2025

The weighting results for the sub-criteria in the Managerial Capability aspect indicate that time management has the highest weighting of 0.381 (38.1%), making it a top priority because project delays can impact costs and work quality. Team coordination is in second place with a weighting of 0.378 (37.8%), indicating its role is almost equal to time management in ensuring synergy between work units in the field. Meanwhile, documentation and reporting has a weighting of 0.241 (24.1%), which, although the lowest, remains important as a tool for project monitoring, evaluation, and transparency.

Financial Capability Sub-Criteria Assessment Weighting

Element weights are obtained from the Eigenvector values expressed as percentages, as shown in the following table:

Table 7: Weighting and Priority Order of Financial Capability Sub-Criteria

Criteria	Weight	Order of Priority
Ability to provide initial capital	0.478	**1**
Financial track record	0.270	**2**
Tax compliance	0.252	**3**

Source: Data Processing Results by the Author, 2025

The weighting results for the sub-criteria in the Financial Capability aspect indicate that the ability to provide initial capital is the most important factor, with a weighting of 0.478 (47.8%), as the availability of initial funds is crucial to ensuring the smooth running of the project without relying on payment terms or loans. Financial track record is in second place with a weighting of 0.270 (27.0%), indicating the importance of sound and accountable financial records in assessing a contractor's financial stability. Meanwhile, tax compliance has a weighting of 0.252 (25.2%), which, although the lowest, is still necessary as an indicator of a company's integrity and legal responsibility.

Reputation and Legality Sub-Criteria Assessment Weighting

Element weights are obtained from the Eigenvector values expressed as percentages, as shown in the following table:

Table 8: Weighting and Priority Order for Reputation and Legality Sub-Criteria

Criteria	**Weight**	**Priority Order**
Certification (ISO, K3)	0.375	**1**
Legal Compliance	0.340	**2**
Previous Project Reputation	0.286	**3**

Source: Data Processing Results by the Author, 2025

The weighting results for the Reputation and Legality sub-criteria indicate that certifications such as ISO and K3 have the highest weighting of 0.375 (37.5%), making them a key factor because they reflect the quality of quality management, occupational safety, and the contractor's commitment to professional standards. Legal compliance comes in second with a weighting of 0.340 (34.0%), indicating the importance of contractor integrity in complying with legal and licensing requirements. Meanwhile, reputation for previous projects has a weighting of 0.286 (28.6%), which, although the lowest, remains relevant as an indicator of contractor experience and performance.

CONCLUSION

Based on the data analysis and discussion, the following conclusions can be drawn:

1. The selection of a breakwater project contractor is determined by four main criteria. Technical capability includes experience on similar projects, work methods, and equipment availability. Managerial capability includes time management, team coordination, and documentation and reporting. Financial capability includes initial capital, financial track record, and tax compliance. Reputation and Legality reflect certification, legal compliance, and the reputation of previous projects. Literature and expert interviews demonstrate alignment and mutually reinforce these criteria as the basis for contractor selection.

2. Using the Analytical Hierarchy Process (AHP) method, the weighting and priority order of each criterion were obtained based on questionnaires completed by nine expert respondents. Technical Capability was the highest priority, with a weighting of 30%, with experience in similar projects being the primary factor assessed. Managerial Capability came in second with a weighting of 28%, emphasizing the importance of time management. Financial Capability was weighted at 24%, focusing on the availability of initial capital to support the smooth running of the project. Finally, Reputation and Legality received a weighting of 19%, which, although the lowest, remains significant as an indicator of a contractor's credibility and integrity.

RECOMMENDATIONS

Based on the research results and conclusions presented, the researcher will propose recommendations, hoping they will benefit all stakeholders. The recommendations are as follows:

1. Government/Agencies: Use the AHP method in contractor selection, focusing on quality, not just price, and create clear, data-driven selection guidelines. 2. Contractors: Improve technical capabilities, equip equipment, strengthen management and finances, and meet certification standards such as ISO and K3.

3. Future Researchers: Add sustainability and marine-friendly technology aspects to the selection model, then validate it with other projects or combine AHP with other methods such as TOPSIS.

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