

Risk Analysis of Implementation of Water Resource Construction Projects Based on Price Ratio of Offer to Owner Estimate

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Abstract

Contractor selection is a decision characterized by multiple objectives. Project owners want to minimize possible project costs but they also want contractors to be able to complete work on time and meet acceptable quality standards. The methods used in this research are Questionnaire, Microsoft Excel, and Statistical Package for the Social Science (SPSS). The purpose of this research is to identify the risks that may or may occur in the implementation of water resources construction projects based on the bid price against the owner estimate to determine the actions that must be taken to prevent and handle the risks that occur in the implementation. The results of the analysis of the 27 (twenty-seven) risk variables above, several risk variables have a high value (high risk), meaning that the risk has the potential to occur in the implementation of water resources construction projects, both at the bid price < 80% owner estimate and the bid price > 80% owner estimate.

Keywords

construction project; owner estimate; the price ratio



I. Introduction

There are several methods used to evaluate and select bidders; One of them in developed countries uses the lowest-bid method (low-bid method). Where the contractor who submits the lowest bid and meets the required technical qualifications will be the winner of the tender. The main advantage of this method is that it requires bidders to lower their costs by implementing technological and managerial innovations. Thus the project owner gets the best value for a transaction called a contract (Trickey 1982; Lingard et al. 1998).

Contractor selection is a decision characterized by multiple objectives. Project owners want to minimize possible project costs but they also want contractors to be able to complete work on time and meet acceptable quality standards. The evaluation of the lowest bidding method indicates that to win the competition, contractors compete solely on the bid price, this will potentially lead to low construction quality (Hatush et al. 1998).

Various parties assess that the government's procurement system for infrastructure projects with the lowest bidding method is the main trigger for the low quality of construction in Indonesia. In the Presidential Decree No. 16 of 1994 and earlier, the government has limited the bidding price for construction projects. The lowest bid is set at a maximum of 80% (eighty percent) of the owner estimate. However, the regulation was abolished after the issuance of Presidential Decree No. 18 of 2000 until Presidential Decree No. 80 of 2003. Therefore, in the auction, the contractors can submit the lowest possible bid price.

According to the Regulation of the Minister of Public Works of the Republic of Indonesia Number 14/PRT/M/2013 concerning Standards and Guidelines for the Procurement of Construction Works and Consulting Services that in the procurement of Construction Works, for the bid price whose value is below 80% (eighty percent) of the HPS, an evaluation must be carried out reasonableness of price so that there are no deviations that affect the scope, quality, and results/performance and are believed to be able to complete the work in accordance with the stipulated requirements.

In addition, so as not to reduce the quality of the desired construction due to increasingly higher bid price competition. So there is a link between bid price risk and construction project performance. Therefore, the author tries to identify the risks that must be taken into account in the bid price that can affect the performance of a construction project.

The aim of this research is:

1. Knowing the risks that may occur in the implementation of water resources construction projects based on the ratio of the bid price to the owner estimate.
2. Determine the actions that must be taken to prevent and handle risks that occur in the implementation of water resources construction projects based on the ratio of the bid price to the owner estimate.

II. Research Method

In this study, the research instrument used was a questionnaire. As Choudhry et al (2014) did, the questionnaire was created by examining previous studies to take risk variables that were more appropriate for the Indonesian construction industry. In addition to questionnaires, the tools used in this research are computer programs, namely Microsoft Excel and the Statistical Package for the Social Science (SPSS).

Data used in the study:

- a. Primary data
Primary data is obtained by distributing questionnaires and conducting direct interviews with project owners and supervisory consultants who are competent on the issues under study to identify possible risks.
- b. Secondary Data
Secondary data were obtained from SIRUP (General Procurement Plan Information System) and LPSE (Electronic Procurement Service).

III. Results and Discussion

3.1 Results

In this study, the risk identification is divided into 2 categories, namely the identification of project implementation risks on the bid price below 80% owner estimate and above 80% owner estimate. The researcher took the object of research, namely the water resource construction project carried out by the government in the 2017-2018 budget year in the Provinces of West Java and Central Java.

a. Respondent General Profile Data

In this case, the owner respondents are Commitment Making Officers (PPK) and Technical Controllers who have knowledge and experience in implementing hydropower dumber construction projects, while the respondents from the Supervisory Consultants are company leaders. The success of leadership is partly determined by the ability of leaders to

develop their organizational culture. (Arif, 2019). The following is the respondent's data based on education, experience, and position:

Table 1. Data for Project Respondents < 80% HPS and Projects > 80% HPS

Project	Respondent	Position	Work Experience (Years)	Last education
P1 < 80% HPS	R1	Commitment Making Officer	10	S2
P2 < 80% HPS	R2	Technical Controller	7	S1
P3 < 80% HPS	R3	Supervising consultants	5	S1
P4 < 80% HPS	R4	Commitment Making Officer	10	S2
P5 < 80% HPS	R5	Supervising consultants	10	S1
P6 > 80% HPS	R6	Technical Controller	5	S1
P7 > 80% HPS	R7	Technical Controller	5	S1
P8 > 80% HPS	R8	Supervising consultants	3	S1
P9 > 80% HPS	R9	Supervising consultants	3	S1
P10 > 80% HPS	R10	Technical Controller	3	S1

b. Project General Profile Data

Researchers took a sample of 10 projects, of which 5 were projects with a contract price below 80% HPS and 5 were projects with a contract value above 80% HPS. The following is the project data under study:

Table 2. Project data understudy

No.	Project name	Work unit	Owner Estimate/HPS	Contract value	Ratio to HPS (%)
P1	Periodic Maintenance of Cihaur. Primary Channel Inspection Road	BBWS Citanduy	IDR 1,976,720,000.00	IDR 1,476,300,000.00	74.68%
P2	Maintenance of the Citanduy . Stream	BBWS Citanduy	IDR 1.182.260.000,00	IDR 825,280.000,00	69.81%
P3	Irrigation Network Rehabilitation in Cikunten II	BBWS Citanduy	IDR 19,966,360.000,00	IDR 14,364,153,000.00	71.94%
P4	Periodic Maintenance of the Citanduy River Embankment in Wadas Jontor	BBWS Citanduy	IDR 3,673,900,000.00	IDR 2,692,000,000.00	73.27%
P5	Embankment Construction Services	Marine and Fisheries Ministry	Rp 10,335,131,313.39	Rp 7,979,797,256.57	77.21%
P6	Improvement of Channel and Left Cliff Reinforcement of Cijolang River in Kec. Dayeuhluhur Kab. Cilacap	BBWS Citanduy	IDR 6,076,560,000.00	IDR 5,455,000,000.00	89.77%
P7	Construction of Citapenlandeuh Check Dam, Kab. nice	BBWS Citanduy	IDR 2,483,180,000.00	IDR 2,190,059,000.00	88.20%
P8	Normalization of Cirapuan River Channel (Banprov)	District PUPR Office. Pangandaran	IDR 1,883,800,000.00	IDR 1,871,771,000.00	99.36%
P9	Cikembulan Irrigation Network Rehabilitation	District PUPR Office. Pangandaran	IDR 2,273,485,000.00	Rp 1,964,403,065.86	86.40%
P10	Cibeureum Irrigation Network Rehabilitation	District PUPR Office. Pangandaran	IDR 2,461,395,000.00	IDR 2,410,000,000.00	97.91%

c. Data Analysis

1. Questionnaire Validity Test

A validity test is a test step carried out on the content of a questionnaire, to measure the accuracy of the instruments used in a study (Sugiyono, 2006). The validity test aims to determine the extent of the accuracy and accuracy of a measurement instrument in carrying out its measurement function so that the data obtained is relevant / in accordance with the purpose of the measurement. According to Kusnendi (2008), the benchmark for the correlation coefficient for each item of the total variable must be 0.25 or 0.3 as the minimum limit for whether an item is valid or not. For total variable items below that value, it will be removed because it shows that the variable does not have a significant contribution.

2. Variable Valuation for Bid Price < 80 % Owner Estimate

From the survey results, an analysis of the probability (frequency) of the emergence of risks that could potentially occur in the implementation of the project and the impact (severity) of each risk was carried out if the risk occurred in the implementation of a construction project then after getting the level of frequency and impact of the risk then proceed using Probability and Impact Matrix to determine the value of each risk variable, the value is determined by multiplying the probability value and risk impact.

Table 3. Risk Assessment of Offer Price < 80% owner estimate using Probability and Impact Matrix

No.	Variabel Risiko	Total Penilaian			Klasifikasi Risiko	Rank
		Probabilitas	Dampak (Severity)	Tingkat Risiko		
X4	Kontraktor menggunakan material tidak sesuai spesifikasi	4	5	20	High Risk	1
X5	Kontraktor menggunakan material tidak sesuai yang dibutuhkan	4	5	20	High Risk	2
X3	Kontraktor mengajukan perubahan desain	4	4	16	High Risk	3
X7	Kontraktor menggunakan peralatan tua yang produktivitasnya rendah	4	4	16	High Risk	4
X9	Kontraktor tidak menyediakan jumlah peralatan sesuai kontrak	4	4	16	High Risk	5
X13	Kontraktor menggunakan tenaga kerja yang tidak berkualitas	4	4	16	High Risk	6
X14	Kontraktor tidak menempatkan tenaga ahli dilapangan	4	4	16	High Risk	7
X20	Pendanaan proyek yang kurang memadai	4	4	16	High Risk	8
X21	Tenaga kerja tidak dilengkapi dengan Alat Pelindung Diri (APD)	5	3	15	High Risk	9
X2	Kontraktor mengajukan perubahan spesifikasi	3	4	12	Medium Risk	10
X8	Kontraktor menggunakan peralatan tidak sesuai spesifikasi	3	4	12	Medium Risk	11
X10	Kontraktor mengajukan perubahan peralatan	3	4	12	Medium Risk	12
X11	Kontraktor memakai metode pelaksanaan yang tidak tepat	3	4	12	Medium Risk	13
X12	Kontraktor menggunakan operator yang tidak dapat mengoperasikan alat dengan handal	4	3	12	Medium Risk	14
X15	Kontraktor memakai supplier yang tidak kompeten	4	3	12	Medium Risk	15
X17	Kontraktor utama memakai subkontraktor yang tidak kompeten	4	3	12	Medium Risk	16
X18	Subkontraktor merekrut pekerja dibawah standar	4	3	12	Medium Risk	17
X19	Kontraktor merencanakan jadwal pekerjaan yang tidak realitis	4	3	12	Medium Risk	18
X23	Kontraktor tidak melakukan quality control	3	4	12	Medium Risk	19
X24	Kontraktor tidak memberikan pelatihan sistem manajemen mutu	4	3	12	Medium Risk	20

X24	Kontraktor tidak memberikan pelatihan sistem manajemen mutu	4	3	12	Medium Risk	20
X25	Kontraktor tidak melakukan pemeriksaan alat berat	4	3	12	Medium Risk	21
X1	Kontraktor mengajukan perubahan lingkup pekerjaan	3	3	9	Medium Risk	22
X16	Kontraktor tidak melakukan induksi dan pelatihan tenaga kerja	3	3	9	Medium Risk	23
X22	Kontraktor tidak melakukan penerapan K3 diproyek	3	3	9	Medium Risk	24
X26	Tidak adanya biaya untuk pelaksanaan sistem manajemen mutu	4	2	8	Medium Risk	25
X6	Kontraktor mengajukan perubahan jenis material	2	3	6	Low Risk	26
X27	Tidak adanya biaya overhead sewa, penerangan, pengamanan dan lainnya	3	2	6	Low Risk	27

From the results of the variable assessment, it shows that at the bid price < 80% owner estimate, 9 risks that may occur in the high-risk category include: contractors using materials that do not meet specifications, contractors using materials that are not as needed, contractors submitting design changes, contractors using equipment low productivity, contractors do not provide the amount of equipment according to the contract, contractors use unqualified labor, contractors do not place experts in the field, inadequate project funding and workers are not equipped with Personal Protective Equipment (PPE).

3. Variable Valuation for Bid Price > 80% Owner Estimate

From the survey results, a thorough analysis was carried out using the Relative Importance Index (RII) Frequency and Impact assessment scale, which is presented in table 4 as follows:

Table 4. Bid Price Risk Assessment > 80% owner estimate using Probability and Impact Matrix

No.	Variabel Risiko	Total Penilaian			Klasifikasi Risiko	Rank
		Probabilitas	Dampak (Severity)	Tingkat Risiko		
X23	Kontraktor tidak melakukan quality control	4	4	16	High Risk	1
X14	Kontraktor tidak menempatkan tenaga ahli dilapangan	5	3	15	High Risk	2
X21	Tenaga kerja tidak dilengkapi dengan Alat Pelindung Diri (APD)	5	3	15	High Risk	3
X1	Kontraktor mengajukan perubahan lingkup pekerjaan	3	4	12	Medium Risk	4
X2	Kontraktor mengajukan perubahan spesifikasi	3	4	12	Medium Risk	5
X3	Kontraktor mengajukan perubahan desain	3	4	12	Medium Risk	6
X4	Kontraktor menggunakan material tidak sesuai spesifikasi	3	4	12	Medium Risk	7
X5	Kontraktor menggunakan material tidak sesuai yang dibutuhkan	3	4	12	Medium Risk	8
X7	Kontraktor menggunakan peralatan tua yang produktivitasnya rendah	3	4	12	Medium Risk	9
X8	Kontraktor menggunakan peralatan tidak sesuai spesifikasi	3	4	12	Medium Risk	10
X9	Kontraktor tidak menyediakan jumlah peralatan sesuai kontrak	3	4	12	Medium Risk	11
X11	Kontraktor memakai metode pelaksanaan yang tidak tepat	3	4	12	Medium Risk	12
X13	Kontraktor menggunakan tenaga kerja yang tidak berkualitas	3	4	12	Medium Risk	13
X20	Pendanaan proyek yang kurang memadai	3	4	12	Medium Risk	14
X22	Kontraktor tidak melakukan penerapan K3 diproyek	4	3	12	Medium Risk	15
X24	Kontraktor tidak memberikan pelatihan sistem manajemen mutu	4	3	12	Medium Risk	16
X25	Kontraktor tidak melakukan pemeriksaan alat berat	4	3	12	Medium Risk	17

X12	Kontraktor menggunakan operator yang tidak dapat mengoperasikan alat dengan handal	3	3	9	Medium Risk	18
X15	Kontraktor memakai supplier yang tidak kompeten	3	3	9	Medium Risk	19
X16	Kontraktor tidak melakukan induksi dan pelatihan tenaga kerja	3	3	9	Medium Risk	20
X17	Kontraktor utama memakai subkontraktor yang tidak kompeten	3	3	9	Medium Risk	21
X18	Subkontraktor merekrut pekerja dibawah standar	3	3	9	Medium Risk	22
X19	Kontraktor merencanakan jadwal pekerjaan yang tidak realistik	3	3	9	Medium Risk	23
X6	Kontraktor mengajukan perubahan jenis material	2	3	6	Low Risk	24
X10	Kontraktor mengajukan perubahan peralatan	2	3	6	Low Risk	25
X26	Tidak adanya biaya untuk pelaksanaan sistem manajemen mutu	3	2	6	Low Risk	26
X27	Tidak adanya biaya overhead sewa, penerangan, pengamanan dan lainnya	3	2	6	Low Risk	27

From the results of the assessment of the variables above, it shows that at the bid price > 80% owner estimate obtained 3 risks that could potentially occur in the high-risk category, namely: the contractor does not carry out quality control, the contractor does not place experts in the field and the workforce is not equipped with Personal Protective Equipment (Personal Protective Equipment). PPE).

3.2 Discussion

Based on the results of the analysis of the 27 (twenty-seven) risk variables above, several risk variables have a high value (high risk), meaning that the risk has the potential to occur in the implementation of water resources construction projects, both at the bid price < 80% owner estimate and at the price offer > 80% owner estimate which is presented in table 5 and Table 6 as follows:

Table 5. Ranking of the top 10 risk factors that have the potential to occur at the bid price < 80% owner estimate

No.	Variabel Risiko	Total Penilaian			Klasifikasi Risiko	Rank
		Probabilitas	Dampak (Severity)	Tingkat Risiko		
X4	Kontraktor menggunakan material tidak sesuai spesifikasi	4	5	20	High Risk	1
X5	Kontraktor menggunakan material tidak sesuai yang dibutuhkan	4	5	20	High Risk	2
X3	Kontraktor mengajukan perubahan desain	4	4	16	High Risk	3
X7	Kontraktor menggunakan peralatan tua yang produktivitasnya rendah	4	4	16	High Risk	4
X9	Kontraktor tidak menyediakan jumlah peralatan sesuai kontrak	4	4	16	High Risk	5
X13	Kontraktor menggunakan tenaga kerja yang tidak berkualitas	4	4	16	High Risk	6
X14	Kontraktor tidak menempatkan tenaga ahli dilapangan	4	4	16	High Risk	7
X20	Pendanaan proyek yang kurang memadai	4	4	16	High Risk	8
X21	Tenaga kerja tidak dilengkapi dengan Alat Pelindung Diri (APD)	5	3	15	High Risk	9
X2	Kontraktor mengajukan perubahan spesifikasi	3	4	12	Medium Risk	10

Table 6. Ranking of the top 10 risk factors that have the potential to occur at the bid price > 80% owner estimate

No.	Variabel Risiko	Total Penilaian			Klasifikasi Risiko	Rank
		Probabilitas	Dampak (Severity)	Tingkat Risiko		
X23	Kontraktor tidak melakukan quality control	4	4	16	High Risk	1
X14	Kontraktor tidak menempatkan tenaga ahli di lapangan	5	3	15	High Risk	2
X21	Tenaga kerja tidak dilengkapi dengan Alat Pelindung Diri (APD)	5	3	15	High Risk	3
X1	Kontraktor mengajukan perubahan lingkup pekerjaan	3	4	12	Medium Risk	4
X2	Kontraktor mengajukan perubahan spesifikasi	3	4	12	Medium Risk	5
X3	Kontraktor mengajukan perubahan desain	3	4	12	Medium Risk	6
X4	Kontraktor menggunakan material tidak sesuai spesifikasi	3	4	12	Medium Risk	7
X5	Kontraktor menggunakan material tidak sesuai yang dibutuhkan	3	4	12	Medium Risk	8
X7	Kontraktor menggunakan peralatan tua yang produktivitasnya rendah	3	4	12	Medium Risk	9
X8	Kontraktor menggunakan peralatan tidak sesuai spesifikasi	3	4	12	Medium Risk	10

Risk Mitigation

At this stage prepare a plan or response to do something if a risk occurs and also reduce the risk that may occur. With a risk management plan, it is possible when a risk occurs it can be avoided or minimized with an action. Proposed risk management actions are carried out by reducing risk (risk mitigation). For risk reduction to be carried out efficiently and effectively based on the results of evaluations and discussions with stakeholders, recommendations for handling risks that have a high potential to occur (high risk) in the implementation of water resources projects are as follows:

Table 7. Mitigation of risk against risk factors that have a high-risk value

	Risk Factor	Bidding Price	Mitigation
X2	The contractor submits specification changes	< 80% HPS	Finalizing the preparation of specifications so that there are no changes
X3	The contractor submits a design change	< 80% HPS	Finalize the design plan so that there are no design changes during implementation
X4	The contractor uses materials that do not meet the specifications	< 80% HPS	Clarification of material prices at the time of bid evaluation
X5	The contractor uses materials that are not as needed	< 80% HPS	Improve supervision during implementation
X7	Contractors use old, low-productivity equipment	< 80% HPS	Make a requirement in the tender that the tools used are not old equipment
X9	The contractor does not provide the amount of equipment according to the contract	< 80% HPS	Make a contract clause to provide the amount of equipment according to the contract

X13	Contractors use unqualified labor	< 80% HPS	Improve coordination between related parties
X14	The contractor does not place experts in the field	< 80% HPS & > 80% HPS	Making a new policy because until now experts have only been used as a requirement during tenders
X20	Insufficient project funding	< 80% HPS	Make a guarantee from the bank related to the financial condition of the contractor
X21	Workers are not equipped with Personal Protective Equipment (PPE)	< 80% HPS & > 80% HPS	Increase supervision or impose fines in contracts if workers do not wear PPE
X23	The contractor does not do quality control	< 80% HPS & > 80% HPS	Improve supervision and improve coordination between related parties

IV. Conclusion

Initial identification of risk factors in the implementation of water resources construction projects based on the ratio of the bid price to the owner estimate obtained 27 risk factors that may occur and from the analysis, results obtained 11 risk factors that have a high value (high risk) both risk at the bid price <80% owner estimate and risk at the offer price > 80 owner estimate. Potential risks include: 1) Contractor submits a specification change, 2) Contractor proposes a design change, 3) Contractor uses materials that are not according to specifications, 4) Contractors use materials that are not as required, 5) Contractors use old equipment with low productivity, 6) The contractor does not provide the amount of equipment according to the contract, 7) The contractor uses unqualified labor, 8) The contractor does not place experts in the field, 9) Inadequate project funding, 10) The workforce is not equipped with Personal Protective Equipment (PPE), 11) The contractor does not carry out quality control.

In deciding what actions will be taken to manage the risks that occur, namely: 1) Finalizing the preparation of specifications so that no changes occur, 2) Finalizing the design plan so that there are no design changes during implementation, 3) Clarification of material prices at the time of bid evaluation, 4) Increasing supervision during implementation, 5) Making requirements in tenders that the tools used are not old equipment, 6) Making contract clauses to provide the amount of equipment according to the contract, 7) Improving coordination between related parties, 8) Making new policies because until now experts are only used as a requirement at the time of tender, 9) Make guarantees from banks related to the financial condition of the contractors, 10) Improve supervision or apply fines in contracts if workers do not wear PPE, 11) Improve supervision and improve coordination between related parties.

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