

# Assessing the Effects of Price Escalation on Building Construction Projects in Adama, Ethiopia

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**Abstract:** In the Ethiopian construction sector, one key issue is that contemporary building projects demonstrate price escalation. The Management of Cost escalation requires more understanding of its driving forces. Hence, this research aimed to assess the price escalation factors and their effects on building construction projects in Adama, Ethiopia. Through an in-depth literature review and project archives, thirteen (13) possible price escalation-causing attributes and five (5) its effects were identified for this research. Forty-eight (48) self-administered questionnaire survey has been sent to clients, consultants, and contractors that actively participated in Adama city construction projects and forty-three (43) responded. The relative importance index (RII) had computed to rank the price escalation-causing factors and their effects on building projects. The five most significant factors these causing price escalation on building projects were fluctuation in foreign currency exchange rates, an increase in material cost and unstable market conditions, unbalanced demand and supply of construction materials, limitation of construction material producer's capacity, and project schedule changes. While in this study, delayed project progress, cash flow (financing) problems, higher construction projects cost, and increasing disputes between contracting parties were among the utmost significant impact of rising prices happening on building construction in Adama, Ethiopia. To evaluate the respondents' observed level of agreement on the ranking of price escalation factors and their effects, the Spearman rank correlation coefficient with the aid of SPSS version 26 was used. The outcomes were 0.914 among client and consultant, 0.815 with the client and contractor, as well as 0.856 for consultant and contractor on ranking price increase factors, whereas, 0.921 among client and consultant 0.821 with the client and contractor, and 0.975 for consultant and contractor on ranking price increase effects. Therefore, the result implies a positive relationship among respondents towards factors causing price escalation and their effects on building construction projects in Adama city.

**Keywords:** Building Construction, Price Escalation Effects, Price Escalation Factors, Relative Importance Index (RII)

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## 1. Introduction and Literature Review

Projects that were finished with a considerable cost increase are common throughout the history of the global construction sector [1]. In developing nations, where this tendency is more pronounced, the price of building projects sometimes increase by more than 100%. In the Ethiopian construction industry, one significant problem is the current construction projects show significant cost escalation [2]. The project cost has escalated during construction contract execution due to the sequences of occasions. Cost increases happens due to various causes and their waves have caused conflict between clients

and contractors over the subject of project cost difference [3]. Empirical evidence suggests that the growth of construction material price and fluctuation in the foreign currency exchange rate in Ethiopia were the factors of price escalation in construction projects at the contract implementation period [4]. Proper attention of these unmanageable threats at the preliminary stage of the planning level extensively rises the option of decreasing any faults throughout the construction stage. This paper has intended to study the adversarial effects of price increase on Adama city building construction projects. Hence, this study was executed to identify the most important elements of costs increase and their impacts on building projects in Adama, Ethiopia.

### 1.1. Factors Causing Price Escalation

The factors causing price increases on building projects are mixed. Various factors are not only challenging to forecast, but also difficult to control. Understanding the forces that drive the issue or its origins can help you better grasp the price rise elements. Using this knowledge, it should be possible to create policies to address these rate-growth reasons [5]. Two major categories have been used to classify price increase reasons. Factors that cause price increase and client can manage them are internal, whereas external causes are those that exist outside the owner's direct control [6, 7]. A list of the elements connected to project price escalation shown below.

**Inappropriate project planning:** it may help to the inconsistency of supply and request. When consumption exceeds the necessary level, it creates a shortage of the building materials, which in turn causes the price of building materials to increase, which inevitably raises project costs and has a substantial impact on inflation as well as a decline in competent works in the construction sector [8].

**The project delivery system/procurement method:** affects the share of threat among clients and contractors. While the threat is moved towards contracting participant then it is incompetent to regulate the certain risks, the construction price is going to growth consistently. Shortage of knowledge in a delivery system/procurement method as well result in a miscalculation of building costs in addition to the issue of risk allocation [9].

**Engineering and construction complexities:** are the outcome of disagreements or difficulties among the several departments that contributed to the planning and design of a building project. Hence, price escalations are possible to happen if these problems are not resolved timely. [10].

**The Poor estimation:** the projects contains overall faults, adding or neglecting in preparation and making insufficiencies on the whole magnitudes of the project. Poor performance in the planning, estimation methods, tools, and errors do not only affect the quantity of ingredients and facilities required to complete a project, but it also considers additional price for procuring the properties.

**Ambiguous Contract Provision:** indicates weak accountability and reason for the confusion between the client, project designer, and building contractors. Lack of including enough information in the contract paperwork may cause costs to rise while the building project is being carried out [11].

**Project schedule changes:** mainly happen by financial plan limitations or design problems, which can result in unexpected increases in costs even when the degree of price increases is precisely estimated. Clients must consider how much money is worth over time, taking into account the rate of price increases and the timing of spending [4].

**Local concerns and municipal regulations:** it can affect project costs both in the planning and implementation stages. During the building of a project, qualification activities that are enforced by the local administration and state and local environmental organizations can also delay the project's completion period and have an impact on price increase

allowances or add budgets [12].

**An increase in material cost:** significantly impacts the entire cost of the tender items. The cost of building materials has escalated over the previous number of years along with the demand for building projects on both local and foreign markets. And this may be attributable to several causes, especially most notably a restricted capacity for material production and a lack of competition [10].

**Change in legislation:** during the contract period is one cause of price variation. The contract price adjusted to take account of any rise or fall in cost resulting from a change in the laws of the country, the introduction of new or the amendment of existing laws, prepared after the base date. The extra price suffered due to change in regulation should be ask for independently from the extra cost due to rate growth [13].

**Foreign currency exchange rates fluctuations:** If they go over the amount forecasted by the project's promoter and the firms delivering the services, the projects' prices may rise. The overall price of building is greatly influenced by some economic variables, such as the conversation amount of local money to other foreign cash, the rate of price increases, and the interest amount charged on lends amongst other countries [14].

**Unbalanced demand and supply of construction materials:** it's occurred due to the effect of material sources' capacity not growing at the same rate as demand. The resulting supply-demand imbalance has led to an escalation in material values [14].

**Construction material manufacturer's capacity:** The supply of materials is insufficient to meet market demand. A projection of future consumption is used by material producers to plan the capacity of their production facilities. Material manufacturing companies often design their production facilities short of anticipated demand if there is upcoming uncertainty [12].

**Shortage of skilled construction workers:** Due to the current high capacity of building, there is a great need for trained laborers. Given the interconnectedness of the manufacturing procedures and the backward as well as forward links those are engaged, labor shortages can specifically have serious effects in industries like building construction. Due to the increased chance of a delay, the lack of experienced workers raises the contractor's risk [15].

### 1.2. Effects of Price Escalation

The recent, extraordinary price increase has had multiple effects on the construction industry. Undoubtedly, complaints about diminished or removed profit limitations as well as significant project losses have arisen from the community of contractors and subcontractors. Missed payments, damaged or destroyed construction trades, and other repercussions are just some of the ripple effects of this sharp price increase. Effects of price escalation for every construction projects are listed and explained as follows;

**Increasing Dispute between Contracting Parties:** According to [16], conflicts frequently created in time delays, cost increases, legal action, and full project abandonment. Because

of differences in suffering and expenditure at the time of the building project, there are many construction disputes. Construction disputes may start for any one of a number of unfavorable reasons, individually or in combination. The majority of common disagreements are brought on by issues like inflated contract duration and prices, delays' impacts and knock-on effects, estimations of the scope and quality of work, changes to plans explanation and specifications, discouraging obligations, inadequacy, and interruption.

Delayed and reduction in scope/canceled projects: Project delays, scope reductions, and cancellations are common because of the global increase in the cost of private construction materials, which has forced numerous designers to reevaluate the 'quantities' required to justify a private progress. Projects have been canceled, delayed, or had their scopes reduced as a result. Similar to how large project price increases provide unique concerns for public projects financed by bond issues. In the middle of a bond was ratified by the electors and the tender's period for construction projects were established, material values considerably jumped, and tenders approached in at values significantly higher than the accepted contract sums. When more finance is not available, bodies are left with the choice of either discontinuing the project or keeping it on hold (keeping it delayed) or make an effort to reduce the project's scope [17].

Higher construction Project price: The construction that haven't been abandoned or aren't running significantly ahead of schedule (highly late) due to price increase problems frequently suffer greater project costs. Fears of price increases from suppliers and contractors, as well as the absence of price escalation clauses in most construction contracts, frequently result in larger contract pricing and project expenses [18].

Cash Flow (Financing) Problem of the Projects: Pricing changes may have an impact on clients and contractors as well as the project itself. When contractors are not adequately reimbursed, price fluctuations have a significant negative impact on their cash flow (project funding) [19].

## 2. Research Methodology

### 2.1. Description of the Study Area

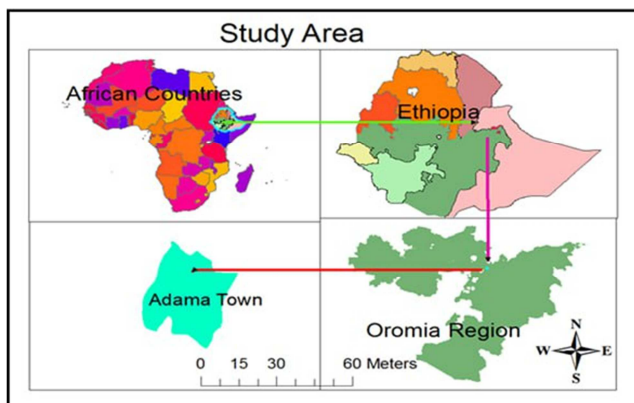


Figure 1. Study area map.

This research has conducted in Adama, Ethiopia. Adama city is surrounded by East Shewa which is in the Special Zone of Oromia. It is 99 kilometers southeast of Addis Ababa at 8.54°N 39.27°E elevation and 1712 meters above sea level.

### 2.2. Data Collection Methods

The research has intended to develop a current understanding of the price escalation issue on building projects through a questionnaire survey. Both quantitative and qualitative approaches have used for this survey. Purposive sampling had used to decide the sample size for this research. To get the most relevant price escalation factors and its effects in the questionnaire, an extensive literature and project archives review was conducted. The study uses a self-administered questionnaire to gather opinions from clients, consultants, and contractors regarding the most critical causes of rate increases and its effects.

The final questionnaire, which included five (5) adversarial effects and thirteen (13) essential factors was then given to over 48 chosen professionals in an effort to get a better balance of equal numbers for targeted groups currently involved in Adama city building construction projects. The respondents have asked to give their intention based on the five-point Likert scale (1=never, 2=seldom, 3=sometimes, 4=often, 5=always) for factors likely contribution to cause price escalation and (1=No Significance, 2=Minor Significance, 3=Average Significance, 4=High Significance, 5=Extreme Significance) for its effects in one of their past or current building construction projects in Adama city.

### 2.3. Data Analysis Methods

The information gathered through the questionnaire survey was analyzed by using percentages and relative importance index. Forty-three (43) full answered questionnaires returned (89.58%). 13 (81.25%) for clients, 14 (87.50%) for Consultants, and 16 (100%) for Contractors were analyzed.

For the reliability of the data, Cronbach's alpha test had applied by SPSS software version 26. The obtained result was 0.809, which is higher than the suggested cut-off value of 0.7. Thus, the internal consistency of this study was good.

The relative importance index is applied to select the relative position to price escalation causes and its effects on building construction projects of Adama city. The relative importance index for each variable has been determined using the five-point Likert scale (1, 2, 3, 4, and 5) [2].

$$RII = \frac{\sum W}{A * N} \quad (1)$$

Where W denotes the respondents' weights (ranging from 1 to 5) given to each factor and effect, A is the maximum weight (for this study, 5), and N denotes the entire amount of respondents (43 for this study).

The relative importance index has values between 0 and 1, where 0 indicates unimportant, and a higher rate of RII indicates the most critical causes and significant effects of rate increase on building projects in Adama city.

With the aid of the Spearman rank correlation coefficient, a statistical test on the respondents' (client, consultant, and contractor) variables positioning agreement was carried out. Whereas the Spearman rank correlation is a nonparametric test correlation that ranges from +1 to -1, with +1 indicate perfect positive correlation and -1 shows a perfect negative correlation, and where a correlation value close to 0 means no correlation [4].

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)} \quad (2)$$

### 3. Results and Discussion

#### 3.1. Questionnaire Response Rate

The survey's overall response rate was 43 (89.58%). The survey received 13 (81.25%) responses from clients, 14

(87.50%) from Consultants, and 16 (100%) from Contractors.

*Table 1. Questionnaire Response Rate.*

Work field	Distributed	Returned	Response rate (%)
Client	16	13	81.25
Consultant	16	14	87.50
Contractor	16	16	100
Total	48	43	89.58

#### 3.2. Respondent's Profile

Table 2 shows that 14% (6) of respondents have experienced less than 5 years, 44.1% (19) of respondents have experienced between 5 to 10 years, and 41.9% (18) have experienced more than 10 years at building construction works. In this research, 14% (6) of the respondents executed less than five building projects, 39.5% (17) of the respondents 6 to 10 projects and, 46.5% (20) of the respondent's more than ten projects.

*Table 2. Respondent's profile.*

Experience (years)	Frequency	Percent (%)	Executed projects by respondents	Frequency	Percent (%)
Less than 5	6	14.0	Less than 5	6	14.0
From 6 to 10	19	44.1	From 6 to 10	17	39.5
More than 10	18	41.9	More than 10	20	46.5
Total	43	100.0	Total	43	100.0

#### 3.3. Factors Causing of Price Escalation

In this part, the statistical analyses and the respondent's perspective towards causes of rate increase for building construction projects in Adama city determined with their relative importance index (RII). From the ranking assigned to each attribute and the most critical ones were identified. RII

was calculated based on all factors, individually for each client, consultant, and contractor and applied to all groups using statistical package for social science software (SPSS). The following parts discuss the importance of critical factors across all three groups towards the whole relative rank displayed in the last column.

*Table 3. Price escalation causing factors.*

Price Escalation Causing Factors	Client		Consultant		Contractor		Overall Score	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Fluctuation in foreign currency exchange rates	0.88	1	0.90	1	0.85	3	0.874	1
Increase in material cost and unstable market condition	0.82	2	0.87	2	0.91	1	0.870	2
Unbalanced demand & supply of construction materials	0.82	2	0.79	3	0.86	2	0.824	3
Limitation of construction material producers capacity	0.77	3	0.71	5	0.83	4	0.772	4
Project schedule changes	0.77	3	0.73	4	0.78	5	0.758	5
Poor estimation	0.77	3	0.70	6	0.74	6	0.734	6
Inappropriate project planning	0.57	6	0.66	8	0.63	9	0.618	7
Ambiguous contract agreement provisions	0.63	4	0.64	9	0.59	11	0.618	7
Local concerns and municipal regulations	0.55	7	0.67	7	0.61	10	0.614	8
Project delivery system/procurement approach	0.55	7	0.60	10	0.68	7	0.614	8
Shortage of skilled construction workers	0.60	5	0.60	10	0.56	12	0.586	9
Engineering and construction complexities	0.55	7	0.56	11	0.64	8	0.586	9
Change in legislation	0.49	8	0.47	12	.46	13	0.474	10

As shown in table 3, the overall ranking states that fluctuation in foreign currency exchange rates is one of the most significant factors ranked first (RII = 0.874) that influence price escalation in building projects. While both client and consultant allocate the same viewpoint, contractor rated this factor on the third place. On the other hand, an increase in material cost and unstable market conditions is to be the most important factor from the standpoint of the contractor, which came second place in the whole group. Whereas the exchange rate is decontrolled, the cost of all

goods and services has been rising. The status of a country's balance of payments may be impacted by foreign exchange rate volatility, which could potentially affect global trade patterns.

An increase in material cost and unstable market condition (RII = 0.870) was the second most important contributing factor in the overall score. Whereas both client and consultant share the same viewpoint with the overall rank, contractor ranked this factor in the first position. Previous studies showed that an increase in material cost and unstable market

conditions were the supreme frequent causes of price escalation, especially in a developing country. To address material value instabilities and raw material delays in volatile market conditions, careful planning and scheduling are required.

The third significant factor, unbalanced demand & supply of construction materials ( $R_{II} = 0.824$ ), postulates the unbalanced supply and demand of building materials impact on cost performance in overall projects. Both client and contractor ranked this factor in the second place, while consultant shares the perspective of overall score that in the third position. Past findings state that, the link between supply and demand is one of the most important elements that determine the building costs as well as the prices of any goods or services. The market values of the products have been determining by the equilibrium conditions of demand and supply. This balance is dynamic, though. This situation is influenced by the shifting powers of the market and changes as some industries grow further alluring than others. Moreover, the capacity of available resources has not grown as quickly as the demand. The resulting supply-demand imbalance has led to an increase in material values [4].

The fourth important factor, limitation of construction material producers' capacity ( $R_{II} = 0.772$ ), by rating it third, the client groups have acknowledged that as it is a very significant factor. The importance position level by both contractor and consultants has been found at fourth and fifth ranks, respectively. The availability of raw materials is not keeping up with market demand. Cement and steel are a couple of the products that are impacted by this demand-supply imbalance. A projection of future consumption is used by material producers to plan the capacity of their production facilities. Material producers often designate a smaller production capacity than anticipated demand when the future is uncertain [12].

The fifth attribute, project schedule changes ( $R_{II} = 0.758$ ), by rating it third, the client groups have acknowledged that as it is a very significant element. Both consultants and contractors have been shown to have importance positions at the fourth and fifth ranks, respectively. The project schedule changes mainly happen due to financial plan limitations or design problems, which can result in unexpected increases in costs even when the degree of price increases is precisely estimated. Clients must consider how much money is worth over time, taking into account the rate of price increases and the timing of spending [8].

The Poor estimation ( $R_{II} = 0.734$ ) was the sixth factor in the overall score. The effect of this factor is observed to be comparatively significant on behalf of clients by assigning it as third-ranking, and both consultant and contractor rank the same viewpoint with an overall ranking. Plans and magnitudes can contain errors and omissions, also general insufficiencies and deprived enactment in preparation and estimation processes. Errors can also occur in the expenses associated with obtaining the materials and services needed to complete a project.

Among the middle order attributes, inappropriate project

planning ( $R_{II} = 0.618$ ) scored the seventh position in the overall ranking. While the sixth ranking by the client supports this as a perceived difficulty for handling project cost escalation, the eighth and ninth rankings of this element by both consultants and contractors demonstrate a reasonable agreement with the overall rank. Although ambiguous contract agreement provisions observed to be comparatively a smaller amount significant by consultant and contractor groups, the effect of this factor is observed to be comparatively high on behalf of clients ( $R_{II} = 0.63$ ) with fourth position and a seventh place on the overall rank.

Amongst the least ranked elements, change in legislation was one of the traits that received the lowest ratings across all client, consultant, and contractor categories. Similarly, some of the least order factors were engineering construction complexities, and the Shortage of skilled construction workers set as a strong difference to the assertion created by earlier scholars in the topic [8].

### 3.4. Respondent's Agreement on Ranking Price Escalation Factors

A statistical test has conducted on the perceptual agreements amongst the respondents (client, consultant, and contractor) on variables rank with the aid of the nonparametric Spearman ranking correlation coefficient test.

*Table 4. Correlation of the respondents on price escalation factors.*

Groups	rho	P-value
Clients & Consultant	0.914**	0.000
Clients & Contractor	0.815**	0.001
Consultant & Contractor	0.856**	0.000

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Using a Spearman correlation coefficient test of the respondents for ranking the overall price escalation factors has presented in table 4 above. The client and consultant's correlation coefficient was 0.914, and the two-tailed p-value for the test was 0.000. Given that the P-value is less than 0.05, there is a substantial association between the client and the consultant. While the client and contractors had a 0.815 correlation coefficient and a P-value (two-tailed test) of 0.001, respectively. There is a substantial association among the client and the contractor because the P-value is below the level of significance, which is 0.05. Also, there is a significant relationship between consultant and contractor as evidenced by the correlation coefficient of 0.856 and P-value (two-tailed test) of 0.000.

### 3.5. Effects of Price Escalation

In this section, the statistical analyses with the help of relative importance index, the respondents' perspectives towards recurrent adversarial impacts of price increases on building projects in Adama city have been conducted. Using spearman's correlation coefficient the relationships among the respondents in leveling the effects have also done. The statistical findings of respondents in ranking the recurrent

effects of price increases are shown below in the (Table 5).

**Table 5.** RII ranking results for price escalation effects.

Price Escalation Effects	Client	Consultant	Contractor	Overall Score	
	RII	RII	RII	RII	Rank
Delayed project progress	0.85	0.84	0.84	0.84	1
Cash flow (financing) problem	0.80	0.81	0.81	0.81	2
Higher construction project costs	0.85	0.81	0.72	0.79	3
Increasing dispute between Contracting Parties	0.57	0.69	0.63	0.63	4
Scope reduction/Cancelled	0.46	0.59	0.60	0.55	5

According to the statistical calculations shown in the table above, a Delay project progress comes in first place with a RII score of 0.84. This result indicates the significance of this influence on building construction projects in Adama city because it is same position in terms of the clients, consultants, and the contractors. Delays are one of the frequent results of price hikes, which then have an impact on the client and contractor. In the event of a delay, the price of necessary goods or machineries possibly will rise, or these products may become scarce in the domestic markets, leading to value increases. Longer delays also result in significant cost inflation for projects.

With a RII score of 0.81, the Project's Cash flow (financing) problems, which entails the contractor's cash flow (cash in and cash out), is identified as the second key influence. This demonstrates how crucial money is to the project's advancement. Any contractor cash flow issue will result in a number of issues, including productivity decline and delayed progress. Likewise, the contractors won't get the tools and materials they require.

The third rank, which has a RII score of 0.79, is where higher project costs are found. It also received the highest ranking from the client as a result of the excessive cost growth that necessitates an extra financial plan. This, in turn, depletes the nation's limited monetary resources and leads further budget shortfall for building projects. This hinders the planned increase in the production of goods and services, and as a result, this phenomenon has a detrimental impact on the rate of national growth.

Table 5 shows that increasing disputes between parties are placed fourth with a RII value of 0.63 by clients, consultants, and contractors. Large-scale projects frequently included intricate finance, planning, and designing for phasing, as well as legal considerations. There was much overlap and interaction between the parties. As a consequence, there were more and more disagreements between the contractor and the client. The additional time needed to resolve these issues affects the project timeline, which in turn affects the project's overall duration and associated expenses.

**Table 6.** Correlation of respondents for effects of price escalation.

Groups	rho	P-value
Clients & Consultant	0.921**	0.000
Clients & Contractor	0.821**	0.001
Consultant & Contractor	0.975**	0.000

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The client and consultant's correlation coefficient was 0.921, and the two-tailed p-value for the test was 0.000. Given that the P-value is less than 0.05, there is a substantial association between the client and the consultant. While the client and contractors had a 0.821 correlation coefficient and a P-value (two-tailed test) of 0.001, respectively. There is a substantial association among the client and the contractor because the P-value is below the level of significance, which is 0.05. Also, there is a significant relationship between consultant and contractor as evidenced by the correlation coefficient of 0.975 and P-value (two-tailed test) of 0.000. Therefore, it shows that they share similar views and perceptions about the price increases effect on projects.

## 4. Conclusion

The most important variables that determine project budget and its effects during the course of a project's construction lifecycle were examined based on the perspectives of the key stakeholders. From descriptive statistical investigation, 13 chosen price escalation factors and 5 its adversarial effects rated by means of the relative importance index based on the perception of clients, consultants, and contractors working on Adama city building construction projects.

Questionnaire survey and project archival reviews are applied to provide supportive evidence on project cost escalation related issues. The key concerns were determining the attractiveness of the project price escalation problem, ranking the significance of the identified causes and effects, increasing the top positioned attributes, and measuring the agreement of the respondents' group on price escalation factors and its effects were the main issues.

The critical outcomes that fluctuation in foreign currency exchange rates, increase in material price and unstable market condition, unbalanced demand and supply of construction materials, limitation of construction material producers capacity, and project schedule changes play an important part in the escalation of project prices. The total project fee status may be impacted if the client, consultants, and contractor are unaware of these critical causes.

In this study, the major consequences of price inflation were delayed project progress, problems with the projects' cash flow (funding), higher construction project costs and increasing dispute between contracting parties.

Finally, in the Ethiopian construction industry, it is commonly known that building projects are shows escalated price due to material price increase. So, this study

recommends that the administration should establish an atmosphere of economic strength that is suitable to inspire investors. Particularly in the manufacture of construction and building materials, sufficient quantity and quality must be available on the local market. Consequently, this will prevent the import of construction materials from experiencing significant price volatility, and it reduces the currency expenditure due to imported construction input from abroad.

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