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Unlocking Sustainable Growth: How Delayed Certificate of Completion and Compliance (CCC) Issuance Impacts Development in Malaysia

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ABSTRACT

This paper examines the impact of delays in issuing Certificates of Completion and Compliance (CCC) on sustainable development. Such delays represent a significant obstacle to achieving sustainability goals, as they can hinder economic productivity and contribute to environmental harm. The primary aim of this research is to identify the major effects of delayed CCC issuance on sustainable development in Malaysia. A quantitative survey was conducted involving four respondent groups: architects, engineers, local authorities, and Green Building Index (GBI) facilitators. The study employs the Kruskal-Wallis statistical analysis method and Importance Index Calculation to analyze the data. The research reveals three key findings: the effects of 'escalated costs,' 'revenue loss,' and 'pollution' are deemed highly significant. Additionally, the impacts of 'community disruption' and 'reduced investor confidence' are considered important. These insights offer valuable guidance to policymakers, government agencies, regulatory bodies, and construction industry stakeholders, enabling them to make informed decisions and implement targeted strategies to address these challenges

Keywords: Impactss; certificate of completion and compliance; sustainable development; Malaysia

INTRODUCTION

Sustainable development is an important concept that emphasizes the need to balance economic growth, environmental protection, and social equity to meet the needs of the present without compromising the ability of future generations to meet their own needs. In Malaysia, where rapid development is taking place alongside environmental conservation efforts and social inclusivity initiatives, sustainable development holds particular importance (Zainol et al. 2023). The Certificate of Completion and Compliance (CCC) is key to ensuring sustainable development in construction projects. The CCC's document signifies that a construction project has met the necessary regulatory requirements, quality standards, and environmental considerations (Zainul Abidin and Amir Shariffuddin, 2019). Fundamentally, the CCC acts as a tangible symbol of a project's adherence to sustainable development principles. The study aims to explore the impacts of delayed CCC issuance on sustainable development in Malaysia, including environmental integrity, social equity, and economic progress.

REGULATORY FRAMEWORK GOVERNING CCC ISSUANCE AND ITS IMPORTANCE IN ENSURING COMPLIANCE

In Malaysia, the issuance of the CCC is governed by various regulations and building codes (Uniform Building By-Laws, Environmental Quality Act, Fire Services Act, Street, Drainage, and Building Act) aimed at ensuring the safety, quality, and sustainability of construction projects (Streets, Drains, and Buildings Act 1974 (Act 133), Zakaria et al. 2014). The CCC serves as proof that a building has been constructed following approved plans, adheres to building regulations, and meets essential safety standards (Zakaria et al. 2014). The regulatory framework for CCC issuance encompasses environmental, social, and economic considerations.

Environmental regulations require compliance with environmental impact assessments, waste management protocols, and pollution control measures to mitigate the environmental footprint of construction activities (Zakaria et al. 2013). Social considerations involve ensuring that construction projects promote social equity, community engagement, and inclusive development (Zainol et al. 2023). This may include provisions for affordable housing, accessibility features, and amenities that benefit surrounding communities. Economic standards focus on promoting efficient resource utilization, cost-effectiveness, and long-term financial viability in construction projects (Ramli et al. 2023). This includes adherence to budgetary constraints, financial planning, and risk management practices to ensure projects remain economically sustainable over time (Edy and Hussin 2017).

The regulatory framework governing CCC issuance plays a crucial role in promoting sustainable development by ensuring that construction projects adhere to environmental, social, and economic standards (Edy and Hussin, 2017). By sustaining these standards, CCC issuance helps mitigate the adverse impacts of construction activities and fosters the creation of sustainable built environments in Malaysia.

FACTORS CONTRIBUTING TO DELAYED CCC ISSUANCE

CCC issuance is a crucial milestone in the construction process, indicating that a building has been completed following approved plans and regulatory standards (Bashir 2018; Zakaria et al. 2013). However, delays in CCC issuance can slow down project timelines and have significant implications for sustainable development. Several factors contribute to these delays, ranging from administrative procedures to technical challenges and external factors (Zakaria et al. 2013, Mohammad et al. 2023; Abedi 2011). Understanding these factors is essential for stakeholders to identify areas for improvement and streamline the CCC issuance process. Figure 1 below shows the key factors contributing to delayed CCC issuance in construction projects:

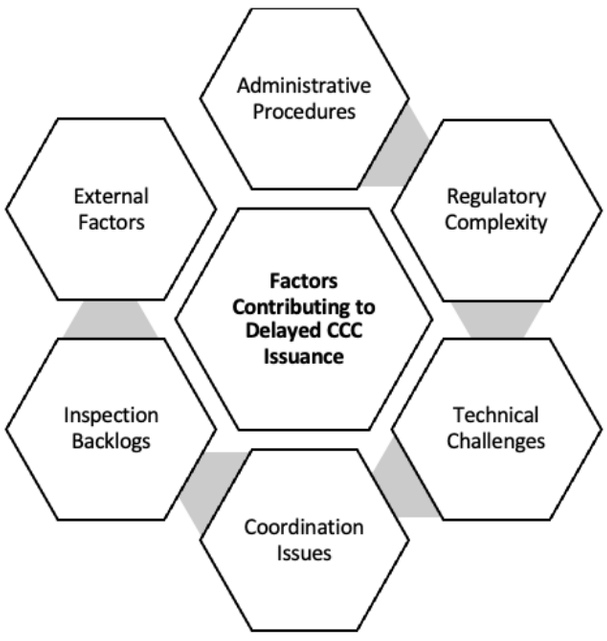

FIGURE 1. Factors Contributing to Delayed CCC Issuance

LITERATURE REVIEW

Delays in CCC issuance can have significant implications for sustainable development. This literature review explores the effects of delayed CCC issuance on various aspects of sustainable development, including environmental integrity, social equity, and economic progress.

EFFECTS OF DELAYED CCC TO SUSTAINABLE DEVELOPMENT

This subsection examines how delayed issuance of the Certificate of Completion and Compliance (CCC) affects different aspects of sustainable development, encompassing environmental preservation, social equity, and economic advancement (Figure 2).

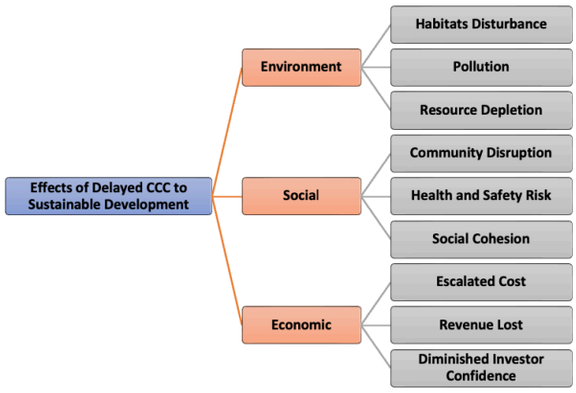

FIGURE 2. Effects of Delayed CCC to Sustainable Development

ENVIRONMENT IMPACT

Delays in issuing the Certificate of Completion and Compliance (CCC) can cause significant harm to the environment. When construction activities are prolonged, they disrupt natural habitats, including plants and animals (Hifza et al. 2023; K. Nagamany, 2016). This disruption can lead to habitat loss, force animals to move away, and reduce biodiversity (K. Nagamany, 2016; Sambasivan & Soon, 2007). Longer construction periods also mean these negative effects last for a more extended time, making it harder for nature to recover.

Construction sites produce pollution in various forms, such as dust, noise, and harmful gases from machines and vehicles (Mohamad, 2017). If CCC issuance is delayed, these pollutions continue for a longer time, worsening air quality, contaminating water sources, and damaging the soil (Lilian et al. 2023; Maideen, 2018). Dust from construction can cause breathing problems, while water runoff can carry chemicals into rivers, harming fish and other aquatic life. Noise from construction can disturb both wildlife and nearby residents.

Another issue is the continued use of natural resources. Delayed projects require more materials like wood, sand, gravel, and fuel (K. Nagamany, 2016). This overuse of resources harms the environment and makes it harder to achieve sustainability goals. Prolonged construction also increases energy use and greenhouse gas emissions, contributing to climate change.

These problems show why it's essential to avoid delays in CCC issuance. Speeding up this process can reduce environmental harm and promote more sustainable building practices. Authorities and project teams should work together to ensure that projects finish on time to limit their impact on the environment.

SOCIAL IMPACT

Delays in issuing the Certificate of Completion and Compliance (CCC) can significantly impact the lives of people living near construction sites. Prolonged construction activities often cause disturbances such as noise, dust, and increased traffic congestion, which disrupt daily routines and reduce the quality of life for nearby residents (Mohammad et al. 2022). These disruptions can make everyday activities like commuting, studying, or relaxing at home challenging, leaving residents feeling frustrated and inconvenienced (Maideen, 2018).

Another serious concern is the health and safety risks caused by extended construction periods. Residents and workers are exposed to hazards such as dust, loud noises, and the potential for accidents involving construction vehicles (Sambasivan & Soon, 2007). For example, dust from construction can worsen respiratory problems, while excessive noise can lead to stress or hearing issues. Traffic congestion near construction sites increases the chances of accidents, putting both drivers and pedestrians at risk.

The social effects of delayed CCC issuance go beyond physical disruptions. Prolonged construction can create stress and dissatisfaction among residents, which may harm community relationships. Continuous disturbances can lead to feelings of frustration and even conflict between residents, as people struggle to adapt to the challenges posed by the construction (Nor Afifah Husen, 2021; Zakaria et al. 2014). For instance, disagreements might arise between individuals or groups who perceive the disruptions

differently, leading to social tension and weakening community bonds (K. Nagamany, 2016).

Addressing delays in CCC issuance is not just about completing construction projects but also about supporting the well-being of communities. By minimizing delays, the negative social impacts can be reduced, helping to maintain harmony and ensuring that residents feel secure and satisfied in their neighbourhoods. Policymakers and project teams should prioritize efficient processes to protect communities from these prolonged disturbances and foster a more cohesive social environment.

ECONOMIC IMPACT

The economic impact of delayed CCC issuance is complex and can significantly affect construction projects and the stakeholders involved. Firstly, delays in CCC issuance prolong construction timelines, resulting in increased costs such as labour expenses, equipment rentals, and overhead costs (Nor Afifah Husen, 2021, K Nagamany, 2016). These additional expenses can strain project budgets, leading to financial challenges for developers and contractors. Secondly, delayed completion due to CCC issuance delays results in postponed revenue streams for developers from property sales or rentals (K Nagamany, 2016, Zakaria et al. 2014). This revenue delay can disrupt cash flow and profitability, impacting the overall financial health of the project and potentially affecting long-term viability (Sambasivan & Soon, 2007). Furthermore, delays in CCC issuance may diminish investor confidence in construction projects (K Nagamany, 2016). Investors, including financial institutions and private investors, may become hesitant to commit funds to projects experiencing CCC issuance delays due to uncertainty surrounding project timelines and potential financial implications (Maideen, 2018, Sambasivan & Soon, 2007). This diminished investor confidence can hinder the flow of investment into the construction sector, further exacerbating financial challenges for ongoing and future projects (Mohamad, 2017). Therefore, addressing delays in CCC issuance is crucial for mitigating economic impacts and ensuring the financial sustainability of construction activities.

METHODOLOGY

The research methodology involved a few processes (Refer to Figure 3) which consist of relpilot survey and main survey. All the processes involved were discussed.

PILOT SURVEY

In preparation for a bigger study, a pilot survey is a "small study to test research methods, instruments for gathering information, sample recruitment strategies, and other research methodologies." A pilot survey is one of the important stages of a research project, according to Hassan (2006), and is carried out before the major survey to identify potential issue areas and deficiencies in the research instruments. As Cronbach's alpha is frequently utilised when Likert-type scales are used, it was chosen as a reliability approach in this study (Gliem & Gliem, 2003). Also, most studies in the social sciences that are connected use Cronbach's alpha to evaluate the reliability of their instruments.

MAIN SURVEY

The population for this study comprises professionals involved in green building practices in Malaysia, specifically architects, engineers, Green Building Index (GBI) facilitators, and local authorities. The sampling frame was established using professional registries and databases, such as the Board of Architects Malaysia (LAM), Board of Engineers Malaysia (BEM), and the list of certified GBI facilitators provided by the Green Building Index (GBI) organization. Their inclusion is critical due to their key roles in implementing sustainable building practices, aligning with the study's focus on green construction methodologies. A total of 120 respondents were targeted, with 30 representatives from each group (Applying the Central Limit Theorem (CLT)). This number was determined to ensure equal representation and facilitate comparative analysis. Purposive sampling was employed to ensure that participants had relevant expertise and experience in practices. Respondents were contacted by telephone and email before the distribution of the questionnaires to obtain their consent to participate in the survey. After obtaining their consent, the researcher started a questionnaire survey online. The number of samples required and response rate from the four groups of respondents are as in Table 1.

The completion of the questionnaire survey led to the analysis. Data analysis involves three analysis techniques which are Kruskal Wallis, and Importance Index Calculation. The findings of the analysis were discussed in the next subsection.

TABLE 1. Total population from four groups of respondents

No	Population Group	Number of Samples	Approval Rate	Returned Questionnaire
1.	Architect	30	28	28
2.	Engineer	30	29	27
3.	GBI Facilitator	30	27	25
4.	Local Authority	30	27	27
TOTAL		120	111	107

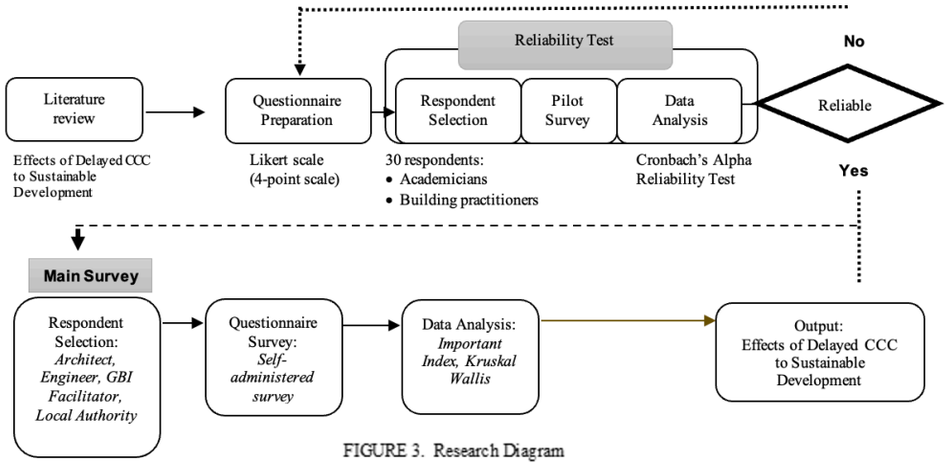

FIGURE 3. Research Diagram

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RESULT ANALYSIS AND DISCUSSION

The discussion of the results covers the effects of delayed CCC on sustainable development in the Malaysian construction industry.

RELIABILITY TEST CRONBACH ALPHA

The Cronbach's Alpha reliability test was conducted to identify the reliability of the responses obtained for each of the effects listed in the questionnaire. The result of the reliability test is shown in Table 2.

The Cronbach 's Alpha Reliability Test shows that the scale is reliable with the value of alpha more than 0.70. This indicates that all effects are statistically reliable, and the questionnaire can be used for the main data collection.

TABLE 2. Reliability statistic

Cronbach's Alpha	N of Items
0.875	9

KRUSKAL WALLIS NONPARAMETRIC TEST

The Kruskal Wallis Nonparametric test was performed to identify the difference of opinions among the four groups of respondents (architect, engineer, GBI facilitators, local authority) on the effects of delayed CCC on sustainable development. The result of the Kruskal Wallis Nonparametric test is shown in Table 3 below.

TABLE 3. Kruskal Wallis nonparametric test (Effects of delayed CCC on sustainable development)

No.	Effects	Asymp. Sig.
1.	Habitats Disturbance	0.241
2.	Pollution	0.010
3.	Resource Depletion	0.113
4.	Community Disruption	0.251
5.	Health and Safety Risk	0.017
6.	Social Cohesion	0.142
7.	Escalated Cost	0.136
8.	Revenue Lost	0.211
9.	Diminished Investor Confidence	0.156

The result of the Kruskal Wallis Nonparametric test shows that there is no significant difference in mean ranking based on p values being less than 0.05. This indicates that there is no significant difference of opinions among the four groups of respondents on all effects of delayed CCC on sustainable development in Malaysia.

IMPORTANCE INDEX CALCULATION

The importance index calculation utilized the formula depicted in Figure 4, providing importance values for each effect of delayed CCC on sustainable development. The importance index formula, as shown in Figure 4, is a weighted scoring method designed to quantify the relative significance of different effects based on respondent feedback.

$$\textbf{Importance Index} = \frac{\sum w}{AN} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5N}$$

w represents the weight assigned to each response, ranging from the highest importance (e.g., 5) to the lowest (e.g., 1).

A denotes the maximum possible weight (e.g., 5 for a 5-point Likert scale).

N is the total number of respondents.

FIGURE 4. Importance index formula (*Source:* Zainol 2016)

The importance values obtained from the calculation of the importance index should be compared with the standard deviation to determine the significance level of each effect. As explained by Alao (2021) and Zainol (2016), Table 4 outlines the summary process for assessing importance levels, including SD for Standard Deviation, Mean for Mean Importance Index, and Importance Index Value.

TABLE 4. Process summary to identify the level of importance (*Source:* Zainol, 2016)

<SD1	SD1-Mean	Mean-SD2	>SD2
Least Important	Somewhat Important	Important	Very Important

Furthermore, Zainol (2016) categorized the level of importance into four groups: very important, important, somewhat important, and least important. The findings of the importance index calculation for the effects of delayed CCC on sustainable development are outlined in Table 5 below.

TABLE 5. Importance index calculation for effects of delayed CCC to sustainable development

No.	Effects of delayed CCC on sustainable development	Importance Index Value (I.I Value)	Level of Importance
1.	Habitats Disturbance	0.863	Somewhat Important
2.	Pollution	1.108	Very Important
3.	Resource Depletion	0.845	Somewhat Important
4.	Community Disruption	0.900	Important
5.	Health and Safety Risk	0.824	Somewhat Important
6.	Social Cohesion	0.698	Least Important
7.	Escalated Cost	1.204	Very Important
8.	Revenue Cost	1.110	Very Important
9.	Diminished Investor Confidence	0.903	Important
Mean Importance Index Standard Deviation		= 0.939 = 0.165 (SD1=0.774, SD2=1.104)	

The identification of "escalated cost," "revenue cost," and "pollution" as very important effects of delayed CCC to sustainable development.

1. Escalated Costs

Delays in CCC issuance led to substantial increases in costs at various stages of construction projects. Extended timelines result in higher labour costs, as workers are required on-site for longer periods. This issue is compounded by the need to rent or purchase additional materials and equipment, which may fluctuate in price during prolonged project durations (Sharifah 2021; Zainul Abidin 2019). Moreover, delayed CCC can lead to contractual disputes, as parties may argue over liability for the delays. This situation often triggers costly claims, arbitration, or legal proceedings, further straining project budgets. For example, infrastructure and high-rise developments often have tight budget constraints and timelines. When delays occur, investors and stakeholders are left to bear the financial burden of these escalating costs, reducing the overall return on investment. Furthermore, increased costs may discourage future investment in the construction industry, weakening the sector's financial viability and hindering the achievement of broader economic sustainability goals. To address these issues, there is a pressing need for timely CCC issuance supported by efficient project management practices, such as robust risk assessment and contingency planning.

2. REVENUE COSTS

Revenue costs refer to lost opportunities for income generation due to delays in project completion. When projects are unable to secure CCC, they cannot be occupied or operationalized, leading to missed rental income, sales revenue, or other financial returns (Weng, 2012). For example, developers of commercial properties may face prolonged periods without tenants, while residential projects may see a delay in handover to buyers. These revenue losses create a ripple effect, impacting investors, property owners, and even financial institutions that provide loans for the projects. Additionally, delays in obtaining CCC may reduce property values and market competitiveness. Consumers often perceive non-compliance or delays as indicators of poor quality or mismanagement, eroding trust and demand for the properties in question (Zakaria et al. 2014). For developers to mitigate these losses, prioritizing CCC compliance from the early stages is crucial. Incorporating sustainability features into building designs, such as energy efficiency and eco-certifications, can also restore consumer confidence and enhance the attractiveness of properties to investors and tenants.

3. POLLUTION

Delayed CCC issuance exacerbates pollution, which poses significant risks to both the environment and public health. Construction activities, particularly when unregulated or prolonged, contribute to air pollution from dust and vehicle emissions, water contamination through site runoff, and soil degradation from improper waste disposal (Weng, 2012; Yong & Mustafa, 2012). For instance, dust particles released over an extended period can lead to respiratory issues in nearby communities, while runoff may carry harmful chemicals into local waterways, threatening aquatic ecosystems. Delays in implementing sustainable building practices also prolong the environmental footprint of construction projects. Energy-efficient designs, green infrastructure, and waste management systems, if delayed, lead to increased carbon emissions, resource depletion, and strain on local ecosystems. This not only undermines environmental sustainability but also conflicts with global efforts to combat climate change. Addressing pollution requires stricter enforcement of environmental regulations and proactive promotion of green building certifications. Motivating developers to adopt sustainable practices early in the project lifecycle can significantly reduce negative environmental impacts and contribute to a more resilient built environment.

CONCLUSION

In conclusion, this paper has shed light on the effects of delayed issuance of Certificates of Completion and Compliance (CCC) on sustainable development, with a focus on Malaysia. The research revealed that persistent delays in CCC issuance pose significant challenges across multiple dimensions of sustainable development, including economic, social, and environmental aspects. Through the quantitative analysis involving architects, engineers, local authorities, and GBI facilitators, this study identified several key effects of delayed CCC issuance. Escalated cost, revenue cost, and pollution were found to be of utmost importance, highlighting their critical role in hindering sustainable development efforts. Additionally, community disruption and diminished investor confidence were also

recognized as important effects, further highlighting the complex effects of delayed CCC issuance.

The findings of this study provide valuable insights for policymakers, government agencies, regulatory bodies, and stakeholders in the construction industry. By recognizing the significant effects of delayed CCC issuance, stakeholders can make informed decisions and implement targeted interventions to address the underlying issues. This may include streamlining regulatory processes, enhancing collaboration among stakeholders, and promoting sustainable practices in the construction sector. Addressing the challenges associated with delayed CCC issuance is essential for advancing sustainable development goals in Malaysia and beyond. By addressing these challenges proactively, stakeholders can foster economic prosperity, social equity, and environmental stewardship for present and future generations. Policymakers and industry stakeholders must take decisive actions to ensure timely CCC issuance and promote sustainable development in the built environment.

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DECLARATION OF COMPETING INTEREST

None.

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