PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 22 ISSUE 3 (2024), Page 79 – 89

ADOPTION OF SOCIAL COST AMONG STAKEHOLDERS IN MALAYSIA CONSTRUCTION INDUSTRY

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Abstract

Social costs are the overall impact of economic activity on the welfare of society. Social costs are the 'invisible' components of building operations, hence are not included in the tender price. However, the people of a nearby construction zone pay the price by enduring disturbed economic activity, pollution, and disrupted health and social well-being; without any adequate compensation. The purpose of this study is to identify the level of understanding of social cost among construction players and to identify the level of importance of social cost consideration among construction players. This research will provide new information for predicting or assuming the link between the level of understanding and level of importance among construction stakeholders. According to the literature, social cost indicators as a result of construction-related negative impacts for construction players include transportation, economic activities, and social, ecological, and health systems. The respondents for this research were conducted among clients, contractors, architects, engineers, and quantity surveyor firms. A quantitative method using questionnaires is applied to obtain data. In terms of social cost understanding, the data shows that different types of construction stakeholders have varying levels of understanding. According to the findings of the study by mean, the level of understanding of social costs for most respondents is road safety problems, followed by construction site water pollution causing irreversible damages. Then, the third highest mean score which is the air pollution of construction machinery produces air emissions that contain carbon and nitrogen oxides, toxic substances, and heavy metals. The finding emphasises that the level of understanding and the level of importance of social costs consideration among construction players are aware that road safety problems are the main reason for missing construction projects. Meanwhile, there is no significant relationship between the level of understanding and the level of importance of social costs.

Keywords: Economic, Social Costs, Quantitative Method

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INTRODUCTION

Multifaceted construction industry accommodates engineering projects of either building new infrastructure or renovation of an existing building involving alterations or maintenance (Behm, 2008). Construction industry contributes to the sustainable development of a country's economy by delivering output as well as generating and redistributing income (Durdyev et al., 2020).

However, it is undeniable that construction projects unintentionally cause negative impacts on their surrounding environment although the completion of a development project positively influences the wellbeing of the society in general. The equivalent monetary values associated with the significant disruptions caused by the negative effects of the construction activities that are borne by the community are referred to as social costs. According to Danku et al., (2020), social costs involved are not limited to poor traffic conditions, pollution of the environment, road user related risk factors, deterioration of road surfaces, and existing infrastructure; it also decreases the adjacent property value and lowers business turnovers. Thus, fits the definition of social cost coined by Johnston et al. (2021) that "Social costs are the overall impact of an economic activity on the welfare of society. Social costs are the sum of private costs arising from the construction activity and any externalities".

Construction industry of the country contributes to depletion of natural resources, dust pollution, soil erosion and sedimentation, flash floods, destruction of vegetation in addition to using construction materials harmful to human health (Abd-Mutalib et al., 2020). Hence, projects should be executed with social responsibility by estimating building construction related social costs at the construction zone (Onubi et al., 2020).

RESEARCH BACKGROUND

Social costs are 'invisible' constituents of construction activities, hence, was not priced in tenders. However, the price is paid by the residents of the nearby construction zone with affected economic activities, pollution, disrupted health and social wellbeing; without any appropriate compensations (Budayan & Celik, 2021; Çelik et al., 2019).

Road damage is the first-hand effect experienced by communities near a construction zone. According to Çelik et al., (2019) no amount of patchwork will settle a damaged road because once the soil underneath settles it will cause potholes. Excavation decreases pavement life expectancy and subsequent or inadequate periodic road restoration remains an expensive problem. Furthermore, Sarawak Public Works Department assistant director, Awang Mohd Fadilah said seven federal roads frequently used by overloaded construction lorries are severely damaged and require an estimated RM15.8 million for major repair works (News Straits Times, 2019).

Consideration or quantification of social costs are ignored or goes unnoticed by traditional construction management practices (Yan et al., 2004; Yu & Lo, 2007). Primarily, construction social costs are completely expected to be borne by the public instead of the construction company. Hence, they are not included on the bill of quantities (BQs) of the project. Secondly, since the public is not part of the project planning and management process, their benefits are overlooked during the project lifecycle. Thirdly, it is difficult to quantify visible costs of construction social costs since they are intangible in nature. However, the awareness on the significance of social costs absorbed by the adjacent community not engaged in the contractual agreement is gaining momentum from city planners, municipal administrators, and the engineering community (Saito, 2012). Therefore, developing an understanding on the social cost pertaining to a construction project will highlight the key areas where the organisation can channel the effort to deliver the goal of minimised or zero social cost.

This study aimed to identify the level of understanding of social cost among construction players and to identify the level of importance of social cost consideration among construction players. The study will highlight to the construction players on the need to include social cost in cost estimation of a construction project. This will eventually formulate a way to define nuisance criteria. Hence, the consequences of residing adjacent to the construction zone could be justified to compensate for the social costs to the society.

SOCIAL COST IN REVIEW

Social cost definition

According to Johnston et al. (2021), "Social costs are the overall impact of an economic activity on the welfare of society. Social costs are the sum of private costs arising from the activity and any externalities". Private costs are identifiable specific costs related to the activity; contrarily external costs are not estimated by the profit makers but incurred on the third parties. Comparably numerous authors have explained social costs considering construction background. However, the work zone caused negative impacts such as extended travel time, wear and tear effect on the vehicle, accidents due to heavy traffic, or air pollution due to the congested traffic are four types of social or external cost components (Margorínová & Trojanová, 2019).

Therefore, the definition of social cost provided by Gilchrist & Allouche (2005) are the costs stemming from a construction project executed by the parties of the contractual agreement. In other words, negative impacts caused by construction in which the contractor, designer, or project owner are not held accountable are labelled as social costs (Çelik et al., 2019).

Consideration of social cost

Social costs associated with the eruption of engineering projects are widely acknowledged but completely disregarded during designing, planning and cost estimation or evaluation (Gilchrist & Allouche, 2005). Furthermore, the norm of making the public the scapegoat to undertake the effect of social cost rather than the project participants or beneficiaries themselves led to conveniently excluding estimation of social cost from contractual bid value. However, Matthews (2010) explained that the lack of a standard quantification method precludes construction associated with social cost from the bid estimation of a tendered project.

Table 1: Summary of Social Cost Themes Approached (Budayan & Celik, 2021; Çelik et al., 2017; Danku et al., 2020; Gilchrist & Allouche, 2005)

A) Damage on health	A1	Construction activities produce airborne particles or dust
	A2	Noise and disturb to human
	A3	Road surface and sub-surface disruption due to intercept water flows may affect their volume, velocity and sedimentation rate
	A4	Vibration of pile driving, dynamic compaction, blasting and the operation of heavy construction equipment produce high levels of vibration
B) Civil damage rights	B5	Treating compromised physical and mental health which is the administration costs of the Social Welfare Department to provide assistance to the injured worker
C) Transportation	C6	Increased traffic accidents rate due to improper construction lane changing or merging
	C7	Additional fuel consumption
	C8	Traffic: Utility construction and highway renovation directly impact roads and generate traffic delays
	C9	Loss of parking space
	C10	Prolonged closure of road space
	C11	Detour to secondary roads
	C12	Travel delays due to utility construction and highway renovation
	C13	Road safety problems
D) Loss of income	D	Loss of income due to retailers may loss business

E) Loss of decreased productivity	E14	Productivity reduction due to traffic delay that affect the ability of people to perform their work
F) Loss of revenues	F15	Loss of tax revenues due to reduction in business sales and personal income
G) Pollution	G16	Air pollution of construction machinery produces air emissions that contain carbon and nitrogen oxides, toxic substances, heavy metals
	G17	Construction site water pollution causes irreversible damages
H) Resource costs	H18	Utility cuts due to construction rehabilitation and replacement of buried services
	H19	Restoration cost which uses to replace the damaged environment with a comparable resource
	H20	The material requirement for the new building was chosen to reduce carbon dioxide emissions
I) Property damage	I21	Public property damage due to destruction of the original building
	I22	Lower housing and property values due to construction noise

Although social costs are subjected as 'non-existent' or 'invisible', it may on modest estimation rise-up to 400% of construction costs in some incidents (Vanier et al., 2004). Therefore, a conscious move to consider social costs during quotation preparation and tendering process will be a big step in moving the construction industry in the direction of sustainability. Furthermore, estimation and consideration of social cost will be advantageous because the magnitude of the social costs is directly proportional to construction time.

Potential adverse impacts of construction projects

The social costs generated at the area surrounding the construction are absorbed either directly or indirectly by the public at large (Aizuddin et al., 2023). It either causes monetary or intangible losses such as alterations to the environmental or inconvenient change of lifestyle (Ariff et al., 2023). Whether permanent or temporary, the severity and predictability of the adverse impact may differ. Construction industry associated adverse impacts incurred during the construction phase could be classified as traffic, economic activities, pollution, and ecological/ social/ health. Vibration works during construction is a common source of disturbance that affects people, buildings, and sensitive equipment. Driving of piles, dynamic compaction, blasting, and the operation of heavy

construction equipment produce high levels of vibration that can cause a public perception of a lack of safety. Construction vibration effects may range from annoyance to visible structural damage (Waddington et al., 2014).

Vibration works during construction can damage structures either directly due to the impact of traveling energy waves or indirectly due to vibration-induced settlement (Waddington et al., 2014; Yu & Lo, 2007). The costs associated with the impact of vibration works on people are not well known.

Quantification of construction social cost

Project participants and stakeholders whose constructional activities contributed to the social cost should compensate for the negative impact incurred by the public. This could be achieved by estimation and incorporation of the associated social costs into the contractual agreement during the tendering process. Bartholomew (2022) and Gilchrist and Allouche (2005) highlighted that "Traditional contractual and bid evaluation practices do not account for economic losses resulting from construction-related activities that are borne by parties not engaged in the contractual arrangement". Danku et al. (2020) and Yu and Lo (2007) have identified three reasons for the difficulties involved in measuring the social cost. First and foremost, social costs associated with construction activities are excluded from bill of quantities (BQs) since it is absorbed by the public instead of the project participants. Secondly, social costs caused by construction activities are intangible, hence, quantifying is nearly impossible. Thirdly, society is generally overlooked since they are not active participants during the planning and management phase.

Recommendation for social cost quantification

The implementation of a development project, whether it be an urban underground expressway, public utility, residential building, or pipeline infrastructure, will inevitably result in alterations to the current biophysical environment, cultural status, and socio-economic landscape. (Balaban, 2012; Çelik et al., 2017). Hence, Environmental Impact Assessment (EIA) of a development project should be conducted to identify the consequences of an engineering project to the environment (Çelik et al., 2017; Ramírez et al., 2021). However, quality of life will also be equally affected in the neighbourhood adjacent to the construction area by the development project despite of the socio-economic benefits it may generate. Thus, it is advisable to prioritize classification, quantification, and compensation of the social costs beyond EIA approval of a proposed development (Çelik et al., 2017; Ramírez et al., 2021). Automatically, the focus will shift from tender price to emphasis on sustainable construction by adopting social costs consideration.

RESEARCH METHODOLOGY

Data to answer the posed research questions were collected via quantitative research methodology involving a questionnaire to various construction players in Peninsular Malaysia. Quantitative research methodology allows to examine the relationship among variables by analysing numerical data via statistical tool. In the questionnaire, the 5-point Likert scale is used to determine a respondent's level of agreement with a statement or group of statements (Alabi et al., 2023; Bertram, 2007)

Collected data was arranged and analysed using descriptive analysis via frequency studies. Data analysis is the process of transforming, evaluating, and modelling data to infer information to support decision-making. Data gathered via structured instrument such as questionnaire or interview is classified into categories to visualise the frequency distribution. It is presented in the form of list, table or chart for easier visualisation of frequency of various outcomes in a sample.

A total of 111 questionnaires were returned successfully and for further analysis. The respondents include 18% of architects, 19% civil and structural engineers, 22% of contractors, 18% of developers and 23% of quantity surveyors.

A mean comparison analysis had been performed. To establish the categories of respondents, types of personal values, and conflict elements, a mean score is necessary. The mean score is calculated by adding the entire number of responses and dividing it by the total number of respondents. Then, ranking analysis is used to determine the level of understanding and importance of social costs among building stakeholders.

ANALYSIS ON LEVEL OF UNDERSTANDING OF SOCIAL COSTS AMONG CONSTRUCTION PLAYER

For the level of understanding of social costs towards construction player in the construction industry, the results show that the top implication chosen by the respondents is “Road safety problems” with the highest mean score of 4.37. The value described as unaccustomed driving conditions and diverted roads with narrow residential streets will increase incidents of road accidents and vehicular traffic disruption due to extended travel period (Çelik et al., 2019).

The second highest mean score is 4.28 which is “Construction site water pollution causes irreversible damages”. This is because previous study shows that construction as the upper hand environmental pollutant causes water pollution, generates solid and liquid waste, emits harmful gases and generates dust (Enshassi et al., 2016). Pollution-associated impacts not only pose health threats but reduce quality of life to those in adjacent neighbourhoods.

Then, the third highest mean score is 4.19 which is “Air pollution of construction machinery produces air emissions that contain carbon and nitrogen

oxides, toxic substances, heavy metals". According to (Ijigah et al., 2013), construction accounts for 90% of all non-fuel mineral consumption, and all forms of constructions consume electricity.

Table 2: Highest Mean Ranking on Level of Understanding of Social Costs

	Mean	Std. Deviation	Ranking
Road safety problems	4.37	.841	1
Construction site water pollution causes irreversible damages	4.28	.765	2
Air pollution of construction machinery produces air emissions that contain carbon and nitrogen oxides, toxic substances, heavy metals	4.19	.668	3
Construction activities produce airborne particles or dust	4.14	.784	4
Noise and disturbance to human	4.11	.802	5

ANALYSIS ON LEVEL OF IMPORTANCE OF SOCIAL COSTS AMONG CONSTRUCTION PLAYER

For the level of importance of social costs towards construction player in the construction industry, the results show that the top implication chosen by the respondents is "Road safety problems" with the highest mean score of 4.49. According to (Çelik et al., 2019), no amount of patchwork will settle a damaged road because once the soil underneath settles it will cause potholes. Excavation decreases pavement life expectancy and subsequent or inadequate periodic road restoration remains an expensive problem.

The second highest mean score is 4.34 which is "Construction site water pollution causes irreversible damages". Interception flow construction projects may influence the volume, velocity, and sedimentation rate of the flow, resulting in riverbank erosion, floods, disruptions in the usual course of rivers and streams, and aquaculture damage. Dehydration activities that lower the water table can deteriorate green living, limit agricultural water consumption, and cause building subsidence. Precipitation, dust, and fuel leaks can all have an impact on water quality (Gilchrist & Allouche, 2005).

Then, the third highest mean score is 4.15 which is "Construction activities produce airborne particles or dust". Gilchrist and Allouche (2005) mentioned, construction operations can cause particles or dust to be released into the air. Although dust occurs naturally, building dust has been found to cause significant disruption to people within 150 meters of a construction site. Dust

may wreak havoc on electrical and mechanical systems, as well as decrease sight. The societal costs of dust include higher cleaning and maintenance expenses, lower agricultural productivity, and lower environmental aesthetic quality. Civil contractors plan-ahead of time to manage dust pollution and are thus more prepared than building contractors. To reduce dust pollution, civil contractors frequently have their own water wheels and other supplies on-site (Yu et al., 2004).

Table 3: Highest Mean Ranking on Level of Importance of Social Costs

	Mean	Ranking
Road safety problems	4.49	1
Construction site water pollution causes irreversible damages	4.34	2
Construction activities produce airborne particles or dust	4.15	3
Air pollution of construction machinery produces air emissions that contain carbon and nitrogen oxides, toxic substances, heavy metals	4.14	4
Noise and disturbance to human	4.10	5

CONCLUSION

In terms of the level of social costs, the findings indicate that different categories of construction stakeholders have different levels of understanding of social costs. From the results of analysis by mean analysis, the level of understanding of social costs for most respondents are road safety problems, followed by construction site water pollution causing irreversible damages. Then, the third highest mean score which is air pollution of construction machinery produces air emissions that contain carbon and nitrogen oxides, toxic substances, heavy metals. Next, the fourth highest mean score of social cost by construction activities is the production airborne particles or dust, and the fifth highest mean score is noise and disturbance to human.

Furthermore, in terms of societal expenses, data analysis from the gathered questionnaires clearly reveals that road safety issues are the most important cause for building projects amongst construction players. The result underlines that all construction professionals, including the developer, contractor, civil and structural engineer, architect, and quantity surveyor, are aware that road safety issues are the leading cause of project delays.

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Received: 22nd Mar 2024. Accepted: 8th July 2024