IMPACTS OF CONSTRUCTION MATERIALS AND SITE ACTIVITIES TO THE NEIGHBOURHOOD ENVIRONMENT

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A project report submitted in partial fulfilment of the requirements for the award of the Master of Project Management

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DECLARATION

I, **CHAN HAN WANG** hereby declare that the dissertation is based on my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.

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APPROVAL FOR SUBMISSION

I certify that this project report entitled "**IMPACTS OF CONSTRUCTION MATERIALS AND SITE ACTIVITIES TO THE NEIGHBOURHOOD ENVIRONMENT**" was prepared by **CHAN HAN WANG** has met the required standard for submission in partial fulfilment of the requirements for the award of Master of Project Management at Universiti Tunku Abdul Rahman.

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ABSTRACT

Construction sites will unavoidably disrupt local residents' daily life and affect the surrounding environment. The purpose of this study is to provide an overview of the impact of construction materials and site activities on the neighbourhood environment and to assess the extent to which Malaysian construction industry are complying with the Malaysian Building By-Laws and Acts. A total of 16 construction material used and on-site activities performed, 9 major impacts and 6 different fields of requirement by Malaysian Building By-laws and various acts that need to be complying in order to mitigate the neighbourhood environmental impacts were identified through comprehensive literature review from published researchers. A detailed questionnaire was distributed to the construction industry practitioners within Klang Valley region and a total of 121 fully completed samples were collected from the survey, with an overall response rate of 60.5%. The data collected was analyzed statistically by SPSS. The overall ranking for the top 5 most influential construction materials and on-site activities are: (1) dust from exposed areas of cement and sand, (2) demolition and material handling, (3) transporting of fill on public roads, (4) excavation and placement of the fill in stock piles or to embankment and tied (5) driving piles and vehicle activity on dry unsealed roads. The overall ranking for top 5 impacts that affecting neighbourhood environment are: (1) noise generation; (2) dust generation; (3) damaged public road; (4) construction traffic and; and (5) mosquitoes from stagnant water. Moreover, factor analysis successfully identified 6 underlying factors (air pollution control; water pollution control, noise pollution control; construction traffic management; construction waste management; and mosquitoes control) from 22 practices of neighbourhood environment control. This paper aims to investigate in extent of compliance of the Malaysian construction industry with regard to neighbourhood environmental pollution to understand whether they are doing or following all the prevention strategies that determine by various acts. It provides insights and raises the awareness of the construction industry and society on the control practices of the Malaysian construction industry's impact on the neighbourhood environment.

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LIST OF SYMBOLS / ABBREVIATIONS

α	Cronbach's Alpha Reliability Coefficient
t	t Statistic
CIDB	Construction Industry Development Board
CO2	Carbon Dioxide
DBKL	Dewan Bandaraya Kuala Lumpur
DF	Degree of Freedom
DOE	Department of Environment
DPM	Diesel Particular Matter
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EQA	Environmental Quality Act
etc.	Et Cetera
KMO	Kaiser-Meyer-Olkin
N	Number
NO2	Nitrogen Dioxide
PCA	Principal Component Analysis
PM	Particular Matter
SO2	Sulfur Dioxide
SPSS	Statistical Package for Social Sciences

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This research will study about the impacts of construction materials used and site activities in the construction site to the neighbourhood environment. It is inevitable that construction projects will disrupt local residents' daily life and harm the surrounding environment. Construction-related inconveniences and disadvantages include dust and noise production, waste materials deposited in public areas, soil and water contamination, increased traffic, visual impacts, harm to public drainage systems, and plant destruction, among others. There are a few sub-topics involved in this chapter which includes background information, a brief overview of the background of the effect of construction materials used and site activities involved in the construction site to the neighbourhood environment, followed by problem statement, research questions and objectives, scope of research, research method, significance of research and the summary.

1.2 Research Background

Construction activities and the materials used in them can have significant impacts on the surrounding environment, including the quality of life for people living in nearby neighbourhoods. These impacts can be both positive and negative. On the one hand, construction can bring new development, create job opportunities, and stimulate economic growth. On the other hand, construction can cause noise pollution, air and water pollution, traffic congestion, and other negative effects that can harm the health and well-being of nearby residents (Oliveira et al, 2019).

It has only lately become more important than ever to consider how construction activity affects the environment, and in many nations, doing so is now mandated by law (Mustafa, 2022). Studies have shown that construction activities and the materials used in them can have different levels of impact depending on various factors, including the type and scale of the construction project, the location of the construction site, and the characteristics of the surrounding neighbourhood. For example, construction of a large-scale infrastructure project in an urban area may have different impacts than a smaller residential construction project in a suburban area, mostly in the neighbourhood of residences that is inevitable. Similarly, the use of certain materials, such as concrete, may have different environmental impacts than the use of other materials, such as wood or steel.

Noise and odour can be grating and upsetting. The rest, comfort, and health of construction employees, local neighbours, and the visiting public may all be negatively impacted by excessive noise generated on a site, as well as the regular operations of nearby schools, hospitals, and other facilities. (Qosimov et al, 2021). For varied lengths of time, construction would have varying degrees of impact on the neighbourhood. Other, noise was the common effect that affect to the neighbourhood. Noise is usually associated with construction work although modern preventive measures like sound insulation barriers, which may substantially reduce the amount of noise in the neighbouring, but it does not completely solve the problem. Noise may adversely affect resident's health, including effects such as stress, sleep disturbance, high blood pressure and even hearing loss (Jung et al, 2020).

Construction activities such as demolition, earthmoving, and excavation may result in billowing dust clouds that can irritate eyes and pose other health risks in addition to making cleaning more difficult for those who already have respiratory conditions. Site fences and other objects degrade the aesthetics, which could be interpreted as environmental aggression (Sundquist et al, 2018).

Traffic from vehicles and equipment coming from or connected to the site may significantly worsen local traffic congestion, posing safety risks. Due to construction activities such as trench cutting and road closures, nearby neighbourhoods may have access issues. For instance, road closures could force traffic to take other routes that pass through neighbourhoods and community centres. Parking spaces that are generally available are frequently scarce due to the increased demand from employees and suppliers. Public spaces like sidewalks, gardens, concrete drains, and inspection covers are particularly vulnerable to damage from construction activities (Ingram, 2019).

Construction would temporarily affect quality of life to the neighbourhood. Any given neighbourhood would experience construction for two to five years, depending on the project. The presence and movement of construction tools and supplies, soil removal and exposure, the installation of lighting for nighttimes work, and overall visual alterations in the surrounding landscape are all activities related to the project's construction (Zou, 2018).

Although environmental impacts of construction site activities have recently received more attention globally, Malaysia's situation is different. In order to determine if construction companies have the resources to comply with Malaysian legislation to lessen these consequences, a survey was undertaken to evaluate the negative impact of building materials and other site activities on public nuisance produced by those operations.

1.3 Problem Statement

The construction industry is one of the major contributors to neighbourhood environmental degradation (Qosimov et al, 2021). The use of different construction materials and activities on construction sites generates a range of environmental impacts, including noise pollution, dust and air pollution, and vibration, which can affect the quality of life of the people living in the neighbourhoods adjacent to the construction site (Oliveira et al, 2019). While regulations are in place to minimize these impacts, there is limited research exploring the impacts of construction materials and site activities on the neighbourhood environment, and the effectiveness of these regulations (Luderer et al, 2019). Understanding these impacts is important for mitigating negative effects and promoting sustainable construction practices (Sundquist et al, 2018). Therefore, this study aims to investigate the impacts of construction materials and site activities on the neighbourhood environment, with a focus on identifying key factors that contribute to these impacts and potential strategies for reducing their effects.

Construction site workers play a vital role in ensuring that little harm is done to the environment and people because they are the ones who are directly involved in site activities. Although environmental impacts of construction site operations have recently received more attention globally, Malaysia's construction industry situation is different. In order to determine if construction companies have the means to comply with Malaysian legislation to lessen these impacts and further develop more effective environmental regulations to minimize these impacts and ensure sustainable development of the construction industry, they are listed by others various act and regulations such as Environmental Impacts Assessment (EIA) and Environmental Quality Act (EQA), which is make by Department of Environment (DOE).

1.4 Research Questions

The research questions of this study are the following:

a) What are the construction materials used and site activities involved at a typical construction site most likely to have an impact on the neighbourhood environment?

b) What are the environmental impacts of construction materials and site activities from the construction site to the neighbourhood environment?

c) What are the extent of compliance by Malaysian construction industry to the Malaysian Building By-laws and Acts to reduce the environmental impacts?

1.5 Research Objectives

The aim of this study is to carry out research on the impacts of construction materials and site activities to the neighbourhood environment and to assess the extent of compliance by Malaysian construction industry to the Malaysian Building By-laws and Acts.

In order to accomplish the aim above, the following objectives are formulated to work towards the aim:

a) To identify the construction materials used and site activities involved at a typical construction site most likely to have an impact on the neighbourhood environment.

b) To study the environmental impacts of construction materials and site activities from the construction site to the neighbourhood environment.

c) To assess the extent of compliance by Malaysian construction industry to the Malaysian Building By-laws and Act to reduce the environmental impacts.

1.6 Research Hypothesis

Ho = There is no statistically significant relationship between impacts control and practises from Malaysian laws and various act and the impacts brings from construction site to the neighbourhood environment.

Ha = There is the statistically significant relationship between impacts control and practises from Malaysian laws and various act and the impacts brings from construction site to the neighbourhood environment.

1.7 Research Scope

The objective of this study is to categorize the construction materials and site operations used at a typical construction site, to assess the effect on the neighbourhood of building materials and site operations and to evaluate the extent to which Malaysian construction industry comply with Malaysian construction law. As a result, it is critical to collect data equally from various job positions in the construction industry. Different position of every individual would give a huge impact on the result, and will also make the collected data more accurate.

The target respondents for this research are the workers involved who are work in the construction firm within the Klang Valley. In order to achieve the objectives of this study, 200 sets of questionnaires which in English version will be prepared and distributed to the parties who are involved in the construction industry in the different job position, such as clients, architects, engineers, quantity surveyors, and construction industry, via email or WhatsApp with Google Form.

1.8 Research Method

Step 1: Formulating problem statements

Firstly, problem statement will be identified and supported by scholarly paper which already published at the internet sources. The scholarly paper has done by collecting data and it has high accuracy on the research. Therefore, the problem statement formulated will be high trustworthy.

Step 2: Identify research aim and objectives

The research aim and objectives must be determined before conducting the research. Aim and objectives of research act as a guideline when doing the research. The conclusion at the end must achieve the aim and objectives which has been set earlier. The aim and objectives also helps the research to be done smoothly.

Step 3: Literature review

Literature review is important for a research. Review some scholarly paper which has been published in the social media is important. This is to prove that all the information written has the data supported behind and ensure that it is really happen in the construction industry. Literature review provides theoretical framework to the research.

Step 4: Collecting data

This research data is collected by using primary research method with on-line questionnaire. 200 sets of questionnaires are distributed to the parties involved in the construction industry. This huge amount of questionnaire is distributed in order to achieve at least 100 respondents which are provided high quality and high accuracy of results.

Step 5: Analysis of data

After all the data is collected, analysis of date is required. The data will be analysed in statistically by using IBM SPSS Statistics software. The statistics of data is studied and discussed further in the research with aid of some necessary data table and figure.

Step 6: Recommendation and conclusion

Some recommendations are provided in order to solve all limitations faced when conducting this research. A conclusion will be made after analysing the results. Conclusion is to summarise all the important information in this research and it must meet the aim and objectives set earlier.

Step 7: Presentation and Feedback

A presentation is carried out to introduce the audience about their research and present the main idea of the research. Questions can be asked by the audience if they have any queries. Audience can provide feedback orally or in written form to the presenter about their research which helps the presenter to improve themselves.

1.9 Significance of Research

The significance of this study is determining how construction materials and site activities affect the local environment. Besides, this research can also serve as a guide for the construction industry practitioners to adopt suitable impacts control practices to mitigate and control the impacts from construction site to neighbourhood environment. This research also enhance to the body of knowledge in the field of the environmental impact of construction sites and provide useful insights into whether environmental impacts control practices are effectively influencing the Malaysian construction industry. In addition, we can through this research collect by respondents data to assess that problem and how to solve the problem more effectively.

1.10 Chapter Outline

The introduction, literature review, research methods, results and discussion, as well as the conclusion and recommendations, are the five key chapters in this study report.

Chapter 1: Introduction

A research report begins with an introduction that describes the report's overall content. The research background, problem statements, goals and objectives, research scope, justification for the research, research methodology, and chapter summaries were all included in this chapter. This introduction will provide a brief understanding for readers about the existence problems in construction field and the purpose on conducting the research.

Chapter 2: Literature Review

This chapter is devoted to reviewing the literatures that discuss information that has been published for a specific field of study. A literature review is to study on scholarly paper which includes knowledgeable source and professional substantive findings. This chapter will discuss the definition and impacts of various type of construction material used and different construction on-site activities which may bring impacts to neighbourhood environmental. This chapter also discusses possible actions to lessen impacts and the compliance with building by-laws.

Chapter 3: Research Methodology

In this chapter, the method and mechanism to complete this research is described and drawn. This chapter includes research methodology procedures, types of research method, sampling size data collection method and data analysis.

Chapter 4: Results and Discussion

This chapter is to discuss the results after the data collection process. Analysing of the data obtained from the questionnaires which have been prepared and discuss on the results. In order to fulfil the aims and objectives of the research, the generated results must be appraised.

Chapter 5: Conclusion and Recommendations

The research's final chapter is the conclusion. This chapter serves as a summary of the research's key findings and offers some expert advice for future related research studies that should be conducted. In order to improve future research, this chapter also explains the limitations of the current study.

1.11 Summary

The research topic's introduction and background, which is how building site activities and materials affect the local ecosystem, were the main points of this chapter 1. After that, study objectives and research questions were established. This chapter's concise presentation of the research's scope and rationale can aid readers in getting a better understanding of the study. 200 sets of questionnaires will be created for the methodology and delivered to workers who are working in construction industry within Klang Valley area. Besides, the collected data will be analysing by using IBM SSPS Statistics software.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This study is aimed to investigate the impacts of construction materials and site activities to the neighbourhood environment. In order to measure the impacts of construction materials and site activities to the neighbourhood in this study, literature review will discuss about the theoretical concept which is helpful to achieve and understanding the aim and the objectives of this research. This chapter is reviewing from numerous of resource such as journals, articles and books related to the research topic.

2.2 Impacts on Construction Material Used

The various kinds of materials used for construction are known as building materials. Wood, concrete, steel, cement, bricks, and metal are some of the common building materials. Engineers today employ the effective methods of "mix and match" to create the greatest building materials and create high-quality constructions. The size of the project and the efficiency of the materials have a significant impact on the overall choice of the construction material (Domone and Illston, 2018). To ensure the durability and quality of the building, it is crucial to select the proper kind of construction material. There is a very high likelihood that various problems will develop in the building, even if you hire the services of the most skilled construction team but use low-quality construction materials. Saving money is a key factor in why people choose alternative building materials. However, the long-term construction period must have certain negative impacts that will bring to neighbourhood environment (Qosimov et al, 2021).

2.2.1 Cement

Cement is any substance that, through a series of chemical reactions known as setting, binds together other materials. Cements are dry powders that are not to be confused with concrete or mortar, but they are an essential component of all of these materials, acting as the 'glue' that gives structures their strength. Because it is a major component of all of these building materials, cement is an incredibly valuable construction element. Mortar is a combination of cement and sand, while concrete also contains rough aggregates. It is used in the construction of many of the modern world's infrastructure, including houses, bridges, runways, and roads (Mishra et al, 2022).

It is also used for structural elements and other architectural elements. Cement is the world's second most consumed product, after water, due to the continuous demand for all of these structures, which is increasingly coming from the developing world. Depending on the cement's capacity to set in the presence of water, cements used in building can be classified as hydraulic or non-hydraulic. It dries and reacts with carbon dioxide in the air to set non-hydraulic cement; it does not set in wet conditions or under water. After setting, various dangerous compounds may assault it (Mishra et al, 2022). A chemical reaction between the dry materials and water causes hydraulic cements, such as Portland cement, to set and become adhesive. Mineral hydrates are formed as a result of the chemical reaction and are not very water soluble, making them very stable in water and resistant to chemical attack. This allows the hardened material to be set in wet or underwater conditions while still protecting it from chemical attack (Dunuweera and Rajapakse, 2018).

The use of cement in the construction of buildings and infrastructure in a neighbourhood can have several impacts on the local environment. Some of these impacts are (Dunuweera and Rajapakse, 2018):

(i) Urban Heat Island Effect: Cement absorbs and retains heat, which can lead to an increase in local temperatures, causing the "urban heat island effect." This effect can have negative impacts on the local climate, air quality, and human health.

(ii) Water Runoff: Cement is impermeable, which means it does not allow water to pass through. This can result in increased runoff during heavy rainfall, which can lead to flooding and erosion. It can also lead to a decrease in groundwater recharge, which can have negative impacts on the local ecosystem.

(iii) Air Quality: Cement production is a significant source of greenhouse gas emissions, which contribute to air pollution and climate change. Cement dust can also be a source of air pollution and can negatively impact the respiratory health of people living in the neighbourhood.

(iv) Land Use: Cement production requires a significant amount of natural resources, including minerals, water, and land. This can result in the destruction of natural habitats and biodiversity loss.

(v) Aesthetics: The use of cement can have negative impacts on the visual appearance of a neighbourhood, especially if it is used extensively in the construction of buildings and infrastructure. This can impact the quality of life of residents and visitors to the area.

Overall, the impacts of using cement in a neighbourhood can be significant and wide-ranging. It is important to consider these impacts when planning and designing construction projects and to explore alternatives to cement where possible.

2.2.2 Aggregates

Aggregates are inert granular substances like sand, gravel, or crushed stone that are required in concrete in addition to water and portland cement. To create an appropriate concrete mix, aggregates must be free of absorbed chemicals, clay coatings, and other fine pollutants that could cause concrete to decay. 60 to 75 percent of the entire volume of concrete is made up of the two main types of aggregates, fine and coarse. The majority of the particles in fine aggregates are frequently made of crushed stone or natural sand, and they frequently pass through a 3/8-inch filter. A coarse aggregate is defined as any particle larger than 0.19 inches, which often has a diameter of between 3/8 and 1.5 inches. Gravel makes up the majority of the coarse aggregate used in concrete, and crushed stone makes up the majority of the remaining material (Hafez, 2020).

Natural gravel and sand are typically extracted by digging or dredging from a pit, river, lake, or ocean floor. By crushing quarry rock, boulders, cobbles, or large-size gravel, crushed aggregate is created. Recycled concrete is a practical source of aggregate and has been successfully utilized in new concrete, granular subbases, and soil-cement (Jesus et al, 2019).

The properties of freshly mixed and hardened concrete, mixture ratios, and economy are all significantly influenced by aggregates. As a result, choosing aggregates is a crucial process. Although some variance in aggregate attributes is anticipated, grading, durability, particle shape and surface texture, abrasion and skid resistance, unit weights and voids, absorption and surface moisture are all factors to be taken into account (Tam et al, 2018).

Grading is the process of figuring out how big the aggregate's particles will be. Because these characteristics influence the amount of aggregate used, cement and water requirements, workability, pumpability, and durability of concrete, grading limits and maximum aggregate size are specified (Hafez, 2020). In general, a wide range of grading can be utilized without significantly affecting strength if the water-cement ratio is adjusted correctly. Some aggregate particle sizes are excluded from the size continuum when gap-graded aggregate is specified. To achieve homogeneous textures in exposed aggregate concrete, gap-graded aggregate is used. To prevent segregation, close management of mix proportions is required. (Jesus et al, 2019).

Aggregates from construction site can have significant impacts on the environment of the neighbourhood in which it takes place. Here are some of the impacts (Hafez, 2020):

(i) Dust and Air Quality: The mining, crushing, and transportation of aggregates can generate a lot of dust, which can have negative impacts on air quality. Dust can cause respiratory problems for nearby residents, and can also lead to property damage.

(ii) Noise Pollution: Aggregates operations can be very noisy, particularly during the crushing and screening processes. This can disrupt the peace and quiet of the neighbourhood and affect the quality of life of residents.

(iii) Habitat Destruction: The extraction of aggregates can lead to the destruction of natural habitats, particularly in areas where the aggregates are sourced from rivers or streams. This can have negative impacts on local wildlife and biodiversity.

(iv) Traffic Congestion: The transportation of aggregates to and from construction sites can lead to increased traffic on nearby roads, which can cause congestion and inconvenience for residents.

(v) Land Use: Aggregates mining and extraction can result in significant changes to the landscape, including the creation of large quarries or pits. This can have negative impacts on the aesthetic appeal of the neighbourhood.

Overall, the use of aggregates in the neighbourhood environment should be carefully considered, with a focus on minimizing any negative impacts.

2.2.3 Concrete

Concrete is a composite material composed of fine and coarse aggregate bonded together with a fluid cement (cement paste) that hardens (cures) over time. Concrete is the second-most-used substance in the world after water, and is the most widely used building material. Its usage worldwide, ton for ton, is twice that of steel, wood, plastics, and aluminium combined (Chica and Alzate, 2019). The ready-mix concrete market, the largest segment of the global concrete market, is predicted to produce sales of more than $600 billion by 2025. The production of cement is particularly notable for producing large amounts of greenhouse gas emissions, accounting for a net 8% of global emissions. Further environmental concerns include numerous illicit sand mining activities, damaging effects on the environment such increased surface runoff or the urban heat island effect, and possibly hazardous components. A lot of research and development is being done to try and reduce emissions or make concrete a source of carbon sequestration, as well as enhance the percentage of recycled and secondary raw materials in the mix, in order to achieve a circular economy. (Abdullah, 2022).

Construction concrete can have significant impacts on the environment of the neighbourhood in which it takes place. Here are some of the impacts (Chica and Alzate, 2019):

(i) Heat island effect: Concrete can absorb and retain heat from the sun, contributing to the "heat island" effect in urban areas. This can increase temperatures in neighbourhoods, making them less comfortable for residents and contributing to air pollution.

(ii) Lack of permeability: Concrete is impermeable, which means it can prevent rainwater from being absorbed into the ground. This can lead to stormwater runoff and flooding in neighbourhoods.

(iii) Aesthetics: Some people find concrete to be unattractive and sterile-looking, which can have a negative impact on the overall aesthetic of a neighbourhood.

(iv) Health impacts: Concrete dust can be a respiratory irritant and can contribute to health problems such as asthma and bronchitis. Additionally, the production of concrete can contribute to air and water pollution, which can have negative impacts on the health of residents.

Overall, it is important to consider the specific context and environmental factors when deciding whether or not to use concrete in a neighbourhood. It is important to also consider the potential negative impacts and explore alternative materials and design strategies.

2.2.4 Steel

Steel production has a number of impacts on the environment, including air emissions (CO, SOx, NOx, PM2), wastewater contaminants, hazardous wastes, and solid wastes. The major environmental impacts from integrated steel mills are from coking and iron-making (Liew and Akbar, 2020).

The first is the climate change. Virtually all of the greenhouse gas emissions associated with steel production are from the carbon dioxide emissions related to energy consumption (Liew and Akbar, 2020).

Emissions of harmful products into the air come in second. One of the main sources of pollution from the steel industry is the production of coke. Coke ovens emit air emissions such coke oven gas, naphthalene, ammonium compounds, crude light oil, sulphur, and coke dust (Liew and Akbar, 2020).

Furthermore, is emission of harmful product to the water. Water emissions come from the water used to cool coke after it has finished baking. Quenching water becomes contaminated with coke breezes and other compounds. While the volume of contaminated water can be great, quenching water is fairly easy to reuse. Most pollutants can be removed by filtration (Song et al, 2021).

Last is the disposal of waste by steel industries. The majority of iron-making by-products are composed of slag, which is composed of the iron ore and limestone impurities gathered at the top of the molten iron. In air emissions control devices, sulphur dioxide and hydrogen sulphide are volatized, caught, and the leftover slag is sold to the building sector. Solid waste does not end up in landfills, even though this is not a pollution prevention method. The two main types of waste produced by electric arc furnaces are gaseous emissions and metal dust. (Song et al, 2021).

The impacts of steel on the neighbourhood environment can vary depending on a number of factors, including the location of the steel plant, the size of the facility, and the production processes used. Some potential impacts of steel production on the neighbourhood environment include (Liew and Akbar, 2020):

(i) Air pollution: Steel production can release pollutants such as particulate matter, sulphur dioxide, and nitrogen oxides into the air, which can have negative impacts on air quality and public health.

(ii) Water pollution: Steel production can generate wastewater that contains heavy metals, chemicals, and other pollutants, which can contaminate local waterways and harm aquatic ecosystems.

(iii) Noise pollution: Steel plants can generate significant noise pollution, which can be disruptive to nearby residents and can have negative impacts on health and quality of life.

(iv) Traffic congestion: Steel plants may generate a significant amount of traffic, which can contribute to congestion on local roads and highways.

(v) Visual impacts: Steel plants can be large and visually imposing structures, which can have negative impacts on the aesthetic quality of the surrounding area.

It is important to note that many modern steel plants employ advanced technologies and practices to minimize their environmental impacts. However, the potential for negative impacts on the neighbourhood environment remains a concern, particularly in areas with large or older facilities.

2.3 Impacts on Construction On-Site Activities Performed

Furthermore, the ‘construction process, sometimes called the ‘construction stage’, is the physical processes of building, landscaping or refurbishing plus all the associated activities, such as demolition, site clearance, and so on (Oliveira et al, 2019). Construction industries are typically in charge of carrying out building work, even if they may also be referred to as builders or home builders in the construction industry. Subcontractor and other providers may be chosen by contractor to complete all or parts of the work. The process may start with the client handing over the project site to the contractor following a procurement procedure and may end with the client receiving the finished product. It does not include pre-construction activities like creating the brief, putting together a design team, or designing, however these activities may be finished simultaneously with construction (Abbas et al, 2018).

2.2.1 Site Clearance

In order to prepare a site for construction, enabling work often includes site clearing. The site needs to be destroyed in order to make room for further remedial, treatment, or demolition activities before the real construction work can begin (Schatzki, 2021).

It comprises taking away all machinery, equipment, unnecessary surplus items, rubbish, and other things from a place. In addition to removing vegetation and surface debris, site preparation may also involve levelling the land to make it suitable for the planned building activities. Care should be taken to make sure that the appropriate approvals are in place, especially for trees that may be protected (Schatzki, 2021).

A site waste management plan (SWMP) could be created before site clearing. This discusses how materials will be efficiently handled and disposed of in a way that will maximize their ability to be recycled and reused. Waste of every kind must be removed from the site efficiently and safely. If there are any contaminated wastes or possibly hazardous substances (like asbestos), they must be handled carefully by consulting trash disposal specialists.

Site clearance may be done as part of the primary construction contract, or it may be done beforehand as part of a larger contract that also includes other enabling or facilitating works, such as demolition, soil stabilization, diverting services, building access roads, etc (Harris et al, 2021).

During site clearing, the removal of trees and other vegetation takes place in order to prepare the site for excavation. A good place to begin to mitigate potential damage is by determining what vegetation can stay on site for as long of a time frame as possible. Vegetation prevents soil exposure, which in turn minimized erosion and the formation of sediment.

Site clearance can have a significant impact on the neighbourhood environment, both during the clearance process and afterwards. Some of the potential impacts are (Schatzki, 2021):

(i) Noise pollution: Site clearance often involves the use of heavy machinery and equipment, which can generate significant noise levels that can be disturbing to residents in the neighbourhood.

(ii) Dust and air pollution: The demolition process can create large amounts of dust and debris, which can lead to air pollution and potentially harmful particles in the air that can cause health problems.

(iii) Traffic disruptions: Site clearance activities can cause traffic disruptions, especially if the site is located near a major road or thoroughfare, which can affect the flow of traffic in the neighbourhood.
(iv) Safety hazards: Site clearance activities can create safety hazards, such as falling debris or damaged sidewalks, which can pose a risk to pedestrians and nearby buildings.
(v) Visual impact: Site clearance can significantly alter the visual landscape of the neighbourhood, as buildings are demolished and cleared away, which can be distressing to residents and affect property values.
(vi) Disruption to utilities: Site clearance may require the disconnection of utilities such as electricity, gas, and water, which can disrupt the lives of residents in the neighbourhood.

It is important for site clearance activities to be carried out in a safe and responsible manner, with measures taken to minimize the impact on the neighbourhood environment. This can include controlling noise and dust levels, ensuring traffic flow is maintained, and taking steps to protect the safety of pedestrians and nearby buildings.

2.2.2 Transportation

Transport in the construction site refers to the use of trucks to transfer items like asphalt, tools, or rubble. When certain building materials are urgently required on a construction site, construction transport is typically conducted. Heavy machinery that isn't intended for infrastructure must be moved to the construction site before excavation can begin. Getting critical construction materials to a construction site on time will mean the difference between a project's success and failure (Jin et al, 2018).

The project must be finished after the lengthy period of transporting machinery and materials. Then, after the construction project is completed, transportation machinery is just as useful for hauling waste during the cleanup process. Crews can carry out each of these tasks on a construction site using a variety of hauling and material handling tools, depending on the application. For material handling or equipment transportation, some sort of hauler is required for almost all construction projects. Large trucks with rubber tyres may be classified as street vehicles. On local roads, however, certain tracked vehicles can be allowed. Tipper trucks, large concrete mixers, trailers, and dump trucks are all self-propelled and offer advantageous advantages in handling materials or machines. Moreover, concrete trucks and tipper trucks are two of the most popular forms of heavy machinery utilized on building sites (Elshaboury, N. and Marzouk, M., 2021).

Construction transportation can have significant impacts on the environment of the neighbourhood in which it takes place. Here are some of the impacts (Jin et al, 2018):

(i) Noise pollution: Heavy trucks and construction equipment produce a lot of noise. This can be especially problematic for residents who live near the construction site. Excessive noise can cause disturbances and disrupt the daily lives of residents.

(ii) Air pollution: Construction vehicles and equipment emit pollutants, including carbon monoxide, nitrogen oxides, and particulate matter. These pollutants can contribute to poor air quality, which can harm the health of residents, especially those with pre-existing respiratory conditions.

(iii) Traffic congestion: Construction vehicles and equipment can cause traffic congestion, especially if the construction site is located on a busy road. This can cause delays and inconvenience for residents who are trying to get to work or school.

(iv) Road damage: Heavy construction vehicles can damage roads and sidewalks, which can cause safety hazards for pedestrians and drivers.

(v) Visual impacts: Construction equipment, debris, and materials can be unsightly and diminish the aesthetic appeal of the neighbourhood.

To mitigate these impacts, construction companies should take measures to minimize noise and air pollution, manage traffic flow, and control runoff from construction sites. Additionally, local governments should enforce regulations that require construction companies to adhere to environmental standards and provide compensation to affected residents.

2.2.3 Excavation

Excavation work is the process of removing soil, rock, or other materials in order to create an open face, hole, or cavity as part of building or demolition work. An excavation is defined as any earthwork, trenching, cofferdam, caisson, well, shaft, tunnel, or underground working (Lv et al, 2020).

Understanding the center line and excavation drawings, laying out the plan on the ground, excavating the soil, and removing extra soil are all steps in the work procedure for excavation at a building site. It is important to perform quality checks such marking reference points and the ground level. Most construction projects necessarily require topsoil excavations, sub-grade compaction, earth lying and compaction, and slope defence. The design of a building entails the development of foundations, substructures, and superstructures. Excavation, earth and rock shifting are the primary activities for substructures (Lin et al, 2021).

Potential risk from excavation to watersheds depends on whether or not underground storage tanks are present onsite and whether or not these tanks have been properly removed, tested and remediated to ensure that the surrounding soils have not been contaminated by the contents of these storage units. Typically, storage tanks held home heating fluids and as homes were updated to no longer required heating old to be stored in tanks underground or adjacent to the home, these tanks have were buried and pose a risk if they contain old heating or other fluids (Lin et al, 2021).

Construction excavation can have significant impacts on the environment of a neighbourhood. Some of the impacts include (Lv et al, 2020):

(i) Noise pollution: Construction excavation often involves the use of heavy machinery such as excavators, backhoes, and bulldozers, which can generate a lot of noise. The noise can be disruptive to residents and can affect their quality of life.

(ii) Dust and air pollution: Construction excavation can generate a lot of dust, which can be a health hazard to people living nearby. The dust can also damage vegetation and contribute to air pollution.

(iii) Traffic congestion: Construction excavation can cause traffic congestion as vehicles delivering materials and equipment may block roads and cause delays.

(iv) Damage to buildings: The excavation process can cause vibrations that may damage nearby buildings, particularly if they are old or poorly constructed.

(v) Visual impact: The excavation site can be an eyesore, particularly if it is left unattended or poorly managed.

(vi) Disruption to utilities: Excavation work may disrupt the functioning of utilities such as water, gas, and electricity, which can cause inconvenience to residents.

It is essential for construction companies to minimize the impacts of excavation on the environment and the neighbourhood by implementing appropriate measures such as noise barriers, dust control measures, traffic management plans, and regular site maintenance. Additionally, companies can communicate with the neighbourhood residents about the construction schedule and possible impacts to minimize disruptions and concerns.

2.2.4 Demolishing

Building and structure demolition is necessary for a number of reasons. For buildings and other structures, demolition procedures and methods are detailed. As is common knowledge, every building or structure design has what is known as a "design life." The building is constructed with an 80–100 year lifespan in mind. When the building's design life is ended, it becomes unsafe for occupants and nearby structures. A building may be demolished for a variety of reasons, and outdated buildings should be replaced with new ones. The building's stability was lost, or there was structural damage. To develop larger structures, smaller ones must be destroyed, etc (Li et al, 2020).

The dismantling, razing, damaging, or wrecking of any house or structure, or any portion thereof, is referred to as demolition. Many of the risks that come with construction are present in demolition work (Aslam et al, 2020). However, demolition involves additional hazards due to unknown factors which make demolition work particularly dangerous. When we build more structures, we will eventually have to demolish older ones, either for safety purposes or to make space for newer structures. Demolition is the demolition of a structure using pre-planned or regulated methods. However, demolition entails highly qualified experts dealing with rubble, environmental conditions, structures, mass, and physics, in addition to swinging a wrecking ball (Aslam et al, 2020).

There are chemicals present in the homes being demolished that must be remediated prior to demolition. Leaking of chemicals and other potentially toxic substances from old homes present a risk to the surrounding environment and to people involved in the construction process if proper remediation work has not taken place prior to demolition. Examples of substances that pose a risk include: asbestos, lead, vermiculite and other insulation materials (Li et al, 2019).

Asbestos was used in many different products in the home building industry, including but not limited to cement, floor and ceiling tile, insulation, drywall, pipe insulation and siding. Breathing in asbestos can cause many health issues such as mesothelioma and asbestosis (Li et al, 2019).

Construction demolishing also can have several impacts on the neighbourhood environment, including (Li et al, 2019):

(i) Noise Pollution: Demolishing can produce loud noise that can be very disturbing for people living nearby. The noise can be especially disruptive if the demolition work is carried out early in the morning or late at night.

(ii) Dust and Air Pollution: Demolishing can produce large amounts of dust and debris that can pollute the air and affect the quality of life for residents. This can cause respiratory problems and other health issues.

(iii) Traffic Disruption: Demolishing can cause traffic congestion in the surrounding area, making it difficult for people to travel to and from their homes or workplaces.

(iv) Safety Concerns: Demolishing can be a hazardous process, and if proper safety measures are not taken, it can pose a risk to the workers and people living nearby.

(v) Property Damage: Demolishing can cause vibrations and ground movements that can damage nearby buildings, roads, and other structures.

(vi) Aesthetics: Demolishing can change the character and appearance of the neighbourhood, which may be undesirable for some residents.

Overall, it is essential to take the necessary precautions and measures to minimize the negative impacts of construction demolishing on the neighbourhood environment. This can include using proper dust control and noise reduction measures, informing residents about the demolition schedule and taking their concerns into account, and ensuring the safety of workers and residents alike.

2.2.5 Pile Driving

Piling is a deep foundation construction method used to transfer building loads to underground strata that are far below the surface and strong. Hard bedrock or a layer of dense soil may make up the strong strata. Typically, piles are square or circular-sectioned columns made of reinforced concrete, wood, or steel-concrete composite materials (Lohunova and Wyjadłowski, 2018). Up until the point when their tip touches a dense layer of soil, they are driven or nailed into the ground. The cap of piles, which are flat surfaces attached on top of piles, support the base of the building. After that, the load is transmitted down to the strata below. Pile driving has been used as a building tool since before the dawn of civilization. Driven piles are, in reality, the oldest form of deep foundation (Wang and Zhu, 2021).

Piles are driven or nailed into place, as opposed to other kinds of building components like beams or columns, which are made by casting and joining horizontally. A pile driver, which functions similarly to a screwdriver, is used to screw driven piles into the ground. The pneumatically driven shaft into the earth is used to rotate the pile. With a pneumatic hammer, piles can also be erected using a different approach that involves nailing them into the ground (Fatehnia and Amirinia, 2018).

Because of the subsurface conditions, driving piles allows a structure to be built in an environment that would otherwise be unsuitable. As a result, it is still a very effective method today. Although the process of driving piles has changed significantly, but the basic technique for installing a pile into the ground remains the same (Wang and Zhu, 2021).

Pile driving can have several impacts on the neighbourhood environment. Some of these impacts include (Wang and Zhu, 2021):

(i) Noise Pollution: Pile driving can be very noisy and can cause significant disturbance to the neighbourhood. The noise from pile driving can exceed the allowable noise levels in residential areas and can affect people's quality of life, sleep patterns, and mental health.

(ii) Vibrations: Pile driving can cause vibrations in the ground that can be felt in nearby buildings. These vibrations can cause damage to structures, furniture, and other objects in the neighbourhood. They can also be a cause of concern for people who are sensitive to vibrations or have health conditions that are affected by them.

(iii) Air Pollution: Pile driving can generate dust and other particulate matter that can cause air pollution in the neighbourhood. This can be a concern for people with respiratory problems and can also cause damage to plants and wildlife.

(iv) Traffic Disruption: Pile driving can disrupt traffic in the neighbourhood as trucks and heavy equipment are brought in and out of the area. This can cause inconvenience for local residents and businesses.

Overall, pile driving can have significant impacts on the neighbourhood environment, and it is important to take steps to mitigate these impacts wherever possible. This can include using quieter equipment, limiting the duration and frequency of pile driving, and implementing measures to reduce dust and other pollutants.

2.2.6 Waste Disposal

Construction waste disposal refers to the process of properly disposing of waste materials generated during construction, renovation, or demolition of buildings, infrastructure, and other structures. These waste materials can include concrete, wood, bricks, metals, plastics, insulation, and other debris (Lestari and Trihadiningrum, 2019).

Proper disposal of construction waste is important for several reasons, including reducing the amount of waste sent to landfills, minimizing environmental impact, and ensuring worker safety. Construction waste can be disposed of in several ways, such as recycling, reusing, or disposing of it in designated landfills or incineration facilities (Willis et al, 2018).

Construction waste disposal is regulated by various laws and regulations, which aim to promote safe and responsible handling of waste materials. Proper disposal methods can help mitigate the negative impact of construction waste on the environment and public health (Jiang et al, 2019).

Improper disposal of construction waste can have several negative impacts on the neighbourhood environment. Some of the impacts include (Jiang et al, 2019):

(i) Air Pollution: Burning or dumping of construction waste can cause air pollution, which can be harmful to the health of residents in the neighbourhood. The fumes and smoke released during the burning of waste can contain harmful chemicals and toxins that can cause respiratory problems.

(ii) Water Pollution: Construction waste that is not disposed of properly can also contaminate nearby water sources. Waste dumped in water bodies can cause harm to aquatic life, affect the quality of water and make it unsafe for consumption.

(iii) Noise Pollution: Construction waste disposal activities can generate noise pollution that can disturb the peace and tranquillity of the neighbourhood. This can be particularly problematic if the waste is being disposed of during odd hours.

(iv) Visual Pollution: Improperly disposed of construction waste can create an eyesore in the neighbourhood. It can make the area look unsightly and unclean, which can negatively impact property values.

(v) Health Risks: The improper handling and disposal of construction waste can create health risks for residents in the neighbourhood. The waste can attract rodents, insects, and other pests, which can spread diseases and infections.

Overall, the impact of construction waste disposal on the neighbourhood environment can be significant. It is important for construction companies and waste disposal companies to follow proper procedures to ensure that waste is disposed of in a safe and responsible manner to minimize the negative impact on the environment and the community.

2.4 Environmental Impacts

Many physical activities take place at the building site. Most of the time, these processes are finished in less than five years. Despite their brief existence, they have direct and irrevocable negative effects on the ecosystem.

Construction has major adverse effects on environment and human health as the contaminants emitted during construction phase movement, the transit of cars on unpaved roads, the crushing of material, the processing and the operation of diesel-powered machinery are released to the atmosphere (Sezer and Fredriksson, 2021). In addition, any development strategy aimed at improving quality of life has positive and negative consequences. It should be designed to maximise the positive effects of the construction project and to achieve minimal adverse environmental impacts. Prediction of the environmental impacts of construction in the early stages of projects, may lead to improvements in the environmental performance of construction projects and sites. Construction is likely to damage the vulnerable ecosystem due to the negative effects of construction. As a result of construction works, there is air waste, water pollution, and noise pollution (Kong and Ma, 2020).

According to statistic by CIDB (2022), more than 30% of all garbage produced in Malaysia was generated by the construction and demolition industries alone. The waste created has led to the production of significant pollutants such silt, oil, chemicals, and sewage, which has disrupted the environment, contributed to the problem of global warming, harmed human health, and interfered with people's daily lives. In regard to traffic problems, traffic entering and exiting the property is another intriguing issue that has irritated the neighbourhood and adjacent residents.

Most building projects are located in densely populated areas. Hence, due to dust, vibration, and noise from specific construction activities like excavation and pile driving, people who reside at or close to construction sites are susceptible to negative health impacts. Construction dust and noise are two factors that are thought to have a significant negative impact on people's health during the construction phase of a project. Environmental impacts, natural resource impacts, and public impacts are the three major subjects under which environmental impacts are characterized (Mah et al, 2018).

2.4.1 Noise Generation

In developing countries, noise is the most important cause of emissions. Unwanted sound is known as noise. A common hazard in construction activities is noise. Construction operations produce a great deal of noise. Noise pollution is likely to be the kind of pollution whose consequences are noticed immediately. Construction sites produce a lot of noise, mainly from impacting tools (such as concrete breakers); use of explosives (such as blasting); pneumatically and electrical powered equipment; generators and engines; piling works; concreting activities; and machineries and plant movement (Sholanke et al, 2019).

Despite the fact that loud and terrifying noises are a part of nature, most of the globe has just recently become urban, industrial, and incessantly noisy. This is largely because of the enormous development in industry, particularly that of construction. Community noise, often referred to as environmental noise, household noise, or residential noise, is any noise that is produced outside of an industrial workplace. Road, rail, and air traffic; industries; construction and public works; and the neighbourhood are the main sources of community noise.

Construction noise is a pollution problem that has a significant impact on people and the surrounding neighbourhood in an urban area. When people or animals are exposed to levels of sound that can be upsetting, unpleasant, or harmful to the ears, this is referred to as noise pollution or sound pollution. In particular, the residents' exposure to building noise can lead to various mental and physical symptoms such as irritation, stress, and hearing impairment. These disorders can degrade the health and quality of life of nearby residents in an urban community. Noise pollution can have an adverse effect on the ecosystem by interfering with species' normal cycles and limiting the amount of habitat they can use (Ning et al, 2019).

2.4.2 Air Pollution

Man-made pollutants that are emitted into the atmosphere are referred to as air pollution. Poor air quality threatens global health, and it is estimated that ambient and household air pollution results in 6.7 million avoidable deaths annually (World Health Organization). Moreover, air pollution strongly contributes to global warming and subsequent climate change (Yan et al, 2019).

Since building practises contribute greatly to air emissions, industry organisations have a common obligation to limit the volume they generate. The construction operations, including ground clearance, diesel engine service and demolition and the use of radioactive materials, lead to air pollution. Usually all construction produce dust out of concrete, asphalt, timber, stone and silica, which can be transported for long distances (Elhadi et al, 2018).

Typical building projects that cause air pollution include:

(i) Use of plant and vehicles on site. Depending on the site activity, this may involve equipment including bulldozers, excavators, dumpers, and breakers. In comparison to other vehicles, construction site equipment is not subject to the same level of government regulation. Because many construction projects are so large, machinery frequently runs for a long time while releasing pollutants. Diesel engines, which emit pollutants into the atmosphere, are used in some of the heavy machinery and other on-site vehicles. The gases carbon monoxide, carbon dioxide, nitrogen oxides, and hydrocarbons are included in this. Also, significant amounts of dust can be produced during earth moving and the transport of building supplies. The quantity of material carried, the number of vehicle movements, the climate, and regional elements like soil moisture and silt content all have an impact on how much dust is produced. Prior to beginning work to reduce these concerns, preplanning efforts that account for these problems and identify suitable pollution management strategies should be implemented (Huang et al, 2018).

(ii) Land clearing and demolition. Even while clearing and preparing land for development is frequently necessary, this process must be done in a way that is as environmentally friendly as possible. As ground is disturbed and existing structures are destroyed, in addition to when constructions are built, high volumes of dust are produced (Huang et al, 2018).

(iii) Chemicals. On building sites, it is likely that they will utilize toxic substances. Paints, glues, oils, thinners, polymers, and other chemicals that generate noxious vapours may fall into this category (Huang et al, 2018).

The building dust is known as PM10, which is less than 10 microns in diameter and is opaque to the naked eye. Studies have shown PM10's deep penetration of the lungs and a broad variety of health conditions such as respiratory diseases, asthma, bronchitis and cancer. The diesel engine emissions of trucks and heavy machinery are another significant cause of PM10 on building sites. The soot, sulphate and silicate compound (DPM), all easily combined with other atmospheric pollutants, increase the health risk of particulate inhalation. This is called the diesel particulate matter (DPM). The carbon monoxide pollution, hydrocarbons, nitrogen oxides and carbon dioxide also are responsible for diesel. Therefore, you must be conscious of pollution and take care to limit the adverse effects of your work practises (Zeng et al, 2020).

There is a higher chance that workers who frequently visit construction sites will experience health issues as a result. The following health issues can result from pollution-induced poor air quality:

(i) Coughs, wheezing and shortness of breath.
(ii) Cardiovascular and respiratory diseases.
(iii) Lung cancer.
(iv) Strokes.
(v) Exacerbation of asthma.

Additionally, residents who live close to construction sites may feel the effects of air pollution. Locals may experience the effects of poor air quality long after the project is finished, even though they won't be as close to the pollutants as workers. Wind disperses PM10 and other air pollutants into the vicinity, where they may settle. Here, locals frequently unknowingly breathe them in, which may have the short-term effect of coughing or shortness of breath (Jaafar et al, 2018).

In addition to the effects on human health, understanding how air pollution affects the environment is crucial. 14.5% of PM2.5 (particles with a diameter of 2.5 micrometers) and 8% of PM10 emissions come from construction sites. Diesel-powered construction equipment and generators account for the majority of this, with site activities like demolition accounting for 1% of the total. This contamination makes it difficult for both plants and animals to thrive, resulting in a loss of biodiversity and upsetting the food chain (Zeng et al, 2020).

2.4.3 Water Pollution

Water waste can be contaminated by different chemicals of building due to surface water drainage and groundwater in the immediate vicinity of a construction site. Invisible to the human eye, such as chemicals that dissolve in water, this pollution may also be visible, such as on the surface or deposited on the bed. When toxic chemicals and pollutants are not properly managed, they can end up in the water table during construction activities. As mentioned above, water such as paints, petrol, tar, other hazardous chemicals and cement can be polluted by following building pollutants. The immediate impact is to produce turbidity in runoff and the surface and ground water, since some of the run off can penetrate the groundwater. In reality, groundwater underneath housing and surface runoff close to home can be a pollutant source from building sites (Canter, 2020).

Common construction sources that contribute to water pollution include:

(i) Diesel and oil

(ii) Cement

(iii) Glues

(iv) Paints

(v) Other toxic chemicals

Groundwater can become contaminated by pollutants from construction projects. Since treating groundwater is much more difficult than treating surface water, there is a chance that some chemicals could end up in the water that people drink. If ingested through contaminated water supplies, chemical pollutants such as arsenic and mercury can result in serious health problems, including cancer (Joni, 2019).

Environmental dangers from contaminated water caused by the construction industry are significant. Once pollution has gotten into the water system, it can harm or even kill the fish and other animals that live there or consume the water. This has the potential to upset the entire animal, plant, microbial, and fungal ecology, harming numerous species (Canter, 2020).

2.4.4 Mosquitoes from Stagnant Water

Dengue fever is the most common vector-borne illness in the world. The number of dengue fever and dengue hemorrhagic fever cases recorded in Malaysia has increased dramatically in recent decades. Dengue infection and transmission are made more likely by industrial development, especially in construction sites. Mosquitoes to the ubiquitous crows that now infest our towns and villages are examples of urban pests (Wilke et al, 2019). Construction sites can be ideal mosquito breeding grounds. This is because water can pool in tyre ruts, construction materials, and vehicles. Mosquitoes are known to transmit diseases such as dengue fever, malaria, and encephalitis in urban areas, posing a danger to the settlers' health and wealth. During the study period, the dengue premise index and average larvae count per habitat were both higher in construction sites than in residential premises.

Residents living in the area were the bulk of cases in clusters associated with construction projects (Bayona et al, 2021).

2.4.5 Construction Traffic

Construction sites can be busy places, with workers, deliveries, and machinery all needing access into congested or suburban neighbourhoods and material transport to and from the site can contribute to traffic congestion and noise. Construction sites are one of the workplaces where people and machinery often need to work together (Fredianelli et al, 2019). Normally, traffic control studies are conducted to determine danger, such as the proximity of traffic routes to schools, and preventive steps, such as traffic restrictions and preventing school arrival and departure times. Such traffic precautions could include speed limits, parking spaces, and pedestrian crossings, among others (Zhang and Bai, 2021).

A temporary traffic management system, which might include speed limits, congested lanes, the use of hard shoulders, and contra flows, might be necessary for a construction project. Due to the temporary reduction in travel amenities, this impact may be most noticeable in terms of the human environment; however, there may also be some negative effects on the natural environment. Lane limits can exacerbate traffic congestion, especially during peak hours. Given that vehicles have a higher potential for pollution when driving in stop-and-start traffic, this could have a negative effect on the immediate air quality along the roadside (Saldivar-Carranza et al, 2021).

2.4.6 Vibration

Most of them produce a lot of unwanted noise and vibrations during construction projects. Building vibrations can be caused by a variety of construction project activities, including pile driving, dynamic compaction, and operating large machinery. These sources produce elastic waves in the soil that can adversely affect the neighbourhood. Its effects range from evident structural damage to disturbed working conditions for individuals and sensitive electronics (Hong et al, 2020).

In addition, operation of earth moving equipment, generators, concrete mixers and machinery will create vibration on construction sites which can lead to long term occupational health and safety problems. In addition, processes used on site, such as, bitumen preparation, shot blasting, or pile driving may constitute a nuisance affecting neighbourhood (Yan, 2020).

The soil deposits at a site and the susceptibility ratings of the structures determine the dynamic influence of construction vibrations on nearby and distant structures. Unacceptable structure vibrations may be caused by the driven piles in close proximity, but foundation settlement due to soil vibrations in loose soils may happen at different distances from the source. Vibrating, impacting, rotating, and rolling construction equipment is used for soil excavation, modification and improvement. Machinery with dynamic loads and blasting are sources of construction vibrations. The most prevalent powerful sources of construction vibrations are pile driving, dynamic compaction, and blasting (Yan, 2020).

2.4.7 Construction Waste Pollution

Construction waste pollution refers to the environmental impact caused by the disposal of waste generated during construction, demolition, and renovation activities. This waste can include a wide range of materials such as concrete, wood, brick, asphalt, plaster, insulation, and hazardous materials like asbestos, lead, and mercury (Liu et al, 2020).

Construction waste pollution can have negative effects on air and water quality, as well as on soil and plant life. When construction waste is disposed of in landfills, it can release harmful gases such as methane and other volatile organic compounds, which can contribute to climate change and air pollution. If construction waste is improperly disposed of in water bodies, it can contaminate them, affecting aquatic life and potentially harming human health (Wu et al, 2019).

Furthermore, construction waste pollution can also have economic impacts, as the costs associated with the disposal and management of construction waste can be significant. Therefore, reducing, reusing, and recycling construction waste materials can not only help to reduce environmental pollution but also provide economic benefits to construction companies and communities (Wu et al, 2019).

2.5 Compliance to Malaysian Building By-laws and Various Acts to Reduce Environmental Impacts

The Malaysian Carbon Reduction and Environmental Sustainability Tool, developed by CIDB in Malaysia, intend to help, direct, quantify, and lessen the influence of the built environment on the environment (Construction Industry Development Board Malaysia, 2022).

Legislation and regulations are used in Malaysia as a form for addressing environmental issues. These regulations are generally sector-based and concentrate on specific task fields. Malaysia has seen extensive regulations to deal with the highly complicated environmental issues.

Additionally, in Malaysia have been facing with numerous environmental problems such as air pollution, water pollution etc. In order to complement the effort in improving environmental aspects in construction industry, CIDB has identified and compiled a list of acts, regulations and rules related to the construction activities, in order to complement the effort in improving environmental aspects in construction industry (Construction Industry Development Board Malaysia, 2022).

2.5.1 Noise Pollution Control

Noise was one of the difficulties that the construction site had raised. Sound is a wave that travels as minute changes in air pressure between a source and a receiver, such as a building site and a nearby resident or the employees. Heavy vehicles, excavation and demolition activities employing tractors, jackhammers, etc., portable generator sets, and piling activities are also the main sources of noise in any construction project.

The building industry uses a number of modern tools to reduce noise production to keep the neighbourhood safe. Current mobile generators, for instance, are in use and all of them are constructed inside of a sound enclosure, making them no noisier than a typical car. Thus, the only significant sources of construction site noise that may be heard in nearby homes are heavy vehicles, earthmoving tools, and sporadic jackhammers.

The Department of Environment (DOE) has a mandatory requirement stipulated for the construction project that noise shall be monitored during construction. On the construction site, continuous automated or manual noise control systems are now installed based on the construction standards. This work is being done by a testing facility that is independent. DOE shall report monitoring results as part of the required environmental management plan for this project.

In addition, DOE has specified in its Environmental Impact Assessment (EIA) permission that building activities that could cause noise disturbance can only be carried out between the hours of 8am and 7pm, save in extremely exceptional circumstances. For instance, restoration work or beam launching that requires public protection.

Where the construction noise cannot surpass the limits specified under the DOE, or are considerably above the present environment, the maximum noise parameter by 90dBA can be exercised, which may include monetary fine, by DOE, with regulatory authorisation given in the EIA Approval.

To comply with the DOE, The following mitigating strategies were made available to the construction industry during construction:

(i) Employing low-noise, low-vibration piling techniques.

(ii) Utilization of diesel generating units housed in silencer-equipped acoustic enclosures.

(iii) Construction sites should erect hoarding and barriers to block noise from the site.

(iv) The use of temporary semi-enclosures for loud work processes and equipment screening.

(v) Controlling the movement of large vehicles and traffic flow.

2.5.2 Air Pollution Control

Air pollution is one of the fundamental concerns in Malaysia. There are great amount of dust, emission and odours pollutant such as. CO_2, SO_2, NO_2 and PM_{10} generated from various operation of construction equipment such as machinery and transportation. In Malaysia, there are strict regulations overseeing the state of the well-being of the environment, i.e. the Environmental Quality Act (Amendment) Act 2007. The enforcement of regulations on the prevention of air pollution requires the construction industry to clearly understand and embed the regulation in their construction plans. It should also be appreciated and complied by all employees at the construction site. For example, open burning is a serious offence that is not tolerable in Malaysia. In Section 29A, heavier penalties will be imposed on those who commit open burning (i.e. RM500, 000 or 5 years jail or both). Other good measures related to air pollution control were also being suggested by spraying and wetting the exposed surface and unpaved roads and covering the transported materials (Babalola et al, 2019).

2.5.3 Water Pollution Control

Malaysia is blessed with a sizable network of tropical waterways, as well as lakes and reservoirs that were both created naturally and artificially and are used for a number of things. This water source is essential for maintaining ecosystem balance, flora and fauna habitat, and water quality. One key strategy for addressing the water quality challenges is a legislative one based on the 'polluter pays' idea. Anybody who releases rubbish into rivers shall face an RM 100,000 punishment, 5 years in prison, or both, as per EQA 1974 Section 25. If it is an environmentally dangerous material, there would be a heavier penalty of RM 500 000 (Construction Industry Development Board Malaysia, 2022). Construction professionals must see to it that these rules are compiled and understood. According to Knickmeyer (2020) as the dangers are typically non-point sources, a site does not need need to be close to a river or other body of water to be problematic. So, if building trash is properly managed so that it does not reach the water flow, water contamination can be prevented. Knickmeyer (2020) also highlighted that one key route for the pollution to spread is the drainage system. In order to effectively combat water pollution, construction site discharge systems must be managed and maintained properly.

2.5.4 Mosquitoes Control

Massive dengue outbreaks may be caused by dirty building sites. It is challenging to control the surge in cases and fatalities as a result of construction sites' potential mosquito breeding grounds such as canvas, plastics, pails, drums, containers, and ground depressions. Mosquito breeding can be sparked by human activity, but it can be prevented by doing proper checks and monitoring as well as by abiding by the law (Bayona et al, 2021).

By putting the "Hierarchy of Prevention" principle into practice, the condition of the construction site can be improved. First, the area around the work site needs to be cleared of any extraneous tools, containers, plastic containers, etc. Second, the trash cans used to collect on-site trash must to be protected from rain and sunlight (Bayona et al, 2021). The next step is to practice on-site waste segregation to prevent water from collecting in potential containers. The administrative control should then delegate responsibilities to managers to oversee prospective breeding places. The Environmental Management Plan (EMP) concept and the adaptation of Environmental Impact Assessment (EIA) for construction sites are two further practical methods for enhancing site cleanliness (Wilke et al, 2019).

Site supervisors might inform the workers about this biological danger at the morning briefing (tool box meeting). All employees can get health education on this topic as part of the green card training program. The prevention of dengue infection on construction sites should be a major component of the Construction Industry Development Board (CIDB) awareness day program (Wilke et al, 2019).

Effective vector control techniques can stop mosquito reproduction and lower dengue transmission on the construction site. Every project needs a thorough mitigation measure strategy in order to prevent disease as well as to safeguard the environment. To guarantee that the mitigation strategy is monitored and followed, it is crucial that authorities integrate their connections and contributions.

2.5.5 Traffic Management

Several studies have called attention to the critical environmental issue of traffic or vehicle movement. Fredianelli et al (2019) recommended that deliveries of construction materials should be made at off-peak times, car sharing should be encouraged, public roads should not be used to access the site, and vehicles leaving the site should be regularly washed to avoid dirtiness.

2.5.6 Construction Waste Management

Also related to the issue of the massive amount of garbage that has affected the environment is the topic of the materials utilized on the job site. There are several strategies to enhance waste management operations at building sites, as prior studies have demonstrated. The methods contain six waste management tenets: eliminate, reduce, reuse, recycle, recover, and dispose (Huang et al, 2018). Kabirifar et al (2020) also agreed that waste minimization should be given top priority by the waste management measurers. The next step is to decide if the garbage may be recycled or reused after it has been separated. Following these procedures enables the minimization of unnecessary and unwanted waste before it is disposed of in the authorized landfill. Kabirifar et al (2020) recommended that the efforts be thoroughly outlined in the Waste Management Plan in order to provide a comprehensive plan for controlling the building trash. The strategy should include a thorough and understandable waste action plan guideline that combines knowledge of legal requirements with effective waste management practices to enhance resource efficiency and deposit the right quantity of waste at dump sites (Amaral et al, 2020). Waste management practices such as garbage sorting, recycling or reuse, and waste disposal should all be included in the strategy. Implementing the proper trash disposal procedures and recycling or reusing the material can help to reduce the major pollution that building waste causes. Having a plan has obvious advantages, but it won't function unless the site employees use it and participate in it. So, it is the duty of the approved managers to make sure that the employees implement the plan. (Kabirifar et al, 2020).

2.6 Summary

In short, Chapter 2 was mainly discussing on the overall theoretical concept to achieve the research objectives. Besides, a lot of useful information and researchers' review can be obtained from secondary resources such as journals, books, news and materials from internet. In addition, a list of construction activities and the construction materials has been identified and discussed. Furthermore, the impact to the environmental and the neighbourhood are discussed as well. Lastly, the extent of compliance by Malaysian construction industry to the Malaysian Building By-laws and Acts are also discussed in this chapter.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter displays the subsections on research methods that consist of quantitative research, qualitative research, and mixed methods research; research questionnaires design; data collection methods which comprise of literature review and questionnaire; questionnaire data analysis methods that consist of frequency distribution, pilot test, cronbach's alpha test, mean ranking, one-sample t-test, and factor analysis.

3.2 Research Method

There are three types of research can be conducted which is quantitative research, qualitative research and mixed method. Quantitative research or qualitative research or even both can be applied in a basic research. The quantitative research is conducted by distributing closed-ended question while the qualitative research is conducted by using open-ended question such as interview question.

3.2.1 Quantitative Research

Quantitative research can be used to study any phenomenon that has a quantitative expression. The development and application of mathematical models, theories, and hypotheses relevant to the phenomenon that is being studied is the goal of quantitative research. Moreover, measuring is made possible by quantitative research, which can serve to establish a basic link between empirical observation and mathematical expressions of quantitative relationships (Adam and McGuire, 2022). The use of questionnaires in quantitative research is a good illustration.

The method to adapt for this study is only the quantitative research method. Given that it tends to use less time and money when gathering data, quantitative research is appropriate for this huge sample of research. Also, this approach makes it convenient for responders to react to the inquiries and gather the data required for research (Bloomfield and Fisher, 2019). Additionally, this research aims to identify the construction materials used and site activities involved at a typical construction site, to study the environmental impacts of those materials and activities on the neighbourhood, and to evaluate the degree of compliance by Malaysian construction industry with the Malaysian Building By-laws and Act to lessen the environmental impacts. As a result, the secondary data had been gathered through a thorough literature examination of pertinent books, journals, and newspaper articles. Also, a questionnaire survey will be used to obtain primary data.

3.2.2 Qualitative Research

The second type of research method is qualitative research. Qualitative research is different from quantitative research. It is subjective in nature. Qualitative research is a type of social science research that collects non-numerical data and seeks to interpret meaning from these data. This research method can be conducted through interviews, attitudinal surveys or observations. Qualitative research method is adopted when the researcher attempts to get an in-depth opinion from the respondents or to explore the behaviour, attitude and experiences of an individual or a small number of targeted participants (Busetto et al, 2020).

3.2.3 Mixed Methods Research

Other than the two research methods discussed above, there is another mixed method research which is also commonly used by researchers for their study. This method is the combination of both quantitative and qualitative method, where both methods are being used in the same research for verification and interpretation of data collected (Timans et al, 2019).

3.3 Survey Sample

Generally, there are two major categories of the sampling techniques, namely probability sampling and non-probability sampling. Non-probability sampling techniques such as convenience and snowball sampling method will be used for this study. This method of sampling is preferred because it is capable to get response quickly from sample elements selected at random over a large population.

The target respondents for this study will be identified by convenience. In other word, the questionnaires will be distributed through friends or colleagues working in construction industry i.e. contractor, consultant and developer organization and our friends in turn distribute the questionnaire to their friends and referral networks. This sampling method is adopted because it is an economical method which is able to collect large amount of samples in short period of time.

As the target population for this study is construction industry practitioners, therefore, the sampling frame is determined as individual working in the developer or client, consultants or contractor firms in Klang Valley area. Furthermore, Klang Valley is considered as a suitable area for sampling because most of the established developers, consultant firms or construction companies are based in this region which tends to reflect the most actual case about environmental impacts control and practices in the Malaysian construction industry.

The sample size for this study was determined by the equation by Kang (2021) as shown below:

$$\mathrm{Ss} = \frac{\mathrm{Z}^2 \mathrm{~x~p~x} (1 - \mathrm{p})}{\mathrm{e}^2}$$

where,

Ss= the sample Size

Z= z-value which represents the confidence level in the data

P= the variability of responses

e= the sample error

A confidence interval of 95%, which represents 1.96 under the normal curve (z), and a sample error of 5% were used to calculate the sample size. According to Nnaji et al (2019), sample errors of 5 to 20% have often been utilized in construction management studies especially exploratory studies. With the variability of responses of 50:50, the sample size for this study was determined at 90.25. Therefore, the researcher had aimed at collecting a sample size of a minimum of 100 respondents with even distribution of such personnel from building construction firms.

However, the output and input are definitely different which mean that how much survey distributed does not mean that equal amount of response and return will be obtained. Nnaji et al (2019) studied that for studies utilising data collection from individuals, the response rate was 52.7 percent while response rate of 35.7 percent is yielded from organisations. Thus, a 52.7 percent of response rate is assumed for this research and 200 sets of questionnaires were prepared and distributed to the construction field in order to obtain a minimum of 100 respondents.

3.4 Questionnaires Design

According to Krosnick (2018), questionnaire is a very flexible tool as it enables to organize questions and receives replies without actually having to talk to every respondent. Questionnaire is an effective method which uses to collect the data from the respondents. In order to match with the objectives of this research, questionnaire should be prepared in simple, easy and quick form for ease of respondent to answer in a short time.

The purpose of designing the questionnaire is to get the views and opinions to the personnel who work in construction industry. The questionnaires are designed and divided into 4 major sections, Section A, B, C and D. All of the sections are designed with close-ended questions. Section A is related to the profile of the respondents with respect to participant's position in company, years of experience in the construction industry. Section B consists of questions in relation to objective one of the studies which is regarding various types of construction activities and materials used for the typical construction site purposes that potentially impactful to the neighbourhood environment. Section C consist a list of the environmental impact to the neighbourhood who staying around from the site which is related to objective two of the study. Section D, the final section asked the respondents regarding Malaysian construction industry to compliance the Malaysian Building By-laws and Acts. A sample of the questionnaire is attached as APPENDIX A.

3.4.1 Section A (Demographic Design)

Section A – Related to the background information of the respondents such as their working experience, basic requirement while selecting a residence and others which answered in the form of closed-ended question.

Close ended questions is the easiest way to collect data from the respondents by responding "Yes" or "No" to a specific question. The questions asked usually simple and straightforward. The choices of answers shall be provided in easy and clear to understand. The differences of the answers from bulk of respondent are easier to compare due to limit choices of the answers provided (Vraga et al, 2019).

The closed ended questions will be conducted in Section A. This section used to collect the biography of the respondents and general questions related to this research. This section has 3 questions and respondents are allow to answer the multiple choices questions by tick on the answer given and do not required to provide their own opinion.

3.4.2 Section B (Objective 1)

Section B – Related to the first objective, identify the construction materials used and site activities involved that are the potential to bring impacts from construction site to neighbourhood environment which answered in the form of checklist question.

A checklist question is basically a list of items created specifically for a group of respondents who have precise knowledge and can respond to it with a high degree of certainty (Krosnick, 2018).

In order to achieve the first research objective of this study, the following strategies adopted by the construction industry what are the construction materials used and site activities to cause the environmental impacts to whom staying around the construction site.

3.4.3 Section C (Objective 2)

Likert scale is a type of rating scale used to measure the attitudes or opinion of the respondents. Respondents are asked to rate the items on level of agreement regarding on their opinion. The level of agreement consist of "Strongly Agree", "Agree", "Neutral", "Disagree", and "Strongly Disagree". The level of agreement will vary based on the survey object (Taherdoost, 2019).

Likert Scale is used in Section C. In this section is adopting the respondent's opinion on the environmental impacts from construction site to neighbourhood environment.

3.4.4 Section D (Objective 3)

Section D – Related to the third objective, assess the extent of compliance by Malaysian construction industry to the Malaysian Building By-laws and Acts which the workers can answer in the form of five-point Likert scale method.

Likert scale is a type of rating scale used to measure the attitudes or opinion of the respondents. Respondents are asked to rate the items on level of agreement regarding on their opinion. The level of agreement consist of "Comply very frequently", "Often comply", "Occasionally comply", "Comply very rarely", and

"Not comply it at all". The level of agreement will vary based on the survey object (Taherdoost, 2019).

3.5 Data Collection Method

Data collection is an important aspect in any research studies. In general, data can be classified into two types, namely primary data and secondary data. Primary data is referred to data that are collected directly from the sources through questionnaire surveys and/or interviews. On the other hand, secondary data are those data collected through literature review on text books or journal articles of past research studies.

In this study, the secondary data are collected from the literature review in Chapter 2 of this report and they are used as variables to formulate the questions in the questionnaire. However, the primary data will be collected through questionnaire survey. Google Form was used for the preparation of survey questionnaire and the forms are distributed to the targeted respondents through email and instant messaging applications such as whatsapp and Messenger.

3.6 Data Analysis Method

The information gathered from the questionnaire survey will be examined using the statistical program Statistical Package for Social Science (SPSS) version 23. The data gathered will be analyzed using tests and analyses such as Frequency Distribution on the demography of respondents, Cronbach's Alpha tests, Mean Ranking, One Sample T-test, and Factor Analysis.

3.6.1 Pilot Test

Prior to the pilot test, at least 30 sets of questionnaires were issued and returned to assess the questions' validity, reliability, and appropriateness. Before a larger research study is done, a pilot test is a small-scale exploratory research study to assess the viability of the produced questionnaire. In order to ensure that the respondents understand the questionnaire and comprehend it in the same way, the pilot test, which uses 30 sets of questionnaires as a sample, is an essential component of a successful research study design (Lowe, 2019). Also, the pilot test aids in refining the research tool before the in-depth study is conducted. In this research project, the pilot test was required to avoid collecting unreliable and inconsistent data from the respondents.

3.6.2 Cronbach's Alpha Reliability Test

The internal consistencies from keyed-in data and an index of consistencies will be examined using an adaptation of Cronbach's Alpha reliability test. The most often used indicator of internal consistency is Cronbach's alpha. In addition, Cronbach's Alpha is used to assess the validity of surveys that include several Likert questions. Using Cronbach's Alpha reliability analysis helps reduce measurement errors that are unavoidable and boosts the reliability of results. The data must acquire a Cronbach's Alpha score of 0.700 or higher to demonstrate its reliability; the closer it is to 1, the more dependable it is. This analysis will be used specifically on Questionnaire Section C (Bujang, Omar and Baharum, 2018). The range of Cronbach's Alpha reliability coefficient is as shown in Table 3.1.

Table 3.1: Range of Cronbach's Alpha Reliability Coefficient

Cronbach's Alpha	Reliability on Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

3.6.3 Frequency Distribution

Frequency distribution is a count of number of times each attribute of a variable occurs in a sample of observation, the results from this analysis are usually presented in table form, graph form and pie charts (Kaur et al, 2018). The patterns and relationships between the variables can be analysed through the examination of such presentation.

In this study, frequency distribution will be used to analyse the respondent's background information question 1 to 3 in section A and question 4 in section B of the questionnaire. Both the percentage distribution and actual number of the frequency of observations will be tabulated according to their category.

3.6.4 Mean Ranking

The mean and standard deviation is importance to determine the ranking of each factors. If the causes have matching means (same means), the lower standard deviation is thought to be more significant and will be given a higher ranking (Cipriani et al, 2018). The factor which scores higher than the mean is considered a critical factor among all of the factors. In contrast, the factor which scores lower than the mean is considered less important for the respondents. Based on the studied of Cipriani et al (2018), most of the causes in their studies contain a mean score that are above 3.0 which is considered to be crucial on the ratings scale.

3.6.5 One Sample T-test

One of the hypothesis tests used to determine if the data gathered for the research project are statistically significant or merely happened by chance is the t-test. One-sample t-tests, independent samples t-tests, and paired samples t-tests are the three different forms of t-tests. The one-sample t-test compares the sample to a known population group; the independent-samples t-test compares two samples from two distinct populations regarding the same variable; and the paired samples t-test compares two samples from the same populations regarding the same variable (Mishra et al, 2019).

This study employed a one-sample t-test (test value = 3) to examine if the sample mean for a particular demographic category was statistically significant or the result of random chance. The specific sample of a one-sample t-test is not seen by the respondents as significant when the significance value for a sample produced is larger than 0.05. In other words, if a particular element contributing to the research issue has a significance value lower than 0.05, the respondents will consider it to be significant (Gerald, 2018).

3.6.6 Factor Analysis

The factor analysis serves as a method for data summarization and data reduction. It is possible to determine the underlying relationship between the data (Bandalos and Finney, 2018). It is typically used when a study has a large number of variables that make detailed analysis impossible. By identifying groups among the intercorrelations of the variables, the factor analysis can condense and summarize a large number of variables into a smaller set of factors (Shrestha, 2021).

The exploratory approach and the confirmatory approach are the two basic methods used in factor analysis. The exploratory strategy is typically used early on in the research to examine how the variables interact, whereas the confirmatory approach is frequently used later on to verify specific hypotheses about the structure of the variables (Bandalos and Finney, 2018). However, exploratory approach is employed to explore the underlying factors of the 22 significant variables for environmental impacts control.

It is crucial to evaluate the adequacy of the research's data before starting the factor analysis. As a result, the Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin (KMO) are used. If the KMO value is between 0 and 1, it should be more than 0.50; otherwise, factor analysis is unlikely to generate results that can be relied upon. To confirm that the variables exhibit a structured relationship, the Bartlett's test significance value must be less than 0.05 (Shrestha, 2021).

3.7 Summary

In this study, quantitative approach is used to achieve the objectives. A structured questionnaire survey is adopted to collect the data regarding the construction workers that are work in construction firms in Malaysia. Questionnaire survey is designed with five points likert rating scale, checklist and all the questions are close-ended. Indeed, this chapter has comprehensively described the entire research design and the methodology for the study.

CHAPTER 4

DATA ANALYSIS AND RESULT

4.1 Introduction

The data gathered from the survey was analyzed using the statistical analysis techniques covered in the prior chapter. The Statistical Package for the Social Sciences (SPSS) was used in this work to rearrange, analyse, and tabulate the gathered data. In addition, the findings were assessed and discussed in relation to charts and tables for additional interpretation in order to meet the goals and objectives outlined in Chapter 1.

4.2 Response Rate

In this study, a total of 200 questionnaires were distributed to individual who are working in the developer/owner, consultants or contractor firms in Klang Valley area. A total of 121 fully completed questionnaires were returned within a survey period of approximately 2 months i.e. from 15th December 2022 until 15th February 2023, which represent a response rate of 60.5% was achieved.

4.3 Pilot Test

To ensure the reliability and usability of the questionnaire, a total of 30 sets of it were intentionally dispersed and gathered for a pilot test. To do this, the Cronbach's Alpha Reliability Test, presented in Table 4.1, was used. When the results are greater than 0.70, which is regarded as dependable and acceptable, the research can be resumed and given to new respondents.

According to Table 4.1, the alpha value of the reliability test for the environmental impact variables is 0.931; for air pollution control is 0.720; for both water pollution control and noise pollution control is 0.906; for construction traffic management is 0.781, for construction waste management is 0.825 and the last for mosquitoes control is 0.828. All of the alpha scores are higher than 0.70, indicating that the data are internally consistent. As a result, the pilot test produced a trustworthy result and can be implemented in the full study that follows.

Table 4.1: Cronbach's Coefficient Alpha Values for Pilot Study

No	Variables	Cronbach's Alpha	N of Items
Q7	Environmental Impacts	0.931	9
Q8	Air Pollution Control	0.720	4
Q9	Water Pollution Control	0.906	3
Q10	Noise Pollution Control	0.906	5
Q11	Construction Traffic Management	0.781	3
Q12	Construction Waste Management	0.825	4
Q13	Mosquitoes Control	0.828	3

4.4 Demographic Profile of Respondents

The respondent profile is analyzed by frequency analysis. It displayed the quantity of each response that the respondents had selected. Demographic-type questions will be asked by the researcher through the use of descriptive analysis and demographic analysis. There are a total number of 121 respondents, whereby each of the demographic was measured in terms of type of organisation, working position and years of working experience in the construction industry.

4.4.1 Type of Organisation

There are four types of organisation being categorise, which is consultant firm, contractor firm, developer, and subcontractor firm. From the results in Table 4.2, majority of 77 (63.6%) respondent are from contractor firm. Next will be the consultant firm and subcontractor industry firm, each of them have occupied by 24 (19.8%) and 17 (14%) respondents respectively. Lastly, there are only 3 (2.5%) respondents from developer. As a result, respondent from contractor firm occupied the largest group.

Table 4.2: Type of Organisation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Consultant	24	19.8	19.8	19.8
	Contractor	77	63.6	63.6	83.5
	Developer	3	2.5	2.5	86.0
	Subcontractor	17	14.0	14.0	100.0
	Total	121	100.0	100.0	

4.4.2 Professions of Respondents

Based on the data collected from 121 responses, the result shows that the Quantity Surveyor formed the largest group and has the most frequency of 48 (39.7%) of the respondents. Next, there are 45 (37.2%) of the respondents are work as an Engineer, which is the second largest group. Furthermore, there are 8 (6.6%) of the respondents work as Site Supervisor; 7 (5.8%) of the respondents work as Project Manager; and follow by 3 (2.5%) of the respondents work as Site Engineer. Meanwhile, each has 2 (1.7%) of respondents work as Architect, Land Surveyor and Project Coordinator. Lastly, each has 1 (0.8%) of respondents work as Document Controller, Project Executive, Site Cum Draughmen. The Table 4.3 below will show the frequency analysis of the professions of respondents in their construction industry.

Table 2.3: Professions of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Architect	2	1.7	1.7	1.7
	Document Controller	1	.8	.8	2.5
	Engineer	45	37.2	37.2	39.7
	Land Surveyor	2	1.7	1.7	41.3
	Project Coordinator	2	1.7	1.7	43.0
	Project Executive	1	.8	.8	43.8
	Project Manager	7	5.8	5.8	49.6
	Quantity Surveyor	48	39.7	39.7	89.3
	Site Cum Draughmen	1	.8	.8	90.1
	Site Engineer	3	2.5	2.5	92.6
	Site Supervisor	8	6.6	6.6	99.2
	Technical Executive	1	.8	.8	100.0
	Total	121	100.0	100.0	

4.4.3 Working Experiences of Respondents

According to Table 4.4, the majority of the 69 respondents (57%) have fewer than five years of job experience. The next group of respondents includes 52 (43%) who have more than five years of professional experience. Last but not least, there was not much of a difference between the two groups of respondents just 17 (14%).

Table 4.4: Working Experiences of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5 years and above	52	43.0	43.0	43.0
	Less than 5 years	69	57.0	57.0	100.0
	Total	121	100.0	100.0	

4.5 Ranking of Construction Materials Used and Site Activities Operated

Based on the data gathered in Table 4.5, it can be shown that respondents who work on the construction site selected the materials used and site activities that were most likely to have a negative environmental impact on the surrounding area. Dust from exposed areas of cement and sand, demolition and material handling, transporting of fill on public roads, excavation and placement of the fill in stock piles or to embankment, driving piles, and vehicle activity on dry unsealed roads, had the most adverse environmental effects and there are the top 5 in the list. Whereas less than half (50%) of the respondents chose the rest of the options, which means that the impact of the rest of the options is not completely absent, but may be relatively rare. The findings suggest that the negative environmental effects of building activities can be significantly reduced if these activities can be managed or carried out within acceptable levels.

Table 4.5: Ranking of Construction Materials Used and Site Activities Operated

No	Construction Materials and Site Activities	Percent	Rank
1)	Dust from exposed areas of cement and sand	83.5	1
2)	Demolition and material handling	66.1	2
3)	Transporting of fill on public roads	58.7	3
4)	Excavation and placement of the fill in stock piles or to embankment	54.5	4
5)	Driving piles	50.4	5
6)	Vehicle activity on dry unsealed roads	50.4	5
7)	Crushing and screening of aggregates	45.5	6
8)	Rubble disposal	44.6	7
9)	Stripping and clearing site	38.8	8
10)	Use of scrappers Hammering works	38.0	9
11)	Use of powered mechanical equipment	35.5	10
12)	Erection or dismantling of formwork/scaffolding	28.1	11
13)	Concrete batching	27.3	12
14)	Use of excavators	25.6	13
15)	Use of dozers	14.9	14
16)	Steel bars handling	14.0	15

4.5.1 Stripping and Clearing Site

Based to the result collected in Table 4.6 shown below, 47 (38.8%) respondents had selected "Agree", while there are 74 (61.2%) respondents had selected with "Disagree" to the statement. As a result, most of the respondents disagree this activities will affect the surrounding area, (22.4%) percent difference between agree and disagree statement.

Table 4.6: Stripping and Clearing Site

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	47	38.8	38.8	38.8
	Disagree	74	61.2	61.2	100.0
	Total	121	100.0	100.0	

4.5.2 Transporting of Fill on Public Roads

Based to the result collected in table 4.7 shown below, 71 (58.7%) respondents had selected "Agree", while there are 50 (41.3%) respondents had selected with "Disagree" to the statement. As a result, most of the respondents agree this activities will affect the surrounding area, (17.4%) percent difference between agree and disagree statement.

Table 4.7: Transporting of Fill on Public Roads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	71	58.7	58.7	58.7
	Disagree	50	41.3	41.3	100.0
	Total	121	100.0	100.0	

4.5.3 Excavation and Placement of the Fill in Stock Piles or to Embankment

Based to the result collected in Table 4.8 shown below, 66 (54.5%) respondents had selected "Agree", while there are 55 (45.5%) respondents had selected with "Disagree" to the statement. As a result, most of the respondents agree this activities will affect the surrounding area, (9%) percent difference between agree and disagree statement.

Table 3: Excavation and Placement of the Fill in Stock Piles or to Embankment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	66	54.5	54.5	54.5
	Disagree	55	45.5	45.5	100.0
	Total	121	100.0	100.0	

4.5.4 Demolition and Material Handling

Based to the result collected in table 4.9 shown below, 80 (66.1%) respondents had selected "Agree", while there are 41 (33.9%) respondents had selected with "Disagree" to the statement. As a result, most of the respondents agree this activities will affect the surrounding area, (32.2%) percent difference between agree and disagree statement.

Table 4.9: Demolition and Material Handling

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	80	66.1	66.1	66.1
	Disagree	41	33.9	33.9	100.0
	Total	121	100.0	100.0	

4.5.5 Driving Piles

Based to the result collected in table 4.10 shown below, 61 (50.4%) respondents had selected "Agree", while there are 60 (49.6%) respondents had selected with "Disagree" to the statement. As a result, most of the respondents agree this activities will affect the surrounding area, (0.8%) percent difference between agree and disagree statement.

Table 4.10: Driving Piles

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	61	50.4	50.4	50.4
	Disagree	60	49.6	49.6	100.0
	Total	121	100.0	100.0	

4.5.6 Dust from Exposed Areas of Cement and Sand

Based to the result collected in table 4.11 shown below, 101 (83.5%) respondents had selected "Agree", while there are 20 (16.5%) respondents had selected with "Disagree" to the statement. As a result, most of the respondents agree this activities will affect the surrounding area, (67%) percent difference between agree and disagree statement.

Table 4.11: Dust from Exposed Areas of Cement and Sand

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	101	83.5	83.5	83.5
	Disagree	20	16.5	16.5	100.0
	Total	121	100.0	100.0	

4.5.7 Vehicle Activity on Dry Unsealed Roads

Based to the result collected in table 4.12 shown below, 61 (50.4%) respondents had selected “Agree”, while there are 60 (49.6%) respondents had selected with “Disagree” to the statement. As a result, most of the respondents agree this activities will affect the surrounding area, (0.8%) percent difference between agree and disagree statement.

Table 4.12: Vehicle Activity on Dry Unsealed Roads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	61	50.4	50.4	50.4
	Disagree	60	49.6	49.6	100.0
	Total	121	100.0	100.0	

4.5.8 Crushing and Screening of Aggregates

Based to the result collected in table 4.13 shown below, 55 (45.5%) respondents had selected “Agree”, while there are 66 (54.5%) respondents had selected with “Disagree” to the statement. As a result, most of the respondents disagree this activities will affect the surrounding area, (9%) percent difference between agree and disagree statement.

Table 4.13: Crushing and Screening of Aggregates

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	55	45.5	45.5	45.5
	Disagree	66	54.5	54.5	100.0
	Total	121	100.0	100.0	

4.5.9 Concrete Batching

Based to the result collected in table 4.14 shown below, 33 (27.3%) respondents had selected “Agree”, while there are 88 (72.7%) respondents had selected with “Disagree” to the statement. As a result, most of the respondents disagree this activities will affect the surrounding area, (45.4%) percent difference between agree and disagree statement.

Table 4.14: Concrete Batching

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	33	27.3	27.3	27.3
	Disagree	88	72.7	72.7	100.0
	Total	121	100.0	100.0	

4.5.10 Rubble Disposal

Based to the result collected in table 4.15 shown below, 54 (44.6%) respondents had selected "Agree", while there are 67 (55.4%) respondents had selected with "Disagree" to the statement. As a result, most of the respondents disagree this activities will affect the surrounding area, (10.8%) percent difference between agree and disagree statement.

Table 4.15: Rubble Disposal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	54	44.6	44.6	44.6
	Disagree	67	55.4	55.4	100.0
	Total	121	100.0	100.0	

4.5.11 Use of Powered Mechanical Equipment

Based to the result collected in table 4.16 shown below, 43 (35.5%) respondents had selected "Agree", while there are 78 (64.5%) respondents had selected with "Disagree" to the statement. As a result, most of the respondents disagree this activities will affect the surrounding area, (29%) percent difference between agree and disagree statement.

Table 4.16: Use of Powered Mechanical Equipment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	43	35.5	35.5	35.5
	Disagree	78	64.5	64.5	100.0
	Total	121	100.0	100.0	

4.5.12 Use of Excavators

Based to the result collected in table 4.17 shown below, 31 (25.6%) respondents had selected "Agree", while there are 90 (74.4%) respondents had selected with "Disagree" to the statement. As a result, most of the respondents disagree this activities will affect the surrounding area, (48.8%) percent difference between agree and disagree statement.

Table 4.17: Use of Excavators

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	31	25.6	25.6	25.6
	Disagree	90	74.4	74.4	100.0
	Total	121	100.0	100.0	

4.5.13 Use of Scrappers Hammering Works

Based to the result collected in table 4.18 shown below, 46 (38%) respondents had selected "Agree", while there are 75 (62%) respondents had selected with "Disagree" to the statement. As a result, most of the respondents disagree this activities will affect the surrounding area, (24%) percent difference between agree and disagree statement.

Table 4.18: Use of Scrappers Hammering Works

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	46	38	38	38.0
	Disagree	75	62	62	100.0
	Total	121	100.0	100.0	

4.5.14 Erection or Dismantling of Formwork or Scaffolding

Based to the result collected in table 4.19 shown below, 34 (28.1%) respondents had selected "Agree", while there are 87 (71.9%) respondents had selected with "Disagree" to the statement. As a result, most of the respondents disagree this activities will affect the surrounding area, (43.8%) percent difference between agree and disagree statement.

Table 4.19: Erection or Dismantling of Formwork or Scaffolding

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	34	28.1	28.1	28.1
	Disagree	87	71.9	71.9	100.0
	Total	121	100.0	100.0	

4.5.15 Steel Bars Handling

Based to the result collected in table 4.20 shown below, 17 (14%) respondents had selected "Agree", while there are 104 (86%) respondents had selected with "Disagree" to the statement. As a result, most of the respondents disagree this activities will affect the surrounding area, (72%) percent difference between agree and disagree statement.

Table 4.20: Steel Bars Handling

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	17	14	14	14
	Disagree	104	86	86	100.0
	Total	121	100.0	100.0	

4.5.16 Use of Dozers

Based to the result collected in table 4.21 shown below, 18 (14.9%) respondents had selected "Agree", while there are 103 (85.1%) respondents had selected with "Disagree" to the statement. As a result, most of the respondents disagree this activities will affect the surrounding area, (70.2%) percent difference between agree and disagree statement.

Table 4.21: Use of Dozers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	18	14.9	14.9	14.9
	Disagree	103	85.1	85.1	100.0
	Total	121	100.0	100.0	

4.6 Cronbach's Alpha Reliability Test

Prior to conducting any statistical analysis, Cronbach's Alpha test was carried out to analyze the internal consistency of data collected for question 7, 8, 9, 10, 11, 12 and 13 in the questionnaire. The summary of the Cronbach's Alpha coefficient values is presented in Table 4.22.

The Cronbach's Alpha coefficient value ranges from 0.0 to 1, where the higher value shows greater internal consistency. The results from the test show that the Cronbach's Alpha coefficient value for question 7, 8, 9, 10, 11,12 and 13 are 0.903, 0.733, 0.882, 0.907, 0.817, 0.894 and 0.870 respectively which indicate that there is high level of internal consistency in the information gathered throughout the survey. As a result, every variable has an alpha value more than 0.7, which is deemed to be a viable and reliable contribution to this study.

Table 4.22: Summary of Cronbach's Alpha Coefficient

No	Variables	Cronbach's Alpha	N of Items
Q7	Environmental Impacts	0.903	9
Q8	Air Pollution Control	0.733	4
Q9	Water Pollution Control	0.882	3
Q10	Noise Pollution Control	0.907	5
Q11	Construction Traffic Management	0.817	3
Q12	Construction Waste Management	0.894	4
Q13	Mosquitoes Control	0.870	3

4.7 Environmental Impacts

4.7.1 Mean Ranking

Table 4.23 illustrated the ranking of 9 environmental impacts from Malaysian construction industry. According to the mean and standard deviation, it is ranked. 121 respondents score each impact on a 5-point Likert scale, and the mean of all individual affects is determined.

To investigate the neighbourhood environmental impacts being emanating by the construction site, he respondents were asked how they felt about the effects of the environment on their neighbourhood being emanating by the construction site based on a 5-point Likert scale provided in question 7 of the questionnaire. Table 4.23 lists nine consequences related to activities and materials used on building sites that should be taken into consideration. The respondents who work on the building site provided mean scores for all of the effects that were higher than the population mean of 3.000. The information reveals that all of the environmental impact consequences from construction sites that the respondents examined were thought to be a serious problem. The rankings of the "environmental impact" consequences are shown in Table 4.23 together with the judgments of the construction industry professionals.

First and foremost, the construction practitioners ranked noise generation and dust generation as the first and second most severe effects respectively from construction site activities. The damaged public road was ranked third among construction practitioners, while construction traffic came in at number four. As a result, those in the construction industry are more worried and paying close attention to environmental effects that directly affect locals who live close to construction sites because doing so will harm their company's reputation and create several issues for the project. Construction professionals are more concerned with questions of cost and overall pollution than they are with the immediate effects of their actions on the local population. Construction industry professionals were concerned about the degraded public road because it will affect to their company progress and cost when the public road damage cause by the construction site that company who handle on the project need to pay to the local authorities as DBKL when complain by the residents who stay nearby the construction site. Besides, construction industry professionals were apparently concerned about the proliferation of mosquitoes and other pests since it might have an impact on the health of their employees and neighbouring residents. Additionally, construction industry are expected to take corrective action to alleviate the annoyance impacts of their site activities while taking into account the concerns of surrounding residents and the broader public.

As results, in rating scale 3 is Neutral, therefore, the environment impacts which have mean less than 3 are considered non-important item. All of the environmental effects listed in the table, nevertheless, total greater than 3. It may be said that the majority of respondents agreed that all of these impacts occur.

Table 4.23: Mean Ranking of Environmental Impacts

	N	Mean	Std. Deviation	Rank
Noise Generation	121	4.1901	.94264	1
Dust Generation	121	4.1488	.90977	2
Damaged Public Road	121	4.0909	.93986	3
Construction Traffic	121	3.9835	.93971	4
Mosquitoes from Stagnant Water	121	3.9752	.94395	5
Vibration	121	3.959	.9609	6
Air Emission	121	3.8347	.90689	7
Generation of Waste Materials	121	3.7686	.96402	8
Water Pollution	121	3.4959	1.00103	9
Valid N (listwise)	121			

4.8 The Extent of Compliance by Malaysian Construction Industry to the Malaysian Building By-laws and Acts

4.8.1 Air Pollution Control

4.8.1.1 Mean Ranking

Based on the result from Table 4.24 below, the most construction practitioner complies with the regulations and guideline to control air pollution is cover truck compartment carrying dusty loads, which has a mean score of 3.8760. Second, for do not conduct open burning at the construction site, has a mean score of 3.7769, follow by spray water on exposed surface and unpaved road, which have mean score of 3.7107. The last is complying with regulation related to air pollution control, which is the lowest mean score with only have 3.5372.

Table 4.24: Descriptive Statistics of Air Pollution Control

	N	Mean	Std. Deviation
Cover truck compartment carrying dusty loads	121	3.8760	.89972
Do not conduct open burning at the construction site	121	3.7769	.95296
Spray water on exposed surface and unpaved road	121	3.7107	.91686
Comply with regulation related to air pollution control	121	3.5372	.96645
Valid N (listwise)	121		

4.8.1.2 One Sample T-test

According to Table 4.25 one sample t-test findings, no practice for air pollution reduction has a significant level greater than 0.001, which is less than 0.05. It shows a 95% confidence level for the results. Conclusion, the null hypothesis is rejected, and all four practices have statistically significant effects on reducing air pollution at construction sites.

Table 4.25: One-Sample Test of Air Pollution Control

	Test Value = 3						
			Significance		Mean	95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Difference	Lower	Upper
AP1	6.114	120	<.001	<.001	.53719	.3632	.7111
AP2	8.967	120	<.001	<.001	.77686	.6053	.9484
AP3	8.527	120	<.001	<.001	.71074	.5457	.8758
AP4	10.710	120	<.001	<.001	.87603	.7141	1.0380

Remarks:
AP1: Comply with regulation related to air pollution control.
AP2: Do not conduct open burning at the construction site.
AP3: Spray water on exposed surface and unpaved road.
AP4: Cover truck compartment carrying dusty loads.

4.8.2 Water Pollution Control

4.8.2.1 Mean Ranking

Based on the result from Table 4.26 below, the most construction practitioner complies with the regulations and guideline to control water pollution is management and maintenance of construction site water discharge system, which has a mean score of 3.5124. Second, for the compliance with regulation related to water pollution control, has a mean score of 3.3388, and the last is ensure no contaminants are discharged into water courses, which is the lowest mean score with only have 3.2645.

Table 4.26: Descriptive Statistics of Water Pollution Control

	N	Mean	Std. Deviation
Management and maintenance of construction site water discharge system	121	3.5124	.99260
Compliance with regulation related to water pollution control	121	3.3388	1.01286
Ensure no contaminants are discharged into water courses	121	3.2645	1.21634
Valid N (listwise)	121		

4.8.2.2 One Sample T-test

The one sample t-test results of this study reveal that, as shown in Table 4.27, two practices for reducing water pollution have less than 0.001 of significant level, or less than 0.05. It shows a 95% confidence level for the results. Conclusion, the null hypothesis is rejected, and all three practices have statistically significant effects on reducing water pollution at construction sites.

Table 4.27: One-Sample Test of Water Pollution Control

	Test Value = 3						
			Significance			95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Lower	Upper
WP1	3.680	120	<.001	<.001	.33884	.1565	.5212
WP2	2.392	120	.009	.018	.26446	.0455	.4834
WP3	5.678	120	<.001	<.001	.51240	.3337	.6911

Remarks:
WP1: Compliance with regulation related to water pollution control.
WP2: Ensure no contaminants are discharged into water courses.
WP3: Management and maintenance of construction site water discharge system.

4.8.3 Noise Pollution Control

4.8.3.1 Mean Ranking

Based on the result from Table 4.28 below, the most construction practitioner complies with the regulations and guideline to control noise pollution is accommodate complaints and community needs, which has a mean score of 3.4463. Second, for ensure construction works are operated only during permitted working hours and follow work specification related to noise control, each have a mean score of 3.4298 and 3.3802 respectively, and then follow by installation of noise barrier or curtain, which have mean score of 3.2645. The last is substitution of quitter equipment, which is the lowest mean score with only have 3.1736.

Table 4.28: Descriptive Statistics of Noise Pollution Control

	N	Mean	Std. Deviation
Accommodate complaints and community needs	121	3.4463	.99121
Ensure construction works are operated only during permitted working hours	121	3.4298	1.09412
Follow work specification related to noise control	121	3.3802	1.01863
Installation of noise barrier or curtain	121	3.2645	1.23672
Substitution of quitter equipment	121	3.1736	.99731
Valid N (listwise)	121		

4.8.3.2 One Sample T-test

According to Table 4.29 one sample t-test findings, three noise pollution control practices have less than 0.001 of a significant level, or less than 0.05. It shows a 95% confidence level for the results. It is clear from the five practices that the null hypothesis is rejected and that they have a statistically significant effect on reducing noise pollution at construction sites. Nonetheless, it has a 6.8% error rate, most likely driven by human mistake.

Table 4.29: One-Sample Test of Noise Pollution Control

	Test Value = 3						
			Significance		Mean	95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Difference	Lower	Upper
NP1	4.105	120	<.001	<.001	.38017	.1968	.5635
NP2	4.321	120	<.001	<.001	.42975	.2328	.6267
NP3	1.914	120	.029	.048	.17355	-.0060	.3531
NP4	2.352	120	.010	.020	.26446	.0419	.4871
NP5	4.953	120	<.001	<.001	.44628	.2679	.6247

Remarks:
NP1: Follow work specification related to noise control.
NP2: Ensure construction works are operated only during permitted working hours.
NP3: Substitution of quitter equipment.
NP4: Installation of noise barrier or curtain.
NP5: Accommodate complaints and community needs.

4.8.4 Construction Traffic Management

4.8.4.1 Mean Ranking

Based on the result from Table 4.30 below, the most construction practitioner complies with the regulations and guideline to control construction traffic is schedule delivery of construction material at off-peak hours, which has a mean score of 3.4628. Second, for restrict the use of public road, has a mean score of 3.0744. The last is encouraged car sharing among site staff, which is the lowest mean score with only have 2.7686.

Table 4.30: Descriptive Statistics of Construction Traffic Management

	N	Mean	Std. Deviation
Schedule delivery of construction material at off-peak hours	121	3.4628	.94905
Restrict the use of public road	121	3.0744	1.10427
Encourage car sharing among site staff	121	2.7686	1.16734
Valid N (listwise)	121		

4.8.4.2 One Sample T-test

As indicated in Table 4.31, the one sample t-test findings of this study reveal that only 1 practice for construction traffic management has less than 0.001 of significant level, or less than 0.05. It denotes a 95% confidence level for the results. The conclusion is that for the two practices, the null hypothesis is rejected, and it demonstrates the statistically significant influence of managing construction traffic on the construction site. Unfortunately, it had 46% errors out of 1 practices, most likely caused by human mistake.

Table 4.31: One-Sample Test of Construction Traffic Management

	Test Value = 3						
			Significance		Mean	95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Difference	Lower	Upper
CT1	5.364	120	<.001	<.001	.46281	.2920	.6336
CT2	-2.181	120	.016	.031	-.23140	-.4415	-.0213
CT3	.741	120	.230	.460	.07438	-.1244	.2731

Remarks:
CP1: Schedule delivery of construction material at off-peak hours.
CP2: Encourage car sharing among site staff.
CP3: Restrict the use of public road.

4.8.5 Construction Waste Management

4.8.5.1 Mean Ranking

Based on the result from Table 4.32 below, the most construction practitioner complies with the regulations and guideline to control construction waste is clear guideline of waste disposal procedures, which has a mean score of 3.5702. Second, for develop a waste management plan, has a mean score of 3.4793, follow by ensure site staff following the right waste management procedures, which have mean score of 3.4463. The last is recycling and reuse waste, which is the lowest mean score with only have 3.4132.

Table 4.32: Descriptive Statistics of Construction Waste Management

	N	Mean	Std. Deviation
Clear guideline of waste disposal procedures	121	3.5702	.96459
Develop a waste management plan	121	3.4793	.93184
Ensure site staff following the right waste management procedures	121	3.4463	.96566
Recycle and reuse waste	121	3.4132	.98039
Valid N (listwise)	121		

4.8.5.2 One Sample T-test

According to Table 4.33 one sample t-test findings, the overall construction waste management practice has a significant level less than 0.001, or less than 0.05. It shows a 95% confidence level for the results. It can be said that the null hypothesis is rejected and that all four practices exhibit statistically significant effects when the construction waste is under control.

Table 4.33: One-Sample Test of Construction Waste Management

	Test Value = 3						
			Significance		Mean	95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Difference	Lower	Upper
CW1	5.658	120	<.001	<.001	.47934	.3116	.6471
CW2	6.503	120	<.001	<.001	.57025	.3966	.7439
CW3	4.636	120	<.001	<.001	.41322	.2368	.5897
CW4	5.084	120	<.001	<.001	.44628	.2725	.6201

Remarks:
CW1: Develop a waste management plan.
CW2: Clear guideline of waste disposal procedures.
CW3: Recycle and reuse waste.
CW4: Ensure site staff following the right waste management procedures.

4.8.6 Mosquitoes Control

4.8.6.1 Mean Ranking

Based on the result from Table 4.34 below, the most construction practitioner complies with the regulations and guideline to control mosquitoes is fogging regularly, which has a mean score of 3.5620. Second, for waste containers to collect on-site waste should be covered from rain and shine, has a mean score of 3.1570. The last is unnecessary equipment, containers, plastic receptacles etc around the construction site should be removed, which is the lowest mean score with only have 3.1322.

Table 4.34: Descriptive Statistics of Mosquitoes Control

	N	Mean	Std. Deviation
Fogging regularly	121	3.5620	.92999
Waste containers to collect on-site waste should be covered from rain and shine	121	3.1570	1.08019
Unnecessary equipment, containers, plastic receptacles etc around the construction site should be removed	121	3.1322	1.10259
Valid N (listwise)	121		

4.8.6.2 One Sample T-test

According to Table 4.35 results from the one sample t-test used in this study, only one practice for controlling mosquitoes has a significant level less than 0.001, or less than 0.05. It shows a 95% confidence level for the results. The conclusion is that for the single practice, the null hypothesis is rejected, and it demonstrates the statistically significant influence of managing construction traffic on the construction site. Unfortunately, it had 30.2% errors out of 2 practices, most likely caused by human error.

Table 4.35: One-Sample Test of Mosquitoes Control

	Test Value = 3						
			Significance		Mean	95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Difference	Lower	Upper
MC1	1.319	120	.095	.190	.13223	-.0662	.3307
MC2	1.599	120	.056	.112	.15702	-.0374	.3515
MC3	6.647	120	<.001	<.001	.56198	.3946	.7294

Remarks:
MC1: Unnecessary equipment, containers, plastic receptacles etc around the construction site should be removed.
MC2: Waste containers to collect on-site waste should be covered from rain and shine.
MC3: Fogging regularly.

4.9 Factor Analysis

The main applications of factor analysis are data reduction and summarization. A vast number of variables are investigated for links between them, and their numbers are trimmed down to a manageable number for easier comprehension. To lessen the effects of construction sites on the Malaysian construction sector, it was decided to explore the major groupings of 6 fields of controls in this study.

4.9.1 Analysis Considerations

The Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity are used to examine the adequacy of the data in this research prior to the use of the factor analysis. The results of KMO and Bartlett's tests are shown in Table 4.36.

As stated in Table 4.36, the KMO value for the 22 component is 0.822, which is higher than the suggested value of 0.50. Also, the Bartlett's test result is 2440.282, with a significance level of 0.000. The obtained significance value for the Bartlett's test was less than 0.05, indicating statistical significance. This backed up the correlation matrix's factorability, which showed that the variables were connected and that the underlying causes could be determined. Hence, the parameters confirmed that the implementation of factor analysis in this study was appropriate.

Table 4.36: KMO and Bartlett's Test

		Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.822
Bartlett's Test of Sphericity		
	Approx. Chi-Square	2440.282
	df	231
	Sig.	<.001

This investigation used the initial eigenvalues and percentage of variance approaches to identify the underlying causes of 22 practices for reducing environmental impacts in the Malaysian construction industry. As indicated in Table 4.37, the principle components analysis (PCA) revealed six components with eigenvalues larger than 1.0 and did not display eigenvalues less than 1.0. The scree plot in Figure 4.2 shows that 6 important components were retrieved after an analysis of the 22 practices. As can be seen in Figure 4.1, the 6 components together explained a total of 80.45% of variance. However, according to (Field, 2013), for analyses with fewer than 30 components, the extracted variance should be at least equal to or greater than 60.0%. This supported the validity of the factor analysis's findings in this study. As shown in Figure 4.1, all 22 variables were extracted into 6 components with factor loadings more than 0.50, indicating that the variables are practically significant. Figure 4.1 and Table 4.37, respectively, show the Scree Plot of the 22 variables of environment impact control practice as they were analyzed and the statistics of total variance explained.

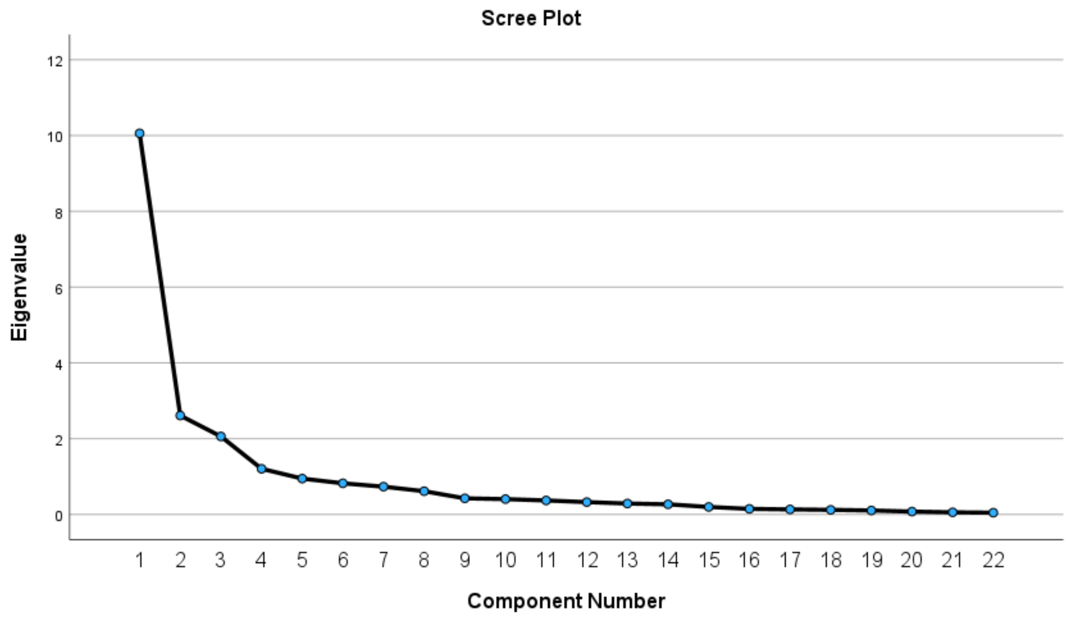

Figure 4.1: Scree Plot

Table 4.37: Total Variance Explained

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
F1	10.057	45.714	45.714	4.955	22.524	22.524
F2	2.610	11.865	57.579	4.066	18.480	41.004
F3	2.058	9.356	66.936	3.579	16.270	57.273
F4	1.806	5.476	72.412	3.243	12.146	69.419
F5	1.143	4.200	76.711	2.730	6.758	76.178
F6	1.114	3.734	80.446	2.388	4.268	80.446

Table 4.38: Factor Analysis Loading Results

	Factor					
Environmental Impacts Control	F1	F2	F3	F4	F5	F6
Spray water on exposed surface and unpaved road	0.886					
Comply with regulation related to air pollution control	0.859					
Cover truck compartment carrying dusty loads	0.680					
Do not conduct open burning at the construction site	0.673					
Management and maintenance of construction site water discharge system		0.925				
Ensure no contaminants are discharged into water courses		0.884				
Compliance with regulation related to water pollution control		0.838				
Follow work specification related to noise control			0.849			
Ensure construction works are operated only during permitted working hours			0.825			
Substitution of quitter equipment			0.822			
Installation of noise barrier or curtain			0.793			
Accommodate complaints and community needs			0.773			
Schedule delivery of construction material at off-peak hours				0.860		
Restrict the use of public road				0.773		
Encourage car sharing among site staff				0.763		
Ensure site staff following the right waste management procedures					0.848	
Clear guideline of waste disposal procedures					0.829	
Develop a waste management plan					0.823	
Recycle and reuse waste					0.685	
Unnecessary equipment, containers, plastic receptacles etc around the construction site should be removed						0.822
Waste containers to collect on-site waste should be covered from rain and shine						0.819
Fogging regularly						0.670

4.9.2 Discussion of Factor Analysis Results

F1: Air Pollution Control

This factor accounted for 22.52% of the total variance explained. It consists of "comply with regulation related to air pollution control", "do not conduct open burning at the construction site", "spray water on exposed surface and unpaved road", and "cover truck compartment carrying dusty loads".

The numerous dust prevention strategies will now be discussed. The primary methods for reducing the impact of dust pollution include using dust screens to enclose the building being constructed as well as a solid barrier around the entire site, enclosing the material hoist and debris chute within a dust screen while construction is taking place, misting water on the debris before it enters a debris chute, misting water on the façade when grinding work is being done, attaching a vacuum cleaner to the equipment during grinding, and covering up the material when it is being moved (Babalola et al, 2019).

The Environmental Quality Act (Amendment) Act 2007 is one of the stringent laws that strictly regulate the environment's wellbeing. Construction industry must fully comprehend and incorporate the legislation into their construction plans in order for the restrictions on the prevention of air pollution to be enforced. All workers at the construction site need to respect it and follow it. Open burning, for instance, is a major offense that is not permitted in Malaysia. Those who engage in open burning will face harsher fines under Section 29A. (i.e. RM500, 000 or 5 years jail or both). So, by complying by the building companies and practitioners in order to decrease the impacts, the air pollution control would be carried out efficiently.

F2: Water Pollution Control

This factor accounted for 18.48% of the total variance explained. It consists of "compliance with regulation related to water pollution control", "ensure no contaminants are discharged into water courses", and "management and maintenance of construction site water discharge system".

One key strategy for addressing the water quality challenges is a legislative one based on the 'polluter pays' idea. Anybody who releases rubbish into rivers shall face an RM 100,000 punishment, five years in prison, or both, as per EQA 1974

Section 25. If it is an environmentally dangerous material, there would be a heavier penalty of RM 500 000 (Construction Industry Development Board Malaysia, 2022). Construction professionals must see to it that these rules are compiled and understood. According to Knickmeyer (2020) as the dangers are typically non-point sources, a site does not need need to be close to a river or other body of water to be problematic. So, if building trash is properly managed so that it does not reach the water flow, water contamination can be prevented. Knickmeyer (2020) additionally emphasized how the drainage system might serve as a vital conduit for the pollutant's spread. In order to decrease water pollution from construction sites, proper management and maintenance of the system for construction site discharges are therefore crucial.

F3: Noise Pollution Control

This factor accounted for 16.27% of the total variance explained. It consists of "follow work specification related to noise control", "ensure construction works are operated only during permitted working hours", "substitution of quitter equipment", "installation of noise barrier or curtain", and "accommodate complaints and community needs".

The building industry uses a number of modern tools to reduce noise production to keep the neighbourhood safe. Current mobile generators, for instance, are in use and all of them are constructed inside of a sound enclosure, making them no noisier than a typical car. So, the only significant noise sources from building sites that can harm surrounding homes are heavy vehicles, earthmoving equipment, and occasionally jack hammers.

Noise monitoring during construction is a statutory obligation set forth for the project by the Department of Environment (DOE). On the construction site, constant automated or manual noise control systems are currently deployed based on the construction requirements. This work is being done by a testing facility that is independent. As part of the required environmental management plan for this project, DOE shall submit monitoring reports.

In addition, DOE has specified in its Environmental Impact Assessment (EIA) permission that building activities that could cause noise disturbance can only be carried out between the hours of 8am and 7pm, save in extremely exceptional circumstances. For instance, restoration work or beam launching that requires public protection. Hence, in order to indirectly lessen the influence of noise on the surrounding environment, construction businesses and practitioners must adhere to the following practice.

F4: Construction Traffic Management

This factor accounted for 12.15% of the total variance explained. It consists of "schedule delivery of construction material at off-peak hours", "encourage car sharing among site staff", and "restrict the use of public road".

Several studies have called attention to the critical environmental issue of traffic or vehicle movement. Fredianelli et al (2019) recommended that deliveries of construction materials should be made at off-peak times, car sharing should be encouraged, public roads should not be used to access the site, and vehicles leaving the site should be regularly washed to avoid dirtiness. Due to the construction companies' and workers' compliance, the effects on the neighbourhood environment will be minimized during the course of the construction traffic.

F5: Construction Waste Management

This factor accounted for 6.76% of the total variance explained. It consists of "develop a waste management plan", "clear guideline of waste disposal procedures", "recycle and reuse waste", and "ensure site staff following the right waste management procedures".

Also related to the issue of the massive amount of garbage that has affected the environment is the topic of the materials utilized on the job site. There are several strategies to enhance waste management operations at building sites, as prior studies have demonstrated. The methods contain six waste management tenets: eliminate, reduce, reuse, recycle, recover, and dispose (Huang et al, 2018). Kabirifar et al (2020) was decided that the waste management measurers should give waste reduction first attention. After separating the waste, the next stage is to determine whether it may be recycled or reused. By taking these actions, unneeded and unwanted garbage can be reduced before being dumped in an approved landfill. Toward a comprehensive approach to managing building trash, Kabirifar et al (2020) proposed that the plan for waste management include a thorough breakdown of the activities. A detailed and easy-to-understand summary of the waste action plan that combines information on legal requirements with efficient waste management strategies to maximize resource efficiency and deposit the appropriate amount of trash at disposal facilities should be included in the strategy (Amaral et al, 2020). Waste management practices such as garbage sorting, recycling or reuse, and waste disposal should all be included in the strategy. Implementing the proper trash disposal procedures and recycling or reusing the material can help to reduce the major pollution that building waste causes. Having a plan has obvious advantages, but it won't function unless the site employees use it and participate in it. So, it is the duty of the approved managers to make sure that the employees adhere to the plan (Kabirifar et al, 2020). The following practice must be followed by construction businesses and practitioners in order to limit the amount of construction waste produced, hence indirectly lowering the impact of construction waste on the local ecosystem.

F6: Mosquitoes Control

This factor accounted for 4.27% of the total variance explained. It consists of "unnecessary equipment, containers, plastic receptacles etc around the construction site should be removed", "waste containers to collect on-site waste should be covered from rain and shine", and "fogging regularly".

By putting the "Hierarchy of Prevention" principle into practice, the condition of the construction site can be improved. First, the area around the work site needs to be cleared of any extraneous tools, containers, plastic containers, etc. Second, the trash cans used to collect on-site trash must to be protected from rain and sunlight. The next step is to practice on-site waste segregation to prevent water from collecting in potential containers. The administrative control should then delegate responsibilities to managers to oversee prospective breeding places. The Environmental Management Plan (EMP) concept and the adaptation of Environmental Impact Assessment (EIA) for construction sites are two further practical methods for enhancing site cleanliness (Wilke et al, 2019). Hence, mosquito management is crucial, particularly in a country like Malaysia where there is only one season, the rainy one, which is the hardest to avoid. Hence, in order to indirectly lessen the influence on the local environment, building businesses and practitioners must adhere to the following practice.

4.10 Summary

In this chapter, the data will be analyzed, and the results will be presented and interpreted in light of the literature review. Prior to conducting the main survey, a pilot test is undertaken to make sure the questions are appropriate and the data generated is trustworthy for this research. To demonstrate that the results are accurate and sufficient for this research, the demographic profile of respondents is also explained in this chapter. The building materials utilized and the site operations that have the greatest potential to have an impact are ranked. The accuracy of the data collection was also examined using the Cronbach's Alpha reliability test. The results of the reliability test indicated that the information gathered for this study was trustworthy. The perceptions of the respondents who work in the construction business have been used to rank the 9 environmental impacts. For each of the elements from the 6 main fields of environmental impact control practices, there is a mean ranking and one sample T-test. Moreover, component analysis was used to successfully isolate 6 fundamental causes among the 22 practise of environmental impacts control strategies.

CHAPTER 5

CONCLUSION AND RECOMMONDATIONS

5.1 Introduction

In this chapter, on the basis of the goals and objectives decided upon early in the research, the study's findings will be finalized and summarized. This chapter emphasizes the implications of the research. In the conclusion of the chapter, recommendations are made for future research that will help to address this study's limits and increase the studies' thoroughness in the direction to impacts of construction material and site activities to the neighbourhood environment and the extent to which Malaysian construction industry's compliance with Malaysian law.

5.2 Research Findings

The aim of this study is to carry out research on the impacts of construction materials and site activities to the neighbourhood environment and to assess the extent of compliance by Malaysian construction industry to the Malaysian Building By-laws and Acts.

The three primary objectives for finishing this study were listed in Chapter 1 of the report. The objectives are listed below:

a) To identify the construction materials used and site activities involved at a typical construction site most likely to have an impact on the neighbourhood environment.

b) To study the environmental impacts of construction materials and site activities from the construction site to the neighbourhood environment.

c) To assess the extent of compliance by Malaysian construction industry to the Malaysian Building By-laws and Act to reduce the environmental impacts.

Objective 1:

Respondents are prompted to respond to the question in Section B of the created questionnaire in order to meet the study's initial goal. Respondents were asked to select the activities they believed to have the most prevalent impact from construction site to the neighbourhood environment, which the literature analysis found 16 construction materials and on-site activity handling at construction sites. Further research is advised in this area of study because there has not been much done to examine how construction sites affect the local ecosystem in Malaysia. The top 5 position overall most influential construction materials and on-site activities are: (1) Dust from exposed areas of cement and sand, (2) Demolition and material handling, (3) Transporting of fill on public roads, (4) Excavation and placement of the fill in stock piles or to embankment and tied (5) Driving piles and Vehicle activity on dry unsealed roads. “Dust from exposed areas of cement and sand” are ranked at the first place while the “Steel bars handling” is ranked at the last place among the 16 construction materials and on-site activities. By judging from the top five rankings, they all have a huge relationship to the air pollution and noise pollution. This means that air pollution and noise pollution have a greater impact than the others.

Objective 2:

In order to achieve the second objective of this study, 9 factors that can affect the neighbourhood environment were identified from the literature review. The respondents were asked to rank the level of relevance for each of the nine factors indicated in Section C of the questionnaire survey. The overall ranking for top 5 factors that affecting neighbourhood environment are: (1) Noise Generation, (2) Dust Generation, (3) Damaged Public Road, (4) Construction Traffic and (5) Mosquitoes from Stagnant Water and the rest is (6) Vibration, (7) Air Emission, (8) Generation of Waste Materials and (9) Water Pollution. By judging from the top five rankings, they all have a huge relationship with related and consistent to objective 1. This means that air pollution and noise pollution are still a greater impact than the others.

Objective 3:

The third research objective is also accomplished through respondents' assessments of environmental consequences in 6 distinct domains. 6 outcomes that show whether site employees or firms in the construction industry are adhering to the measures, rules, and laws outlined in the numerous acts and laws to reduce and regulate impacts from construction sites have been found in the literature review. To determine if there is conformity in their own field of view, the respondents are asked to rank the degree of agreement on the 6 outcomes listed in Section D of the questionnaire survey. The 6 outcomes of environment impacts control are: (1) Air Pollution Control, (2) Water Pollution Control, (3) Noise Pollution Control, (4) Construction Traffic Management, (5) Construction Waste Management and (6) Mosquitoes Control. These 6 outcomes overall have the mean more than 3.000 and thus implied that in the construction industry in Malaysia, most of them have complied, but they are not very strict. And it is all between occasional compliance and frequent compliance.

In a nut shell, the extent of compliance to the Malaysian Building by-laws and various acts still needs to improve in Malaysian construction industry. In Malaysia, there are still many factors that lead to lax practices of various construction companies, after all there is always another culture in Malaysia, such as bribery. Of course, if the relevant units can pay more attention to and advocate environmental impacts control, if it is more stringent, it may be different. Finally, workers on the construction site must also have awareness about these impacts, such as some general workers who lack knowledge in this area, so as to protect themselves and others， so that they can reduce and control those impacts from the inside out.

5.3 Research Limitations

This research is not perfect and there are several limitations are detected on this study:

1. Questionnaire surveys are conducted mainly in Klang Valley area. The outcomes might not accurately reflect the full Malaysian construction industry.
2. It is possible that the sample size is insufficient to adequately represent the entire Malaysian building industry. It is challenging to get more responses in this short amount of time because the research time is limited.
3. Some respondents might not be able to completely comprehend the questions provided in the surveys because they are only produced in the English version. Every person has a varied level of linguistic proficiency and comprehension.
4. Some respondents are hesitant to invest the time necessary to complete the questionnaire because they believe it is unimportant. As a result, while they are trying to do the task as quickly as possible, their response could not be correct enough. That will unquestionably have an impact on the quality and dependability of the data gathered.

5. Different positions have different job scopes, which lead to some respondents not knowing what is happening on the construction site, and the lack of contact with the construction site will also affect the data collected.

5.4 Recommendation for Future Work

In order to enhance the completeness for future study which related to building environment in Malaysian construction industry, there are several recommendations is provided as below:

1. Respondents in the construction industry from other Malaysian states, particularly those from Sabah and Sarawak in East Malaysia, can be included in questionnaire surveys.
2. The sample size should be increase as much as more than 200 respondents and the number of respondents from each position should be fixed in order to obtain more reliable and precise results.
3. Different language version of questionnaire can be designed for those individuals who are less educated for ensuring every question is understandable by every respondent.
4. Distributing questionnaires by using hand method is highly recommended. This is because it can allow the researcher and respondents to have face to face discussion and eyes contact while answering the questionnaires. Thus, the respondents are able to ask any queries on the question to avoid ambiguous and the researcher can explain much on the aim, objectives and intentions of the study.
5. The questionnaire can be aimed at more experienced people on the construction site, so that the data collected will be more accurate.

5.5 Conclusion

This chapter outlines the overall study's conclusion, which must be related to the three primary objectives listed in Chapter 1 in order to be valid. Also, this research's weaknesses are noted along with relevant suggestions for future studies. Future researchers should focus more on the effects of construction materials and site operations on the local environment as well as assess how well Malaysian construction industry adhere to local laws. Also, they should make every effort to increase the research's quality by gathering the necessary data.

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APPENDICES

Impacts of Construction Materials and Site Activities to the Neighbourhood Environment

Dear respondents,

I am Chan Han Wang, a student from Universiti Tunku Abdul Rahman (UTAR), studying Master of Project Management. I am doing my Final Year Project with the title of "Impacts of Construction Materials and Site Activities to the Neighbourhood Environment" to complete my postgraduate studies. This research focuses on the parties involved in the Malaysia construction industry.

There are three main objectives to be achieved:

1. To identify the construction materials used and on-site activities involved at a typical construction site.
2. To assess the environmental impacts of construction materials and site activities to the neighbourhood.
3. To assess the extent of compliance by Malaysian construction industry to the Malaysian Building By-laws and Act.

This questionnaire consists of FOUR (4) sections, Section A, B, C and D. It should take around 5 to 10 minutes to complete. Please kindly answer all the questions as your responses are very important for my research.

Thank you for your time and participation. Your help is very much appreciated. All responses provided will be kept private and confidential and solely for academic purpose.

If you have any inquiries, please do not hesitate to contact me.

Best Regards,

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Section A: Profile of the Respondents

The purpose of this section is to obtain some personal information of participants. Please place a tick (√) at appropriate column of your answer for question 1 to 4.

1. Type of organisation?

Developer	
Consultant	
Construction industry	
Subconstruction industry	

2. What is the background of your profession?

Construction industry	
Project Manager	
Site Supervisor	
Other:	

3. How long is your working experience in the construction industry?

Less than 5 years	
5 years and above	

Section B: To identify the construction materials used and site activities involved at a typical construction site.

Q4: From your experience which of the following construction materials used and site activities in the construction site have the most potential to bring impacts to the neighbourhood environment?

Construction Materials Used and Site Activities	Please Tick	
	Agree	**Disagree**
Stripping and clearing site		
Transporting of fill on public roads		
Excavation and placement of the fill in stock piles or to embankment		
Demolition and material handling		
Driving piles		
Dust from exposed areas of cement and sand		
Vehicle activity on dry unsealed roads		
Crushing and screening of aggregates		
Concrete batching		
Rubble disposal		
Use of powered mechanical equipment		
Use of excavators		
Use of scrappers Hammering works		
Erection or dismantling of formwork/scaffolding		
Steel bars handling		
Use of dozers		

Section C: To assess the environmental impacts of construction materials and site activities to the neighbourhood.

Q5: Please indicate your perceptions with the environmental impact faced by neighbourhood who staying surrounding the construction site.

	***Please give a rating for each perception by ticking (√) either one from scale 1 to 5**	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
		1	**2**	**3**	**4**	**5**
a.	Noise Generation	1	2	3	4	5
b.	Air Emission	1	2	3	4	5
c.	Water Pollution	1	2	3	4	5
d.	Mosquitoes From Stagnant Water	1	2	3	4	5
e.	Generation of Waste Materials	1	2	3	4	5
f.	Dust Generation	1	2	3	4	5
g.	Vibration	1	2	3	4	5
h.	Construction Traffic	1	2	3	4	5
i.	Damaged Public Road	1	2	3	4	5

Section D: To assess the extent of compliance by Malaysian construction industry to the Malaysian Building By-laws and Acts

In your opinion, when caring out construction activities and materials used on site, does the construction industry or site workers complies with the regulations and guideline to reduce the various environmental impact?

		Whether they have not comply it at all	Comply very rarely	Occasionally comply	Often comply	Comply very frequently
	Q6: Air Pollution Control	**1**	**2**	**3**	**4**	**5**
a.	Comply with regulation related to air pollution control	1	2	3	4	5
b.	Do not conduct open burning at the construction site	1	2	3	4	5
c.	Spray water on exposed surface and unpaved road	1	2	3	4	5
d.	Cover truck compartment carrying dusty loads	1	2	3	4	5
	Q7: Water Pollution Control					
a.	Compliance with regulation related to water pollution control	1	2	3	4	5
b.	Ensure no contaminants are discharged into water courses	1	2	3	4	5
c.	Management and maintenance of construction site water discharge system	1	2	3	4	5

	Q8: Noise Pollution Control					
a.	Follow work specification related to noise control	1	2	3	4	5
b.	Ensure construction works are operated only during permitted working hours	1	2	3	4	5
c.	Substitution of quitter equipment	1	2	3	4	5
d.	Installation of noise barrier or curtain	1	2	3	4	5
e.	Accommodate complaints and community needs	1	2	3	4	5
	Q9: Construction Traffic Management					
a.	Schedule delivery of construction material at off-peak hours	1	2	3	4	5
b.	Encourage car sharing among site staff	1	2	3	4	5
c.	Restrict the use of public road	1	2	3	4	5
	Q10: Construction Waste Management					
a.	Develop a waste management plan	1	2	3	4	5
b.	Clear guideline of waste disposal procedures	1	2	3	4	5
c.	Recycle and reuse waste	1	2	3	4	5
d.	Ensure site staff following the right waste management procedures	1	2	3	4	5
	Q11: Mosquitoes Control					
a.	Unnecessary equipment, containers, plastic receptacles etc around the construction site should be removed	1	2	3	4	5
b.	Waste containers to collect on-site waste should be covered from rain and shine	1	2	3	4	5
c.	Fogging Regularly	1	2	3	4	5