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A STUDY ON ENVIRONMENTAL IMPACT FROM CONSTRUCTION OPERATION IN RESIDENTIAL AREAS

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Abstract:

Air pollution is a growing problem because of rising urban populations, new developments of housing, unchecked urban and industrial expansions and the phenomenal surge in the number and use of motor vehicles. Without a proper protection and mitigation plan, construction activities and new developments will cause uncomfortable conditions to nearby residential areas due to air pollution. This paper aims to highlight the impact of environment from construction operations based on experiences of the residents. The objectives are to identify the awareness of residents towards environmental impacts on their quality of life and to identify factors causing air pollution to the residential areas. Two locations in Shah Alam were chosen as a case study; Section U11 and Section U12. There are construction activities which operate at about 100-metre distance from the residential areas. A questionnaire survey was conducted in March 2018. 42 respondents were involved in this survey. The results revealed that many of the respondents were knowledgeable on the issues of environment but not many of them had taken a preventive measure to reduce this environmental impact. It is anticipated that this study will benefit both construction players and public to work together for a better quality of life though protecting our environment.

Keywords: Environment; Air Pollution; Construction; Residential

1.0 INTRODUCTION

Malaysia is a rapidly developing country in all sectors of the industries, such as, the agricultural industry, manufacturing industry, automotive industry and others. One of the industries that has an impact and plays a significant role to the country's infrastructure and facilities development is the construction industry. It has succeeded in raising the name of Malaysia as one of the developing countries that can compete with other developed countries like Japan and China. However, construction industry will not succeed by ignoring sustainability and green impact. It is everyone's responsibility in any industries, especially in constructions, to consider the issues of environment and their impacts towards the wellbeing of humans.

Environmental pollution caused by construction projects consists of several types, such as, water pollution, noise pollution, air pollution and others. However, the most vulnerable pollution in the public or nearby residents near the construction site is the air pollution that can give bad impacts on humans' health in general. Wind mechanisms that aid the spread of this pollution consist of dust, smoke and small chemical mechanisms resulting from piling, drilling, vehicle carrying and many more.

1.1 Aim and Objectives

The aim of this research is to identify methods to reduce the implication of air pollution to the community. Therefore, two objectives have been constructed for this purpose: 1. to identify the main sources of air pollution from construction projects near residential areas in Shah Alam; 2. to identify an improvement plan to reduce air pollution at selected areas.

2.0 LITERATURE REVIEW

Environmental pollution can be caused by several factors such as industry, port, construction area and total road transport in Malaysia. However, this study only focuses on the construction sector in Malaysia which contributes to environmental pollution from site projects. Environmental pollution in constructions is inevitable and continues to occur. This is because each development in a new area will undoubtedly affect the natural resources of the area and consequently bring impact on lives, such as humans, animals and plants. However, this problem can be mitigated or properly managed if there is a strategic plan for construction and environmental protection.

2.1 Environmental Issues in Construction

Construction projects are increasingly giving direct impacts on the environment. The impacts include air pollution and others types of pollution, such as, noise, water chemical and many more that can usually be found in many types of construction projects. Furthermore, the problems of air pollution have greater impacts on the surrounding environment simply because generally people live in these areas. A study was done through a long-term observation on the trends of major air pollutants in Malaysia. They include nitrogen dioxide (NO₂), carbon monoxide (CO), ground level ozone (O₃), total suspended particulate (particularly PM₁₀), and sulfur dioxide emitted from industrial and urban areas from the early 1970s (Latif et al., 2006). Yip (2000) said the internal environment within buildings is often polluted by the poor design and construction.

It can also be said that air pollution caused by construction work in construction sites or projects can give bad impacts on living beings surrounding on health, economic and social issues. Besides that, issues that are related to air pollution is very serious due to the fact that elevated air pollutant levels from these anthropogenic sources tend to occur in environments where serious harm to human health and welfare is more likely to occur in densely populated urban areas such as Klang Valley, Kuala Lumpur, and Shah Alam (Jamal et al., 2004).

Many clients or contractors take the environmental issues into account only from their business benefit point of view. For examples, they only often consider the protection of construction components or activities, or resources from the effect of the environment. Mainly, this is because it is the tradition that construction management work takes only three aspects into consideration: cost, time and quality. This traditional approach pays little attention to the environment but as environmental issues are given greater concern by all sectors in the society, this historical model has less value for future project success (Barnes, 1988).

In Malaysia, air pollution has been recognized as one of the major concerns that have high potential for deleterious effects on health (Jamal et al., 1998). Air pollution has been known for increasing risks of a wide range of diseases, such as respiratory and heart diseases (Yang et al., 2015). The environmental impacts due to construction of highways are temporary in nature and these would affect the population residing in areas near the construction site. Such impacts are caused due to movement of earth moving machinery, operation of construction and supporting equipment, various civil construction activities, and many more (Basu et al., 2008).

The air pollution and hazards generated from construction sites are normally related to construction methods, materials and management, as stated by Chen et al. (2002). Heavy duty diesel (HDD) equipment is needed to construct and maintain transportation infrastructure. This equipment requires fossil fuel for energy and it emits air pollutants that are harmful to the environment and human health. HDD equipment is a substantial contributor to the growing air pollution problem. Therefore, new ways to quantify and characterize air pollution must be found in order to mitigate it and achieve a smart and sustainable built environment (Chen et al., 2002).

2.2 Construction Contribution to Air Pollution

The construction industry is still considered an important source of atmospheric pollution due to particulate matter emissions, causing negative impacts on human health and the environment. Dust and PM emissions can come from a number of sources during construction activities, as well as from

off-site vehicles associated with the construction works and on-site machinery (off-road emissions), including both static and non-road mobile machinery (Resende, 2007).

According to Council London (2006), dust and other air pollution from demolition and construction can impact greatly on the health and quality of the lives of people working on and living close to these sites if they are badly managed. Potential sources of dust and other air contaminant discharges may cause nuisance beyond the site boundary during adverse conditions if adequate controls and mitigation measures are not adopted. The sources include dust from roads and access areas generated by trucks and other mobile machinery movements during dry and windy conditions, excavation and disturbance of dry material, loading and unloading of dusty materials to and from trucks, stockpiling of materials including material placement and removal, storage and handling of bulk cement; and concrete grinding undertaken as part of the manufacture of pre-cast concrete bridge components (Quality, 2013).

There are several nature of sources: demolition, sanding, grinding, welding, waste transfer and storage, on-site traffic movements, diesel exhaust emissions, earthmoving and excavation, unpaved access roads and pathways, and the clearing of access roads, masonry activities (preparation of concrete, cement and mortar mixes; cutting stone, bricks or pavers), concrete drilling or cutting, crushing or screening (i.e. sorting) aggregate materials, wind erosion from stockpiled material, and last sanding and grit blasting (Government & Quality, 2001). Table 1 shows the details of construction activities in phases.

Table 1: Construction Activities by Phases (Araújo et al, 2014).

Activities and Methods	Phase 1	Phase 2	Phase 3
Construction activities at different points	<p>Point 1 Main activities: manual excavation, meso structure, razing of auger piles foundations, vehicular traffic on the soil, land transportation, truck traffic at the construction site.</p> <p>Other activities around: superstructure, lift masonry, execution of self-leveling, floor, masonry cement, mortar coating execution, treatment for concrete and floor regularization with cement.</p>	<p>Point 2 Main activities: execution of reinforced concrete (columns, beams and slabs), lift masonry, mortar execution, and masonry shaft.</p> <p>Other activities around: interior and exterior finishes (ceramic coating (wall), mortar coating, marble and granite fillet door), plumbing and electrical installation systems, waterproofing with asphalt blanket and crystallized waterproofing.</p>	<p>Point 3 Main activities: external and internal mortar finishing activities, grouting masonry façade, ceramic coating (wall), crystallized waterproofing, countertops marble and granite, lining plasterboard plates, sanding (wall and ceiling).</p> <p>Other activities around: execution of reinforced concrete (columns, beams and slabs), lift masonry, mortar execution and masonry shaft.</p>

3.0 METHODOLOGY

This study uses a quantitative research approach. A set of questionnaires were distributed to the residents at the selected locations. The questionnaires were distributed in March 2018. Convenient sampling was used in this study. Respondents were chosen from the distance of 100 meters from the construction site. 64 responses were gathered. Table 2 shows the details of the response rate.

Table 2: Questionnaires response detail

Location	Population at 100 meter distance	Response	Percentage
U11	30	10	33%
U12	50	32	64%
Total	80	42	52% (mean)

All data gathered were then grouped, summarized, analyzed and presented in the form of tables and charts.

4.0 ANALYSIS AND FINDINGS

This section discusses the findings of the study. The findings were discussed in several sections: demographic analysis, effects of air pollution to residential areas and the main causes of air pollution.

4.1 Demographic Analysis

Based on the survey, the data has been organized into several sections for easier discussion. Data were analyzed using Excel Software. Descriptive analyses were conducted for this study. Table 2 and Table 3 show the demographic details of the respondents. It is shown that majority of the respondents are female (69%) compared to only 31% whom are male. This is very common where many of the respondents are housewives who spent most of their time at home. These are the people who experience the impact of environment due to nearby construction activities most of the time.

Table 3: Respondent's gender

Gender	Location				Total Frequency	Total Percentage
	U 11		U12			
	Frequency (n)	Percentage %	Frequency (n)	Percentage %		
Male	3	30	10	31	13	31
Female	7	70	22	69	29	69
Total	10	100	32	100	42	100

Table 4.: Respondent's age

Age	Location				Total Frequency	Total Percentage
	U 11		U12			
	Frequency (n)	Percentage %	Frequency (n)	Percentage %		
Below 20 years	0	0	4	12.4	4	9.5
21-30 years	0	0	10	31.3	10	23.8
31-40 years	6	60	16	50	22	52.4
41-50 years	4	40	2	6.3	6	14.3
50 above	0	0	0	0	0	0
Total	10	100	32	100	42	100

The results also show that majority of the residential are at the age range of 31 to 40 years old (52.4%), followed by the age range of between 21 to 30 years old (23.8%), below 20 years of age (9.5%) and between the age of 41 to 50 years(14.3%). Most respondents have stayed in this area less than 10 years. This area can be considered as a new development area where construction of housing is rapidly growing. A majority of the residents are Malays.

4.2 Factors Causes of Air Pollution to the residential area

Figure 1 reveals the factors causing air pollution to the residents It clearly shows that a majority of the respondents are affected by the construction activities. 90% of the respondents said that the main cause of air pollution is from construction daily work followed by the movement of vehicle as the main reason (81%). Vehicles and machineries are commonly used during construction, such as, backhoe, crane, lorries and trucks that load construction materials every day. However, this result also

shows the emission of polluted gases from other transports was also rated quite high i.e. 50% agreed that this is the main cause of air pollution.

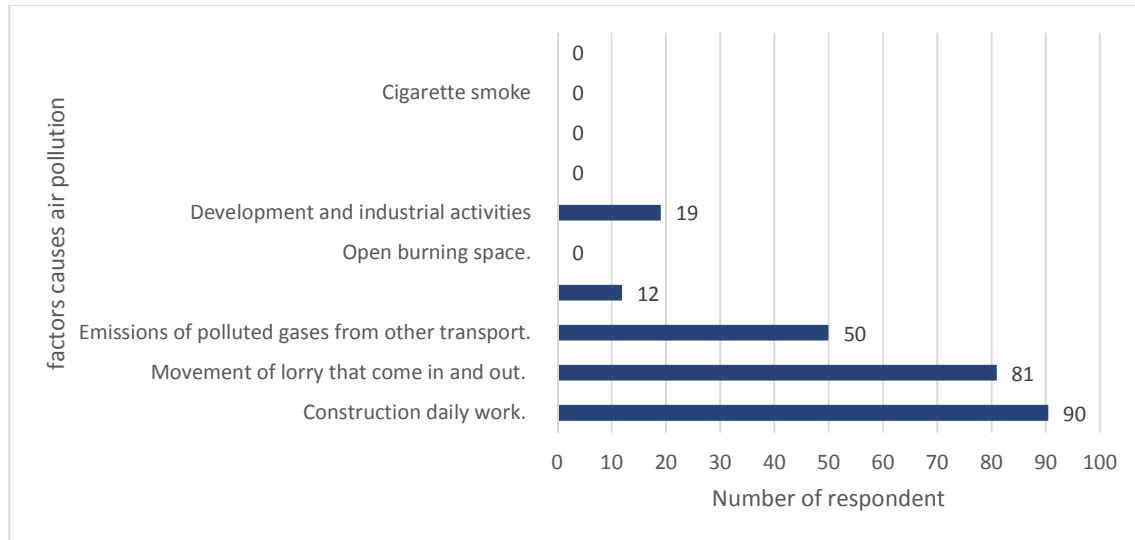


Figure 1: Factors causes of air pollution to residences

Table 5: Year 2018 Air Pollution rate

Rate Situation	Location				Total Frequency	Total Percentage
	U 11		U12			
	Frequency (n)	Percentage %	Frequency (n)	Percentage %		
Much better	0	0	0	0	0	0
A little bit better	0	0	0	0	0	0
Same	0	0	4	12.5	4	9.5
A little bit worse	4	40	10	31.3	14	33.3
Much worse	6	60	18	56.2	24	57.2
Total	10	100	32	100	42	100

The study also investigates the residents' experience on the condition of air quality as compared from the previous year. The results in Table 5 show that residents are much more affected by air pollution this year. They unanimously agreed that this is all caused by the nearby construction activities.. The data in Table 4 show that 33.3% of the respondents feel that the condition is slightly worse and 57.2% felt it is much worse. In addition, it is also found that this poor air quality has much affected their daily routine Based on the informal interview with the respondents, they are faced with dusty environment at all time. Sometime they need to a wear face mask to protect their health when they are outside of the house.

5.0 CONCLUSION

Having analyzed the data, it can be concluded that there is a need for an improvement to reduce the effects of environmental problems due to construction activities. It is suggested that construction team plays an important role to closely monitor the condition of environment during the construction stage. Mitigation methods, such as using a water sprinkle system, using environmental green energy

technology and limiting the speed at the area of construction sites would be a good solution to reduce this negative impact to nearby residences. Residents also need to pay extra attention if there are any illegal activities during the construction operation and report to the authority for legal actions. It is anticipated that this finding may benefit the construction players and the public in general to create awareness on protecting our environment.

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