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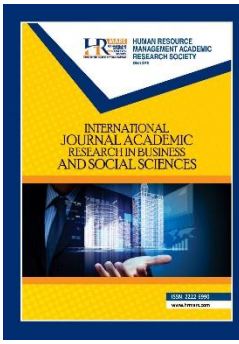
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ABSTRACT

Cement industry is one of the main sources of particulate matter (PM). This study is aimed to identify the distribution pattern of density PM production in Rawang. This paper presents comparison of samples in terms of several weather parameters in which the temperature, wind velocity and humidity. This survey was carried out in the region of Rawang using the primary and secondary data. The primary data was obtained from the field observation of PM_{10} and $PM_{2.5}$, temperature, humidity and wind velocity in Rawang within 11 observation site locations. The secondary data was obtained from several published documents, articles and journals. The data were analyzed using descriptive statistics which includes mean, median, maximum, minimum, and standard deviation. Finding shows that the average concentration in the central location of the study increases in both parameters which refers to PM_{10} of 119.31 µg/m^3 and $PM_{2.5}$ of 35.44 µg/m^3. This indicated that the level of particles concentration in the region of Rawang was critical.

Keywords: Air Pollution, PM_{10} and $PM_{2.5}$, Cement Industry, Weather Parameters

INTRODUCTION

Particulate Matter (PM_{10}) pollution is often associated with manufacturing, construction and industrial activities. The construction sectors in Malaysia were flourished since the early 1980s when the economy started to lead especially in the manufacturing and service sectors. The development of the services sector has stimulated the progress for better infrastructure in business activity and the production of goods. According to Ibrahim Wahab (1991), the industry sector is important for a country in order develop the national economy. Sub-industries development such as the construction industry is considered an important element which could help the development of sustainable national development.

Typically, many of the construction industry require raw materials such as cement, steel, sand and wood. Among these materials, cement is a basic element in the construction of a building.

Cement is defined as a binder that is cohesive and able to sticks debris and chunks into a bulk phase. Therefore, all the adhesive material can be considered as cement whether it is organic or not organic as long it has the properties of cement such as Portland cement, Alumina cement, gypsum, calcium carbonate, clay and limestone also including cement from starch, blood and cement other organic (Rana, S.V.S.,2007;Zakaria M. A.,2002). This study focused on suspended particles in solid form used by the cement plant in the study area. However, the size of particulate matter that being calculated in air pollution quality is within the range of 0.1 m to 10 m (almost equal to the size of bacteria). Particulate matter which smaller than 1 m are not inclined to settle quickly through the influence of gravity. Particulate material will be suspended in the air and the duration is influenced by the weather.

STUDY AREA

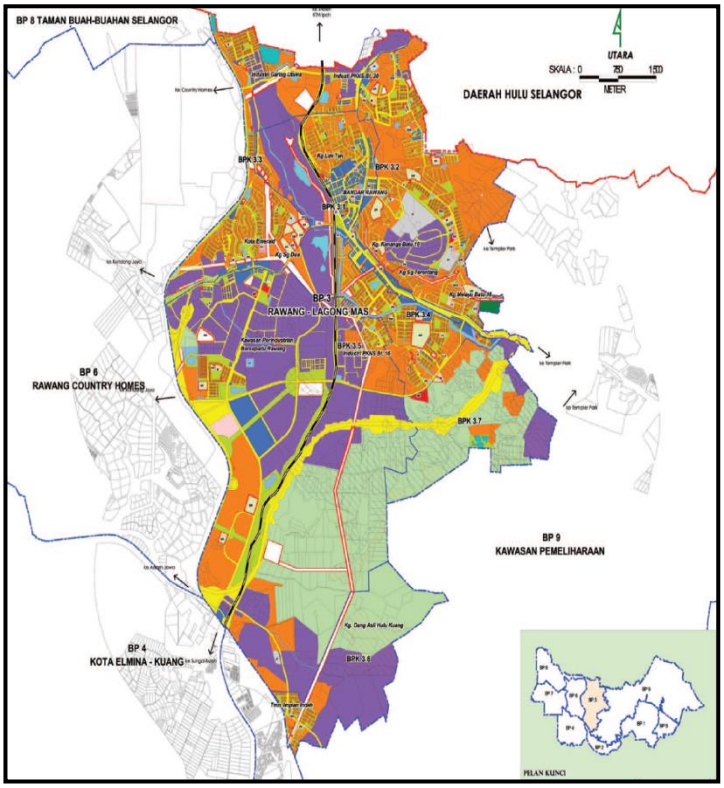
This study was conducted in Rawang, Selangor. Rawang is located at 3°19'N and 101°35'T in the district of Gombak, Selangor (Figure 1). Rawang is an area which managed by the Selayang Municipal Council (MPS). Gombak district has the total area of 54.559 hectares including the study area which is Rawang – Lagong Mas (4,941 hectares). The sub-area of Rawang is can be divided into industrial areas, residential areas, development areas, maintenance areas and new urban areas (Figure 1).

The climate of a city is not only affected by the construction, but it is influenced by the surroundings environment of the area. Rawang area is surrounded by hills. Bukit Lagong is the highest hill in Rawang with a height of 575.16 meters (1,887 feet). Also, Rawang area is featured by the forest which consist of Sg. Kanching Tropical Forest, Templer Forest Park and Bukit Lagong Reserved Forest. Rawang climate is more to hot and humid throughout the year. Due to the absence of meteorological station in Rawang, climate classification is based on Subang Meteorological Station. The annual maximum temperature of Rawang is 32.7°C, and the annual minimum temperature is 25.8°C with a difference of 2°C per month. The daily temperature is 33.0°C during the daylight while at night the average temperature is 23.3°C (Environmental Department Of Malaysia,2000).

The cement plant is a subsidiary of Lafarge Company Bhd, which is Malayan Cement Industry Sdn. Bhd (MCI). The three largest cement plants in Malaysia belong to Lafarge located in Rawang (Selangor), Kanthan (Perak) and Langkawi (Langkawi). MCI Cement Factory in Rawang is the smallest plant in the Lafarge company. It starts operating in 1964 with the initial capability of producing 250,000 tons of clinker cement per year. Currently, the plant is capable of producing 2.8 million tonnes of clinker and 4.23 million tonnes of cement per year.Quarry is a temporary rock production industry until all materials are discharged or a period approved by the authorities. Quarry activity involves the breakdown of rocks using blasting methods. According to inventory issued by the Department of Health and Licensing of the Selayang Municipal Council, there were 10 companies registered in 2008 under the Selayang Municipal Council. Of these, a total of 8 registered quarry companies operate in Rawang that is Generation Screen (M) Sdn. Bhd, Yu Bee Industries (M) Sdn. Bhd, Batu Tiga Quarry Sdn. Bhd, Kuang Rock Products Sdn. Bhd, Hanson Quarry (Central) Sdn. Bhd, Pati Technologies Sdn Bhd, Sunway Quarry Industries Sdn. Bhd and Mahumas Sdn. Bhd. Quarry operations involves complex engineering. For example, for the limestone quarry activity in Rawang, a hole will be dug 10 meters deep for blasting. Blasting work will produce large quantities of rocks.

Drilling and explosive work involves high dust and noise operations. This phenomenon quarry and cement proses causes dust problems to occur that lead to environmental issues.

Figure 1. Land Use Map And Construction Planning
(Local Plan of the Selayang Municipal Council,2011)



METHODOLOGY

The data in this study can be divided into two groups which is primary data and secondary data. The primary data obtained through observation and surveys that being conducted in the study area. These data include suspended particles, temperature, wind velocity, and humidity. Meanwhile, secondary data obtained from various sources such as printed or electronic books, pamphlets, research reports, academic papers, paper and through the internet.

Primary Data Source

The data collection of PM_{10} concentrations require raw data from observations and field studies. The method is to get the level of suspended particles concentration by using the Model 164 GRIMM dust indicator. In addition, the temperature, humidity, and wind directions are taken using whirling hygrometer and anemometer to determine the rate of dispersion and the relationship between the parameters of the suspended particle. This study requires high sensitivity observations in order to get accurate and precise data. In this study, the observation is made to differentiate the level of

pollution and daily behavior and the actions or changes between people living near the cement factory and remote area of the refinery.

Secondary Data Source

Secondary data collection for this study was obtained from various sources such as books literature, annual reports, newsletters, and publications related to the study. Secondary data refers to the data that has been published and used by researchers for research purposes (Ahmad M.A.,2002).This method is used to strengthen the data obtained from primary sources. Through this method, the information obtained from the annual report of the Department of Environment (JAS) on air quality is processed to be linked with the goals and objectives of the study.

Pm_{10} Concentration Data Analysis

The process of data analysis was performed when all data has been collected. The data then compiled and encoded in a computer to obtained from observation of each station. The purpose of the analysis is carried out to obtain the required information as well as to identify whether the formed hypothesis can be accepted or otherwise rejected.Data collected were analyzed using IBM Statistical Package for Social Science (SPSS) version 20.0 and Microsoft Excel 2010. This analysis method depending on the goals and objectives of the study. The data obtained in this study is in the form of statistics. Initially, the data were analyzed using descriptive statistics which includes mean, median, maximum, minimum, and standard deviation. This observation was carried out within six days for the study site. Each area has 11 observation locations and the sixth location is the center of the study area. Each station was observed for 15 minutes within three times every 5 minutes. All of the three values were averaged into one value.

RESULTS

Averege PM_{10} and $PM_{2.5}$

The results shown in this chapter include environmental parameters measured concentrations of PM_{10} and $PM_{2.5}$.The main purpose in this study is focused PM_{10} concentrations are influenced by environmental elements. However, the observation data for $PM_{2.5}$ concentrations were also carried out to strengthen the study. This is because the particle size which considered dangerous in the air pollution is ranging between 0.01µm to 100 µm. These fine particles which measured at 2.5 µm can affect human and animal respiration system by entering the nasal cavity to the trachea and connected to bronchial tubes and ended up in the lungs. Each left and right bronchi will shrink into smaller parts that contain a lot of alveoli. The alveoli function as a surface enables the exchange of oxygen and carbon dioxide between the air inhaled through the nose or the capillaries (Sadhana C., Ashwani K., & Anand Dev G.,2013). The size of the particulate matter that exceed a certain limit will be trapped in the hair and nasal passages. The smaller size particle will fit into the trachea and bronchial system. In the tracheal and bronchial system, particle will be trapped by mucus. There is a probability that the fine particulate entering through the lungs and it is very harmful to human health .

Overall concentration shows a clear distinction between the station and between the two regions. Based on an average of PM_{10} and $PM_{2.5}$ in Rawang showed an increase and decrease at each

station. The average concentration in the central location of the study showed increases in both parameters which refers to PM_{10} of 119.31 μg/m^3 and $PM_{2.5}$ of 35.44 μg/m^3. The concentration of PM_{10} in Rawang shows an increase started from station 2 until station 6 and began to decline until station 11. The concentration of $PM_{2.5}$ in Rawang also shows an increase starting from station 2 to station 6 (research centre) and began to decline until station 10 but the level of concentration is still high (Table 1).

Table 1. PM_{10} Concentration Statistics in Rawang, Selangor.

Station	Distance (km)	Average	Min	Median	Max	Standart Daviation (σ)
1	5	13.76	12.5	13.76	14.93	0.95
2	4	23.09	13.67	24.85	25.57	4.63
3	3	28.94	13.83	32.97	36.17	8.37
4	2	30.15	20.27	31.9	37.4	7.09
5	1	65.17	34.33	74.83	82.77	20.13
6	0	119.31	50.57	123.72	174.63	45.75
7	1	45.54	32.57	47.65	53.47	7.95
8	2	30.54	12.5	32.22	39.97	9.93
9	3	23.42	17.53	23.22	29.53	3.99
10	4	23.88	19.43	21.98	30.87	4.49
11	5	20.41	17.9	18.55	25.07	3.33

Table 2. $PM_{2.5}$ Concentration Statistics in Rawang, Selangor.

Station	Distance (km)	Average	Min	Median	Max	Standart Daviation (σ)
1	5	10.83	9.67	10.85	11.83	0.76
2	4	18.97	12.2	21.3	22.27	4.32
3	3	20.28	11.97	22.93	23.27	4.61
4	2	24.87	12.7	28.63	29.97	6.84
5	1	25.4	18.73	24.22	36.37	5.83
6	0	35.44	34.1	35.71	35.87	0.67
7	1	24.26	15.97	24.68	30	4.61
8	2	20.10	9.67	20.77	25.97	5.98
9	3	16.96	14.4	17.22	18.1	1.33
10	4	16.52	14.53	15.89	21.27	2.47
11	5	16.09	13.57	15.84	19.63	2.03

To observe clearer value of each data, figure used to reflect condition in every station. Distance study found result play role in describing how far the particle dispersion move. Distance placed is in radius of 5 km from central study location which his class interval is every 1 km. Based on Table 1 and 2, the data showed research centre is highest polluted. In distance of 2 kilometre, air pollution PM_{10} from research centre had move until station 4(30.15 μg/m^3), station 5(65.17 μg/m^3), station 7(45.54 μg/m^3), and 8(37.47 μg/m^3). The concentration of $PM_{2.5}$ in Rawang also shows highest polluted from station 3(20.28 μg/m^3), station 4(24.87 μg/m^3), station 5(25.4 μg/m^3), station 6(35.44 μg/m^3), station 7(24.26 μg/m^3) and station 8(20.10 μg/m^3).

Comparison between Temperature and Concentration

The increase in temperature causes an increase in the concentration of particles in the Rawang area. At 29.09 ° C at station 1, the particle concentration was 13.76 μg/m^3, but when the high temperature at station 6 was 35.47 ° C, the concentration was at 119.31 μg/m^3. This shows that station 6, cement plant location, is the highest temperature and the highest concentration. The lowest temperature is at station 1 with reading 29.09 ° C and the concentration at station 1 is also the lowest. The low temperature at station 1 is due to its surroundings surrounded by forests (Figure 2).

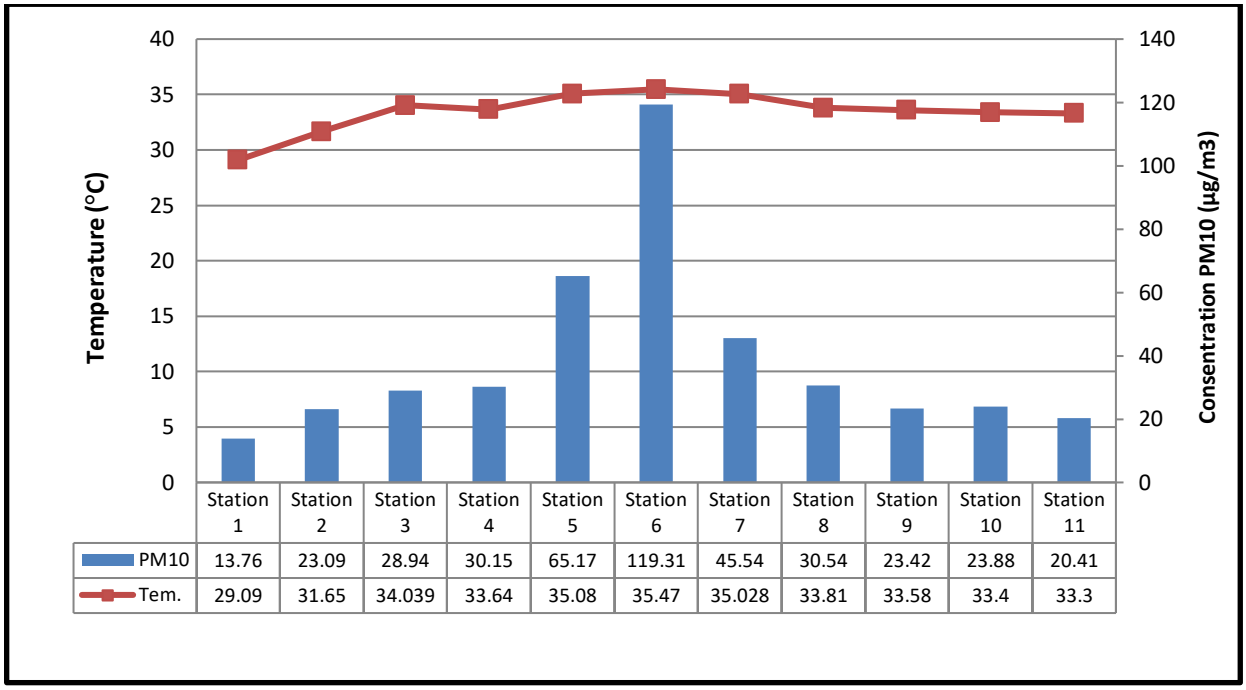
Comparison of Humidity With Concentration

At Station 1 the particle level is 13.76 μg/m^3 with humidity at 75.23%. In contrast to Station 6 wherein the concentration of PM10 is at 119.31 μg/m^3, humidity is 55.11%. Both of these situations are influenced by the state of the surrounding temperature and conditions during the observation. The highest humidity was found at station 1 with 75.23% and the lowest reading was at station 6 with reading of 55.11%. Based on the results of the study, at the highest humidity reading, the concentration level was the lowest while at the lowest humidity reading, the concentration level was highest (Figure 3).

Comparison of Wind Speed With Concentration

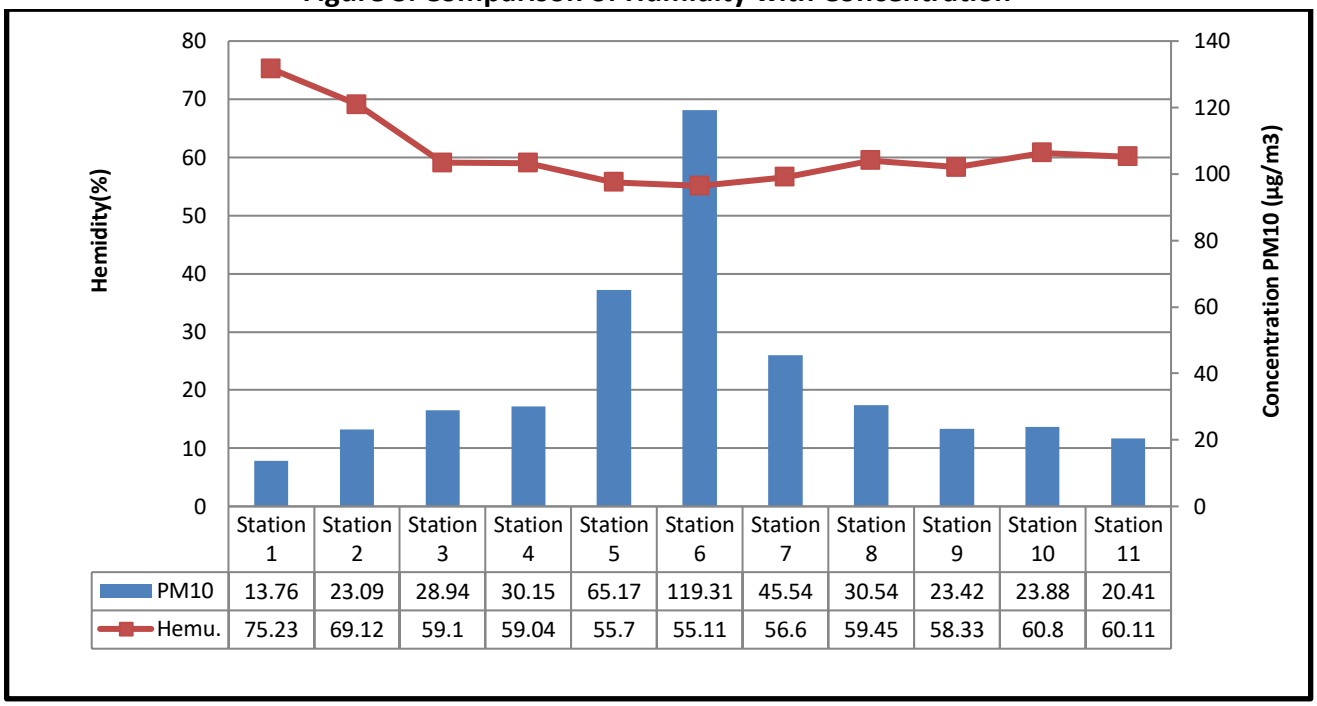
The average wind speed indicates a weak speed with the highest speed at station 6 of 3.43 m/s and the lowest wind speed is 1.51 m/s. At station 5 wind speed reading is 2.21 m / s followed by a concentration of 65.17 μg / m3. In contrast to station 7 where wind speed reading is 3.42 m / s with its concentration of 45.54 μg / m3 (Figure 4). These two stages are the same location as the main station at 1 km, but has a reverse relationship between concentration concentration and wind speed. According to Norshahida (2014), at low wind speed conditions, concentration levels are at high levels and at concentrations of atmospheric levels of concentration are low.

Figure 2. Comparison between Temperature and Concentration



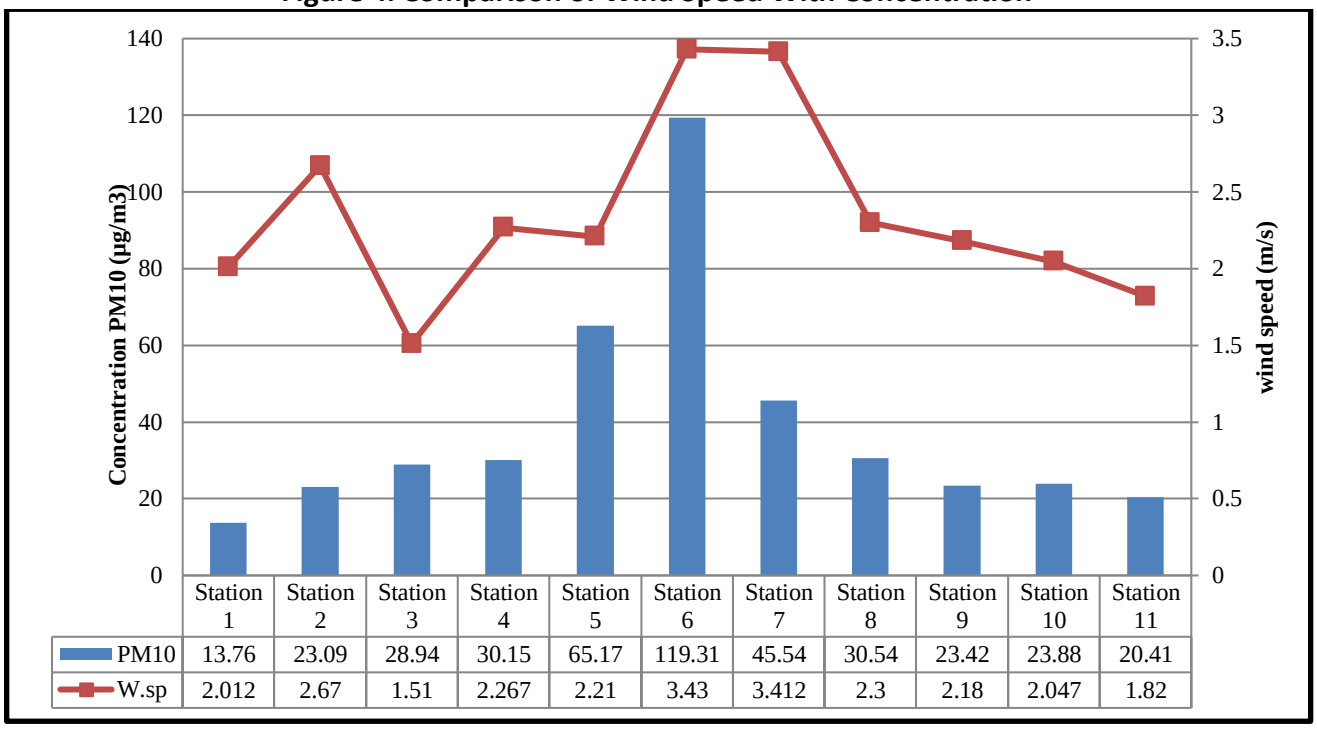
	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7	Station 8	Station 9	Station 10	Station 11
PM10	13.76	23.09	28.94	30.15	65.17	119.31	45.54	30.54	23.42	23.88	20.41
Tem.	29.09	31.65	34.039	33.64	35.08	35.47	35.028	33.81	33.58	33.4	33.3

Figure 3. Comparison of Humidity with Concentration



	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7	Station 8	Station 9	Station 10	Station 11
PM10	13.76	23.09	28.94	30.15	65.17	119.31	45.54	30.54	23.42	23.88	20.41
Hemu.	75.23	69.12	59.1	59.04	55.7	55.11	56.6	59.45	58.33	60.8	60.11

Figure 4. Comparison of Wind Speed With Concentration



	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7	Station 8	Station 9	Station 10	Station 11
PM10	13.76	23.09	28.94	30.15	65.17	119.31	45.54	30.54	23.42	23.88	20.41
W.sp	2.012	2.67	1.51	2.267	2.21	3.43	3.412	2.3	2.18	2.047	1.82

CONCLUSION

The quarry activity and the cement industry in Rawang have create height density of pollution on the environment and has disturbed the well-being and comfort lifestyle. To assess the environmental pollution mechanism, research on pollution sources including operations involved in quarry and cement processing activities is very important and necessary. In a conclusion, the particle concentrations released from the Cement Factory in Rawang contribute to air pollution. Distance is one of the variable that can show the extent of moving particle concentrations. The distance of the cement plant industry with the settlement area creates a variety of problems including road congestion, dust and dust pollution and some other health problems. Hence, a very broad role for a country like Malaysia should be dealt with between state governments and local authorities. Therefore, the Selayang Municipal Council should be more proactive in approaching community communities in its administrative districts with various forms of environmental awareness activities so that issues involving a reduction in the quality of life can be addressed from the beginning. To overcome this problem, the role played by individuals, public and non-governmental organizations (NGO) should be implemented perfectly.

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REFERENCE

Miller, G.T. (1992). *Living In The invironment*. Califonia : Wadsworth Inc.

Wahab, I. (1991). *Pembangunan Bandar Di Malaysia*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

Zakaria M. A. (2002). *Simen Portland sebagai bahan pengikat: kepentingan dan cabaran dalam industri komposit papan simen*. Pualau Pinang: Sinaran Bros Sdn.Bhd.

Rana, S.V.S. (2007). *Essentials Of Ecology And Enviromental Science*. Meerut: Chaudhary Charan Singh University.

Jabatan Alam Sekitar (2000). *Laporan Kualiti Alam Sekeliling Malaysia*. Kuala Lumpur: Jabatan Alam Sekitar.

Ahmad M.A. (2002). *Kaedah penyelidikan sosioekonomi*. Kuala Lumpur: DewanBahasa Dan Pustaka

Van Dalen, D.P. (1999). *Memahami penyelidikan pendidikan*. (Trj.). Abdul Fatah Abdul Malik & Mohd Majid Konting. Serdang: Penerbit Universiti Putra Malaysia.

Ujang, Z. (1997). *Pengenalan Pencemaran Udara*. Dewan Bahasa dan Pustaka: Kuala Lumpur.

Sadhana C., Ashwani K., & Anand Dev G. (2013). Effect Of Cement Industry Pollution On Chlorophyll Content Of Some Crops At Kodonor, Gujerat India. *International Academy of Ecology and Environmentel Sciences*. Vol 3: 288 – 295.

Norshahida S., Abdul A. J., Mohd Talib Latif & Sayang Mohd Deni (2014). Anomly detection and assessment of PM10 funtional data at several locations in the Klang Valley, Malaysia. *Atmospheric Pollution Research 6* (2014): 365-375.