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Analysis of Air Pollution in Ado Ekiti Residential and Commercial Areas

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Abstract

Air pollution is one of the environmental challenges threatening the wellbeing of man, animals and plants as well as the environment. A number of research works has linked air pollution with adverse health, acid rain, climate change and global warming. This study investigated the level air pollution in Ado Ekiti. The air pollutants investigated includes Particulate matter (PM2.5 and PM10), Total suspended particles (TSP), carbon monoxide (CO), Hydrogen sulfide (H2S), nitrogen dioxide (NO2), and sulfur dioxide (SO2). The air quality samples were taking in July 2017 (Rainy season) and January 2018 (Dry season) for a period of one week in each season. Seven (7) sampling points across the two (2) major environmental zones in the study area namely; commercial and residential (high income and low income areas) were considered, resulting in forty nine (49) samples, three (3) times daily for each of the seven (7) air pollutant totaling two thousand and fifty eight (2058) samples. It was discovered that most of the air pollutants sampled were disgustingly higher than the World health organization (WHO) standard thereby posing great risk to the public health in particular and the environment in general. The federal, state and local government is doing nothing to mitigate the air pollutant in the study area. As it were, air pollution and its attendant consequences in the urban area under study should be made public. Steps that could be taken for air pollution mitigation such as controlling the pollution at source; deal with the pollutants and; deal with the polluted areas should be clearly spelt out.

Index terms — air, pollution, urban, residential, commercial, ado-ekiti.

1 I. Introduction

armful chemicals break away from several anthropogenic and natural activities to the environment which may results in adverse effects on human health and the environment. Increased combustion of fossil fuels in the last century is responsible for the progressive change in the atmospheric composition (Marilena Kampa and Elias Castanas, 2008), (Awopetu, 2018), **??**Masitah Alias, 2017). Considering the fact that Ado Ekiti is characterized with burning of bush and refuse, civil engineering construction activities, commercial activities based on oil (diesel and petrol) run combustion engines, every household owing and daily running generator for power supply, many households use charcoal, woods, sawdust or stoves for cooking and heavy vehicular movement with automobile exhaust. All these activities are potential sources of air pollution in Ado Ekiti, thus the need to assess the air quality and its effects on the environment becomes imperative. The continuous deterioration of air quality in many cities in Nigeria (including Ado-Ekiti) sequel to human activities exerts a major strain on the health and well-being of the dwellers. The environment and health of urban dwellers are greatly impaired by poor quality of air characterized with pollutants such as the following; a) Particulate Matter (PM 2. 5

2 and PM 10)

PM 10 is particulate matter 10 micrometers or less in diameter, PM 2.5 is particulate matter 2.5 micrometers or less in diameter. PM 2.5 is generally described as fine particles. These particles constantly enter the atmosphere from many sources. Natural sources include: soil, bacteria and viruses, fungi, mold and yeast, pollen and salt particles from evaporating sea water. Human sources include: Combustion products from space heating, industrial processes, power generation and motor vehicle use. The components of particulate matter (PM) include finely divided solids or liquids such as dust, fly ash, soot, smoke, aerosols, fumes, mists and condensing vapors that can be suspended in the air for extended periods of time. The smaller the particles, the deeper they can penetrate into the respiratory system and the more hazardous they are to breathe. The PM 2.5 is more dangerous since they are so small and light, fine particles tend to stay longer in the air than heavier particles.

3 b) Total suspended particulates (TSP)

Can be referred to as a name given to particles of sizes up to about 50 ?m. The larger particles in this class are too big to pass through human noses or throats, and so, they cannot enter lungs. They are often from wind-blown dust and may cause soiling of buildings and clothes. However, TSP samples may also contain the small PM 10 and PM 2.5 particles that may enter into human lungs [17,18].

4 c) Carbon monoxide (CO)

This is a colorless, odorless gas created when a fuel is burned or from incomplete combustion of hydrocarbons in gasoline-powered engines such as generator, this is common especially in developing countries. It is worthy of note that there are reported cases of breathlessness, restlessness and unconsciousness following inhalation of fumes produced by an electric generator that was put in a confined area , Seleye-Fubura et at, (2011)). As reported by Aliyu, I. and Ibrahim, Z. F. (2014) was a case of CO poisoning resulted in loss of consciousness as seen in a family of six children who slept in an overcrowded room, polluted with burning charcoal which was meant to generate heat for warmth.

5 d) Nitrogen Dioxide (NO 2)

A natural source of nitrogen oxides occurs from a lightning stroke. The very high temperature in the vicinity of a lightning bolt causes the gases oxygen and nitrogen in the air to react to form nitric oxide. The nitric oxide very quickly reacts with more oxygen to form nitrogen dioxide. Nitrogen dioxide is part of a group of gaseous air pollutants produced as a result of road traffic and other fossil fuel combustion processes (Debbie et al 2018). Its presence in air contributes to the formation and modification of other air pollutants, such as ozone and particulate matter, and to acid rain. Nitrogen dioxide not only is it an extremely toxic gas with an acrid smell, but its presence in the atmosphere puts it at the root of several environmental problems. At first sight, NO 2 seems similar to CO 2 , carbon dioxide. Because 78 percent of the air we breathe is nitrogen gas, many people assume that nitrogen is not harmful. However, nitrogen is safe to breathe only when mixed with the appropriate amount of oxygen. These two gases cannot be detected by the sense of smell. A plethora of outdoor studies have examined the health effects of exposure to outdoor nitrogen dioxide. While there are concerns that some of the associations reported for health effects and outdoor nitrogen dioxide may be explained by co-pollutants, extensive reviews have concluded that respiratory health is associated with nitrogen dioxide exposure, independently of these other exposures **??**EPA, 2008; WHO 2016) e) Sulphur Dioxide (SO 2)

Sulfur dioxide (SO 2) belongs to the family of sulfur oxide (SOx) gases. These gases are formed when fuel containing sulfur (mainly coal, gasoline and fuel oil) is burned (e.g., for electricity generation) and during metal smelting and other industrial processes as well as in the oxidation of naturally occurring sulfur gases, as in volcanic eruptions. High concentrations of SO 2 are associated with multiple health and environmental effects. The highest concentrations of SO 2 have been recorded in the vicinity of large industrial facilities. SO 2 emissions are an important environmental issue because they are a major precursor to ambient PM 2.5 concentrations. Short-term exposure to airborne SO 2 has been associated with various adverse health effects (U.S. EPA, 1994; **??**TSDR, 1998). Multiple human clinical studies, epidemiological studies, and toxicological studies support a causal relationship between shortterm exposure to airborne SO 2 and respiratory morbidity. The observed health effects have included respiratory symptoms, airway inflammation, and increased emergency department visits and hospitalizations for all respiratory causes. Inhaling sulfur dioxide causes irritation to the nose, eyes, throat, and lungs. Typical symptoms include sore throat, runny nose, burning eyes, and cough. Inhaling high levels can cause swollen lungs and difficulty breathing. Skin contact with sulfur dioxide vapor can cause irritation or burns.

6 II. Research Settings

Ado Ekiti is a city in southwest Nigeria, the state capital and headquarters of the Ekiti State. It is also known as Ado. It has a population of above 424, 340. The people of Ado Ekiti are mainly of the Ekiti sub-ethnic group of the Yoruba. Ado Ekiti has four tertiary educational institutions namely: Ekiti State University, Afe Babalola University and The Federal Polytechnic Ado Ekiti and Ekiti State School of Nursing and Midwifery. It also play host to two local television and three radio stations; NTA Ado Ekiti, Ekiti State Television (ESBS), Ekiti FM, Voice FM and Progress FM Ado Ekiti. Various commercial banks and enterprises operate in Ado Ekiti. Ado Ekiti also have ninety four (94) hotels and more that fifty (50) petrol stations all running on generating sets as source of electricity between two to twenty four hours per day.

The town lies between the latitude 7 0 33 1 and 7 0 42 1 North of the equator and the longitude 5 0 11 1 and 5 0 20 1 East on a low-land surrounded by several isolated hills and inselbergs, [4]. Geologically, the region lies entirely within the pre-Cambrian basement complex rock group, which underlies much of Ekiti State [5]. The temperature of this area is almost uniform throughout the year; with little deviation from the mean annual temperature of 27 0 C. February and March are the hottest 28 0 C and 29 0 C respectively, while June with Is created naturally by decaying organic matter and is released from sewage sludge, liquid manure, and sulfur hot springs. It is formed when Sulfur is removed from petroleum products in the petroleum refining process and is a by-product of paper pulping. Hydrogen Sulfide (H_2S) Hydrogen sulfide is a colorless, flammable, extremely hazardous gas with a "rotten egg" smell. It occurs naturally in crude petroleum and natural gas, and can be produced by the breakdown of organic matter and human/ animal wastes (e.g., sewage). H_2S can cause possible life-threatening situations if not properly handled. In addition, hydrogen sulfide gas burns and produces other toxic vapors and gases, such as sulfur dioxide.

Therefore, there is a need to carry out investigation on quality of air in Ado-Ekiti in order to scientifically establish the quality. This research work will provide a baseline data on air pollutants and level of air pollution in a typical Nigerian city. temperature of 25 0 C is the coolest [6]. The mean annual rainfall is 1,367mm with a low co-efficient variation of about 10% and 117 raining days in year 2017. Rainfall is highly seasonal with well marked wet and dry season. The wet season lasts from April to October, with a break in August.

7 III. Research Method a) Sampling

Air sampling collection and analysis is required in order to quantify the air pollutants in the study area. To obtain valid data considering the fact that measuring air pollution is a complex task and requires due care and diligence, the following issues were put into consideration: (i) Appropriateness of the sample points; (ii) How representative will the sample be in time and space; and (iii) How appropriate is the sampling equipment, analysis and calibration techniques.

Hand held portable Aeroqual series 500 ambient air quality sampling equipment was used to measure $PM_{2.5}$, PM_{10}, TSP, CO, H_2S, NO_2, and SO_2. The air quality sample was taking in July 2017 (Rainy season) and January 2018 (Dry season) for a period of one week in each season. All sampling locations were sampled at different times of the day (morning, afternoon and evening). Morning readings were taken between 8am-11am, afternoon readings between 12pm-3pm and evening readings were taken between 4pm-7pm.

Seven sampling points for seven days across two environmental zones in the study area namely; commercial and residential (high income and low income areas) were considered, resulting in 49 samples for each of the seven air pollutants totaling 2058 samples. Air monitoring was carried out in seven core sites which are as follows:

i. Old garage: (this is characterized by retail shops, market, high vehicle and pedestrian traffic, it also serves as transfer point for mini buses and taxi linking other towns, urban, peri-urban and rural destinations);

iii. Ajilosun: (represented medium economic status residential area where majority of the residents either use kerosene or cooking gas for cooking); iv. Dalimore Junction: (this serves as an important commuter route within ado Ekiti which represented heavy-traffic sites); v. Odo Ado: Odo Ado-Ekiti (represent rural background area); vi. Fajuyi Park: (represented civil engineering construction activity area); and vii. Ilokun: (represented low economic status residential area where the houses are built of mud bricks without plastering and the floors were not paved or cemented. A lots of fire wood burning activities were taking place).

8 IV. results and discussion

Ado Ekiti is a typical town in Nigeria, it is a civil or public servant dominated areas with a lots of commercial activities without a single industrial activity. showed that air pollution level is generally higher in dry season than that of the raining season. The WHO standard for $PM_{2.5}$ and PM_{10} are 25 µg/m 3 and 150 µg/m 3 respectively, the least $PM_{2.5}$ was 17.5 µg/m 3 in GRA (Table 3) while the highest 137.6 µg/m 3 was recorded in Old garage (Table 2). On the contrary, the least PM_{10} was 44.7 µg/m 3 in Ilokun (Table 14) while the highest 1036.9 µg/m 3 was recorded in Old garage (Table 2). The $PM_{2.5}$ and PM_{10} concentrations were higher in dry season. This was similar to the study conducted Zirui **??**iu et al (2004). In a similar study conducted by Ngele et al (2015), PM10 concentration in Motor Park fell between 32 and 58 µg/m 3 which was lower than the results obtained in motor park area of the current study area. It was observed that GRA and Ilokun had $PM_{2.5}$ and PM_{10} that meet the WHO ambient air quality standard.

The raining season highest daily average of TSP concentration 2202.1 µg/m 3 was recorded at Fajuyi (Table 12) while the lowest (63.8 µg/m 3) was recorded in Ilokun. Further, the dry season highest daily average of TSP concentration (1400 µg/m 3) was recorded at Old garage (Table 2) while the lowest (74.6 µg/m 3) was recorded in Ilokun. It is disheartening to note that the TSP concentration exceeds the WHO standards. This much higher than the 250 ?gm 3 maximum daily average TSP sets by the national environmental pollution regulatory body, Federal Environmental Protection Agency. In a similar study conducted by Sana'a Abed El-Raoof Odat (2009), the highest monthly average TSP in May ranged between 108 -455 µg/m 3 and the lowest found in March ranged between 56 -352 µg/m 3 and this concentration also exceed WHO standards. According to the data collected, it is possible to assert that the construction site activities at Fajuyi influenced the environment through a higher emission of TSP during the studied period.

It was observed that the CO pollutant measured was relatively higher than 10ppm FEPA (Nigerian) standard. The entire CO measured during dry and raining seasons in GRA and Ilokun fell between 0.8 -9.23 ppm and 0.03 -1.40 ppm respectively which is lower than Nigeria standard [Federal Environmental protection Agency of Nigeria (FEPA)]. Limits set also by FEPA are CO -10ppm, SO 2 -0.01ppm, NO 2 -0.04-0.06ppm. It was also observed that most of CO air pollution measured at Old garage, Dalimore, Odo -Ado, Fajuyi and Ajilosun were higher than the Nigerian standard with Old garage recorded the worst CO pollutant concentration (2.2 -30.5 ppm). CO has affinity to interferes with the blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects. The high value of CO observed at Old garage could be attributable to high vehicular movement in and around the area. In a similar study carried out by Abam and Unachukwu, (2009) in Calabar, Nigeria, the CO concentration ranged between 4.4 -8.7ppm which was lower than the Nigerian standard, while Augustine C. (2012) recorded CO between 0.00 and 13. 0 ppm in a study carried out in Port Harcourt, Nigeria

The H 2 S, NO 2 , and SO 2 pollutant measured in the study area ranged between 0.03 -1.23ppm, 0.055 -0.057ppm and 0.01 -1.30 ppm respectively. It was observed that the SO 2 concentration was higher than the Nigerian standard while the NO 2 concentration fell within the range specified by the Nigerian regulating body. In a similar study conducted by Koku and Osuntogun, (2007) in Ado -Ekiti, the highest level obtained were NO 2 -0.6 ppm at Ijigbo Junction and SO 2 -0.8ppm at Old garage junction. The obtained results of SO 2 and NO 2 , were found to be higher than FEPA limits.

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10 V. Conclusions And Recommendations

Obviously, air pollution is something we cannot overlook in our generation; the adverse effect is already evident. Man remain passive and aloof to air pollution mitigation will definitely spell doom for human, plant, animal and the environment. The study area (Ado Ekiti) is grossly polluted as manifest by the results in the Tables 1 -14. It is disheartening to note that the state and local government had no air quality maintenance scheme. Absolutely there is no policy formulation towards air quality mitigation or control. It is also pertinent to note that apart from data collected by a small number of individuals and corporate organizations at spread locations, there is no all-inclusive and pragmatic database on the enormity of the peril and its injurious effects on the ecosystems and people in the area. Taking into consideration, the causes of air pollution and its adverse effects, each person is responsible for all the causes of air pollution and the polluted environment that we dwell in today.

11 It is recommended that:

i. There is a need to develop monitoring mechanisms, regulations and enforcement measures; ii. The current internal generation revenue (IGR) driven motor vehicles annual testing and other regulations such as electrical generators should be reoriented and tailored towards environmental mitigation driven; iii. There should be a consideration on the reduction of pollution levels from vehicles and domestic burning of woods and charcoal, to permissible levels as defined in national and international standards;

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Figure 1: Table : 1

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Figure 2: Table 1 :

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2

Daily average	PM 2.5 µg/m 3	PM 10 µg/m 3	TSP ppm	CO ppm	H 2 S ppm	NO 2 ppm	SO 2 ppm
Mon	92.3	826.3	1221.4	14.5	0.50	0.057	1.30
Tue	94.0	846.8	1400.1	16.2	0.50	0.056	1.20
Wed	75.1	1036.9	825.2	12.7	0.30	0.057	1.00
Thu	115.5	824.4	1191.4	16.1	0.60	0.057	1.10
Fri	137.6	558.2	1232.4	12.9	0.60	0.057	0.90
Sat	77.9	644.9	489.4	8.5	0.40	0.057	1.30
Sun	109.4	611.4	908.5	20.3	0.70	0.056	1.00

Figure 3: Table 2 :

3

Daily average	PM 2.5 µg/m 3	PM 10 µg/m 3	TSP ppm	CO ppm	H 2 S ppm	NO 2 ppm	SO 2 ppm
Mon	19.4	48.8	67.0	2.03	0.11	0.056	0.07
Tue	18.4	49.2	64.9	0.80	0.05	0.056	0.07
Wed	19.6	48.5	65.2	1.50	0.09	0.056	0.15
Thu	23.7	48.5	69.0	1.03	0.05	0.056	0.17
Fri	23.0	66.4	109.9	1.73	0.05	0.056	0.17
Sat	20.6	58.0	105.7	1.03	0.03	0.056	0.07
Sun	17.1	52.5	90.0	1.57	0.04	0.056	0.01

Figure 4: Table 3 :

4

Daily average	PM 2.5 µg/m 3	PM 10 µg/m 3	TSP ppm	CO ppm	H 2 S ppm	NO 2 ppm	SO 2 ppm
Mon	21.4	57.77	85.3	4.90	0.83	0.057	0.41
Tue	18.9	64.7	76.5	4.33	0.70	0.057	0.71
Wed	17.2	55.4	80.8	3.30	0.96	0.057	0.46
Thu	16.3	75.5	83.6	2.07	1.03	0.055	0.55
Fri	16.7	55.6	79.0	3.73	0.76	0.057	0.66
Sat	18.6	82.1	87.1	2.17	0.60	0.056	0.48
Sun	13.8	71.5	79.3	9.23	1.01	0.056	0.65

Figure 5: Table 4 :

5

Daily average	PM 2.5 µg/m 3	PM 10 µg/m 3	TSP ppm	CO ppm	H 2 S ppm	NO 2 ppm	SO 2 ppm
Mon	32.7	209.0	387.3	2.50	0.12	0.056	0.11
Tue	33.7	202.7	405.9	3.23	0.18	0.056	0.07
Wed	34.2	225.6	356.8	3.07	0.17	0.056	0.07
Thu	31.1	248.3	328.7	6.24	0.14	0.055	0.06
Fri	26.6	219.2	274.7	5.94	0.08	0.056	0.16
Sat	26.9	142.5	217.3	7.13	0.21	0.056	0.18
Sun	21.7	64.9	96.5	5.93	0.17	0.057	0.14

Figure 6: Table 5 :

6

Daily average	PM 2.5 µg/m 3	PM 10 µg/m 3	TSP ppm	CO ppm	H 2 S ppm	NO 2 ppm	SO 2 ppm
Mon	43.3	297.9	346.4	5.10	0.12	0.057	0.44
Tue	43.7	331.9	319.7	5.73	0.14	0.057	0.50
Wed	28.8	102.8	305.7	10.83	0.31	0.057	0.55
Thu	42.6	318.8	403.4	15.20	0.25	0.056	0.08
Fri	35.4	229.6	295.0	11.10	0.17	0.056	1.18
Sat	45.9	316.1	437.6	6.27	0.14	0.057	0.25
Sun	109.7	231.6	277.5	10.87	0.09	0.056	0.40

Figure 7: Table 6 :

7

Daily average	PM 2.5 µg/m 3	PM 10 µg/m 3	TSP ppm	CO ppm	H 2 S ppm	NO 2 ppm	SO 2 ppm
Mon	30.7	127.7	201.8	10.67	0.11	0.056	0.15
Tue	32.3	149.5	215.5	9.37	0.08	0.056	0.18
Wed	52.4	272.9	275.0	6.70	0.06	0.055	0.12
Thu	75.5	340.7	298.5	5.80	0.09	0.055	0.09
Fri	71.3	320.8	293.4	9.00	0.07	0.055	0.05
Sat	45.7	466.1	679.7	8.43	0.20	0.055	0.14
Sun	23.3	436.3	702.0	10.43	0.28	0.055	0.13

Figure 8: Table 7 :

8

Daily average	PM 2.5 µg/m 3	PM 10 µg/m 3	TSP ppm	CO ppm	H 2 S ppm	NO 2 ppm	SO 2 ppm
Mon	40.6	121.8	274.3	13.77	0.11	0.056	0.91
Tue	54.4	391.4	371.4	12.36	0.09	0.055	0.45
Wed	49.3	354.6	431.7	12.17	0.28	0.055	1.16
Thu	43.5	379.7	428.4	14.77	0.08	0.056	0.81
Fri	41.9	343.6	488.2	17.33	0.18	0.056	0.56
Sat	59.8	426.4	488.8	17.17	0.25	0.056	0.83
Sun	65.8	138.8	131.2	12.13	0.17	0.056	0.78

Figure 9: Table 8 :

9

Daily average	PM 2.5 µg/m 3	PM 10 µg/m 3	TSP ppm	CO ppm	H 2 S ppm	NO 2 ppm	SO 2 ppm
Mon	51.0	189.7	229.5	8.37	0.18	0.056	0.02
Tue	49.5	197.7	293.1	10.03	0.19	0.056	0.08
Wed	46.1	187.0	426.8	10.07	0.24	0.055	0.18
Thu	48.8	173.8	534.9	12.03	0.20	0.055	0.20
Fri	43.7	136.3	428.0	13.97	0.17	0.055	0.21
Sat	39.9	127.7	297.5	15.57	0.13	0.056	0.19
Sun	30.8	87.3	154.0	15.27	0.16	0.056	0.30

Figure 10: Table 9 :

10

Daily average	PM 2.5 µg/m 3	PM 10 µg/m 3	TSP ppm	CO ppm	H 2 S ppm	NO 2 ppm	SO 2 ppm
Mon	58.2	234.3	308.4	12.70	0.35	0.056	0.77
Tue	61.3	226.1	459.9	12.30	0.34	0.056	0.70
Wed	53.4	162.0	881.4	17.30	0.43	0.057	1.16
Thu	63.3	296.0	316.2	14.13	0.37	0.056	0.80
Fri	60.8	360.5	449.6	9.07	0.29	0.056	0.75
Sat	65.8	359.6	455.0	12.47	0.34	0.056	0.36
Sun	69.4	261.7	233.1	11.80	0.31	0.056	0.66

Figure 11: Table 10 :

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Figure 12:

11

Daily average	PM 2.5 µg/m 3	PM 10 µg/m 3	TSP ppm	CO ppm	H 2 S ppm	NO 2 ppm	SO 2 ppm
Mon	60.7	1083.3	1978.5	7.26	0.19	0.056	0.08
Tue	61.2	1082.7	1974.4	9.23	0.24	0.056	0.09
Wed	51.2	626.7	754.2	10.00	0.24	0.055	0.06
Thu	57.3	551.9	585.4	10.13	0.20	0.055	0.07
Fri	56.3	727.6	949.9	11.07	0.13	0.055	0.08
Sat	52.3	560.7	1452.9	10.73	0.16	0.055	0.05
Sun	43.2	604.4	2202.1	13.23	0.25	0.056	0.14

Figure 13: Table 11 :

12

Daily average	PM 2.5 µg/m 3	PM 10 µg/m 3	TSP ppm	CO ppm	H 2 S ppm	NO 2 ppm	SO 2 ppm
Mon	59.4	725.1	926.4	7.26	0.19	0.057	0.55
Tue	58.6	467.5	316.2	10.13	0.20	0.056	0.07
Wed	42.6	515.5	404.9	13.23	0.25	0.057	0.14
Thu	59.9	717.9	308.4	9.23	0.17	0.056	0.26
Fri	65.2	598.4	436.5	11.07	0.29	0.056	0.29
Sat	60.1	883.8	455.1	16.43	0.17	0.057	0.12
Sun	55.8	258.4	180.5	11.17	0.03	0.057	0.72

Figure 14: Table 12 :

13

Daily average	PM 2.5 µg/m 3	PM 10 µg/m 3	TSP ppm	CO ppm	H 2 S ppm	NO 2 ppm	SO 2 ppm
Mon	23.6	74.8	92.4	0.30	0.09	0.055	0.60
Tue	22.9	67.0	95.0	0.33	0.13	0.056	1.04
Wed	22.0	65.8	89.5	0.08	0.06	0.056	1.01
Thu	24.4	68.3	84.8	0.10	0.06	0.056	0.95
Fri	19.8	62.1	66.7	0.08	0.02	0.056	0.51
Sat	20.9	51.4	63.8	0.78	0.04	0.056	0.51
Sun	23.7	48.5	69.0	1.03	0.05	0.056	0.17

Figure 15: Table 13 :

14

Daily average	PM 2.5 µg/m 3	PM 10 µg/m 3	TSP ppm	CO ppm	H 2 S ppm	NO 2 ppm	SO 2 ppm
Mon	30.4	77.8	100.3	0.49	0.09	0.056	1.13
Tue	24.6	63.9	116.7	0.43	0.06	0.056	1.10
Wed	26.7	49.3	99.1	0.74	0.05	0.057	0.71
Thu	30.5	60.5	78.5	1.40	0.62	0.057	1.29
Fri	23.5	44.7	87.2	0.03	0.51	0.056	0.62
Sat	24.6	58.3	74.6	0.96	0.41	0.056	0.64
Sun	44.4	79.7	89.7	0.77	1.23	0.057	0.47

Figure 16: Table 14 :

11 IT IS RECOMMENDED THAT:

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