1. INTRODUCTION

Air pollution can be defined as the presence of pollutants, such as sulphur dioxide (SO₂), particle substances (PM), nitrogen oxides (NOₓ) and ozone (O₃) in the air that we inhale at levels which can create some negative effects on the environment and human health (Turk and Kavraz, 2011). It can be classified into natural air pollution which includes wind-blown dust, volcanic ash, and gases, smoke and trace gases from forest fires, and anthropogenic air pollution which includes products of combustion such as nitrogen oxides (NOₓ), carbon oxides (COₓ), sulphur dioxide (SO₂) (Oyekanmi et al., 2010). Pollutants that are pumped into the atmosphere and directly pollute the air are called primary pollutants while those that are formed in the air when primary pollutants react or interact are known as secondary pollutants (Agbaire, 2009).

Industrial pollution adversely affects human health, sometimes leading to chronic diseases of permanent nature. It is a serious threat to environmental health in many cities with a wide range of symptoms such as low birth weight, increased hospitalization, sudden infant death and high mortality (Brook et al., 2004). According to WHO, more than two million premature deaths each year can be attributed to the effects of urban outdoor and indoor air pollution and more than half of this disease burden is borne by the populations of developing countries (Mohammed, 2009). Chemicals found in polluted air could cause cancer, birth defects, brain and nerve damage and long term injury to the lungs and breathing passages in certain circumstances while long term exposure to high concentrations can cause severe injury or even death (Oyekanmi et al., 2010). Effects of air pollutants on structures include discoloration of buildings, while impairment of normal visibility often leads to disruptions in transportation system, death and stunted growth of crops, and acute toxicological effect in humans (Abdulkareem and Kovo, 2006). The costs of this burden of illness would include lost years of life and income, health care costs, and quality of life related costs. Beyond the toll on human health, there will also be corresponding impacts on domestic animals and food production (Bikkhu et al., 2009).

Studies have reported high concentrations of gaseous pollutants such as NOₓ, CO, SO₂ and hydrocarbon above permissible limits. Rene (2008)
measured high levels of particulate matter, CO, NO₂, SO₂ and Ozone above the environmental regulation limits in Vaal air shed of South Africa with warnings of serious health implications for residents, while Nkwocha and Egejuru (2008) revealed a strong association between air pollution indices and diseases such as cough, cold, bronchitis, sinusitis and phlegm among some school children in Nigeria with the strongest effect recorded among those below two years of age. Noise from industrial areas is often overlooked and has received very little attention over the years. In Nigeria, many industrial estates are located within the heart of towns and cities, while residential and commercial buildings might just find their way into industrial zones as a result of poor enforcement of town planning laws. Without strict environmental regulation and control laws in many developing countries, industrial noise sources can pose severe health risks (Nwobodo et al., 2004). The observed effects of noise on motivation, as measured by persistence with a difficult cognitive task, may either be independent or secondary to cognitive impairments (SRC, 2007). Homes, schools, hospitals and other structures found in industrial areas could be adversely affected by environmental noise. Depending on its duration and volume, the effects of noise on human health and comfort are divided into four categories; physical effects, such as hearing defects; physiological effects, such as increased blood pressure, irregularity of heart rhythms and ulcers; psychological effects, such as disorders, sleeplessness and going to sleep late, irritability and stress; and finally effects on work performance, such as reduction of productivity and misunderstanding what is heard (Ozer, 2009). Similarly, Olayinka et al. (2008), found that the noise exposure level (LAeq) in minerals crushing mills, soft drinks bottling, beer brewing, bottling and tobacco making industries was above 85 dBA and noise level was well above 60 dBA recommended by World Health Organization in five selected processing and manufacturing industries in Ilorin, Nigeria.

Air pollutions from industrial sources and their possible effects have been widely studied and this has improved the understanding of the link between air pollution and health effects thereby driving improvements of air quality in many countries. However, many challenges remain especially in the developing countries like Nigeria which are not heavily industrialised but still experience significant air pollutions in their cities. Many of these challenges include inadequate monitoring of air quality, high pollution index, scarce air pollution epidemiological research and weak enforcement of standards among others (Agbai, 2009).

Table 1. Noise exposure limits for Nigeria (NESREA, 2009)

| Facility                                                                 | Maximum permissible noise limit (dBA) |
|-------------------------------------------------------------------------|---------------------------------------|
|                                                                        | Day        | Night     |
| Hospital, convalescence home, home for the aged, sanatorium and         | 45         | 35        |
| institutions of higher learning, conference rooms, public library,      |            |           |
| environmental and recreational sites.                                   |            |           |
| Residential buildings                                                  | 50         | 33        |
| Mixed residential (with some commercial and entertainment)              | 55         | 45        |
| Residential + industry or small-scale production + commerce             | 60         | 50        |
| Industrial (outside perimeter fence)                                    | 70         | 60        |

Table 1 and Table 2 shows the National Environmental Standards Regulation Agency (NESREA) limits for noise and emissions. It specified the benchmark for noise level in various types of premises while indicating the acceptable limits for some air pollutants for long-term and short-term exposures rates.

The broad objective of this study was to evaluate the level of noise and some air pollutants, determine exceedance of ambient air quality standard and draw up management plan where necessary, while the specific objectives were:
- To evaluate the general level of some air pollutants in the study area.
- To determine seasonal variations in air qualities.
- To assess the level of noise pollution in the industrial estate.
To establish the impact of industrial activities on ambient air qualities.

To determine a possible exceedance of ambient air quality standards.

### Table 2. National emission limits for some air pollutants

| Pollutant | Emission limits (mg/m³) |
|-----------|--------------------------|
|           | Long-term limits | Short-term limits |
| CO        | 1.0               | 5.0              |
| HC (Total)| 2.0               | 5.0              |
| H₂S       | 0.008             | 0.008            |
| SO₂       | 0.1               | 0.5              |
| SPM       | 0.2               | 0.2              |
| Pb        | 0.005             | 0.002            |
| Hg        | 0.0003            | -                |
| O₃        | 0.1               | 0.2              |

### 2. METHODOLOGY

#### 2.1 Site description

The study area, as shown in Figures 1 and Figure 2, was Oluyole industrial Scheme situated within Ibadan metropolis of Oyo state, Southwest Nigeria. Its geographical coordinates are Latitude 7° 21′ 19″ N and Longitude 3° 51′ 1″ E and covers about 1,926,600 m². Also located within the scheme are high and medium density residential areas, schools, clinics, places of religious and commercial centre. The Oluyole area of the metropolis has a population of about 282,585 according to the 2006 national population census.

The metropolis has a tropical wet and dry climate, with a lengthy wet season and relatively constant temperatures of about 32°C throughout the year. The wet season runs from April through October, though a lull in precipitation is experienced in August which nearly divides the rainy season into two segments of wet season.

#### 2.2 Sampling measurement

Twenty three randomly selected sampling points as illustrated in Figure 2, separated by at least 200 m covered the study area (industrial and residential) while the control area had four points, making twenty seven points altogether. The sampling design for the study area covered the industrial area with thirteen (13) points while the residential area had five (5) points on the east and west of the industrial area. Similarly, in the control (Government Residential Area devoid of Industrial Activities) within the metropolis, four randomly selected sampling points were assessed. The average value for repeated readings at each sampling point were recorded while assessment of noise and air quality parameters was carried out fortnightly for eight weeks during two periods of wet season (August to September) and dry season respectively (February to March). Concentrations of carbon monoxide (CO), sulphur-dioxide (SO₂), hydrogen sulphide (H₂S), and hydrocarbon (HC) were measured with an ITX Multi-gas Monitor while suspended particulate matter (SPM) was determined with a Personal Data RAM-1200 (Park Davis) and noise level dBA using a sound level meter (Extech Instruments 407730). Other parameters including air temperature, wind speed and wind pressure were determined by a portable weather station as a guide in the positioning of sampling equipment. Temperature and relative humidity were measured using a Pen monitor while wind speed and wind pressure were determined with a portable weather station and the coordinates of sampling points were taken with Garmin GPS. Iyaganku was selected as a control because of its serene environment.

Data obtained from the assessment were subjected to descriptive analysis and one-way analysis of variance (ANOVA) to separate means using the statistical package for social sciences (SPSS).

### Table 3. Sampling points in the study

| S/N | Location          | Latitude | Longitude |
|-----|-------------------|----------|-----------|
| 1   | Residential area   | N 06° 35.489 | E 003° 22.331 |
| 2   | Residential area   | N 07° 21.821 | E 003° 51.460 |
| 3   | Residential area   | N 07° 21.803 | E 003° 51.417 |
| 4   | Residential area   | N 07° 21.832 | E 003° 51.348 |
| 5   | Residential area   | N 07° 21.762 | E 003° 51.376 |
| 6   | Industrial area    | N 07° 21.498 | E 003° 50.983 |
| 7   | Industrial area    | N 07° 21.448 | E 003° 50.946 |
| 8   | Industrial area    | N 07° 21.373 | E 003° 50.037 |
| 9   | Industrial area    | N 07° 21.231 | E 003° 50.932 |
| 10  | Industrial area    | N 07° 21.405 | E 003° 50.869 |
| 11  | Industrial area    | N 07° 21.371 | E 003° 50.834 |
| 12  | Industrial area    | N 07° 21.323 | E 003° 50.773 |
| 13  | Industrial area    | N 07° 21.360 | E 003° 50.728 |
| 14  | Industrial area    | N 07° 21.400 | E 003° 50.607 |
| 15  | Industrial area    | N 07° 21.438 | E 003° 50.733 |
| 16  | Industrial area    | N 07° 21.539 | E 003° 50.730 |
| 17  | Industrial area    | N 07° 21.726 | E 003° 50.742 |
| 18  | Industrial area    | N 07° 21.786 | E 003° 50.751 |
Table 3. Sampling points in the study (cont.)

| S/N | Location     | Latitude  | Longitude     |
|-----|--------------|-----------|---------------|
| 19  | Residential  | N 07° 21.802 | E 003° 50.674 |
| 20  | Residential  | N 07° 21.802 | E 003° 50.525 |
| 21  | Residential  | N 07° 21.901 | E 003° 50.251 |
| 22  | Residential  | N 07° 21.911 | E 003° 50.175 |
| 23  | Residential  | N 07° 21.916 | E 003° 50.117 |
| 24  | Control      | N 07° 21.900 | E 003° 50.253 |
| 25  | Control      | N 07° 21.900 | E 003° 50.253 |
| 26  | Control      | N 07° 21.900 | E 003° 50.253 |
| 27  | Control      | N 07° 21.900 | E 003° 50.253 |

Figure 1. Map showing the study area

Figure 2. Map of study area showing land use and sampling points
3. RESULTS AND DISCUSSION

In the dry season, as illustrated in Table 4, within the residential area, noise level, SPM, CO and HC ranged between 46.19-68.47 dBA, 9.0-206 mg/m³, 0.0-4.0 mg/m³, and 0.0-6.0 mg/m³ respectively, with mean values of 55.85 dBA, 48.91 mg/m³, 1.23 mg/m³ and 2.10 mg/m³ respectively. CO was above the long-term exposure limit of 1.0 mg/m³. HC level was generally above the 2.0 mg/m³ long-term exposure limit while some sampling points had values as high as 7.5 mg/m³ which is above the short-term exposure limit. SO₂ in the residential area was less than 0.001 mg/m³ all through. This could be due to either a low level of sulphur release from production processes in many of the industries or due to dissolution, dispersion, mixing or any other atmospheric reaction leading to a low ground level concentration. Generally, the residential area is free from SO₂ and H₂S pollution at levels less than 0.01 mg/m³.

For the industrial area, noise levels have a clustered range of 53.06-82.36 dBA with a mean of 66.98 dBA. In five of the sampling areas, the mean noise level was found with values as high as 273 dBA. SPM was low in places close to residential areas but measured up to as much as 721 mg/m³ in the core industrial zone with a mean of 192.08 mg/m³ and values ranging between 25-721 mg/m³. The range of all values for CO was 0-8 mg/m³ while the mean is 2.14 mg/m³ which is higher than the long-term national emission limits. HC ranged between 0-6 mg/m³ with a mean of 0.56 mg/m³ while concentrations were above both short-term and long-term limit in a few parts of the industrial zone. SO₂ levels were generally below 0.01 mg/m³, while hydrogen sulphide ranged between 0-11 mg/m³ with a mean of 0.62 mg/m³. Dispersion or fall out could be responsible for these low values. Meanwhile, in the control area, the noise level ranged between 38.72-46.48 dBA with a mean of 43.60 dBA, while SPM had a mean of 6.0 mg/m³ and values that ranged between 2.0-11 mg/m³. CO, H₂S and SO₂ levels were less than 0.01 throughout the sampling period of the season, but HC levels ranged between 0-5 mg/m³ while the mean was 2.13 mg/m³.

Table 4. Variation in the values of air parameters during dry season

| Parameter | Locations | Residential | Industrial | Control |
|-----------|-----------|-------------|------------|---------|
| T (°C)    | 34.45±0.30ᵇ | 35.60±0.21ᵃ | 28.19±0.33ᶜ |
| RH (%)    | 62.08±1.42ᵇ | 54.44±1.22ᵃ | 77.63±1.29ᵃ |
| WS (m/s)  | 7.23±0.43ᵃ | 7.47±0.36ᵃ | 5.37±0.38ᵇ |
| WP (mm Hg)| 1.51±0.38ᵃ | 1.29±0.21ᵇ | 0.39±0.18ᵇ |
| NOISE (dB)| 55.85±0.83ᵇ | 66.98±0.93ᵃ | 43.60±0.61ᶜ |
| SPM (mg/m³)| 48.91±5.28ᵇ | 192.08±26.68ᵃ | 6.00±0.52ᵃ |
| CO (mg/m³)| 0.80±0.21ᵇ | 2.14±0.31ᵃ | 0.00±0.00ᵇ |
| H₂S (mg/m³)| 0.00±0.00ᵇ | 0.62±0.31ᵃ | 0.00±0.00ᵇ |
| SO₂ (mg/m³)| 0.00±0.00ᵃ | 0.00±0.00ᵃ | 0.00±0.00ᵃ |
| HC (mg/m³)| 2.10±0.29ᵃ | 0.56±0.20ᵇ | 2.13±0.38ᵃ |

Values in the same row and with different superscript are significantly different at p<0.05.

In the rainy season, as shown in Table 5, noise levels ranged between 52.50-81.90 dBA with a mean of 62.15 dBA, while SPM ranged between 5.0-100 mg/m³ with a mean value of 35.56 mg/m³. CO was found to be within the range of 0.0-8.0 mg/m³ with a mean of 2.88 mg/m³, while HC level ranged between 0.0-3.50 mg/m³ with a mean of 1.34 mg/m³. H₂S and SO₂ levels were not detectable.

Noise levels in the industrial area ranged between 62.50-89.60 dBA with a mean of 75.96 dBA. Moreover, SPM ranged from 6.0-521 mg/m³ with an average value of 107.52 mg/m³, while CO ranged between 0.00-10 mg/m³ having a mean of 6.10 mg/m³. Hydrocarbon level was within 0.00-4 mg/m³ with a mean value of 1.55 mg/m³, while SO₂ and H₂S levels were very low and almost undetectable.

Noise levels within the control area was in the range of 45.2-62.7 dB with an average of 54.81 dBA, while the measured level of the suspended particulate matter was in the range of 16-54 mg/m³.
with a mean value of 28.36 mg/m³. The measured level of CO in the area falls within the range of 0-7 mg/m³ with a mean value of 1.94 mg/m³, while the hydrocarbon level was between 0-3 mg/m³ with an average value of 0.88 mg/m³. Similarly, H₂S and SO₂ levels were below detectable limits.

**Table 5.** Variation in the values of air parameters for wet season

| Parameter       | Locations  | Industrial | Control  |
|-----------------|------------|------------|----------|
| T (°C)          | 29.10±0.28b | 30.61±0.17a | 30.51±0.21a |
| RH (%)          | 68.18±1.23a | 61.54±0.80b | 61.70±0.61b |
| WS (m/s)        | 8.67±0.29b  | 9.82±0.27a  | 8.59±0.52b  |
| WP (mm Hg)      | 1.90±0.15b  | 2.41±0.13a  | 1.85±0.26b  |
| NOISE (dB)      | 62.15±0.95b | 75.96±1.03a | 54.61±1.07c |
| SPM (mg/m³)     | 35.58±3.44b | 107.52±16.32a | 29.55±2.53b |
| CO (mg/m³)      | 2.88±0.3475b | 6.10±0.43a  | 2.05±0.46b  |
| H₂S (mg/m³)     | 0.00±0.00a  | 0.00±0.00a  | 0.00±0.00a  |
| SO₂ (mg/m³)     | 0.00±0.00a  | 0.00±0.00a  | 0.00±0.00a  |
| HC (mg/m³)      | 1.34±0.17ab | 1.55±0.16c  | 0.85±0.21b  |

Values in the same row and with different superscript are significantly different at p<0.05.

Seasonal variation as shown in Table 6 indicated a significant variation (p<0.05) in noise levels during the dry (55.85±0.82, 66.98±0.97 and 43.60±0.61) and wet season (62.15±0.95, 75.96±1.03 and 55.23±1.23) at all locations. The level of SPM within the Residential and Industrial areas was significantly higher (p<0.05) during the dry season (48.91±5.28 and 192.08±26.68) than the wet season (35.58±3.44 and 107.52±16.32) except for the control area with reverse situation.

Also, there was a significant variation (p<0.05) in CO concentrations during the dry (0.80±0.21, 2.14±0.32 and 0.00±0.00) and wet season (2.89±0.35, 6.10±0.43 and 2.13±0.54) at all three locations. Meanwhile, there was no significant variation (p>0.05) in the values of H₂S except in the Industrial area in wet season. A similar situation was recorded for SO₂ concentrations. However, the values of HC varied significantly (p<0.05) among locations during both dry and wet seasons.

The comparison of air pollutant levels with permissible limits, as shown in Table 7, the noise level in residential areas during both wet and dry seasons were found to be above 50 dBA which is the standard limit stipulated by NESREA while that of the control area was not above limit. There was exceedance during the dry season in the industrial area with values above 70 dBA while the mean value during the wet season was not above the standard limit. Generally, noise levels were higher during the dry season.

Similarly, Table 8 illustrates that during the dry season, there was exceedance in the level of suspended particulate matter for long and short-term exposure limits in all locations, while there was exceedance in CO and HC for short-term exposure limit in both residential and control area. The levels of SO₂ and H₂S with values below 0.001 mg/m³ did not exceed both standards, while in the industrial area the level of suspended particulate matter and H₂S exceeded standards for both long and short-term exposure limits. CO and HC showed exceedance only for long-term exposure limit. SO₂ levels were less than 0.001 mg/m³ which does not exceed exposure limits.

For the wet season, the level of suspended particulate matter exceeded limits for both long-term and short-term exposures in all location, but CO, HC and H₂S levels only exceeded long-term exposure standards in all locations, whereas the level of SO₂ was generally not above standard with a mean value of 0.001 mg/m³.

This study showed that industrial activities contributed significantly to the noise level in the surrounding residential areas, making it higher than the permissible limit. Noise levels within the industrial area were above the permissible limit during dry season. Industrial noise impact was found to decrease with increasing distance from the
The health of people working and living in the area could be negatively impacted by a high concentration of air pollutants. Kowalska et al. (2006) found that measured concentrations of airborne particulate and gaseous pollutants in the Katowice Conurbation (0.035 mg/m$^3$ and 0.049 mg/m$^3$ of SO$_2$ and SPM respectively) influenced daily mortality pattern among the inhabitants of the region while the largest impact was seen in relation to the elderly and the case of cardiovascular mortality and SO$_2$ remained the most powerful determinant among the examined air pollutants. The effects of long-term exposure to ambient PM apply to cardiopulmonary mortality and probably to lung cancer also (WHO, 2004). Peng et al. (2008) revealed that a 10 mg/m$^3$ increase in PM2.5-PM10 was associated with 0.36% increase in cardiovascular disease admissions on the same day while Yang et al. (2008) found CO and SO$_2$ to be significantly associated with chronic obstruction pulmonary disease (COPD).
Table 6. Variation in the values of air parameters for dry and wet seasons

| Parameter   | Residential (dry season) | Residential (wet season) | Industrial (dry season) | Industrial (wet season) | Control (dry season) | Control (wet season) |
|-------------|--------------------------|--------------------------|-------------------------|-------------------------|----------------------|----------------------|
| T (°C)      | 34.42±0.30 <sup>a</sup> | 29.09±0.28 <sup>b</sup> | 35.60±0.22 <sup>a</sup> | 30.61±0.17 <sup>b</sup> | 28.19±0.33 <sup>a</sup> | 30.52±0.26 <sup>b</sup> |
| RH (%)      | 62.08±1.42 <sup>b</sup> | 68.175±1.23 <sup>a</sup> | 54.44±1.22 <sup>b</sup> | 61.54±0.80 <sup>a</sup> | 77.63±1.29 <sup>a</sup> | 61.31±0.72 <sup>b</sup> |
| WS (m/s)    | 7.23±0.432 <sup>b</sup> | 8.665±0.29 <sup>a</sup> | 7.47±0.36 <sup>c</sup> | 9.82±0.27 <sup>a</sup> | 5.37±0.38 <sup>a</sup> | 8.71±0.62 <sup>a</sup> |
| WP (mm Hg)  | 1.51±0.38 <sup>b</sup> | 1.896±1.45 <sup>a</sup> | 1.29±0.21 <sup>b</sup> | 2.41±0.13 <sup>a</sup> | 0.39±0.18 <sup>b</sup> | 1.92±0.31 <sup>a</sup> |
| NOISE (dB)  | 55.85±0.82 <sup>b</sup> | 62.15±0.95 <sup>a</sup> | 66.98±0.97 <sup>b</sup> | 75.96±1.03 <sup>a</sup> | 43.60±0.61 <sup>b</sup> | 55.23±1.23 <sup>a</sup> |
| SPM (mg/m³) | 48.91±5.28 <sup>a</sup> | 35.58±3.44 <sup>b</sup> | 192.08±26.68 <sup>a</sup> | 107.52±16.32 <sup>b</sup> | 6.00±0.52 <sup>b</sup> | 28.75±2.67 <sup>a</sup> |
| CO (mg/m³)  | 0.80±0.21 <sup>b</sup> | 2.89±0.35 <sup>a</sup> | 2.14±0.32 <sup>b</sup> | 6.10±0.43 <sup>a</sup> | 0.00±0.00 <sup>b</sup> | 2.13±0.54 <sup>a</sup> |
| H₂S (mg/m³) | 0.00±0.00 <sup>a</sup> | 0.00±0.00 <sup>b</sup> | 0.62±0.31 <sup>a</sup> | 0.00±0.00 <sup>b</sup> | 0.00±0.00 <sup>b</sup> | 0.00±0.00 <sup>a</sup> |
| SO₂ (mg/m³) | 2.10±0.30 <sup>a</sup> | 1.34±0.17 <sup>b</sup> | 0.56±0.20 <sup>a</sup> | 1.55±0.16 <sup>a</sup> | 2.13±0.38 <sup>a</sup> | 0.72±0.20 <sup>b</sup> |

Values in the same row and with different superscript are significantly different at p<0.05.

Table 7. Noise level in comparison with permissible limits of NESREA

| Facility                | Maximum permissible limit (dBA) | Mean value for wet season (dBA) | Mean value dry season (dBA) |
|-------------------------|---------------------------------|---------------------------------|-----------------------------|
|                         |                                 | Residential                     | Control                      |
|                         |                                 | Residential                     | Control                      |
| Residential buildings   | 50                              | 55.85                          | 43.6                        |
| Industrial area (Outside perimeter fencing) | 70                              | 66.98                          | 75.96                        |

Table 8. Air pollutant concentrations in comparison with permissible limits of NESREA

| Pollutant | Long-term limits (mg/m³) | Short-term limits (mg/m³) | Dry season | Wet season |
|-----------|--------------------------|---------------------------|------------|------------|
|           | Residential (mg/m³)      | Industrial (mg/m³)        | Control (mg/m³) | Residential (mg/m³) | Industrial (mg/m³) | Control (mg/m³) |
| SPM       | 0.20                     | 48.91                     | 192.01     | 6.00       | 35.58       | 107.52       | 28.38       |
| CO        | 1.00                     | 1.23                      | 2.13       | 2.14       | 2.88        | 6.10         | 1.94        |
| H₂S       | 0.008                    | 0.00                      | 0.62       | 0.00       | 0.00        | 0.00         | 0.00        |
| SO₂       | 0.10                     | 2.10                      | 0.56       | 2.13       | 1.34        | 1.55         | 0.88        |
| HC (Total)| 2.00                     | 5.00                      | 2.10       | 0.56       | 2.13        | 1.34         | 1.55        |
4. CONCLUSIONS

Emissions released from industries located in the industrial scheme contributed significantly to the ground level concentration of H₂S, PM, and noise in surrounding residential areas while exceedance of exposure limits by NESREA was recorded for all parameters except in SO₂. Seasonal variation played an important role in the difference between ground level concentrations of pollutants. The presence of industries contributed significantly to high ground level concentrations of air pollutants in the surrounding and distant residential areas therefore reductions in air pollution will be of significant benefits to both living and non-living resources in and around the metropolis.

There is the need for air quality monitoring on the part of a relevant government agency while the residence should be enlightened on the inherent danger posed by air pollution and how to seek redress though they may rather feel that the industries are important to them regarding economic opportunity.

ACKNOWLEDGEMENTS

We seek this medium to appreciate the support and cooperation received from the staffs of the planning department of Oluyole Local Government, Ibadan without whom this project would be impossible.

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