AIR QUALITY INDEX AS A TOOL FOR MONITORING ENVIRONMENTAL DEGRADATION AND HEALTH IMPLICATIONS

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ABSTRACT

Considering the importance of air to human existence, air pollution is a critical issue that requires collective effort for its prevention and control. The anthropogenic activities keyed into a crystal responsibility which resulted in environmental dilapidation and ruin. One of the tools that can be used for such a campaign is Air Quality Index (AQI). This study carried out an air quality survey of some air pollutants in Ado-Ekiti, Ekiti State Nigeria with the view to develop the AQI. The AQI was based on the concentrations of four pollutants. The index is calculated from the concentrations of the following pollutants: $PM_{2.5}$, PM_{10}, CO and SO2. 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. Seven sampling points across two environmental zones in the study area, namely commercial and residential (high-income and low-income areas), were considered, resulting in 42 samples for each of the 4 air pollutants, totaling 392 samples. The results show that the AQI was generally lower during the rainy season than the dry season, and that the AQI in the high-income residential areas was most favorable, ranging from good to unhealthy for sensitive group. The worst scenario was recorded in the commercial environmental zones, which ranged from moderate to hazardous. There is a need for constant and continuous monitoring of air quality for development of AQI, which in turn will enable clear communication of how clean or unhealthy the air in the study area is; it will usher in environmental degradation, dilapidation and will ruin the awareness campaign.

Keywords: air, quality, index, pollution, Ado Ekiti, environmental, degradation, pollutants.

1 INTRODUCTION

Air pollution can be described as a leading environmental problem associated with urban areas around the world. A range of monitoring programs have been put in place to determine the quality of air by generating huge amount of data on concentration of each air pollutant in different parts of the world. The large data often do not convey the air quality status to the scientific community, government officials, policy makers, and in particular to the general public in a simple and straightforward manner. This problem is addressed by determining the Air Quality Index (AQI) of a given area.

Human existence in comparison with its environment is more and more getting threatened sequel to air pollution occasioned majorly by human coupled with natural activities. Earth is getting warmer, the ozone layer is getting depleted, and acid rain is being experienced, all as a result of air pollution (Awopetu [1], Awopetu [2]). Nigeria is facing myriad of environmental issues which include but not limited to air pollution, improper waste disposal, water pollution, climate change and global warming that are of great concern to environmentalists (Awopetu [2]). The effects of this environmental degradation are detrimental to human, plant and animal existence. The anthropogenic activities keyed into a crystal responsibility which resulted in environmental dilapidation and ruin. In order for this trend to change there has to be environmental degradation, dilapidation and ruin campaign which will usher in awareness. One of the tools that can be used for such campaign is AQI. The AQI is a reporting system; an important tool of risk communication.

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Consciousness of everyday levels of air pollution is vital to the citizens, particularly for those who are suffering from illnesses occasioned by exposure to air pollution. Achievement of a nation to advance air quality is not unconnected with the cooperation and support of its citizens who are knowledgeable about local and national air pollution problems and about the progress of mitigation efforts (San Salvador [3]). Therefore, an uncomplicated and effective communication of air quality is very important. The theory of an AQI that transforms weighted values of individual air pollution related parameters such as Particulate matter (PM_{10}, $PM_{2.5}$), Carbon monoxide (CO) and Sulfur dioxide (SO_2) into a single number or set of numbers is widely used for air quality communication. In what follows is the explanation of individual pollutants that constituted the AQI

Carbon monoxide (CO) 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 practically impossible to detect the presence of CO through senses in an environment since CO has no smell or taste. 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 [4], [5]. As reported by (Aliyu and Ibrahim [6]) 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.

According to Nordqvist [7]. Hemoglobin is the molecule in red blood cells that carries oxygen from the lungs to tissues all over the body, and it brings carbon dioxide (CO_2) back from the tissues. CO binds to hemoglobin over 200 times more easily than oxygen does, so if CO is present, oxygen will not be able to find space to get into the hemoglobin. This is because the space is occupied with CO. As a result, parts of the body will be starved of oxygen, and the affected parts will die. The human body needs oxygen, but it has no use for CO.

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 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. Short-term exposure to airborne SO_2 has been associated with various adverse health effects [8], [9]. Multiple human clinical studies, epidemiological studies, and toxicological studies support a causal relationship between short-term exposure to airborne SO_2 and respiratory morbidity. Sulfur dioxide also causes acid rain which can damage or kill trees and crops.

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. 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.

PM is also known to trigger or worsen chronic disease such as asthma, heart attack, bronchitis and other respiratory problems. Exposure to such particles can affect both lungs and heart. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including; decreased lung function, increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.

Several studies from across the world have documented the many ways in which air pollution can affect people's health, including but not limited to making it difficult to breathe for those with asthma or other respiratory diseases, regularly sending the young and old to hospital or causing them to miss school or work, and contributing to early death from heart and lung disease (Health Effects Institute [10]). Therefore, an AQI is helpful for: (i) public to know air quality in a simplified mode, (ii) politicians to know they cannot completely shield away from effects of air pollution and then invoke quick actions, (iii) a decision maker to be aware of the trend of air pollution events and to map out corrective pollution control strategies.

2 MATERIAL AND METHODS

2.1 Study area

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 Yorubas. 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 plays 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 than 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, (Oyedele [11]). Geologically, the region lies entirely within the pre-Cambrian basement complex rock group, which underlies much of Ekiti State (Awosusi and Jegede [12]). The temperature of this area is almost uniform throughout the year; with little deviation from the mean annual temperature of 27°C. February and March are the hottest 28°C and 29°C respectively, while June with temperature of 25°C is the coolest (Adebayo [13]). The mean annual rainfall is 1,367 mm 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.

2.2 Research method

2.2.1 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}, CO 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 across two environmental zones in the study area namely; commercial and residential (high income and low-income areas) were considered, resulting in 42 samples for each of the 4 air pollutant totaling 168 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 minibuses and taxi linking other towns, urban, peri-urban and rural destinations);
ii) GRA: (represented high economic status residential area with low vehicular and pedestrian traffic volume);
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 lot of firewood burning activities were taking place).

The purpose of the AQI is to help people understand what local air quality means to their health. To make it easier to understand, USEPA has developed an AQI that is used to report air quality which is divided into six categories indicating increasing levels of health concern (Table 1). An AQI value over 300 represents hazardous air quality and below 50 the air quality is good, (US EPA, [14]).

Table 1: AQI. *(Source: US EPA [14].)*

AQI Value	AQI Color	AQI Color
0–50	Good	Green
51–100	Moderate	Yellow
101–150	Unhealthy for sensitive groups	Orange
151–200	Unhealthy	Red
201–300	Very unhealthy	Purple
301–500	Hazardous	Maroon

The AQI is a yardstick that runs from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 represents good air quality with little or no potential to affect public health, while an AQI value over 300 represents air quality so hazardous that everyone may experience serious effect (Table 2).

Table 2: AQI health messages. *(Source: US EPA [14].)*

AQI Value	Health Message	AQI Color
0–50	None	Green
51–100	Unusually sensitive people should reduce prolonged or heavy exertion	Yellow
101–150	Sensitive groups should reduce prolonged or heavy exertion	Orange
151–200	Sensitive groups should avoid prolonged or heavy exertion; general public should reduce prolonged or heavy exertion	Red
201–300	Sensitive groups should avoid all physical activity outdoors; general public should avoid prolonged or heavy exertion	Purple
301–500	Everyone should avoid all physical activity outdoors	Maroon

2.2.2 Computing the AQI

Fourteen days (Monday to Sunday) monitors record concentrations of four pollutants at seven locations across the study area were taken. These raw measurements were converted into a separate AQI value for each day using standard equations (eqn (1)) developed by EPA. The AQI values are recorded as the AQI value for that day. The AQI is a piecewise linear function of the pollutant concentration. At the boundary between AQI categories (Table 3), there is a discontinuous jump of one AQI unit. To convert from concentration to AQI, eqn (1) is used [15].

$$I = \frac{I_{high} - I_{low}}{C_{high} - C_{low}} (C - C_{low}) + I_{low}, \quad (1)$$

where I = AQI; C = pollutant concentration; C_{low} = concentration breakpoint, that is ≤ C; C_{high} = concentration breakpoint that is ≥ C; I_{low} = index breakpoint corresponding to C_{low}; I_{high} = index breakpoint corresponding to C_{high}.

Table 3: Breakpoints for the AQI. *(Source: US EPA [15].)*

S/N	Breakpoints				Equal these AQIs	Category
1	$PM_{2.5}$ (μg/m^2)	PM_{10} (μg/m^2)	CO (ppm)	SO_2 (ppm)	AQI	
2	0.0–15.4	0–54	0.0–4.4	0.000–0.034	0–50	Good
3	15.5–40.4	55–154	4.5–9.4	0.035–0.144	51–100	Moderate
4	40.5–65.4	155–254	9.5–12.4	0.145–0.224	101–150	Unhealthy for sensitive group
5	65.5–150.4	255–354	12.5–15.4	0.225–0.304	151–200	Unhealthy
6	150.5–250.4	355–424	15.5–30.4	0.305–0.604	201–300	Very unhealthy
7	250.5–350.4	425–504	30.5–40.4	0.605–0.804	301–400	Hazardous
8	350.5–500.4	505–604	0.000–0.034	0.805–1.004	401–500	Hazardous

3 RESULTS AND DISCUSSION

It is seen from Tables 4 to 17 that the AQI ranges between good to hazardous during the raining season (Tables 4 to 10) and moderate to hazardous during the dry season (Tables 11 to 17). During the raining season, GRA (Table 5) had the best AQI which ranged between good and moderate while Old Garage (Table 4) had the worst AQI which ranged between moderate to hazardous. The friendly and acceptable AQI in GRA can be linked to the economic status of the people living in the area. GRA represents high economic status residential area with low vehicular and pedestrian traffic volume. The area also had a very low commercial activity with lots of green vegetations. Old Garage on the other hand is characterized with retail shops, market, high vehicle and pedestrian traffic; it also serves as transfer point for minibuses and taxi linking other towns, urban, peri-urban and rural destinations. It is the hub of commercial activities in the study area. Most of the retail shops in the Old Garage used generator for electricity supply. Woods, charcoal and kerosene stoves were used for cooking activities. All these anthropogenic activities are responsible for the worst AQI in the study area.

It was generally observed that AQI was worst in the dry season when compared with raining season, except Fajuyi (Table 9) which recorded hazardous in two days (Monday and Tuesday). GRA still recorded the friendliest AQI during the dry season, the AQI ranges between moderate to unhealthy for sensitive groups while Old Garage recorded the worst AQI (hazardous for seven days) during the same period. Hazardous levels of health concern, which are AQI values over 300, trigger health warnings of emergency conditions. The entire population is even more likely to be affected by serious health effects. Fajuyi (Table 16) also recorded hazardous on a Saturday while other days are mostly very unhealthy meaning everyone may experience more serious health effects.

Table 4: Daily AQI for Old Garage in Ado Ekiti during the raining season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	148	636	139	516	360		Hazardous
Tuesday	154	668	201	457	370		Hazardous
Wednesday	85	94	117	119	104		Unhealthy for sensitive group
Thursday	157	626	171	654	402		Hazardous
Friday	72	430	142	393	259		Unhealthy
Saturday	102	118	25	118	91		Moderate
Sunday	108	451	301	206	267		Unhealthy

Table 5: Daily AQI for GRA in Ado Ekiti during the raining season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	59	45	23	68	49		Good
Tuesday	57	46	9	68	45		Good
Wednesday	59	45	17	102	56		Moderate
Thursday	67	45	12	119	61		Moderate
Friday	66	57	20	119	65		Moderate
Saturday	61	54	12	65	48		Good
Sunday	54	49	18	10	33		Good

Table 6: Daily AQI for Ajilosun in Ado Ekiti during the raining season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	85	128	28	83	81		Moderate
Tuesday	87	125	37	65	78		Moderate
Wednesday	88	136	35	68	82		Moderate
Thursday	82	147	68	117	103		Unhealthy for sensitive group
Friday	73	133	65	179	112		Unhealthy for sensitive group
Saturday	73	94	77	189	109		Unhealthy for sensitive group
Sunday	63	60	65	54	61		Moderate

Table 7: Daily AQI for Dalimore in Ado Ekiti during the raining season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	122	118	90	29	72		Moderate
Tuesday	119	122	110	73	85		Moderate
Wednesday	112	117	111	123	92		Moderate
Thursday	117	110	144	135	101		Unhealthy for sensitive group
Friday	107	91	176	139	103		Unhealthy for sensitive group
Saturday	99	87	201	127	103		Unhealthy for sensitive group
Sunday	81	67	198	198	109		Unhealthy for sensitive group

Table 8: Daily AQI for Odo Ado in Ado Ekiti during the raining season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	81	87	121	101	97		Moderate
Tuesday	84	98	51	122	89		Moderate
Wednesday	124	160	78	82	111		Moderate
Thursday	157	193	87	74	128		Unhealthy for sensitive group
Friday	154	184	55	56	112		Moderate
Saturday	111	352	61	97	155		Unhealthy for sensitive group
Sunday	66	315	117	95	148		Unhealthy for sensitive group

Table 9: Daily AQI for Fajuyi in Ado Ekiti during the raining season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	190	979	79	29	319		Hazardous
Tuesday	191	979	98	73	335		Hazardous
Wednesday	171	523	109	123	231		Very unhealthy
Thursday	183	448	112	135	219		Very unhealthy
Friday	181	624	127	139	268		Very unhealthy
Saturday	173	457	122	127	220		Very unhealthy
Sunday	155	500	163	198	254		Very unhealthy

Table 10: Daily AQI for Ilokun in Ado Ekiti during the raining season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	67	61	3	300	108		Moderate
Tuesday	66	57	4	520	161		Unhealthy
Wednesday	64	56	1	505	156		Unhealthy
Thursday	69	58	1	473	150		Unhealthy for sensitive group
Friday	59	55	1	269	96		Moderate
Saturday	62	48	9	269	97		Moderate
Sunday	67	45	12	119	61		Moderate

Table 11: Daily AQI for Old Garage in Ado Ekiti during the dry season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	166	821	185	654	457		Hazardous
Tuesday	167	842	206	599	453		Hazardous
Wednesday	156	1032	154	511	463		Hazardous
Thursday	179	819	205	534	434		Hazardous
Friday	191	553	157	463	341		Hazardous
Saturday	158	640	83	656	384		Hazardous
Sunday	175	606	233	513	382		Hazardous

Table 12: Daily AQI for GRA in Ado Ekiti during the dry season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	63	52	55	237	102		Unhealthy for sensitive group
Tuesday	59	53	50	237	100		Moderate
Wednesday	63	56	54	248	105		Unhealthy for sensitive group
Thursday	58	56	49	355	129		Unhealthy for sensitive group
Friday	58	58	53	308	119		Unhealthy for sensitive group
Saturday	52	54	36	267	102		Unhealthy for sensitive group
Sunday	54	51	38	251	99		Moderate

Table 13: Daily AQI for Ajilosun in Ado Ekiti during the dry season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	106	375	57	45	146		Unhealthy for sensitive group
Tuesday	107	392	63	65	157		Unhealthy
Wednesday	77	178	124	82	115		Unhealthy for sensitive group
Thursday	105	386	150	21	165		Unhealthy
Friday	90	291	128	188	174		Unhealthy
Saturday	112	384	69	14	145		Unhealthy for sensitive group
Sunday	176	292	124	32	156		Unhealthy

Table 14: Daily AQI for Odo Ado in Ado Ekiti during the dry season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	66	84	172	453	194		Unhealthy
Tuesday	93	253	149	250	186		Unhealthy
Wednesday	83	200	146	578	252		Very unhealthy
Thursday	71	236	189	403	225		Very unhealthy
Friday	68	195	213	285	190		Unhealthy
Saturday	103	303	212	413	258		Very unhealthy
Sunday	115	92	145	386	185		Unhealthy

Table 15: Daily AQI for Dalimore in Ado Ekiti during the dry season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	137	140	154	385	204		Very unhealthy
Tuesday	143	136	148	350	194		Unhealthy
Wednesday	127	104	55	579	216		Very unhealthy
Thursday	148	171	179	398	224		Very unhealthy
Friday	142	209	93	373	204		Very unhealthy
Saturday	151	208	150	218	182		Unhealthy
Sunday	153	154	139	330	194		Unhealthy

Table 16: Daily AQI for Fajuyi in Ado Ekiti during the dry season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	138	621	79	283	280		Very unhealthy
Tuesday	137	354	112	67	167		Unhealthy
Wednesday	105	412	163	100	195		Unhealthy
Thursday	139	614	98	173	256		Very unhealthy
Friday	150	494	127	191	241		Very unhealthy
Saturday	140	780	207	88	304		Hazardous
Sunday	131	153	129	460	218		Very unhealthy

Table 17: Daily AQI for Ilokun in Ado Ekiti during the dry season.

Day of the week	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Monday	80	62	6	563	178		Unhealthy
Tuesday	69	55	5	549	170		Unhealthy
Wednesday	73	46	8	355	121		Unhealthy for sensitive group
Thursday	81	54	16	642	198		Unhealthy
Friday	67	41	0	307	104		Unhealthy for sensitive group
Saturday	69	53	11	320	113		Unhealthy for sensitive group
Sunday	108	63	9	255	109		Unhealthy for sensitive group

Tables 18 and 19 shows the weekly AQI for the study area during raining and dry season respectively. The overall AQI index in GRA for both seasons still remains most favorable, followed by that of Ilokun while Old Garage and Fajuyi still recorded the worst AQI scenario.

Table 18: Weekly AQI for Ado Ekiti during the raining.

Location	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Old Garage	118	432	157	352	265		Very unhealthy
GRA	60	48	16	79	51		Moderate
Ajilosun	79	118	54	108	89		Moderate
Dalimore	108	102	147	118	119		Unhealthy for sensitive group
Odo Ado	111	198	81	90	120		Unhealthy for sensitive group
Fajuyi	178	644	116	118	264		Very unhealthy
Ilokun	65	54	4	350	118		Unhealthy for sensitive group

Table 19: Weekly AQI for Ado Ekiti during the dry season.

Location	$PM_{2.5}$ $\mu g/m^3$	PM_{10} $\mu g/m^3$	CO ppm	SO_2 ppm	AQI	Colors	Levels of health concerns
Old Garage	170	759	175	561	416		Hazardous
GRA	58	54	48	272	108		Unhealthy for sensitive group
Ajilosun	111	328	102	64	151		Unhealthy
Dalimore	86	195	175	396	213		Very unhealthy
Odo Ado	143	160	131	376	203		Very unhealthy
Fajuyi	134	490	131	194	237		Very unhealthy
Ilokun	78	53	8	427	142		Unhealthy for sensitive group

4 CONCLUSIONS AND RECOMMENDATIONS

This study presents the AQI for Ado Ekiti in Nigeria. As shown; the inhabitants of the study area are perpetually exposed to a diversity of pollutants as indicated by the measured AQI concentration. The main conclusion drawn is that, Ado Ekiti air is polluted and the level of human exposure to the pollutants requires further investigation to ascertain the health effect among the populace. The conclusion is supported by a number of epidemiological studies on the effects of air pollutants such as $PM_{2.5}$, PM_{10}, CO, and SO_2 on human health. It was discovered that most of the air pollutants sampled for the development of AQI was 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. There is a need for continuous of air pollutants, regular development of AQI and public education on the adverse effects of air pollution on both health and environment. 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 at individual and domestic level should be clearly spelt out. Considering the AQI in most of the study locations, government intervention in terms of air quality regulation and mitigation is much needed.

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