

# AIR QUALITY INDEX OVER BASRA PROVINCE, SOUTH OF IRAQ

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**Abstract** — This study is one of the recent approaches to deal with management of environmental pollution. It was carried out to analysis the pollution levels in the ambient air, of Basra province. Five different stations for gases concentrations were chosen through a period of time from January to December 2015. Air pollutants were monitored by a handheld gas analyzer (Instruments E- 4400) for NOX, SO<sub>2</sub>, CO<sub>2</sub> and CO, while PDR -1200 ( Personal Data Ram) device to measure total suspended particles (TSP). The reason of choosing this subject is the negative effects of air pollution on the citizens, which causes economical and health issues. This study contains important information for Basra province and pollution risk of health on people .the result show annual and seasonal AQI values found high concentrations of pollutants distributed clearly in the study stations, as winter record greatest values that most concentrations were higher than the global limitations but within the local limitations.

**Index Terms** — Basra, air quality index, gases, TSP, AQI.

## I. INTRODUCTION

Pollution can be defined as un acceptable change in the biological, chemical or physical characteristics of the air, water or land that can effect on organisms and all life. When the humans are exposed to air pollution, it can cause respiratory related decreases and aggravate the conditions such as asthma, bronchitis. Energy needs of the industries and domestic activities are met by burning fuels, which also emit poisonous wastes leading to air contamination. Sulphur dioxide (SO<sub>2</sub>), Nitrogen dioxide) NO<sub>2</sub>) and particulate matters (PM) are known to be the major air pollutants in Iraq. Degradation of air quality in Iraq cities is mainly due to emissions from the vehicles on road, power plant and oil fields. In the past few decades or so, there has been a tremendous raise in road transportation, increase in the number of fuel consuming vehicles and establishment of large number of industries have resulted in drastic increase in the concentration of gaseous and particulate matter in air. Air quality standards and guidelines have been proven based upon air pollution affect also to the human health and well being. The best available background materifor estimate of health effects of the US- EPA criteria documents and the air quality guidelines for Europe.

## II. MATERIAL AND METHODS

### A. Study Area:

The city of Basra is place in south of Iraq and the center area of Basra city is overcrowded, congested and commercial area. The selected sampling sites include industrialized, heavy traffic, commercial, residential and more populated areas. The natures of the sites are described in Table (1)

### B. Instruments:

1. Gases analyzer ( portable combustion gas analyzers E4400 ) has been used for outdoor air quality monitoring. pollutant gases were measured using this instrument. Air gases were sucked in to the analyzer such as SO<sub>2</sub>, NO<sub>x</sub> , CO and CO<sub>2</sub>.
2. Fine Particulate Sampler PDR( personal data ram) device type 1200 (Thermo Electron Corporation): has been used for sampling total suspended particles) TSP ).

Table (1) Sampling sites selected for the study in Basra city

Site	Description of the site
<b>Qurna</b> 31°00'49.0"N 47°25'52.1"E	large scale industries functioning, moderate traffic
<b>Ashar</b> 30°31'01.6"N 47°50'12.2"E	Heavy traffic, maximum commercial activities
<b>Tannuma</b> 30°31'47.4"N 47°51'15.1"E	Residential area with moderate traffic
<b>Abu-Khaseb</b> 30°27'10.2"N 47°59'04.8"E	Moderate scale industries functioning, Moderate traffic
<b>Zubair</b> 30°23'26.0"N 47°41'49.4"E	Extension area with less traffic, thin population

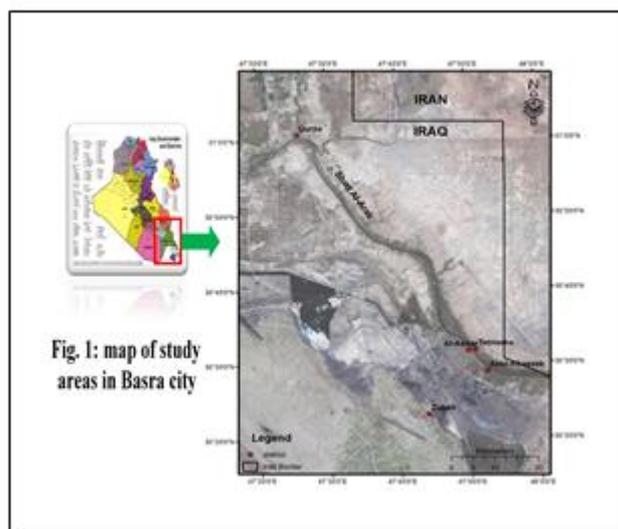


Fig. 1: map of study areas in Basra city

### III. RESULTS AND DISCUSSION

The obtained seasonal concentration of TSP, SO<sub>2</sub>, CO, CO<sub>2</sub> and NO<sub>x</sub> are recorded in tables (2) and (3), From these tables It can be seen that there are considerable variations in the pollution level over different seasons and show the range of air quality index with AQI category that appear the side effect on the people health .

AQI index for the current study gases, the stations recorded indicators ranging from 30 to 48. This category is good for the concentrations of carbon monoxide (CO), while the Ashar station was marked by the highest values of the AQI index. The average values of AQI were zero for the nitrogen and sulfur oxides concentrations. They were good and for all stations. The values of TSP index were marked by the highest AQI values ranging from 104 to 172. The indicator class was unhealthy for the sensitive groups of all stations, except Zubair station that recorded a non-health indicator (Unhealthy).

The present study found that the values of the AQI index for single gases in the different study stations did not exceed 100 and less than 150 occurred within the green color, which indicates that the presence of these gases under the conditions of air quality within the normal level is a good indicator. Registration of yellow color (moderate) which indicates that air quality is moderate and acceptable conditions. However, the contamination within this category may be a moderate health problem with a small number of individuals who have a sensitive to ozone or particles pollution and those who suffer from respiratory diseases. As recorded for TSP, the score of AQI was high values exceeded the normal levels of the index and most stations recorded orange color that warns the group of sensitive persons and was characterized by the station. Zubair station recorded red indicator indicates that the air is unhealthy for people may begin to face the various health effects resulting from inhalation particles and dust in the air. The particles of the outstanding atmosphere have the ability to

Table (2) Seasonal mean concentration of gases and particles in different seasons.

#		1	2	3	4	5
station	Season	Qurna	Ashar	Tannuma	Abu-Khaseb	Zubayr
TSP (µg/m <sup>3</sup> )	winter	147.35	222.04	215.15	180.18	249.01
	spring	292.79	370.36	297.48	219.36	437.69
	summer	186.029	261.814	219.071	207.973	304.717
	autumn	175.55	228.61	185.65	132.02	232.1
SO <sub>2</sub> (ppm)	winter	0.165	0.162	0.121	0.016	0.126
	spring	0.267	0.227	0.206	0.081	0.266
	summer	0.431	0.336	0.338	0.155	0.334
	autumn	0.147	0.169	0.165	0.028	0.138
CO (ppm)	winter	5.54	9.57	8.31	4.4	8.13
	spring	2.34	4.2	3.92	2.57	3.86
	summer	3.25	4.91	3.95	2.33	3.87
	autumn	4.45	8.14	4.15	3.82	5.27
CO <sub>2</sub> (ppm)	winter	221.5	300.05	294	207.5	270.02
	spring	214.33	237.68	241.67	166.35	221.03
	summer	232.07	258	254.44	203	250.37
	autumn	244.51	270.5	234.51	203.5	239.49
NO <sub>x</sub> (ppm)	winter	0.153	0.169	0.167	0.039	0.168
	spring	0.197	0.105	0.102	0.052	0.101
	summer	0.617	0.506	0.27	0.1	0.538
	autumn	0.185	0.055	0.076	0.055	0.104

penetrate depths of the human lung when inhaled in large quantities and stay for long periods may destroy the lungs, leading to death.

Most of the oxides in the study stations were caused by human activities, such as car exhaust products and fossil fuel combustion, as is the case in power plants other than a part of the naturally occurring suspended matter. Inhalation is the common method of exposure to polluted oxides when acute exposure to high concentrations of carbon monoxide resulting from incomplete combustion will reduce the body's oxygen ability, causing anemia, chest pain, mental alertness, and nitrogen oxides cause a dangerous effect on the body. Or breathing and mucous membranes and irritation of the eyes, nose, throat and lungs.

The results in figure 2 obtained for the annual values of the AQI indicators for all the study stations show that the Abu-Khaseb station recorded the lowest annual values of 45 in the category of good (green color), while the Qurna station recorded the value of 104, Al-Ashar 119, Al-Tannuma 104 and Al-Zubayr 108, Unhealthy for Sensitive Groups.

Table(3) Describes the Range of Air Quality Index ( AQI ) and its AQI category

Gases	station	mean	AQI	AQI category	Standard AQI
CO (ppm)	1	3.505	40	Good	50 - 0
	2	5.201	58	Moderate	100- 51
	3	4.235	48	Good	
	4	2.690	30	Good	
	5	4.290	48	Good	
NOx(ppm)	1	0.108	0	Good	
	2	0.109	0	Good	
	3	0.127	0	Good	
	4	0.091	0	Good	
	5	0.102	0	Good	
TSP( $\mu\text{g}/\text{m}^3$ )	1	162.54	104	Unhealthy for Sensitive Groups	101-150
	2	236.02	141	Unhealthy for Sensitive Groups	
	3	223.52	135	Unhealthy for Sensitive Groups	
	4	192.66	119	Unhealthy for Sensitive Groups	
	5	297.01	172	Unhealthy	200-151
SO <sub>2</sub> (ppm)	1	0.133	0	Good	
	2	0.182	0	Good	
	3	0.108	0	Good	
	4	0.026	0	Good	
	5	0.210	0	Good	

It is clear from AQI values that seasonal and annual concentrations were relatively high and spread at study stations. Most of concentration were within local limitation but more than world limitation of air pollution quality.

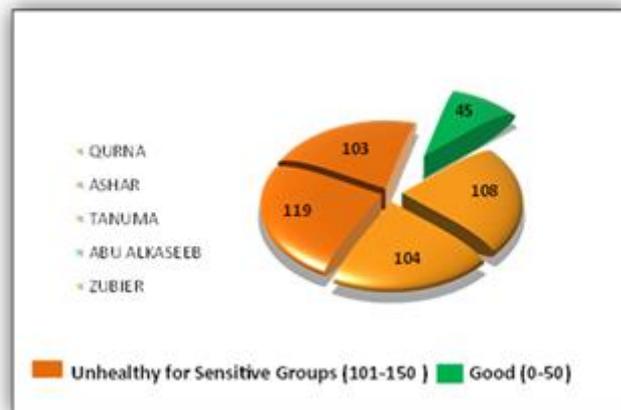


Figure 2: Annual AQI proportion of all gases in the study stations in Basra Province

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