

AIR QUALITY ANNUAL SUMMARY REPORT

ABU DHABI

2018



INTRODUCTION

The objective of EAD's air quality priority is to ensure that ambient air quality in Abu Dhabi protects human health and the environment. EAD will focus on improving the comprehensiveness of ambient air quality monitoring across the Emirate, advancing capabilities for analysing, modelling and reporting air quality information, and ensuring that emission standards, regulations and enforcement regimes are in place for the key sectors and pollutants that pose the greatest threats to public health, wildlife, and quality of life in Abu Dhabi.

The Environment Agency – Abu Dhabi (EAD) started monitoring air quality in 2007. Quality Assurance/Quality Control (QA/QC) methods and procedures are implemented with full documentation and are validated through an international certified calibration reference laboratory. Forms and log sheets document every activity in the air monitoring stations and document all maintenance, calibration, operation and other activities such as all visits to the stations.

This annual report provides an overview and analysis of air quality monitoring data in Abu Dhabi for the year 2018, and a short comparison of monitoring results with earlier years. The analysis covers the three regions in Abu Dhabi Al Ain Region (Eastern Region), Al Dhafra Region (Western Region) and Central Region (Greater Abu Dhabi and its surrounding).

The report summarizes the data available at the twenty fixed stations in Abu Dhabi Emirate, in addition two mobile stations. The network monitors up to 17 pollutants.

//AIR POLLUTION SOURCES AND HEALTH EFFECTS

POLLUTANT



SULPHUR
DIOXIDE SO₂

- Traffic pollution
- Fuel Combustion
- Electric Utilities
- Industrial Processes
- Oil and gas activities



CARBON
MONOXIDE CO

- Traffic Pollution
- Fuel Combustion



NITROGEN
DIOXIDE NO₂

- Traffic Pollution
- Fuel Combustion
- Electric Utilities
- Industrial Boilers



PARTICULATE
MATTER PM

- Arid climate
- Regional dust clouds
- Fuel Combustion
- Industrial processes
- Traffic Pollution
- Construction Activities



OZONE
O₃

- Secondary pollutant typically formed by photochemical reaction of volatile organic compounds (VOCs) and NOx in the presence of sunlight.



HYDROGEN
SULPHIDE H₂S

- Sewage Network
- Oil and Gas industrial activities
- Waste-water treatment plants



Respiratory diseases

Cardiovascular diseases

Odor nuisance

02

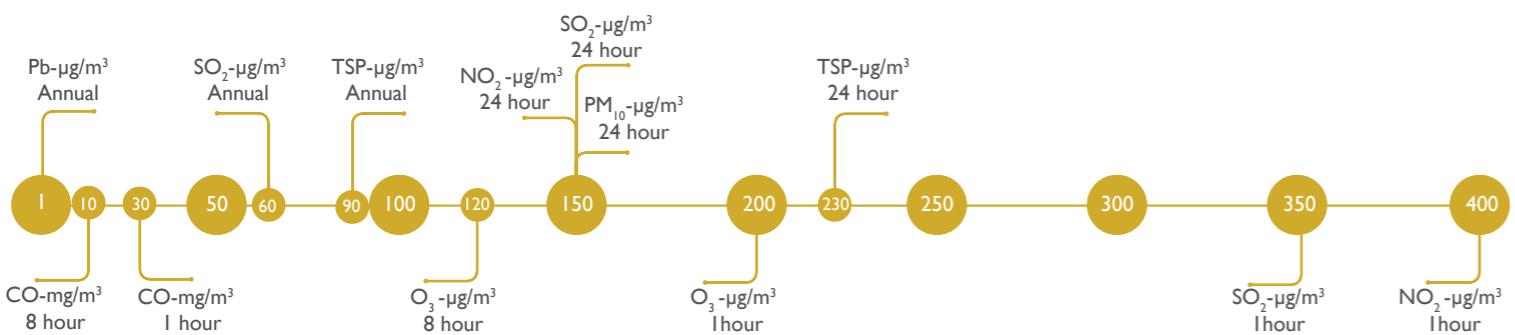


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//AMBIENT AIR QUALITY LIMITS (AQL)

The air pollution levels have been compared to the UAE Air Quality Limits defined in the Cabinet of Ministers Decree No. 12 for 2006 concerning Protection of Air from Pollution. A summary of these Ambient Air Quality Limit (AQL) concentration levels is presented below.



*TSP = Total Suspended Particles



//AIR QUALITY INDEX

This report establishes the Air Quality Index (AQI) to evaluate air pollution. EAD simplifies the Ambient Air Quality State by calculating the AQI Range based on Air Quality National Standards for the major five parameters; Particulate matter, Ground level ozone, Sulphur dioxide, Nitrogen dioxide and Carbon monoxide.

AQI values that are below 100 are compliant with the air quality limits and are therefore considered to be acceptable.

US EPA AQI Classifications		
AQI RANGE	CLASSIFICATIONS	CONDITIONS
0 to 50	Good	Considered satisfactory
51 to 100	Moderate	Air quality is acceptable
101 to 150	Unhealthy for Sensitive Groups	Members of sensitive groups may experience health effects
151 to 200	Unhealthy	Everyone may begin to experience health effects
201 to 300	Very Unhealthy	Health alert, meaning everyone may experience more serious health effects.
301 to 500	Hazardous	Health warnings of emergency conditions.

05

//AIR QUALITY MONITORING STATIONS

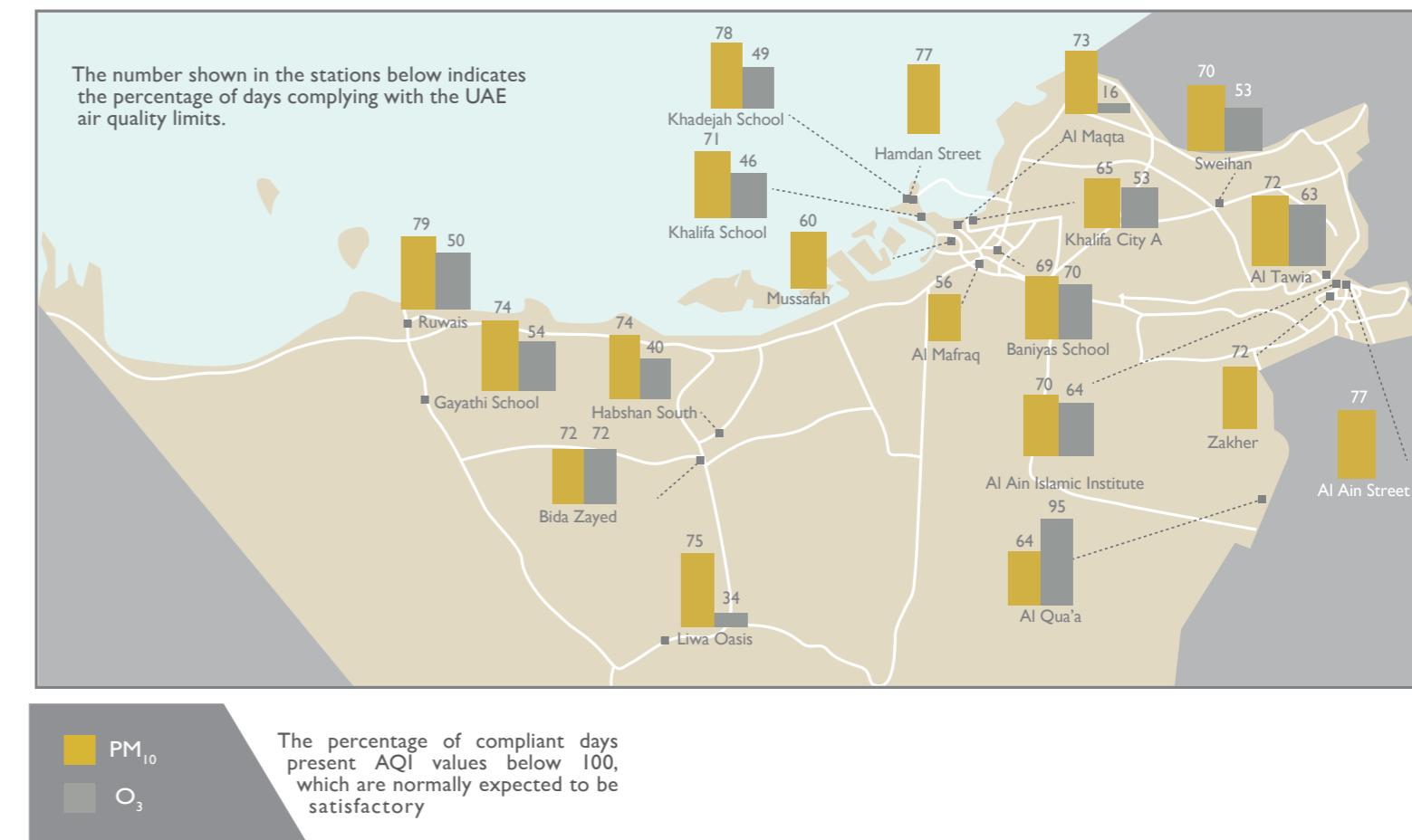
STATION NAME	STATION REPRESENTATIVITY (AREA TYPE)	MAIN PARAMETERS						
		SO ₂	NO ₂	CO	O ₃	PM ₁₀	PM _{2.5}	H ₂ S
CENTRAL ABU DHABI AREA								
HAMDAN STREET	URBAN TRAFFIC	●	●	●		●	●	
KHADEJAH SCHOOL	URBAN BACKGROUND	●	●		●	●	●	●
KHALIFA SCHOOL	SUBURBAN BACKGROUND	●	●		●	●	●	●
AL MAQTA	SUBURBAN BACKGROUND	●	●	●	●	●	●	●
KHALIFA CITY A	SUBURBAN BACKGROUND	●	●		●	●	●	●
BANIYAS SCHOOL	SUBURBAN BACKGROUND	●	●		●	●	●	●
MUSSFAH	SUBURBAN INDUSTRIAL	●	●		●	●	●	●
AL MAFRAQ	SUBURBAN INDUSTRIAL	●	●		●	●	●	●
AL AIN REGION								
AL AIN STREET	URBAN TRAFFIC	●	●	●		●	●	
AL AIN ISLAMIC INSTITUTE	URBAN BACKGROUND	●	●		●	●	●	●
AL TAWIA	SUBURBAN BACKGROUND	●	●		●	●	●	●
ZAKHER	URBAN BACKGROUND	●	●		●	●	●	●
SWEIHAN	SUBURBAN BACKGROUND	●	●	●	●	●	●	
AL QUA'A	REGIONAL RURAL BACKGROUND	●	●	●	●	●	●	
AL DHAFRA REGION								
EII ROAD*	RURAL TRAFFIC	●	●	●		●	●	
BIDA ZAYED	SUBURBAN BACKGROUND	●	●		●	●	●	●
HABSHAN SOUTH	RURAL INDUSTRIAL	●	●		●	●	●	●
RUWAIS	SUBURBAN INDUSTRIAL	●	●	●	●	●	●	●
GAYATHI SCHOOL	SUBURBAN BACKGROUND	●	●		●	●	●	●
LIWA OASIS	REGIONAL RURAL BACKGROUND	●	●		●	●	●	

* EII Road Station currently under relocation.

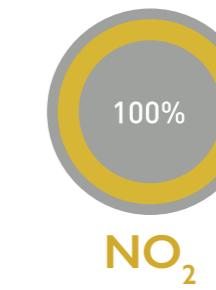
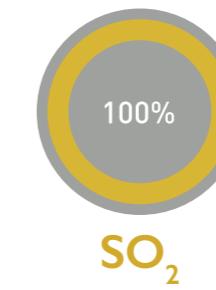
Measured Parameters

06

//AIR QUALITY STATUS



THE PERCENTAGE OF
COMPLIANT DAYS
WITHIN THE YEAR
IN ABU DHABI
MONITORING STATIONS



//METEOROLOGICAL DATA

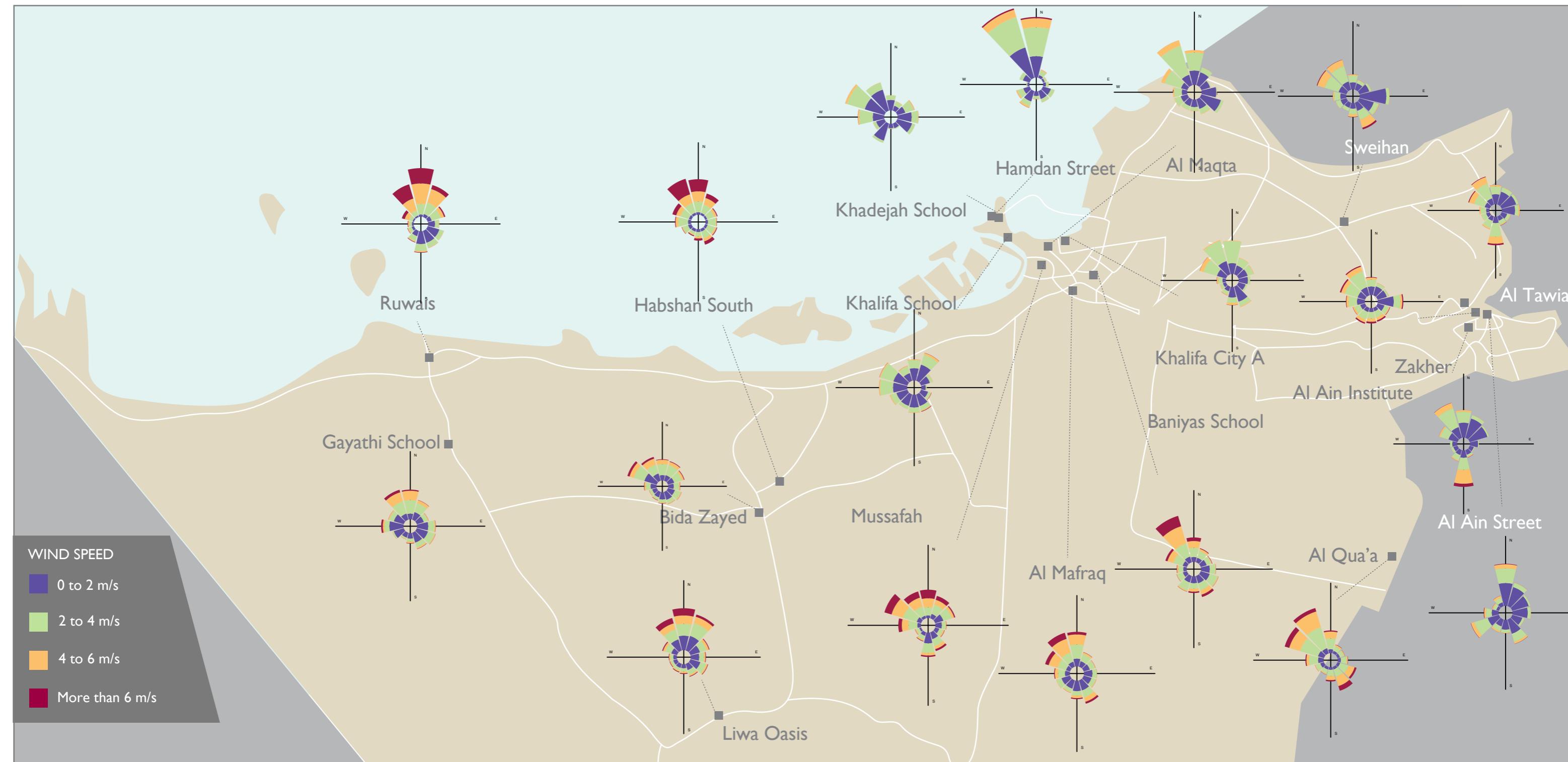
7

All EAD air quality monitoring stations are equipped with sensors to record meteorological parameters, which are essential to understand the ambient air quality patterns and local meteorological conditions. The meteorological parameters measured are: wind speed, wind direction, temperature, relative humidity, net radiation and barometric pressure.

The prevailing winds over Abu Dhabi are northwesterly winds, though differences in wind speed and wind direction may occur in specific locations due to local conditions and patterns. During the night, wind blowing from south-southeast also has a high percentage of occurrence.

The below map shows the wind roses in all of Abu Dhabi stations from 2007 to 2018, and the wind rose is a graphic tool used to describe the distribution of the wind speed and wind direction in a particular location. The frequency of the winds is plotted by wind direction, with colour bands showing wind speed ranges. The direction of the longest spoke shows the predominant wind direction in that location.

//WIND SPEED/DIRECTION DATA IN ABU DHABI STATIONS FROM 2007 TO 2018



PARTICULATE MATTER PM₁₀

Figure 1 shows the annual average PM₁₀ concentrations by region together with the linear regression of PM₁₀ annual means measured at all stations from the beginning of 2007 until the end of 2018.

Overall, there was a slight decrease in the trend of PM₁₀ concentrations from the beginning of 2007 until the end of 2018. During 2018, PM₁₀ concentration increased in all region except in Abu Dhabi industrial areas which constant. In Abu Dhabi Region the lowest concentration of PM₁₀ recorded by Khadejah School station, in Al Ain Region recorded by Al Ain Street station, and in Al Dhafra Region recorded by Ruwais station.

ANNUAL AVERAGE PM₁₀ CONCENTRATIONS

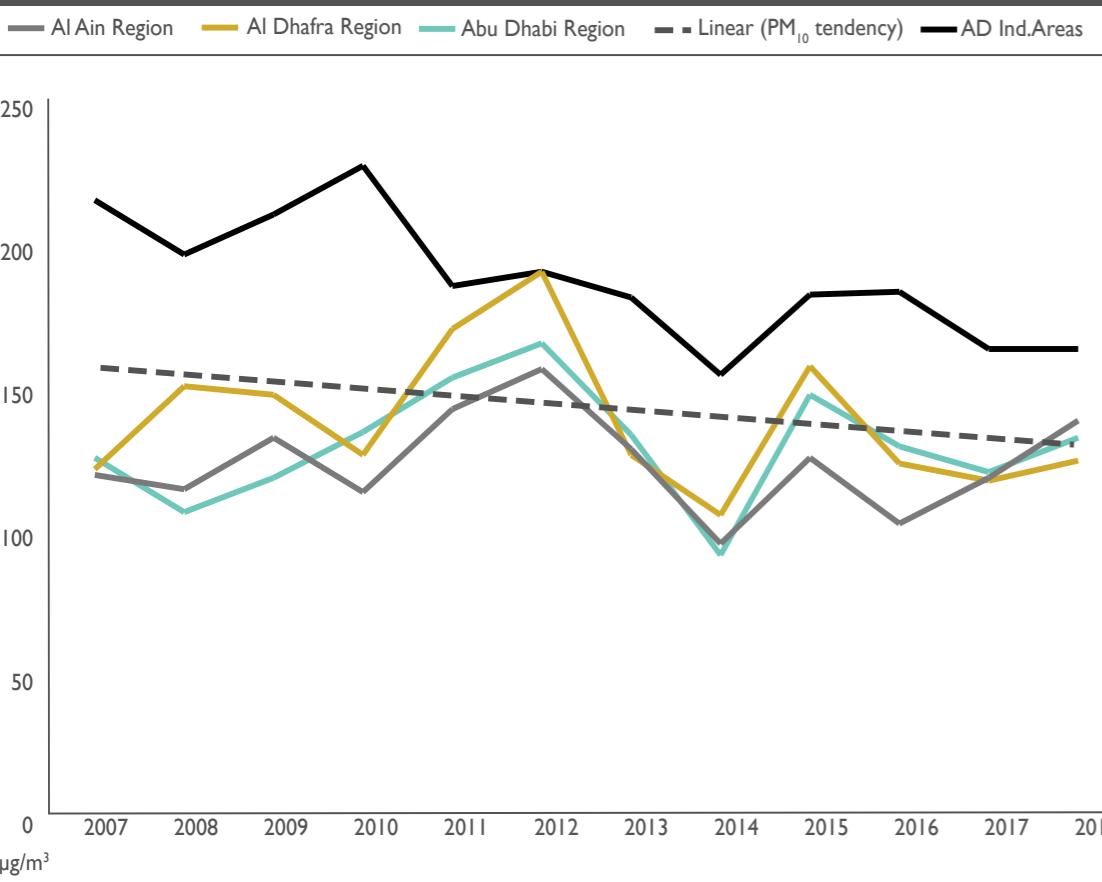
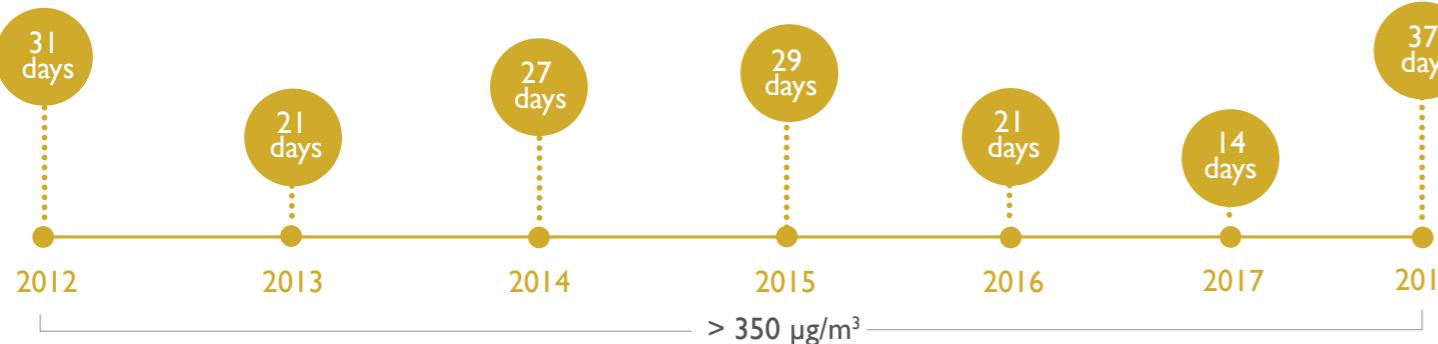


Figure 1:

Annual average concentrations for PM₁₀ given for the sites in the Al Dhafra Region, Al Ain Region, Abu Dhabi Industrial Areas and Abu Dhabi Emirate PM₁₀ linear regression from 2007 to 2018

The number of days where daily averages were above 350 µg/m³ are:



PARTICULATE MATTER PM_{2.5}

Figure 2 shows the annual average PM_{2.5} concentrations by region together with the linear regression of PM_{2.5} annual means measured at all stations from the beginning of 2012 until the end of 2018. The monitored PM_{2.5} levels in Abu Dhabi.

Overall, there was a slight increase in the trend of PM_{2.5} concentrations from the beginning of 2012 until the end of 2018. During 2018, PM_{2.5} concentration increased in all regions except in Abu Dhabi industrial area. In Abu Dhabi Region the lowest concentration of PM_{2.5} recorded by Khalifa City A station, in Al Ain Region recorded by Al Qu'a station, and in Al Dhafra Region recorded by Habshan Station.

ANNUAL AVERAGE PM_{2.5} CONCENTRATIONS

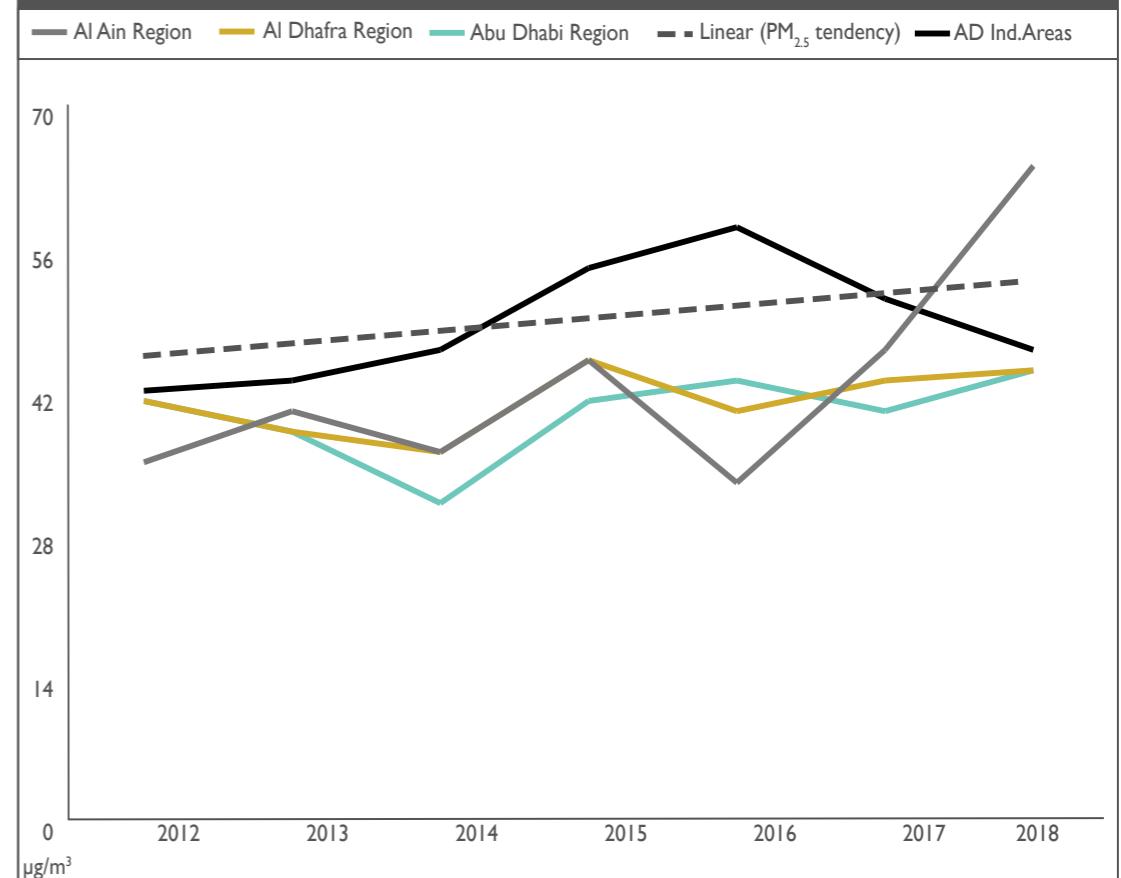


Figure 2:

Annual average concentrations for PM_{2.5} given for the sites in the Al Dhafra Region, Al Ain Region, Abu Dhabi Industrial Areas and Abu Dhabi Emirate PM_{2.5} linear regression from 2012 to 2018

2

OZONE O_3

Figure 3 shows the annual average O_3 concentrations by region together with the linear regression of O_3 annual means measured at all stations from the beginning of 2007 until the end of 2018.

Overall, there was a notably increasing in the trend of O_3 concentrations from the beginning of 2007 until the end of 2018. During 2018, O_3 concentration increased in all regions. In Abu Dhabi Region the lowest concentration of O_3 recorded by Baniyas School station, in Al Ain Region recorded by Al Qu'a station, and in Al Dhafra Region recorded by Bida Zayed Station.

O_3 TREND

Ozone trend can be related to the following factors:

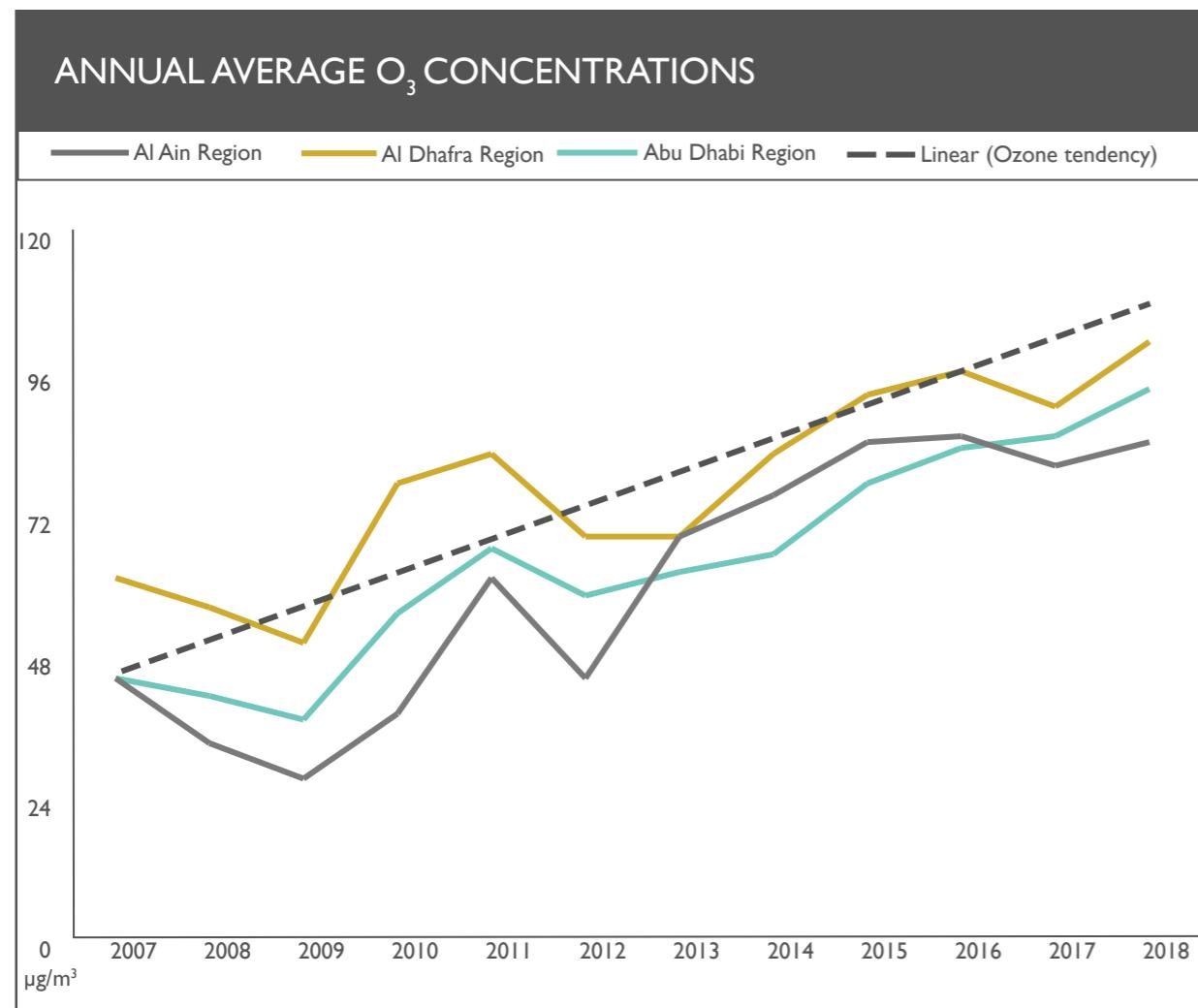


Figure 3:

Annual average concentrations for O_3 given for the sites in the Al Dhafra Region, Al Ain Region, Abu Dhabi Industrial Areas and Abu Dhabi Emirate O_3 linear regression from 2007 to 2018

DECREASE



Expand the use of renewable energy(e.g. solar energy) to reduce greenhouse gases.



Apply the best available technologies to control emissions.



Encourage the use of international best practices to minimize emissions.

INCREASE



An Increase of traffic and industrial activities.



Effect of global atmospheric circulation.



Climate change increasing global temperature leading to higher potential for O_3 generation

3

SULPHUR DIOXIDE SO₂

Figure 4 shows the annual average SO₂ concentrations by region together with the linear regression of SO₂ annual means measured at all stations from the beginning of 2007 until the end of 2018.

Overall, there was a slight increase in the trend of SO₂ concentrations from the beginning of 2007 until the end of 2018. During 2018, SO₂ concentration increased in all regions. In Abu Dhabi Region the lowest concentration of SO₂ recorded by Baniyas School station, in Al Ain Region recorded by Al Ain Street, Al Tawia and Al Qua'a stations, and in Al Dhafra Region recorded by Liwa Oasis Station.

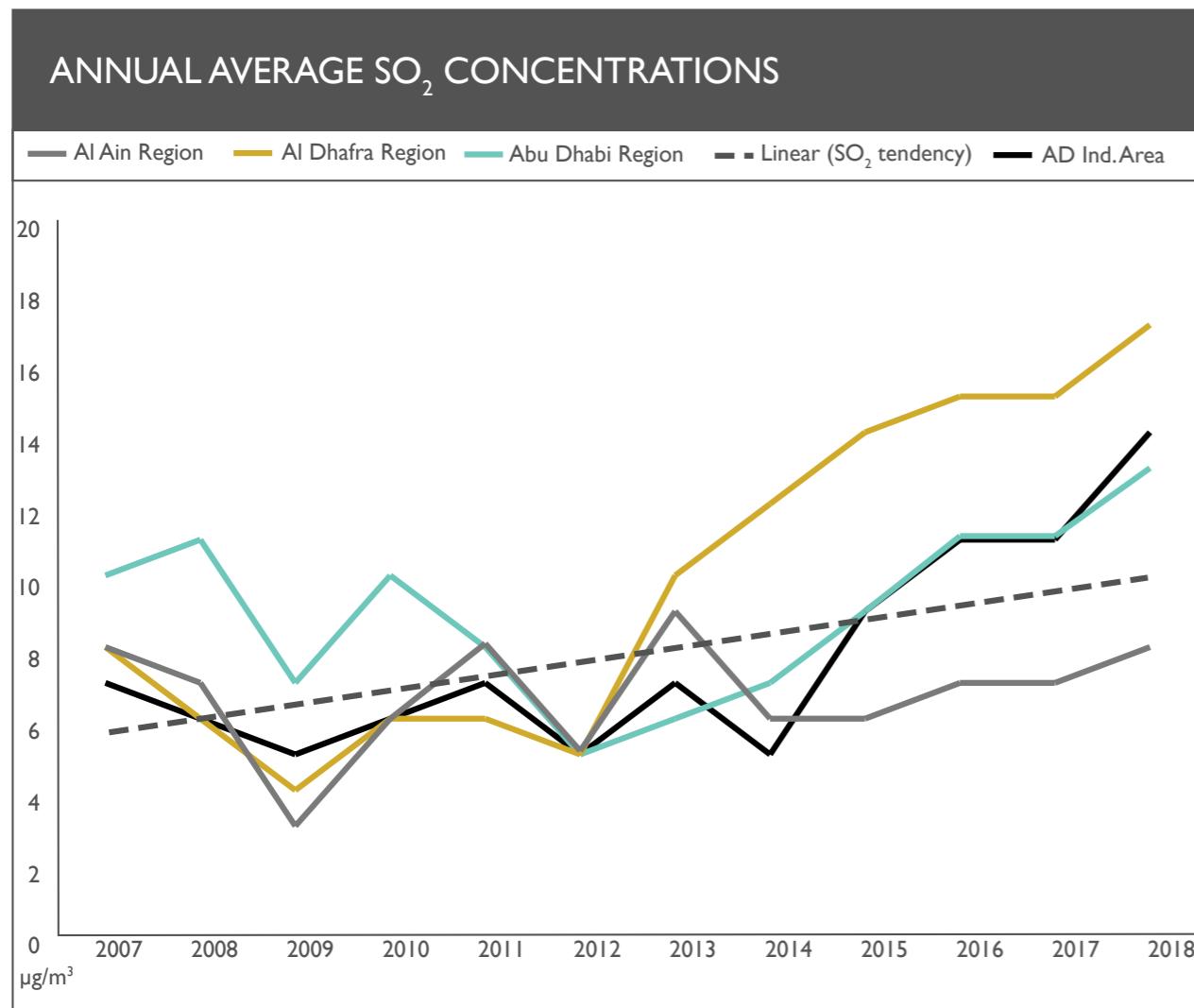


Figure 4:

Annual average concentrations for SO₂ given for the sites in the Al Dhafra Region, Al Ain Region, Abu Dhabi Industrial Areas and Abu Dhabi Emirate SO₂ linear regression from 2007 to 2018

NITROGEN DIOXIDE NO₂

Figure 5 shows the annual average NO₂ concentrations by region together with the linear regression of NO₂ annual means measured at all stations from the beginning of 2007 until the end of 2018.

Overall, NO₂ concentrations trend almost constant from the beginning of 2007 until the end of 2018. During 2018, NO₂ concentration slightly increased in both of Abu Dhabi Industrial Area and Al Dhafra Region, while constant in both of Abu Dhabi Region and Al Ain Region. In Abu Dhabi Region the lowest concentration of NO₂ recorded by Khalifa city A station, in Al Ain Region recorded by Al Qua'a station, and in Al Dhafra Region recorded by Liwa Oasis Station.

The annual average NO₂ concentrations reached 135%, 132%, 129%, 111% and 103% of the annual WHO guideline value at Hamdan Street, Mussafah, Al Mafraq, Al Maqta and Al Ain Street stations respectively.

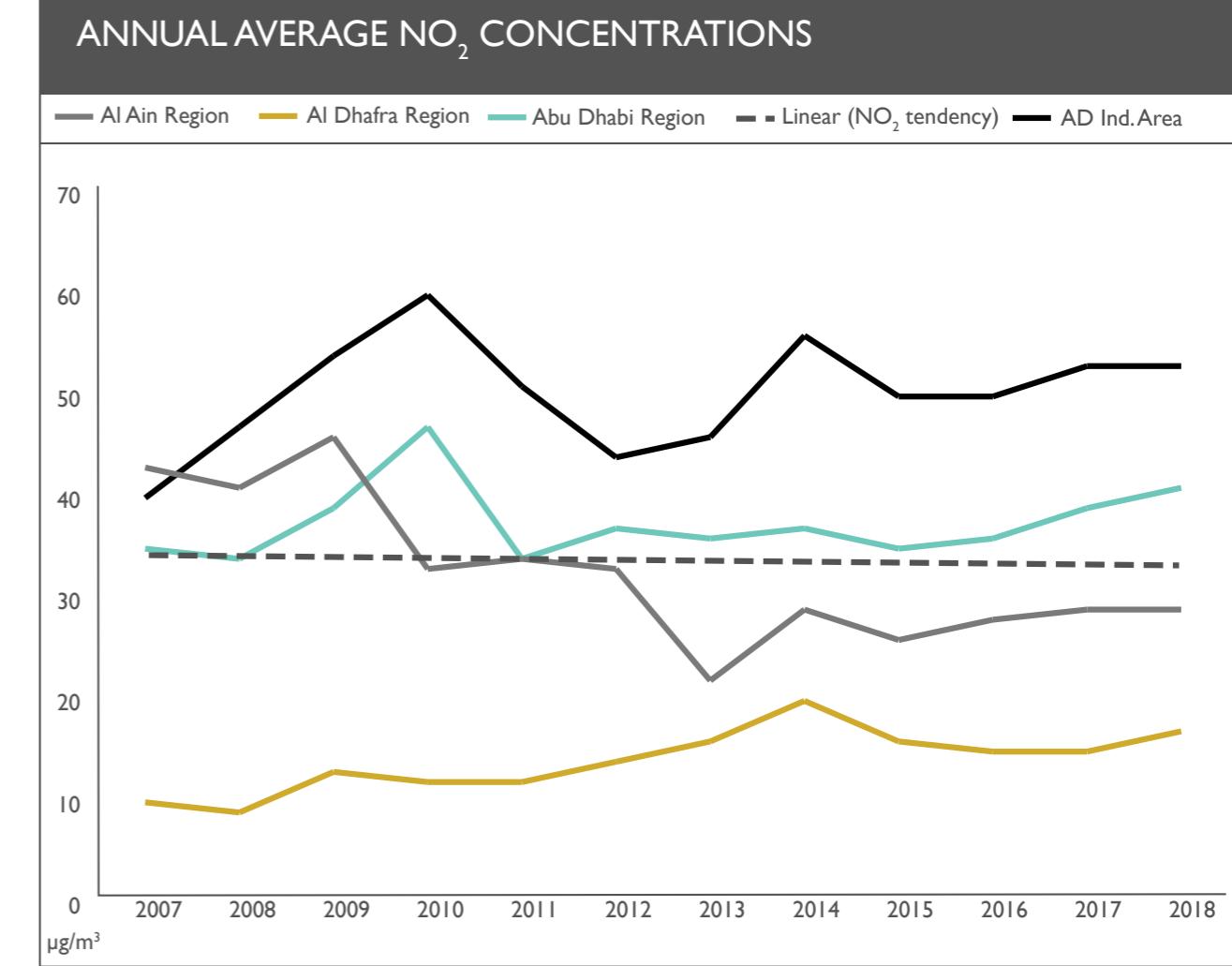


Figure 5:

Annual average concentrations for NO₂ given for the sites in the Al Dhafra Region, Al Ain Region, Abu Dhabi Industrial Areas and Abu Dhabi Emirate NO₂ linear regression from 2007 to 2018

4

5

CARBON MONOXIDE CO

The figure 6 shows the annual average CO concentrations by region together with the linear regression of CO annual means measured at all stations from the beginning of 2007 until the end of 2018.

Overall, there was a decrease in the trend of CO concentrations from the beginning of 2007 until the end of 2018. During 2018, CO concentration decreased in all region except Al Ain Region constant, and CO concentrations never exceeded any of the air quality limit value in the same year.

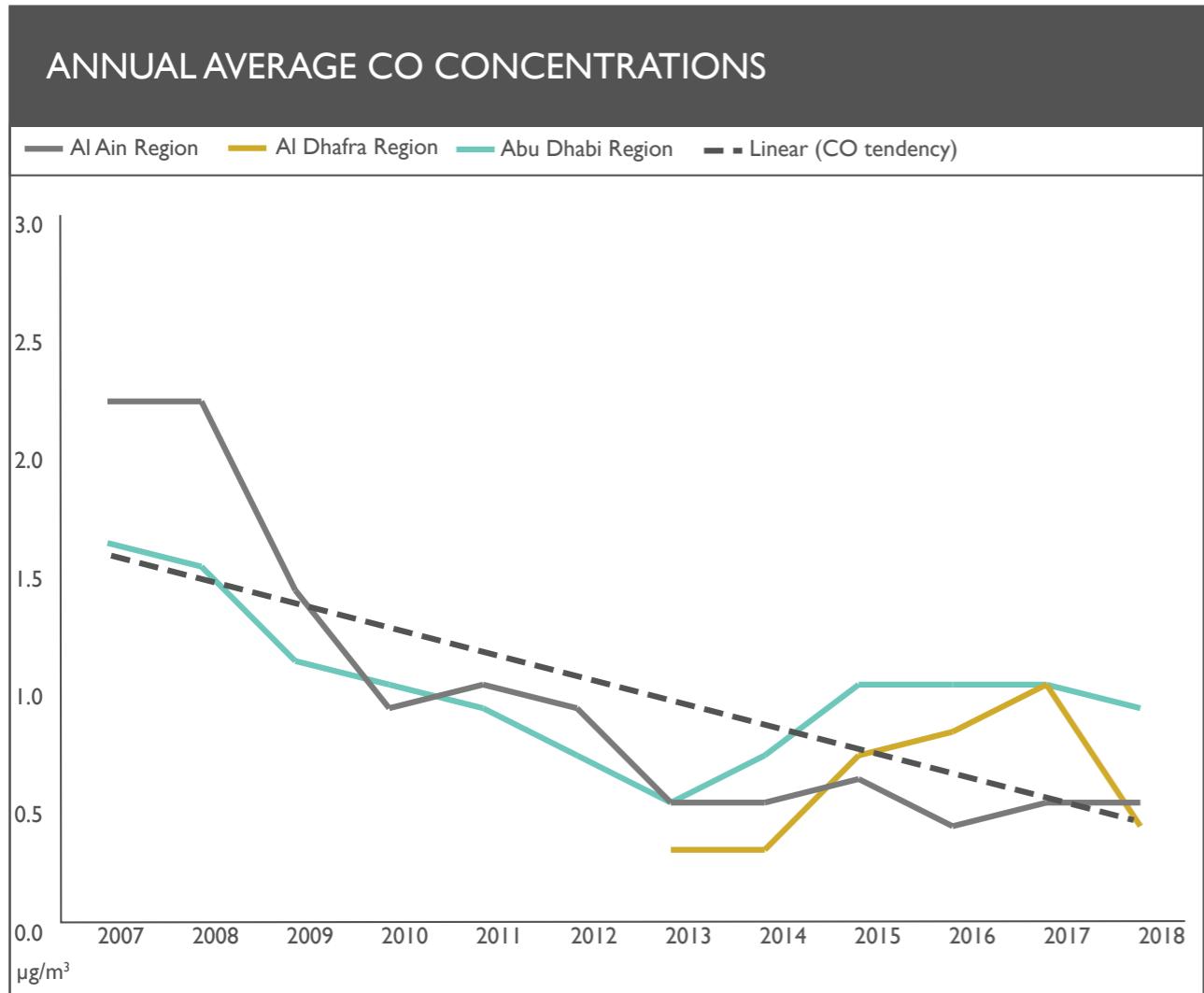


Figure 6 :

Annual average concentrations for CO given for the sites in the Al Dhafra Region, Al Ain Region, Abu Dhabi Industrial Areas and Abu Dhabi Emirate CO linear regression from 2007 to 2018

HYDROGEN SULPHIDE H₂S

There is no air quality limit value for H₂S in UAE. H₂S is not one of the criteria pollutants, but may cause odour nuisance at concentrations far below those that cause health hazards. The World Health Organization has presented a 24 hour average guideline value of 150 $\mu\text{g}/\text{m}^3$. Half-hour average concentrations exceeding 7 $\mu\text{g}/\text{m}^3$ are likely to produce odor problems and complaints among persons exposed.

The WHO guideline given for 24-hour average concentration of H₂S at 150 $\mu\text{g}/\text{m}^3$ was never exceeded. The highest observed daily average H₂S concentration observed in 2018 was 17% of the WHO guideline value at the Al Mafraq station.

In Abu Dhabi Emirate H₂S concentrations are well within the health threshold recommended by WHO. However, there has been an increase in H₂S concentrations in some specific area, which may cause odour nuisances.

6



The background image shows a satellite view of the Abu Dhabi coastline. The left side features a dark green, densely vegetated area, likely the Al Reem Island, transitioning into a light brown desert landscape. The water is a clear turquoise color. In the bottom right corner, there is a large, solid yellow rectangular block with a white diagonal line through it.

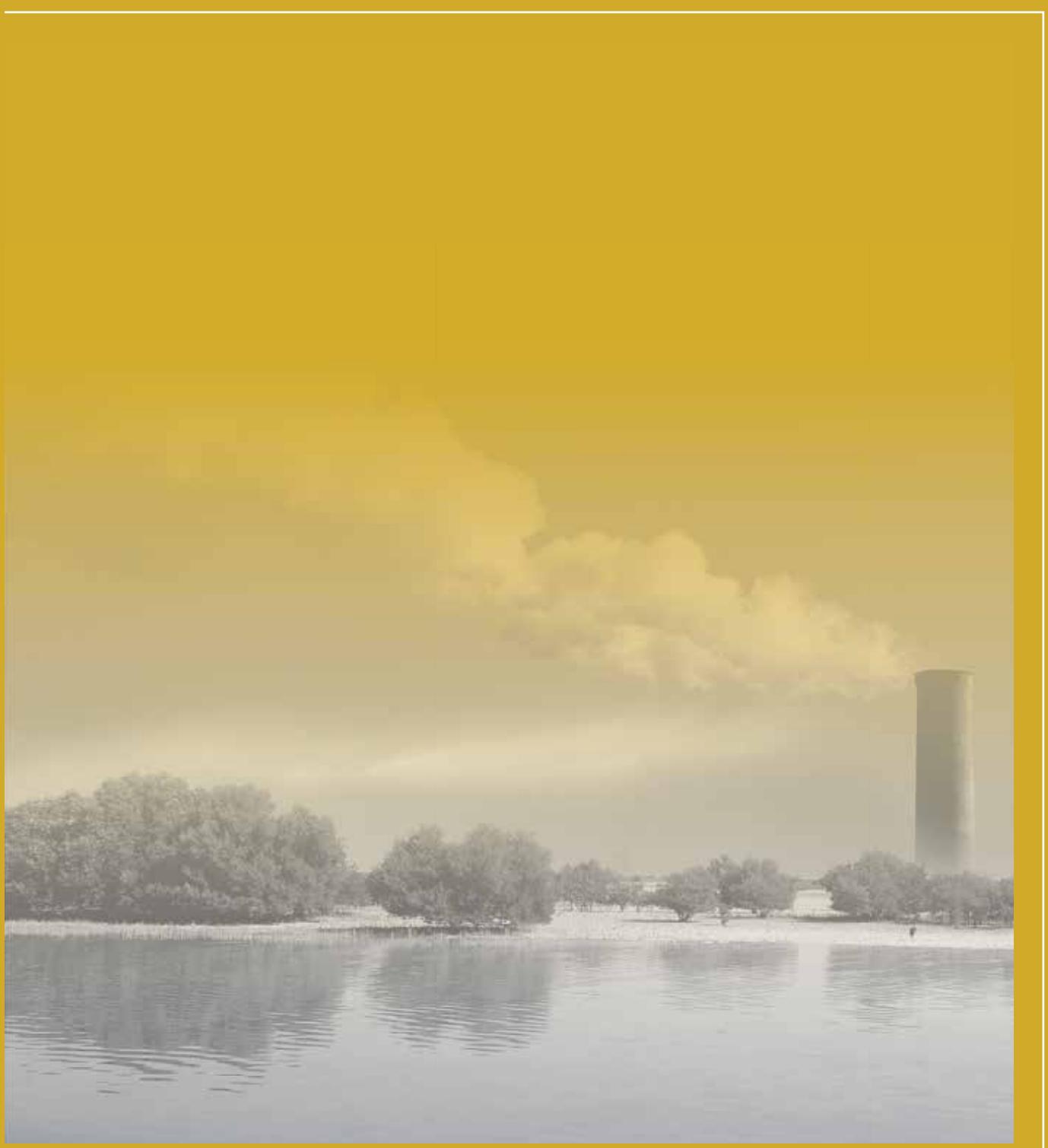
/CONCLUSION

Natural and man-made activities are the main contributors to the air quality of Abu Dhabi. Our desert environment plays an important role in quality of the air as well. As our population grows, our contribution to the level of air quality will get affected.

Together with the efforts of the Environment Agency-Abu Dhabi and all government entities who do their best in monitoring and minimising the effects of these man made activities in order to provide us with a clean environment.

To sum up, compared to the previous year, 2018 show a increase in the average PM_{10} concentration at all area except in Abu Dhabi Industrial Area constant. Also, there was a slight increase in O_3 average concentrations at all area in 2018 compared with the previous year. However SO_2 , NO_2 and CO were compliant in all the stations.





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