

Environmental Assessment of Criteria Pollutants in the Atmosphere of Northern Cyprus

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Abstract: The assessment of air quality involves the collection of data from different monitoring stations that record daily the concentration of major pollutants: carbon monoxide, sulphur dioxide, ozone, and nitrogen dioxide. for this study we used the data collected in the stations of Nicosia 0011, Kyrenia 0021, Famagusta 0031, Alevkayasi 0041, Nicosia 0051, Teknecik1 0061, teknecik2 0071, Kalecik 0081, Morphou 0091 and we could evaluate the quality of the air by interpreting the results of the collected data.

Keywords: Air Quality, Assessment, Criteria Pollutants, Monitoring Stations

INTRODUCTION

Air pollution results from various activities both human and artificial such as transport vehicles exhausts, construction and industrial activities leading to the release into the atmosphere of many pollutants such as carbon monoxide. Micro particles are much more produced by quarries and construction, sulfur dioxide and lead which they are much more produced by various industries. Although measures are taken to regulate the air quality in Northern Cyprus in accordance with international standards, it is difficult to ensure effective air quality because air quality monitoring is not possible ^[1]. The EC Directive, 2008 (2008/50 / EC) allows a maximum uncertainty of 15-25% for methods using fixed monitors, depending on pollutant considered, whereas the indicative measures modelling techniques have larger margins of error of up to 25-50%. To get an idea of air quality a network of terrain samples is generally placed in the area of interest ^[2]. Pfeffer et al. methods are expensive^[2] to implement and maintain and are also spatially limited because of their space and temporal variability, atmospheric aerosol monitoring is difficult. Based on data from various quality monitoring stations, it will be a question of assessing the air quality in Northern Cyprus.

MATERIALS AND METHOD

Method

In the air quality assessment, the key parameters considered are the values of the main pollutants (CO, NO_x, Pb, O₃...) which is achieved through measurements in different stations dispersed in the area (Northern Cyprus). Weekly data from April 18, 2018 to April 25, were collected from Nicosia 0011 station to view the concentration of these pollutants at different hours of the day. Also, the results of Nicosia 0052 traffic station were taken to see the contribution of vehicles to have an idea of how vehicles contribute to air pollution.

Materials

Northern Cyprus is covered by 9 monitoring stations Nicosia 0011, Kyrenia 0021, Famagusta 0031, Alevkayasi 0041, Nicosia 0051, Teknecik1 0061, teknecik2 0071, Kalecik 0081, Morphou 0091 the hourly concentration of air in carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen oxides (NO_x), suspended particles (PM) and ozone (O₃) are recorded and archived.

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Figure 1. Geographical Distribution of Monitoring Stations Monitoring Station of Nicosia 0011 Station Code: AMS-0011 ^[3]

Description of the Station

- Station Code: AMS-0011
- Station Type: Monitoring Station
- List of staff and measured quantities:
 - AF22M - SO₂
 - AC32M - NO, NO₂, NO_x
 - O342M - O₃
 - Sharp 5030 - PM_{2.5}
 - Meteorology (Kipp&zonen CMP3 pyranometre (4-20mA), HYGRO-THERMO TRANSMITTER - COMPACT Thies, Barotransmitter B-278-1T Thies, WindSonic - option I Gill) - WD, WV, T, H, GLRD, P



Figure 2. Air Monitoring Station (AMS) 0011 Equipment ^[3]



Figure 3. NICOSIA 0011 Monitoring Station ^[3]

RESULTS

In Nicosia station 0011 low SO₂ values were recorded, and moderate values of O₃ and PM10. At the Alevkayesi station moderate ozone values are recorded and low values of NO₂ and PM10 were recorded. while in the tekneçik1 monitoring station the values of SO₂ and O₃ are moderate and PM10 low. the Morphou station has found moderate data in PM10 and low data in NO₂. other stations did not collect significant data.

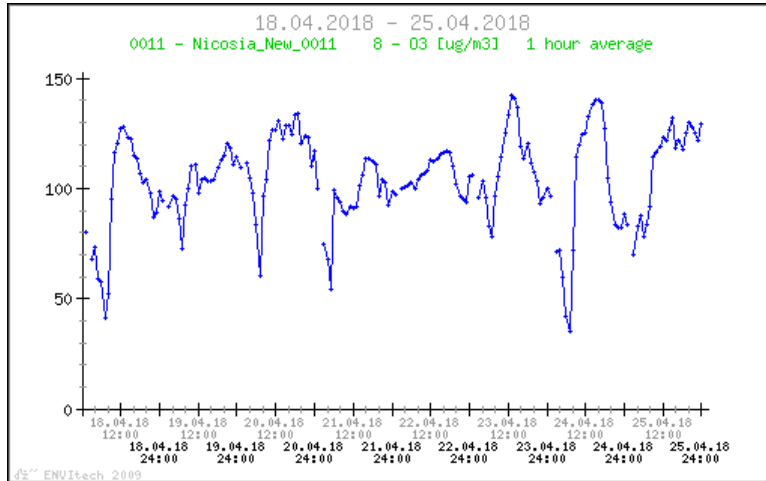


Figure 4. Ozone O₃, [ug/m³] in Nicosia, AMS – 0011 [4]

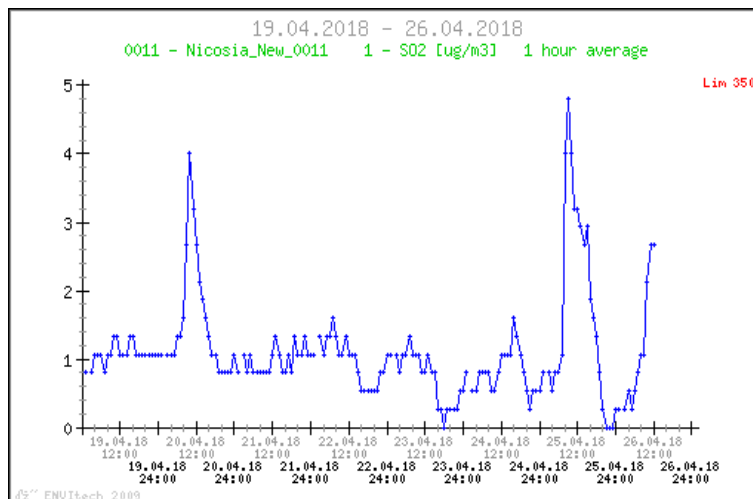


Figure 5. SO₂ Graph in Nicosia AMS – 0011 [5]

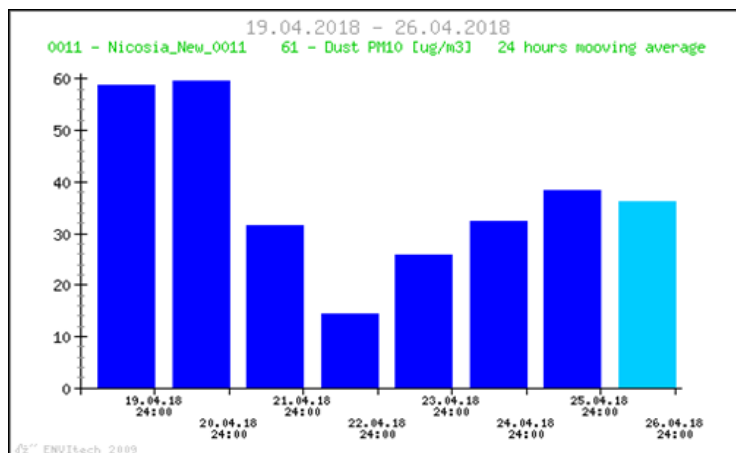


Figure 6. PM10 [ug/m³] Graph, Nicosia AMS – 0011 [6]

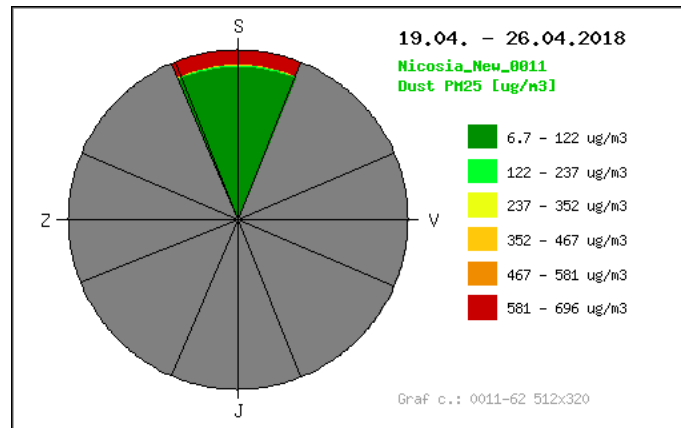


Figure 7. PM2 Concentrations Nicosia AMS – 0011 [7]

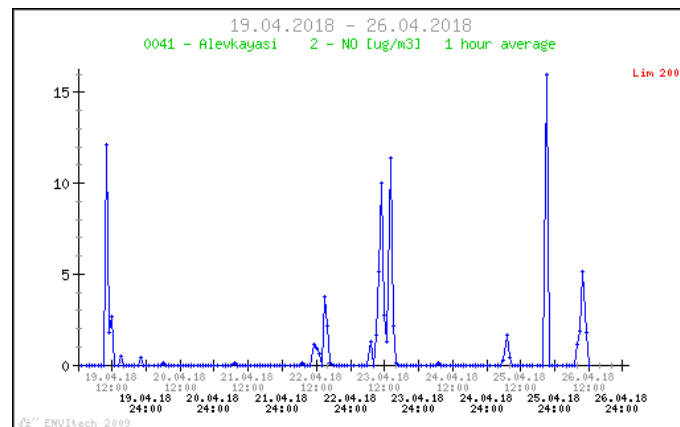


Figure 8. NO [ug/m³] Graph, Nicosia AMS – 0011 [8]

Concentrations change considerably during the week with the highest values recorded on April 25, 2013 (16ug/m³) and smallest value on April 22,2013 (2 ug/m³).

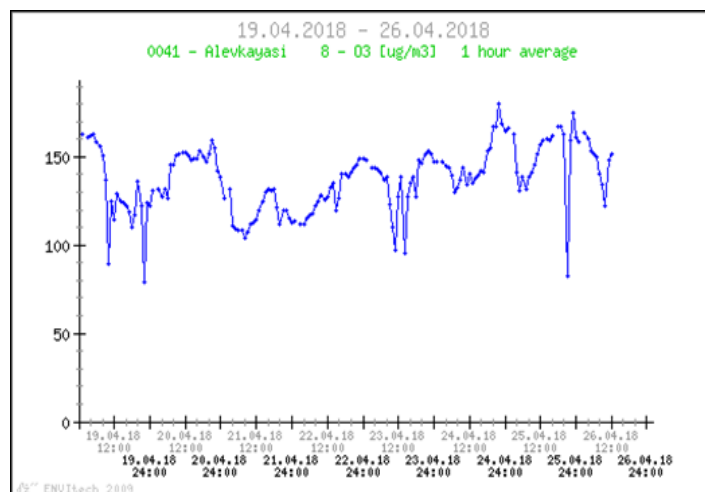


Figure 9. O₃ [ug/m³] Graph, Alevkaysi AMS – 0041 [9]

We can observe how the concentrations have changed a lot during the week with the highest value recorded on April 25, 2018 (180ug / m³) and the smallest value on April 26, 2018 (70ug / m³).

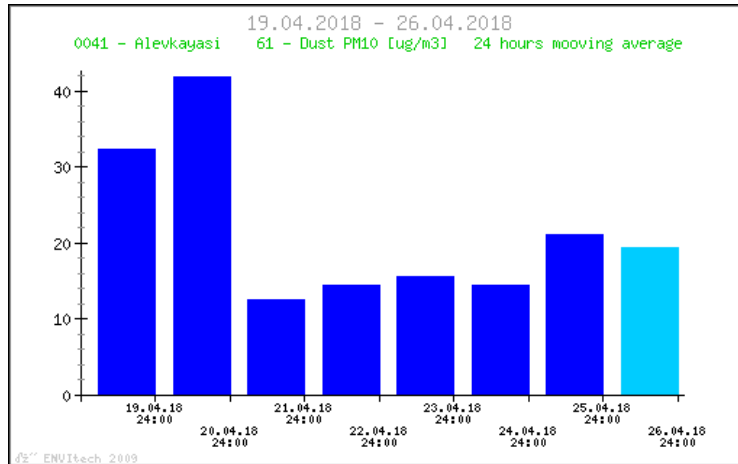


Figure 10. PM10 [ug/m3] Graph, Alevkayasi AMS – 0041 ^[10]

The maximum value of PM10 recorded in this station is 42ug / m3 on April 20, 2018 and the smallest value was 10ug / m3 on April 21, 1818.

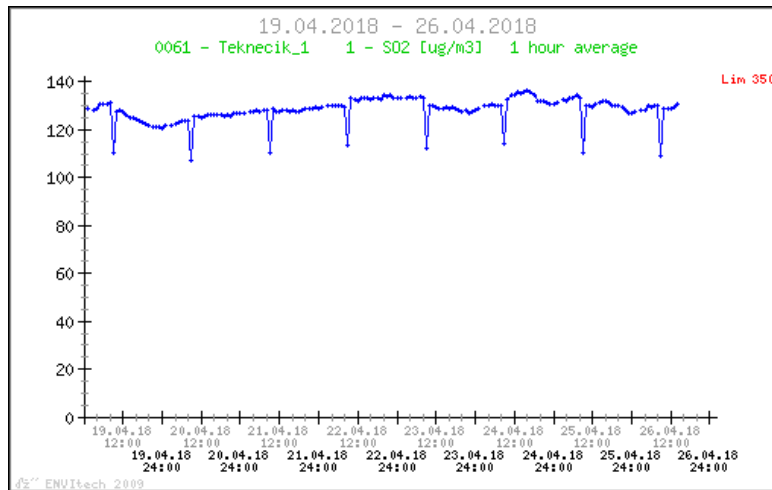


Figure 11. SO₂ [ug/m³] Graph in Teknecik_1 AMS – 0061 ^[11]

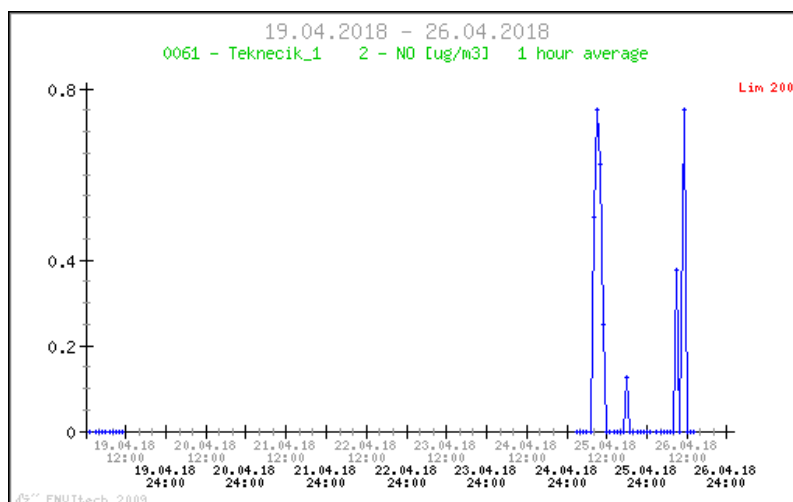


Figure 12. NO [ug/m³] Graph in Teknecik_1 AMS – 0061 ^[12]

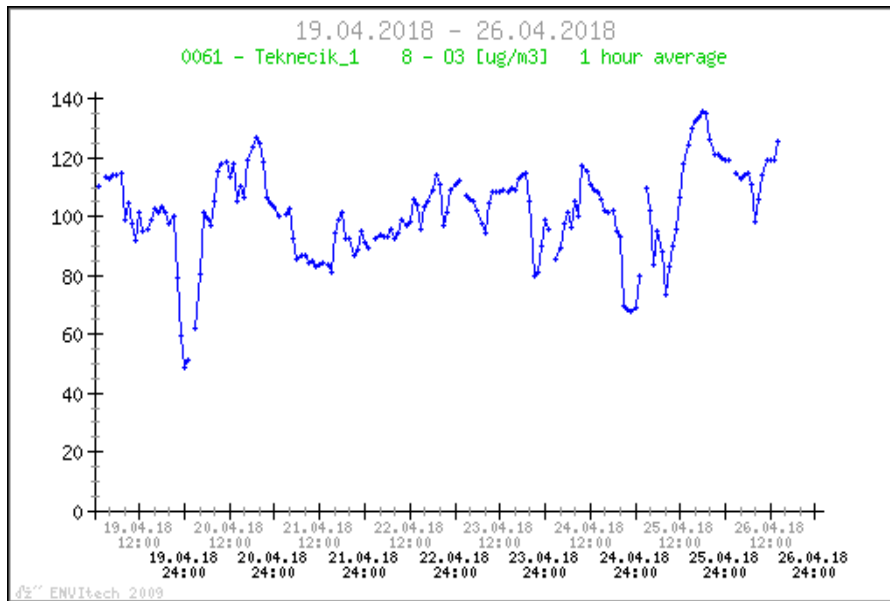


Figure 13. O₃ [ug/m³] Graph in Teknecik_1 AMS – 0061 [13]

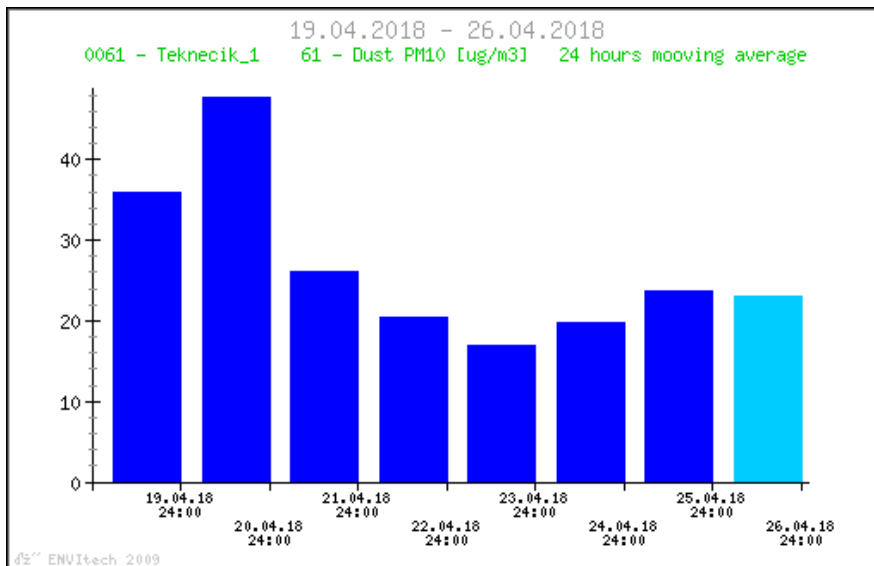


Figure 14. PM10 [ug/m³] Graph in Teknecik_1 AMS – 0061 [14]

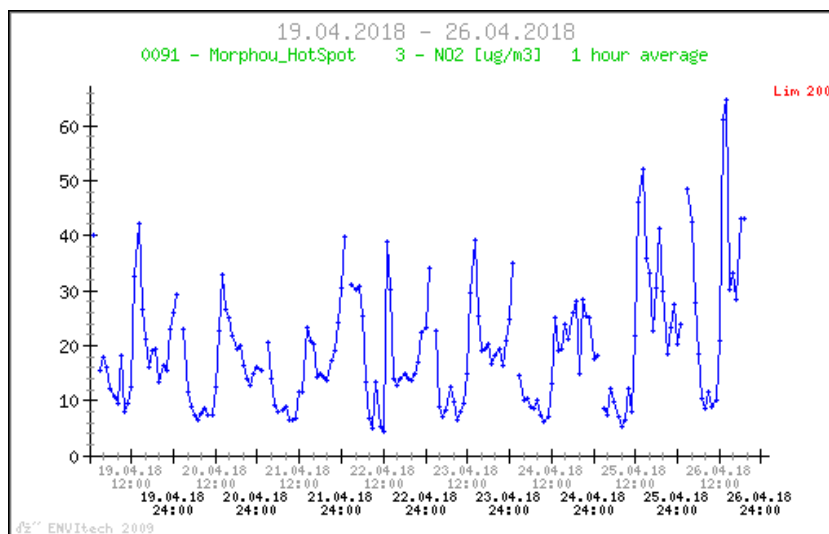


Figure 15. NO₂ [ug/m³] Graph in Morphou AMS – 0091 [15]

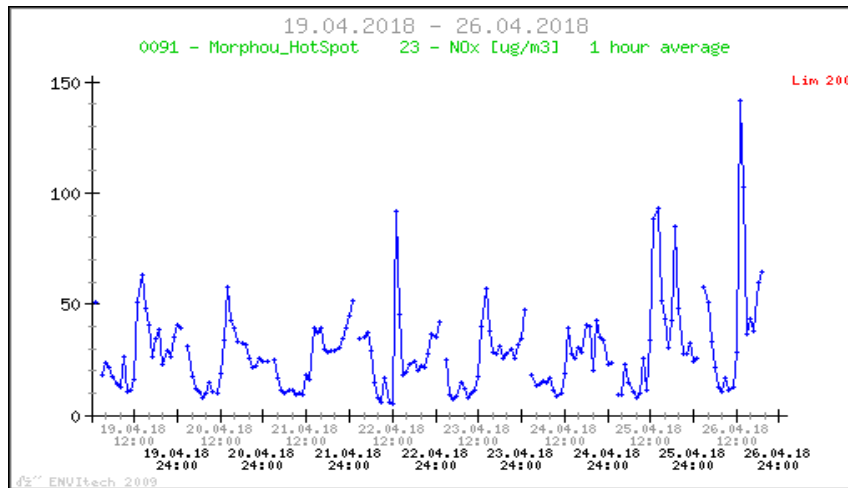


Figure 16. NO_x [ug/m³] Graph in Morphou AMS – 0091 [16]

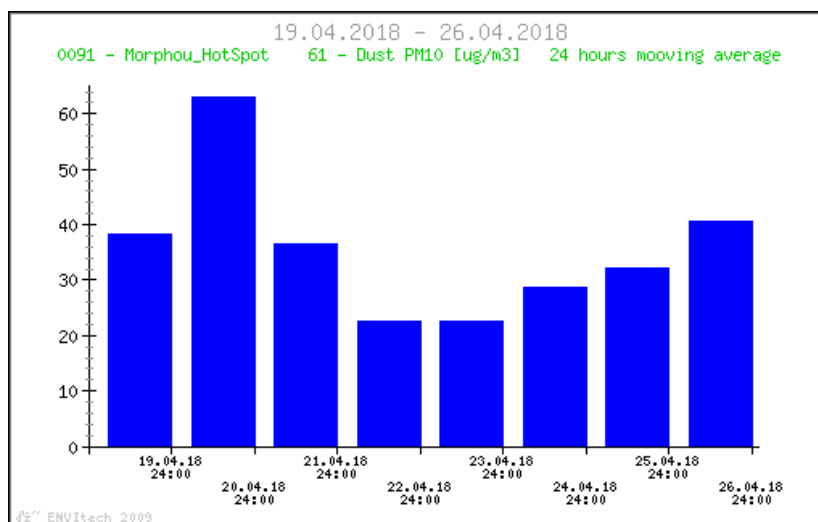


Figure 17. PM10 [ug/m³] Graph in Morphou AMS – 0091 [17]

DISCUSSION

Although in several stations there have been no reports criticizing what reflects a good air quality in these areas there are Nicosia stations 0011, Alevkayasi 0041, Morphou 0091, tekneçik1 have recorded data that may prove to be harmful and therefore requires action to regulate the quality of the air. Conformity to the norms will be of greater aid to air pollution related diseases and environmental impact. Table 1 and 2 give an account of the air quality as monitored in North Cyprus with table 3 showing a consistent standard of air-quality. Better policy making and air pollution control methods could be implemented.

Table 1. Air Quality Index - Stations

26.4. 2018 12:00	SO ₂	NO ₂	CO	O ₃	Dust PM10
Kyrenia	-	-	-	-	-
Famagusta	-	-	-	-	-
Alevkayasi	-	1	-	4	2
Nicosia_New_0011	1	-	-	3	3

Nicosia_Old_0051	-	-	-	-	-
Teknecik_1	3	1	-	3	2
Teknecik_2	-	-	-	-	-
Kalecik	1	-	-	-	-
Morphou_HotSpot	-	1	-	-	3

Table 2. Air Quality Index - Quantity

26.4. 2018 12:00	1	2	3	4	5	6	not measuring
SO2	2x		1x				6x
NO2	3x						6x
CO							9x
O3			2x	1x			6x
Dust PM10		2x	2x				5x

Table 3. Reference Guide for Pollutant Values

Pollution level	Index	PM10[24h] ug/m ³	O3[1h] ug/m ³	NO2[1h] ug/m ³	CO[8h] ug/m ³	SO2[1h] ug/m ³	Health Description
1	low	≤15	≤40	≤50	≤2	≤50	Effects are unlikely to be not those who are sensitive to air pollution
2	low	>15; ≤30	>40; ≤80	>50; ≤100	>2; ≤4	>50; ≤100	Effects are unlikely to be not those who are sensitive to air pollution
3	moderate	>30; ≤40	>80; ≤120	>100; ≤150	>4; ≤7	>100; ≤200	Mild effects, unlikely to require action, may noticed amongst sensitive individuals
4	moderate	>40; ≤50	>120; ≤180	>150; ≤200	>7; ≤10	>200; ≤350	Mild effect, unlikely to require action, may noticed amongst sensitive individuals

5	high	>50; ≤100	>180; ≤240	>200; ≤400	>10; ≤20	>350; ≤500	Significant effects may be noticed by sensitive individuals and action to avoid or reduce these effects may be needed
6	very high	>100	>240	>400	>20	>500	The effects on sensitive individuals may worsen, people are advised to reduce outdoors activities

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