



**1<sup>ST</sup> AFRICAN/MIDDLE-EAST EXPERT  
MEETING AND WORKSHOP ON THE  
HEALTH IMPACT OF AIRBORNE DUST**

**Amman, Jordan, 2-5 November 2015**

**eMISK : A Web-based  
GIS Application for the  
Management and  
Dissemination of Air  
Quality Data**



**الهيئة العامة للبيئة  
Environment Public Authority  
State of Kuwait**

**Dr. Marwan Al-Dimashki  
&  
Mr. Khaled Al-Dwaisan**

 **eMISK**  
Environmental Monitoring  
Information System of Kuwait

# Contents:

- 1) Environmental Protection Law in the State of Kuwait(No42/2014) .
- 2) Air Quality Management & Monitoring in Kuwait.
- 3) Establishment of the Environmental Monitoring Information System of Kuwait([www.emisk.org](http://www.emisk.org)).
- 4) Environmental Data Sharing and Publishing through the Kuwait Official Environmental Portal ([www.Beatona.net](http://www.Beatona.net)) and eMISK-Enterprise (intranet GIS-based application).
- 5) GCC-Environmental Portal.



# الهيئة العامة للبيئة بدولة الكويت

## Kuwait Environment Public Authority (KEPA)



**Article 7** of the new Environmental Protection Law N0 42/2014  
17 items defining KEPA's duties and tasks for the protection of the Environment in Kuwait

- Develop environmental policies, strategies and action plans.
- Develop national environmental standards, regulations and legislations.
- Establish environmental monitoring programmes and networks to monitor the environment.
- Conduct comprehensive inventories for the various environmental domains

# Chapter 3:

- **Article (50):** KEPA publishes air quality indicators on the website and informs the public of air quality levels.
- **Article (51):** KEPA establishes and develops the National Ambient Air Quality Monitoring Network. Governmental and private organizations must also establish their own air quality monitoring systems and link them with KEPA

# National Ambient Air Quality Standards (2001)

Pollutant	Unit	Hour*		8 hours		Day**		Year	
		ppb	µg/m <sup>3</sup>	ppb	µg/m <sup>3</sup>	ppb	µg/m <sup>3</sup>	ppb	µg/m <sup>3</sup>
Sulfur Dioxide (SO <sub>2</sub> )		170	444	-	-	60	157	30	80
Hydrogen Sulphide (H <sub>2</sub> S)		140	200	-	-	30	40	6	8
Nitrogen Dioxide (NO <sub>2</sub> )		100	225	-	-	50	112	30	67
Carbon Monoxide (CO)		30000	34000	10,000	11500	8000	9000	-	-
Ozone (O <sub>3</sub> )		80	157	60	120	-	-	-	-
Ammonia (NH <sub>3</sub> )		#800	850	-	-	-	-	140	148
Hydrocarbon Compounds without Methanes	1/10 from specified rate in works environment (TLV's) 0.24 ppm for three hours from 6:00 – 9:00 morning (a.m)								
Suspended particulate matter (PM-10)		-	-	-	-	-	350	-	90
Dust – Fall out Matter		-	-	-	-	-	-	7.5 ton /km <sup>2</sup>	
Lead		-	-	-	-	-	-	1.5 mg/m <sup>3</sup>	
Chlorine ##		30.0 (30 min.)	100	-	-	10	30	-	

## Notes:

\* Average hour should not occur more than twice during the period of 30 days on the same site.

\*\* Daily average (24 hours) should not occur more than once during the year.

## Should not occur more than once per year.

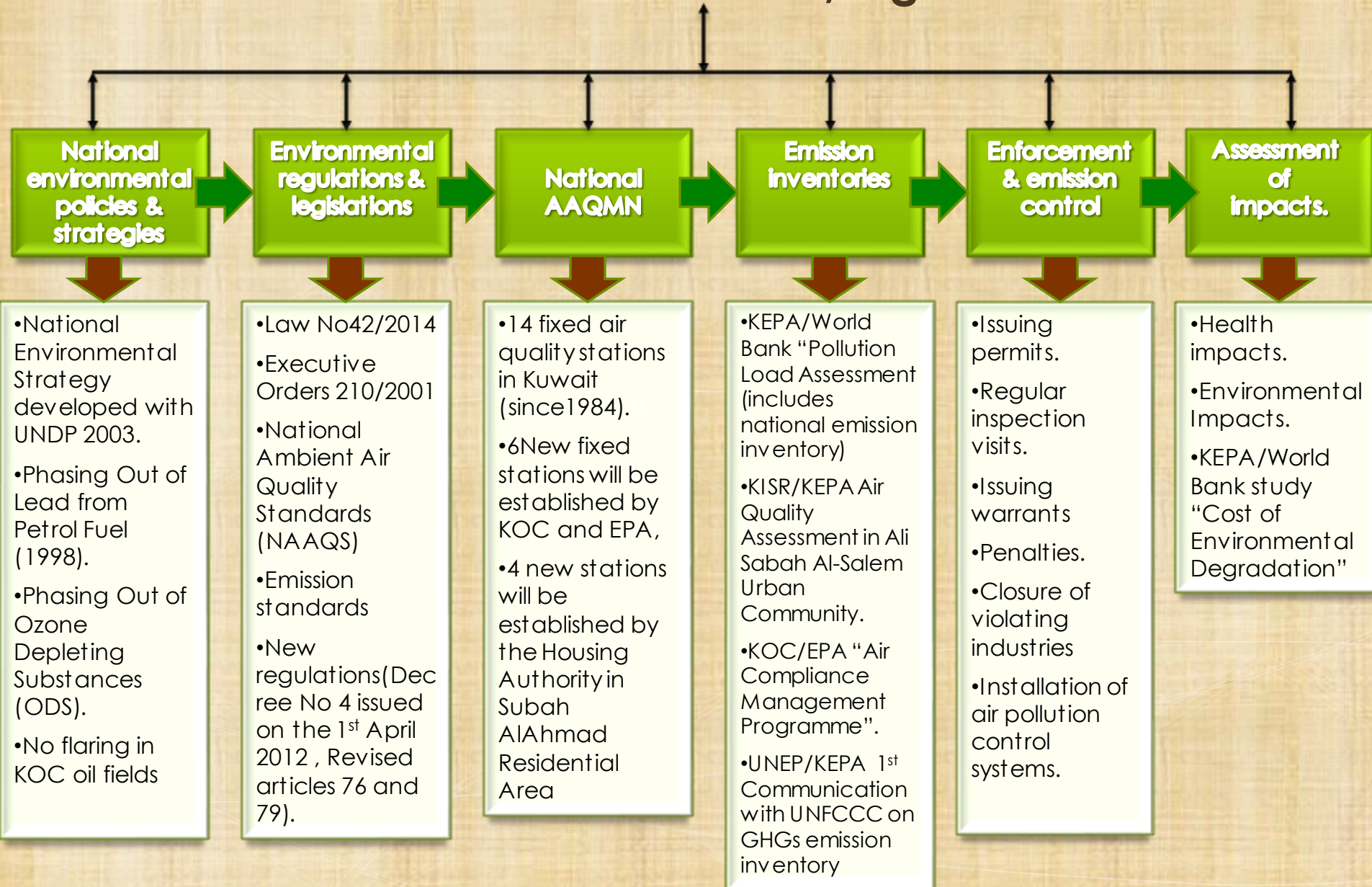
- Should apply in residential dominated areas that lie on the border of industrial areas.



**(2)**

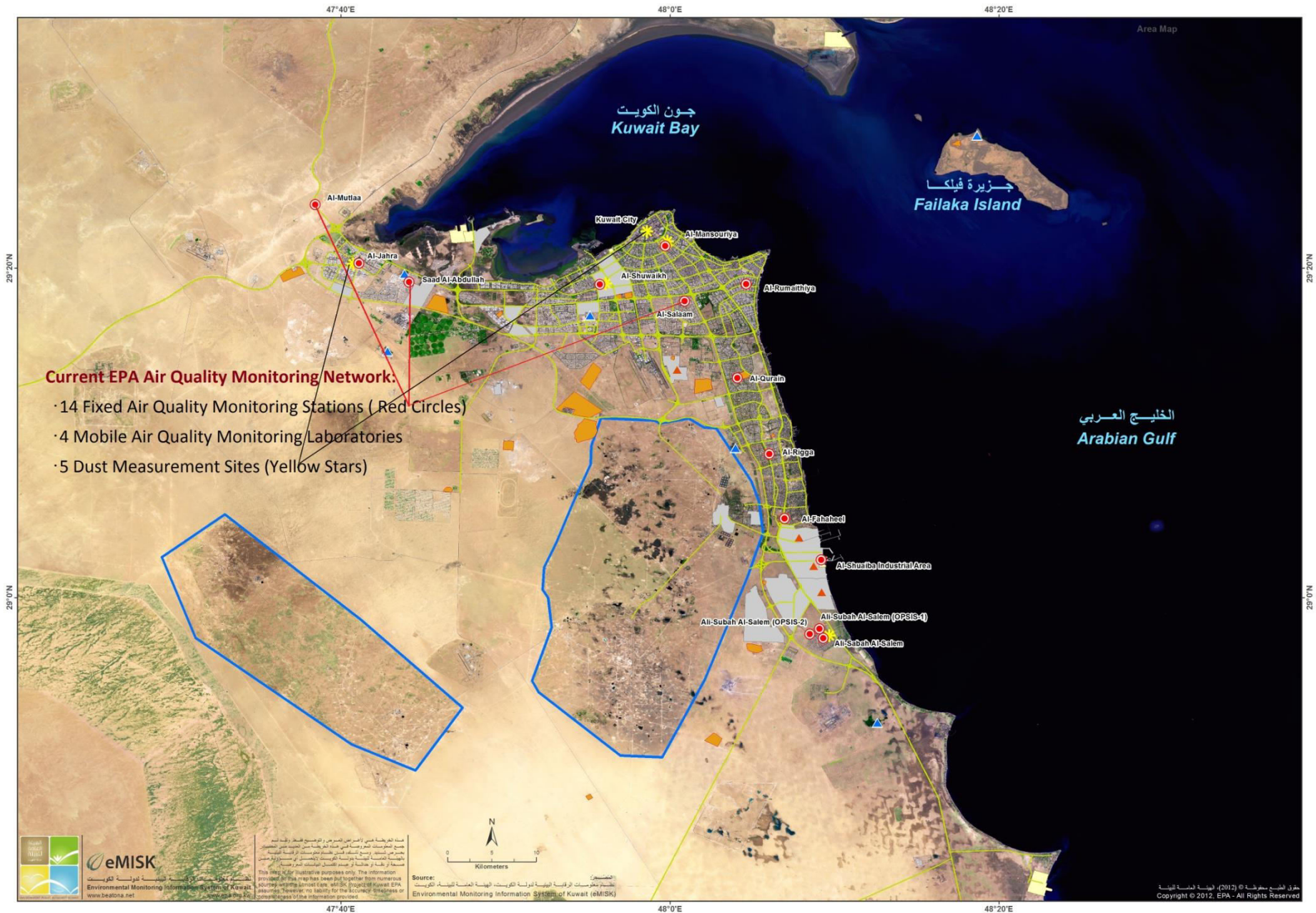
# **Air Quality Management and Monitoring in Kuwait**

# Kuwait Environment Public Authority in collaboration with relevant authorities/organizations





# Major Sources of Anthropogenic Air Pollution in Kuwait





# Air Quality Monitoring Stations (fixed and mobile)

## Air Quality Monitoring Stations (AQMS) in Kuwait:

**KEPA:** 15 Fixed + 4 mobile units + 1 roadside  
**KISR:** 3 mobile units  
**KOC/KEPA:** 7 Fixed (OPSIS)  
**KU:** 2 mobile units  
**KNPC:** 3 mobile units  
**EIA Firms:** 6 mobile units  
**Total AQMS = 41**



Road side



Conventional



OPSIS

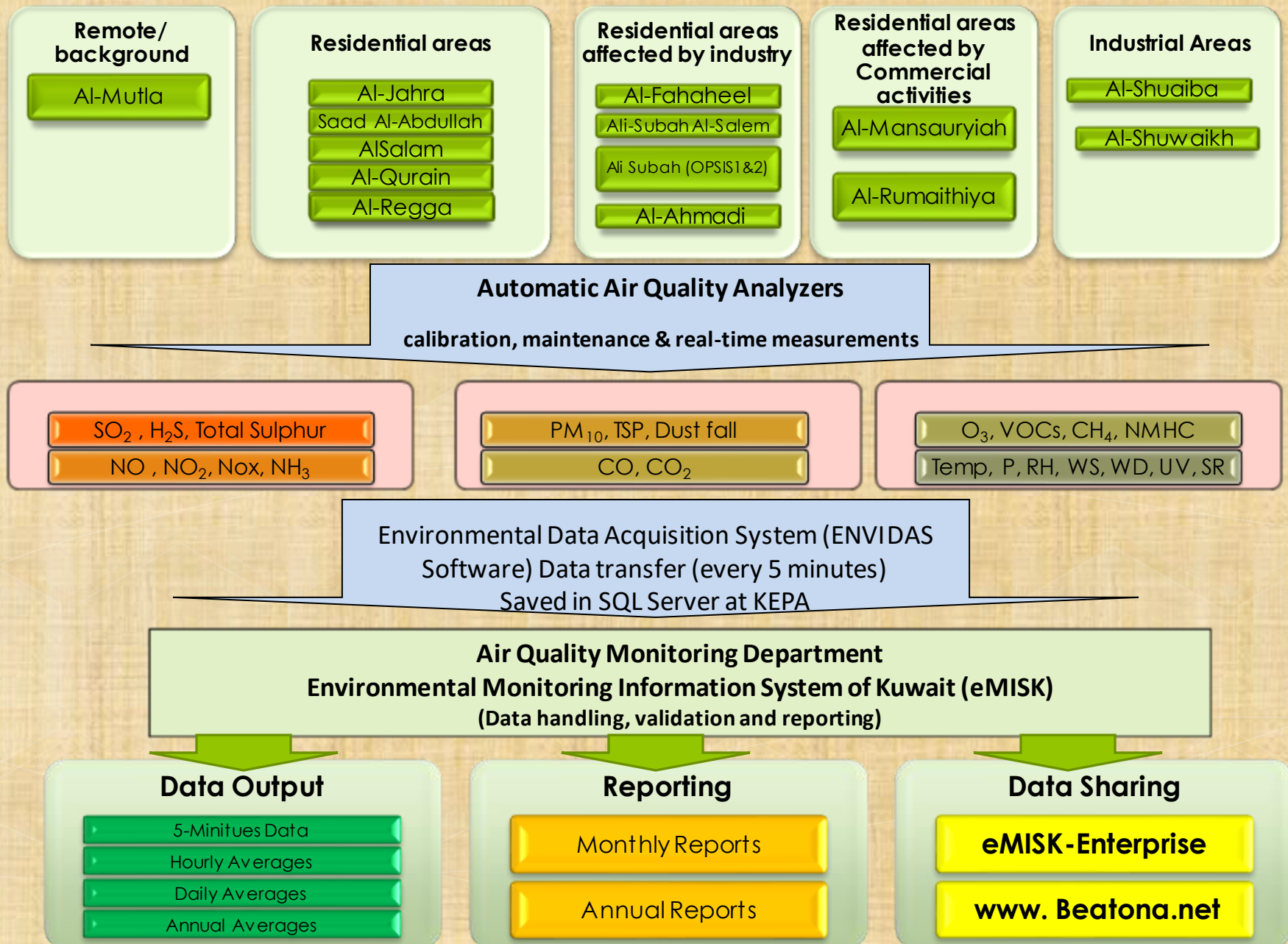


OPSIS



Conventional

# Ambient Air Quality Data Flow



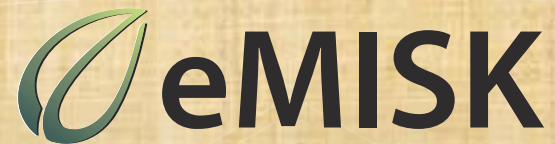


# Challenges in Environmental Data Management

- 1) Huge environmental data sets (1983)
- 2) Scattered at various departments and authorities  
(Gov., NGO's, Private sector, Oil sector, Research ins., etc..)
- 3) Present in different formats  
(printed tables, reports, maps, Excel, Word, ASCII, Access, SPSS)
- 4) Require validation

**(3)**

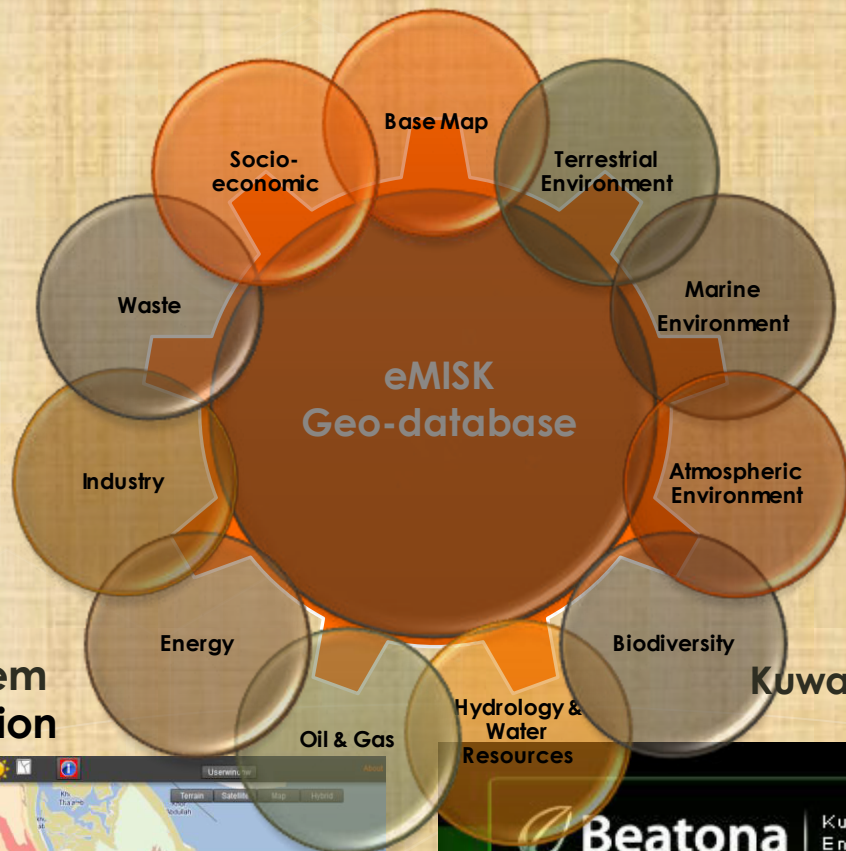
## **The Environmental Monitoring Information System of Kuwait (eMISK)**





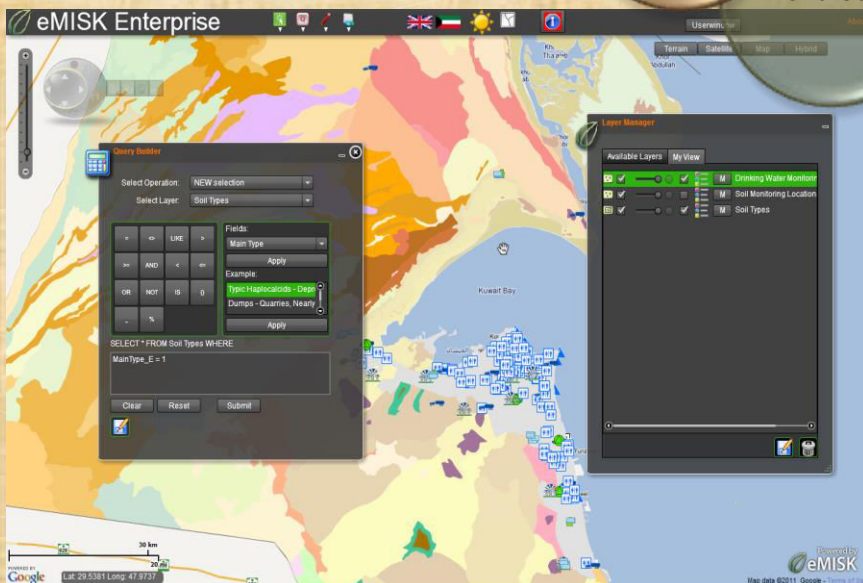
# eMISK Users





## eMISK-Enterprise System Intranet GIS Application

## Kuwait Official Environmental Portal Internet GIS Application

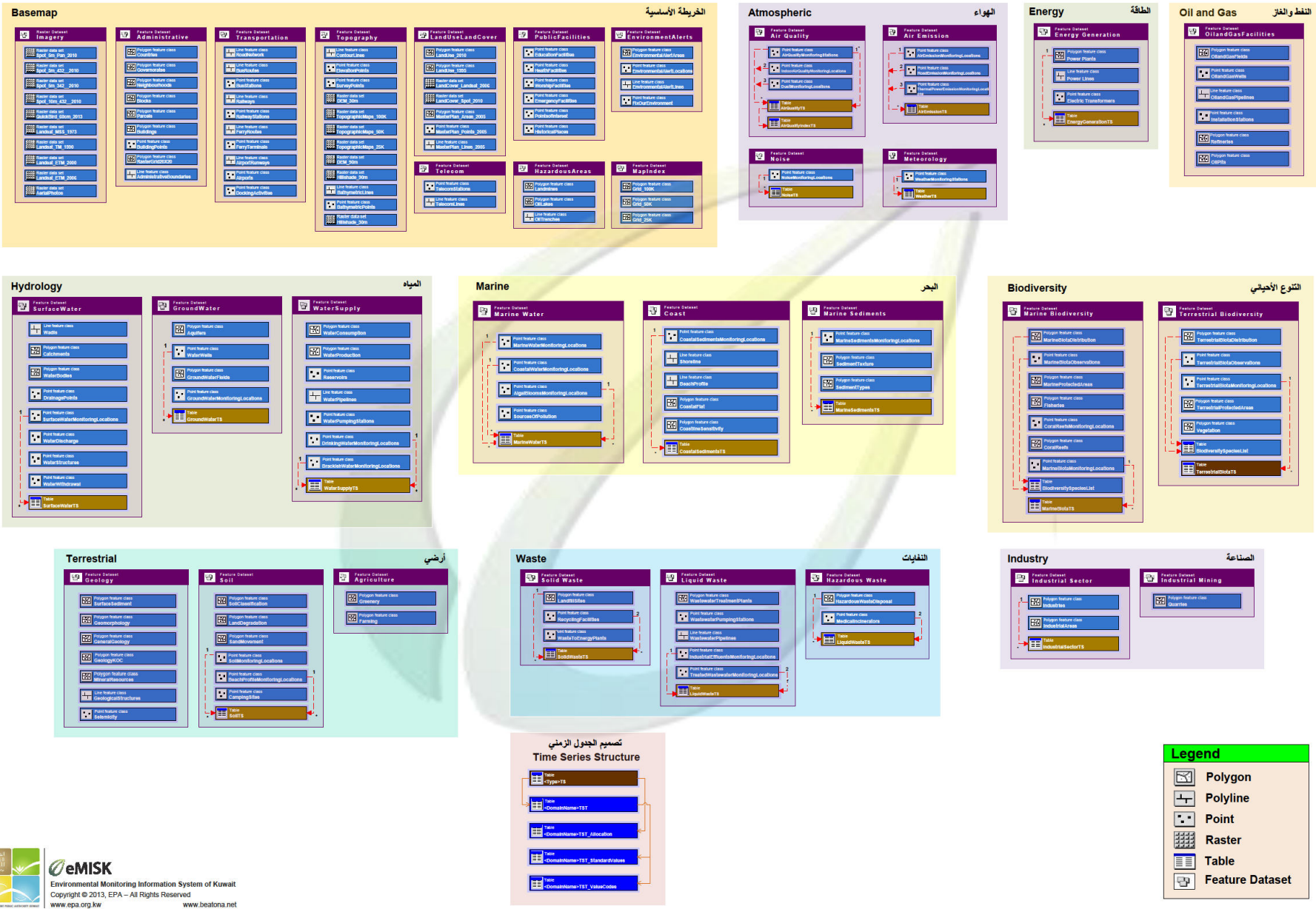


Kuwait Vision on Environmental Data  
Management





## eMISK Geo-database Structure



**(4)**

**Environmental Data Sharing and Publishing  
through :**

**eMISK-Enterprise**

**(<http://www.emisk.org/emiskenterprise/> )**

**and**

**Kuwait Official Environmental Portal**

**([www.Beatona.net](http://www.Beatona.net))**



# Review and analyze available GIS layers using

**eMISK Enterprise** English عربي

Terrain Satellite

50 km 40 mi

Lat: 29.2139 Long: 49.9503

**Layer Manager**

Available Layers My View

Search Layer:

Select Domain:

Basemap Terrestrial Hydrology Marine Industr

Select Dataset:

Geology Soil Agriculture

Available Layers:

- ☐ M Beach Profile Monitoring Locations
- ☐ M Camping Sites
- ☒ M Soil Types
- ☐ M Soil Groups
- ☒ M Sand Movement
- ☐ M Greenery
- ☐ M Farming
- ☐ M Land Suitability

clear Filter

POWERED BY Google

Terms of Use

# Time-series data

## Time Series

- ☒ Mean Value
- ☐ Exceedances above the National Standards in selected year/month
- ☐ Number of exceedances for selected station

Select Domain: Atmospheric

Select Layer: Air Quality Monitoring Stations

Select Stations: Al-Jahra New

Al-Mansouriya

Al-Mutlaa

Al-Qurain

Select a Parameter: Ozone

Particulate Matter -less than 10 micromete

Sulfur Dioxide

Averaging Time:

Year and Month

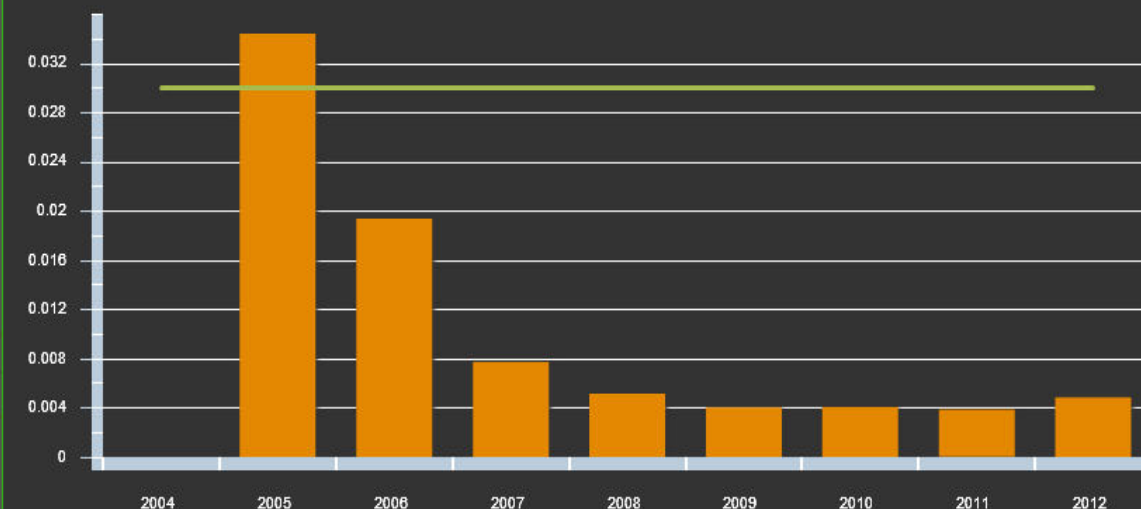
create chart

edit table

... finished

## Annual Mean Value of Sulfur Dioxide in Monitoring Station(s)

SO2, ppm



Al-Mansouriya Standard Value

Standard Value = 0.030 ppm

print result

export csv



# Number of hourly exceedance above the NAAQS per station over the years

eMISK Enterprise

English

عربي

Userwindow

Terrain

Satellite

Map

Hybrid

## TimeSeries

- ☐ Mean Value
- ☐ Exceedances above the National Standards in selected year/month
- ☒ Number of exceedances for selected station

Select Domain: Atmospheric

Select Layer: Air Quality Monitoring Stations

Select a Station: Al-Fahaheel

Ali-Subah Al-Salem

Ali-Subah Al-Salem (OPSIS-1)

Ali-Subah Al-Salem (OPSIS-2)

Select Parameters: Ozone

Particulate Matter -less than 10 micrometer

Sulfur Dioxide

Averaging Time: [object PeriodDTO]

[object PeriodDTO]

[object PeriodDTO]

from Year to Year 2006

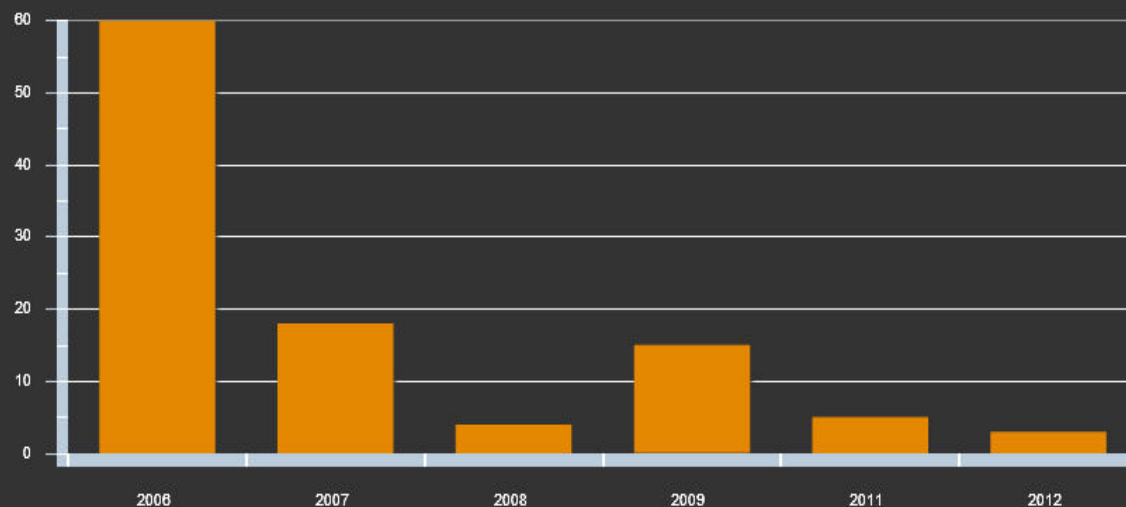
create chart

edit table

... finished

## Number of Hourly Exceedances above the National Standards for Al-Fahaheel Station

Column ...

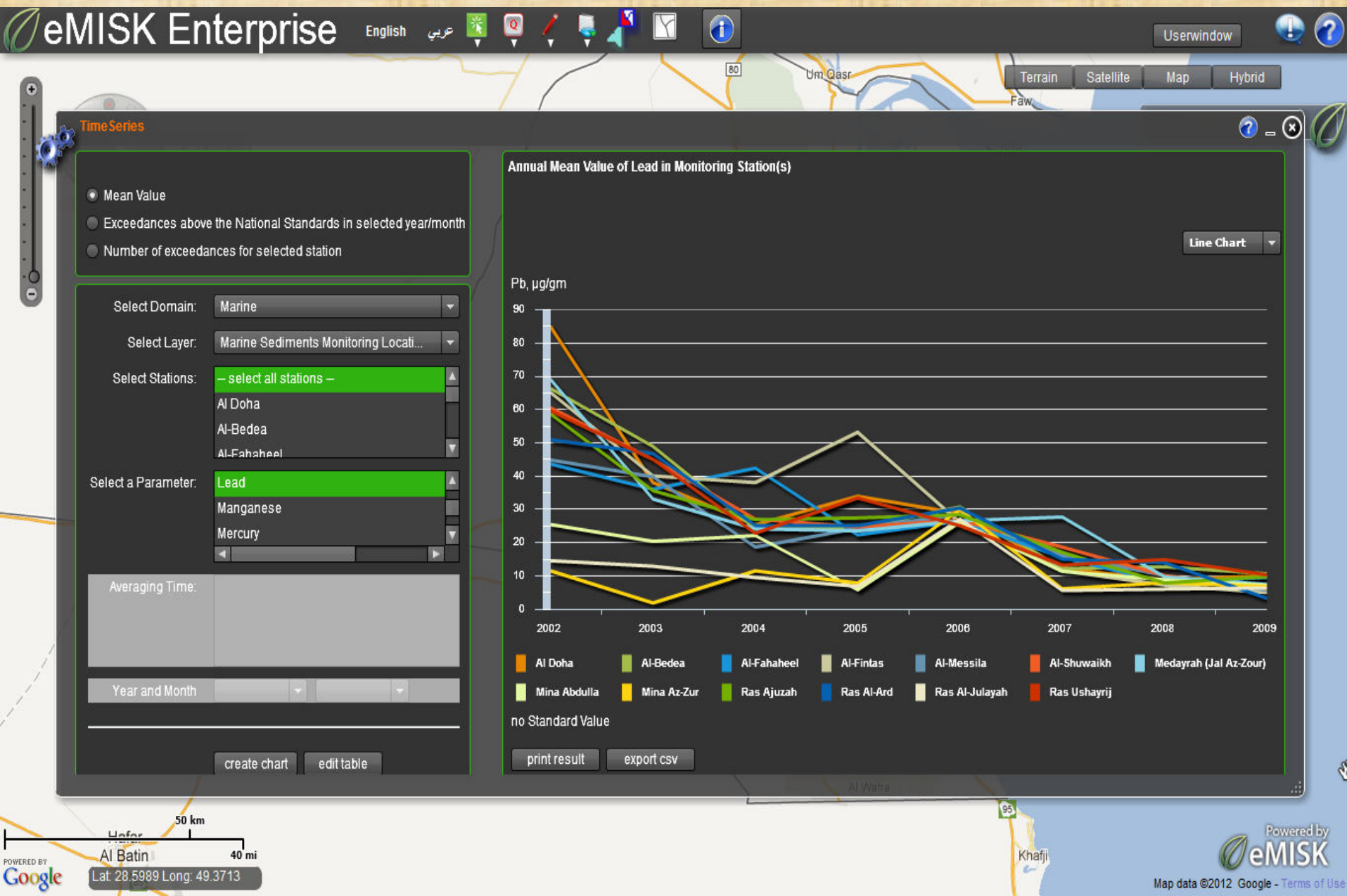


Sulfur Dioxide

print result

export csv

# Decline of lead concentration in marine sediments over the years following the phasing out of lead from petrol





# Kuwait Official Environmental Portal

## [www.Beatona.net](http://www.Beatona.net)

Beatona.net is composed of two major sections:



# Environmental Explorer (GIS-Based)

Environmental Explorer | Knowledge Base | Tuesday 03 Nov 2015 | العربية | English

Beatona Our Environment | Kuwait Official Environmental Portal

Street Satellite Hybrid Terrain None

5 Major Modules

The Module “Our Environment Status” displays the continuous air quality monitoring data as “Air Quality Index” as well as charts of the historical air quality data in Kuwait.

Relevant Organizations | Partners

Environment Public Authority (EPA)

EXPLORE Beatona & Create your own GIS Map

HOT ISSUE

حوت نافق بطول 15 متراً في رأس عجوزة

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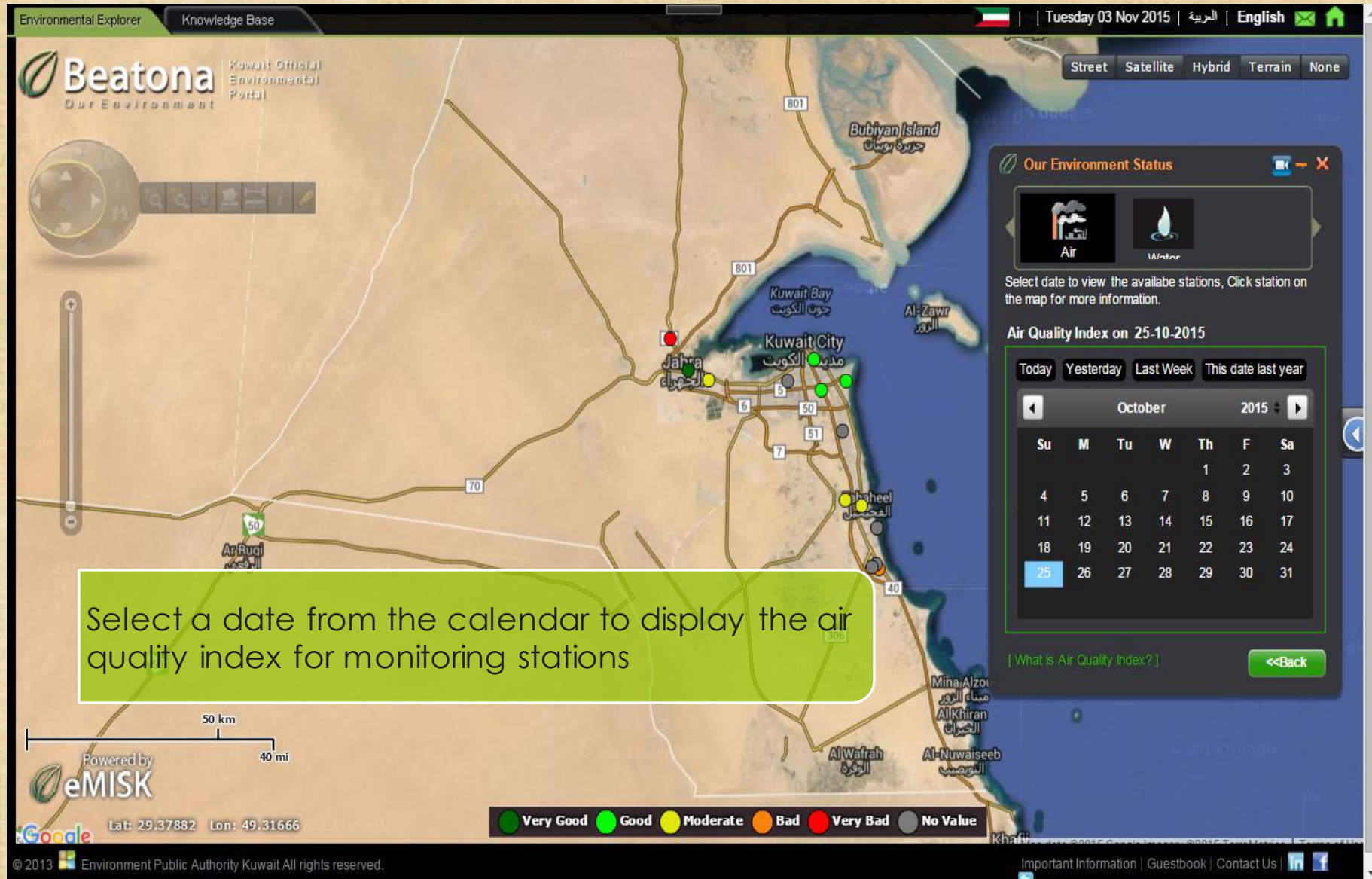
# KAQI Categories and description

$$I_p = \frac{I_{Hi} - I_{Lo}}{BP_{Hi} - BP_{Lo}} (C_p - BP_{Lo}) + I_{Lo}$$

KAQI Category	KAQI Value	Description
Very good	0 – 50	The air quality considered To be very good. Concentrations of all air pollutants are well below the National Air Quality Standards (NAQS)
Good	51 – 100	Air quality is acceptable. Concentrations of all air pollutants are still within the National Air Quality Standards (NAQS) with no reported exceedances
Moderate	101 – 150	The air quality is moderate, where a limited/marginal exceedance above of the National Air Quality Standards (NAQS) has been reported. Members of sensitive groups may experience health effects, however, the general public is not likely to be affected
Bad	151 - 300	The air quality is bad, where a significant exceedance above the National Air Quality Standards (NAQS) has been reported. Everyone may begin to experience health effects. Members of sensitive groups may experience more serious health effects
Very bad	301 – 500	The air quality is very bad, where a very high exceedance above the National Air Quality Standards (NAQS) has been reported. Health warnings of emergency conditions. The entire population is more likely to be affected

# Our Environment Status

## Display Air Quality Index for Monitoring Stations





# Our Environment Status

## Display Air Quality Index & Station Details

Environmental Explorer Knowledge Base

Beatona Kuwait Official Environmental Portal

Street Satellite Hybrid Terrain None

**Our Environment Status**

**Air Station**  
**Al-Fahaheel**  
Last Updated : 31-10-2015  
Address: Fahaheel New Health Centre.  
Location: Lat: 29.08033 Lon: 48.11601  
Site Description: This station is located in the south of Al-Fahaheel residential area on the roof of the new health care centre. This site is close to AlAhmadi Port and Al-Shuaiba and Mina Abdulaah Industrial Areas in the south and the oil fields

Air Quality Index on 25-10-2015  
**Moderate**  
Click on pollutant for more details.

O <sub>3</sub> 18	<b>NO<sub>2</sub></b> 113	SO <sub>2</sub> 7
PM <sub>10</sub> 32	CO 23	

The AIR QUALITY was Moderate because Nitrogen Dioxide levels were above the national air quality standards.

[ What is Air Quality Index? ]

<<Back Exit

View station details and the air quality index (AQI) for 5 criteria air pollutants (Ozone, Nitrogen Dioxide, Sulphur Dioxide, Carbon Monoxide and Particulate matter of 10 microns)

Powered by eMISK

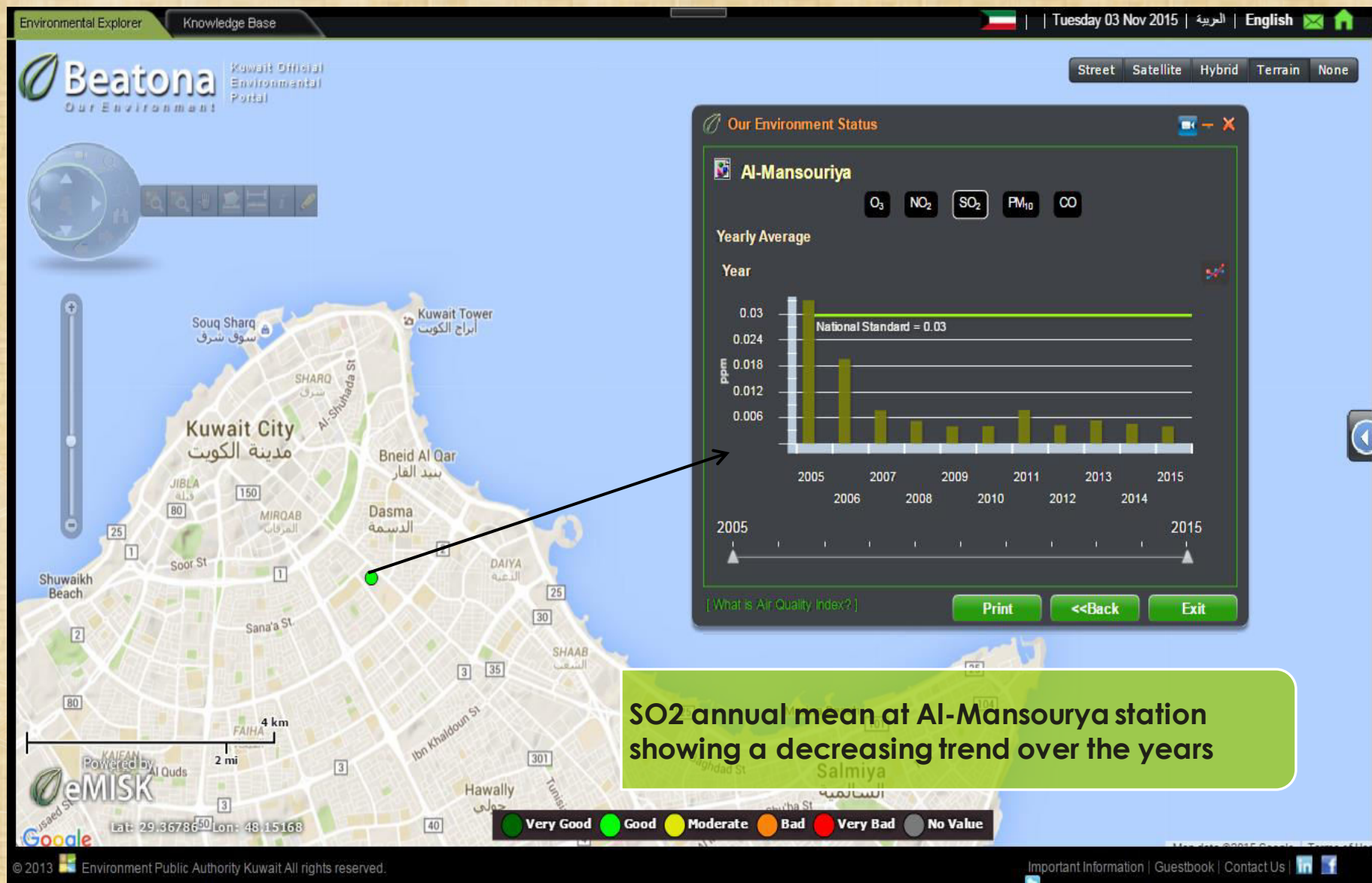
Google Lat: 29.15805 Lon: 48.39202

Very Good Good Moderate Bad Very Bad No Value

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# Our Environment Status

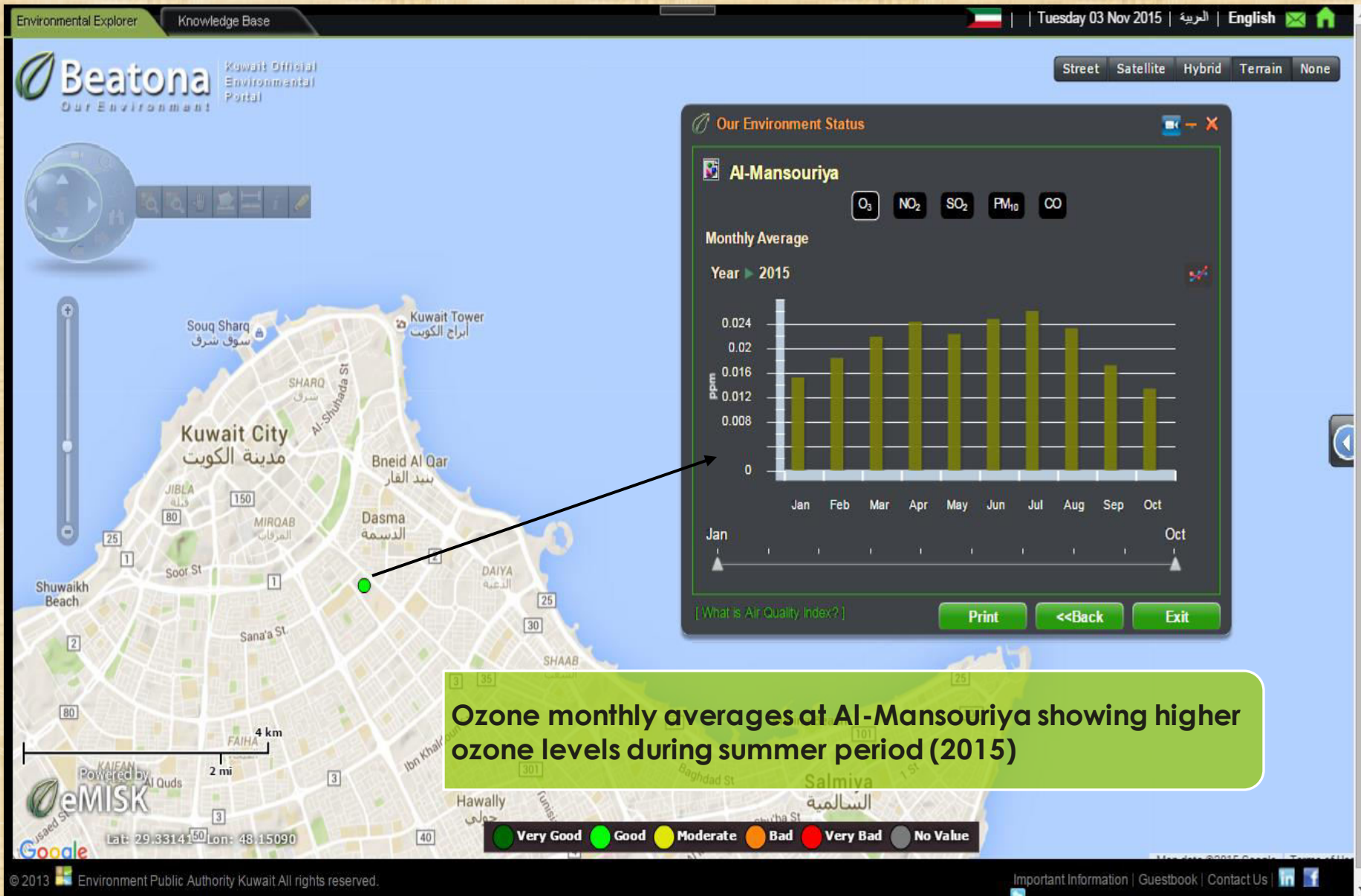
## Display Air Quality Data for Primary Air Pollutants



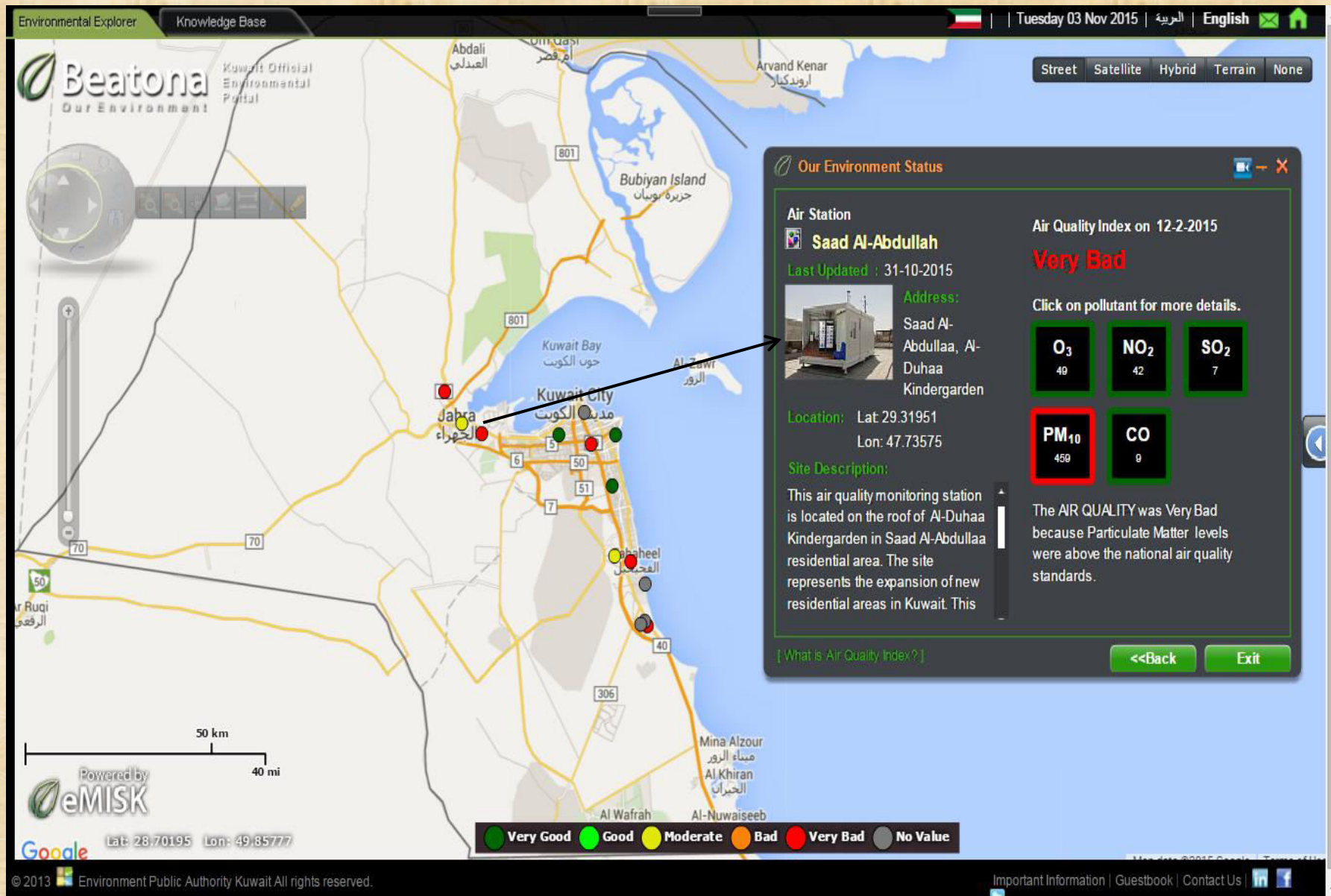


# Our Environment Status

## Display Air Quality Data for Primary Air Pollutants

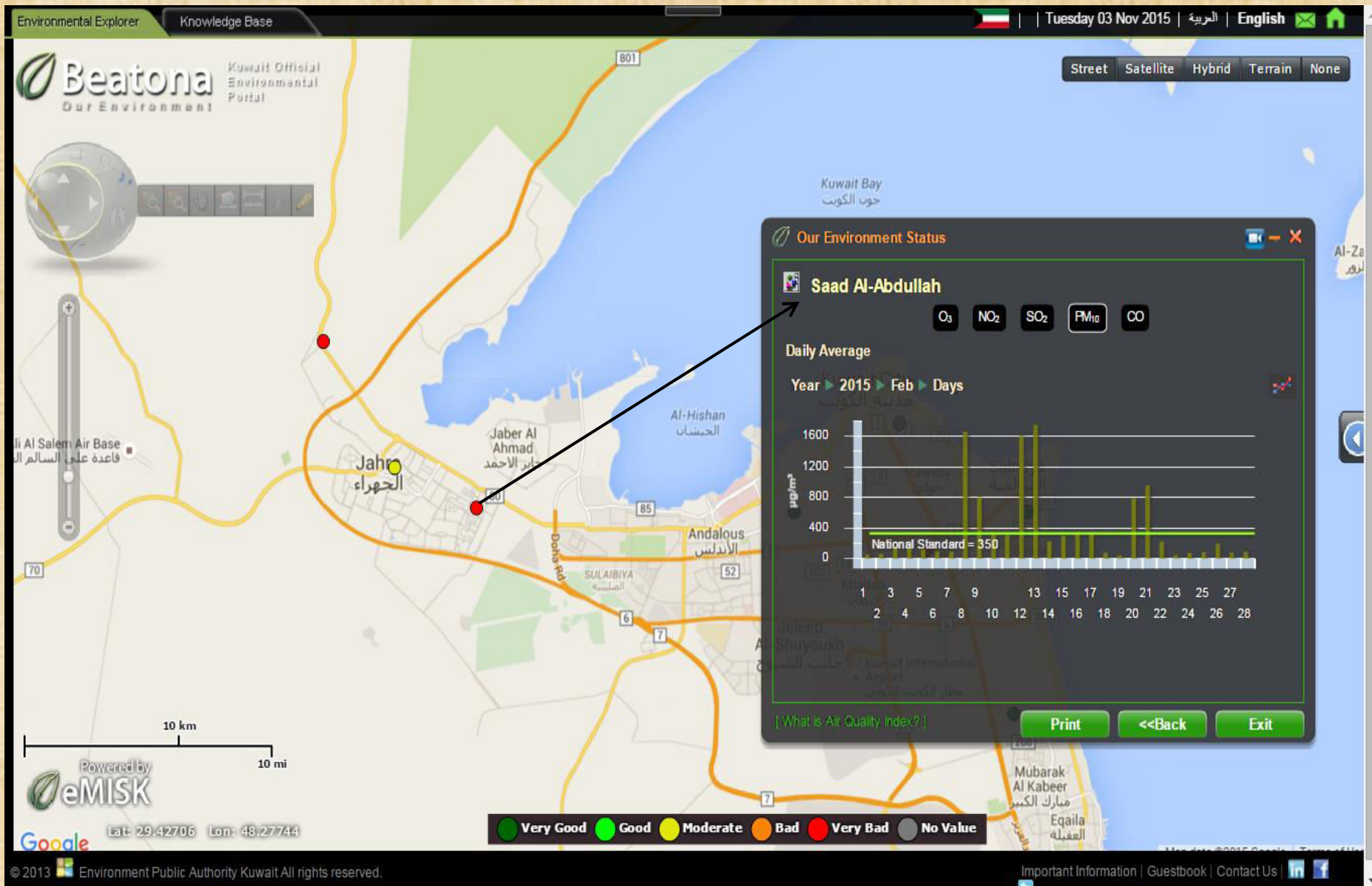


# AQI during Dusty Days





# AQI during Dusty Days



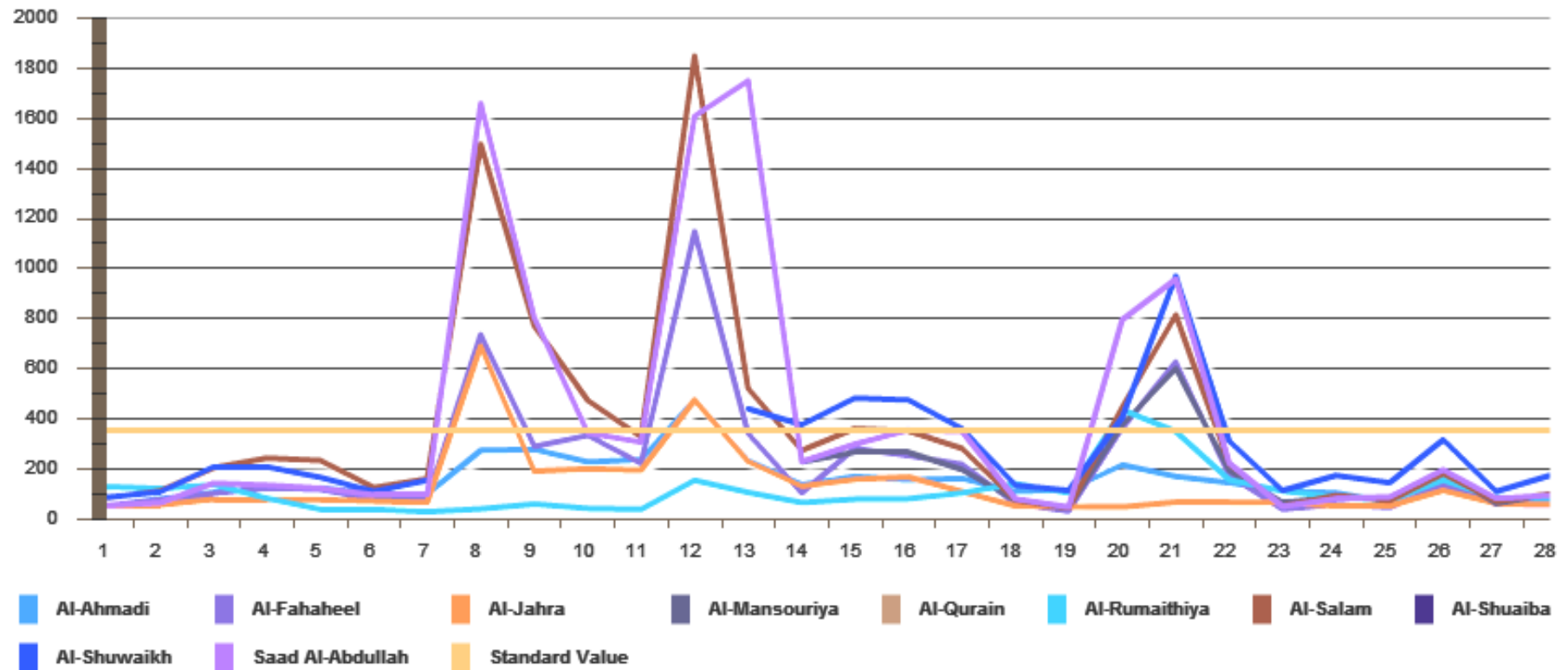
# Comparison of PM10 Concentrations reported at all stations during dusty days (February-2015)

Daily Mean Value of Particulate Matter - less than 10 micrometers in Monitoring Station(s)

February, 2015

years months days

PM10,  $\mu\text{g}/\text{m}^3$



Standard Value = 350.000  $\mu\text{g}/\text{m}^3$



**(5)**

**GCC-Environmental Portal**

# GCC-Electronic Environmental Portal



البوابة البيئية الرسمية لدول مجلس التعاون لدول الخليج العربية

GCC Official Environment Portal

Enter

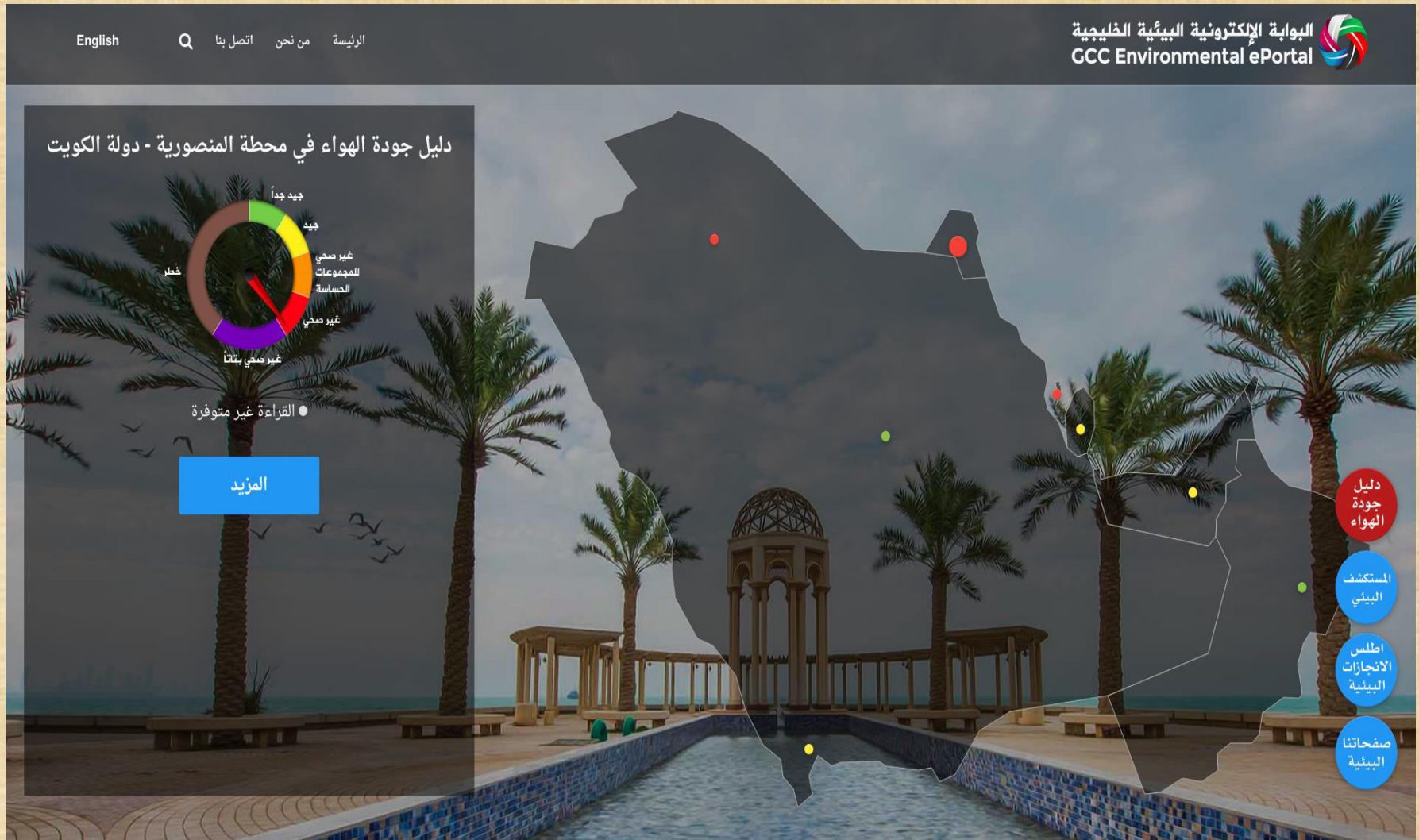
دخول





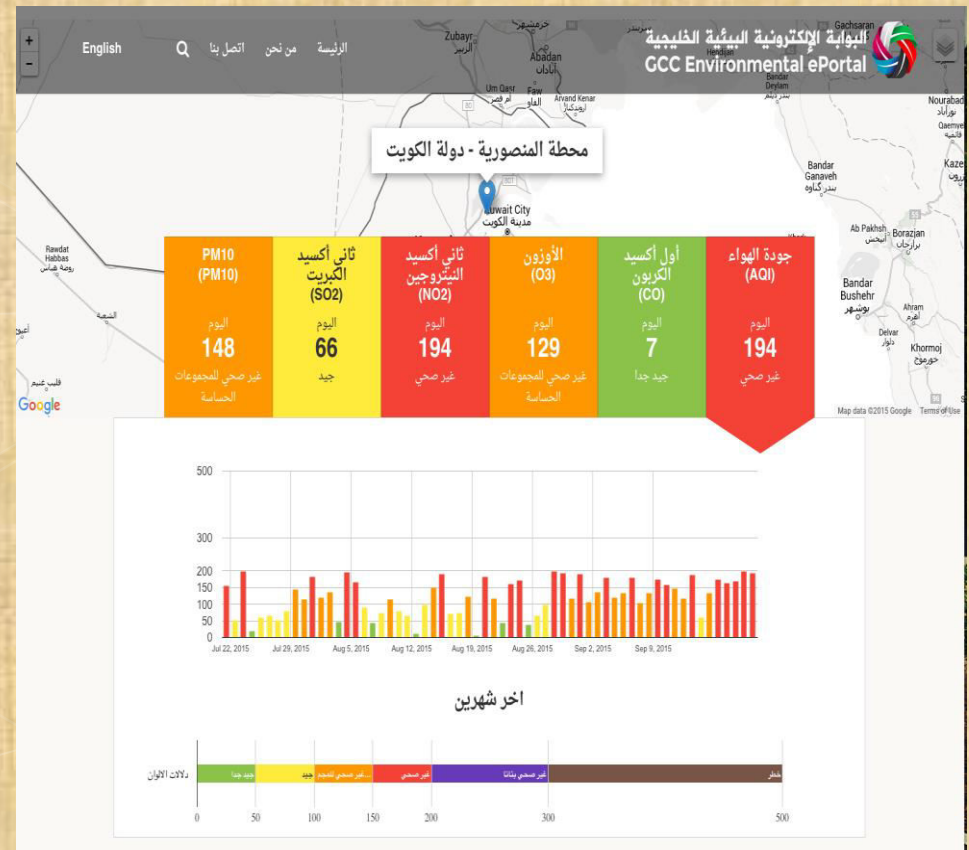
# G C C -Environmental Portal

## The main screen



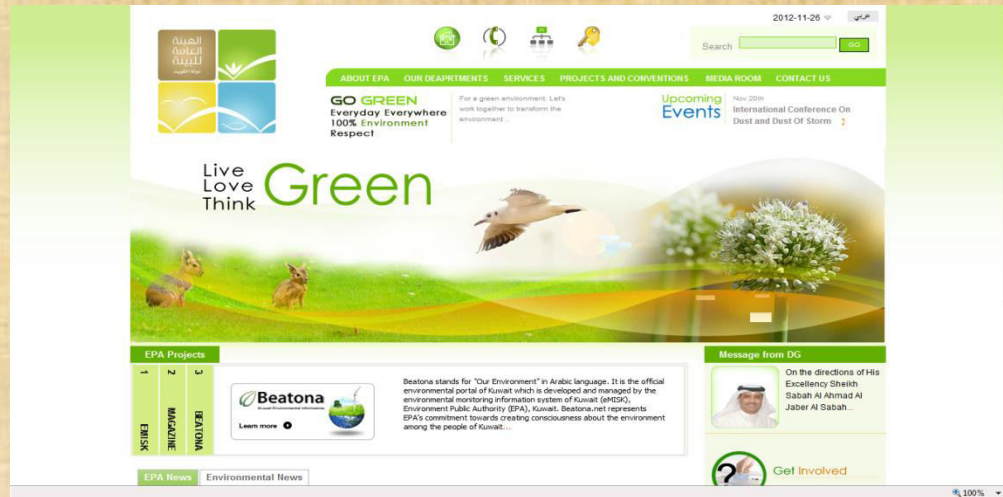
# Air Quality Index

- ✓ Simple way to show air quality in GCC
- ✓ Explore air quality monitoring stations in GCC
- ✓ Show stations readings for air pollutants in GCC on daily bases
- ✓ Five air pollutants ( $O_3$ , CO,  $NO_2$ ,  $SO_2$ ,  $PM_{10}$ )





For more information, please visit our websites :



<http://www.epa.org.kw>



[www.emisk.org](http://www.emisk.org)



[www.beatona.net](http://www.beatona.net)