



**Atmospheric Composition Constellation  
Workshop on Air Quality**

# **IMPACT OF SATELLITE MEASUREMENTS TO LOCAL AQ MONITORING IN LONDON**

# Outline

Use of satellite data for AQ forecasting

CERC's *yourair* systems across Europe

Systems data requirements

Some examples

Public response

# Outline

Use of satellite data for AQ forecasting

CERC's *yourair* systems across Europe

Systems data requirements

Some examples

Public response

Non-scientific – Focus on the servicing to population

# CERC's AQ forecasting systems

- CERC is running AQ forecasting systems since 1997
- System includes:
  - City of York
  - CUBA (Bristol and surrounding local authorities)
  - M4NTAIS (South Wales)
  - Budapest (DASY)
  - Strasbourg (Numtech)
  - Shenyang, China (Shenyang EPB)
  - Wakefield (Northern England)
  - London
  - Beijing
  - Vienna
- Forecasts are provided via the web, as emailed text files and alerts to phones

# CERC's *yourair* system



**Input** → **System engine** → **Output**

# CERC's *yourair* system



**Input** → **System engine** → **Output**

- Regional background concentration
- Ground based monitoring
- Emissions
- Meteorology
- Land use
- Surface topography

**LOCAL  
FORECASTS**  
ADMS-Urban

- Colour contour image of forecast overlaid on image
- Text and number summaries
- Alerts to TV, the public, health professionals
- **Send alert via SMS, e-mail or voice mail**

# CERC's *yourair* system



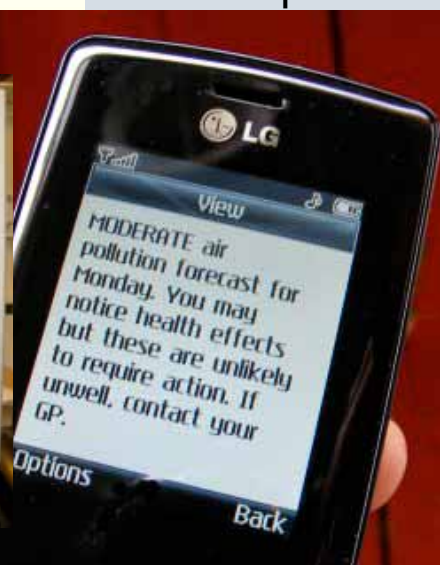
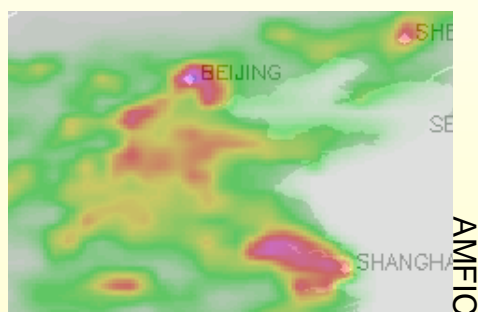
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SMS,  
mail



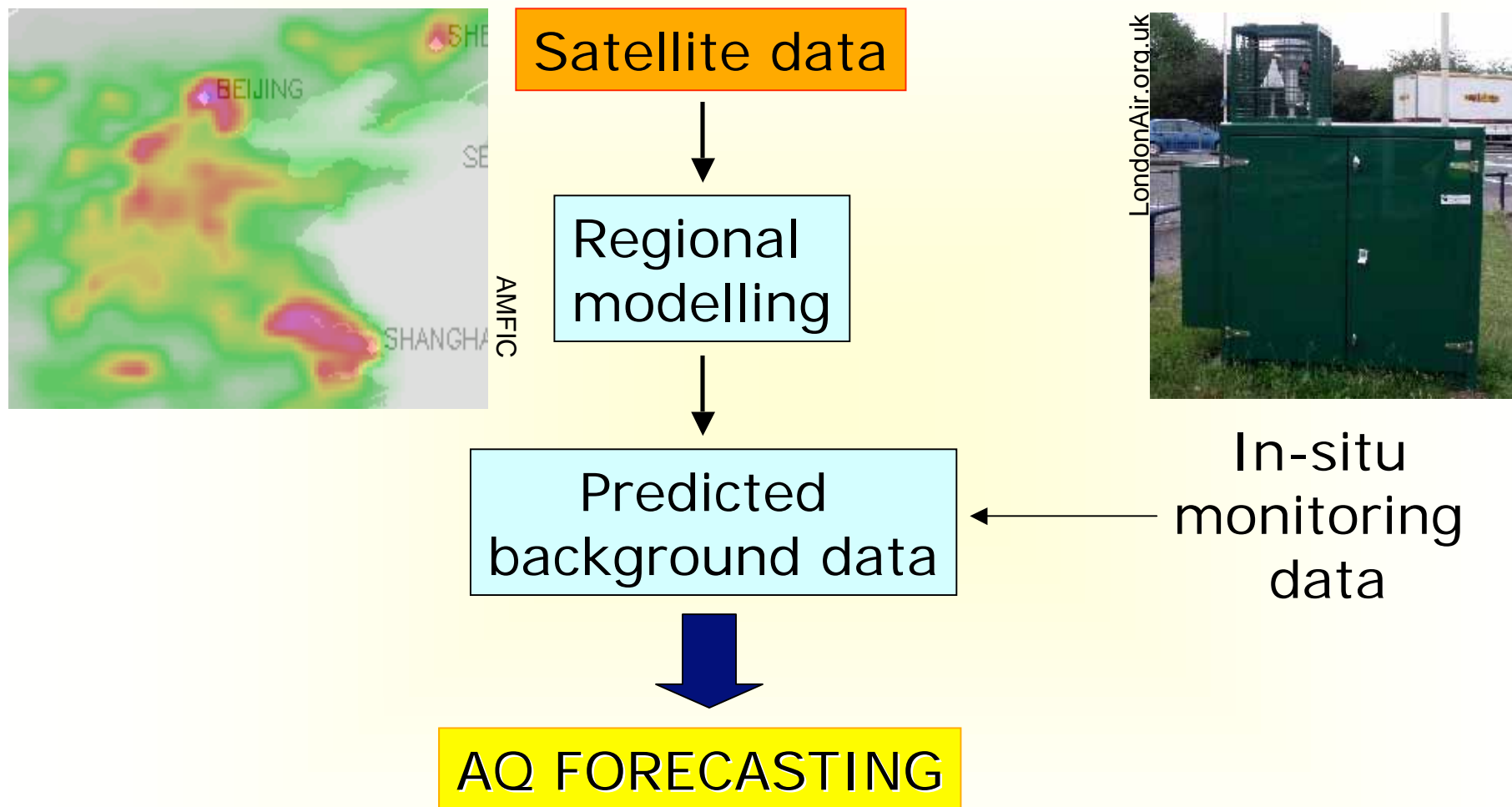
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- Forecast concentrations (regional scale)
- Forecast meteorology (regional scale)
- Emission inventory (local scale)
- *Monitored concentrations* (local scale) – for validation



# CERC's forecasting under PROMOTE



# CERC's forecasting: LondonAir

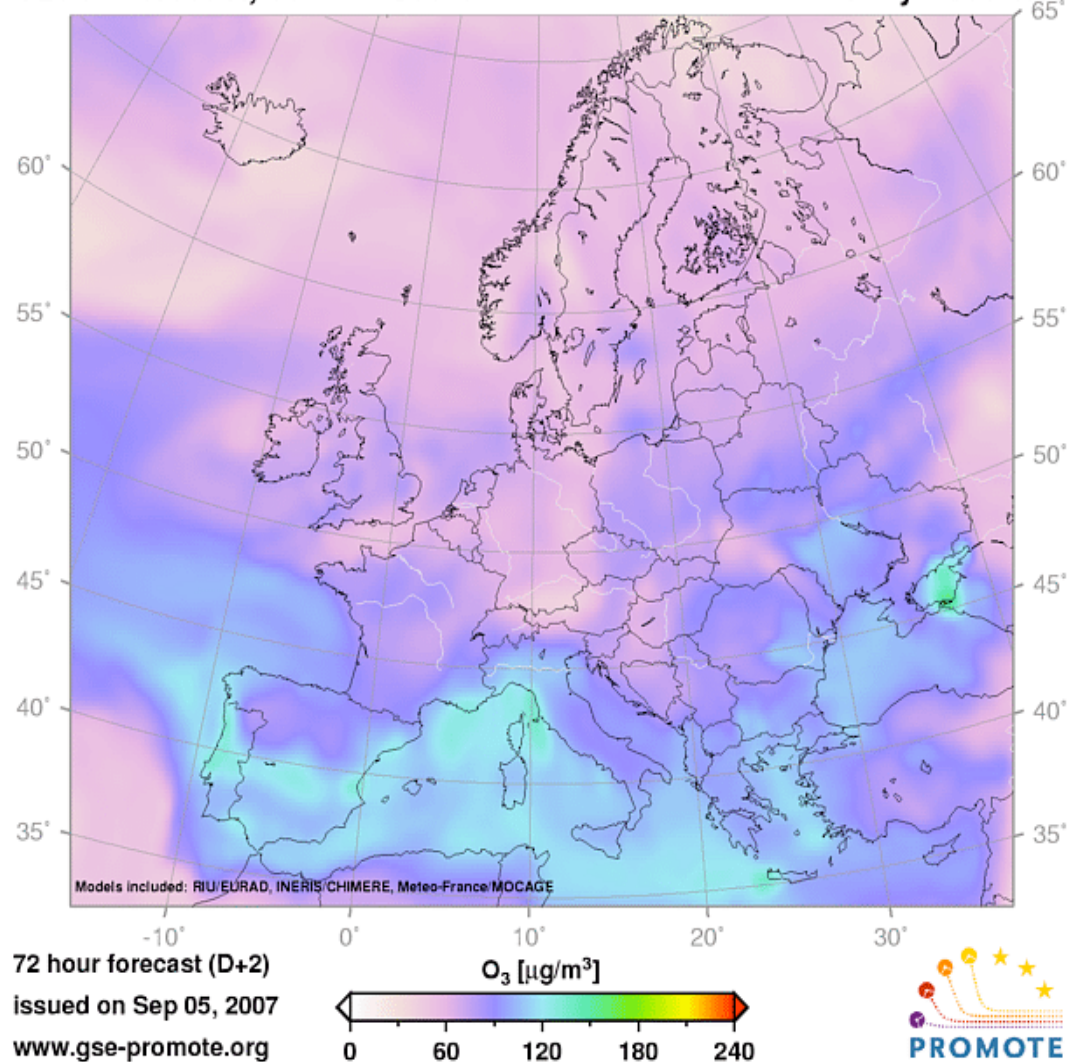
## London airTEXT

Met forecast by  
MeteoGroup

Background AQ  
model PREV'AIR by  
INERIS

Integrated Air Quality Ensemble  
Ozone Forecast, Surface Level

Sep 07, 2007  
Daily Maximum



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# CERC's forecasting: *airTEXT*

Air pollution alerts by text, email, and voicemail

forecasts

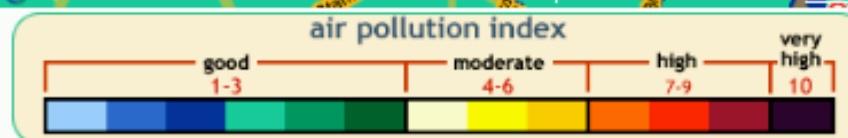
log in

health advice

how it works

news

Forecast for Friday June 12th, 2009 - Central London



**sign up here**  
free alerts  
text - email - voice

airTEXT alerts you if elevated pollution is expected in your chosen area:

Forecast of Air Pollution Index for:  
Friday June 12th, 2009

Central London:  
LOW air pollution expected  
everywhere

Forecast selector:

- Choose a Zone -  
- Choose a pollution type -

[Calendar: archived forecasts](#)

Zoom map to your post code:



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# BeijingAir

# BeijingAir 北京

## BeijingAir 北京

Met forecast by  
ECMWF

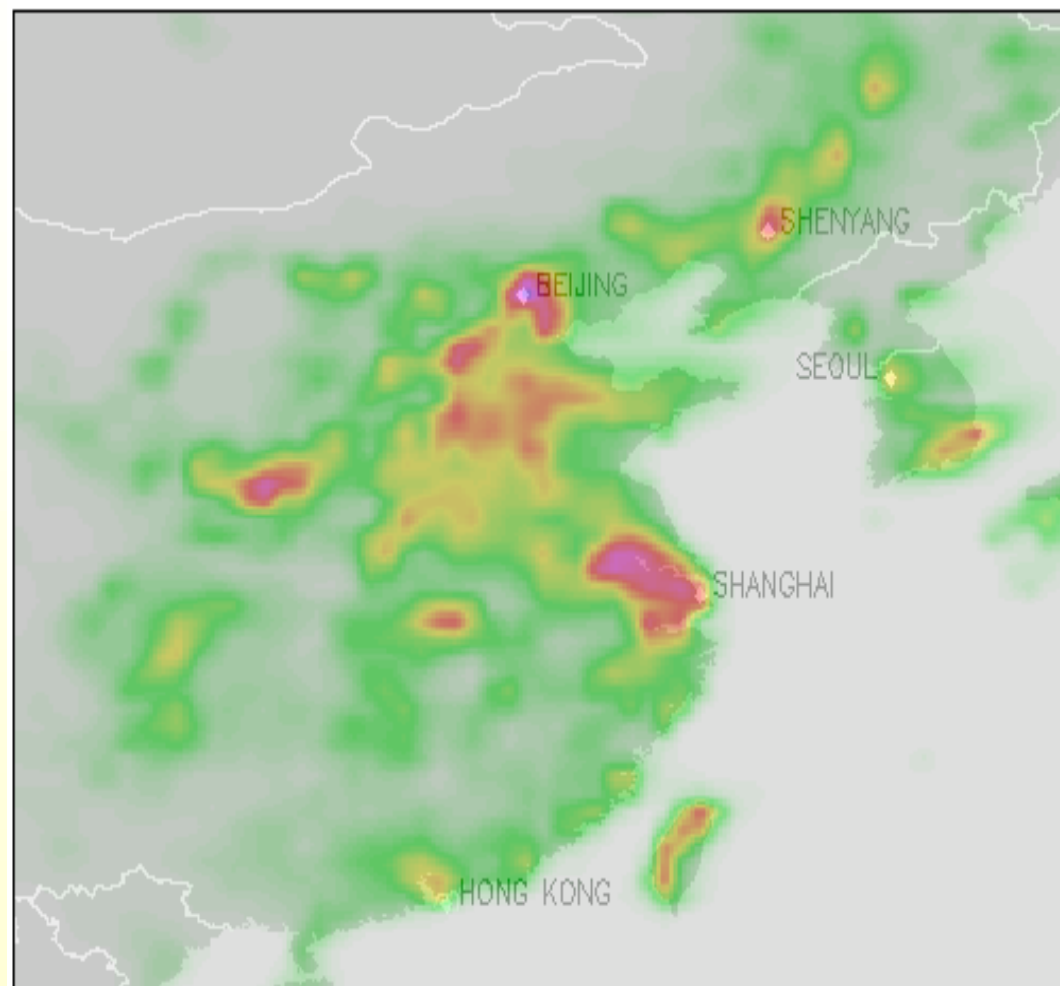
Background AQ  
model

CHIMERE by KNMI




East China – NO<sub>2</sub> daily average

CHIMERE surface NO<sub>2</sub> average, F0, 06 Jun 2008



NO<sub>2</sub> concentration [ $\mu\text{g}/\text{m}^3$ ]



0 20 40 60 80 100



# CERC's forecasting – *BeijingAir*

*BeijingAir* 北京 • DRAGON 龙计划

Air quality forecasts for Beijing

Partner log In  
English | 中文  
Font: Normal | Larger+ | Larger++ | Text Only

forecasts

health effects

news

data resources

how it works

partner login

Forecast for Saturday 13 June, 2009 - Beijing



BeijingAir provides street-scale air quality forecasts for Beijing:

Forecast of Air Pollution Index for:  
Saturday 13 June, 2009

Beijing: Generally good air quality.

Forecast selector:

Beijing  
Air Pollution Index  
☐ Friday 12 June, 2009  
☒ Saturday 13 June, 2009  
☐ Sunday 14 June, 2009

[Calendar: archived forecasts](#)

Air Pollution Index:

The definitions of air pollution levels and health effects used are those defined by the China National Environmental Monitoring Center.



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# CERC's forecasting – *BeijingAir*

**BeijingAir** 北京 • **DRAGON** 龙计划

Partner log In  
English | 中文  
Font: Normal | Larger+ | Larger++ | Text Only

Air quality forecasts for Beijing

forecasts

health effects

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data resources

how it works

partner login

### Health effects of air quality

[Definition of Air Pollution Index \(API\) in terms of concentrations \(PDF file\)](#)

Depending on how high pollution levels are forecast to be, there are various simple steps you can take to reduce the likelihood of any impacts on you. The action you can take depends on the level of pollution expected. Pollution levels in the People's Republic of China are expressed using the Air Pollution Index (API) defined by the government. The overall Air Pollution Index includes particulates, nitrogen dioxide and sulphur dioxide.

SLIGHTLY POLLUTED	LIGHT POLLUTION	MODERATE POLLUTION	MODERATE TO HEAVY POLLUTION	HEAVILY POLLUTED
API 100-150	API 151-200	API 201-250	API 251-300	API 301+
What health effects may I notice?	What health effects may I notice?	What health effects may I notice?	What health effects may I notice?	What health effects may I notice?
<ul style="list-style-type: none"><li>Those who are susceptible may experience slight deterioration in symptoms.</li><li>The general public may experience some irritation.</li></ul>	<ul style="list-style-type: none"><li>Those who are susceptible will experience severe deterioration in symptoms. Their tolerance for exercise decreases.</li><li>The wider general public will experience some symptoms.</li></ul>	<ul style="list-style-type: none"><li>Those who are susceptible will experience severe deterioration in symptoms. Their tolerance for exercise decreases.</li><li>The wider general public will experience some symptoms.</li></ul>	<ul style="list-style-type: none"><li>Those who are susceptible will experience severe deterioration in symptoms. Their tolerance for exercise decreases.</li><li>The wider general public will experience some symptoms.</li></ul>	<ul style="list-style-type: none"><li>The general public will experience decreased tolerance for exercise with obvious and severe symptoms.</li><li>Some diseases may be prematurely induced.</li></ul>

BeijingAir provides street-scale air quality forecasts for Beijing:

Forecast of Air Pollution Index for:  
**Saturday 13 June, 2009**

**Beijing: Generally good air quality.**

**Air Pollution Index:**

The definitions of air pollution levels and health effects used are those defined by the China National Environmental Monitoring Center.

# CERC's forecasting: ViennaAir

*ViennAir*

Met forecast and  
Background AQ  
model

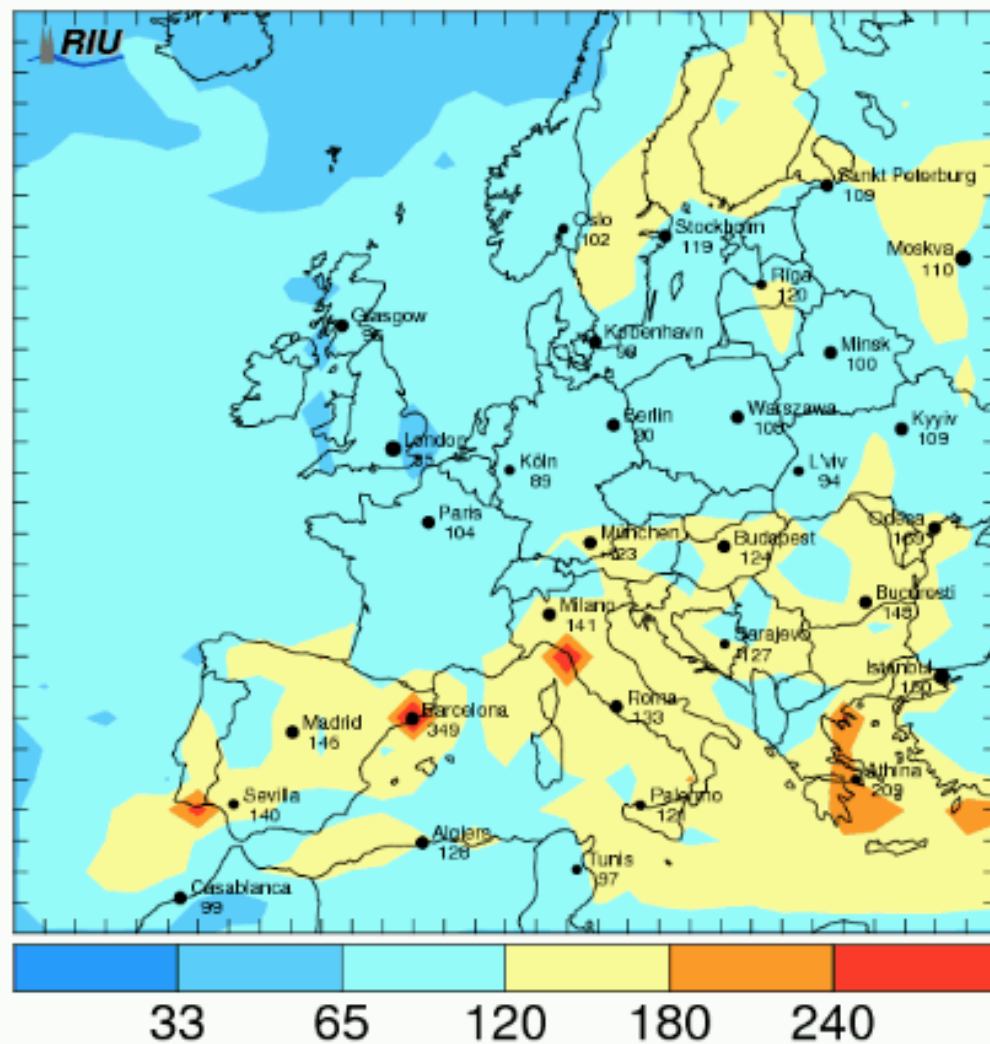
EURAD by RIU and  
University of Cologne

**EURAD**  
System

Ozone  $\mu\text{g}/\text{m}^3$

Level 1


12.06.2009 Daily Maximum



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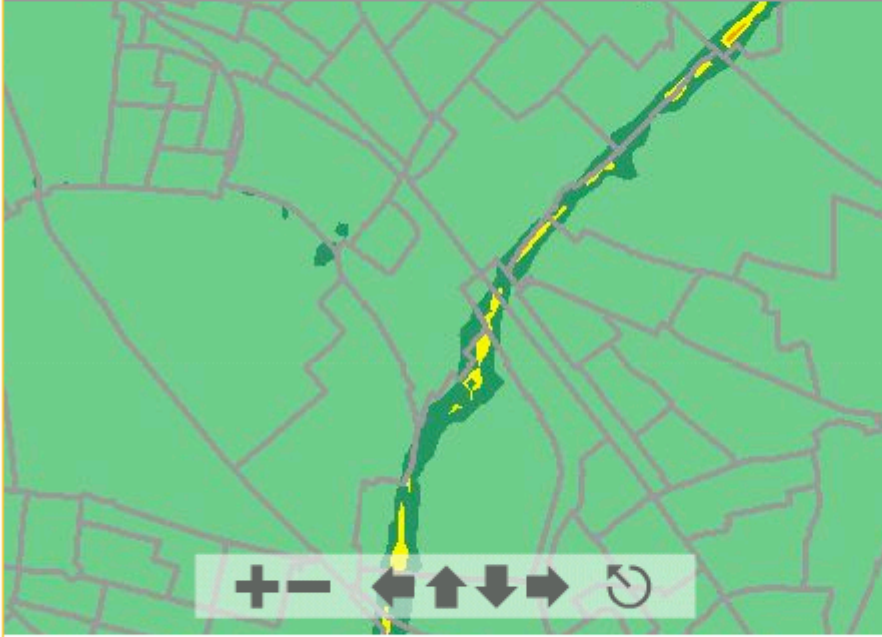
# CERC's forecasting – *ViennAir*

 English | German  
Font: Normal | Larger+ | Larger++ | Text Only

Air pollution forecasts and alerts by text, email, voicemail

**forecasts** | health advice | how it works

Forecast for Tuesday 9 June, 2009 - Vienna





Forecast selector:  
Vienna  
Total Health Index  
Last Tuesday  
[Calendar: archived forecasts](#)

Zoom map to your post code:

**air quality index**

Very good	Good	Satisfactory	Un-satisfactory	Bad	Very Bad
1	2	3	4	5	6

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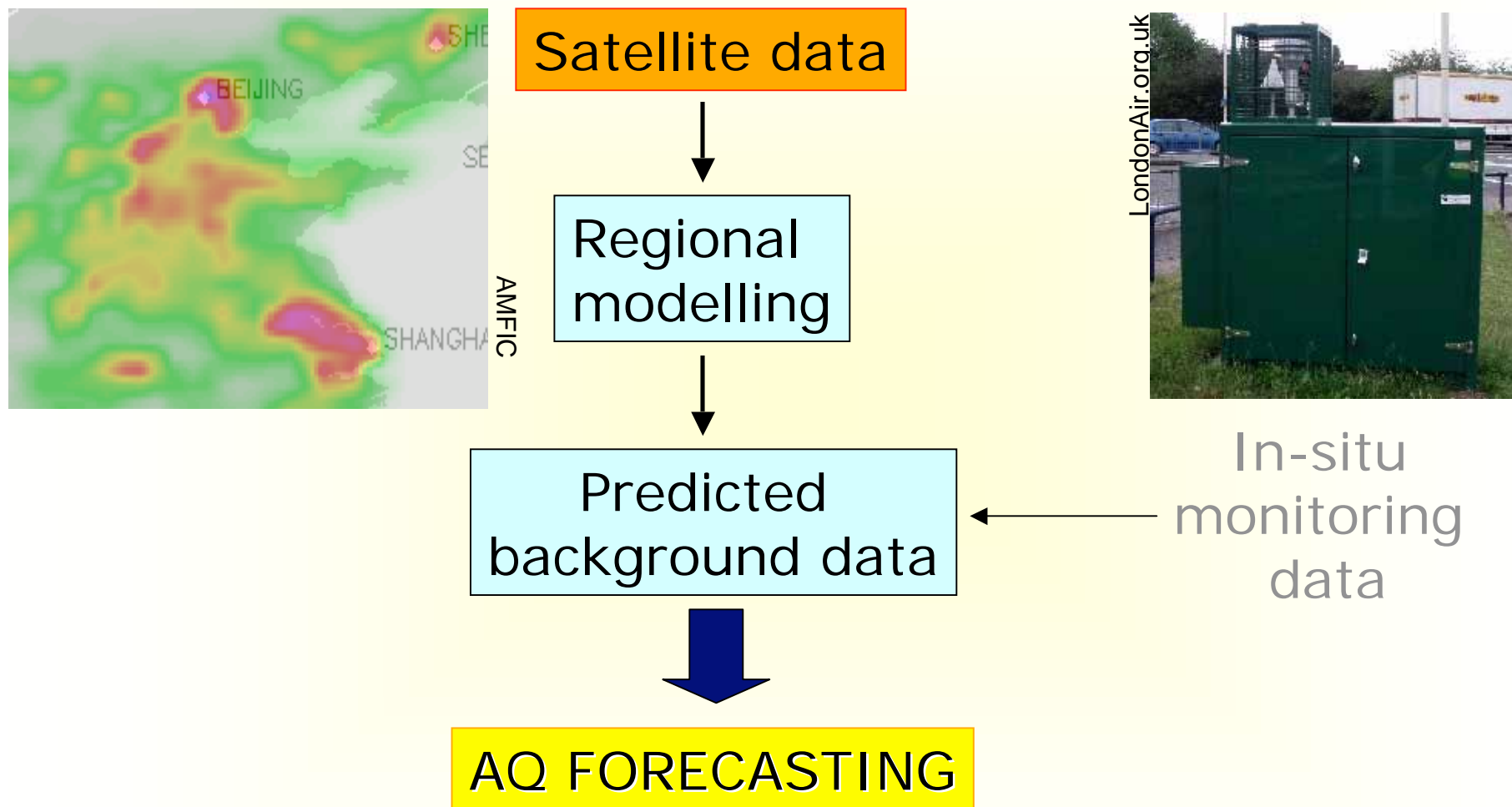
[www.vienna.yourair.info/index.php](http://www.vienna.yourair.info/index.php)

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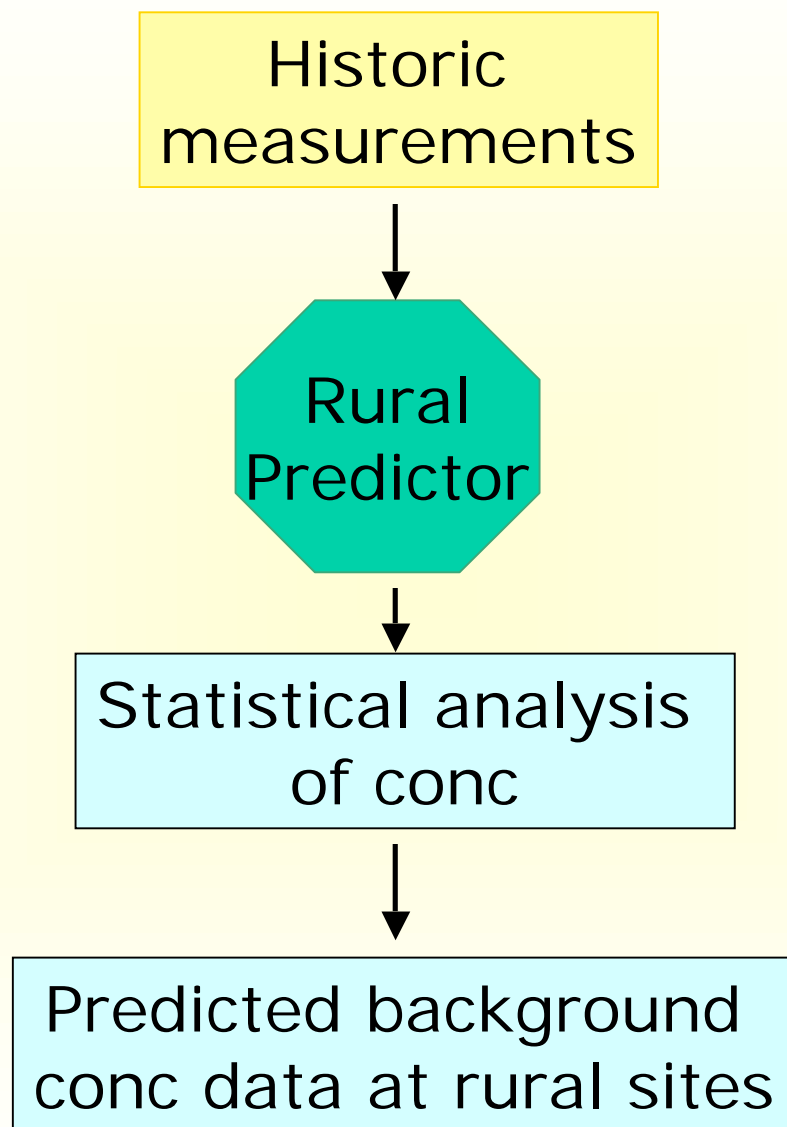
15 - 17 June 2009  
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# CERC's forecasting under PROMOTE

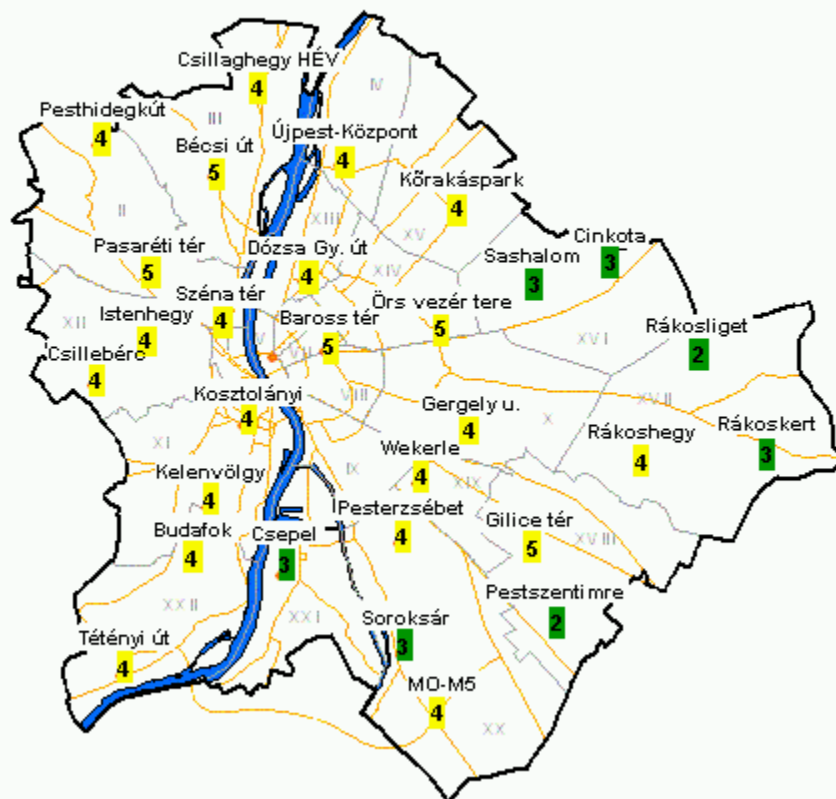


# CERC's forecasting under PROMOTE



# AQ forecasting for Budapest

## BUDAPEST LEVEGŐMINŐSÉGI ELŐREJELZŐ RENDSZER



NO2 előrejelzés készült: 2009. április 20. napjára

Budapest (teljes)

Válasszon szennyezőt:

Nitrogén-dioxid (NO2)  
Por (PM10)  
Ózon (O3)  
Szénmonoxid (CO)

Válasszon napot:

Ma  
Holnap  
Holnapután

Jelmagyarázat

1-2-3 Alacsony  
4-5-6 Közepes  
7-8 Magas  
9-10 Nagyon magas

Budapest (belváros)

Belváros - [Részletek...](#)

<http://web.t-online.hu/dasy/forecast/Budapest.htm>

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# AQ forecasting for Wakefield

Valid to: Midnight Friday June 12, 2009

**Summary:** The forecast is for LOW air pollution everywhere in Wakefield.

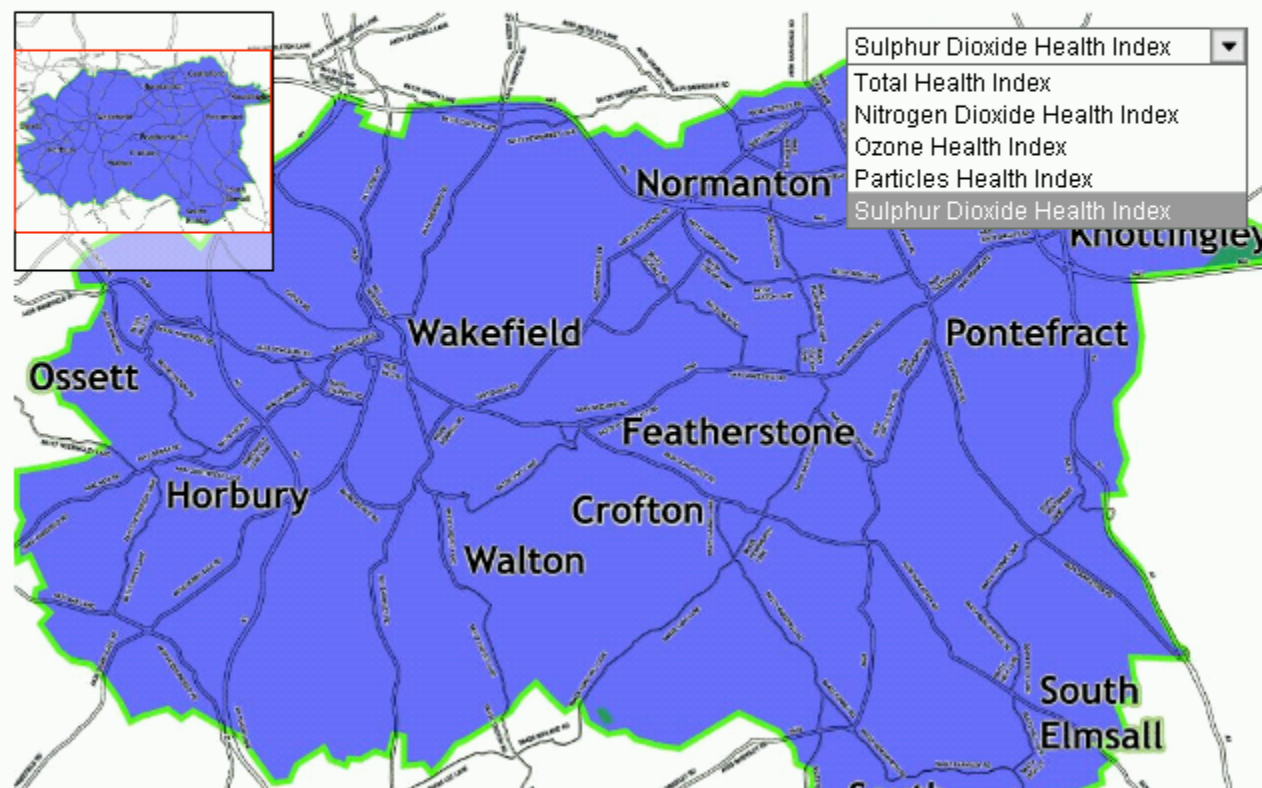
## Health Effects of air pollution in Wakefield



A higher index indicates a greater effect on health.

[More details...](#)

Use the controls on the map below to zoom to your area.



# AQ forecasting for Wakefield

Valid to: Midnight Friday June 12, 2009

Summary: The forecast is for LOW

Health Effects of air pollution



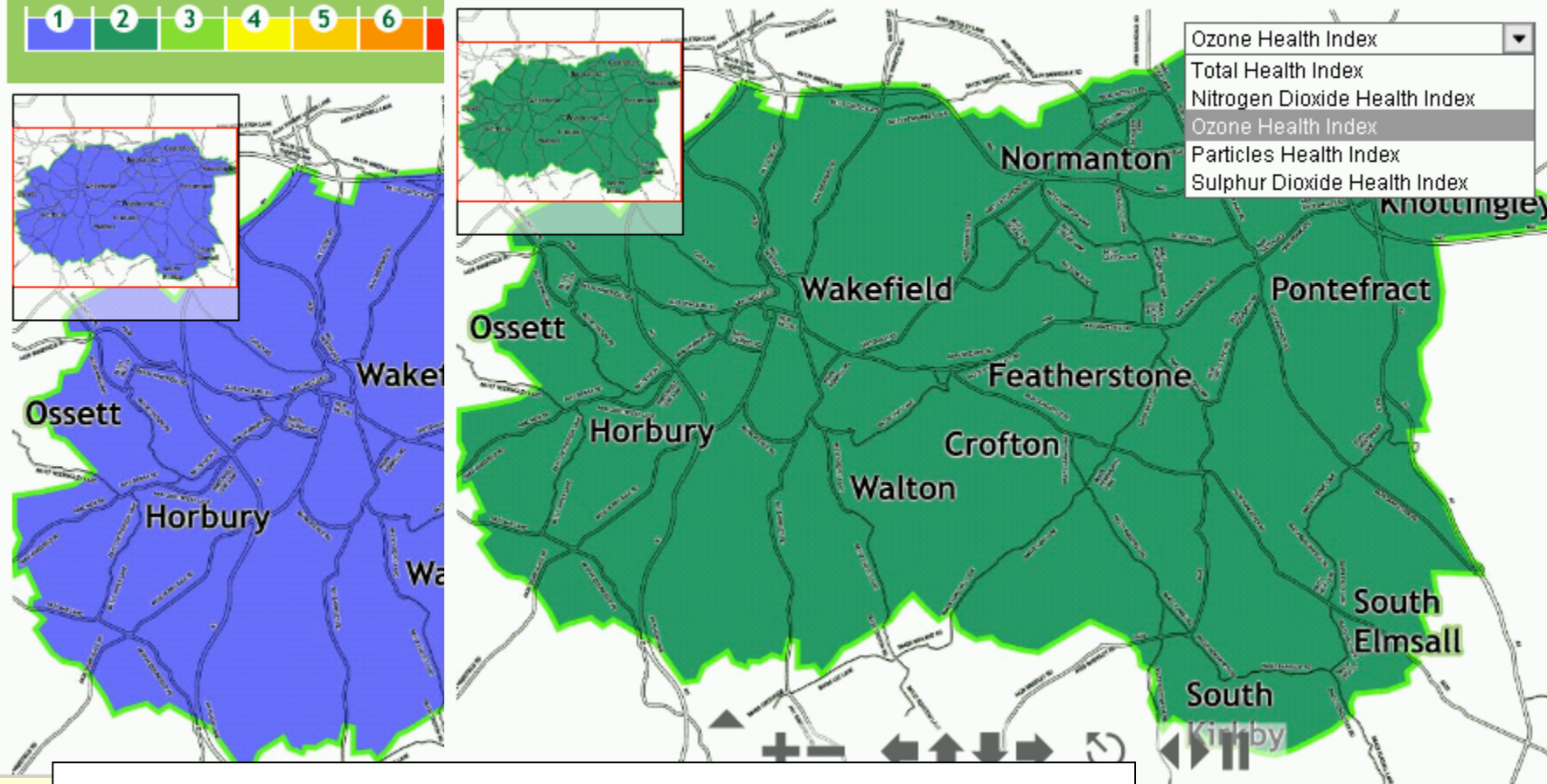
Health Effects of air pollution in Wakefield



A higher index indicates a greater effect on health.

[More details...](#)

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[www.cerc.co.uk/YourAir/Wakefield/index.asp](http://www.cerc.co.uk/YourAir/Wakefield/index.asp)

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# London airTEXT: Turning forecasts into public information

- airTEXT London system is funded by PROMOTE, uses your**air** system.
- System covers all of London, has been running for 2 years
- Street level pollution contours posted to web
- Alerts sent by email, text message or voice message
- Subscribers can receive alerts the evening before or the morning of an alert
- Alert sent if MODERATE, HIGH or VERY HIGH pollution predicted



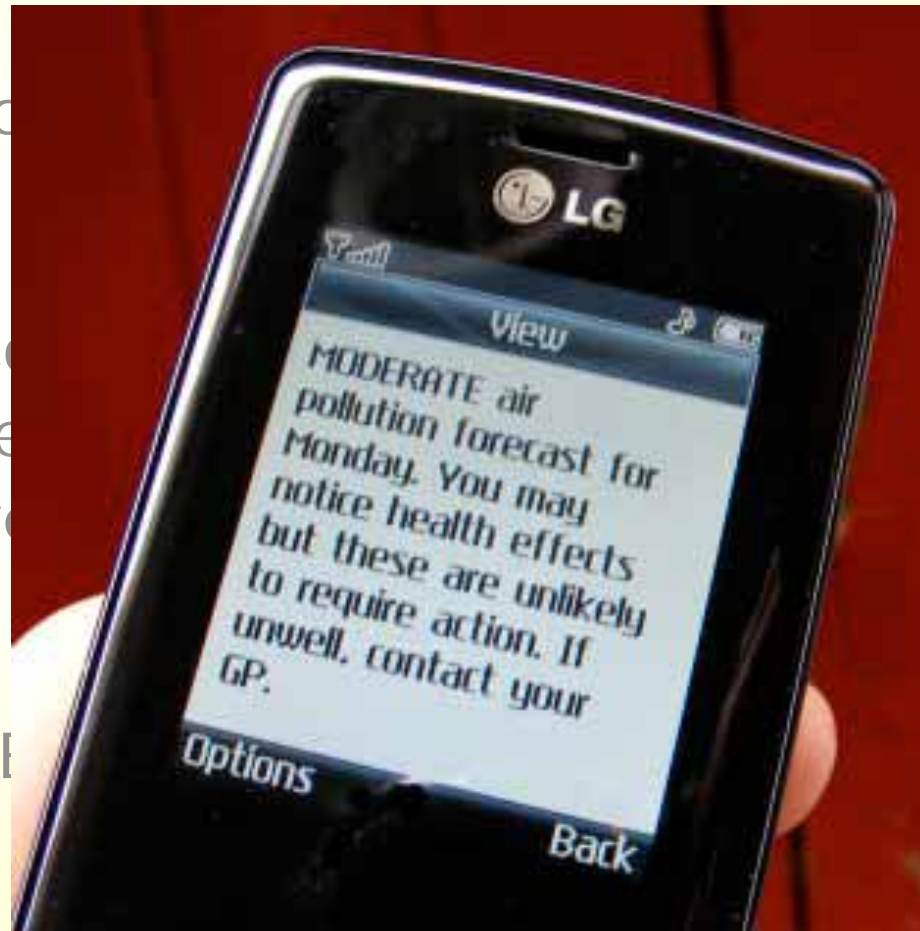
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System covers all of London  
years

Street level pollution forecasts  
Alerts sent by email, text  
Subscribers can receive  
morning of an alert

Alert sent if MODERATE  
predicted



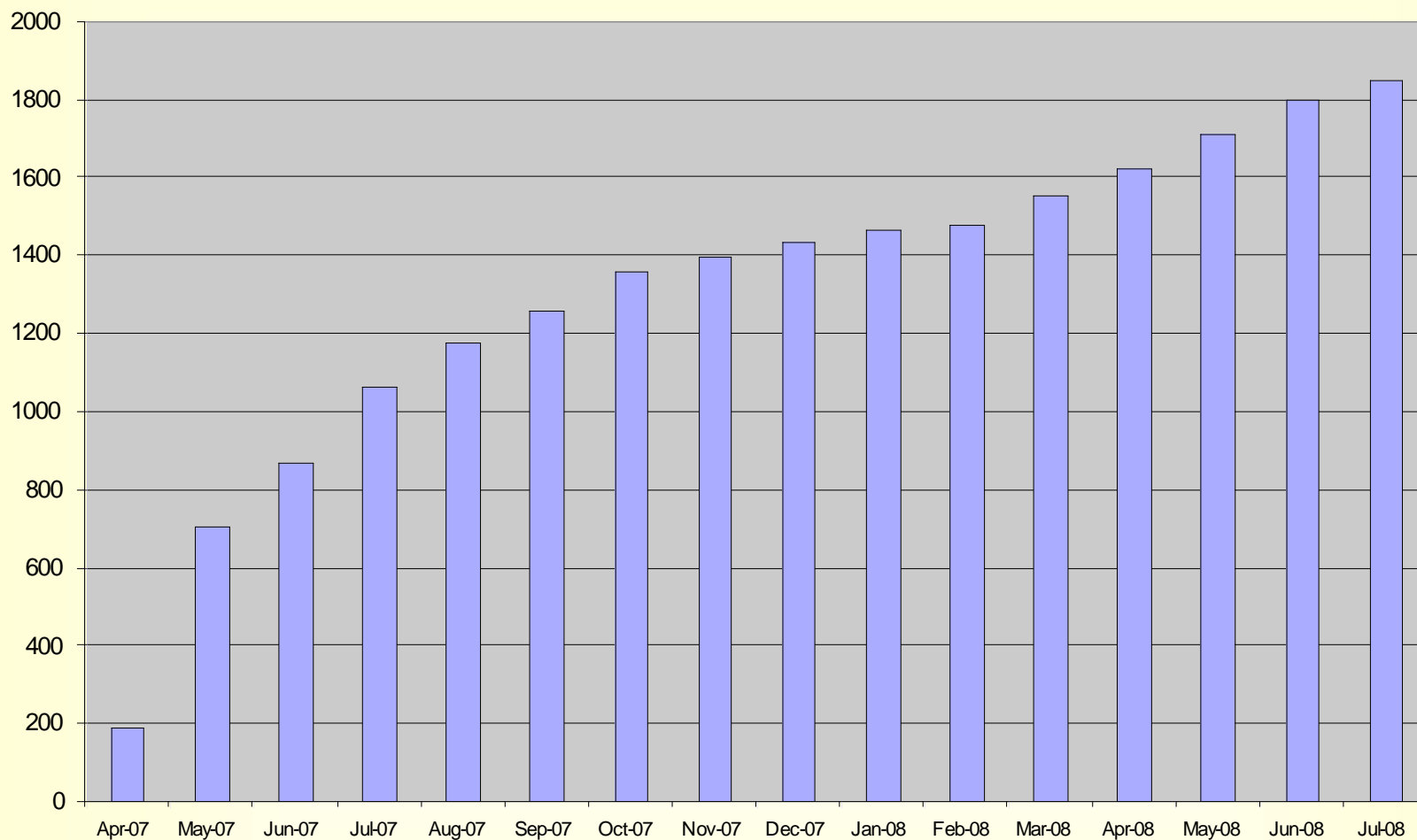
# London airTEXT: Public response

End of year 1, users were surveyed for their reaction to the system.

- ▶ 80% reported changing their behaviour on receiving an alert.
- ▶ 97% reported being satisfied or very satisfied with the service

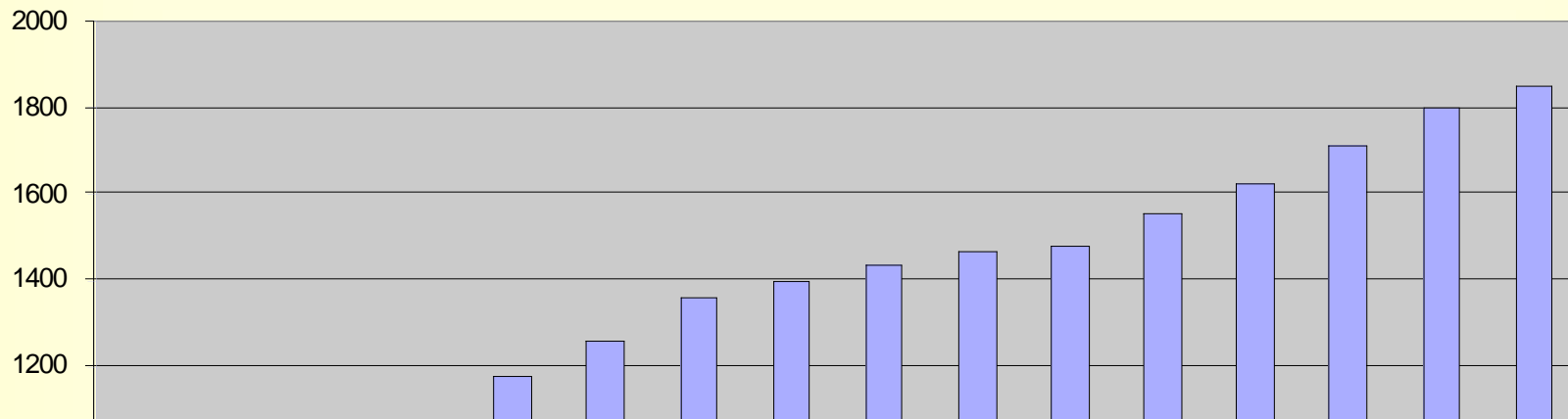


# London airTEXT: Public response

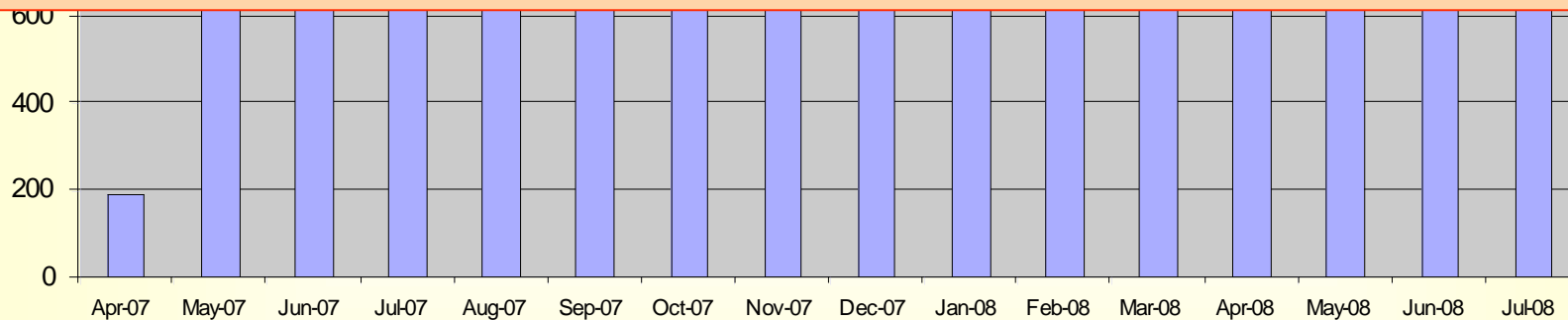


Number of subscribers

# London airTEXT: Public response



To date, about **5,000** people  
have subscribed to *airTEXT*



Number of subscribers

The public response to airText has been very positive so far

The example of airText shows how the use of satellite data can ultimately be of direct usefulness for the health and well-being of citizens in Europe

From an operational prospective, accurate satellite data can be used in conjunction with ground level monitoring for providing reliable background concentration and boundary conditions for AQ modelling and forecasting



Thanks to ESA for founding the work carried out  
under the PROMOTE project

