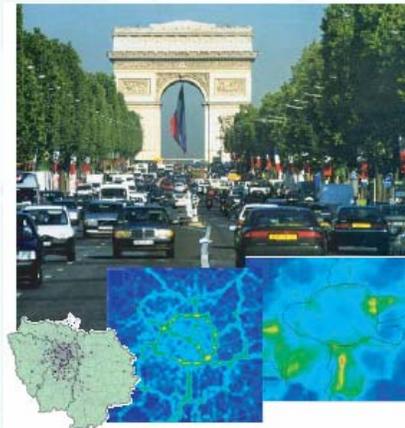
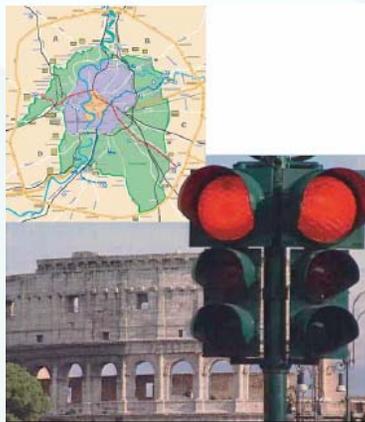
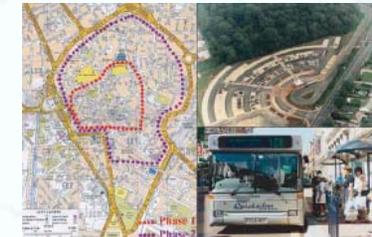


Common Air Quality Index - CAQI in Europe

Sef van den Elshout, DCMR EPA Rotterdam/Rijnmond
Karine Leger, Airparif, Ile-de-France

CITEAIR's proposed common index

- ❖ **Makes the cities comparable across Europe**
- ❖ **Attractiveness for the public, the authorities and the media**
- ❖ **Easily usable by any city**



PUBLIC DISPLAY OF AIR QUALITY INFORMATION :

**European context
and potential for developing a common index**

European context

❖ Public information:

- ⇒ **EU requirement**: EU directives and Aarhus convention
- ⇒ needed for **local policies**

❖ Dissemination of modelled or monitored air quality data :

- ⇒ mostly on the **internet**
- ⇒ most widespread way: **index ranging from good to bad**

❖ Information available for air quality experts :

- ⇒ Ozone Web (see Ozone Web, ozone.eionet.eu.int)
- ⇒ AirBase (see airbase.eionet.eu.int)

European context

However:

❖ for general public, comparisons are difficult to make:

- ⇒ Different presentations
- ⇒ Different interpretation criteria
- ⇒ Based on different typologies of stations, not often clearly explained
- ⇒ Different methodology of calculation, not often detailed
- ⇒ Which monitoring method is being used (e.g for PM 10) ...?

Example: public information in 4 CITEAIR's cities

❖ three out of four cities have an index:

⇒ Scale:

◇ Two cities range from 1 to 10

◇ The other from 1 to 100

⇒ Classes:

◇ Two cities have 10 classes

◇ One has 5

◇ One has 4

⇒ Description of air quality:

◇ Two in terms of “good” and “bad”

◇ One in terms of health

◇ The fourth in terms of pollution levels

⇒ Class boundaries:

◇ Some take into account EU alert thresholds but not for the same class

◇ UK index based on health effects

Example: public information in 4 CITEAIR's cities

- ❖ Comparison of the air quality of those 4 cities at a given moment:
 - ❖ 4 completely different presentations & qualifications
 - ❖ need to search 4 websites

⇒ *almost impossible for the general public*

E.g.: Local indices compared to the proposed common index on a day of relatively poor dispersion conditions

	Own city index	Pollutant	Own city classification	CAQI	Pollutant
Leicester	4	Ozone	low-moderate	59	PM10
Paris	6	PM10	mediocre	64	PM10
Rome	79	Ozone	mediocre	60	Ozone
Rotterdam	-	PM10	bad	59	Ozone

European context

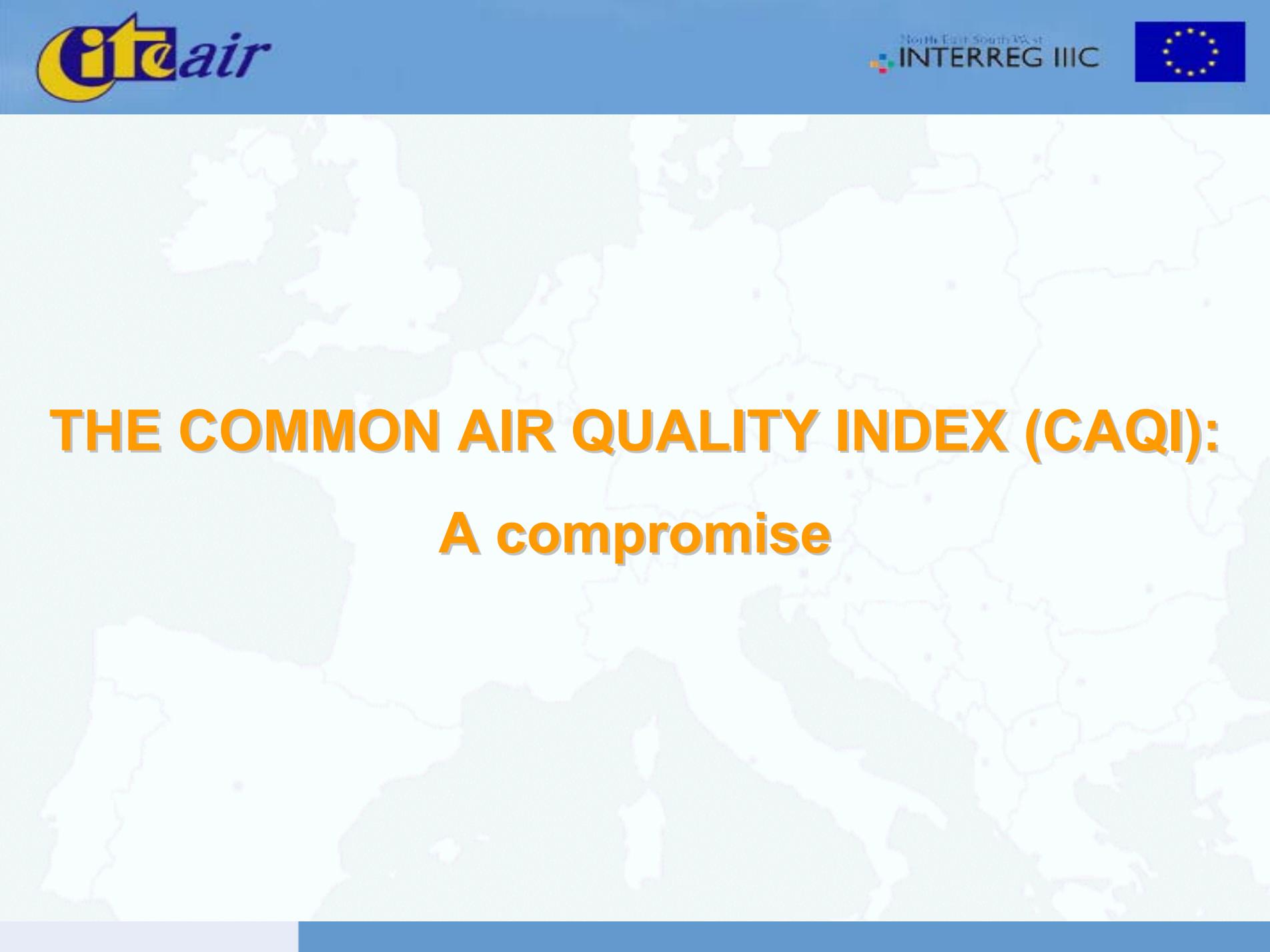
❖ Advantages of air quality indices:

- ⇒ Simple information **more understandable** by the general public (instead of $\mu\text{g}/\text{m}^3$ or ppb)
- ⇒ **Many of them already available** in different countries / cities
 - ❖ provide an homogenous information inside of a country
 - ❖ may allow comparison of cities inside of a country

❖ **BUT such an AQI does not exist at the European scale**

- ⇒ Despite EU common regulations
- ⇒ Different AQI even sometimes inside of a same country

⇒ ***CITEAIR's proposes a common index***

A light blue map of Europe serves as the background for the slide. The map shows the outlines of the continents and countries in a pale blue color.

THE COMMON AIR QUALITY INDEX (CAQI): A compromise

The common index: A COMPROMISE

Between a number of objectives:

- ❖ **Communication to the general public (target group)**
- ❖ **Scientifically reasonably rigorous**
 - presented in different symposiums and to experts for feedbacks
 - representativeness initially tested through one year data from 4 CITEAIR cities (van den Elshout et al, 2006)
- ❖ **Common agreement, at first between the CITEAIR's partners and review at the end of the project**
- ❖ **Easy to join for any city**

The common index: A COMPROMISE

Between existing indices:

- ❖ **Developed after a review of existing indices**
(UK, Brussels' POLLUMETER, South African index, French ATMO, US EPA's AQI...)

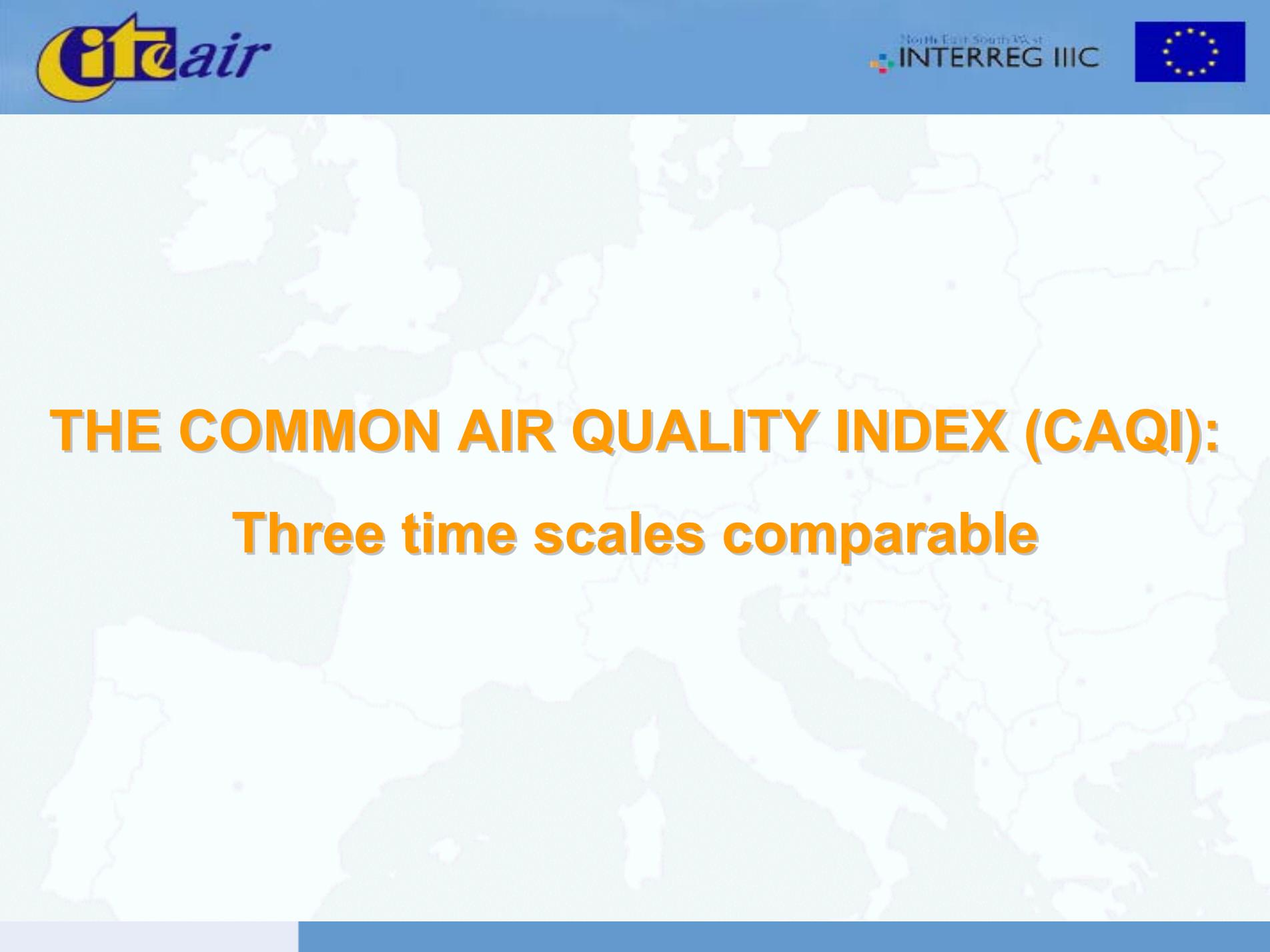
- ❖ **Resembles existing ones**
 - the Brussel's POLLUMETER,
 - the German index
 - and the French ATMO,

The common index: A COMPROMISE

Between technical issues:

CITEAIR can not solve technical issues such as:

- ❖ **Uniformity in PM measurements**
- ❖ **Data quality control, e.g. site selection of monitoring stations**

A light blue map of Europe is visible in the background of the slide.

THE COMMON AIR QUALITY INDEX (CAQI):

Three time scales comparable

The common index: 3 time scales

An hourly index for today (D)

- ❖ calculated **every hours**
- ❖ Only concerns the cities able to provide hourly values
but of **MAJOR INTEREST** for the public, the authorities
and the media

A daily index for yesterday (D-1)

- ❖ Based on **maximum hourly concentrations of the past day**
- ❖ Calculated **once a day**
- ❖ **Displayed at D on the CITEAIR common website**
- ❖ Concerns most cities taking part in this website

➔ *the worst pollutant determines the index*

The common index: 3 time scales

Hourly and daily index

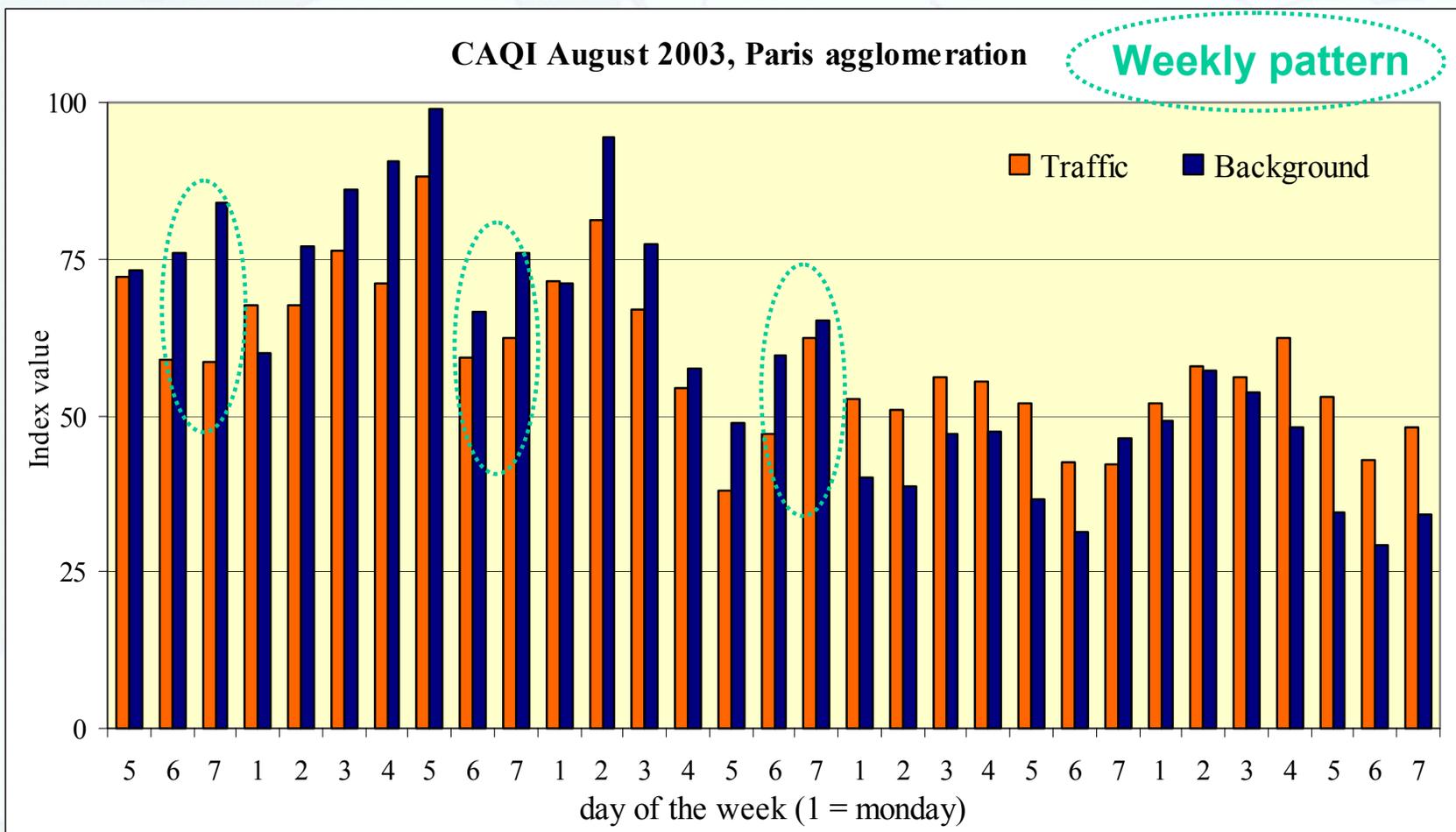
Common air quality index calculation grid

Index	Class	Main Pollutants			Additional Pollutants	
		NO ₂	O ₃	PM ₁₀	CO	SO ₂
Very High	> 100	> 400	> 240	> 100	> 20000	> 500
High	100	400	240	100	20000	500
	75	200	180	75	10000	300
Medium	75	200	180	75	10000	300
	50	100	120	50	7500	100
Low	50	100	120	50	7500	100
	25	50	60	25	5000	50
Very Low	25	50	60	25	5000	50
	0	0	0	0	0	0

- NO₂, O₃, SO₂: hourly value / maximum hourly value in µg/m³
- PM₁₀: hourly value / daily average in µg/m³
- CO: 8 hours moving average / maximum 8 hours moving average in µg/m³

The common index: 3 time scales

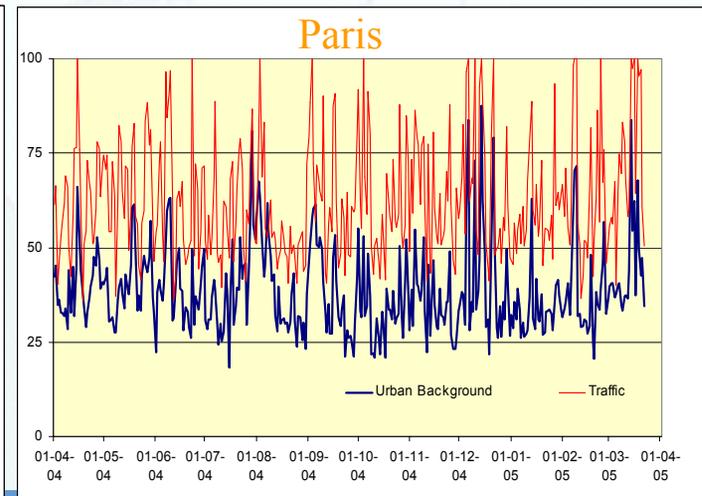
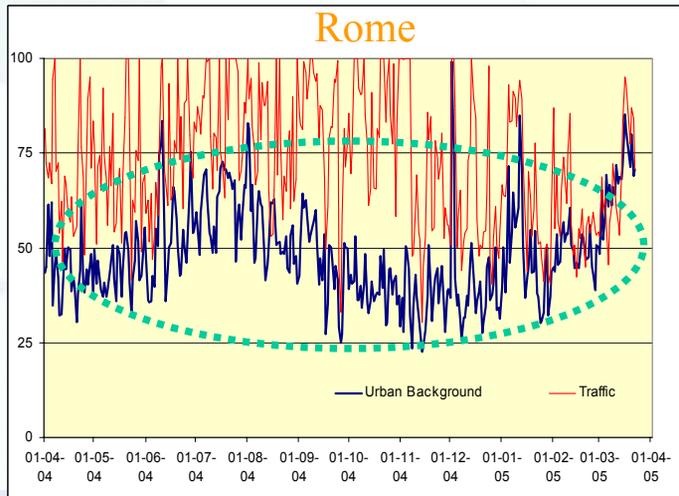
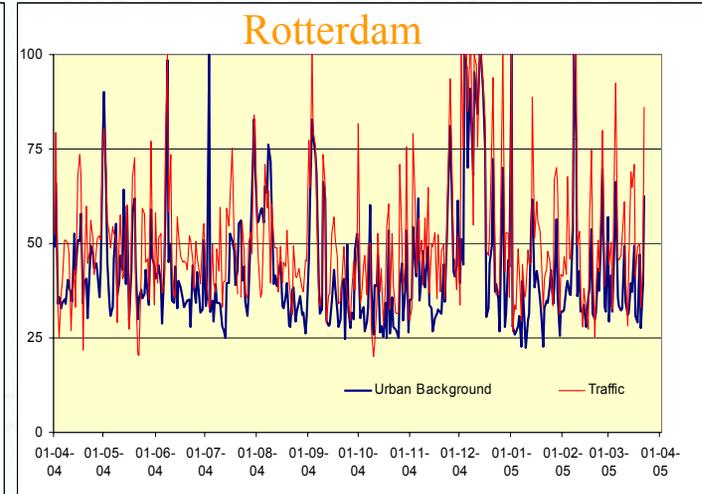
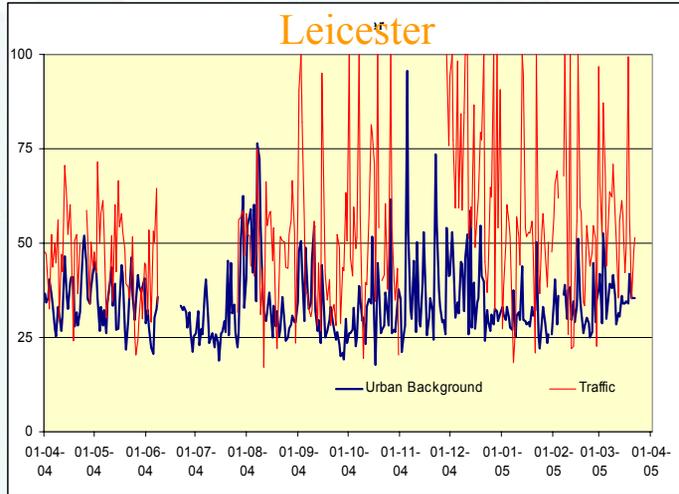
Hourly and daily index



❖ Comparison of the daily Common AQI (traffic and background) in 4 cities through 1 year of data (April 2004/2005)

Rome:
 seasonal
 pattern
 - Winter

dominated by
 PM₁₀ and NO₂
 (lesser extent)
 - Summer O₃



The common index: 3 time scales

A year average index

- ❖ better takes into account long term exposure
 - ❖ based on EU annual limit value / target values,
 - ❖ Concerns all cities taking part in this website
-
- ➔ *a distance to reach the EU directives
(distance to target index
where targets are derived from the directives).*
 - ➔ *the average of the main sub-indices determine the city index.*

The common index: 3 time scales

Annual index

Pollutant	Target value / limit value	Calculation
NO ₂	Year average is 40 µg/m ³	Year average / 40
PM10	Year average is 40 µg/m ³ Number of daily averages above 50 µg/m ³ #50	Year average / 40 #50 / 35
Ozone	The target is an 8-hour average value of 120 µg/m ³	Max. 8-hour average / 120
SO ₂	Year average is 20 µg/m ³	Year average / 20
Benzene	Year average is 5 µg/m ³	Year average / 5
CO	-	Not calculated

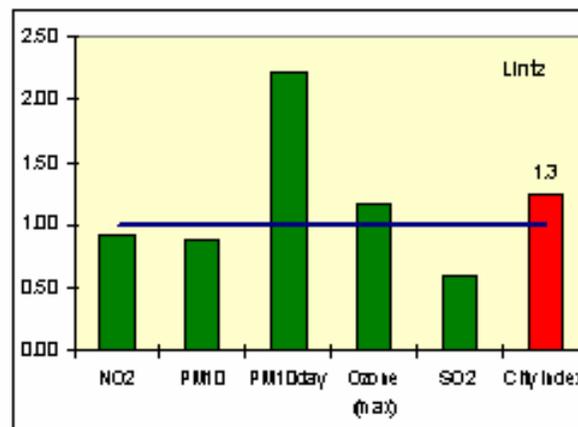
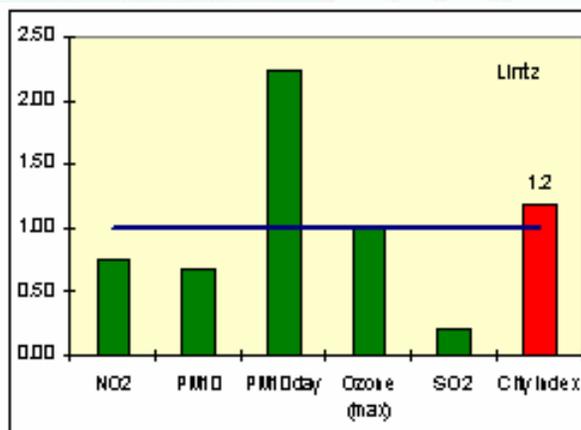
Calculation basis for the year average index

The common index: 3 time scales

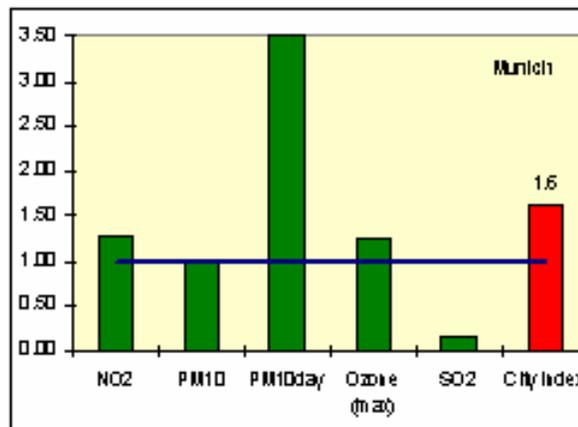
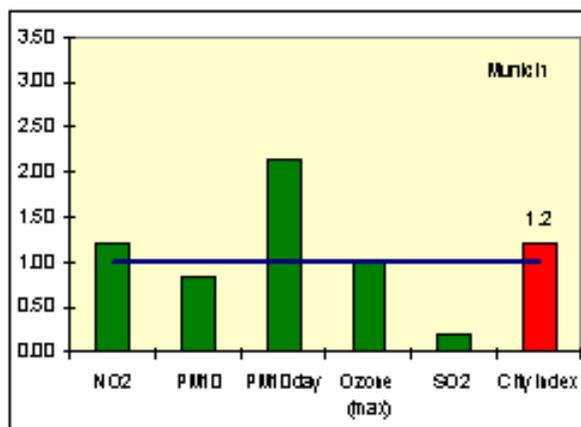
Annual index

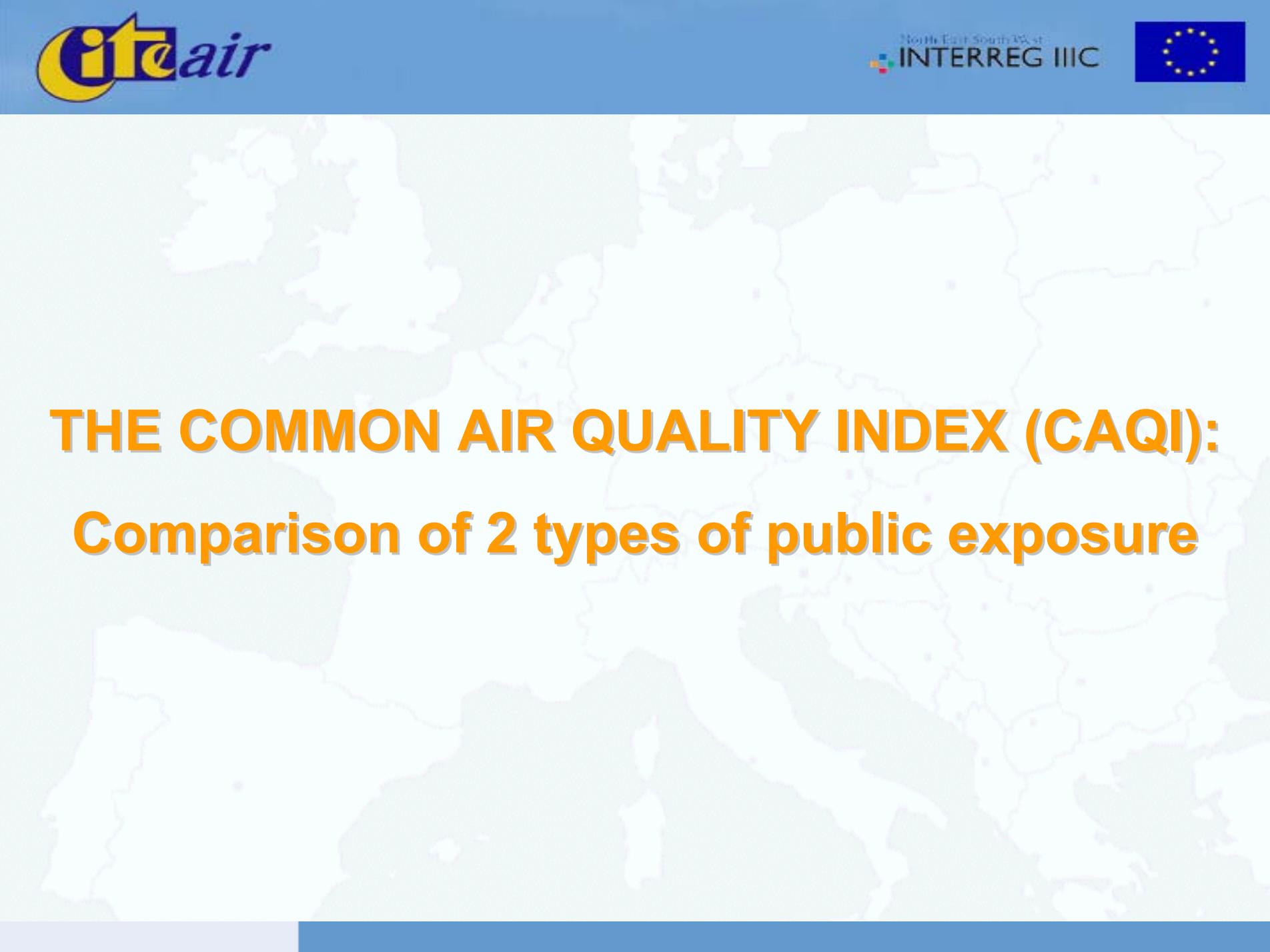
Examples of calculation of the year average index based on air quality data in the cities of Lintz and Munich

2002



2003



A light blue map of Europe is visible in the background, showing the outlines of the continents and countries.

THE COMMON AIR QUALITY INDEX (CAQI):

Comparison of 2 types of public exposure

Two different indices: Representative of two types of exposure

❖ An urban background index



⇒ Representative of the **average background situation of the city**

❖ A traffic index



⇒ Showing **typical roadside situation** in the city

Depending on the city's choice, the index calculation is either based:

⇒ on 1 station

⇒ or on an average of stations,
solution to be preferred to avoid lack of data

Pollutants taken into account: pollutants of main concern

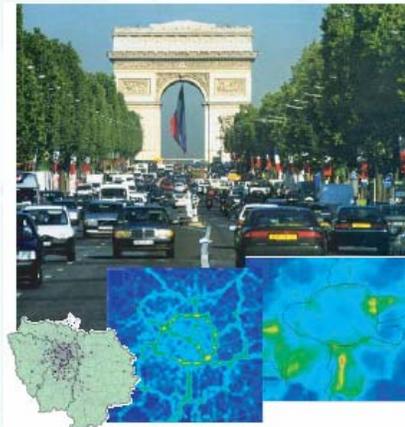
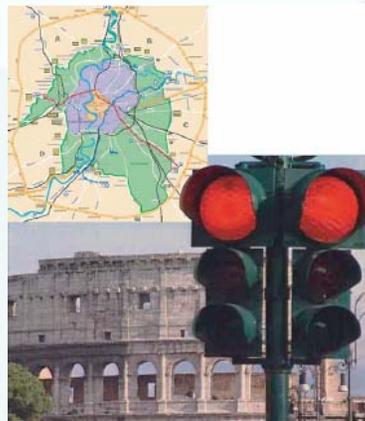
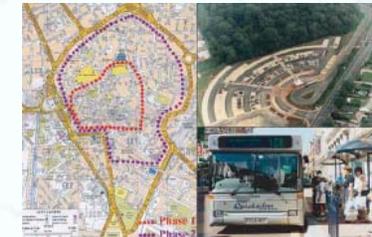
- ❖ **Main pollutants** (data mandatory):
 - ❖ For traffic stations: **PM10** and **NO2** 
 - ❖ For background stations: **O3** ozone is added 

- ❖ **Additional pollutants** (only if data available):
 - ❖ Traffic stations: **CO** 
 - ❖ Background stations: **SO2** 

- ❖ **Future development:** **PM2.5** to be included

CITEAIR's proposed common index

- ❖ Make the cities comparable across Europe
- ❖ Attractiveness for the public, the authorities and the media
- ❖ Easily usable by any city



Attractiveness of a common index

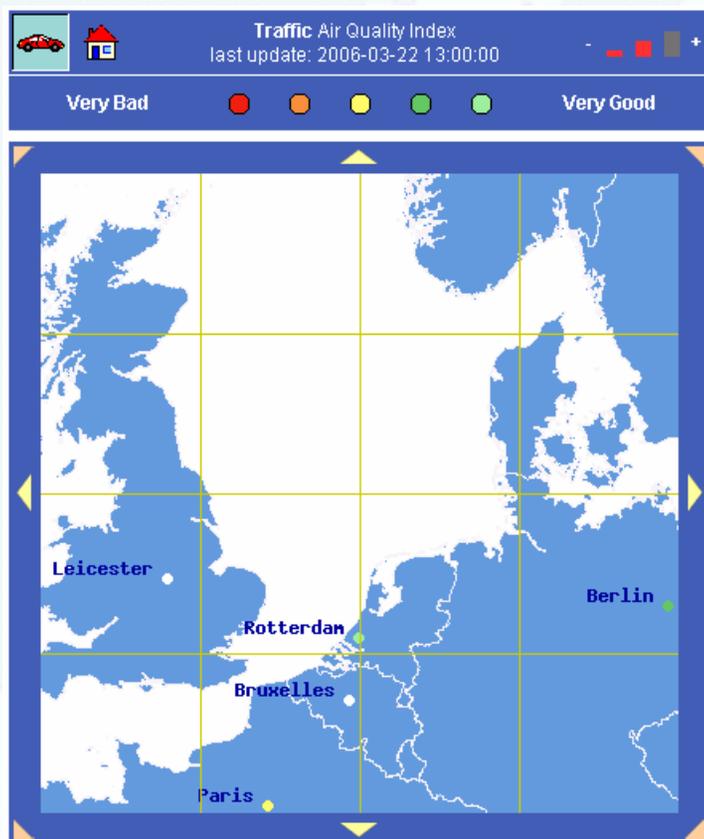
- ❖ **A common index linked to people's preoccupations:**
 - ❖ what is the **air quality where I am living** compared to **where I am traveling**
 - ❖ **exposure** caused by the traffic vs background conditions
 - ❖ class borders related as much as possible to **EU limit values and alert thresholds** : main concern for sensitive people
 - ❖ **long term exposure** taken into account through the annual index based on distance the target set by the EU annual limit values (linked to WHO recommendations and health protection)

Attractiveness of a common index

❖ An index easy to consult

- ❖ Through a **common international platform**
- ❖ in addition to local website
- ❖ with a **standard presentation and interpretation:**

www.airqualitynow.org



City Name	Roadside Index		Background Index	
	Now	Yesterday	Now	Yesterday
Berlin	36	57	-	-
Bruxelles	-	36	-	28
Leicester	-	-	-	-
Paris	52	64	22	27
Prague	-	83	-	>100
Roma	-	78	-	75
Rotterdam	23	27	36	35

Legend

Air Quality	Very Good	Good	Medium	Bad	Very Bad
Index value	0 ~ 25	25 ~ 50	50 ~ 75	75 ~ 100	> 100

Attractiveness of a common index

❖ Value added of a new common index:

A simple, comparable and up to date AQ information

- from different cities across Europe
- for the pollutants of main concern
- inspired by EU regulations

❖ An index technically innovative:

- ❖ Traffic and urban background are presented separately: which currently only exists for Brussels
- ❖ 3 time scales for a better understanding : hourly, daily and annual

Attractiveness of a common index

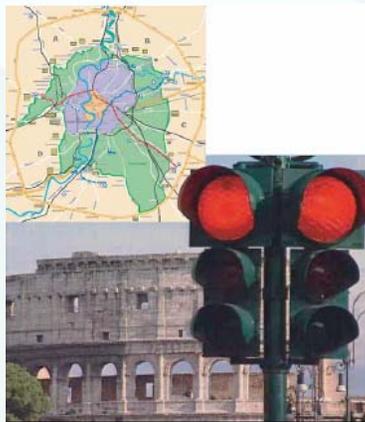
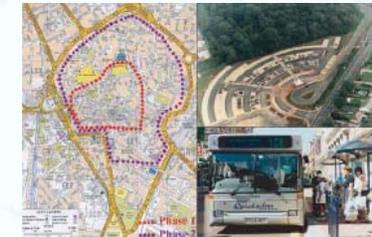
- ❖ **A dynamic index to entice repeated visits**
 - ❖ Hourly index, hourly updates for the current day
 - ❖ Class borders chosen to allow for changing pollutants determining the index.

But class borders are not linked with short term health effects to avoid an index:

- always low and not dynamic enough
- which would be confusing when local communication is based on hot spots and exceedences of the EU regulations

CITEAIR's proposed common index

- ❖ Would make the cities comparable across Europe
- ❖ Attractiveness for the public, the authorities and the media
- ❖ Easily usable by any city



The Common Air Quality Index has been made easy for the cities to join in

- ❖ **An hourly index** when possible
- ❖ **To avoid a restricted participation** : a daily and a yearly index have been developed
enabling cities with particular monitoring devices or validation procedures to join in
- ❖ **Data from one station or from several ones** (to be preferred)
- ❖ **Data transfer is automated and the procedure is easy to use**
- ❖ **Index calculation is automatically made** by the common web site
- ❖ **A link to the local monitoring network is provided**
for detailed information on the local air quality conditions

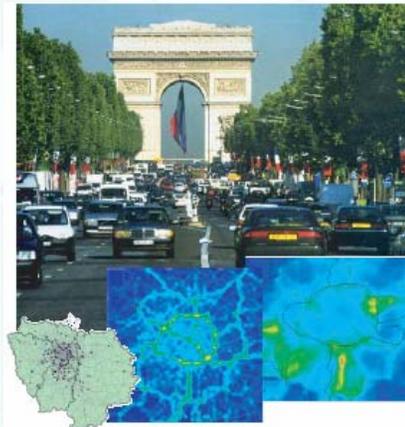
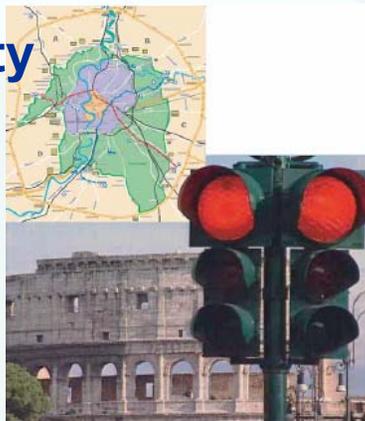
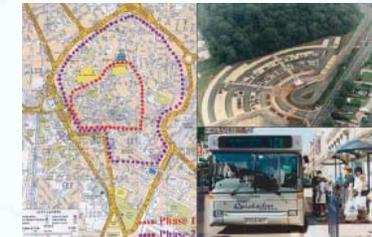
The Common Air Quality Index has been made easy for the cities to join in

But:

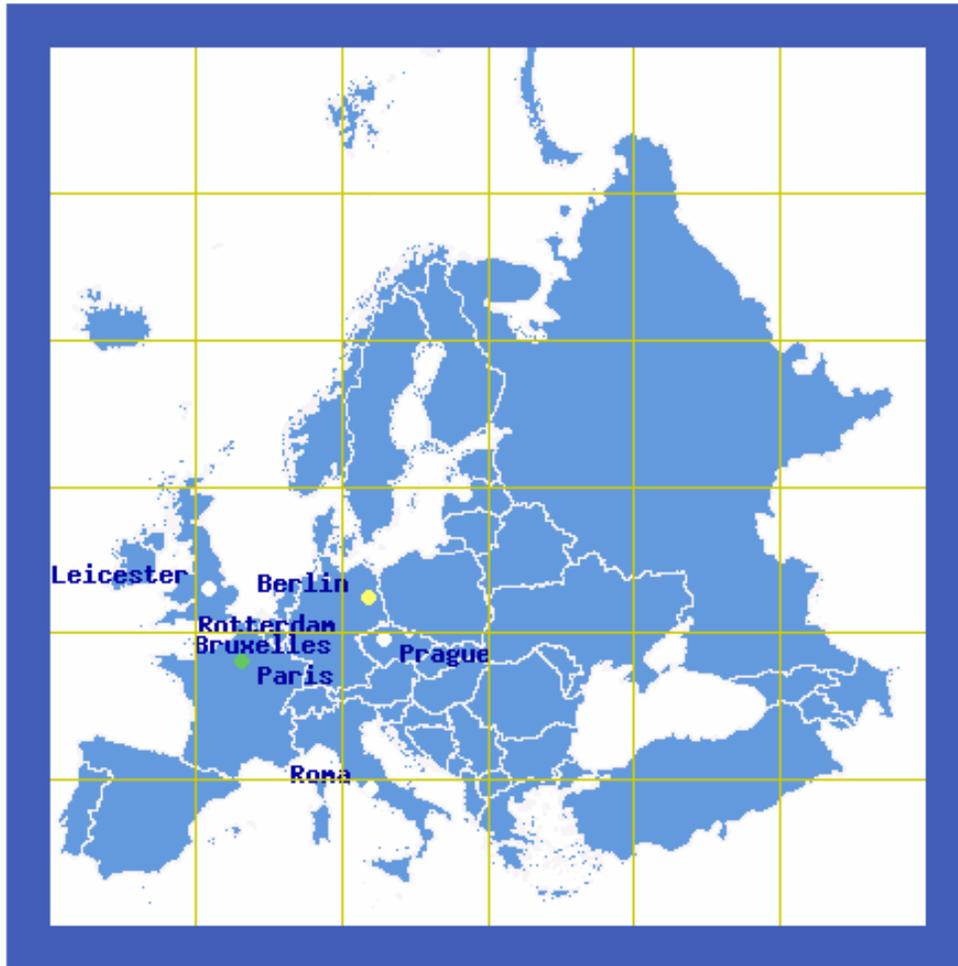
- ❖ We take for granted what is provided by the cities
- ❖ CITEAIRS' common index makes comparisons possible but will not replace the existing and more detailed local information
 - people are used to their own index,
 - local indices are adjusted to local situations
- ❖ The proposed indices and its supporting common web site are not designed for compliance checking, but to give a dynamic picture of the environmental situation in each city

CITEAIR will not solve existing technical issues, but...

- ❖ **Would make the cities comparable across Europe**
- ❖ **Takes into account 2 types of exposure**
traffic and background
- ❖ **Made attractive for the public and the media**
hourly updated
- ❖ **Enables hourly, daily and annual comparisons possible**
- ❖ **Is easily usable by any city**
independently
of the monitoring devices
and the validation
procedure used



Thank you for your attention



www.airqualitynow.org