Bulletin of the *Transilvania* University of Braşov
CIBv 2013 • Vol. 6 (55) Special Issue No. 1 - 2013

OUTDOOR AIR QUALITY MONITORING BY THE NATIONAL NETWORK FOR AIR QUALITY MONITORING

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Abstract: *www.calitateaer.ro is a site dedicated to inform the public in real time about air quality parameters, supervised in 117 stations on Rumanian territory which compose National Network of Monitoring the Air Quality. To have access to the existing dates in the shortest time, the site posts the quality parameters and the measured values, horary actualized, being in process of validation and authentication.*

Key words: *air quality parameters, public display, quality indices*

1. Introduction

Www.calitateaer.ro site is dedicated to real-time public information on air quality parameters monitored in the 117 stations all over Romania that make up the National Network for Air Quality

Monitoring (RNMCA) . In order to have existing data in the shortest time , the site shows the quality indices and the measured values , updated hourly ,that are in the process of validation and certification .

2. Types of Monitoring Stations in RNMCA

There are several types of monitoring stations in RNMCA:

2.1. Station type traffic

- evaluate the influence of traffic on air quality
- Radius area of representativeness is 10 -100 m;
- Monitored pollutants are sulfur dioxide (SO2) , nitrogen oxides (NOx) , carbon monoxide (CO) , ozone (O3) , volatile organic compounds (VOCs) and particulate matter (PM10 and PM2 , 5) .

2.2. Industrial plant type

- evaluate the influence of traffic on air quality
- Radius area of representativeness is 100m - 1km ;

Fig. 1. *Traffic type of monitoring station*

- Monitored pollutants are sulfur dioxide (SO2) , nitrogen oxides (NOx) , carbon monoxide (CO) , ozone (O3) , volatile organic compounds (VOCs) and particulate matter (PM10 and PM2 , 5) and meteorological parameters (wind direction and speed , pressure , temperature, radiant sun , relative humidity , precipitation).

Fig. 2. *Industrial type of monitoring station*

2.3. The urban station

- evaluates the influence of " human settlements " on air quality
- Radius area is representative of 1-5 km;
- Monitored pollutants are sulfur dioxide (SO2) , nitrogen oxides (NOx) , carbon monoxide (CO) , ozone (O3) , volatile organic compounds (VOCs) and particulate matter (PM10 and PM2 , 5) and meteorological parameters (wind direction and speed , pressure , temperature, radiant sun , relative humidity , precipitation)

Suburban station type

- Evaluates the influence of „human settlements „ on air quality ,
- Radius area is representative of 1-5 km;
- Monitored pollutants are sulphur dioxide (SO2) , nitrogen oxides (NOx) , carbon monoxide (CO) , ozone (O3) , volatile organic compounds (VOCs) and particulate matter (PM10 and PM2 , 5) and meteorological parameters (wind direction and speed , pressure , temperature, radiant sun , relative humidity , precipitation)

2.4. Regional station type

- is the reference station for air quality assessment
- Radius area of representativeness is 200 – 500 km;

Fig. 3. *Urban type monitoring station*

Fig. 4. *Suburban type monitoring station*

- Monitored pollutants are sulphur dioxide (SO2) , nitrogen oxides (NOx) , carbon monoxide (CO) , ozone (O3) , volatile organic compounds (VOCs) and particulate matter (PM10 and PM2 , 5) and meteorological parameters (wind direction and speed , pressure , temperature, radiant sun , relative humidity , precipitation).

2.5. EMEP station type

- monitor and assess trans boundary air pollution on long distance
- Are located in the mountains at an average altitude : background , you look and glade ;
- Monitored pollutants are sulphur dioxide (SO2) , nitrogen oxides (NOx) , carbon monoxide (CO) , ozone (O3) , volatile organic compounds (VOCs) and particulate matter (PM10 and PM2 , 5) and meteorological parameters (wind direction and speed , pressure , temperature, radiant sun , relative humidity , precipitation)

Fig. 5. *Regional monitoring station type*

Fig. 6. EMEP *type monitoring station*

3. Data flow

The monitoring system allows local authorities for environmental protection to :

- Evaluate , to know and to keep the public informed , other authorities and institutions concerned about the air quality ;
- To take timely, prompt action to reduce and / or eliminate pollution episodes or in case of emergencies ;
- To prevent accidental pollution ;
- To warn and protect the public in case of emergency.

Information on air quality from the 117 monitoring stations and meteorological data received from the 97 monitoring stations will be sent to locale centers from the 38 local Environmental Protection Agencies .

Data on air quality from the stations will be presented to the public by means of exterior panels (located in the conventional way in densely populated cities) and with the help of interior panels (located at City Hall) .

Fig. 7. *Exterior panel*

Fig. 8. *Interior panel*

Nationally there are 80 informational points for the public (outer panels 40 and 40 interior panels). National network of air quality monitoring data now centralizes the 117 stations data spread throughout Romania. Stations are distributed to the 38 local centres, located in Environmental Protection Agencies.

Online measured values by the analyser's sensors installed in the stations are transmitted via GPRS to local canters. These are inter-connected to form a network that includes central servers, where all data arrives and from where they are made public in real time through this website , the public display panels located in major cities and through information points located in halls.

Wanting to as promptly inform the public, the data presented is that submitted by online analyser's sensors in plants (raw data). Therefore, the values should be regarded as valid provided they are basically just automatically (by software) sampled, following the local canters specialists to manually validate these data and subsequently centrally certify.

Central database archives and stores both raw data and the validated and certified data. Experts access this data, both for different studies and for sending reports from Romania to the European forums.

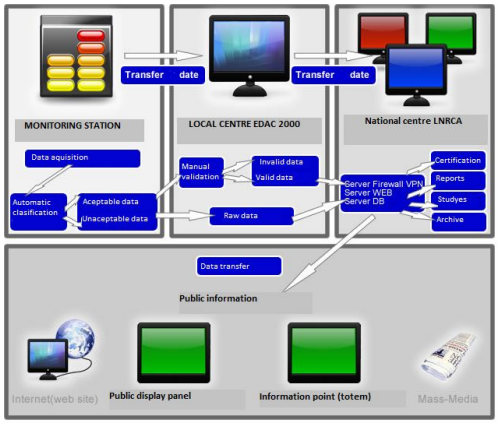

Fig. 9. *Sampling , processing and data transfer in RNMCA*

4. Quality Indices

Specific indicator of air quality in short "specific index" is a coding system for the recorded concentration for each pollutant monitored following: 1. sulphur dioxide (SO 2) 2. Nitrogen dioxide (NO2) 3. Ozone (O3) 4.carbon monoxide (CO) 5. Particulate matter (PM10).

The general index is established for each of the monitoring stations of the National Network for Air Quality Monitoring as the greatest of pollutants monitored. To calculate the appropriate the overall index, at least 3 specific indices must be available for the corresponding pollutants monitored. General and specific indices index are represented by integers between 1 and 6, each number corresponding to a colour the figure will represented both colours and numbers assigned to them) . Specific indices and the overall index of the station are shown every hour.

Fig. 10. *Air Quality Indices*

Sulphur dioxide Specific index is determined by the average hourly concentrations framing in one of the areas of concentration included in the table below:

Range for sulphur dioxide concentrations (ug/m3) specific index

0-49 , (9)	1
50-74 , (9)	2
75-124 , (9)	3
125-349 , (9)	4
350-499 , (9)	5
> 500	6

Nitrogen dioxide specific index is determined by the average hourly concentrations framing in one of the areas of concentration included in the table below:

Range for nitrogen dioxide concentrations (ug/m3) specific index

0-49 , (9) 1
50-99 , (9) 2
100-139 , (9) 3
140-199 , (9) 4
200-399 , (9) 5
> 400 6

Ozone Specific index is determined by the average hourly concentrations framing in one of the areas of concentration included in the table below:

Range for ozone concentrations (ug/m3) specific index

0-39 , (9) 1
40-79 , (9) 2
80-119 , (9) 3
120-179 , (9) 4
180-239 , (9) 5
> 240 6

Carbon monoxide Specific index is determined by framing arithmetic average of hourly values recorded in the last 8 hours in one of the areas of concentration included in the table below:

Range for carbon monoxide concentrations (mg/m3) specific index

0-2 , (9) 1
3-4 , (9) 2
5-6 , (9) 3
7-9 , (9) 4
10-14, (9) 5
> 15 6

Specific index corresponding to particulate matter is determined by classification arithmetic average of hourly values recorded in the last 24 hours , in one of the areas of concentration included in the table below:

Range for particulate matter concentrations (ug/m3) specific index

0-19 , (9) 1
20-29 , (9) 2
30-49 , (9) 3
50-79 , (9) 4
80-99 , (9) 5
> 100 6

For the following pollutants that are monitored by RNMCA , stated is their health effect on human and on ecosystem as well as CMA (maximum allowable concentration) threshold is defined by :

Sulphur dioxide SO2
NOx nitrogen oxides (NO / NO 2)
ozone O3
Carbon monoxide CO
benzene C6H6
Particulate matter PM10 and PM2.5
Lead and other toxic metals Pb, Cd, As and Hg
Polycyclic aromatic hydrocarbons PAHs

CMA exemplified for carcinogenic pollutant PM10 - particulate matter:

Order no. 592 of 25 June 2002
Particulate matter - PM10
Stage 1 limit values

50 ug/m3 PM 10 - daily limit value for human health protection (up to 1 January 2007)

40 ug/m3 PM10 - annual limit value for human health protection (up to 1 January 2007) Phase 2

50 ug/m3 PM 10 - daily limit value for human health protection (up to 1 January 2010)

20 ug/m3 PM10 - annual limit value for human health protection (up to 1 January 2010)

Carcinogenic health effects of pollutant PM10 - particulate matter and results monitoring station AB2 Sebes -Alba

Particle size is directly related to the potential to cause effects . An important issue is the particles with aerodynamic diameter less than 10 micrometres , which pass through the nose and throat and enter the alveoli causing inflammation and intoxication. Especially those with cardiovascular and respiratory diseases, children , the elderly and asthmatics are affected. Children younger than 15 years inhale more air , and therefore more pollutants . They breathe faster than adults and tend to breathe more through their mouth,

Table 1

Table of hourly average values measured at station AB2 Sebes of carcinogenic pollutant PM10 - Particulate matter. [1]

29.10.2008	Valori standard (µg/m³)	Procentaj
1:00	97.12	100
2:00	81.40	100
3:00	76.66	100
4:00	74.93	100
5:00	72.86	100
6:00	78.07	99
7:00	130.28	100
8:00	96.18	100
9:00	85.14	100
10:00	71.84	100
11:00	67.32	99
12:00	70.25	100
13:00	70.88	100
14:00	71.47	100
15:00	69.43	100
16:00	75.54	95
17:00	88.35	96
18:00	116.16	97
19:00	216.57	98
20:00	317.60	99
21:00	328.71	99
22:00	177.13	99
23:00	215.69	99
24:00	207.88	99

bypassing the natural filters in the nose. They are more vulnerable , because their lungs are not fully developed, and lung tissue that develops in childhood is more sensible. Powder pollution makes asthma symptoms worse , or cough, chest pain and difficulty breathing .

Long-term exposure to low concentrations of dust can cause cancer and premature death. By accessing the website: www.calitateaer.ro , I found the monitoring station AB2 , as in the days of 22, 23 and 24 October 2008 were excessive hourly , minimum being 71 mg / cm , high 252mg/mc to the maximum permitted level of 50 mg / m³ (20 mg / m of 1 January 2010) .

5. Conclusions

Since in the late 2008 year, the monitorization station AB2 concentrations of PM10 greater than the limit were recorded (24-hour average was exceeded 35 times during October 2008- February 2009), AP.M.Alba with County Commissioner of G.N.M. started the procedure for identifying the source / sources responsible for these overruns . AP.M. Alba notified of potential powder polluters Sebes , SC Kronospan S.A and SC Holzindustrie Schweighoffer LLC to take measures to reduce emissions of pollutants into the air so that concentrations of PM10 in ambient air to be within the limits stipulated by law.

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References

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