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UNIVERSITY
'POLITEHNICA' from
TIMISOARA

TIMISOARA 1 (South-West) AIR QUALITY MONITORING REPORT

TO:

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Results of the Air Quality Monitoring Campaign in South-West area of Timisoara

Location: Timisoara / south-west

Coordinates of the AQM station:

45°432665 N, 21°091194 E, altitude 84 m

Start on: 28 June 2011 10:00

End on: 3 July 2011 17:00

Experts for Romanian team: Francisc Popescu, Nicolae Lontis, Dorin Lelea, Gavrilă Trif-Tordai, Virgil Stoica, Aleksandar Pavlovic,

Overview of the monitoring site:



Timișoara was first mentioned as a place in either 1212 or 1266. The territory later to be known as Banat was conquered and annexed by the Kingdom of Hungary in 1030. Timișoara grew considerably during the reign of Charles I, who, upon his visit here in 1307, ordered the construction of a royal palace. Timișoara's importance also grew thanks to its strategic location, which facilitated control over the Banat plain. John Hunyadi established a permanent military encampment here, and moved here together with his family. In 1552, Ahmed Pasha conquered the city with a 16,000 Ottomans and transformed it into a capital city in the region.

Timișoara remained under Ottoman rule for nearly 160 years, controlled directly by the Sultan and enjoying a special status, similar to other cities in the region such as Budapest and Belgrade. During this period, Timișoara underwent a process of Islamization, until Prince Eugene of Savoy conquered it in 1716. Subsequently, the city came under Austrian rule, and it remained so until the early 20th century except Ottoman occupation between 1788-1789



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during Ottoman-Hapsburg war. During this time, Timișoara evolved from a strategic fortress to an economic and industrial center: numerous factories were built, electric illumination and public transport were introduced, and railroad connections were established. The city was defortified, and several major road arteries were built to connect the suburbs with the city center, paving the way for further expansion of the city limits.

Timisoara was the first mainland European city to be lit by electric street lamps in 1884. It was also the second European and the first city in what is now Romania with horse drawn trams in 1867. Gustave Eiffel, the creator of the Eiffel Tower in Paris, built one of Timișoara's footbridges over the Bega.

On October 31, 1918, local military and political elites establish the "Banat National Council", together with representatives of the region's main ethnic groups: Hungarians, Romanians, Serbs and Germans. In the aftermath of World War I, the Banat region was divided between the Kingdom of Romania and the Kingdom of Serbs, Croats and Slovenes, and Timișoara came under Romanian administration after Serbian occupation between 1918-1919. In 1920, King Ferdinand I awarded Timișoara the status of a University Center, and the interwar years saw continuous economic and cultural development. A number of anti-fascist and anti-revisionist demonstrations also took place during this time.

During World War II, Timișoara suffered damage from both allied and Axis bombing raids, especially during the second half of 1944. On August 23, 1944, Romania, which until then was a member of the Axis, declared war on Nazi Germany and joined the Allies. Surprised, the local Wehrmacht garrison surrendered without a fight, and German and Hungarian troops attempted to take the city by force throughout September, without success.

After the war, the People's Republic of Romania was proclaimed, and Timișoara underwent Sovietization and later, systematization. The city's population tripled between 1948 and 1992. In December 1989, Timișoara witnessed a series of mass street protests by Romanians, Hungarians and Serbs, in what was to become the Romanian Revolution of 1989.

According to the last Romanian census, from 2002, there were 317,660 people living within the city of Timișoara, making it the fourth most populous city in Romania.

Of this population, 85.52% are ethnic Romanians, while 7.64% are Hungarians, 2.25% Germans, 1.98% Serbs, 0.96% ethnic Roma, 0.38% Bulgarians, 0.23% Ukrainians, 0.17% Slovaks, 0.11% Jews and 0.76% others.

As of 2009, Timișoara has an estimated population of 312,113. 14.2% of the population are under 15 years of age, 4.0% are over 75. The Timisoara metropolitan area has a population of 365,545.

In an article in late 2005, French magazine *L'Expansion* called Timișoara Romania's economic showcase, and referred to the increased number of foreign investments as a "second revolution".

Cited from <http://en.wikipedia.org/wiki/Timișoara>

Most important premieres

- 1718 – Opening of the first elementary schools in Timisoara, the first in Romania;
- 1745 – Construction of the municipal hospital, the first in Romania (24 years before Vienna and 34 years before Budapest);



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1753 – Timisoara is a city with a permanent theatrical season (the third city of the Habsburg monarchy, after Vienna and Budapest);
 1771 – The first newspaper in Romania and also the first German newspaper in south-eastern Europe “Temeswarer Nachrichten” was published
 1815 – Josef Klapka library, first public lending library in the Habsburg Empire, the kingdom of Hungary and the Romanian territory;
 1823 – Janos Bolyai announces the discovery of the world’s first non-Euclidean geometry;
 1884 – First town on the European continent with electric lighted streets, with 731 lamps;
 1886 – First ambulance station in Hungary and Romania;
 1895 – First asphalt road in Romania;
 1899 – First electric tram in Romania;
 1969 – Prof. Dr. Ghermanescu published the first encyclopedia in the world of functional equations;
 1989 – The first free town in Romania;
 1996 – Birth of first child conceived in vitro in Romania, and the first child conceived by embriotransfer technique, made the team of Professor Ioan Munteanu;
 2001 – The first laser heart surgery in Romania;
 2003 – Planning the first sculpture park in Romania, at the intersection of Mures street with Route Martyrs;
 2003 – The first transplant of hematopoietic stem cells, to regenerate heart muscle in a patient with extensive myocardial infarction (first in Eastern Europe, the team of Prof. Dr. Stefan I. Dragulescu).

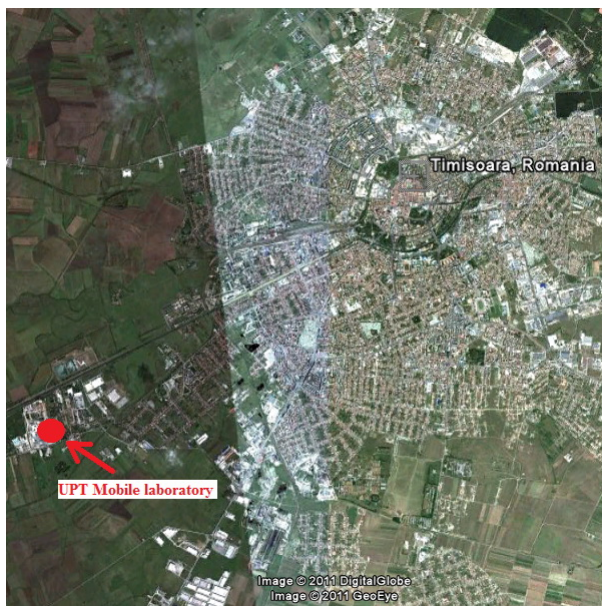


Figure 1. View of the measurement site



Equipment used in the monitoring campaign in Timisoara 1 (South-West area)

In table 1 the measurement techniques involved, equipments and the measurement uncertainty is presented.

Table.1. Equipments used and relevant informations.

Pollutant	Methods	Standard	Equipment	Measurement uncertainty
CO	NDIR	EN 14626:2005	Environnement CO12M	4 %
NO (NO ₂ , NO _x)	Chemiluminescence	EN 14211:2005	Environnement AC31M	2.06 %
O ₃	UV photometry	EN 14625:2005	Environnement O341M	6.98 %
CH ₄ , NMHC, THC	FID (flame ionization detection)	EN 12619:2002 EN 13526:2002	Horiba APHA 370	0.9 %
SO ₂	UV fluorescence	EN 14212:2005	Environnement AF21M	1.76 %
PM ₁₀	Gravimetric / Light scattering	EN12341	TSI Dusttrack	5 %
Wind speed and direction, air pressure, temperature and humidity	Professional mobile wetter station	-	KRONEIS	-

The equipments are part of the air quality monitoring mobile laboratory and procedures used are in full compliance with ISO/CEN 17025:2005 standard for quality assurance in analytic laboratories. The laboratory is the property of "Politehnica" University of Timisoara and more details and information's (including certifications) can be found on www.mediu.ro Linde and DKD (Deutsche Kalibrierdienst) calibrations gases (NO, SO₂, CO, CH₄ in N₂) were used.

Monitoring results.

The mobile laboratory is equipped with reference point instruments for major pollutants (SO₂, O₃, NO_x, CO, CH₄, NMHC, THC and PM₁₀). Meteorological sensors (wind speed and direction, air temperature, pressure and humidity) are mounted around the mobile laboratories. The following pollutants have been continuously measured, with 10 second resolution, over the entire measuring episode with high precision equipment:

- SO₂ measured with Environnement AF21M instrument, measurement principle is UV fluorescence, reference method: EN 14212:2005. The combined measurement uncertainty is $U = 1.76 \%$ for recorded values;
- NO, NO₂ and NO_x measured with Environnement AC31M instrument, measurement principle is chemiluminescences, reference method: EN 14211:2005. The combined measurement uncertainty is $U = 2.06 \%$ for recorded values;
- O₃ measured with Environnement O341M instrument, measurement principle is UV photometry, reference method: EN 14625:2005. The combined measurement uncertainty is $U = 6.98 \%$ for recorded values;



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- CO and CO₂ measured with Environnement CO12M instrument, measurement principle is NDIR (Non Dispersive Infrared), reference method EN 14626:2005. The combined measurement uncertainty is $U = 4\%$ for recorded values;
- CH₄, NMHC and THC measured with Horiba APHA370 instrument, measurement principle is FID (flame ionization detection), reference method EN 12619:2002. The combined measurement uncertainty is $U = 0.9\%$ for recorded values;
- PM10 (suspended particles, fraction PM10), TSI DUSTTRACK, measurement principle is light scattering / laser.

In table 2 the resulted values for daily mean values for all pollutants are presented.

Table 2. Daily mean values for relevant pollutant concentration in ambient air

Day	O ₃ μg/m ³	SO ₂ μg/m ³	NO μg/m ³	NO ₂ μg/m ³	NO _x μg/m ³	CH ₄ mg/m ³	NMHC mg/m ³	THC mg/m ³	CO mg/m ³	CO ₂ ppm	PM10 μg/m ³
06/28/11	22.36	4.64	11.71	27.20	38.91	3.96	0.32	4.28	0.66	400.20	48.995
06/29/11	16.10	4.88	9.45	26.30	35.75	4.17	0.22	4.39	0.78	400.16	39.066
06/30/11	18.48	5.39	9.55	26.22	35.77	4.27	0.28	4.55	0.70	400.03	48.554
07/01/11	16.93	5.32	11.23	28.72	39.95	4.30	0.25	4.55	0.59	400.62	44.630
07/02/11	17.78	5.15	10.24	28.81	39.05	3.99	0.22	4.22	0.77	389.89	48.407
07/03/11	21.95	4.75	10.24	30.44	40.69	4.06	0.45	4.50	0.68	389.61	50.058

CH₄, NMHC, THC and CO one hour mean value concentrations measured in Timisoara est industrial area

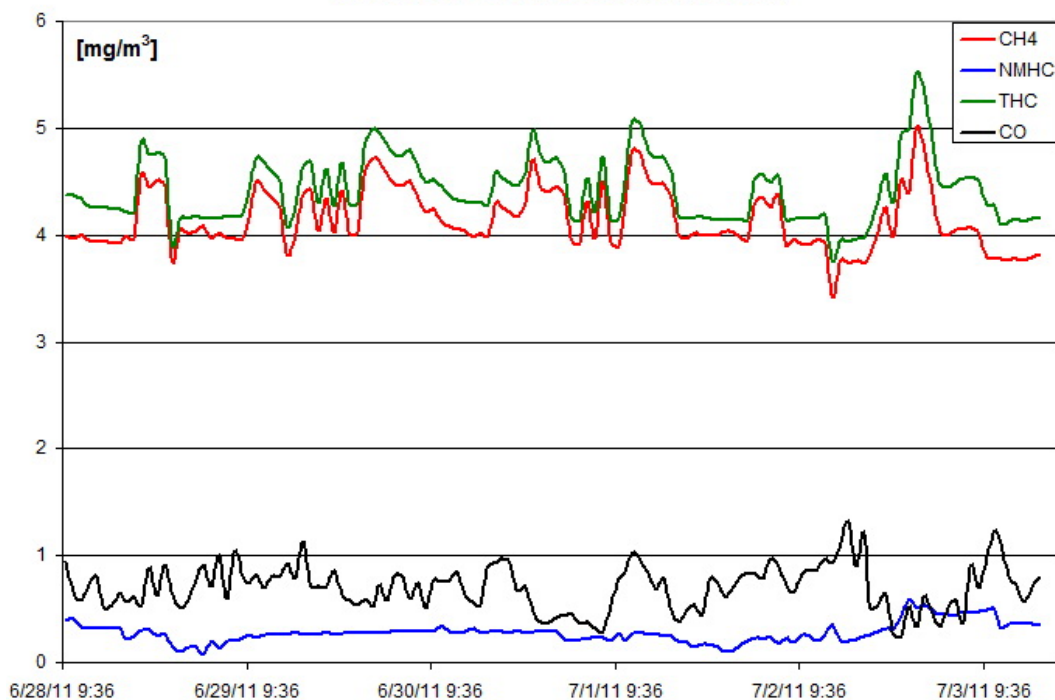


Figure 2. Hourly mean values recorded for CO₂, CH₄, NMHC, THC and CO in Timisoara south-west industrial area



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O₃, SO₂, NO, NO₂ and NO_x one hour mean value concentrations measured in Timisoara est industrial area

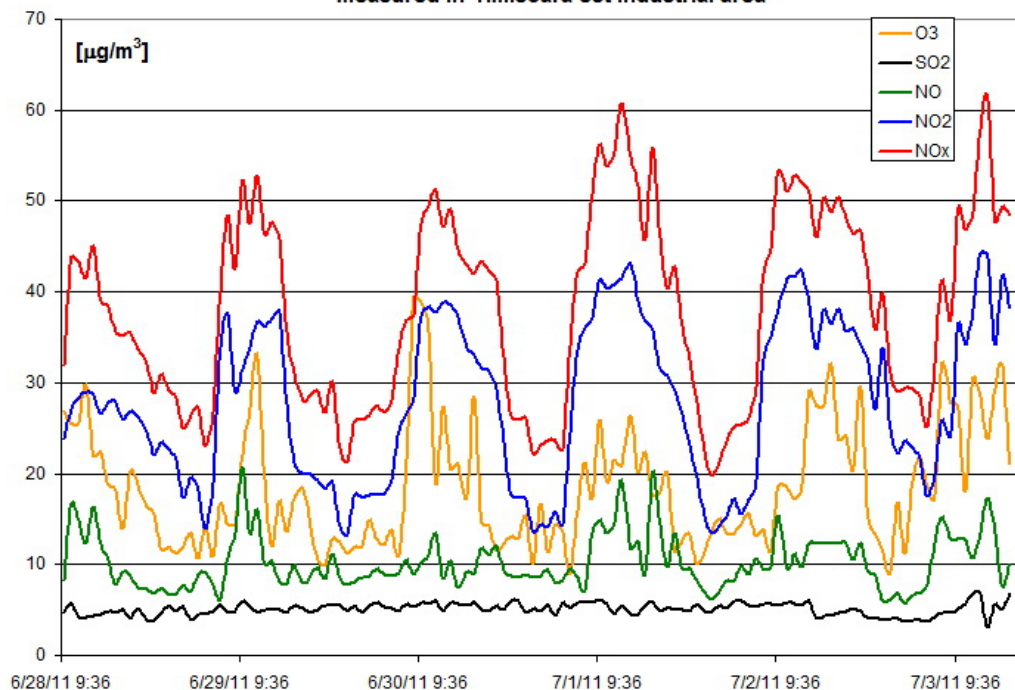


Figure 3. Hourly mean values recorded for O₃, SO₂, NO, NO₂ and NO_x in Timisoara south-west industrial area

O₃, SO₂, NO, NO₂ and NO_x daily mean value concentrations measured in Timisoara est industrial area

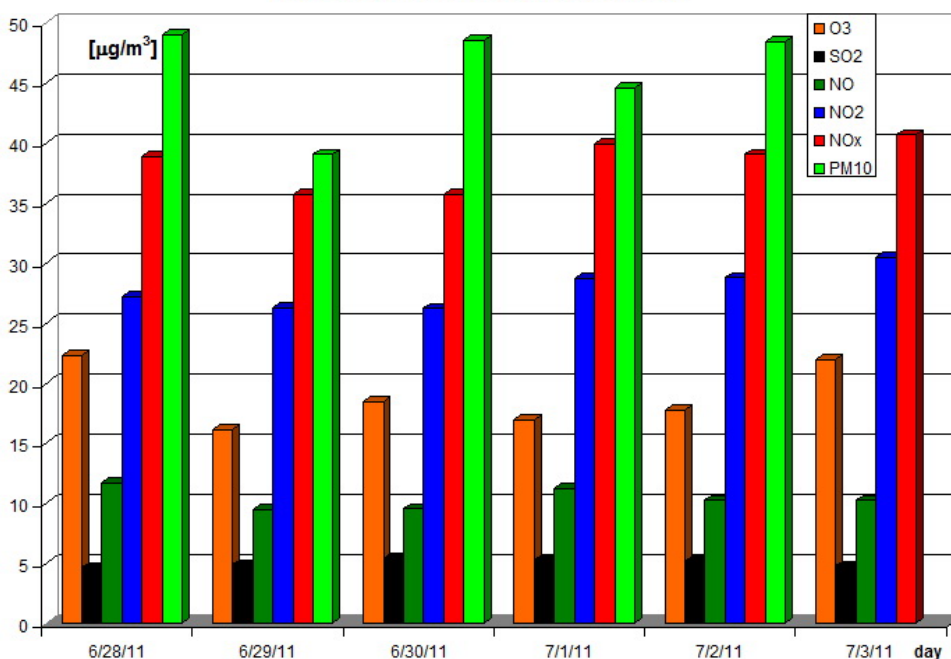


Figure 4. Daily mean values recorded for O₃, SO₂, NO, NO₂ and NO_x in Timisoara south-west industrial area



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CH₄, NMHC, THC and CO daily mean value concentrations measured in Timisoara est industrial area

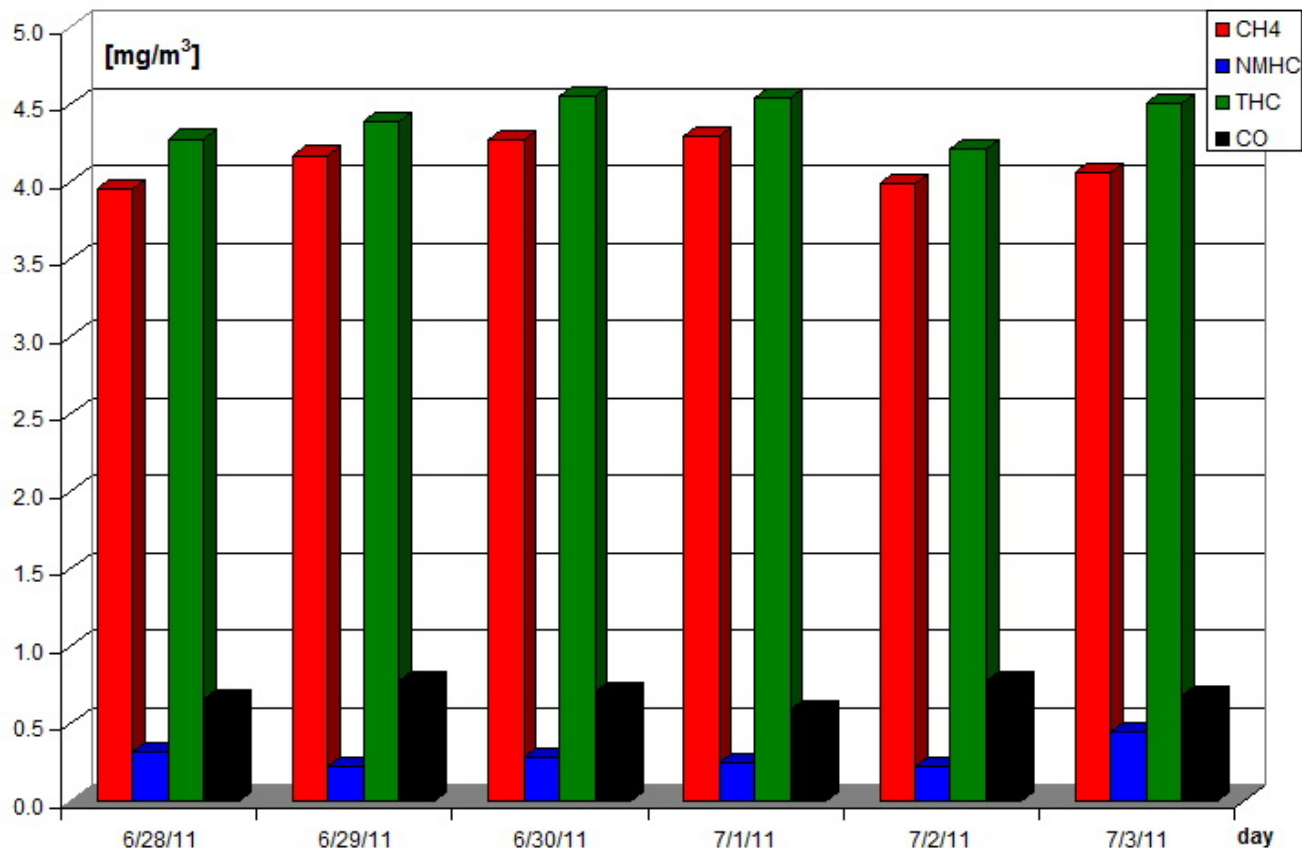


Figure 5. Daily mean values recorded for CH₄, NMHC, THC and CO in Timisoara south-west industrial area

In conclusion we can note that all relevant air pollutants are under the admissible EU and national limits. This is expectable due to the fact that the Timisoara south-west industrial area recorded a severe downgrade after 1989. Today the area is under development and several large companies located their production facilities here, most important are Smithfield prod and ContiTech Romania. The campaign is considered important due to the fact that the area development potential is high and the recorded data are useful as comparison background for the future.

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