

The Barcelona Supercomputing Centre has demonstrated that the 80km/h speed limit on access roads to Barcelona has improved air quality

- **The reduction in nitrogen oxide levels exceeded an average of 5-7% in the first six months of 2008**
- **With respect to particles, the improvement is an average of between 2 and 4%, with reductions on certain days above 8-10%**
- **The reduction of the nitrogen oxide emissions and particles is equal to the removal of 20,200 vehicles per day from the rapid access roads where the new speed limit has been applied.**
- **If this tendency continues, reductions will be made of some 93,400 tones of CO₂ per year, with savings of 30,000 tonnes of fuel and almost 44.5 million euros.**

09.26.2008

This morning, the Director of the Earth Sciences Department at the Barcelona Supercomputing Centre (BSC), and professor of Environmental Engineering in the Polytechnic University of Catalonia (the UPC), José María Baldasano, presented the results of the investigation Effects on your Air Quality through the Introduction of the Speed Limit to 80 km/h on Barcelona Access Roads, which was commissioned by the Department of Environment and Housing. MareNostrum, one of the most powerful supercomputers in Europe and which is capable of carrying out more than 94 billion operations per second, was used by Baldasano for the investigative work.

The investigation makes a preliminary evaluation of the first six months of the introduction of the speed limit to the rapid access roads of Barcelona, one of the 73 measures which comprise the [Action Plan for the Improvement of Air Quality](#) in 40 municipal areas in the metropolitan area. The measure was approved by the Catalan Government in June 2007 in order to re-establish the air quality in those areas decreed as requiring special atmospheric environmental protection due to the high levels of two contaminating substances detected in the air: Nitrogen oxides (NO_x) and particles in suspension with a diameter of less than 10 micras (PM₁₀). In compliance with European regulations, data from an entire year is required for figures to be considered sufficiently representative.



The 80km/h speed limit measure is applied on the rapid access roads in the denominated Zone 1, or first metropolitan ring, which comprises the city of Barcelona and 15 of the nearest municipal areas in the area, with high concentrations of the two contaminating substances mentioned. This includes the Baix Llobregat motorway, or the A-2, to the connection with the AP-2 with the B-23, the junction of the El Garraf motorway or C-32 with the Ronda de Dalt highway or B-20, the Castelldefels motorway or C-31 Sur, the B-10 or Ronda Litoral, the El Maresme highway or C-31 nord, the Pota Nord or B-20, l'eix del Llobregat or C-16, l'eix del Congost or C-17 and the motorways of the El Vallès area or the C-33 and C-58.

The Results of the Investigation

The study reveals that if we compare data with the first 6 months of 2007 with those of the same period of 2008, the impact of the speed limit has meant lowered pollution in the application area of the measure, despite the fact that vehicle intensity has been similar.

The reduction of the emissions is estimated to be between 3.5% and 4% for nitrogen oxides (NOx) and 3.5% for particles (PM10) as an average value throughout Zone 1, and which is centred basically near principal vehicle routes. This reduction is attributed both to a reduction in speed as to a reduction in traffic congestion.

In the areas studied of the C-31 highway (the municipal area limit of Badalona), l'AP-2 motorway (in the Sant Feliu de Llobregat, Molins de Rei and Sant Vicenç dels Horts sections) and the A2-C-32 motorway (between El Prat de Llobregat and Cornellà de Llobregat), the reduction of the levels of nitrogen oxides (NOx) (emissions) exceeded an average of 5-7% during the first six months of 2008. With respect to particles (PM10) the improvement in air quality is given as an average of between 2 and 4%, with reductions on certain days above 8-10%. The measure has also improved the reduction of CO₂ emissions, which are responsible for the so-called greenhouse effect, by approximately 3.7%, which represents a reduction of some 93.400 tonnes of CO₂ per year.

At the same time, this has led to a reduction in the consumption of fuel of around 3.7%, i.e., if the tendency continues, a saving of some 30,000 tonnes per year of fuel (18.56 millions of litres of benzene and 18.85 million litres per year of diesel) will take place. Economically speaking this will mean a saving of some 44.33 million euros by the end of the year.

Taking into account this reduction in fuel consumption, the reduction of NOx and PM10 emissions is equal to the removal of 20,200 vehicles per day from the rapid access roads where the new speed limit has been applied.

The Methodology Used

The dispersion model used in order to evaluate the impact of the measure on the levels of air quality comprises a meteorological module (ARW-WRF), an emissions model (Hermes 2004), a traffic and a chemical model (CMAQ). In order to evaluate the measure the results have been compared with the model results for the first 6-month period of both 2007 and 2008. With respect to the data entered into the model, it must be said that the only emission data which has varied from one year to another has been that of the traffic model. The task itself involved the inclusion of hourly data of more than 2,700 points with information regarding daily average intensities (IMD) and average traffic speeds (VMC), from 2007 and 2008, respectively, which were provided by the Catalan Transit Service. With respect to the meteorological model, 2008 was taken as a reference year, in order to avoid different atmospheric conditions influencing the results regarding emission levels.

The dispersion model used was adapted to provide a resolution of one square kilometre. This level of detail has meant that it has been possible to quantify the impact of rapid access roads with respect to their nearby surroundings.

Other Benefits of the Measure

According to data provided by the Catalan Transit Service, during the first six months of 2008, the number of deaths and serious injuries was reduced by 50% on all the roads in the Barcelona metropolitan area where the measure to limit traffic speed to 80km/h has been implemented. In this group of roads, from the 1st of January to the 30th of June 2007 there were 298 accidents with victims (6 deaths, 24 serious injuries and 385 minor injuries). Therefore there was a total number of 30 serious victims, taking into account those dead and the seriously injured. However, from the 1st of January to the 30th of June 2008, there were 220 accidents with victims (26% less than the first 6-month period of 2007), with 4 dead (33% less), 11 seriously injured (54% less) and 256 minor injuries (33% less). As such, this year there have been 15 serious victims less.

Evidence has also shown a reduction of traffic congestion. Since the introduction of the new speed limit, traffic flow is more constant and therefore emissions are reduced. Traffic is more fluid even during rush-hours with respect to the first six months of last year.

Another positive effect attributed to the reduction of the speed limit is the lowering of noise intensity from the main roads by up to 3 decibels, according to research undertaken by the certification company Applus. This reduction is equivalent to that which would be produced by reducing vehicles in constant traffic flow by half. This is a beneficial effect, above all for the population who live or work in the areas near to these roads.



It has been calculated that the number of persons who directly benefit from the reduction of emissions (the population close to the roads concerned), is 1.35 million people, while 3.29 million are potentially benefited.

Report on the 80 km/h Speed Limit

The average speed in the area limited to 80 km/hr has dropped by up to 27% and accidents causing injuries and death are down by over 40%.

The level of compliance with respect to the speed limit in the first ring of the metropolitan area of Barcelona where the 80km/h speed limit is applied ranges between 11 and 27% according to data from the January report from the Catalan Transit Service - Servei Català de Trànsit (SCT).

According to this data, speed during working days has lowered between the 11.5% registered at the entrance to the Castelldefels motorway (C-31 Sur) and the 23.1% registered at the exit of the Maresme motorway (C-31 Norte). During public holidays and at night the reduction has ranged between 11% at the entrance to the B-23 and 27% at the C-31 nord.

The measure has also brought with it a reduction in accident mortality and injury rates of 43.2% and 42.4%, respectively.

During the month of January an average of 684 daily fines were served per day from traffic comprising an overall total of 23,956,707 vehicles, some 800,000 of which travelled every day. During the same period of time the Catalan police force, the Mossos d'Esquadra set up 20 speed checks, resulting in 462 speed-related convictions. There has been no criminal speeding offence registered in the 80km/h zone.