

# Resum de Tesi Doctoral



UNIVERSITAT POLITÈCNICA DE CATALUNYA  
BARCELONATECH

Escola de Doctorat

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Títol de la tesi	Air quality management: Assessing the impacts of on-road transport strategies and industrial emissions in urban areas.
Unitat estructural	Departament de projectes d'enginyeria
Programa	Enginyeria ambiental
Codis UNESCO	250902 330801 330800 330804

(Mínim 1 i màxim 4, podeu veure els codis a <http://doctorat.upc.edu/gestio-academica/impresos/tesi-matricula-i-diposit/codis-unesco>)

Resum de la tesi de 4000 caràcters màxim (si supera els 4000 es tallarà automàticament)

Urban growth, the use of fossil fuels and current means of transport cause serious problems of air pollution. Assessing the effects of air quality management strategies in urban areas is a major concern. In recent decades, there have been significant management initiatives to reduce main emission sources and improve air quality (e.g. implementing ambitious Euro emission standards, increasing fuel quality and continuing downward pressure on industrial emissions). Despite those measures for air quality management, road traffic and the presence of industrial activities at the periphery of cities, still imply air pollution. The present Ph.D thesis has applied modelling techniques to assess the air quality impacts in urban areas of: 1) the two main European initiatives to reduce road traffic emissions in urban areas and improve urban air quality: mobility management and electric vehicles; and 2) industrial emissions.

The Ph.D. thesis has shown that air quality modelling is an important part in the development of air quality management strategies. Air quality modelling allows for quantitatively assess the effects in advance of a future strategy and to complement other methodological approaches (observations and emission assessments). Air quality modelling has proved to be versatile tool to analyse a set of air quality management measures in three different urban areas (Barcelona, Madrid and Santa Cruz de Tenerife) with different characteristics (geographical situation, emission patterns, atmospheric dynamics, vehicle fleet composition, etc.).

In general terms, road transport is the main emission source in urban areas. Two paradigm shifts have been analysed: mobility management measures to reduce vehicle kilometre travelled (VKT) and the introduction of electric vehicles. The first conclusion that may be highlighted is that there is no unique/universal solution to reduce road transport emissions. A combination of complementary measures has to be taken in consideration. Furthermore, to get desired emission reductions and related air quality improvements, ambitious changes in current road transport sector are needed.

The effect of the analysed strategies in urban air pollutant concentrations is positive. However the degree of the effect is different depending on each measure, fleet composition and pollutant.

Mobility planning and VKT reduction help to improve air quality levels; including both NO<sub>2</sub> and PM<sub>10</sub>. The definition of future scenarios also allowed for analysing the effect of fleet renewal by introducing newer technological improvement. Model results proved that fleet renewal is an effective measure to improve urban air quality.

Regarding electric vehicles, fleet electrification offers a potential for reducing air pollutant concentrations, especially related to NO<sub>2</sub> and CO emissions. Regarding PM<sub>10</sub> and PM<sub>2.5</sub>, lower reductions are observed because fleet electrification does not reduce non-exhaust emissions. Electric vehicles entail an additional load on the electricity power system, resulting in increased emissions from electrical generation, dependent on power mix.

Even though in general terms road transport is the main emission source in urban areas, other emission sources have a significant impact on urban air quality. The city of Santa Cruz de Tenerife presents air quality related problems, especially regarding SO<sub>2</sub>, and in a lesser extend concerning PM<sub>10</sub>. Two complementary approaches were applied to analyse air quality levels in Santa Cruz de Tenerife: the analysis of air quality observations and the application of modelling techniques. The combination of both methodologies permitted to relate the emission sources, the transport and reactions of the emissions and their impact in the air quality levels of the city. Model results confirmed that an oil refinery located in the city limits has a significant impact on SO<sub>2</sub> levels, while the episodes of high PM<sub>10</sub> concentrations are related to Saharan dust episodes.

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