A COMPREHENSIVE TOOL FOR THE PREDICTION AND MANAGEMENT OF AIR QUALITY IN THESSALONIKI

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EXTENDED ABSTRACT

An integrated air quality management system was developed for supporting the activities of the Organisation for the Master Plan and Environmental Protection of Thessaloniki in the prediction of air pollution levels and the design of sustainable air quality strategies.

The system allows for the calculation of emissions from the road transport sector through a module which utilises EMME/2 model results for the road network information and an algorithm based on the COPERT methodology. The emission inventory comprises of a total of 14 sources and a user interface which allows the alteration of the emitted pollutant quantities in order to adapt the database to each of the scenarios considered. The wind fields simulation and the description of non reactive air pollutants transport are performed using the mesoscale model MEMO, whereas for the simulation of chemical transformation and dispersion of air pollutants, the photochemical model MARS/MUSE is applied.

This paper presents the results obtained from the applications performed to verify the system's overall effectiveness and viability in analysing the impact of alternative transportation development scenarios on the air emission and air pollution levels in the wider urban area of Thessaloniki. The simulations focused on the baseline and three alternative traffic and transportation scenarios for the years 2004, 2014, 2014+, related to the reformation of the existing infrastructure and policies in the study area. For constructing the emission inventories for each of the scenarios studied only interventions to the road transport sector were considered.

The results for the year 2004 reveal an increase of NO_x emissions by about 10% with respect to the current situation, whereas for NMVOC and CO an increase of the order of 20% is expected and the emissions of particulate matter also appear elevated. The predictions for the year 2014 show a significant decrease in the emissions of all pollutants (NO_x, CO, NMVOC) of the order of 40%, associated with an increase of mean vehicle speed resulting from the infrastructure improvements considered in the scenario. The 2014+ scenario leads to a further decrease in emissions. Compared with the present situation, no major changes of the O_3 and NO_2 concentration levels for the year 2004 can be expected. However, the 2014 scenario leads to a significant improvement in the air quality of Thessaloniki, as an important decrease in both NO_2 and O_3 maximum concentrations is obtained. For the 2014+ scenario an even larger decrease in the concentrations is predicted. Overall, the results indicate that unless large changes occur to the existing transport related infrastructure (such as those considered in the scenarios 2014 and 2014+), the emissions and corresponding pollutant concentrations mainly related to the road transport sector will remain at high levels in the future.

Key words: air quality, air emissions, modelling