



Future anthropogenic pollutant emissions in a Mediterranean port city with emphasis on the maritime sector emissions - Study of the impact on the city air quality

Natalia Liora, Anastasia Poupkou, Konstantinos Markakis, Theodoros Giannaros, Athanasios Karagiannidis, and Dimitrios Melas

Aristotle University of Thessaloniki, Department of Physics, Laboratory of Atmospheric Physics, 54124 Thessaloniki, Greece.
Tel: +30 2310 998009. E-mail address: lioranat@auth.gr

The aim of this study is the estimation of the future emissions in the area of the large urban center of Thessaloniki (Greece) with emphasis on the emissions originated from the maritime sector within the port area of the city which are presented in detail. In addition, the contribution of the future anthropogenic emissions to atmospheric pollution levels in Thessaloniki focusing on PM levels is studied. A 2km spatial resolution anthropogenic gaseous and particulate matter emission inventory has been compiled for the port city of Thessaloniki for the year 2010 with the anthropogenic emission model MOSESS, developed by Laboratory of Atmospheric Physics of the Aristotle University of Thessaloniki. MOSESS was used for the estimation of emissions from several emission sources (road transport, central heating, industries, maritime sector etc) while the natural emission model NEMO was implemented for the calculation of dust, sea salt and biogenic emissions.

Maritime emissions originated from the various processes inside the area of the port (harbor operations such as stockpiles, loading/unloading operations, machineries etc) as well as from the maritime transport sector including passenger ships, cargo shipping, inland waterways vessels (e.g. pleasure crafts) and fish catching ships. Ship emissions were estimated for the three operation modes; cruising, maneuvering and hotelling. For the calculation of maritime emissions, the activity data used were provided by local and national authorities (e.g. Thessaloniki Port Authority S.A.).

Pollutant anthropogenic emissions were projected to the year 2020. The emissions from all the anthropogenic sources except for the maritime sector were projected using factors provided by the GAINS model. Future emissions from the maritime activities were estimated on the basis of the future activity data provided by the Port Authority and of the legislation for shipping in the future.

Future maritime emissions are determined by the vessels traffic changes as foreseen for the year 2020 by the Port Authority Investment Plan and by the reduction of the sulfur content in fuels used by ships in cruising mode to 0.5% m/m according to a revision of the MARPOL Annex VI. Based on the above, an approximately 60% increase in the future maritime sector PM10 emissions is expected due to the high increase of the traffic of vessels.

The impact of future emissions on the air quality of Thessaloniki is examined with the use of the modelling system WRF-CAMx applied with 2km spatial resolution over the study area. Simulations of the modelling system are performed for a summertime (July 2011) and a wintertime (15 November to 15 December 2011) period accounting for present time (scenario A) and future time (scenario B) pollutant emissions. The differences in pollutant levels (mainly PM) between the scenarios examined are presented and discussed.