

Multi-objective integrated assessment modeling to support air quality policy in Italy

Short Description

Aim of the project is the design and the implementation of a Decision Support System (DSS) for air quality planning focused on secondary pollution at mesoscale.

The control problem can be defined as a multi-objective problem, minimizing pollution exposure indicators, emission abatement costs and external costs.

The methodology is focused on the mesoscale in order to:

- (1) better interpret the physical situation of the specific urban and industrial structure in the area, the local meteorological conditions, the contribution of regional and local precursor emissions;
- (2) define reduction measures in a uniform socio-economical context.

The DSS has been implemented and tested on a Northern Italian domain, characterized by complex terrain, high urban and industrial emissions, dense road network and often affected by severe photochemical and PM pollution episodes.

The research is articulated in the following steps:

- Definition of the DSS aims with respect to the European and National Directives.
- Formulation of the multi-objective decision-making problem:
 - (1) identification of the air quality indicators and cost functions,
 - (2) definition of the decision variables and constraints,
 - (3) analysis and selection of optimization algorithms.
- Design of local source-receptor models, describing the cause-effect relation between the decision variables and the air quality indicators; the models are identified processing GAMES multiphase modeling system long term simulations.
- Estimation of the emission reduction cost functions.
- Estimation of the external costs in terms of health effects.
- Analysis of the not-dominated solutions for the multi-objective problem.
- Comparison between the expected emission scenarios based on the National and European Directives and the effective ones.

The project is at the moment funded by the Italian Space Agency in the frame of QUITSAT project (www.quitsat.it). The project will span for the period 2006-2009.

Bibliography

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