Project OPERA

An integrated assessment methodology to plan local cost-effective air quality policies harmonized with national and European actions

air pollution

PROJECT DESCRIPTION

Air pollution is one of the biggest problems for many Italian and European cities, as underlined in the Thematic Strategy on air pollution (COM 2005 446) and Directive 2008/50/EC on ambient air quality and cleaner air for Europe. Despite the application of the current regulation on emission control, high levels of pollutants continue to be recorded which threaten both **human health and ecosystems**. This is the case in the **Po Valley**, in Northern Italy, where the population is exposed to high levels of air pollution mainly due to the strong presence of **human activities**. An analogous situation, even if less critical, can be found in **Alsace** (France), where factors such as high population density in the upper Rhine valley, intense traffic due to its position close to Germany and Switzerland, as well as the presence of important industrial areas, have led to a worsening of air quality, with frequent exceedances of the allowed values of **particulate** matter and **ozone** compounds.

OBJECTIVES

The objective of the OPERA project was to **develop and apply a methodology to support regional/ local authorities in defining, applying and evaluating effective policies to improve air quality** and consequently reduce exposure of the population to atmospheric particulate (PM_{10}, $PM_{2.5}$), nitrogen oxide (NO_X) and ozone (O_3). The proposed methodology has been implemented in the **RIAT +** software (*Regional Integrated Assessment Tool*) to be used by local and regional administrators, which can foster greater awareness in the choice of actions to improve air quality taking into account also the containment of costs and maximization of the environmental benefits. RIAT+ is the evolution and integration of different regional experiences, mainly of the RIAT tool, developed by the University of Brescia and TerrAria for the JRC of Ispra (Institute for Environment and Sustainability) on the case of Lombardy.

PROJECT PHASES

Main project actions focused on:

- **preparatory actions** which concerned **the revision of the existing air quality plans and the methodologies as well as the identification of requirements**, in order to identify strengths and weaknesses of the available methodologies and to propose a set of requirements for improving them. The analysis focused primarily on the tools already available to partners, for example the Ninfa system of the ARPA Emilia-Romagna and the AtmoRhénA system of the CNRS (*Center national de la recherche scientifique*), as well as the RIAT system of JRC. Furthermore, a **collection of data was carried out in the two experimentation areas of the project** with the aim of populating the databases necessary for the application of OPERA in Emilia-Romagna and Alsace.
- **actions for the improvement of existing tools and their implementation**. Activities focused on system design and software development, carried out following the EU rules on data exchange (the so called INSPIRE Directive 2007/2/CE), and on the application of OPERA in Emilia-Romagna and Alsace in order to test the RIAT+ methodology and software.

This phase was composed of 4 sub-actions:
  - **OPERA methodologies and design;**
  - **Implementation of the OPERA: RIAT+ software;**
  - **Application of OPERA in Emilia-Romagna;**
  - **Application of OPERA in Alsace.**
- **Communication and dissemination actions** which concerned, in particular, the promotion of the project and the dissemination, to a specific target (technicians and politicians involved in the management of air quality and policies at regional and local level) of the tools produced, through conferences, meetings, information material, Laymans' report, etc.

PROJECT RESULTS

Opera has helped provide regional and local authorities with a tool (RIAT+) that can support them in choosing effective measures to combat air pollution at the lowest cost, and managing the specificities of each territory. Initially, RIAT + was used to optimize the annual average of PM_{10} in the entire Region of Emilia-Romagna, but this tool is also useful for companies that want to assess the impact of their innovative technologies and products on the air quality. In particular, the project realized:

- the RIAT software (downloadable for free), a regional application for integrated evaluation modeling, developed with open-source technologies and with a user-friendly interface both for data entry and for processing and navigating the outputs through maps, tables, graphs. The tool, applicable in any region (isolating the specificities of the application domain in the system entry database), allows you to choose between two different decision-making paths:
- scenario analysis: used above all to design plans for air quality on a regional/ local scale. Emission reduction measures are selected based on the judgment of experts or predominant sources subsequently evaluated through simulations of an air quality model. This approach does not guarantee the cost effectiveness of the chosen measures, the costs and further impacts are assessed ex-post.
- optimization: indicates the most convenient measures, both technical (*end-of-pipe*) and non-technical (energy efficiency and behavioral) aimed at improving air quality, and explicitly considers impact and costs.

RIAT +'s main outputs include: the quantification of the reduction of emissions on the domain, the table with the application rates for each technology used, a series of maps of the main indicators relating to air quality (AQI) and the Pareto chart which provides the most efficient solutions that can be implemented as costs vary (only for the optimization path). In the application the relationship that links the emissions with the air quality indicators (AQI) is described through Source/ Receptor (S/R) models. Such models can be as simple as a linear relationship, or as complex as a Chemical Transport Model (CTM). To reduce calculation time, RIAT+ uses nonlinear relationships identified by artificial neural networks (ANN), prepared to replicate the results of a limited set of simulations performed by users with deterministic air quality models;

- RIAT+ guidelines, divided in three parts: "RIAT+ instructions for use", "RIAT+ Output" and "RIAT+ Methodology". The document is a support tool for decision makers and experts interested in identifying efficient air quality improvement policies at minimum cost, using RIAT+;
- video tutorial presenting RIAT+'s main characteristics;
- the application of RIAT+ in "optimization" mode led, in particular in Alsace, to the definition of a **list of potential measures** that could possibly be included in the next revision of the regional plan for air, energy and climate; while in Emilia-Romagna the tool was used in the preparation phase of the *PAIR 2020*, Regional Integrated Air Plan, to set the emission reduction target. The preliminary document was approved by the Region in 2013 while the final approval of PAIR 2020 was granted in 2014;
- further applications: RIAT+ has been tested and applied, in addition to the project areas, in different regions; in Lombardy within the project VALUTA funded by ARPA and also in the APPRAISAL project in its final phase, appling it in the Brussels Capital Region (Belgium) and in the region of Porto, in North-Portugal. The application of RIAT+ in these latter regions was important for drafting the *Guidance Document* (final objective of the APPRAISAL project). In fact, Opera's main focus was to guarantee the versatility of the method and in particular the possible application of the methodology in furthe European countries;
- preparation of a register containing the emission reduction measures of the two project areas. Each measure is defined on the basis of its efficiency in reducing emissions and costs, and is linked to specific strategies. The complete documentation may support new software users;
- 3 conferences held: in the first meeting (Bologna) policy makers and technicians met to define a methodology capable of supporting the definition, implementation and monitoring of air quality improvement plans; the second conference (Strasbourg) offered an important opportunity to review the methodologies used in Europe to optimize the cost-effectiveness of air quality policies, present the RIAT+ methodology and the first results of OPERA to a panel of experts

as well as discuss with the participants the new developments; in the third conference (Bologna) the tools developed within the project were presented;
- 2 training courses on the use of the RIAT+ software, held after the end of the project with 33 participants from different EU countries.

Opera was selected as one of the 22 BEST LIFE Environment in 2014.

-

Acronym
OPERA

Number of reference
LIFE09 ENV/IT/000092

Reference Programme
LIFE

Beneficiary Coordinator
Arpa Emilia-Romagna

Contacts
Eriberto de Munari

EU contribution
1.089.544

Call Year
2009

Start Year
2010

End Year
2013

Beneficiary headquarters

Via Bottego, 9
43121 Parma PR
Italy

Region
Emilia-Romagna

Description

Emilia-Romagna (IT), Alsazia (FR)