

## Partners

**ARIA Technologies** was founded in 1990 in Paris to respond to a single concern, the atmospheric environment, through numerical simulation of the dispersion of pollutants in the atmosphere. This single focused specialization has enabled ARIA Technologies to build a comprehensive team of engineers, research scientists, and environment specialists who bring together the knowledge of fluid dynamics, meteorology, atmospheric chemistry, applied computing, database management, and geographic information systems.

**The National Environment Protection Agency (NEPA)** is a public institution with legal personality, financed by the national budget, subordinated to Ministry of Environment and Sustainable Development (MESD), with responsibilities in policies and legislation implementation in the environment protection domain. Its main objectives are the strengthening of Romania's administrative, monitoring and enforcement capacities and capabilities at national, regional and local level in the environment protection domain.

**RSI Electro** is a provider of measurements thanks to its own mobile laboratories. Its core competences are located in monitoring systems for environmental quality, mobile laboratories for air pollution monitoring, gas monitoring systems for the control of industrial procedures, detection systems dedicated to toxic and explosive gases, oxygen measurement equipments and waste water measurement systems.

**Euroquality** is a service provider established in 1997 specialised in Innovation and European research projects. Its main activities are consultancy in innovation, technology transfer, economical studies and policy evaluation, technological audits and the management of European research and development projects. Euroquality is also an expert of IT developments and communication services.

## Contact

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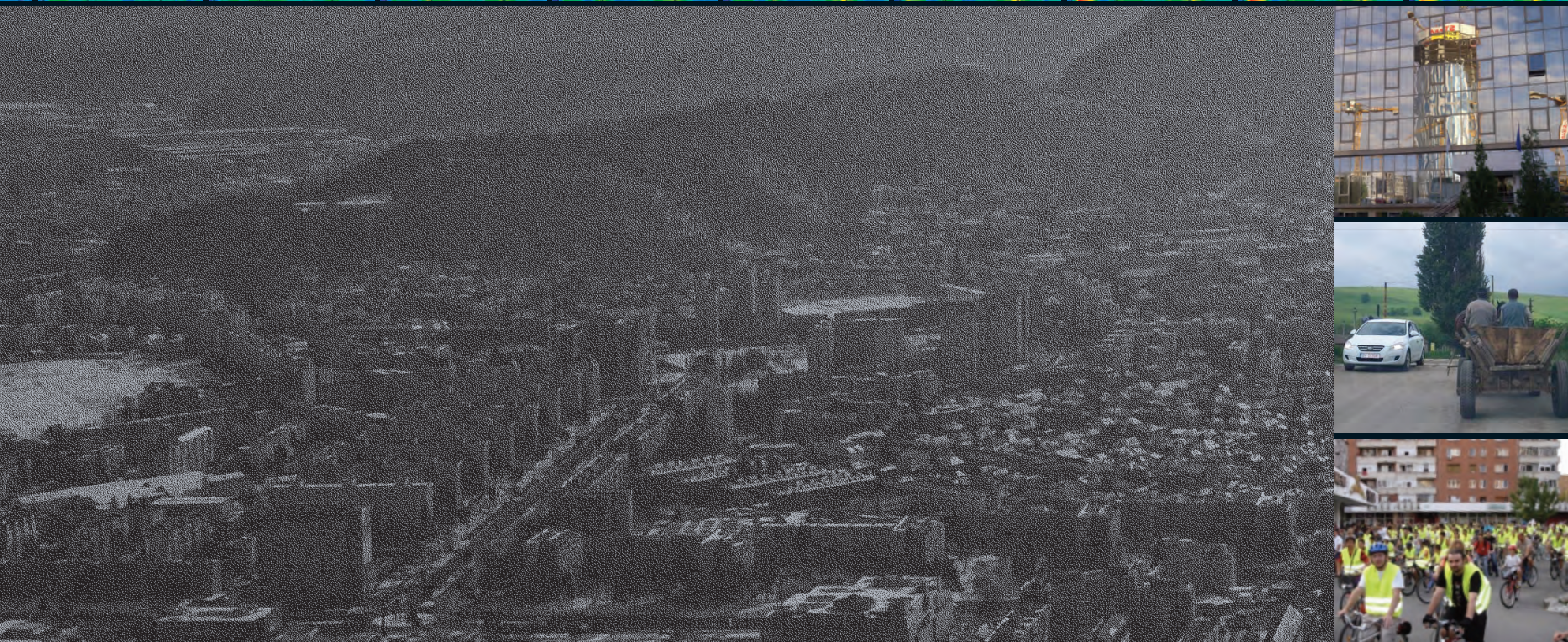
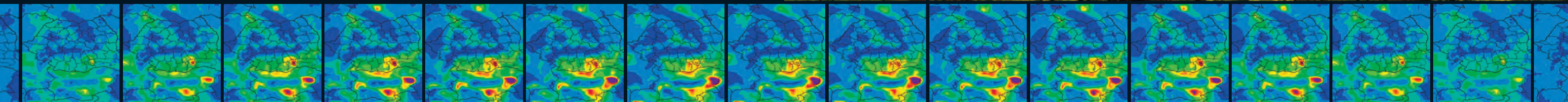
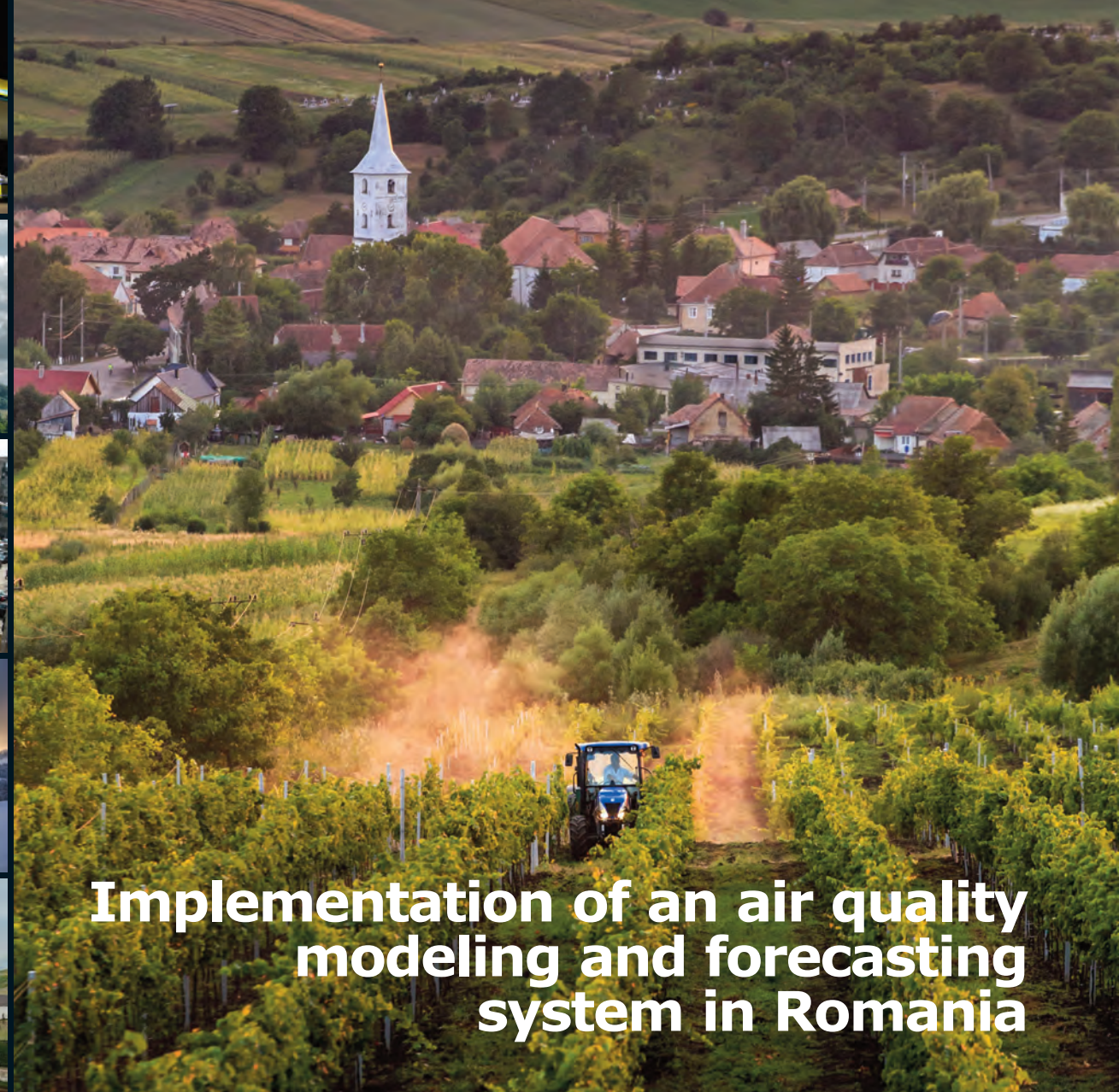
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The ROMAIR project has been financed by LIFE, the EU's funding instrument for the environment



# romair



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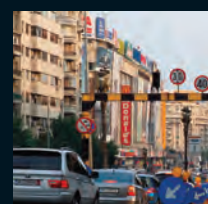


**The ROMAIR project aims at helping the Romanian authorities to improve public health and quality of life, with a comprehensive air quality modeling and forecasting system.**

**ROMAIR was implemented during the year 2008–2012 and provides the authorities with complementary tools enabling operational air quality forecasting as well as strategic planning for the study of future emission reduction scenarios. Moreover, it encourages changes in the behaviour of citizens as far as air quality and environment are concerned.**

## The EU background behind ROMAIR

### The context



With a population of 2.000.000 inhabitants, Bucharest is the financial, cultural and industrial capital of Romania. Like other European cities, pollution has become a major concern for the city.

Atmospheric pollution is an important challenge for all European Members, since there is clear evidence of its dangerous consequences both on health and environment. Atmospheric pollution is a complex problem: it is an extended phenomenon generated by many activities, such as rising industrial and energy production, burning of fossil of fuels, increasing road traffic, residential heating, etc.

#### The implementation of EU directives

For more than 40 years, EU has been implementing directives to tackle air pollutants, instituting targets regarding ambient air quality in the European Union; evaluating ambient air quality in all the member States based on common methods and criteria; obtaining adequate information for the public; maintaining ambient air quality where it is good or otherwise improve it.

The European Union's Directives have been integrated into the Romanian legislation; the necessary administrative structure has been established and put into practice; the Romanian Government adopted a National Strategy concerning Climate Change.

The approach chosen by ROMAIR was fully in line with the European Union's perspective and priorities, and its goal was to allow the Romanian authorities to tackle increasing atmospheric pollution. The outcome of the project was:

- A complete emission inventory for Romania (including greenhouse gases), inserted in a geographical information system, and processed for an air quality modeling system.

## First phase of the ROMAIR project

### Data collection



The various data necessary for air quality modeling — emissions sources (large point sources, traffic links, area sources, airports,...), land-use characteristics, air quality and meteorological stations, geographic boundaries for all administrative entities, etc. — has been geolocalized and incorporated into the ROMAIR ArcGIS database which has further been completed with information on emissions sources as well as statistics on population and fuel consumption for the different administrative entities. The calculation of traffic flow and traffic emissions in Romania and Bucharest has been carried out, based on relevant information on the road traffic (road infrastructure, vehicle flow, composition of the vehicle fleet) provided by the Romanian Auto Register (RAR) and the Ministry of Transport.

#### Traffic emission models

The models CarUSO (traffic assignment model) and TREFIC (emission calculation model) were configured and applied for the ROMAIR traffic simulations.



#### Emission Manager

All the data from the emissions inventory was aggregated and processed with a modular package called Emission Manager which processes and prepares inputs for the chemical transport model CHIMERE.

#### Merge of emission inventories

The emissions from neighboring countries have been accounted for. The emission data is taken from the EMEP database (European Monitoring and Evaluation Program) and includes a large part of Europe, Turkey, Ukraine and the south western part of the Russian Federation.

- Implementation and configuration of a meteorological model and of an air quality model for both primary and secondary pollutants set up for three different domains: European, National (Romania) and Regional scale (Bucharest region). The system operates on a daily basis, and in forecast mode, with Web display of results made available to the public on internet.
- Identification of critical areas and critical pollutants with a due consideration to the secondary pollutants such as  $O_3$  and  $PM$ .
- Comparison of model output with measurements of air quality at different stations of the Romanian air quality network. Field experiments were carried out in order to check inconsistent data at identified key stations measuring air quality.
- Study of the impact of scenarios for the reduction



Romania offers an interesting array of landscapes, from traffic-plagued Bucharest (aerial view below) to mid-size industrial towns (Resita, above right) and untouched rural areas (above left).

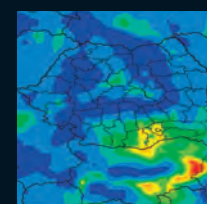
of pollutant emissions derived for example from European Directives and Romanian Government Action Plans.

- Assessment of the impact of climate change on air quality, due to the evolution of meteorological conditions above Romania.

The long-term environmental benefits should be the improvement of the air quality over Romania, with expected benefits on the health of its inhabitants, leading to a situation where EU Air Quality directives are followed. As with all decision support systems, these targets can

## Second phase of the ROMAIR project

### Implementation of the models



The sequence of forecast and simulation models used in the ROMAIR system for meteorology (WRF) and air quality (CHIMERE) is widely used by public bodies in France and in Europe.

WRF is a numerical weather prediction and atmospheric simulation system. The CHIMERE multi-scale model, developed by French major laboratories (IPSL, INERIS and LISA), is

designed to produce daily forecasts of ozone, aerosols and other pollutants and make long-term simulations for emission control scenarios.

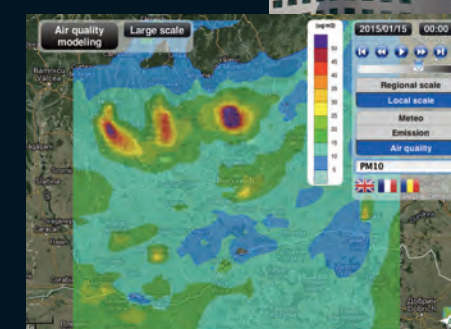
The ROMAIR air quality forecasting system has been adapted and tuned to Romanian conditions. The operational system issues daily reports to inform on the dispersion of pollutants and maps of pollution levels are available to the public on the ROMAIR website.

#### Validation of the models and LIDAR field campaign



For the validation of the photochemical dispersion model, CHIMERE, daily predictions where compared with observations at a selection of ambient air quality stations. Hourly time series of air quality data were extracted from the model predictions and

compared to experimental data, focusing on high pollution episodes for  $O_3$ ,  $NO_2$  and  $PM_{10}$ . A twin LIDAR (acronym for LIght Detection And Ranging) was used for obtaining vertical wind velocity profiles (wind LIDAR) and mixing height (aerosol LIDAR) over Bucharest.



only be met if and when the authorities of Romania take policy decisions on emission reductions. However, with the air quality support system, the public authorities have access to quantitative information on the consequences of different action plans on air quality.

## Third phase of the ROMAIR project

### Scenarios, dissemination and capacity building

#### Definition and simulation of scenarios

The modeling system was applied in scenario mode for evaluating national and regional plans related to emission abatement strategies. Five scenarios of realistic short or medium term solutions to air quality problems and traffic planning were defined and assessed jointly by NEPA and ARIA.

#### Dissemination

The online public portal ([www.romair.eu](http://www.romair.eu)) provides information on the project and its main achievements, and modeling results; a virtual campaign on best practices for the general public (including children); a restricted area for experts.

#### Capacity building

Throughout the whole ROMAIR project, various training sessions optimized the transfer of knowledge. At the final phase of the project, a capacity building session was organized with 10 days of technical training, enabling local users of ROMAIR to reach autonomy on the new system and models implemented in order to maximize its use as a decision-making tool.

