

# TC Projects Description for ARASIA TC Programme Cycle 2016-2017



**Project Number:** RAS/0/076

**Project Title:** Investigating Atmospheric Particulate Matter and Pollution Source Contributions in Urban Environments Using Nuclear Analytical Techniques

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**Overall objective:** To contribute to the enhancement of life quality and environment protection.

**Project duration:** 3 years

## PROJECT DESCRIPTION

**Regional gap / Problem / Need analysis:** Air pollution is a worldwide problem that can affect the environment and human health. However, in ARASIA region there is lack of enough data and study dealing with this issue. It is obvious from the few studies conducted in the Eastern Mediterranean region that Particulate Matter (PM) levels in air are much higher than in other regions, even when compared to the Western Mediterranean. Most probably, high PM background levels in ARASIA region cities could be attributed to several factors like high population density, frequent dust outbreaks, low precipitation rates, poor vegetal coverage and, in some cases, lack of rules and regulations concerning PM levels. The current project RAS 0072 is dealing with sampling and elemental analysis of urban background air pollutants, using a unified sampling and analysis protocol in all participating member states.

The project focuses on elemental analysis of PM<sub>2.5</sub> pollutants using mainly XRF and IBA techniques. The project is unique as it addresses a gap in the available data and information about regional background pollutants. Furthermore, it is expected to build human capacities and expertise in ARASIA MS related to environmental air pollution monitoring. A first campaign of sampling and analysis is to be achieved within RAS0072 with the aim to produce for the first time a data base of PM elemental concentrations in the region. However, the obtained primary results and data evaluation should be further expanded by follow up sampling campaigns, using additional samplers in each country to cover residential and urban areas thus increasing the number of collected aerosol samples. In this way it could be possible to apply effectively pollution source apportionment models such as the Chemical Mass Balance Model (CMB) and the Positive Matrix Factorization model (PMF). The identification of local or regional pollution sources in PM<sub>2.5</sub> and PM<sub>10</sub> is very essential for enforcing measures to improve the air quality in the region. Some of these air pollution sources could have natural or anthropogenic origin such as soil, desert, sea salt or diesel emission industry, power plants, gasoline vehicles, biomass burning, etc.

**This project is proposed as a regional activity for the following reason(s):** Atmospheric aerosols of PM<sub>10</sub> and PM<sub>2.5</sub> are trans-boundary and can effectively contribute to air pollution in a certain localized areas. In fact, pollutants travel in the atmosphere for hundreds of kilometres and can still be suspended in the air from several hours to several days. Indeed, pollutants originating from one state can affect other countries in the region. Thus, it is more correct to consider this problem in a regional perception. A similar project is executed, since many years, in the Pacific East-Asia region. This project will be a continuity of the actual regional RAS 0072 project, where urban background mapping of pollutants is to be performed in a regional context and a first data

base including the elemental composition profile of air pollutants will be created. Therefore, in the new project by having collected an increased number of PM data we will proceed to a next step performing a comprehensive source apportionment and creating for the first time a regional data base of fingerprint pollution sources. It is expected that the obtained results will initiate coherent actions in all the Member States of the region to improve relevant regulations concerning emissions and acceptable levels thus improving the air quality in the region.

**Stakeholder Analysis and Partnership:** Environmental, regulatory or health agencies in addition to Science and technology ministry and educational and research institutions.

**Role of nuclear technology:** The nuclear techniques to be used, beside XRF, are mainly the IBA techniques such as PIXE, PIGE, RBS and probably PESA when available. These techniques have the advantage to be non-destructive, multi-elemental, fast and sensitive and could be performed simultaneously. In addition, Synchrotron radiation techniques such as SR-XRF and XANES could be a plus. Some complementary techniques could be used too, if needed, such as TOF-SIMS, ICP-MS, XRD, RAMAN, FTIR or SEM/EDS.