



An Integrated Analysis of Recent Emissions, Pollutant Concentrations, and Health Impacts over Cyprus: The LIFE SIRIUS Approach

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Addressing the coupled challenges of climate change and air quality in the Mediterranean requires a unified analysis and response from these regions. LIFE SIRIUS (System for Integrated EnviRonmental Information in Urban areaS) is a three-year project with seven expert partners from three different countries dedicated to improving urban air quality planning and management by empowering responsible public authorities with the latest knowledge and competencies in urban air quality governance. The project will ultimately produce Updated Air Quality Plans for three cities, Thessaloniki, Rome, and Nicosia, as well as operational air quality and health-related warning systems and a unified Environmental Management System. At its core, LIFE SIRIUS aspires to lay out a tangible pathway that accelerates and scales up solutions designed to address air quality challenges. This emphasis extends to the health impacts and compound effects associated with air quality and heat stress issues.

In this work we present an analysis of the main research pillars of LIFE SIRIUS over one of its case studies, Cyprus, namely emissions, pollutant concentrations and health impacts. Assessment of anthropogenic emissions over the country reveals the significant contribution of road transport for several primary species (for NO_x, PM_{2.5}, CO, BC), followed by industry and energy production. The results of 10 years of measurements of the main atmospheric pollutants show that the concentrations of most pollutants are below the corresponding limit values established in Cypriot and European legislation. On the contrary, the target value of ozone is exceeded and the limit value of suspended particles with a diameter of less than 10 micrometers (PM₁₀) is exceeded. It is noted that the increasing trend in ozone is accompanied by a decreasing trend in nitrogen oxides, a possible outcome of traffic related measures, while the exceedances of the PM₁₀ limit values are due to both anthropogenic and natural sources. Lastly, we present results from a first study that accounts for the lagged effects of heat stress and air pollution synergy performed explicitly at daily temporal resolution over Cyprus, based on 16 years data of temperature, air pollutant concentrations and daily mortality. Mortality risk due to heat stress is compounded by air pollution with the elderly being the more vulnerable group.