Mitigating the Health **E**ffects of **D**esert Dust Storms Using **E**xposure-Reduction **A**pproaches - **MEDEA**

Project objectives:

The demonstration project "MEDEA" aims to provide the field-based evidence for the adoption of a strategic plan for mitigating the health effects of desert dust storm (DDS) events in South-Eastern Europe. Over the past decade, several studies have demonstrated that DDS in Mediterranean countries, originating mostly from the Sahara and Arabian Peninsula deserts, have been increasing in number and magnitude and linked it to desertification, climatic variability and global warming. EU legislation considers DDS impossible to prevent, implicitly harmless and discounts their contribution to daily and annual air quality standards of particulate matter up to 10 microns (PM10). However, there is increasing evidence from epidemiological studies which correlates exposure to PM10 during DDS with a significant increase in mortality and hospital admissions from cardiovascular and respiratory causes. Therefore, there is a pressing need for EU policies to reduce population exposures and increase individual, population and institutional resilience to the growing frequency and intensity of DDS.

MEDEA ultimate goal is to demonstrate the feasibility and effectiveness of an adaptation strategy to DDS and better inform EU policy making.

Toward this goal, in three of the most highly DDS-exposed Mediterranean regions Cyprus, Crete, and Israel we will accomplish the following specific objectives:

1. Provide evidence for the development of a strategic plan for mitigation of health effects of DDS events through exposure reduction.

2. Design easy to implement and sustainable exposure-reduction recommendations to follow during DDS.

3. Demonstrate which of the recommendations are effective in reducing exposures to DDS and related adverse health effects in panels of adults with atrial fibrillation (AF) and children with asthma.

4. Demonstrate the feasibility of applying models for early forecasting of DDS events and timely notification of the public, targeting susceptible individuals.

5. Transfer efficiently the results to competent authorities, scientific community, social stakeholders and citizens in Cyprus, Crete, and Israel and network with target bodies in other DDS-exposed regions in South-Eastern Europe.

Actions and means involved:

The MEDEA partnership brings together an interdisciplinary consortium of eight institutions from Cyprus (University of Cyprus, Cyprus University of Technology, Department of Labor Inspection, Department of Meteorology, Cyprus Broadcasting Corporation), Greece

(University of Crete, E.n.A Consulting) , and Israel (Soroka Clinical and Research Center) for the successful accomplishment of MEDEA project.

Dr Panagiotis Yialouros (Professor of Pediatrics, Medical School, University of Cyprus) is the Project Coordinator of the MEDEA project. Main associates are Dr Petros Koutrakis (Adjunct Professor, Medical School, University of Cyprus, Professor of Environmental Sciences, Harvard School of Public Health) and Dr Stefania Papatheodorou (Assistant Professor in Public Health, Cyprus University of Technology). The program will start in September 2017 and will last 4 years until August 2021.

The total budget of the program is 3,337,611 million euros and the project is co-financed (1,939,000 million euros) by the European Union within the framework of LIFE program while the rest of the money will be covered by the partner organizations.

During the first project year, detailed guidelines for reduction of outdoor and indoor exposure to DDS will be developed and televised is short animated video cips. In parallel, meteorological models for early detection of DDS events in Cyprus, Crete, and Israel will be developed and validated. In the same time, the IT partner of the project (E.n.A. Consulting) will develop a bidirectional, patient-centred web-based platform for:

a. Collection of early forecasting data from meteorology modellers;
b. Early dissemination of forecasting and exposure reduction recommendations to patients; and
c. Acquisition of health data from patients.

During project years 2 & 3, the effectiveness of recommendations will be assessed for a) indoor exposure reduction by using samplers for measuring indoor PM10, PM2.5, black carbon (BC) and elements, and b) outdoor exposure reduction by measuring the time patients spend outdoors using a global position monitor and their levels of physical activity using accelerometers. Outdoor PM10, PM2.5 levels will be obtained from measurements of local stations and BC and elements by outdoor samplers positioned at a representative sample of premises. In parallel, health outcomes will be collected with the use of questionnaires and lung function tests in children with asthma and downloads from previously implanted pacemakers in adults with AF to assess the effect of exposure-reduction interventions.

In demonstration, protocols will be developed to assess which of the recommendations are more effective to reduce exposure and associated adverse health effects in the panel studies. Transferability will be addressed by targeting a) citizens with social media and smartphone applications and b) institutions and competent authorities in South Europe. DLI, air quality authority in Cyprus, will upgrade local strategic air pollution management plan based on MEDEA findings and will continue using MEDEA web applications after the project life. In dissemination, tools will be set up (TV documentary on DDS, web page, notice boards, layman report), structures (Advisory Board, networking) and events (colloquia, workshops, conferences) to assist the development of adaptation strategic plans in DDS-exposed South Europe areas.

Expected results (outputs and quantified achievements):

MEDEA project will produce indicator-based results of adaptation to the climate change-related increase in DDS events. Within the next 4 years it is anticipated:

1. Adoption of a strategic national plan for adaptation to the increasing DDS events by the competent authorities (CyMET and DLI) in at least one of the participating countries (Cyprus). The Cyprus paradigm will serve as a model for adaptation in other DDS-exposed South Europe regions;

2. A set of evidence-based recommendations for reducing outdoor DDS exposure by 30% and indoor DDS exposure by at least 50%. Televised spots of the recommendations in Greek, Hebrew and English will be produced for download in web and smartphone applications;

3. A sustainable bidirectional web-based platform that communicates DDS forecast information and exposure-reduction recommendations in a timely manner to susceptible citizens and the general population. The competent authorities (CyMET and DLI) in at least one of the participating regions (Cyprus) will adopt this application through an existing long term contract for citizens' notification;

4. A set of highly accurate air quality models that predict DDS events 3 days ahead in the region of Eastern Mediterranean basin;

5. Data demonstrating the effectiveness of the developed recommendations to reduce outdoor and indoor exposure to DDS pollution, especially among vulnerable populations;

6. Quantification of vulnerability of population/patient groups and evidence-based estimates demonstrating which intervention/ recommendations work best in mitigating adverse health effects in children with asthma (primary outcome: increase of Asthma Control Test symptom score by 3), adults with AF (primary outcome: reduction of atrial fibrillation burden by 20%) in South-Eastern Europe;

7. Multiple dissemination activities such as colloquia, workshops, open fair events and conferences for scientific community, stakeholders and citizens in Cyprus, Crete, and Israel;

8. A series of tools (TV documentary on DDS phenomenon, web page, notice boards) for networking with citizens and stakeholders in the three participating regions and other DDS-exposed regions in South Europe.