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Tasks description of WP2

T2.1. Improved evaluation of health effects in epidemiologic time series studies.

Here particulate matter (PM), PM components, black carbon (BC), nanoparticles, oxidative potential (OP) and individual source contributions (from T1.1, T1.3) will be used to complement data on regulated pollutants (PM2.5, PM10, NO2) for epidemiological studies and impact assessment to demonstrate the added value of new metrics beyond routinely measured pollutants. Task will link the time series of new air quality (AQ) metrics to those of daily mortality and hospital admissions and meteorological parameters. We will analyse the pilot cities (Barcelona, Athens, Zurich) (T4.4) and analyse additional cities from the compiled time series in WP1. We will explore novel analyses benefiting from the rich exposure data by characterizing days according to the mixtures of all these pollutants, to try find specific patterns with increased risks. Furthermore, we will examine the combined effect of pollution and meteorology (e.g., heat waves), an important issue providing links to the climate change debate. The second approach is the health impact assessment approach, where we assume a specific exposure response function and combine that with the newly developed time series of novel AQ metrics. This approach can also be applied in cities with a shorter time series such as pilot studies with newly added metrics for about a year. This task will deliver Service Tools (STs) (D2.1-D.2.2) on health effects of novel AQ metrics and source contributions, and will integrate results to provide these for demonstration in the pilots (SP2, T4.4) and provide guidance for the roadmap for upscaling (SP3).

T2.2. Evaluation of oxidative potential (OP) as an additional metric to assess potential toxicological effects of PM10 and PM2.5, in relation to particulate matter (PM) components and their source contributions using online and off-line techniques.

The major contributors to OP are different from those which determine PM mass, and therefore, imply different priorities for air pollution control. There is still a need to establish whether OP is a better predictor of health impacts in human populations than PM mass. There are several available measures of OP (dithiothreitol DTT, ascorbic acid AA, glutathione GSH, dichlorofluorescin DCFH, electron spin resonance ESR assays), which do not correlate well with each other, as they are driven by different oxidizing species. Here we will harmonise measurement protocols for most health relevant OP assays, including online measurements. PM10 and PM2.5 source apportionment data from WP1 will be used to identify the predominant sources contributing to OP with inputs from available data and pilot studies providing both OP and source contribution data (T4.4). This evaluation will be done for Athens, Paris, Zurich and Barcelona. We will deliver (D2.3) an integration of results on the parameters, sources of importance targeted by OP analysis and an assessment to implement these analyses in the pilot

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test-demonstrations (SP2) and the roadmap for upscaling (SP3). D2.4 will analyse epidemiologically the short-term health outcomes of OP values.

T2.3. Mobile monitoring of nanoparticles and citizen observatories to improve evaluation of health effects of long-term exposure.

Different approaches may be used to assess nanoparticles, BC, NO2 and PM2.5 concentrations at fine spatial scales for epidemiological analyses. Mobile platforms and smart sensors networks with involvement of citizens will be used/implemented to obtain the required urban maps supporting LUR modelling approaches. The regional and urban background concentrations will be obtained from modelling tasks in WP3. T2.3 will result in a proposed methodology, including involving citizens and mechanisms to enrol citizens that can be readily upscaled at European levels (D2.5). For mobile measurements prior experience of UU, VITO, NOA and TROPOS will be the basis to develop a ST (as a best practice document on devices, measurement schemes, data quality, data aggregation methods, involvement of citizens, and potential to turn methods into sustainable tools for AQMNs) that will be tested in the pilots T4.3 (Rotterdam, Birmingham, Bucharest). Two cars measuring nanoparticles, NO2, BC and PM2.5 will be combined with targeted measurements by volunteering cyclists or pedestrians with portable instruments for nanoparticles and BC. Algorithms to automated data processing, combined with time series of high range monitors from existing AQMNs for temporal extrapolation into high resolution street-level concentrations will be done. Combining the methodology (D2.5) with the additional measurements lead to a report on the added value of mobile monitoring with citizen involvement and citizen smart networks in health effect assessment (D2.6). Low-cost sensors are currently available for PM2.5 and NO2, but not for nanoparticles. Experiences with low-cost sensors will likely be useful for future integration of low-cost nanoparticle measurements. The city authorities and local AQMNs in the pilot cities will recruit citizens for the mobile monitoring pilots (WP4) and low-cost calibrated portable instruments will be provided to a network of collaborating citizens for targeted measurements, as done previously in NL, BE and FI. The maps of nanoparticles and PM (T2.3) and those of PM source contributions (WP3) will be linked to existing cohort studies, in NL assessing health effects for demonstration.

T2.4. WP2 synergy to support WP3 and SPs 2-3 for exposure and health effects assessment

This is the integration of WP2 results to support demonstration of STs (SP2, T4.3-4.4) and the roadmap for upscaling them in (SP3, T5.1-5.2, T6.2). Additionally, the European added value of the novel AQ metrics and source apportionment will be supported by pan-European results on the associated health effects.

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