**NIAM activity on PM2.5**

As one of our first activities in NIAM, we would like to look at how countries are addressing PM2.5 pollution, including how they model it, how they assess the health impacts, and how this feeds into policy. As a first step, we are gathering information on current work in this area towards organisation of a virtual meeting in November.

If you are interested in participating please register your interest with an e.mail to [h.apsimon@imperial.ac.uk](mailto:h.apsimon@imperial.ac.uk). And if you are already working in this area we shall be grateful if you can also send a response to the questions below which will help us in planning a focus on this topic.

1. **Modelling PM2.5**

If you model PM2.5 concentrations in your country:-

1. Do you use GAINS, or independent modelling- in which case please give brief details.

The modelling system at IEP-NRI is using the GEM-AQ on-line air quality model (Kaminski et al., 2008). The model is used for the operational forecast (both country scale and European in the scope of the CAMS50 Regional Production Service), as well as for national air quality assessment and scenario analysis. The sectional aerosols module describes 5 chemical types of aerosols in 12 bin each. PM2.5 and PM10 are calculated as a diagnostics based on the relevant aerosol bins. In the vertical, the model extends up to the mid stratosphere which allows for the correct representation of large scale transport processes.

1. What distance scales do you cover- e.g. European, national, city: and with what spatial and temporal resolution?

* European – 10km
* Poland – 2.5 km
* City (30 Polish agglomeration > 100K inhabitants) – 0.5 km

1. What components of PM2.5 do you include- e.g. primary PM2.5, secondary inorganic aerosol, secondary organic aerosol, natural dust etc?

* Black carbon
* Organic carbon
* Sulphates
* Mineral dust
* Sea salt
* Additional species: Nitrates, SIA, elemental carbon from wood burning, elemental carbon from fossil fuels, PM10 from wildfires are available in the model version run for CAMS50.

1. What emissions data do you use e.g. a national inventory. Are there particular sources you think are uncertain, missing, or would like to discuss?

National high-resolution inventory (bottom up approach) updated every year.

Emission factors (e.g. agriculture) and spatial variability of the fuel mix for low combustion seem to be the largest sources of uncertainty. Also, the implementation of the regional AQP is not sufficiently updated in the inventory.

1. Have you undertaken validation of your model against measurements, and if so what measurements do you have available to use

Modelled concentrations are always evaluated against observations (in the case of the annual assessment – before the assimilation process) – based on time series of observations. We use both automatic (1 hour) and manual (24hour) AQ observations from the national monitoring station network. Overall, there are over 100 stations per pollutant (for PM10 more). We use DeltaTool developed in FAIRMODE, and the software developed by our group (Python an R).

1. What do you think are the most important uncertainties or aspects of PM2.5 modelling that you would like to discuss

Issues that are a potential source of uncertainty but are difficult to assess:

* The contribution from the natural sources.
* Temporal variability of anthropogenic sources (daily/weekly/monthly profiles vs temperature/wind dependent).
* Deposition and sedimentation (not measured).
* Resuspension

1. **Assessing health impacts**

The health impacts of PM2.5 are a major driver to reduce air pollution.

1. We are interested in how you use data on concentrations of PM2.5, either modelled or measured or both, to assess human exposure and health impacts?

Modelled: annual averages are calculated using modelled hourly values. Modelling results are reanalysed for the annual air quality assessment program. For particular administrative regions, spatial averaging values are calculated.

Observed: in the case of urban areas with more than just one station – we average annual concentrations (no weighting factors are used, although consideration is given to the station type). Observations not used for rural areas – spatial representativeness not defined precisely.

1. If you undertake such assessments of health impacts of PM2.5, do you follow WHO guidance and base this on total mass of PM2.5, or do you focus on particular components and/or differentiate relative toxicity?

The total mass of PM2.5. PM components analysis is available routinely only from few stations in Poland, located in rural areas and campaign measurements in cities cover short periods (few weeks).

1. What health impacts do you consider e.g. mortality, asthma etc; and what risk coefficients do you use?

In Poland, there are no cohort studies. We apply AirQ+ with standard coefficients. However, we have started with the sensitivity analysis for the coefficients to have some indicator of the uncertainty.

1. Do you assess the economic costs of health impacts, and if so what do you include e.g. life years lost, hospital/medical costs, loss in productivity/working days lost etc.?

## The economic costs of health impacts are not included in our analysis, yet. However, we are currently reviewing the CF Delft report on “Health costs of air pollution in European cities and the linkage with transport”, and we consider similar analysis based on more reliable data that better describes the situation in Polish cities.

1. **Policy applications**

We are also interested in the application of your work, particularly as input to development of policy.

1. How do you relate your work to environmental goals e.g. compliance with regulations, or comparison with WHO guidelines?

IEP-NRI is providing air quality modelling analysis to the Ministry of Climate and Environment and the Chief Inspectorate of Environmental Protection in Poland. Modelling results include exposure analysis for the thresholds set by the EU Directives.

1. **Publications**

Have you published your work, in which case please give references is available?

We are preparing several publications. We have started the assessment od health impacts this year. So far, we have prepared:

* Extended abstract (in Polish) on PM2.5 related mortality in Poland in 2018 - will be published in conference proceedings (both paper version and an e-book) in December 2020.
* Presentation during UNECE 2nd Expert Panel on Clean Air in Cities Workshop in September 2020.

Trends of air quality-related mortality in major cities in Poland a 10-year assessment, based on AirQ+ (Paulina Jagiełło and Joanna Struzewska[[1]](#footnote-1)).

* Ongoing: manuscript on the health exposure changes as a result of the implementation of the National Air Quality Plan (focused on emissions from low-level combustion).

1. **Questions**

Are there particular aspects of questions that you would like NIAM to address on PM2.5, including at the virtual meetings proposed for November.

Please e.mail your response to Helen ApSimon: h.apsimon@imperial.ac.uk

1. <https://iiasa.ac.at/web/home/research/researchPrograms/air/policy/14_Struzewska_Trends-AQhealth_Poland.pdf> [↑](#footnote-ref-1)