**NIAM activity on PM2.5 (Switzerland)**

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.

PM2.5 concentrations in Switzerland are modelled with PolluMap, a dispersion model for modelling nationwide ambient concentrations of particulates, nitrogen dioxide, benzene, black carbon and sulfur dioxide. For more information see [FOEN 2013](https://www.bafu.admin.ch/bafu/en/home/topics/air/publications-studies/publications/pm10-and-pm2-5-ambient-concentrations-in-switzerland.html); the model has very recently been updated and improved (final output and report are still pending).

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

The model covers the national and city scales with a spatial resolution of 100x100m and in proximity to roads 20x20m.

Concentration maps are generated for 2015, 2020 and 2030 (emission scenarios correspond to the scenarios used for IIR 2019). Only annual mean concentrations are calculated.

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

Primary PM2.5 based on emission inventories, including condensables; secondary inorganic and organic aerosol concentrations based on EMEP gridded data (0.1°x0.1°); natural dust based on measurement data.

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 emission inventory (for IIR 2019) and various spatial statistical data sets (national traffic models; building statistics; statistics on industrial point sources).

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

More than 100 (PM10) and 9 (PM2.5) measurement stations were used for validation of the model for the reference year 2015.

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

The largest uncertainties are estimated for the emissions.

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?

Population exposure is estimated based on the modelled PM2.5 concentrations (PolluMap) and spatial population statistics. Hereby it is assumed that population exposure is sufficiently characterized by the modelled annual mean ambient PM2.5 concentration at the place of residence.

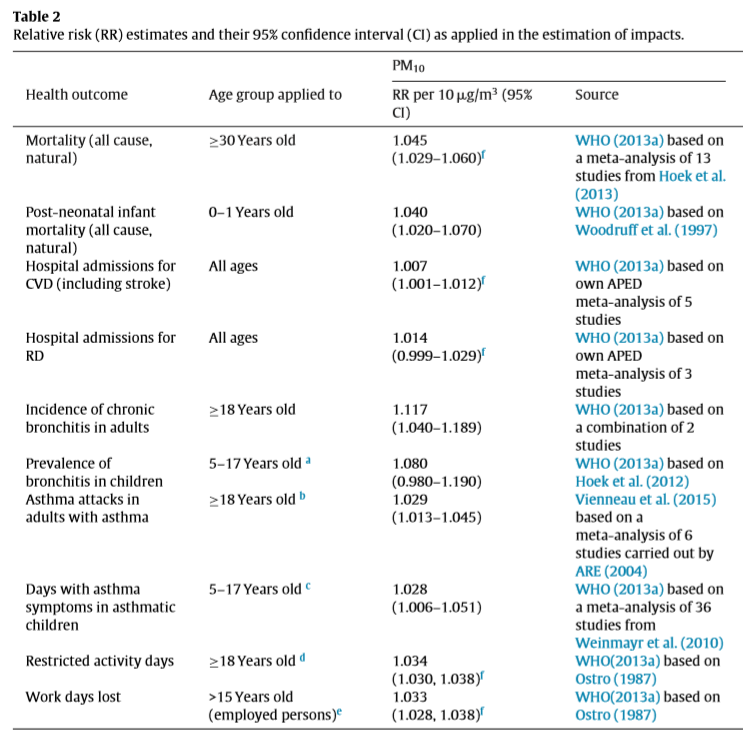
1. If you undertake such assessments of health impacts of PM2.5, do you follow WHO guidance and base this on total mass of PM2.5, or do you focus on particular components and/or differentiate relative toxicity?

Up to now, total mass of PM10 was used as a basis for general health impact assessment. To apply effect estimates based on PM2.5, PM10 data was rescaled based on the mean PM2.5/PM10 ratio in Switzerland (factor of 0.729).

In an upcoming project with the aim to review and update the current health impact assessment, the question on using other endpoints (components/toxicity) will be revisited. The investigations will also consider updated WHO guidance. Results are expected by 2023.

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

Currently considered health endpoints and risk estimates correspond to the information reported in Table 2 of Castro et al. 2017: <https://doi.org/10.1016/j.ijheh.2017.03.012>



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.?

Economic costs of health impacts due to traffic related air pollution are estimated annually (ARE 2020). Economic costs of health impacts due to overall air pollution are estimated every 5 years (ARE 2018). The methodological basis for the calculation of air pollution related health effects (and costs) is updated every 5 to 10 years (Ecoplan 2014, Ecoplan 2019). Current cost estimation includes lost life years, loss in working days and productivity, medical and hospital costs.

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?

Annual PM2.5 concentrations are continuously compared to the Swiss ambient air quality standard for PM2.5, which corresponds to the standard of the WHO guidelines. Health effects and health cost estimates are used to inform policy makers, federal and cantonal administrations, the media, scientific communities as well as the general population.

Furthermore, the Federal Commission for Air Hygiene (FCAH) advises the Federal Department of the Environment, Transport, Energy and Communication (DETEC) and also the Federal Office for the Environment (FOEN) on scientific and methodological questions relating to air pollution control and on the effects of air pollution on human health and the natural world. It also draws up the relevant reports, recommendations, opinions and proposals.

1. **Publications**

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

* BAFU 2020, Luftqualität 2019. Messresultate des Nationalen Beobachtungsnetzes für Luftfremdstoffe (NABEL). Bundesamt für Umwelt, Bern. Umwelt-Zustand Nr. 2020: 28 S.  
  <https://www.bafu.admin.ch/bafu/de/home/themen/luft/publikationen-studien/publikationen/nabel-luftqualitaet.html>
* ARE 2020, Bundesamt für Raumentwicklung, Externe Kosten und Nutzen des Verkehrs in der Schweiz, Strassen-, Schienen-, Luft- und Schiffsverkehr 2017  
  <https://www.are.admin.ch/dam/are/de/dokumente/verkehr/publikationen/externe_kosten_undnutzendesverkehrsinderschweiz.pdf.download.pdf/externe_kosten_undnutzendesverkehrsinderschweiz.pdf>
* ECOPLAN, INFRAS 2019, Externe Effekte des Verkehrs 2015, Aktualisierung der Berechnungen von Umwelt-, Unfall- und Gesundheitseffekten des Strassen-, Schienen-, Luft- und Schiffsverkehrs 2010 bis 2015, Bundesamt für Raumentwicklung (ARE)  
  <https://www.are.admin.ch/dam/are/de/dokumente/verkehr/publikationen/externe-effekte-des-verkehrs-2015-schlussbericht.pdf.download.pdf/20180629%20Externe_Effekte_Verkehr_Aktualisierung_2015_Schlussbericht.pdf>
* ECOPLAN, INFRAS 2014, Externe Effekte des Verkehrs 2010 (Monetarisierung von Umwelt-, Unfall- und Gesundheitseffekten), Bundesamt für Raumentwicklung (ARE)  
  <https://www.are.admin.ch/dam/are/de/dokumente/verkehr/publikationen/externe_effekte_desverkehrs2010.pdf.download.pdf/externe_effekte_desverkehrs2010.pdf>
* FOEN 2013, PM10 and PM2.5 ambient concentrations in Switzerland. Modelling results for 2005, 2010 and 2020. Federal Office for the Environment, Bern. Environmental studies no. 1304: 83 pp.  
  <https://www.bafu.admin.ch/bafu/en/home/topics/air/publications-studies/publications/pm10-and-pm2-5-ambient-concentrations-in-switzerland.html>

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