FAIRMODE
Forum for air quality modelling in Europe

CT8 – #2 HACKATHON ON EXPOSURE & EXCEEDANCE INDICATORS

TOWARDS RECOMMENDATIONS

STIJN JANSSEN, LEONOR TARRASON

25 – 11 – 2021

AGENDA

- Summary of the hackathon & review of best practices
- Topics for further analysis
- Towards a set of FAIRMODE recommendations

EXCEEDANCE SITUATION INDICATORS

CT8#2 hackathon on September 16, 2021

- Review how the exceedance situation indicators are currently assessed and reported under the e-Reporting in your region/country
  - What type of methodologies are used?
  - What type of input data is used for population exposure, road length in exceedance…?
- Analyse what problems are encountered in this process
- Identify concrete options for improvement

→Contributions from Sweden, Poland, Italy, German regions, Portugal, Belgium

LESSONS LEARNT

Positive elements

- Modelling is becoming more and more mature and fit-for-purpose to estimate the exceedance situation indicators
- Modelling is used (in all participating countries and regions) to estimate the exceedance situation indicators → More cooperation between the FAIRMODE and the e-Reporting community than 2-3 years ago!
- Member States are reporting (some of) the indicators via the e-Reporting process

→ see https://discomap.eea.europa.eu/App/AirQualityAttainments/index.html

LESSONS LEARNT

Problems & concerns

- The overall purpose of the exceedance situation indicators is not clear
  - Why are these indicators requested?

  →*Indication of the severity of the exceedance (?)*

  →*Input for health impact & epi studies (?)*
  - Who is looking at the data?

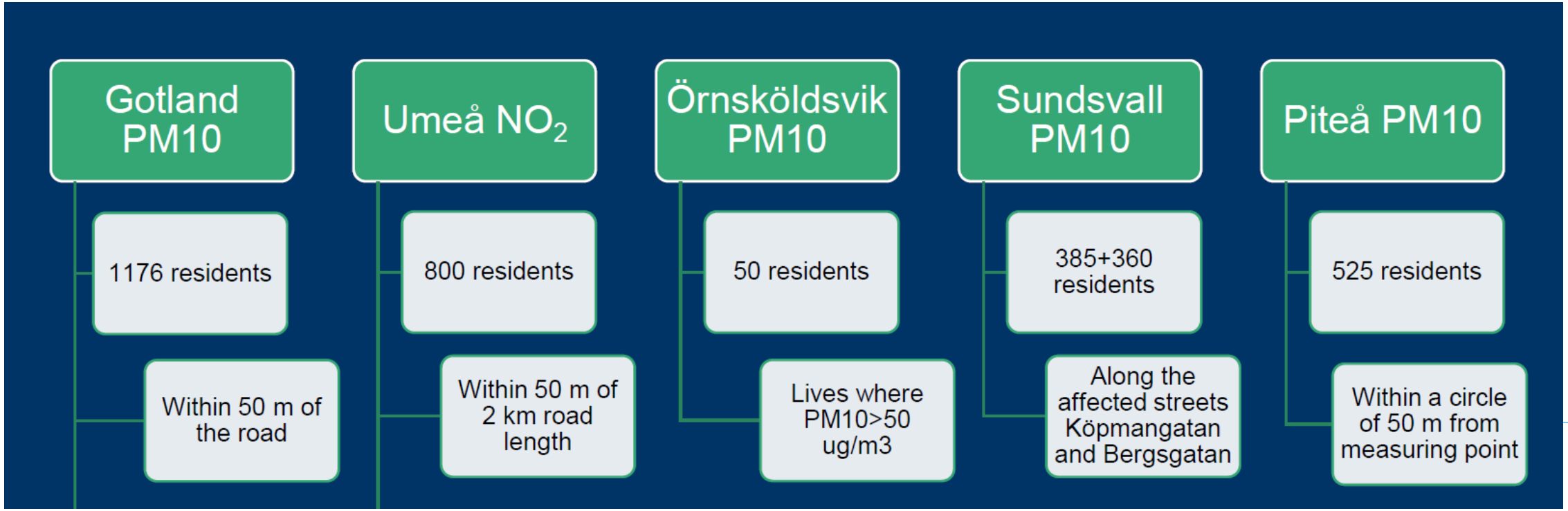
  →*(Almost) nobody**

**after consultantion with the EEA*

LESSONS LEARNT

Example from 5 Swedish cities

- Within the same countries (Sweden, Germany, Italy…) various methods are used over different air quality zones making a fair comparison impossible



LESSONS LEARNT

Problems & concerns

- Lack of a standard method and detailed guidance → varying interpretations & implementation
- The set of indicators could be simplified: area, population, road length above limit value → too many? all of them relevant, robust and useful?
- Threshold indicators are very sensitive (by nature)
- Population exposure → only residents, also commuters, sensitive groups…?
- Indicators only produced and reported during AQ planning process → why not for annual reporting on exceedances?
- Full documentation of e-Reported values is lacking *(although IPR refers to data flow D)*

measurements, modelling or objective estimation used. Assessment methods are reported within Data flow D.

OPEN ISSUES

- What is the purpose of the indicators? Who is looking at the values?
- Report about indicators (via data flow G) when exceedance is reported or during preparation of AQ Plan?
- Which indicators are relevant (area, pop, road, ecosystem)?
- Definition of the indicators?
- Any differentiation regarding pollutants PM10, PM2.5, NO2, O3, BaP/HM…?
- What is a fit for purpose modelling system?
  - What do we recommend about street canyons?
  - What time resolution is required?
- Requirements for the input data?
  - Population density
  - Road link network
- What do we require in terms of reporting?
  - Data flow D is not really appropriate and related to this type of modelling
- What is the link with estimations based on measurements?
- Other open issues?

EXCEEDANCE SITUATION INDICATORS

IPR – Data flow G: Information on the attainment of environmental objectives

Where environmental objectives have been exceeded, estimates of the total area, population and road length exposed to levels above the environmental objective shall be reported for each zone as a whole. Associated geometry information (GIS data) shall also be provided. References to the assessment methods observing the exceedances shall also be given e.g. the fixed or indicative measurements, modelling or objective estimation used. Assessment methods are reported within Data flow D.

BEST PRACTICES

- What is the purpose of the indicators? Who is looking at the values?
  - Information on the attainment of environmental objectives → gives information about the extent of the exceedance
  - Clarify who is using the data
  - Info is important for design of action plan
  - Would be useful if information is available as shape files to put on a map
  - Flagging or health indicator? → has important impacts on the definition of the indicators → what do we want in the AQD?
- Report indicators (via data flow G) when exceedance is reported or during preparation of AQ Plan?
  - Data flow G is now requested when exceedances are observed and reported. Comes together with reporting of SA information.
  - Data flow G links to data flow B → opportunity to report on the extent of the exceedance
  - Recommendation:
    - Information is useful as input for the preparation of an AQ plan → make it mandatory as input for action plan (data flow I)
    - Voluntary in data flow G → information might not be available at that time → only make a crude estimate (report info about the entire zone which can be refined at a later stage) → can we work with a tier-ed methodology?

BEST PRACTICES

- Which indicators are relevant (area, pop, road, ecosystem)?
  - Type of indicator depends on the exceedance and type of station
  - Ecosystem links to type of pollution
  - On/off indicator is not ideal for policy development (too sensitive!) → develop a “reduction like” indicator which is more robust → can be used for planning
  - Health indicator is something different than exceedance indicator → all concentration levels matter here → less sensitive to e.g. meteorology
  - Area of exceedance (+population in that area) is logic
  - Road lenght is very much connceted to street canyons → is easy to calculate for traffic station exceedances
  - Can we come up with an health related indicator?
  - Indicator shout tell something about the problem, is there a problem? → pollution map on/off & concentration levels
  - Comparability is important!
  - Indicator should flag the problem → can be refined at a later stage during the air quality planning phase → different purposes can give rise to different (more complex) indicators
- Definition of the indicators?
  - Keep it simple
  - Road length is easy to estimate but can also be very subjective in its estimation method
- Any differentiation regarding pollutants PM10, PM2.5, NO2, O3, BaP/HM…?
  - Area should work for all pollutants.
  - Indicators are polluant dependend → is no problem

BEST PRACTICES

- What is a fit for purpose modelling system?
  - What do we recommend about street canyons?
    - Strongly recommended for street canyon / traffic stations → OSPM type models (box models)
    - Go we down to full CFD? → No, not yet.
    - What is the minimum level we need for modelling? → what model for what type of indicator? → guidance needed → hierarchie of modeles / tier-ed approach depending on resources available
    - Is 3D building data available ? Not everywhere for sure.
    - How to link street canyon increment in concentration with population exposure?
  - What time resolution is required?
    - Link to aggregation of the environmental objective/limit value
    - Daily limit values (or percentiles) can be linked to annual concentration values
- Requirements for the input data?
  - Population density
    - Static population for the time being
    - Resolution of pop data and model resolution should be aligned
    - Only provide information about population density in that area rather than an exact number → give an indication about the "importance" of the exceedance. Can be used to prioritize the impotance of the exceedances: only "a few" or "many" people are exposed to high levels (politically sensitve → everybody counts!) → "density" might be the way out
    - Sensitive people → use as input for flagging purpose
    - Rely on ranges rather than on "exact" estimates (e.g.: < 100 ; 100 < 1000 ; 1000 < 10000 ; > 10000 - / a few / some / many / a lot) → flagging principle → will not work for a decend health indicator where more detailed information is needed
  - Road link network
    - xxx

BEST PRACTICES

- What do we require in terms of reporting?
  - Data flow D is not really appropriate and related to this type of modelling
    - Up to now, it is not possible to indicate for what purpose the model reported under data flow D is used.
    - Recommendation: make clear what model (incl meta info) is used for the estimation of the exceedance indicators.
- What is the link with estimations based on measurements?
  - Spatial representativeness is a key element here
  - Exceedances in traffic stations can be easily extended to road lenght indicator → you don't need a model but can rely on "simple" extrapolation techniques
  - How do find the highest concentrations in an area? AQUILA / FAIRMODE collaboration is key → indicative measurements and/or (?) modelling to identify hot spots above the UAT (recommendation of AQUILA)
- Other open issues?
  - How to calculate exposure?
    - Dynamic exposure relevant for daily and hourly limit values! → research topic but maybe best practices available
    - How do we deal with street canyons for exposure and health impact?
      → relevant for urban planning! Avoid street canyons in new urban designs
      → Every body who lives in a street canyon counts → reduce concentrations → but overall impact on total pop exposure is limited