German Environment Agency

TFIAM – 53rd meeting, 15-17 April 2024, Paris

Potential average exposure reduction in Germany

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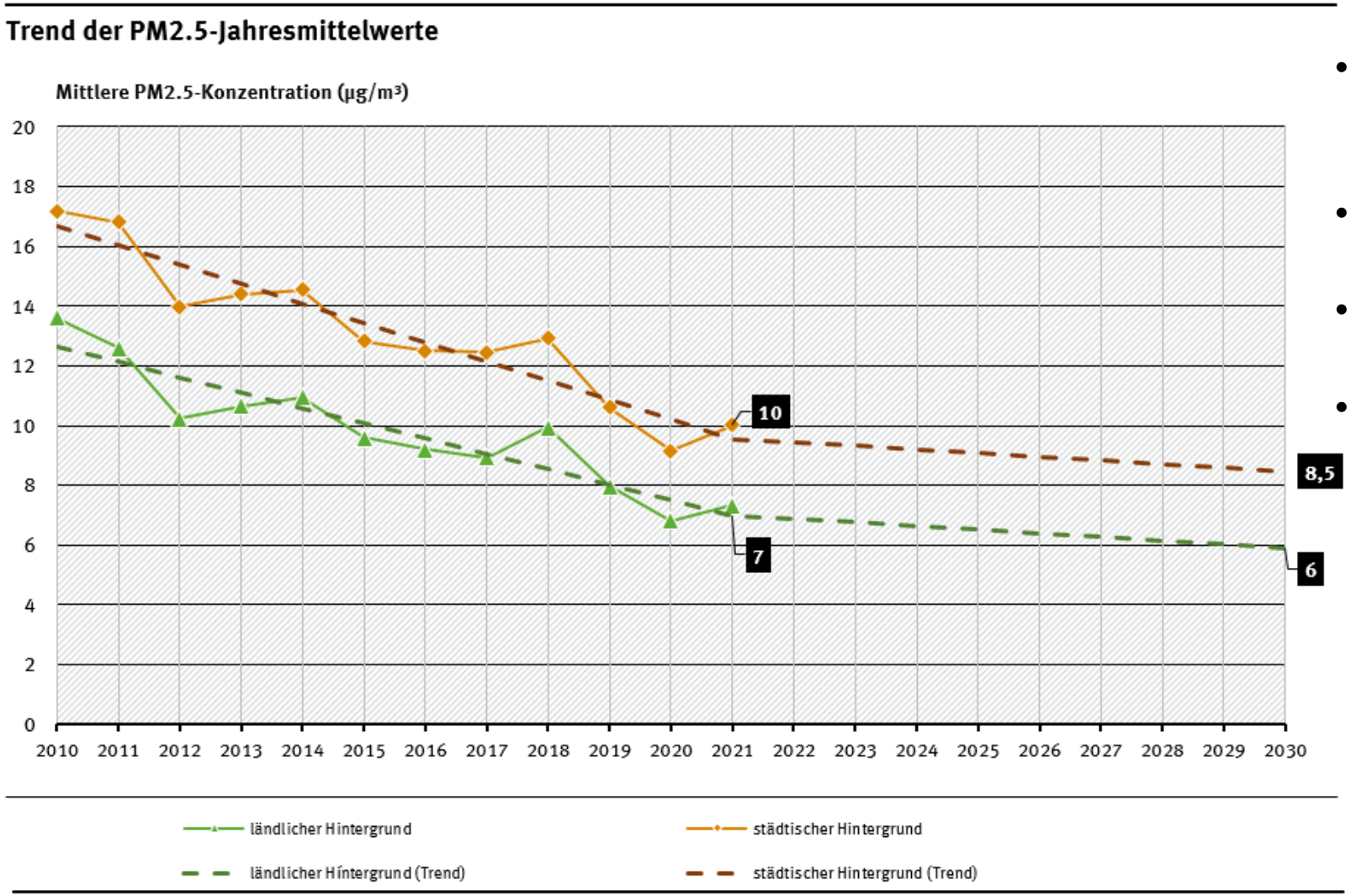
German Environment Agency
Section II 4.1 – General Aspects of Air Quality Management

50 Jahre Umweltbundesamt 1974–2024

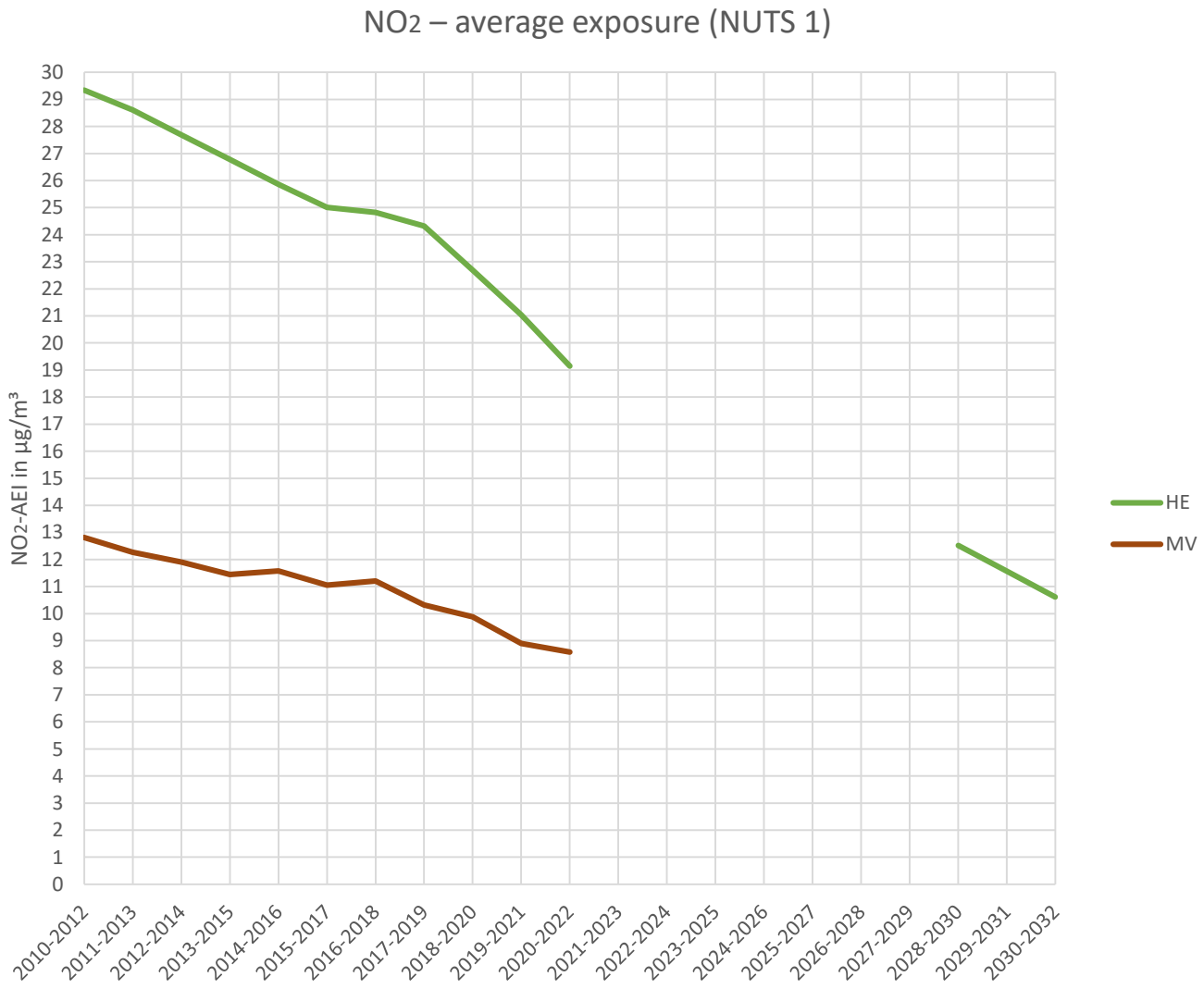
Methodology



Quelle: Umweltbundesamt 2023

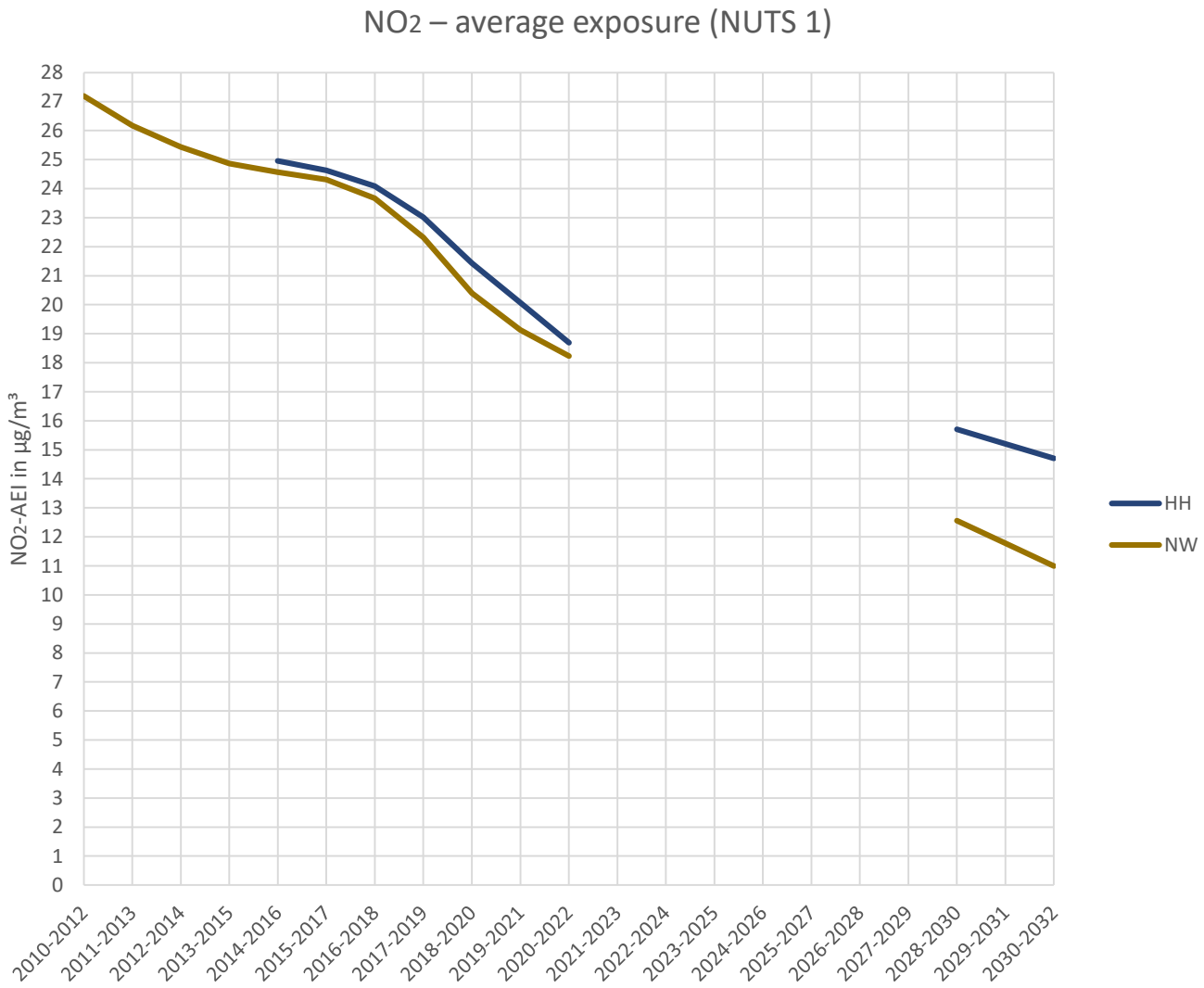
- CTM-simulations for 2020 and 2030 with REM-Calgrid (RCG) in (2x2) km²
- meteorology of 2020 for both years
- NEC-compliance in EU-MS in 2030
- for each grid cell with a measurement station, linear trend from CTM-simulation was added to the 2021 trend value (2010-2021) of the measured concentrations at each station

Results – NO_2 average exposure indicator (AEI) – NUTS 1 Level (Bundesländer)



- highest historic AEI in Hesse (17 stations)
- lowest historic AEI in Mecklenburg-Western Pomerania (3 stations, AEI already below 10 µg/m³)

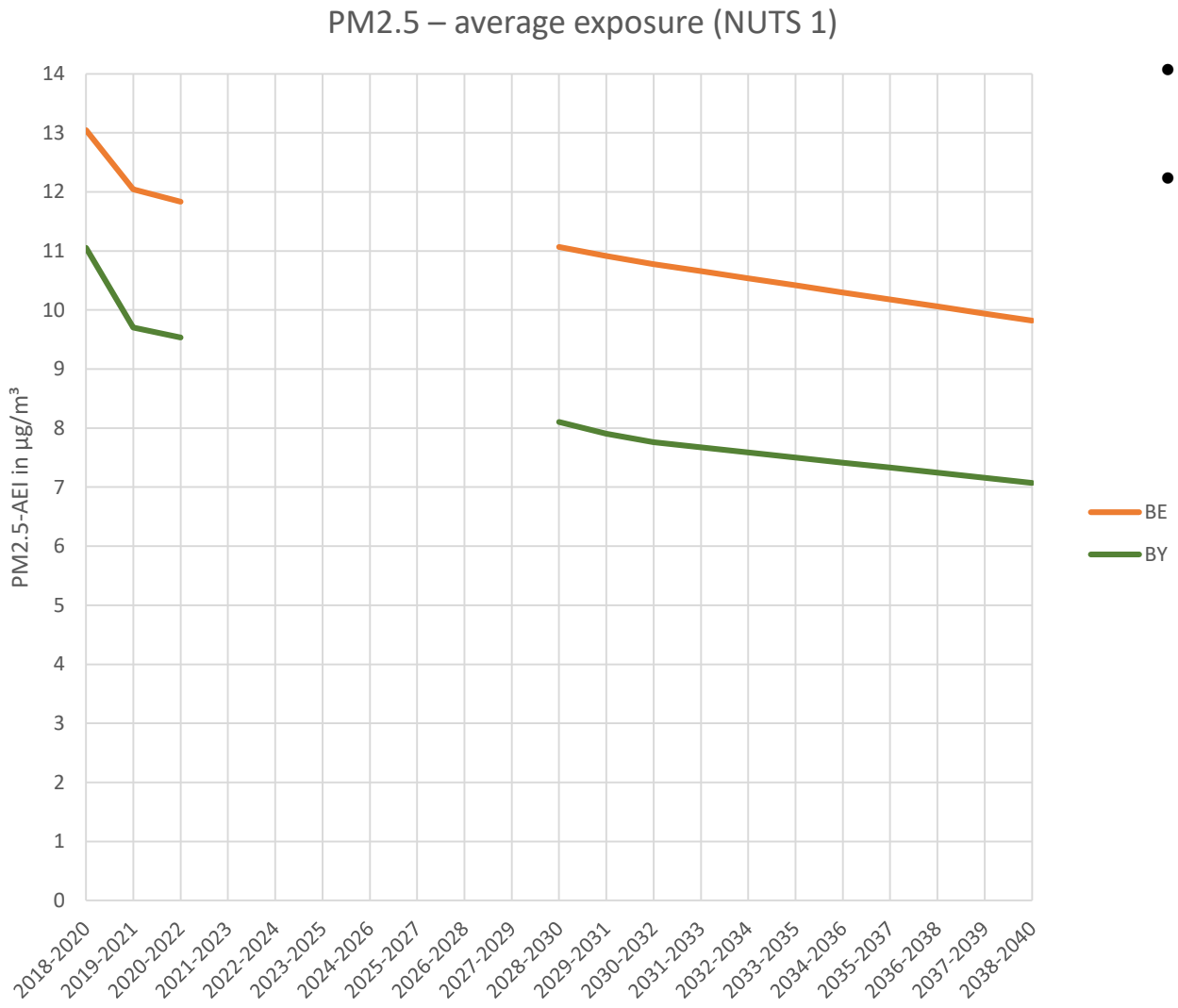
Results – NO_2 average exposure indicator (AEI) – NUTS 1 Level (Bundesländer)



- Historic trend similar to Hesse in North Rhine-Westphalia (21 stations) and Hamburg (6 stations)

- lower projected decrease in Hamburg because of low decrease in assumed emissions connected to the port
  - ➢ Measured concentrations do not prove this result of the CTM simulation.
  - ➢ Are stations, directly influenced by port emissions, really urban background?

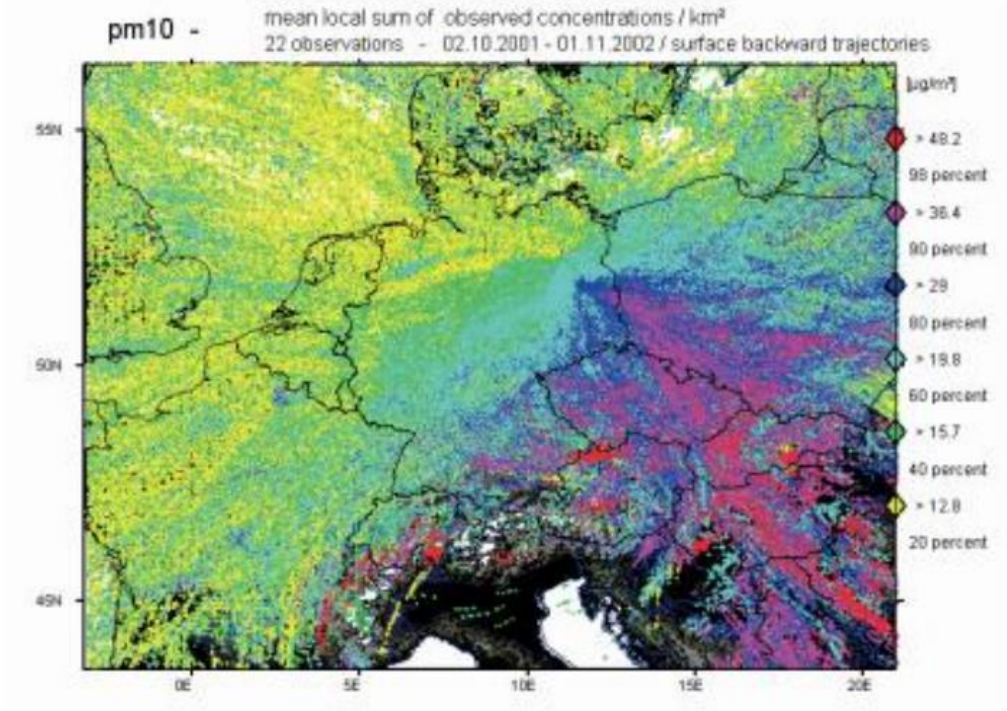
Results – $PM_{2.5}$ average exposure indicator (AEI) – NUTS 1 Level (Bundesländer)



- Bavaria (18 stations) may reach 7 µg/m³ in 2040
- Berlin (4 stations) has the highest average exposure in our projections
  - ➢ Further measures will be needed to reduce the average exposure below 5 µg/m³ (WHO recommendation).
  - ➢ Are the different methods of source apportionment via CTM already fit-for-purpose to choose the right measures to reduce the average exposure (urban background)?

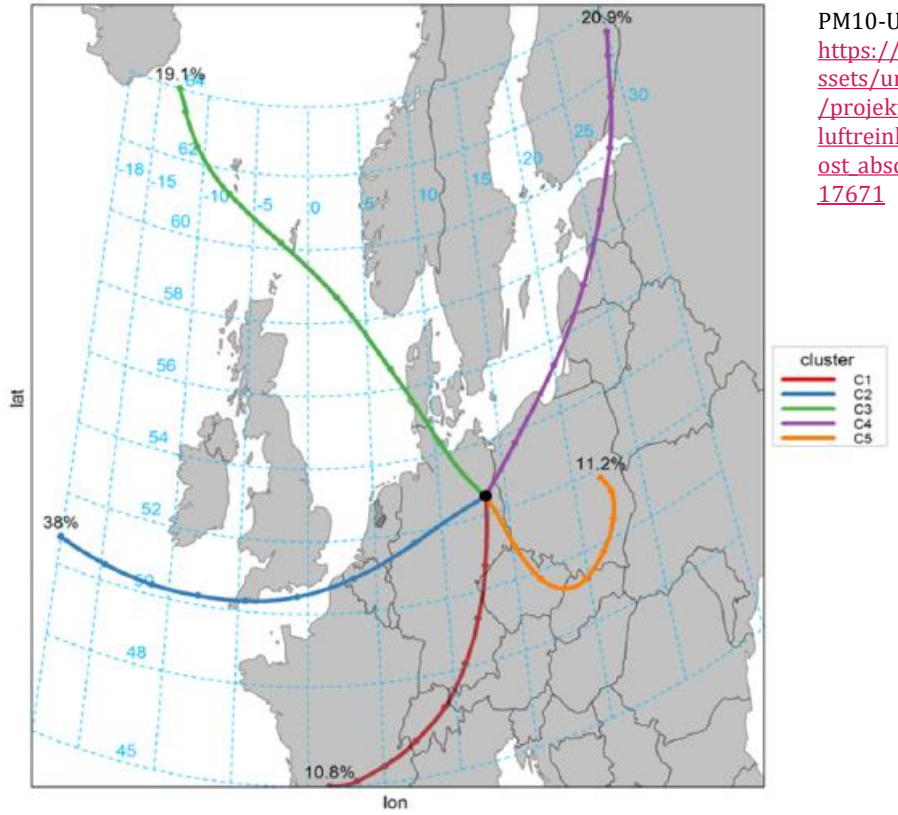
Hypothesis: Current methods for source apportionment are fit-for-purpose to find the most efficient measures to reduce the average exposure.

Abbildung 1: Ursprung der PM10-Belastung des Berliner Raums. Rot cher hoher Beitrag der dort existierenden Quellen an d mittlerer Beitrag; gelbe Gebiete: geringer Beitrag.



Quelle: Freie Universität Berlin, Trajektorie Model www.trumf.de

UBA (2022), TNO-modelling with LOTOS-EURO over the period Sept 2016 – March 2017
https://www.umweltbundesamt.de/publikationen/untersuchung-der-herkunft-des



PM10-Ursachenanlayse (PM-Ost)
https://www.berlin.de/sen/uvk/_assets/umwelt/luft/luftreinhaltung/projekte-zum-luftreinhalteplan/pm-ost_abschlussbericht.pdf?ts=1705017671

Abbildung 40: Clusteranalyse für die Station BEFRA im Untersuchungszeitraum mit den Clustern:

C1	Südwest – kontinental	(11%)
C2	West – kont. / maritim	(38%)
C3	Nordwest – maritim	(19%)
C4	Nordost – maritim	(21%)
C5	Südost – kontinental	(11%)

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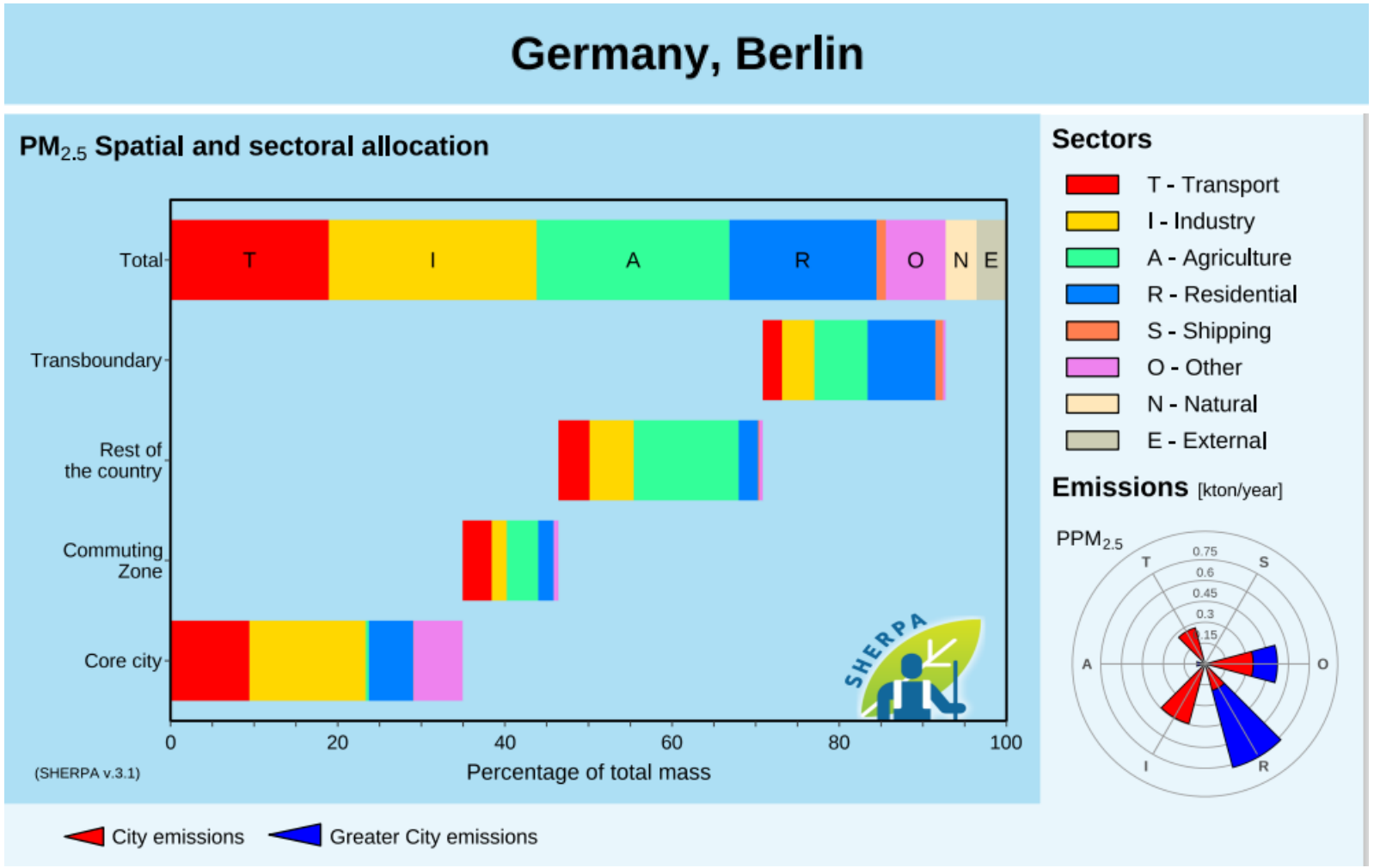

European Commission, Joint Research Centre, Thunis, P., Pisoni, E., Zauli Sajani, S. et al., Urban PM2.5 atlas – Air quality in European cities – 2023 report, Publications Office of the European Union, 2023, https://data.europa.eu/doi/10.2760/63641

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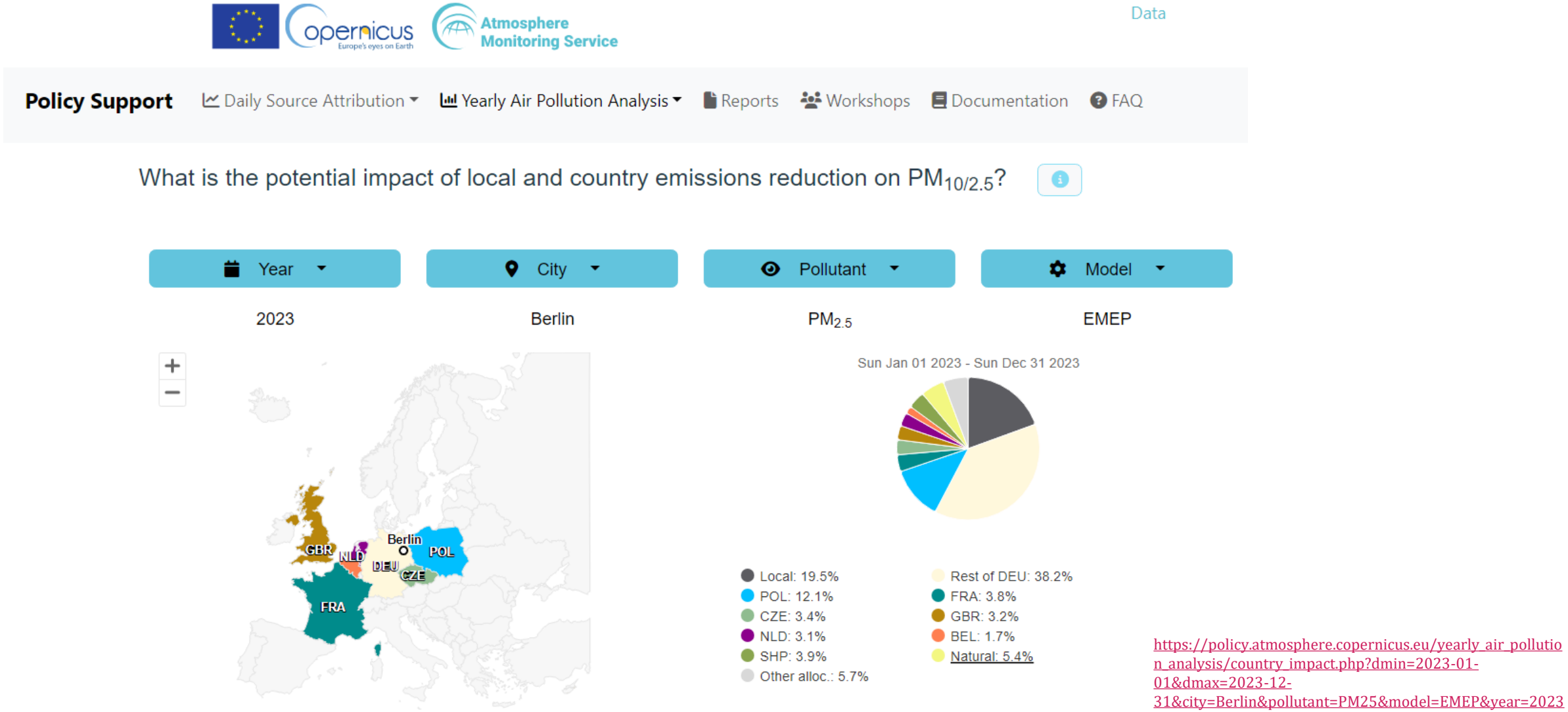

https://policy.atmosphere.copernicus.eu/yearly_air_pollution_analysis/country_impact.php?dmin=2023-01-01&dmax=2023-12-31&city=Berlin&pollutant=PM25&model=EMEP&year=2023

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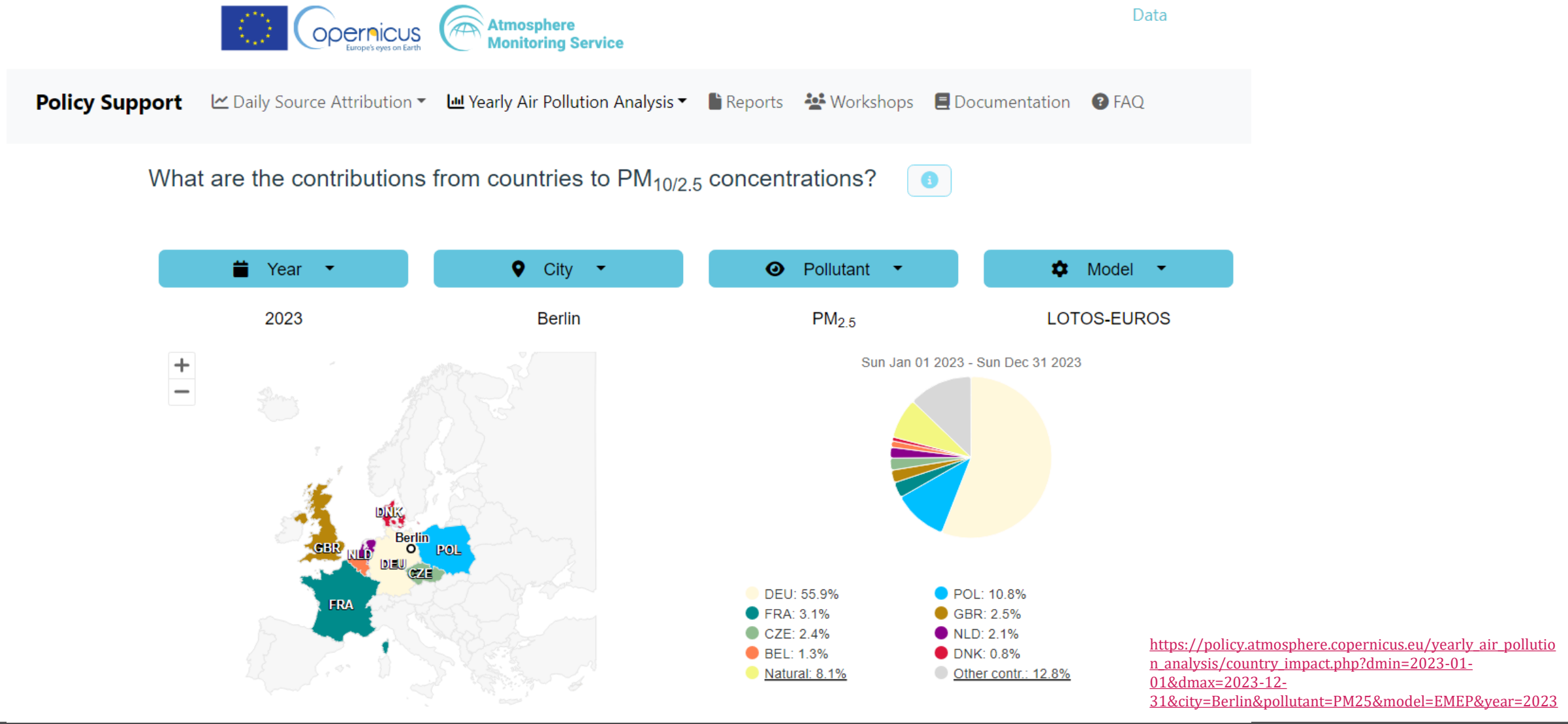

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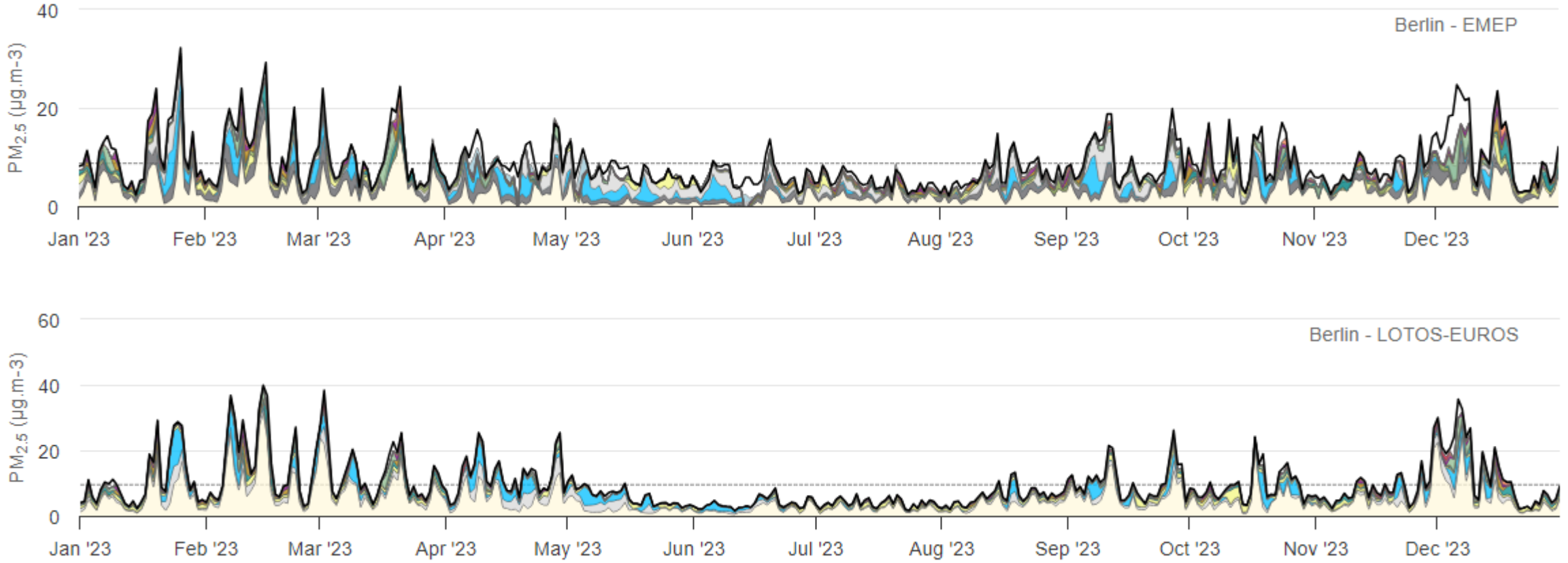

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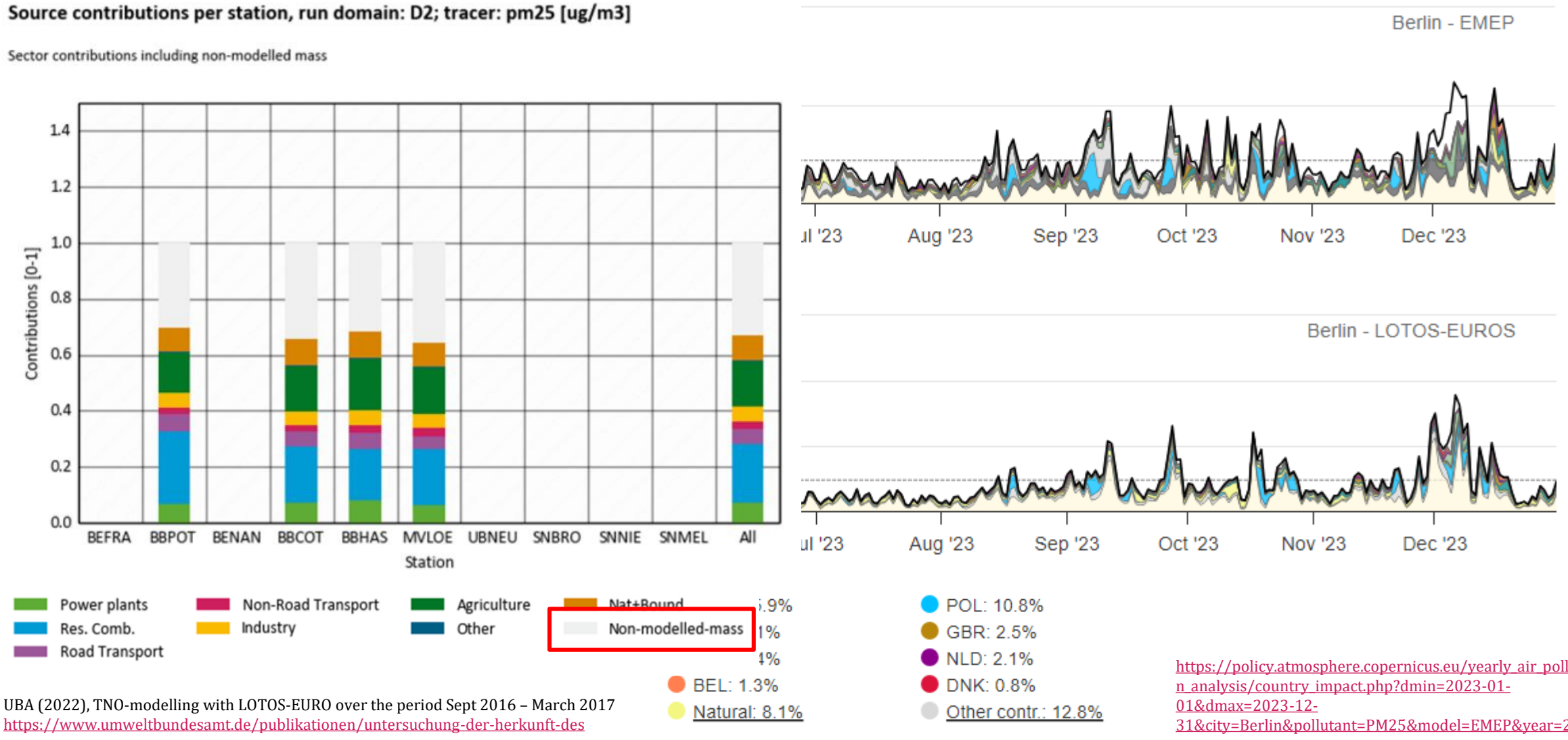

UBA (2022), TNO-modelling with LOTOS-EURO over the period Sept 2016 – March 2017
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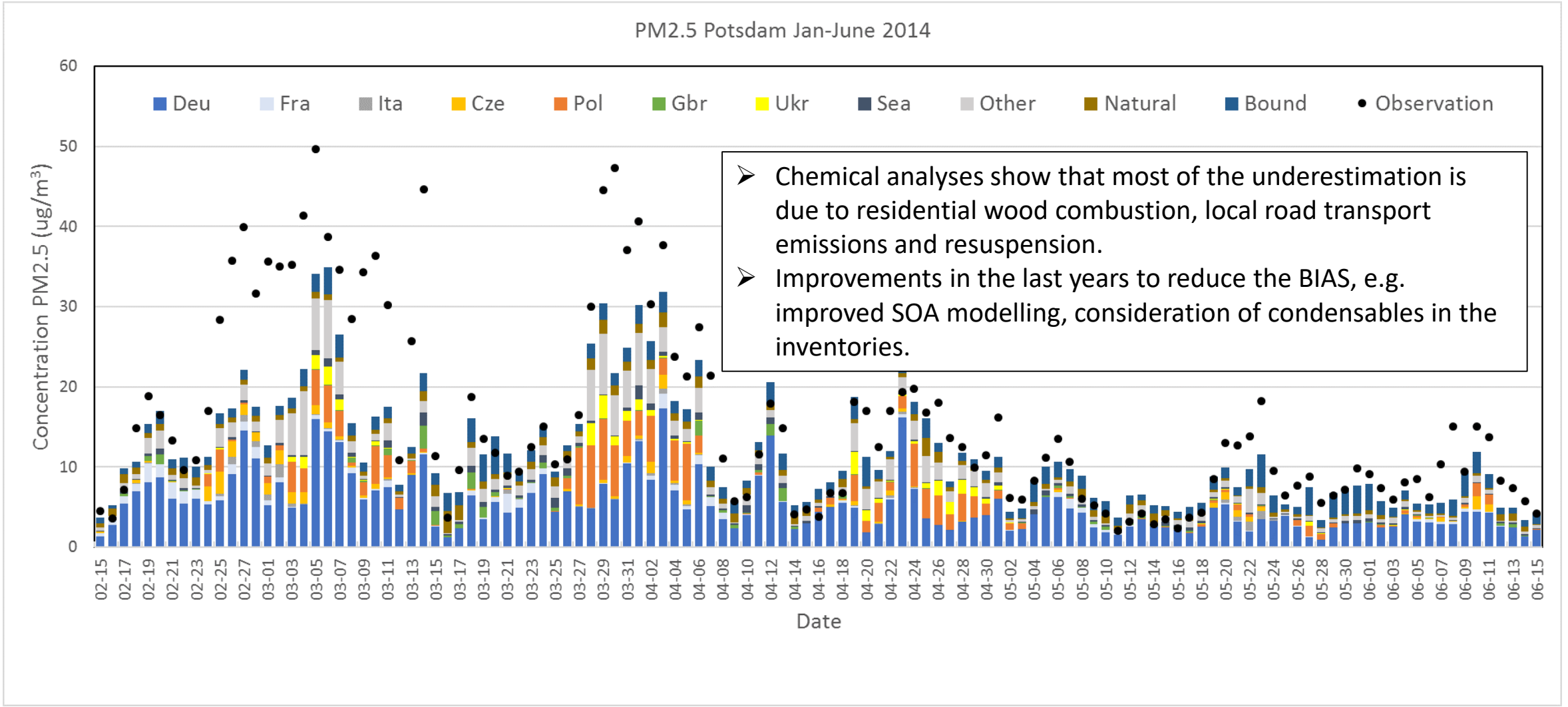

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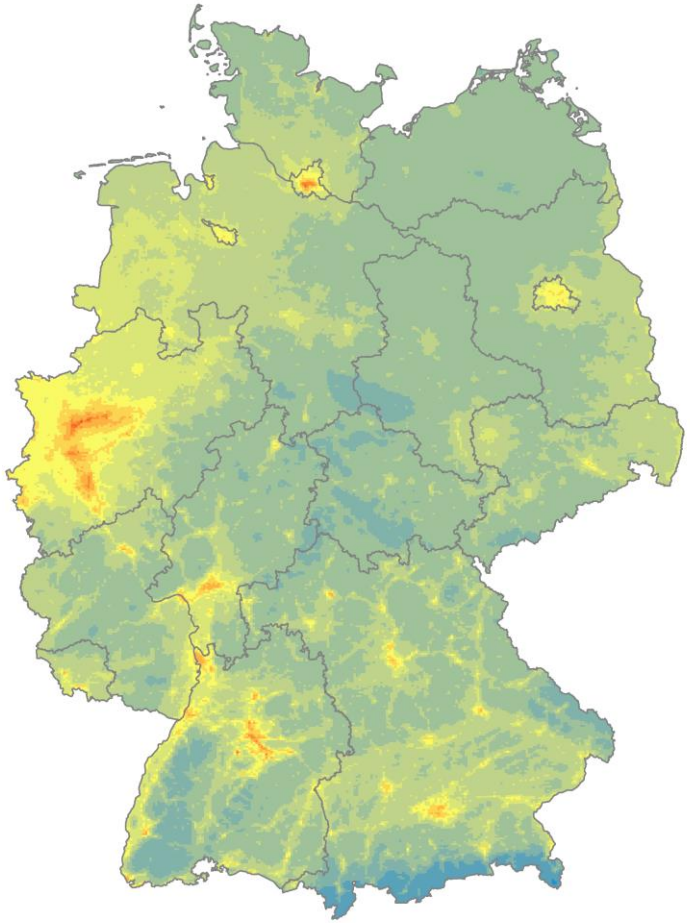
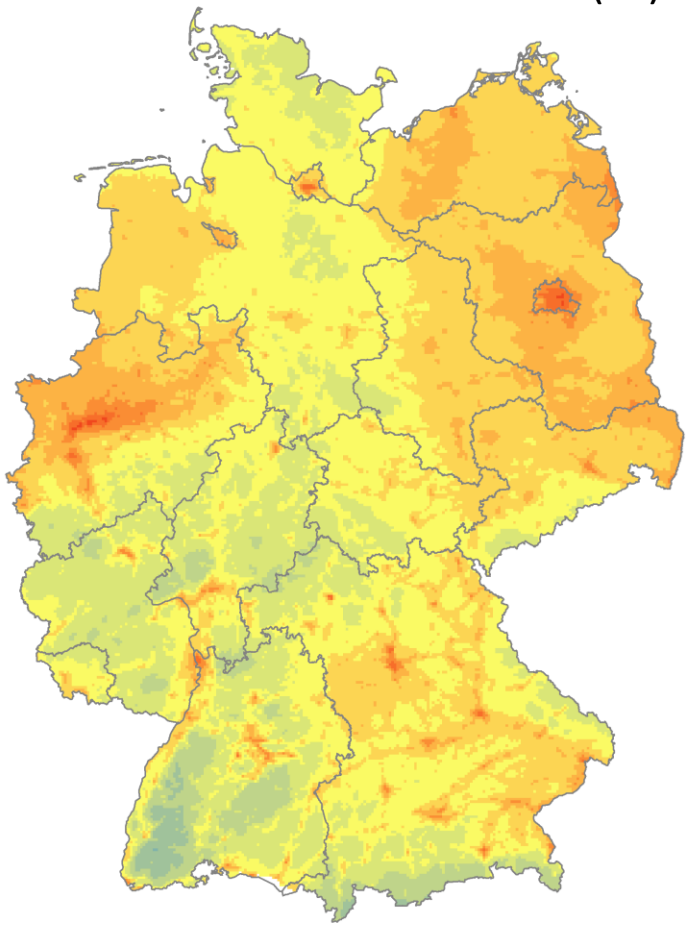
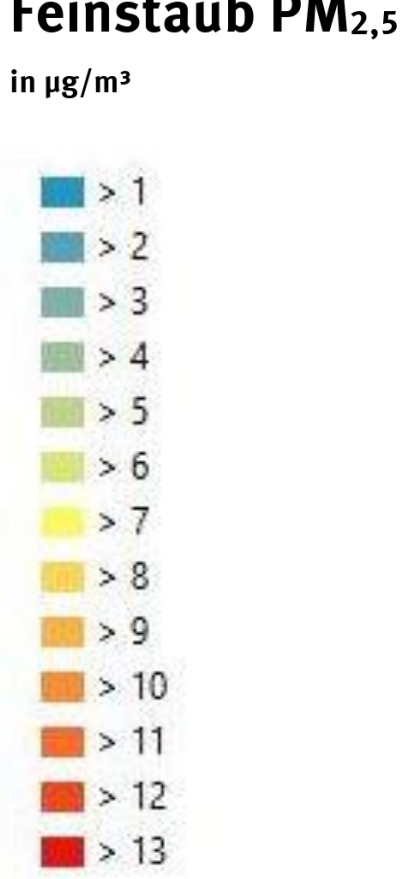
PM2.5 annual average 2022 (2x2 km²)

RCG-run



RCG-run with bias correction (OI)





Thank you very much!

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https://www.umweltbundesamt.de/en/topics/air

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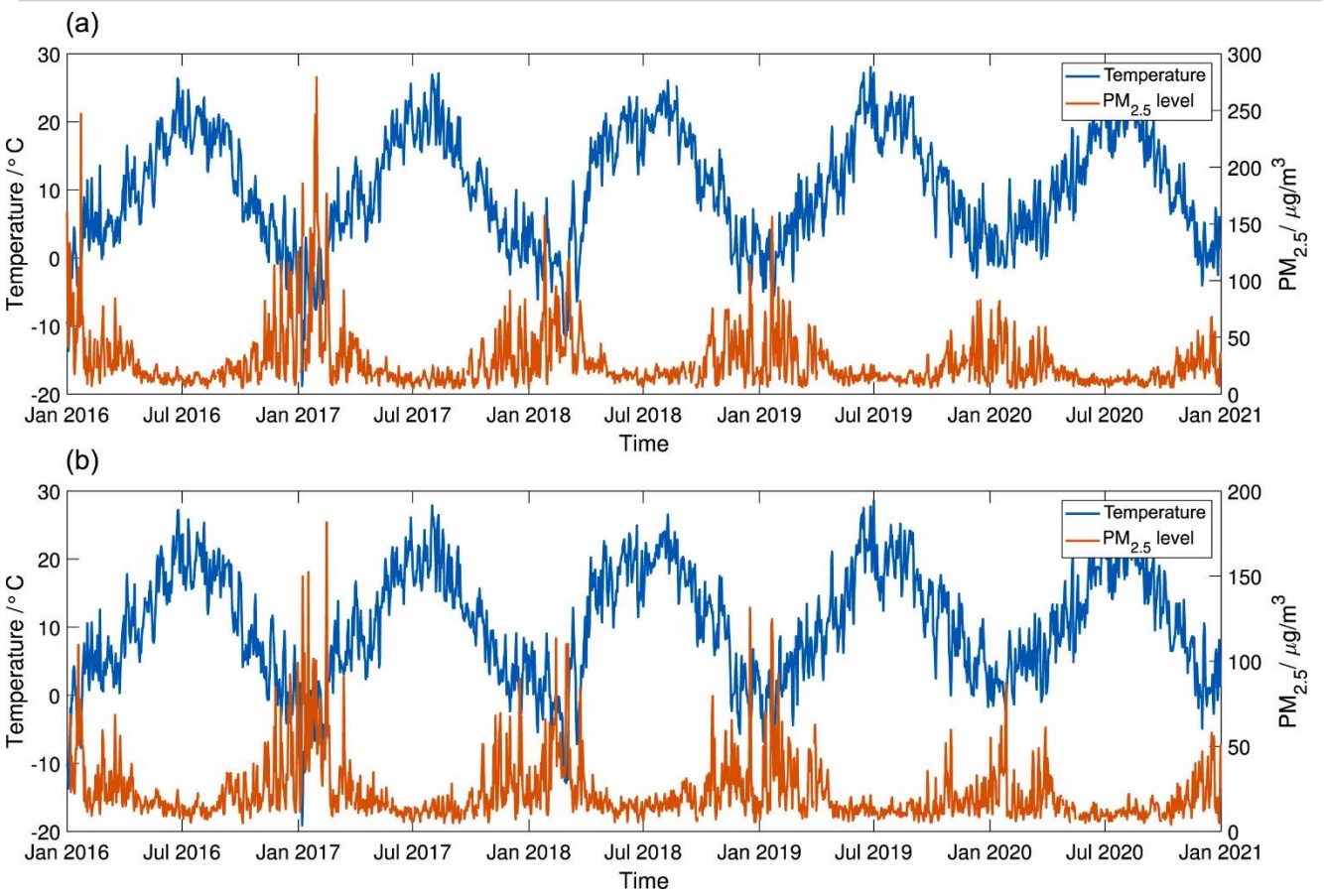
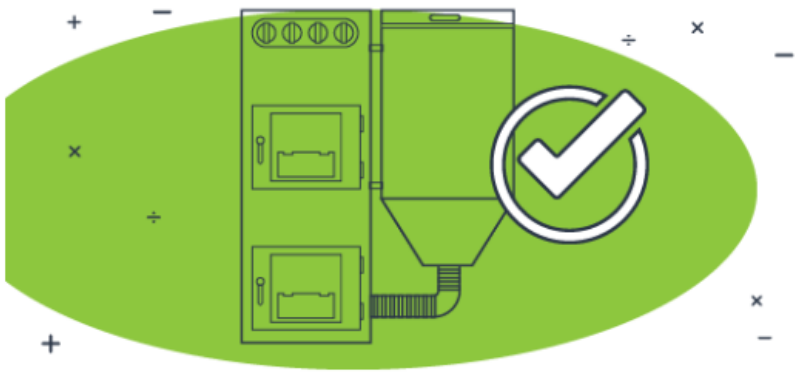
Fig. 4. Temperature and $PM_{2.5}$ level in Kraków (a) and Tarnów (b) during years 2016–2020.



Anti-smog resolution for Małopolska

Limits new sources of pollutant emissions



K.M. Dąbrowski (2022): Impact of fossil fuel usage reduction policy on PM2.5 level changes in a Lesser Poland Area, https://www.sciencedirect.com/science/article/pii/S2210670722003559