Sherpa training

Comparison of SHERPA to other tools/ methods for assessment of transboundary contributions in Germany

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TNO innovation for life

Background

AAQD

Article 21 in new EU AAQD:

In case of exceedances of any limit or target value, average exposure reduction obligation or alert threshold with large contributions from neighboring countries, the Member States should notify the neighboring Member States from which the air pollution originated and the Commission thereof

- **The allocation of air pollution sources is necessary to develop mitigation strategies according to AAQD**

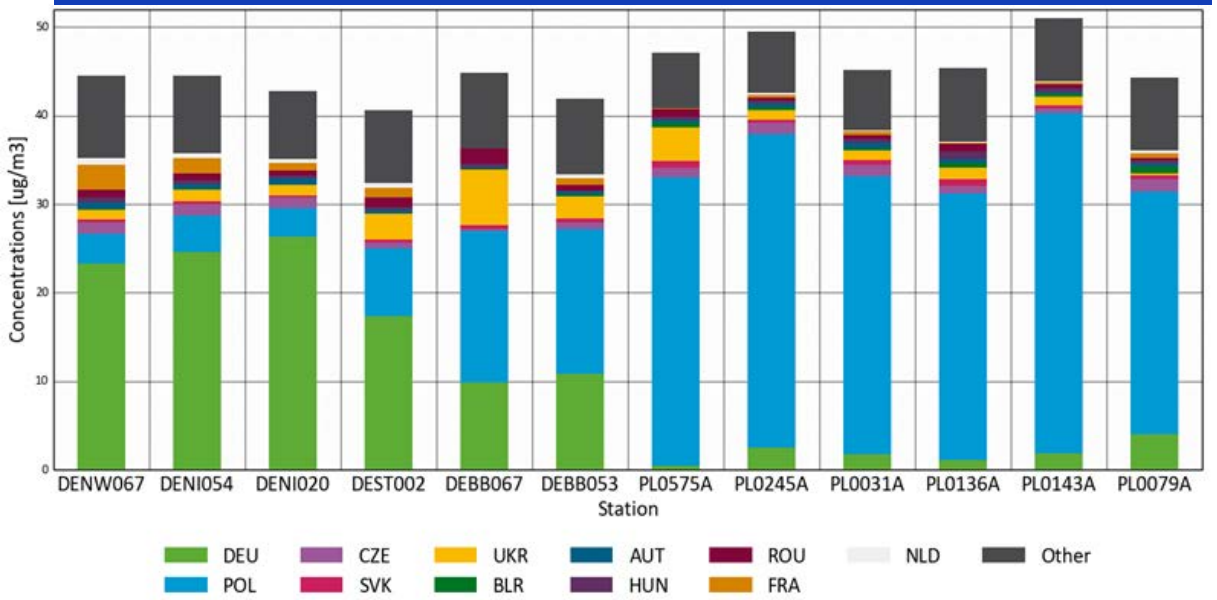
❑ Determining the origin of air pollutant concentration is complex due to atmospheric processes (chemistry, transport, deposition).

❑ Source apportionment with CTMs take into account all relevant processes in the atmosphere and can be utilized to determine the origin of air pollutants.

Transboundary contributions

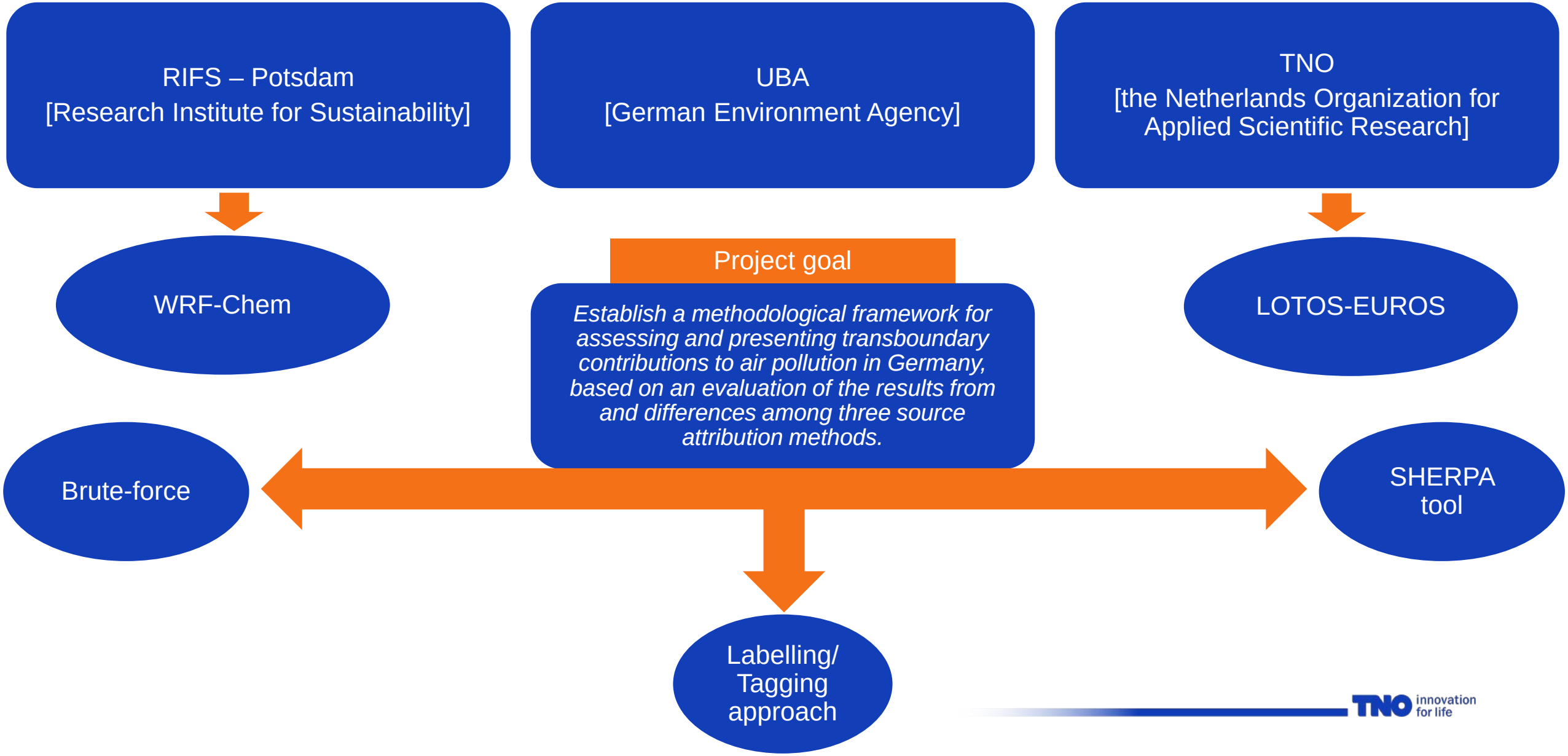
➢ Episodes with increased PM and ozone concentrations in Germany are influenced by German emission sources, neighbouring European sources and sources outside of Europe.

Modelled country attributions averaged for all PM_{10} > 40 µg/m^3 for a selection of rural background sites for the winter period [Sep. 2016 to March 2017].



Source: FKZ 3716 51 203 0: Beitrag von Polnische Grenzüberschreitende Luftverunreinigungen im Osten Deutschlands

Overview of the research project



SOAP approaches and objectives

Labelling/ Tagging approach

Overview of the ***contributions*** of sector/country combinations on air pollutant concentrations in Germany

Objective: Derive ***contributions*** to air pollution levels at specific times and locations with one model run.

Brute-force

Derive the **potential impact** of emission reduction scenarios for specific sector/country combinations

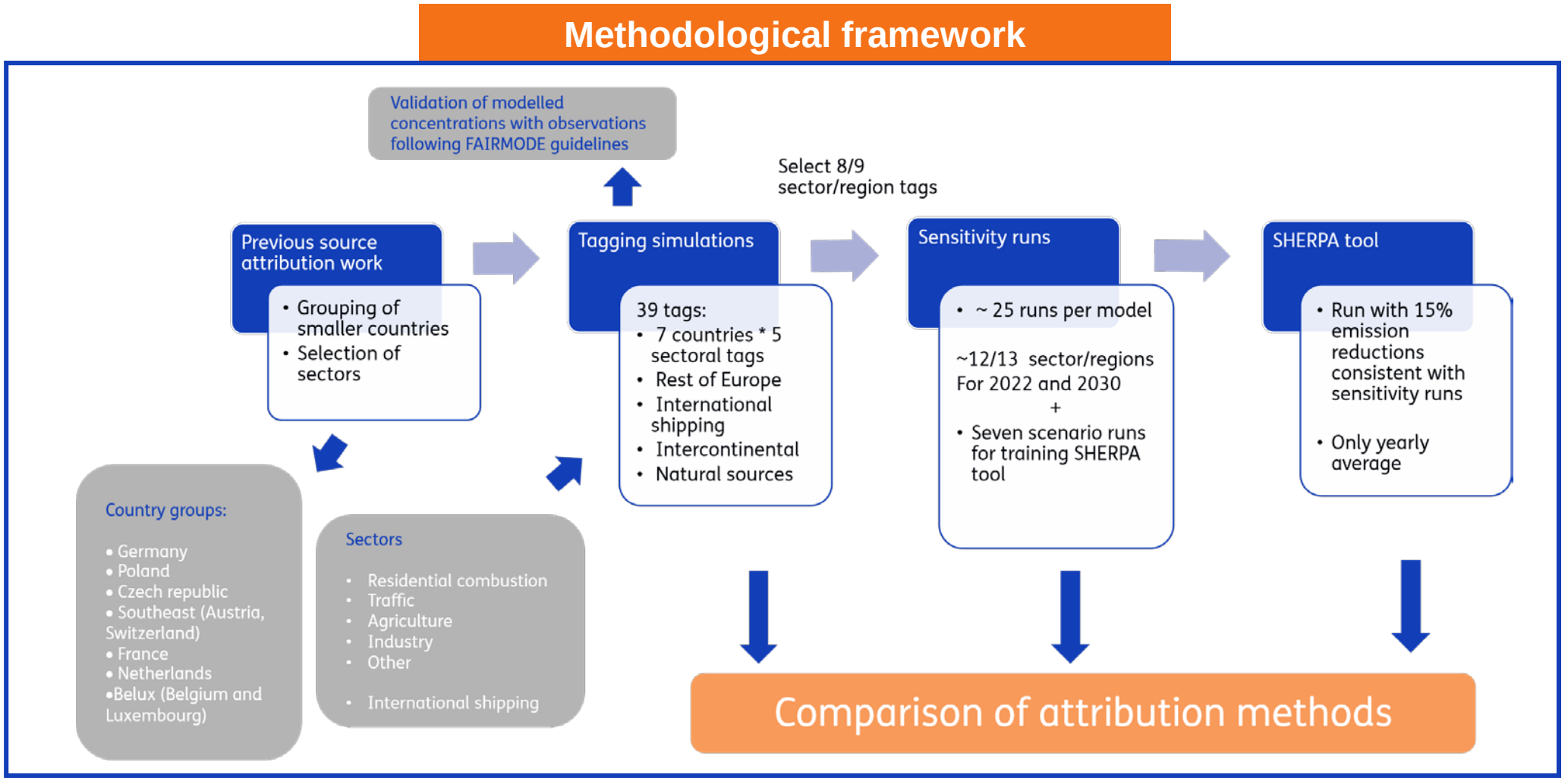
Objective: Derive the ***potential impact*** of 15% emission reductions in neighboring countries on air pollution levels with one model run per defined region/sector .

SHERPA tool

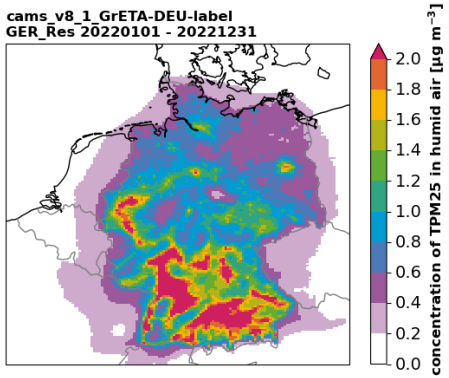
Estimate the **potential impact** of reducing emissions as in the BF method to allow for comparison between methods

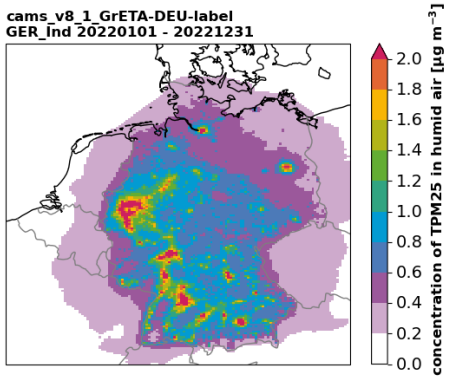
Objective: Approximate the ***potential impact*** of any chosen emission reduction in neighbouring countries.

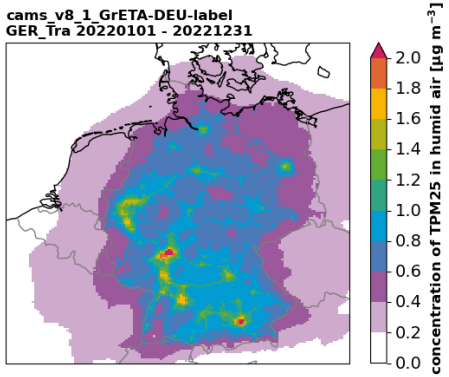
Implementation of SOAP

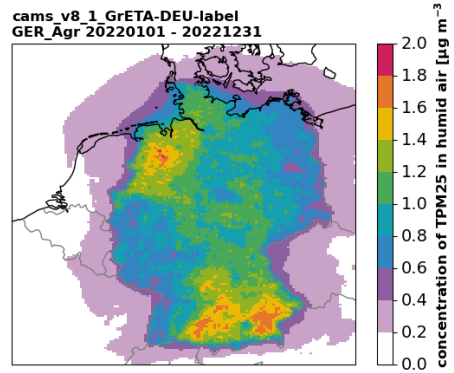


Contributions on $PM_{2.5}$ concentrations over Germany in 2022 – Labelled simulations

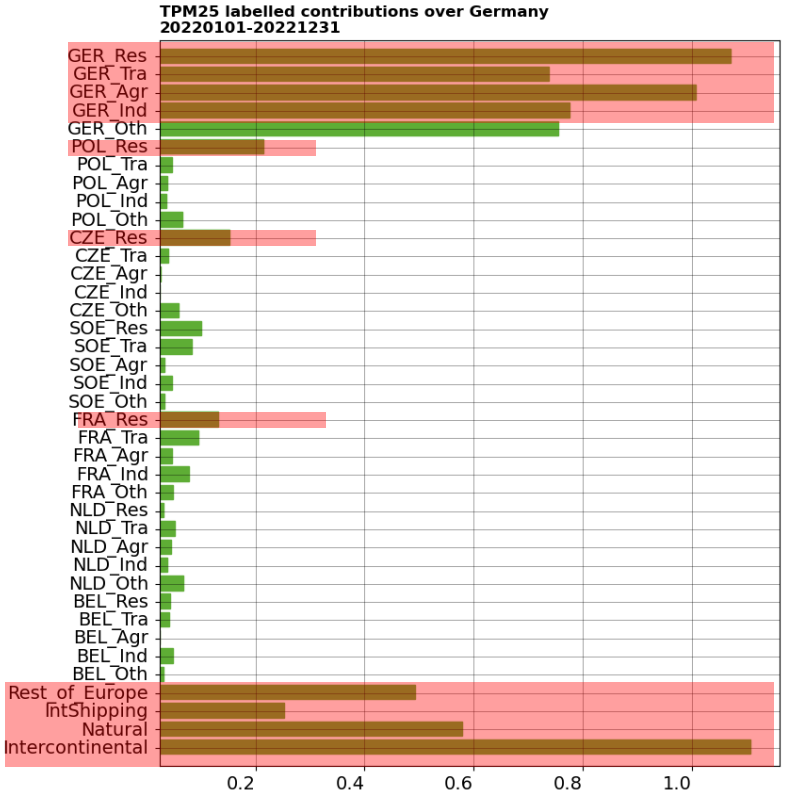


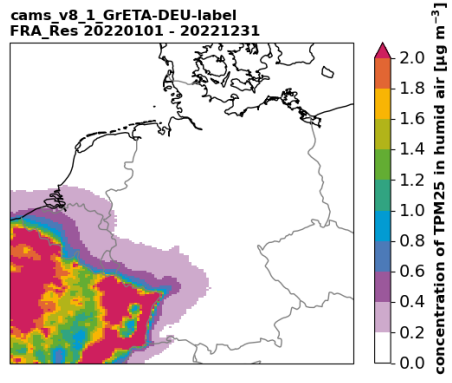


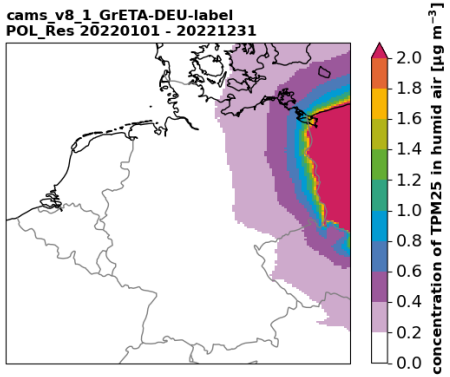


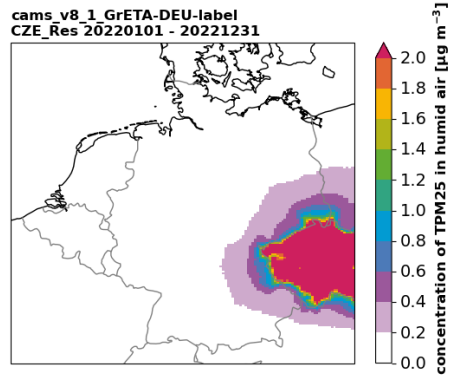


Average TPM2.5 contributions in Germany









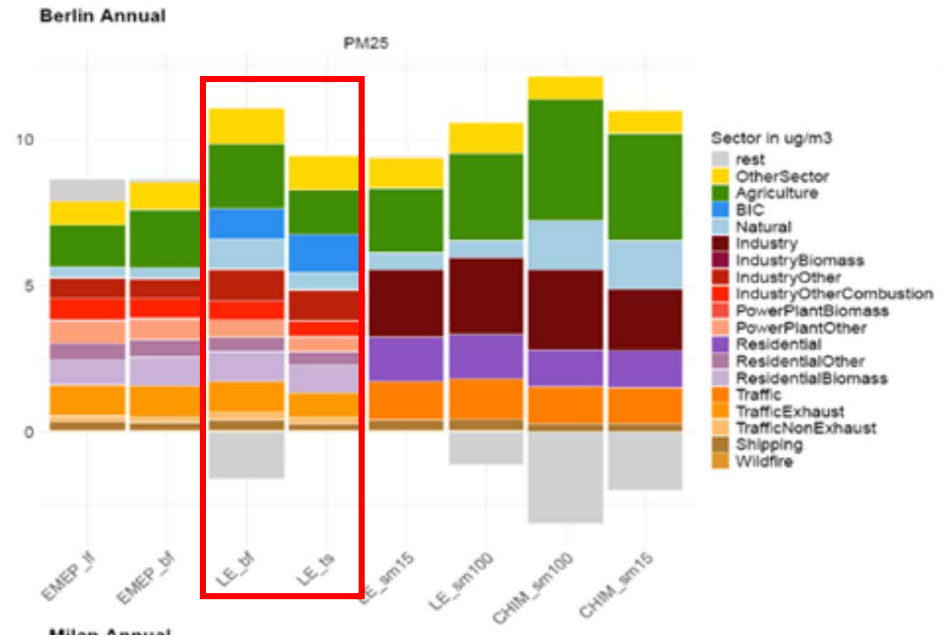
Utilization of the SHERPA tool

SHERPA tool

- Offline SHERPA tool from Git
- Sensitivity runs with the LOTOS-EUROS CTM required as a training set for the SHERPA tool
- ➢ 7 scenario runs [NOx, VOC, NH3, coarse PM, PM2.5, SOx individually (6) and simultaneously (1) decreased by 50%] in addition to a base case without any emission reductions
- Validation of source receptor-relationships with different emission scenarios.
- SOAP with SHERPA tool for 2022→ same region/sector combinations and emissions reductions (15%) as in BF [***impact on a yearly average***].
- Possibility to compare with the online SHERPA for 2022?

Source apportionment results

Labelling/tagging	Sector contributions daily, monthly, yearly No dynamicity (non-linearities)
Brute-force & SHERPA	Dynamicity/Influence of emission changes on an annual basis Evaluation of applicability range (small ER)



Next steps

- Ready to start the SHERPA training runs
- Download the SHERPA tool and implement it offline at TNO
- Decision on the country/sector combinations → initialise BF and SHERPA runs
- Preliminary results → early spring 2026
- Compare contributions and potential impacts from all methods
- **Next year** → present the results of this work