

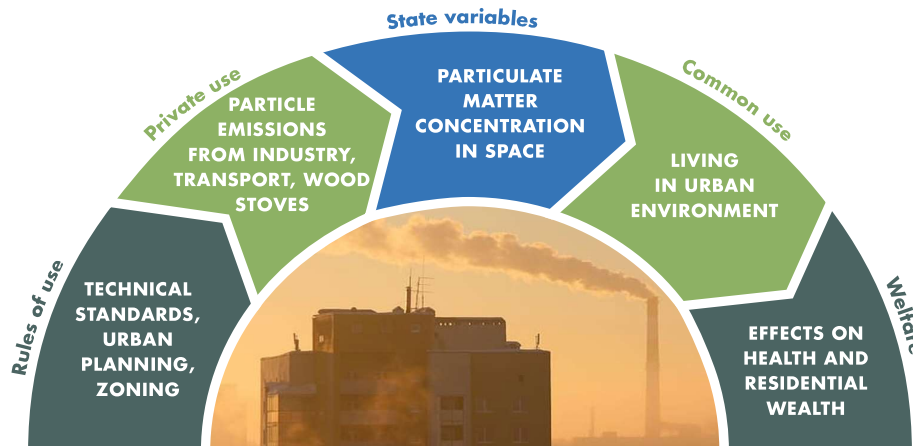


# HOW CAN WE EXPLAIN WITHIN-CITY DIFFERENCES IN AIR QUALITY AND SOCIO-ECONOMIC OUTCOMES?

MELANIE KRAUSE  
URBAN ECONOMICS

BERND SÜSSMUTH  
ECONOMETRICS

INA TEGEN  
ATMOSPHERIC MODELLING



**ATMOSPHERIC AIR QUALITY MODELLING**  
Ina Tegen, Melanie Krause

- How has air pollution changed in previous decades due to changes in emissions and urban structures?
- Second cohort: Include street trees, urban forests, soil-based emissions

Provide inputs to improve the atmospheric model (historic factory locations etc)

Provide model outputs (historical air quality) as regressors for project on air quality and income inequality

**AIR QUALITY AND INCOME INEQUALITY**  
Melanie Krause, Ina Tegen

- How does historical air quality shape contemporary socio-economic outcomes in (German) cities?
- Second cohort: Location of urban green space, forests, street trees

Provide air quality model outputs for particle distribution in specific cities

**HOME OWNERSHIP AND AIR POLLUTION**  
Bernd Süßmuth, Ina Tegen

- How does home ownership and land use affect air pollution?
- Second cohort: Effects of communal policy measures (building land restrictions, municipal tax changes)

Data on World War II bombing (instrumental variable from project on home ownership and air pollution) to be used as a covariate in project on air quality and income inequality



## ICP URBAN AIR

MELANIE KRAUSE, BERND SÜSSMUTH, INA TEGEN

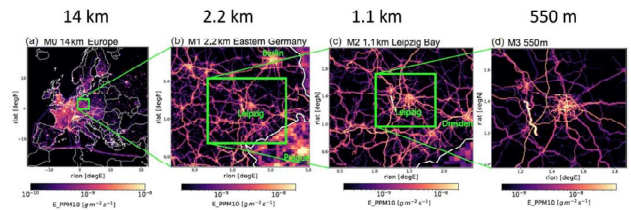
### DETAILS ON PHD PROJECTS

#### PHD PROJECT 1: ATMOSPHERIC AIR QUALITY MODELLING

How has air pollution changed in previous decades due to changes in emissions and urban structures?

##### METHODS

Regional and urban-scale model simulations of fine particle mass concentrations for selected German cities, utilising present-day and refined reconstructed historical emission data. Simulations will be performed for typical weather situations in selected time-slices. Emissions from specific sectors such as industry will be tagged.



Weger et al. (2022, GMD)

##### PRELIMINARY WORK / EXPECTED RESULTS

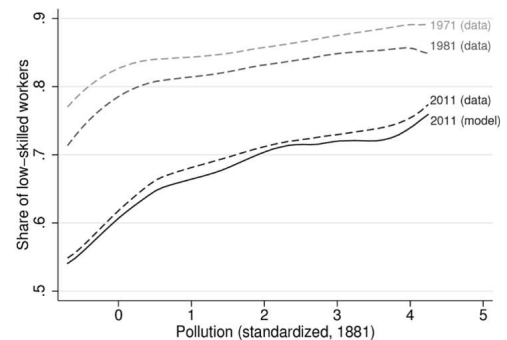
- Wolke et al. (2012, Atmos. Env.) and Weger et al. (2022, GMD) describe the air quality model system and urban parameterisation that will be used in this project
- Simulations of historical development of air quality / particle pollution for specific cities and regional background will provide a basis for further exploration of interactions with the economy

#### PHD PROJECT 2: AIR QUALITY AND INCOME INEQUALITY

How does historical air quality shape contemporary socio-economic outcomes in (German) cities?

##### METHODS

- Econometric (spatial) panel regressions of contemporary within-city income differences on historical air pollution, geographical factors, World War II destruction
- Geo-spatial methods in the data preparation process



##### PRELIMINARY WORK / EXPECTED RESULTS

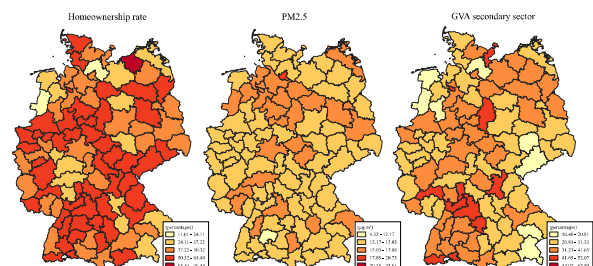
- Hebllich et al. (2021, JPE) use British data to explain the within-city East-West divide in incomes with industrial-era air pollution → generalise results in a German / central-European context, importance of topography, geography and different historical development (war bombings)
- Building on Castells-Quintana, Dienesch, and Krause (2021, Ecol. Econ.) on city structure and air pollution

#### PHD PROJECT 3: HOME OWNERSHIP AND AIR POLLUTION

How does home ownership and land use affect air pollution?

##### METHODS

Time series analysis techniques: (S)VAR, predictability (in- / out-of-sample), Granger causality, impulse response functions; longitudinal data analysis: Panel unit roots, cross sectional dependence, instrumental variables, difference-in-differences and staggered roll-out identification



##### PRELIMINARY WORK / EXPECTED RESULTS

- Simmen and Süßmuth (2022, under review): Test predictions of a theoretical model using longitudinal data of German planning regions, finding robust support for a causal relationship between homeownership and air pollution
- WWII area bombing is used as an instrument for homeownership