

# EXTERNAL EXPOSURE

# FACTORS & CANCER INCIDENCES

Within the complex network of human health, the environment plays a significant role. This study investigates how **external factors** and dangerous pollutants (in the air and drinking water) are linked to **cancer rates** across Czech communities. Emphasis is placed on examining indoor radon concentrations and their potential association with lung carcinoma outcomes. Utilization of data collected over a **20-year period** from **6,258 municipalities**, offers a **novel approach** for its **high spatial and temporal resolution**. Through this analysis, we not only investigate the health risks but also chart the pathways to resilience against the invisible tides of environmental challenges. With targeted public health strategies, this research aspires to **elevate the standard of living and health**, ensuring that the whispers of the past inform the echoes of the future.



## Study Design & Data Collection

This study is part of the EOSC4CANCER and DISCERN Horizon 2020 projects, employing a population-based approach to explore potential relationships between relevant external exposome factors identified through an extensive literature review and the comprehensive health data with focus on lung cancer.

We utilize retrospective cohort of all inhabitants of Czech Republic. Within protected electronic environment, population data are exported from the Czech National Cancer Registry (CNCR). The **lung carcinoma cases** are additionally segmented into **five morphological subtypes**, with smoking status categories: current smokers and former smokers, non-smokers, good for further analysis of the combinations. The lung cancer incidence is linked to other available exposure data spanning from 1990 to 2019 obtained from EIRENE nodes, Czech Republic databases, and Masaryk University's RECETOX such as dataset of measured indoor radon concentration levels at the municipal level.

## Primary Objective

Evaluate **existing and novel methods** for assessing the **impact of exposome factors on biomarkers of effect** and potential **health risks** in human populations with

- **WHERE and WHY** focus on individual communities and city districts
- employing a GEOcoding methodology that integrates both temporal and spatial association analysis.

## Exposome Data Analysis

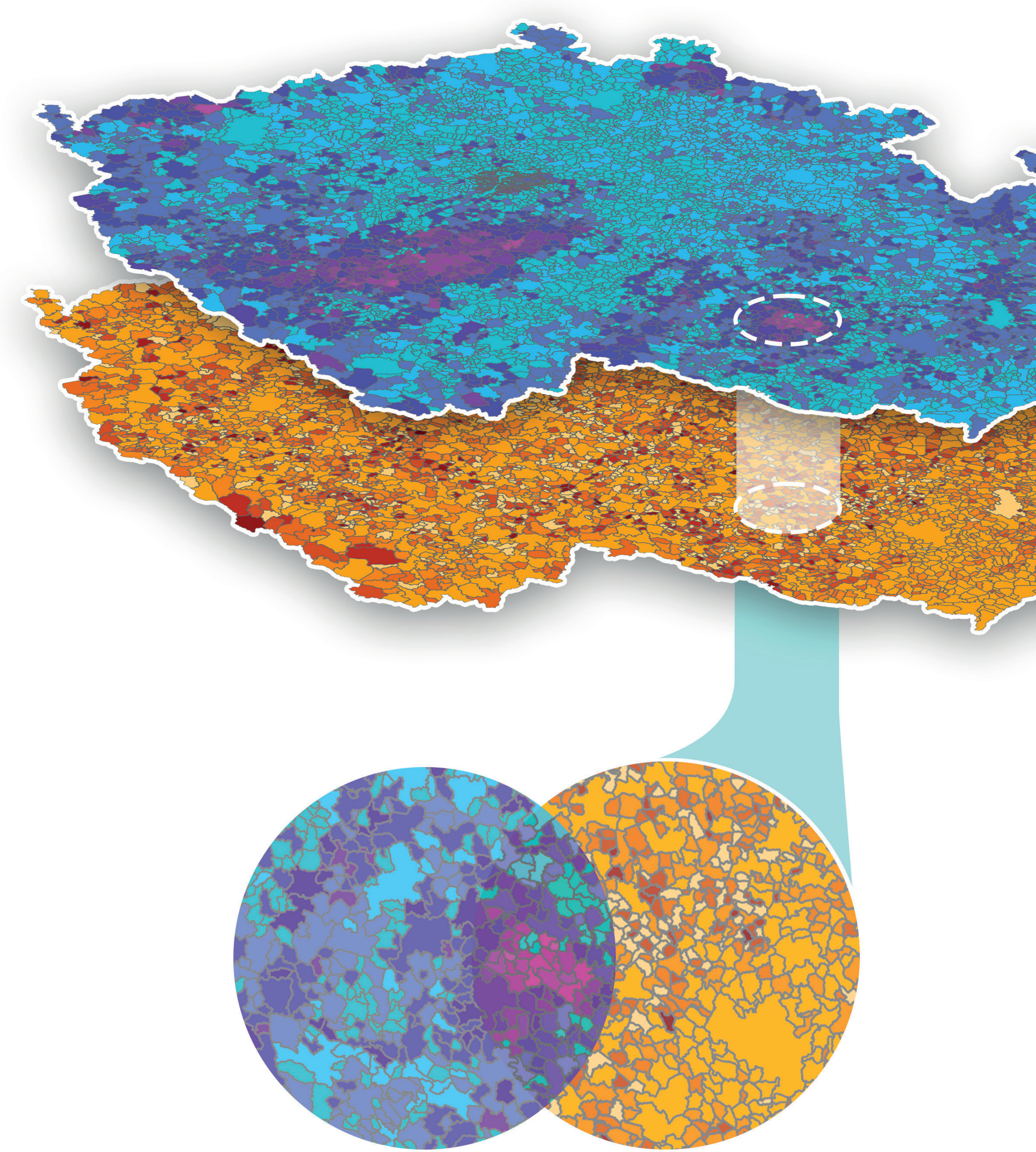
The initial step involved cataloging existing exposome surfaces, prioritizing carcinogens classified as Group 1 or 2A by the IARC. This included generating new exposome surfaces to map the spatial distribution of these carcinogens. Our focus was specifically on radon measured in buildings across the Czech Republic, as well as air and drinking water quality data, crucial for evaluating cancer risk factors.

## Exposome to Cancer Linkage

Utilizing advanced statistical methodologies, including R-scripted Linear Mixed-Effects (LME) models, we delved into a detailed dataset of radon concentrations to explore their association with health outcomes across municipalities. These models uniquely accounted for population size within each municipality, enhancing the precision of our analysis. This approach adhered to the latest EU ASR (Age Standardized Rate) standards and incorporated confounding factors to ensure the reliability of our results.

## Expected Outcomes

Our research aims to deliver actionable insights for public health strategies, particularly in addressing localized chemical exposure effects. By potentially including data from the Netherlands and Italy, we seek to broaden our understanding and application, ultimately addressing the critical question of how the exposome influences lung cancer incidence and identifying key risk factors.



### Radon Exposure

- Geometric mean of radon concentrations (Bq/m<sup>3</sup>) measured in indoor dwellings across the Czech Republic

### Health Outcome

- Age-standardized rates (ASR EU, 2013) at a granular level (polygon size mean = 12km<sup>2</sup>; N=6,258)
- Categorized by smoking status, sex, and detailed combinations of each subtype

