



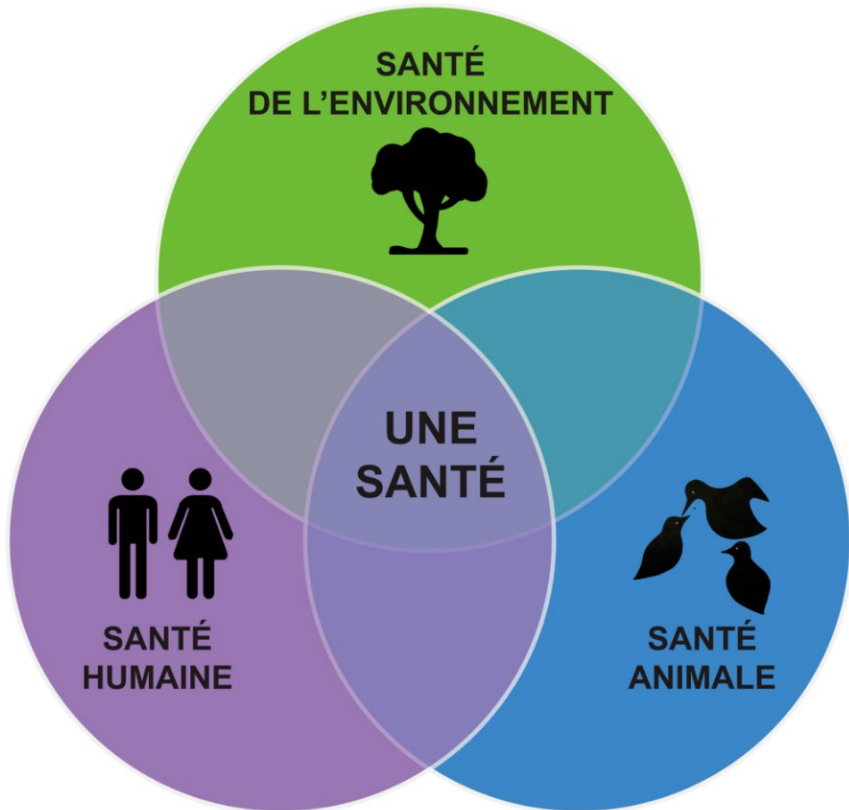
Assessing the benefits of hypothetical air quality interventions on chronic diseases in Belgium

Ingrid Pelgrims

Risk and health impact assessment

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Sciensano : the « One health » concept



More than 900 staff
members



More than 100 par-
liamentary
questions

processed annually



400 scientific
projects and
activities

financed by Belgian and
international partners

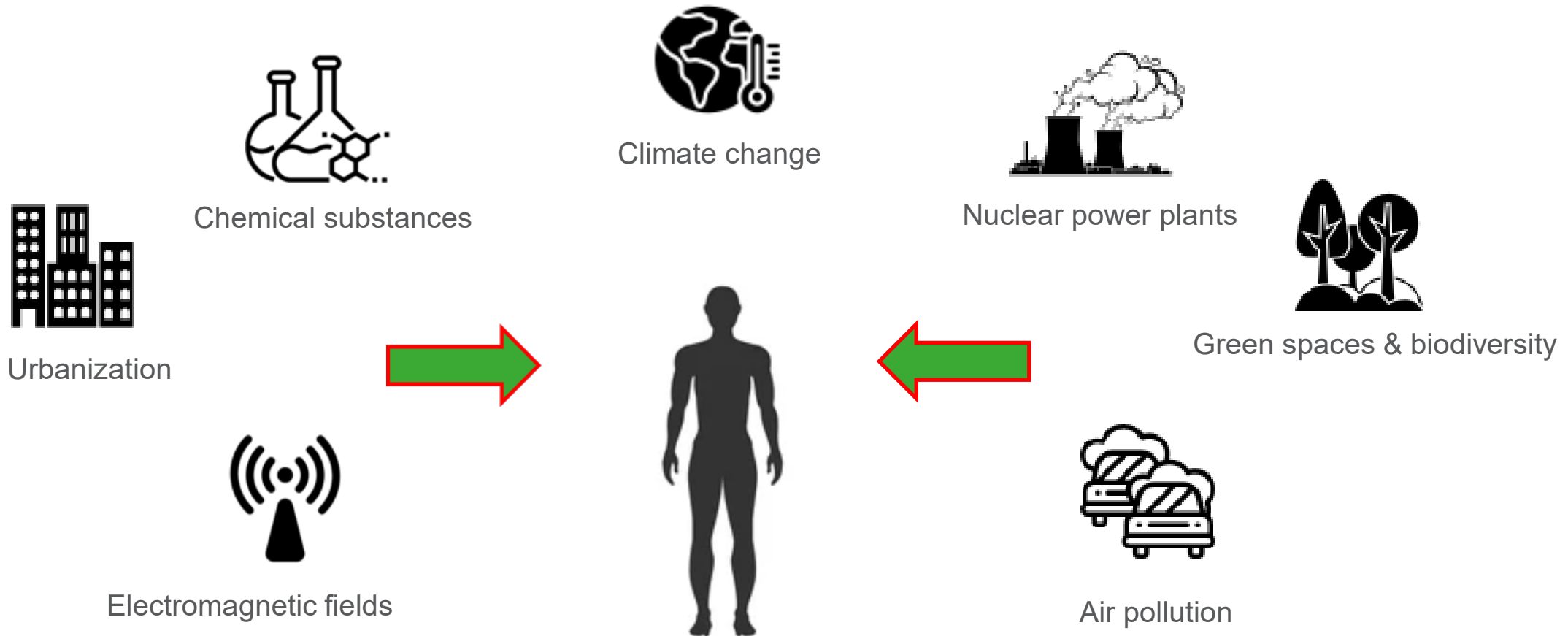


280 peer-reviewed
articles

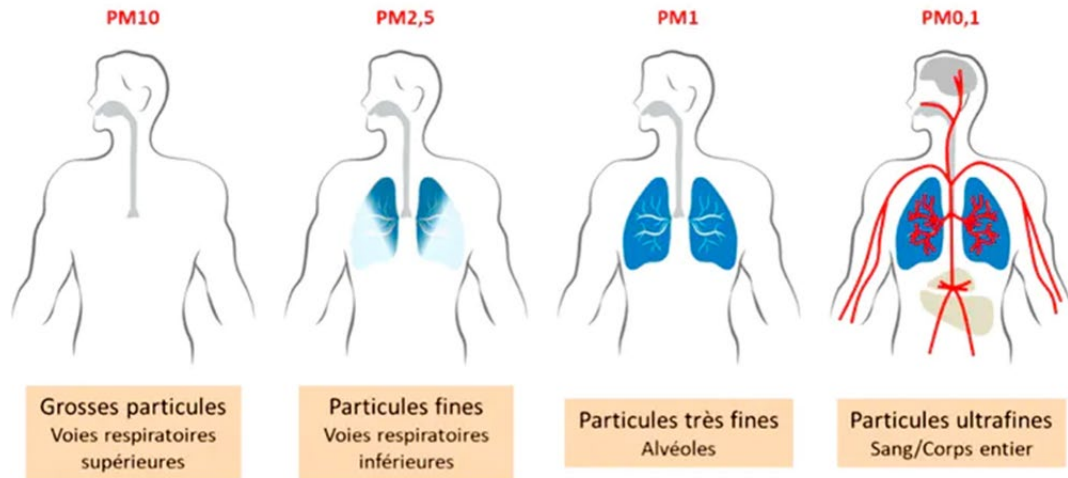
published annually

Health impact assessment unit

Investigating the impact of environmental exposures on human health



Air pollution: the largest environmental health risk in Europe



Particulate Matters

- Combustion of fossil fuels for heating
- Industrial activities
- Transport
- Agriculture

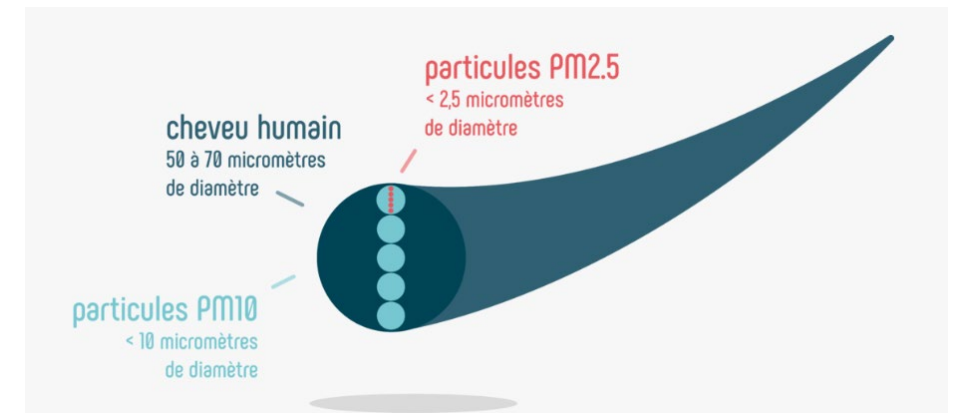
NO₂

- Toxic gas from road traffic

Black carbon

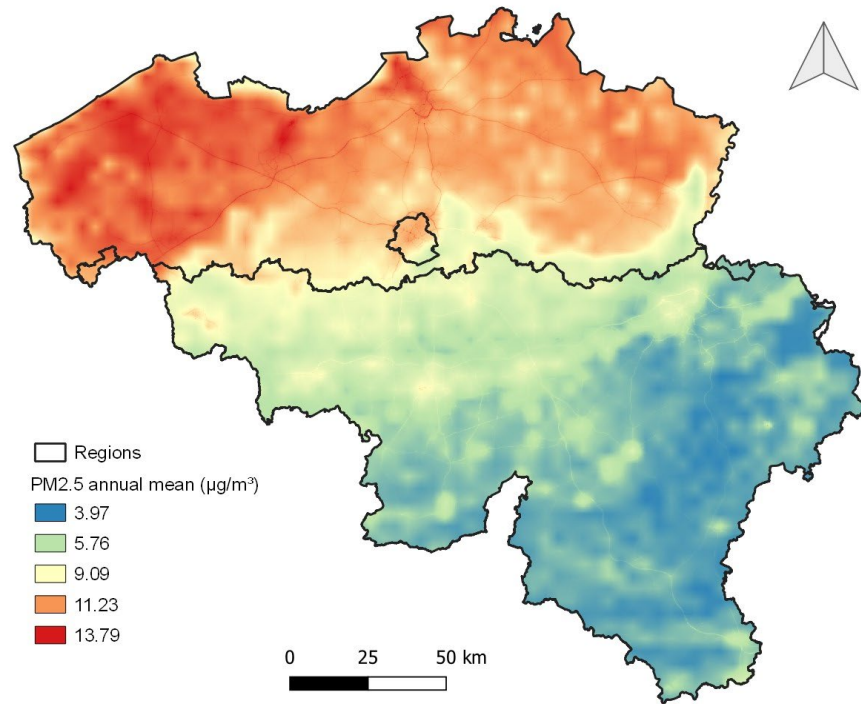
- Soot particles from combustion engines of cars

- Risk factor for **cardiovascular, respiratory & neurological diseases**
- In 2018, PM2.5 responsible of **7400 premature death in Belgium**

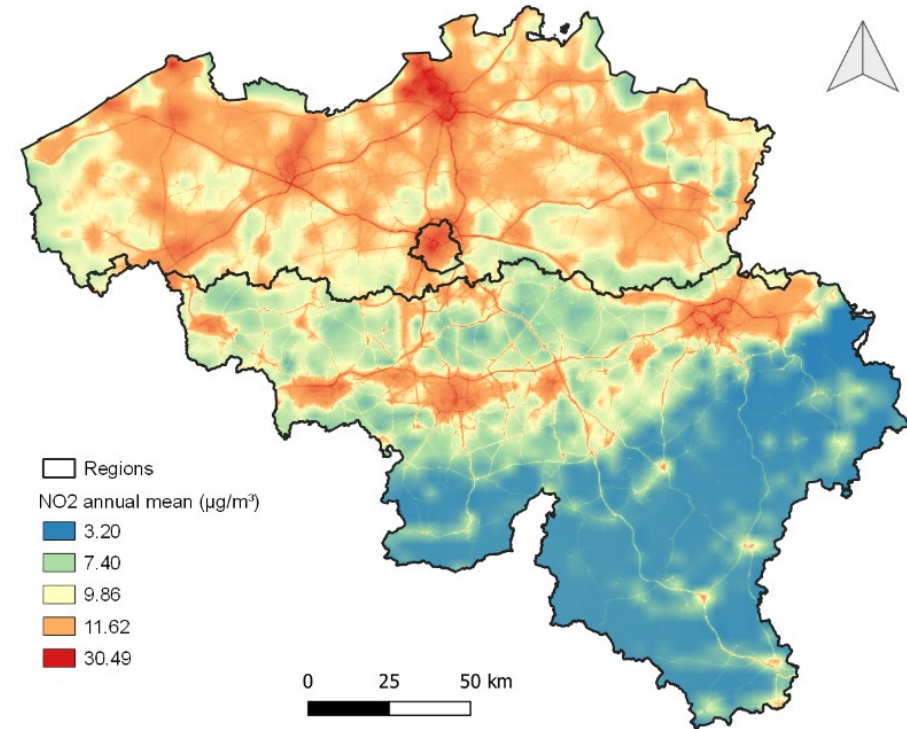


Air pollution in Belgium (2018)

PM_{2.5}



NO₂

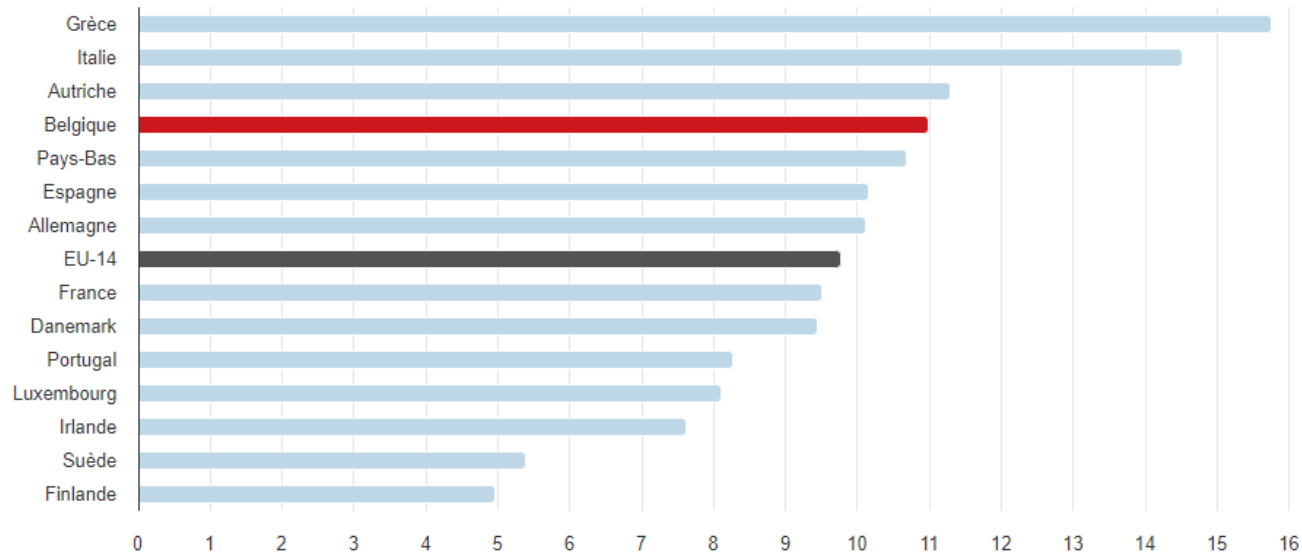


Air pollution in Belgium

Belgium, the fourth most exposed country to fine PM in the EU-14

PM_{2.5} concentration moyenne pondérée par la population ($\mu\text{g m}^{-3}$), 2019

Source: Calculs des auteurs sur base des données de l'Agence Européenne pour l'environnement sur l'exposition à la pollution atmosphérique [19].



Brussels and Antwerp among the top 10 European cities where NO₂ is the deadliest

ISGlobal — RankingOfCities

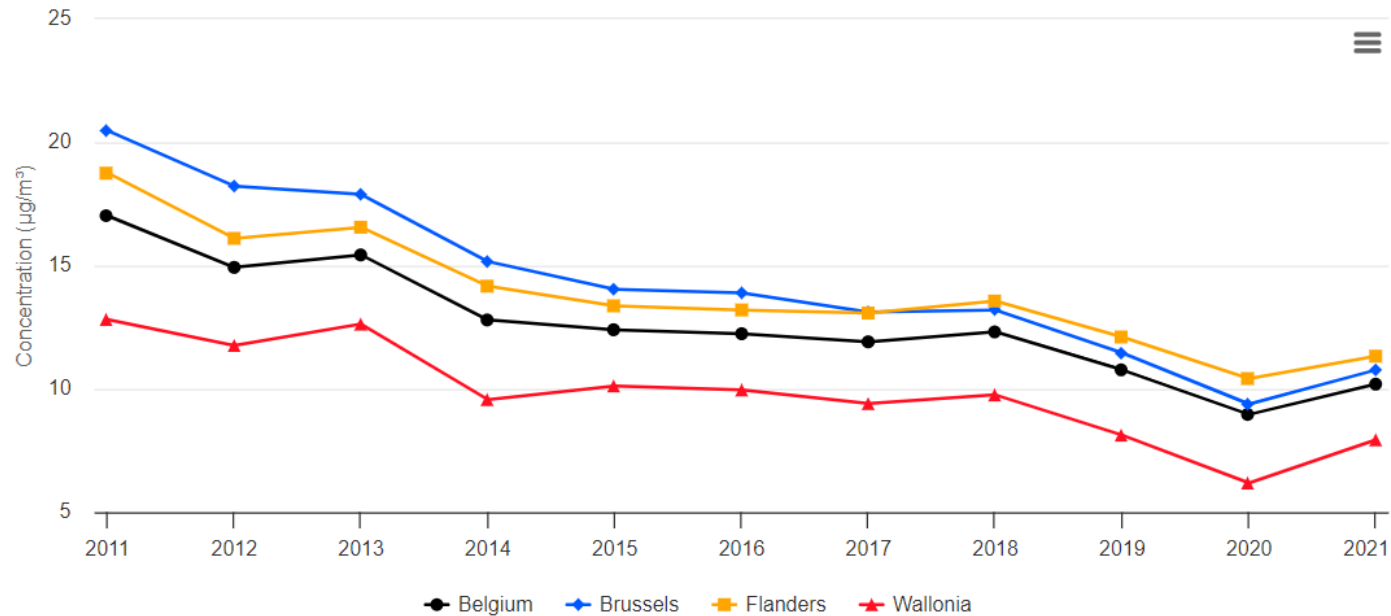
Urban health study in 1,000 European cities

| MORTALITY RANKING | CITY | COUNTRY |
|-------------------|-------------------------------|---------|
| 1 | MADRID (METROPOLITAN AREA) | SPAIN |
| 2 | ANTWERP | BELGIUM |
| 3 | TURIN | ITALY |
| 4 | PARIS (METROPOLITAN AREA) | FRANCE |
| 5 | MILAN (METROPOLITAN AREA) | ITALY |
| 6 | BARCELONA (METROPOLITAN AREA) | SPAIN |
| 7 | MOLLET DEL VALLÈS | SPAIN |
| 8 | BRUSSELS | BELGIUM |
| 9 | HERNE | GERMANY |
| 10 | ARGENTEUIL - BEZONS | FRANCE |

Air quality is improving... but it's not enough!

Exposure to PM_{2.5}, by region, 2011-2021

Source: Own calculations based on air pollution data provided by IRCEL-CELINE [17], and population data provided by Statbel [18].



- The majority of Belgians remain exposed to PM_{2.5} and NO₂ levels above the WHO's recommendations

Evidence about the health impact of air pollution in Belgium

Demoury et al. *Environmental Health* (2024) 23:11
<https://doi.org/10.1186/s12940-024-01050-w>

Environmental Health

RESEARCH

Open Access

Impact of short-term exposure to air pollution on natural mortality and vulnerable populations: a multi-city case-crossover analysis in Belgium

Claire Demoury^{1*}, Raf Aerts^{1,2,3}, Finaba Berete⁴, Wouter Lefebvre⁵, Arno Pauwels^{1,4}, Charlotte Vanpoucke⁶, Johan Van der Hevden⁴ and Eva M. De Clercq¹



Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv



Residential green space, air pollution, socioeconomic deprivation and cardiovascular medication sales in Belgium: A nationwide ecological study

Raf Aerts^{a,b,c,d,*}, Benoit Nemery^e, Mariska Bauwelinck^f, Sonia Trabelsi^g, Patrick Deboosere^f, An Van Nieuwenhuysse^{a,e,1}, Tim S. Nawrot^{c,e}, Lidia Casas^{e,h}



Environmental Research 236 (2023) 116713

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)



ELSEVIER

Environmental Research

journal homepage: www.elsevier.com/locate/envres



Association of air pollution and green space with all-cause general practitioner and emergency room visits: A cross-sectional study of young people and adults living in Belgium

Arthur Vranken^{a,b}, Esmée Bijmens^{c,d}, Christian Horemans^a, Agnès Leclercq^a, Wies Kestens^a, Güngör Karakaya^a, Ludo Vandenthoren^a, Elke Trimpeneers^e, Charlotte Vanpoucke^e, Frans Fierens^e, Tim Nawrot^{f,g}, Bianca Cox^h, Luk Bruvneel^{a,b,*}



Pelgrims et al. *BMC Public Health* (2021) 21:635
<https://doi.org/10.1186/s12889-021-10557-7>

BMC Public Health

RESEARCH ARTICLE

Open Access

Association between urban environment and mental health in Brussels, Belgium

Ingrid Pelgrims^{1,2,3*}, Brecht Devleeschauwer^{3,4}, Madeleine Guyot⁵, Hans Keune^{6,7}, Tim S. Nawrot^{8,9}, Roy Remmen⁷, Nelly D. Saenen⁸, Sonia Trabelsi⁵, Isabelle Thomas^{5,10}, Raf Aerts^{1,8,11} and Eva M. De Clercq¹



➤ **Methodological challenges remain to provide actionable evidence on the potential impact of air quality interventions!**

RESEARCH OBJECTIVES

- **To assess the benefits of hypothetical air pollution reduction interventions on chronic diseases in Belgium**
- **To valorize existing Sciensano data sources**



3 AXES OF WORK



A practical tool for stakeholders involved in air quality management

➤ Facilitate the development of effective air quality measures

Part 1: Stakeholders Identification

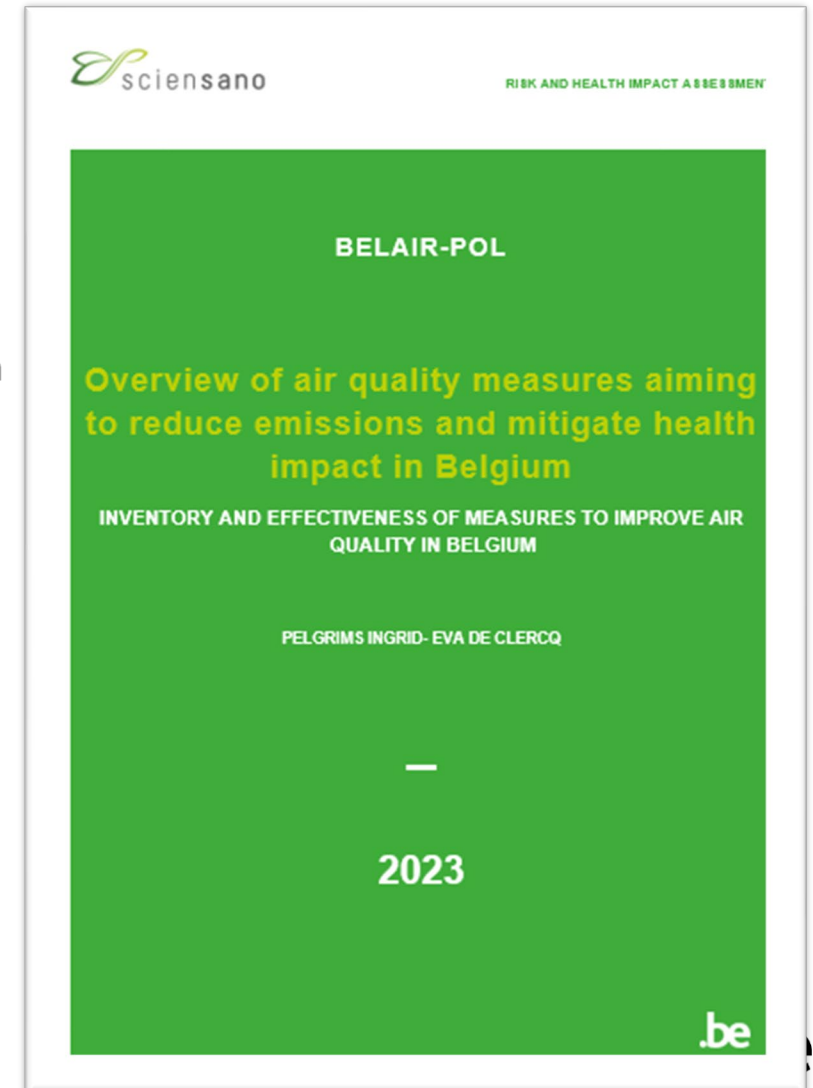
- ✓ **Governmental & non-governmental actors** engaged in addressing air pollution in Belgium

Part 2: Inventory of traffic-related air quality measures

- ✓ **Implemented** in Belgium & **potential future** measures

Part 3: Evaluation of measure effectiveness

- ✓ **Reduction of air pollutant** concentrations and **improvements in public health**



Traffic-related air pollution measures



Regulatory

- WHO air quality guidelines
- EU directives (concentration)
- EU directives (emission)
- Ban on fuel vehicles in 2035
- Executive Orders (region)
- Decree regulating LEZ



Strategic

- EU Zero pollution Action Plan
- EU Green Deal/capitals
- NEHAP
- Interministerial Health Conf.
- Air quality policy plan (region)
- Mobility plan (Good move)



Information & sensitization

- Air quality statistic (EEA/IRCELINE)
- European mobility week
- Citizen science
- Aircasting Brussels project
- Street actions



Traffic management

- Low Emission zones
- Zero emission zones
- Pedestrian zone
- Emergency scheme
- Limited traffic zones
- School streets



Pricing scheme/ incentives

- Parking pricing
- Fuel taxes
- Urban road tolls
- Free public transport
- Mobility budget
- LEZ incentives (companies)



Automotive technology & electric fleet

- Vehicle exhausts catalyts
- Vehicule particulate filter
- Green public transport fleet
- EV charging infrastructure
- Alternative fuels



Shared mobility services

- Car sharing (Cambio, Poppy)
- Bike sharing (Villo, Blue Bike)
- El. bike & scooter (Lime)
- Car pooling (Blabla car)



Active mobility & transport infrastructure

- Tram, metro network extension
- Metro network extension
- Train network extension
- Bicycle lanes network
- Park and ride infrastructures



Transport avoidance

- Working from home
- Car-free days



Urban design

- Urban green spaces
- Street trees
- Wide side walks
- Vegetative barriers

Road-traffic measures effectiveness

LOW EMISSION ZONES



- **Faster air quality improvement for Belgians in LEZ** compared to other cities (Bruyneel L., 2023)
- **30% decrease in NO₂** in Brussels (Dehouck. S., 2022)
- Thermic vehicles phase out in 2030 in Brussels could **avoid 15% of premature death** due to PM_{2.5} & NO₂ (Van de Vel K., 2021)
- 13% reduction in **asthma in children** born in LEZ (Klauber, 2024)
- Decreased risk of **cardiovascular diseases** (Chamberlain R, 2023)

Road-traffic measures effectiveness



SCHOOL STREETS

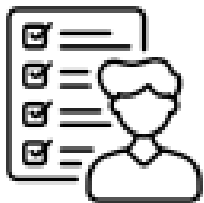
London, reduction in NO₂ peak exposure outside of schools
(Gellatly R., 2021)

CAR FREE DAYS & LOCAL TRAFFIC REDUCTION

30% reduction in **pediatric asthma** incidence in traffic areas
in Brussels (Vandeninden B., 2023)



Statistical analyses: Health benefits of air quality improvement scenarios



Data from the national health interview survey (2008/2013/2018)

- Conducted every five years
- Representative sample of the Belgian population (10,000 participants)
- Self-reported data : health, lifestyle, socio-economic data

Objective environmental data

- Data linkage based on geographical coordinates of residential addresses
- Exposure to air pollution (Annual mean of PM2.5, BC, NO2)
- Exposure to road traffic noise
- Exposure to green spaces: vegetation coverage in 1km buffer



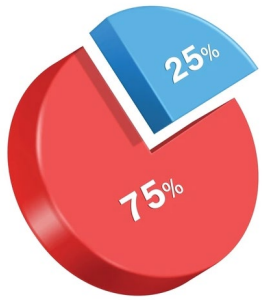
Cause-of-death data

- Mortality follow-up of participants

Use of advanced statistical methods



- ✓ **G-computation:** effects of interventions & actionable evidence for policymakers
- ✓ **Multiple-imputation:** Handle missing data & self-reported bias



- ✓ **Which percentage of disease could we avoid in Belgium if we reduce the air pollution exposure to a target level?**



Respiratory diseases



Cardiovascular diseases

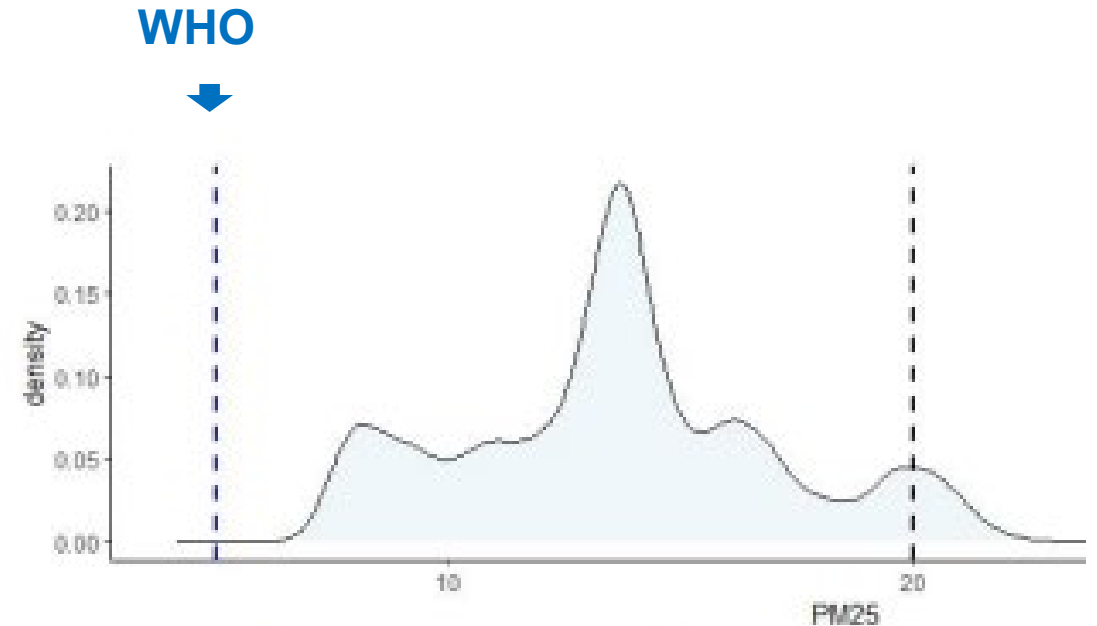
Hypothetical air quality interventions in Belgium



Reduce the average annual exposure to air pollution of each individual to **meet the WHO AQG**



Decrease the average annual exposure to **PM2.5, NO2, and BC** of each individual **by varying percentages**: 20, 40, 60 and 80%

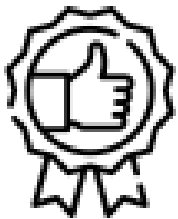


Findings



Significant association between air pollution and

- ✓ Asthma
- ✓ Stroke

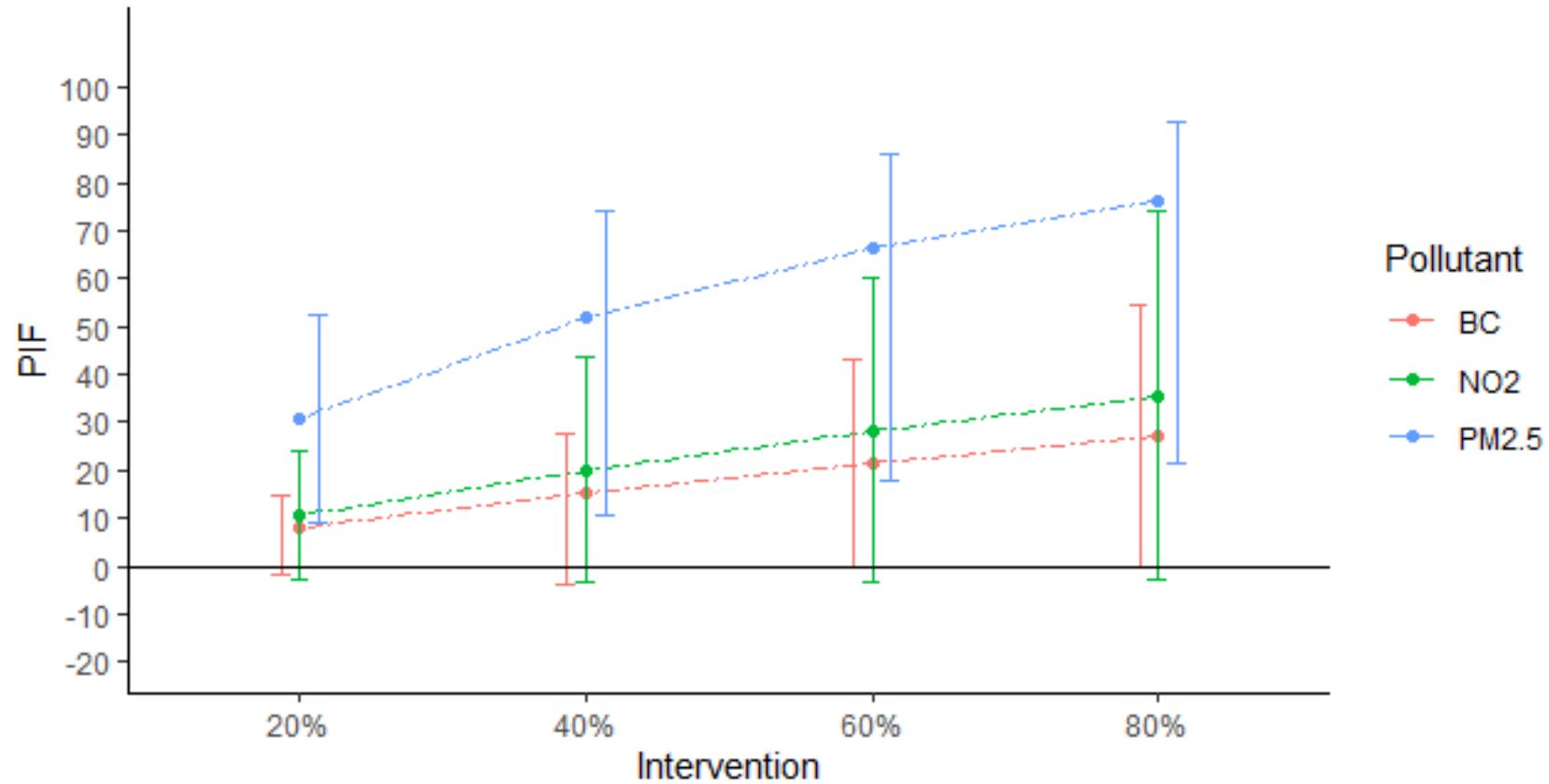


Adhering to WHO air quality guidelines would

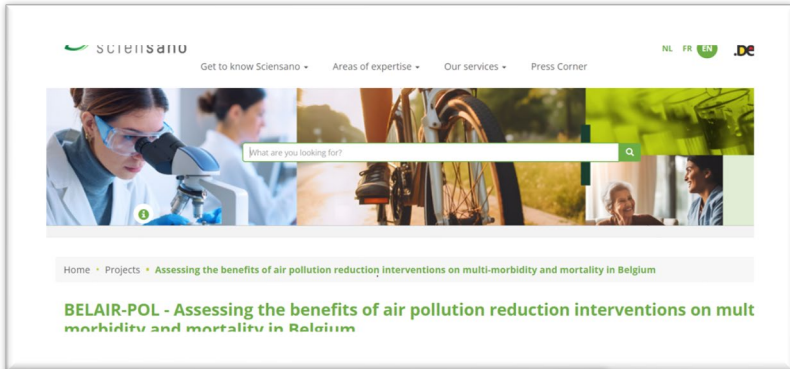
- Reduce stroke risk **by preventing 63% of cases** for PM_{2.5} and 22% for NO₂
- Reduce asthma risk **by preventing 27% of cases** for PM_{2.5} and 16% for NO₂



Benefits of air pollution reduction on stroke



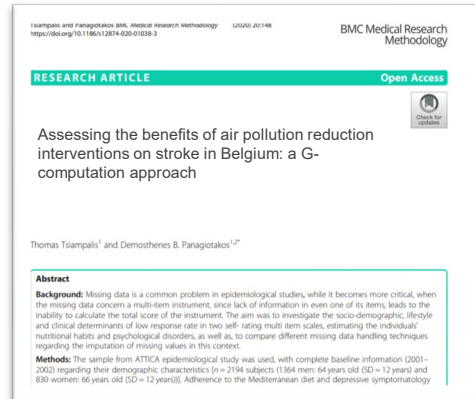
Findings dissemination



<https://lnkd.in/gdbHH2is>

study from our colleagues also showed that air pollution reduction interventions could significantly decrease the prevalence of stroke in Belgium.

More info on the study
<https://lnkd.in/g4SMsF5g>



Press release for European mobility week



Accueil > Semaine de la mobilité | De nouvelles recherches confirment les impacts sur la santé causés par la pollution de l'air liée au trafic en Belgique

Semaine de la mobilité | De nouvelles recherches confirment les impacts sur la santé causés par la pollution de l'air liée au trafic en Belgique ⁽¹⁾

Publié le : Lundi, 16 septembre 2024

Des recherches récentes fournissent des informations cruciales sur l'impact de la pollution de l'air et des températures ambiantes élevées sur la santé des citoyens belges, mettant en évidence le besoin de mesures durables et efficaces pour réduire la pollution de l'air en Belgique.

En Belgique, la pollution de l'air due au trafic routier constitue **un risque environnemental majeur pour la santé**. Elle se compose de polluants tels que le dioxyde d'azote, les particules fines et le benzène, tous connus pour causer des problèmes de santé graves, notamment des maladies respiratoires et cardiovasculaires, ainsi qu'une mortalité prématurée. Bien que des efforts considérables aient déjà été déployés pour réduire les niveaux de pollution de l'air en Belgique, **une part importante de la population est encore exposée à des concentrations nocives de polluants atmosphériques**. Lutter contre la pollution de l'air en Belgique reste un défi crucial pour la santé publique, nécessitant une attention urgente et des efforts coordonnés. La bonne nouvelle est qu'il existe **de nombreuses mesures pour réduire la pollution de l'air liée au trafic**, et leur efficacité a déjà été démontrée : zones à faibles émissions, initiatives de mobilité active favorisant le cyclisme et la marche, zones piétonnes, rues scolaires, etc.



Sciensano
16 septembre · 🌐

Semaine de la [#mobilité](#) 🚗 | De nouvelles recherches confirment les impacts sur la santé causés par la [#pollution](#) de l'air liée au trafic en Belgique.

The set-up of a diverse steering committee

Key stakeholders in the fields of air quality, mobility, and health



Health
Food Chain Safety
Environment

DEPARTEMENT
ZORG



environnement
.brussels



VLAAMSE
MILIEUMAATSCHAPPIJ



Vlaanderen
is milieu



LES CHERCHEURS D'AIR



Kom op
tegen
Kanker



ISSeP



CANOPEA
l'environnement en réseau



irCELine



mutualités
libres



vivalis
.brussels

Observatoire de la Santé et
du Social de Bruxelles-Capitale
Observatorium voor Gezondheid
en Welzijn van Brussel-Hoofdstad

Conclusion

- **Air pollution plays a significant role in the number of stroke and asthma cases in Belgium**
- **Air quality interventions could effectively reduce the prevalence of these diseases in Belgium**



Next step...

- **Assessing the impact of air quality interventions on cause-specific mortality**

Air pollution: why investing in research is essential?

- **Understanding its origins** and measuring its **impact on health**
- **Countering misinformation**
- Guiding public policies in making **informed decisions based on scientific evidence**
- Ensuring the monitoring of **international commitments**: EU directives



- Evaluate the **effectiveness of air pollution control measures**
- Make scientific **information accessible**
- **Raise public awareness** about air quality

Did you know that exposure to air pollution...



Is associated with increased risks of **dementia & depression** ?



Increases the risk of developing **diabetes**?



Increases the risk of **low birth weight**?



Exposure during pregnancy could impact the **development of children's brain**?



Can be transmitted to the infant through **breast milk**?

THANK YOU !



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