

SPACE Launch Event: Armagh  
Observatory and Planetarium

# Exploring relations between health and the environment: a Northern Ireland Perspective

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# SPACE

SUPPORTIVE ENVIRONMENTS FOR  
PHYSICAL & SOCIAL ACTIVITY,  
HEALTHY AGEING & COGNITIVE HEALTH

This work was supported by **UK Research and Innovation** [ES/V016075/1]

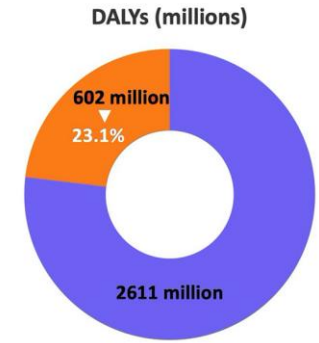
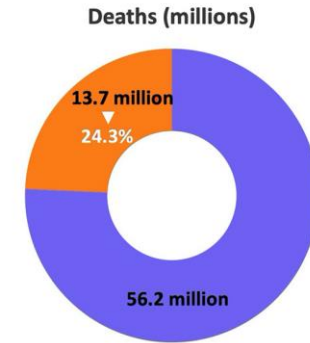


Economic  
and Social  
Research Council



Healthy Ageing Challenge  
Social, Behavioural and  
Design Research

# What's in our environment and how can that affect us?



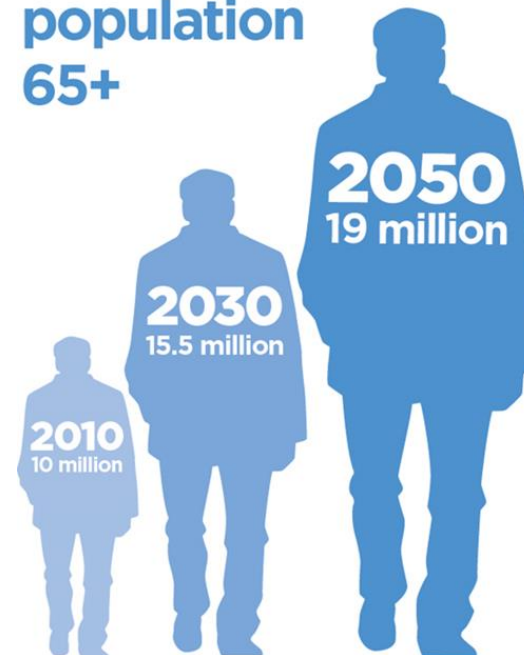
Attributable to the environment  
Not attributable to the environment

Source: Preventing disease through healthy environments: a global assessment of the burden of disease from environmental risks, WHO, 2012. Updated 2016 data tables.

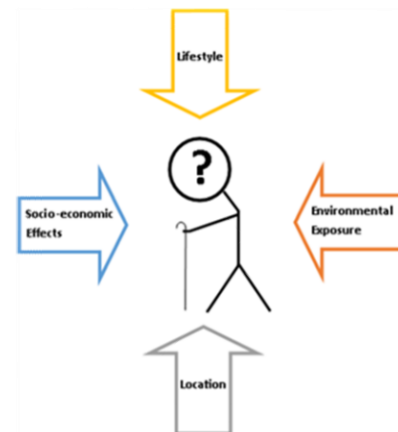
Disability-adjusted life years (DALYs)



UK population 65+



Evidence shows that older adults and those with pre-existing health conditions are at greatest risk.



**ENVIRONMENTAL IMPACTS ON HEALTH**  
**WHAT IS THE BIG PICTURE?**

**FACT:**  
**23%**  
of all global deaths are linked to the environment.  
That's roughly **12.6 million deaths** a year.

**WHERE IS IT HAPPENING?**

- 3.8 million in South-East Asia Region
- 3.5 million in Western Pacific Region
- 2.2 million in Africa Region
- 1.4 million in European Region
- 854 000 in Eastern Mediterranean Region
- 847 000 in the Region of the Americas

World Health Organization  
#EnvironmentalHealth



# The evidence base – Urban pollution



- Particulate matter, NO<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub>
- Heavy metals
- Phenols and other chemicals



- Chronic noise

Image from <https://www.dispatch.ug/tag/noise-standards-and-control-regulations/>



- Outdoor light at night

Image from <https://environmentallysound.wordpress.com/2012/04/03/light-pollution-a-shooting-scar-in-the-sky/>



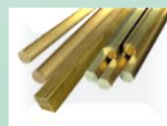


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SUPPORTIVE ENVIRONMENTS FOR  
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<https://flashbak.com/belfast-1955>



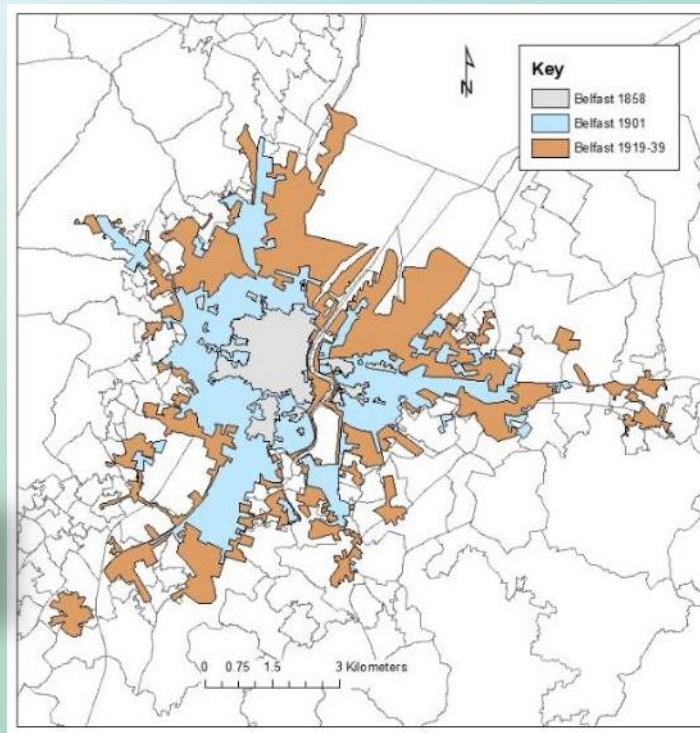
Anthropogenic sources for copper, (Cu), zinc (Zn), tin (Sn), antimony (Sb) and lead (Pb)

# THE HISTORICAL LEGACY – EXPANSION OF BELFAST FROM 1858, 1901 TO 1919-39

McIlwaine et al. (2017) found evidence of a legacy of anthropogenic contamination linked to the historical development of Belfast associated with the elements Zn, Sn, Pb, Sb, As and Mo.



**Soils show evidence of legacy and modern day pollution**



<https://flashbak.com/belfast-1955>



Contents lists available at [ScienceDirect](http://ScienceDirect)

**Environmental Pollution**

journal homepage: [www.elsevier.com/locate/envpol](http://www.elsevier.com/locate/envpol)

ELSEVIER

POLLUTION

The relationship between historical development and potentially toxic element concentrations in urban soils<sup>a</sup>

Rebekka McIlwaine<sup>a,\*</sup>, Rory Doherty<sup>a</sup>, Siobhan F. Cox<sup>a</sup>, Mark Cave<sup>b</sup>

<sup>a</sup> Civil Engineering Research Centre, School of Planning, Architecture and Civil Engineering, Queen's University Belfast, Belfast BT7 1NN, Northern Ireland, UK

<sup>b</sup> British Geological Survey, Keyworth, Nottingham NG12 5GQ, England, UK



# The role of the environment in promoting brain health and preventing dementia– green/blue space, walkability and cyclability

Better air quality,  
cooler  
temperatures,  
less noise

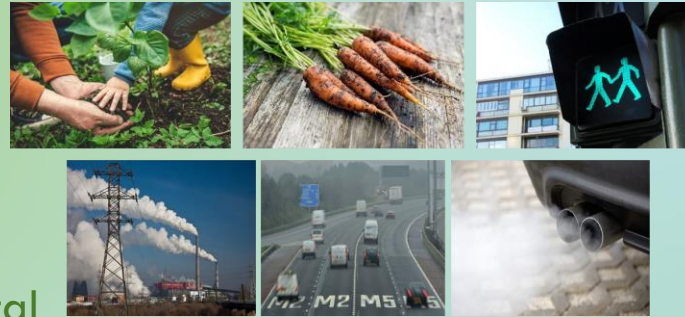
Important  
relationships  
with physical and  
social activity!





# EXPOSURE ANALYSIS REQUIRES AN INTEGRATED APPROACH

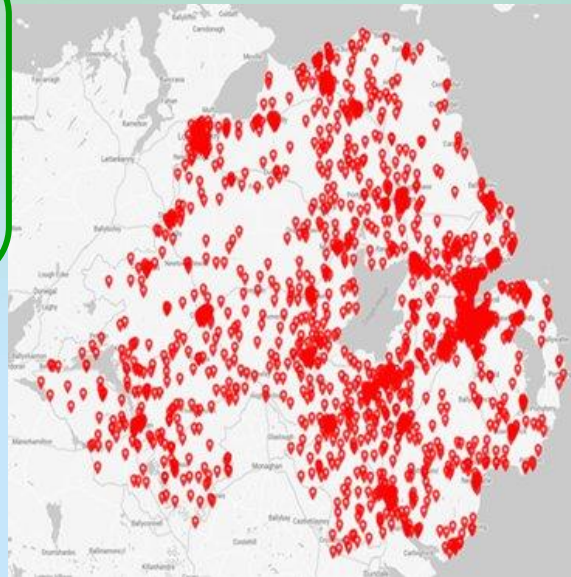
## SOIL, AIR, NOISE POLLUTANTS



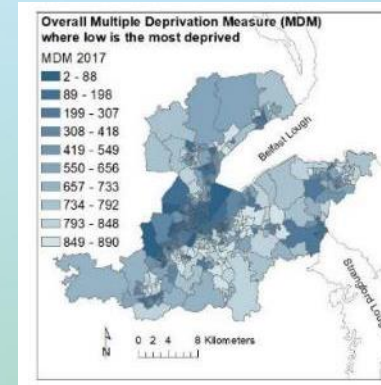
<https://go.qub.ac.uk/spacegeoportal>

How the local environment and pollutants synergistically affect our cognitive health outcomes.

HEALTH DATA  
NICOLA



## DEPRIVATION MEASURES



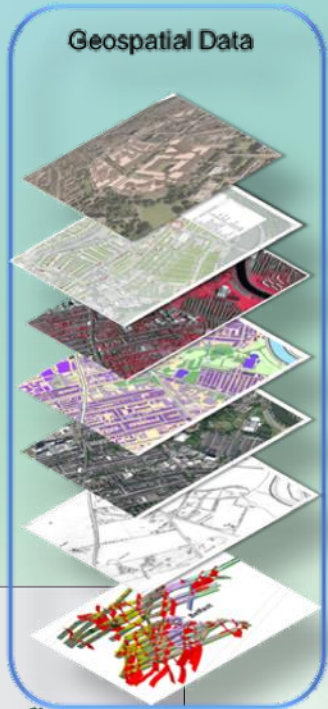
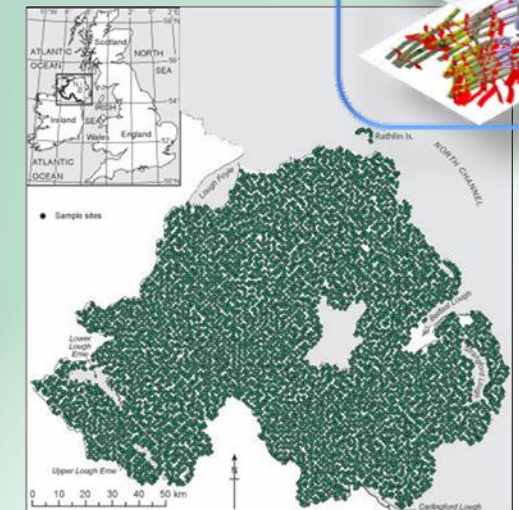
Northern Ireland Multiple Deprivation Measure 2017 (NIMDM2017) | Northern Ireland Statistics and Research Agency ([nirsra.gov.uk](http://nirsra.gov.uk))

## ENVIRONMENTAL DATA SOIL, STREAM GEOCHEMISTRY

Natural sources for Potentially Toxic Elements (PTEs)



**A guide to the Tellus data**  
Young, M. E. and Donald, A. W. (eds). 2013  
Geological Survey of Northern Ireland (GSNI), Belfast.  
<http://nora.nerc.ac.uk/509171/>.







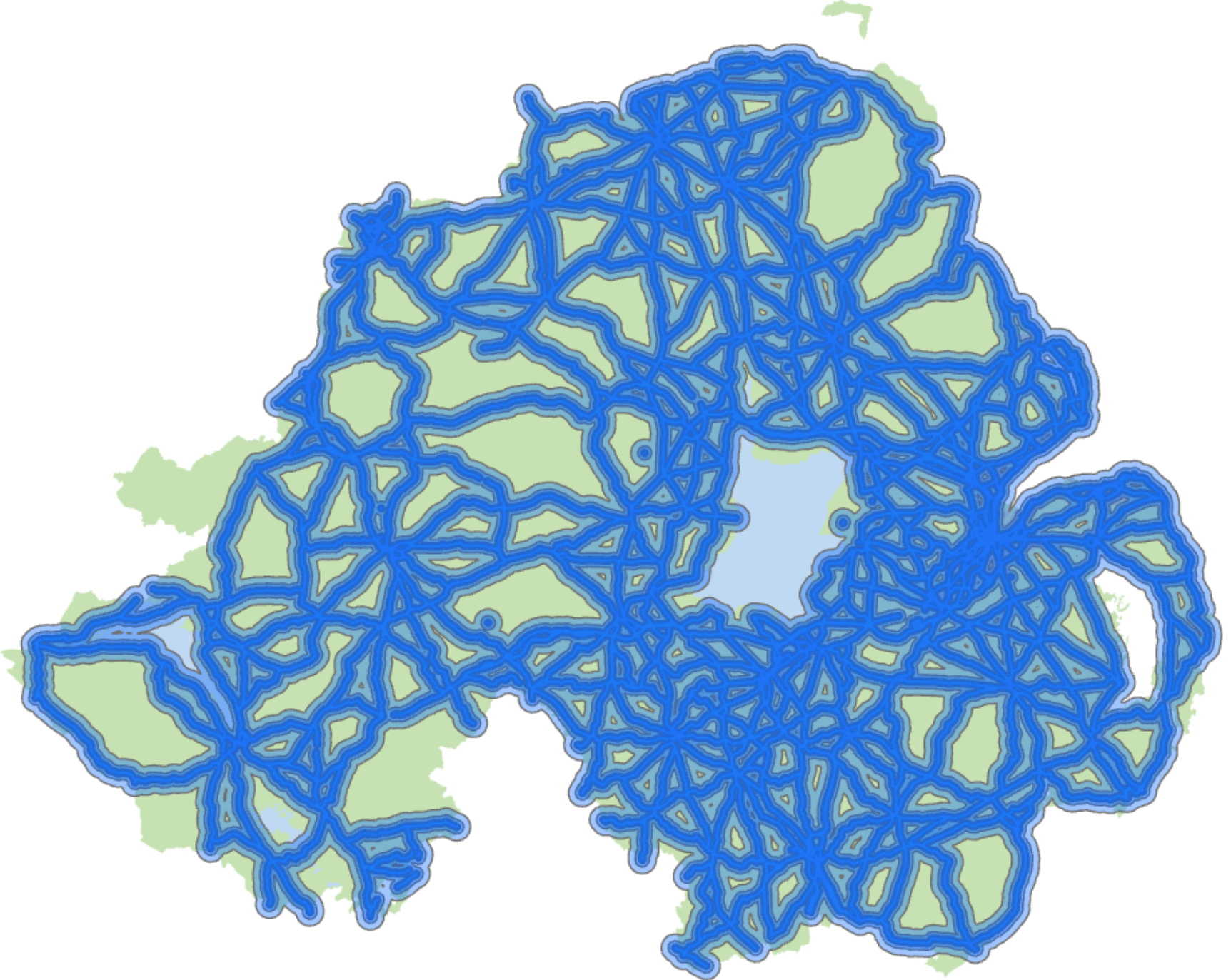
## ROAD BUFFER SIZES

- 300m, 500m, 1000m and 2000m
- Elemental soil road buffer analysis for subcomposition : [As, Cd, Co, Hg, Mo, Pb, Rb, Sb, Se, Sn, Th, U, Al, Ba, Cr, Cu, Fe, Mn, Ni, Sr, V, Zn]

To investigate relationship with

Cognitive Metrics from NICOLA database including Mini-Mental State Exam (MMSE) Alzheimer's / Dementia Test

Montreal Cognitive Assessment (MoCA)



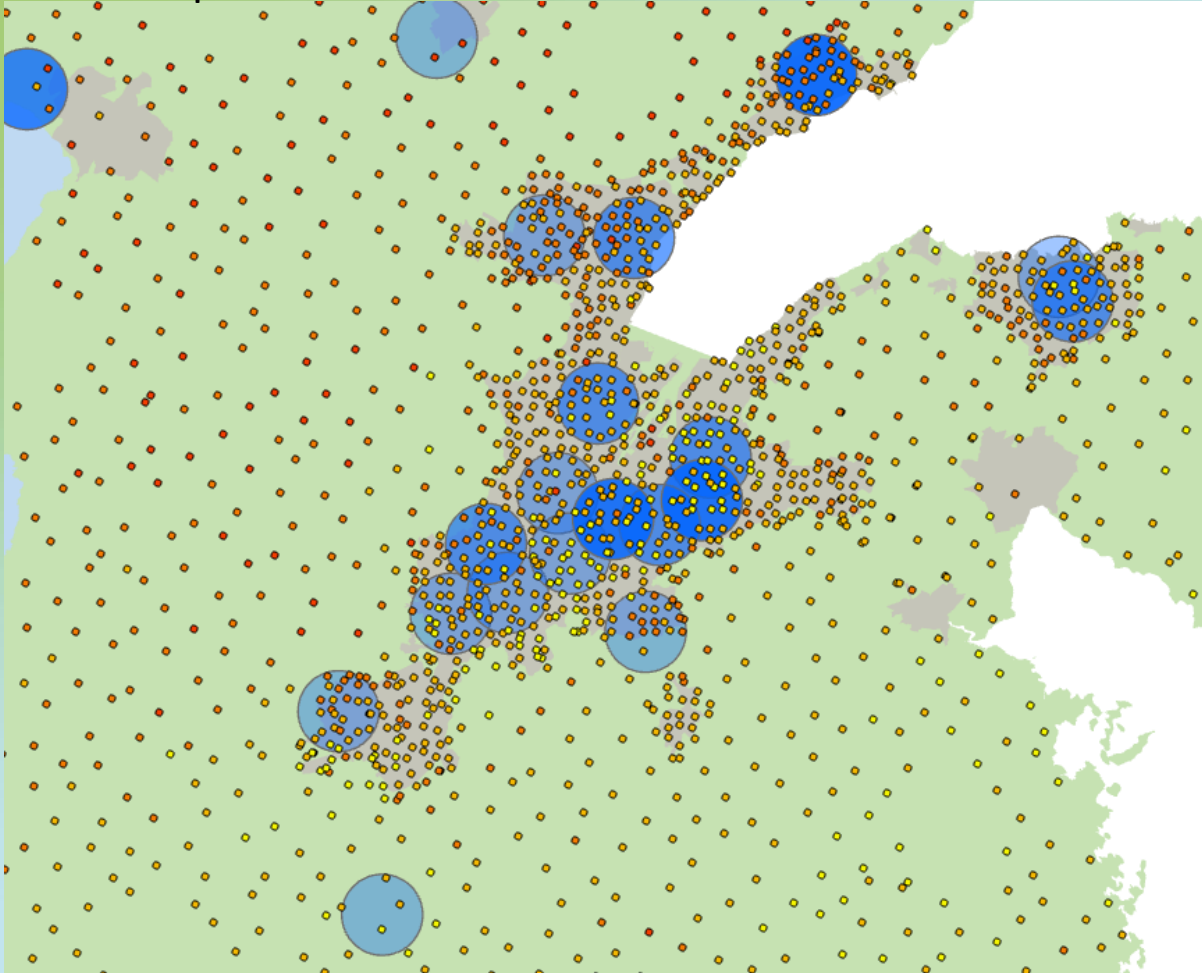




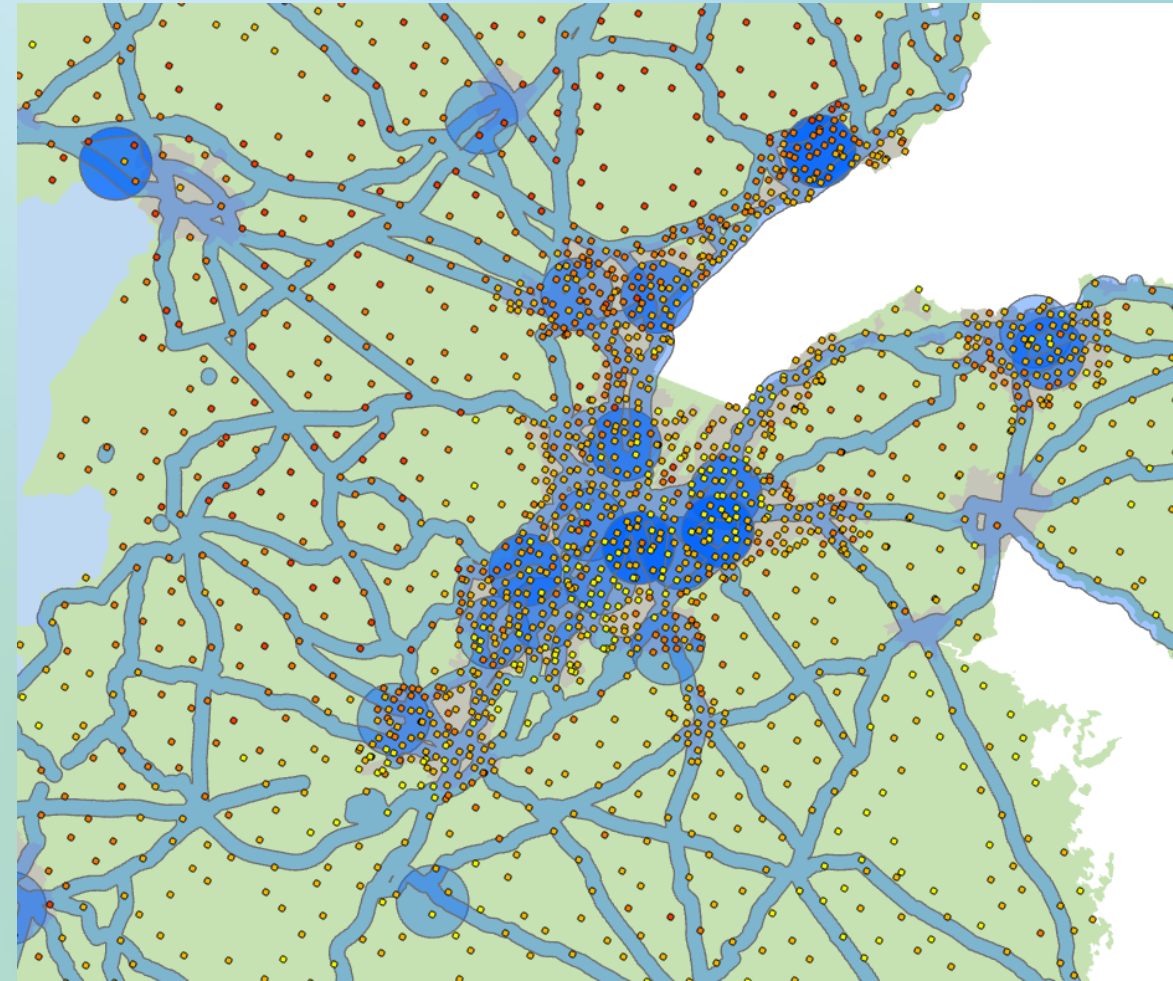


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Representation of buffers around NICOLA cohort



Intersection of NICOLA buffers and road buffers



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**Economic and Social Research Council**



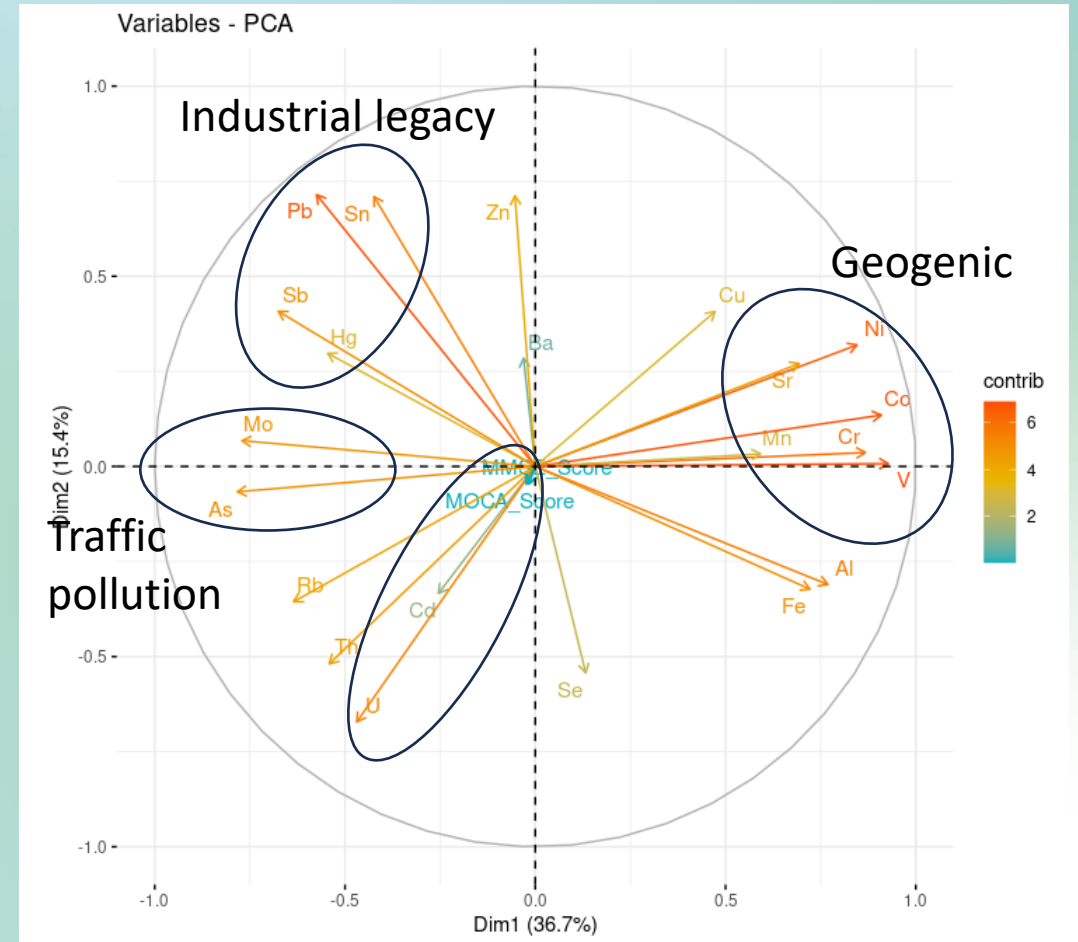
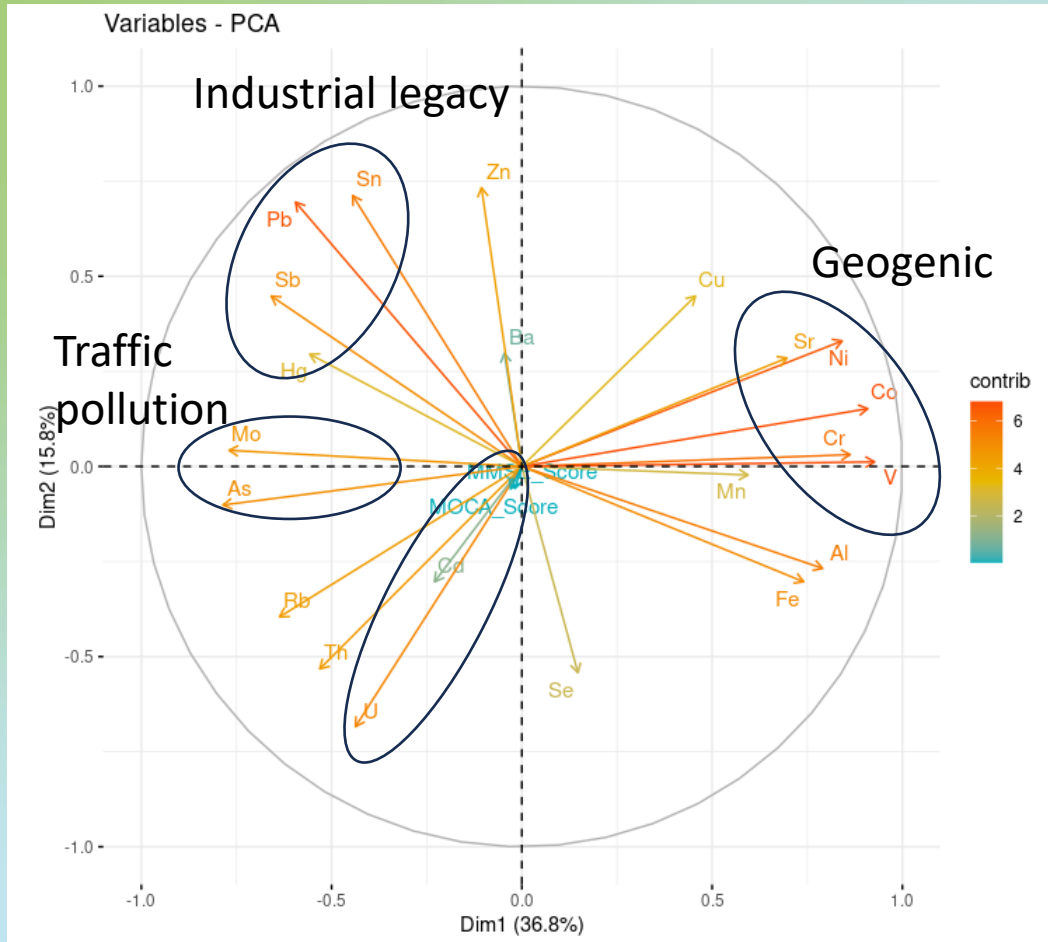
**Healthy Ageing Challenge  
Social, Behavioural and Design Research**



Initial results from investigation between potentially toxic elements to investigate relationship with Cognitive Metrics from NICOLA database including Mini-Mental State Exam (MMSE) Alzheimer's / Dementia Test and Montreal Cognitive Assessment (MoCA)

300m road buffer

2000m road buffer



Further analysis ongoing to confirm associations and strength of relationship





## Next steps:

- To investigate the biological responses to urban environments and related environmental exposures including air pollutants that influence measures of cognitive health.
- Analysing relationship with epigenetics and multi-omics data using road buffer approach.
- To use compositional data analysis to explore impacts of changing lifestyle behaviours – Percentage of daily time spent on activities.





# HEALTH EFFECTS OF CLIMATE CHANGE



- Headline messages
  - Our changing climate poses one of the greatest health security and societal challenges.
  - There is an increasing frequency and intensity of environmental health threats – flooding and heat waves.
  - Impacts will vary at an individual level.
  - Evidence shows that older adults and those with pre-existing health conditions are at greatest risk.
  - Rapid action is needed.

## Health Effects of Climate Change (HECC) in the UK

State of the evidence 2023



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**Contact us:**

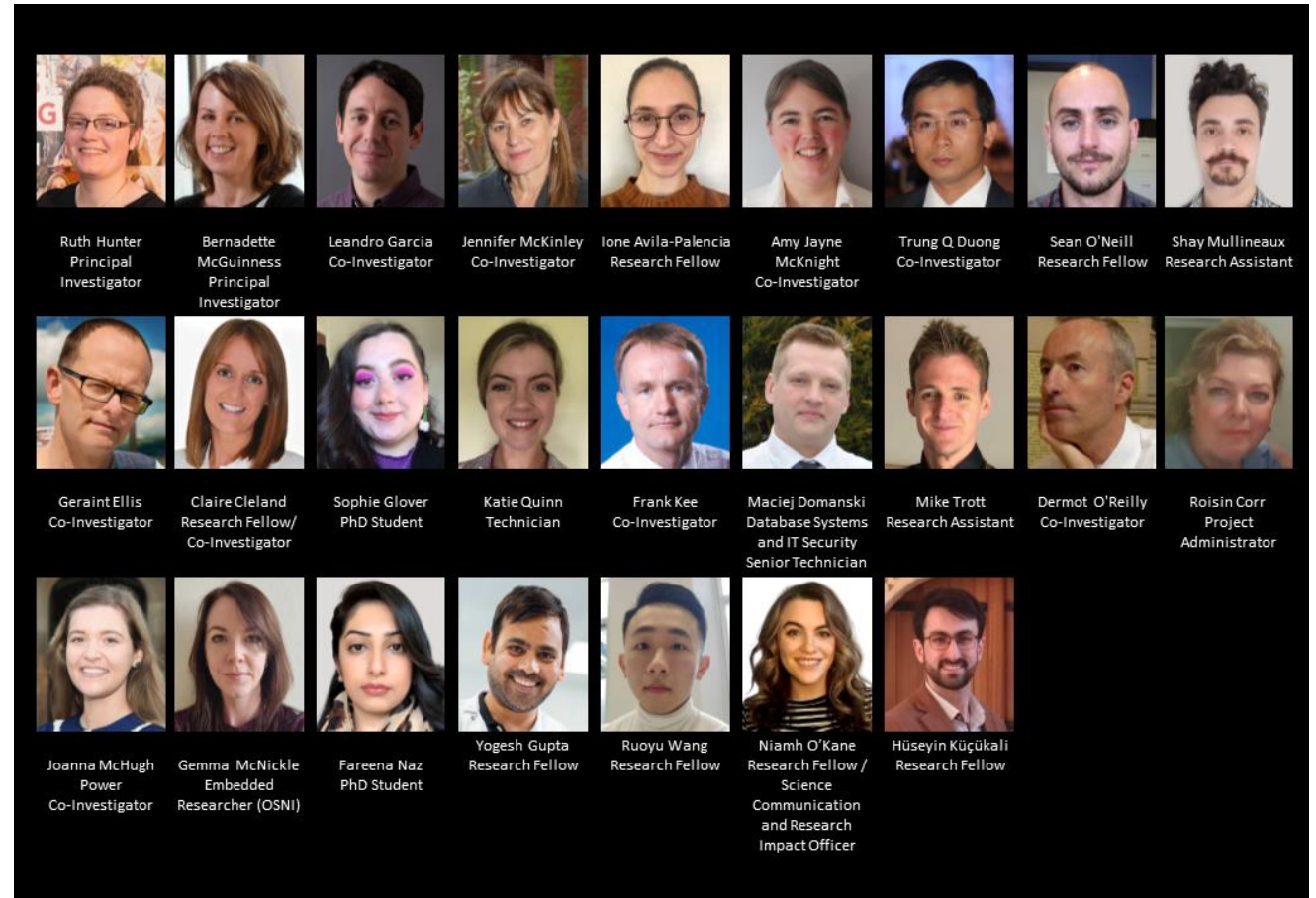
E-mail: [space@qub.ac.uk](mailto:space@qub.ac.uk)

Twitter/X: @spacequb



[qub.ac.uk/sites/space](http://qub.ac.uk/sites/space)

## The SPACE Team



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