How do environmental exposures to UFP change with variation in levels of GI?

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UFP model based on land-use regression approach (2007/8 and 2018/9 data)

324 3-minute mean spot measurements (10am-3pm) sampled across at 54 sites across a GI gradient (summer & winter)
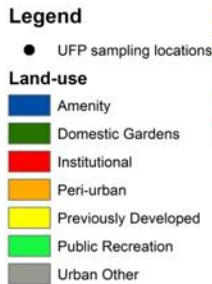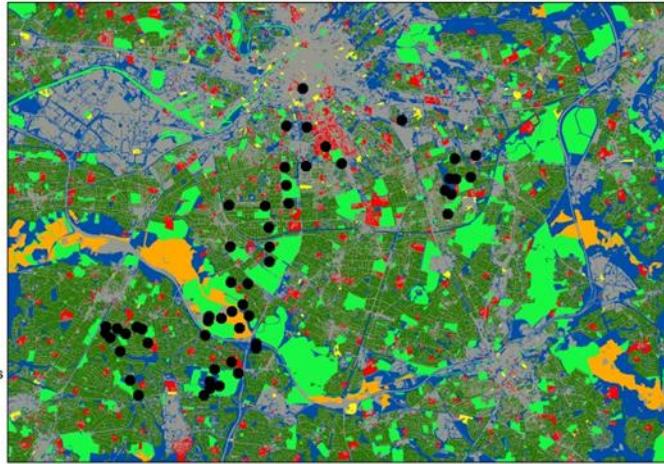
> 500 GIS predictor variables created from 16 road, traffic and built environment factors and 23 GI characteristics

Legend
● UFP sampling locations
Land-use
■ Amenity
■ Domestic Gardens
■ Institutional
■ Peri-urban
■ Previously Developed
■ Public Recreation
■ Urban Other

0   5   10 Kilometres
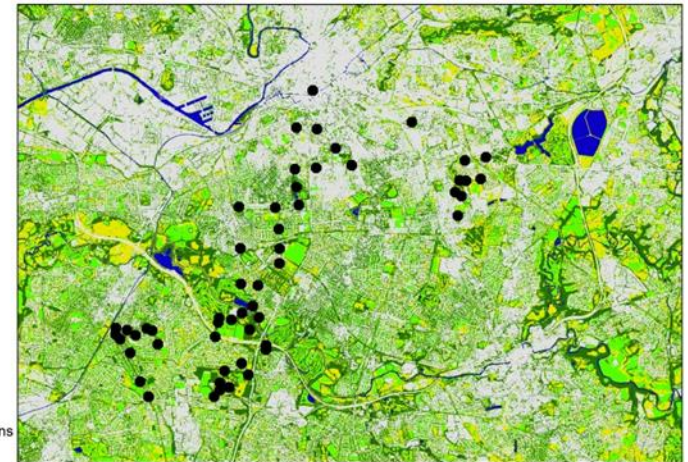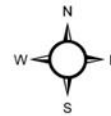
GI characteristics reflecting land-use & land-cover type, patch size, land-cover diversity and density (measured within 50 -1000m buffers of sampling points)

Model controls for local meteorological factors (wind speed, temperature & humidity)

Legend
● UFP sampling locations
Land-cover
■ Built
■ Forbs and shrubs
■ Grasses
■ Tree canopy
■ Water

0   5   10 Kilometres

GHIA campaign:
53 Sites
3 minutes means x 3 replicates

Summer = r² 0.62

Winter = r² 0.66

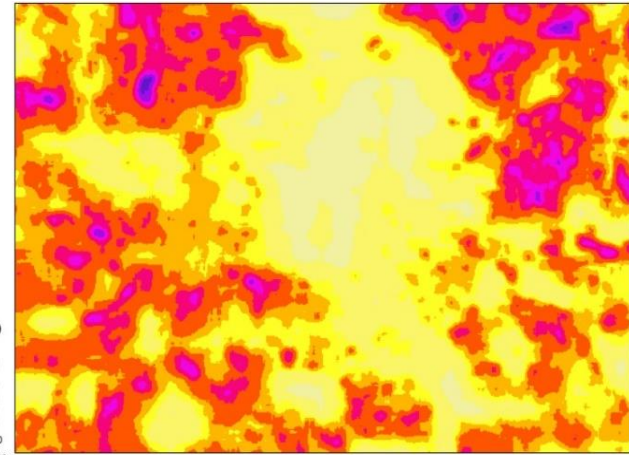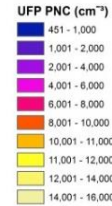Land Use Regression Models for Ultrafine Particles in Six European Areas

Erik van Nunen[*†] [iD], Roel Vermeulen[†], Ming-Yi Tsai[‡§||], Nicole Probst-Hensch[‡§], Alex Ineichen[‡§], Mark Davey[‡§], Medea Imboden[‡§], Regina Ducret-Stich[‡§], Alessio Naccarati[⊥], Daniela Raffaele[⊥], Andrea Ranzi[#], Cristiana Ivaldi[∇], Claudia Galassi[''], Mark Nieuwenhuijsen[*¶∞], Ariadna Curto[*¶∞], David Donaire-Gonzalez[*¶∞], Marta Cirach[*¶∞], Leda Chatzi[†‡], Mariza Kampouri[⊗], Jelle Vlaanderen[†], Kees Meliefste[†], Daan Buijtenhuijs[†], Bert Brunekreef[†], David Morley[*] [iD], Paolo Vineis[⊥*], John Gulliver[*], and Gerard Hoek[†]

R2 = 0.51
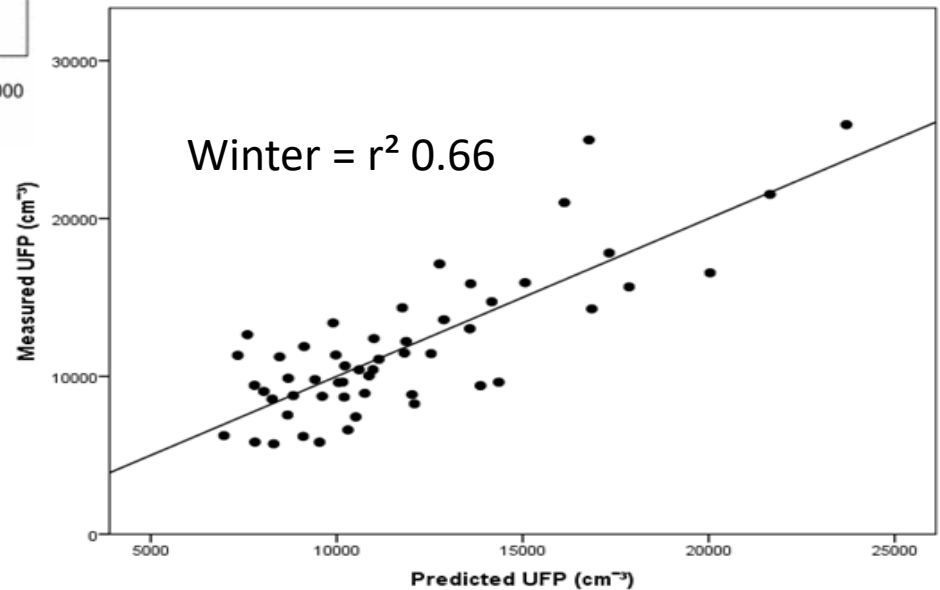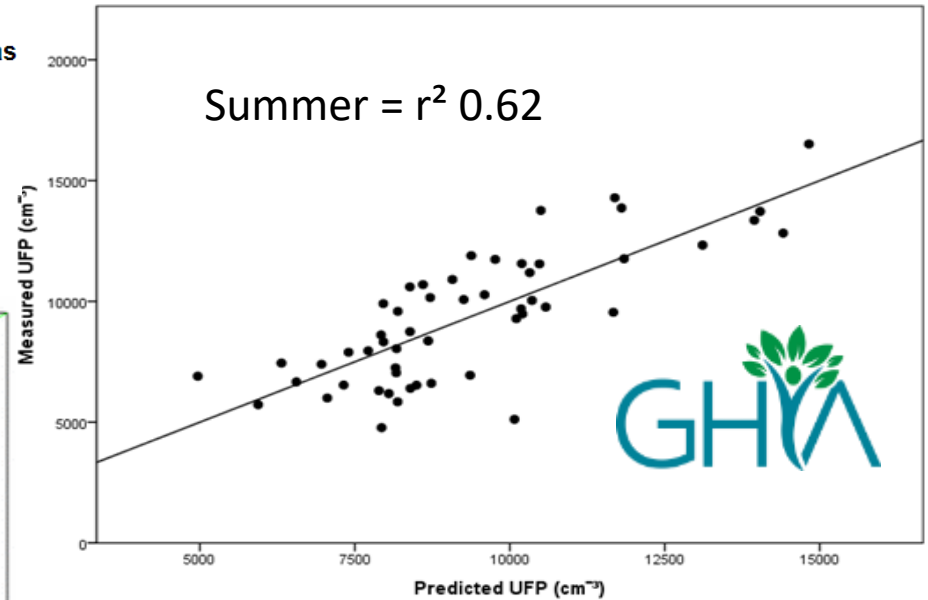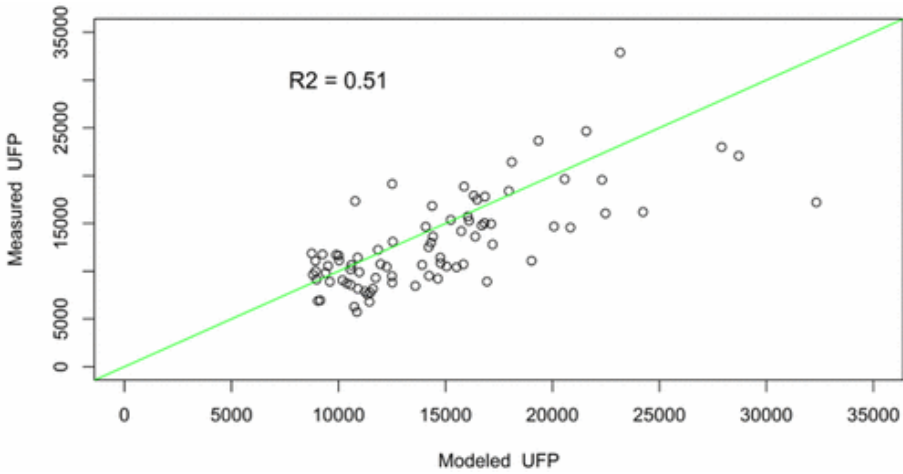
Exposures for GM
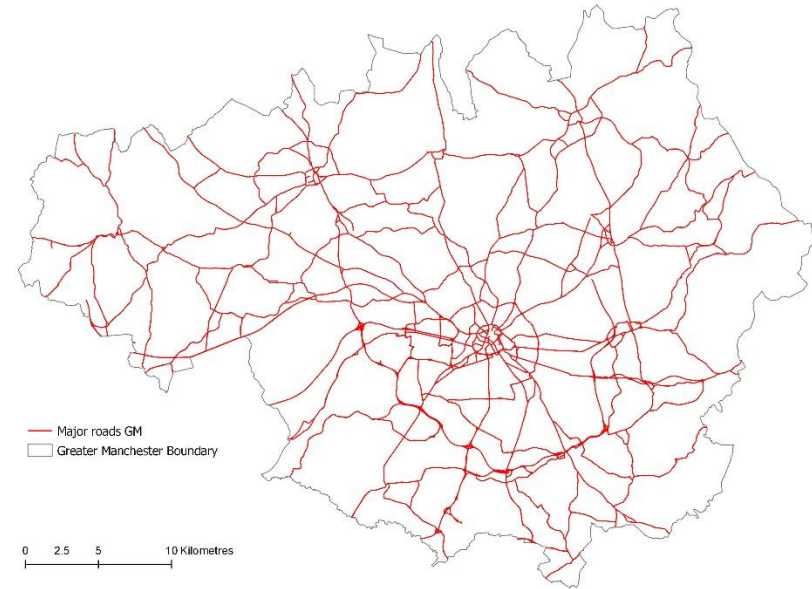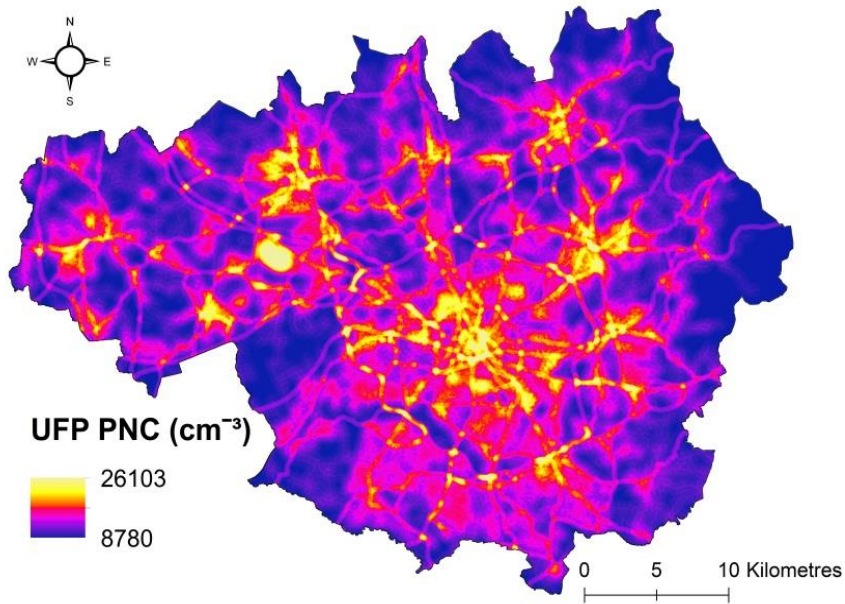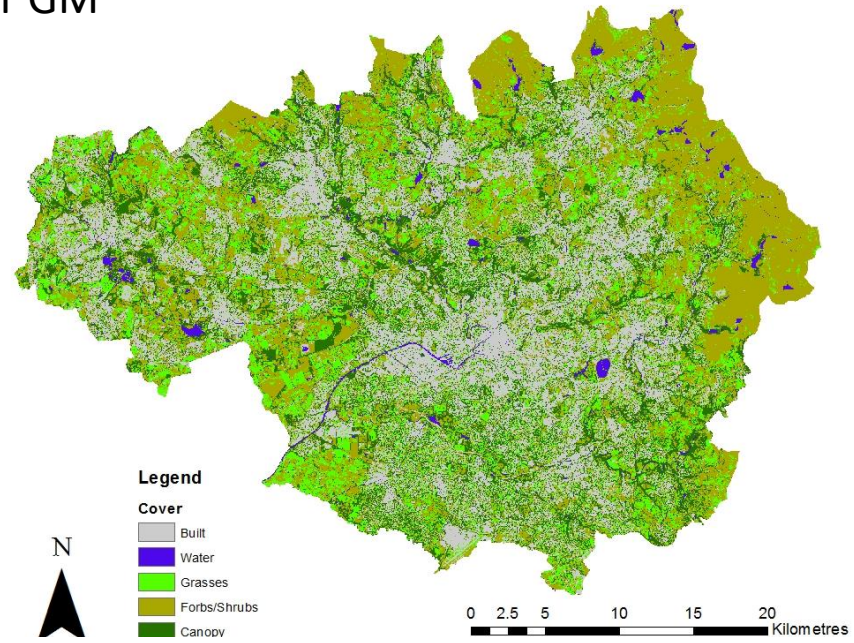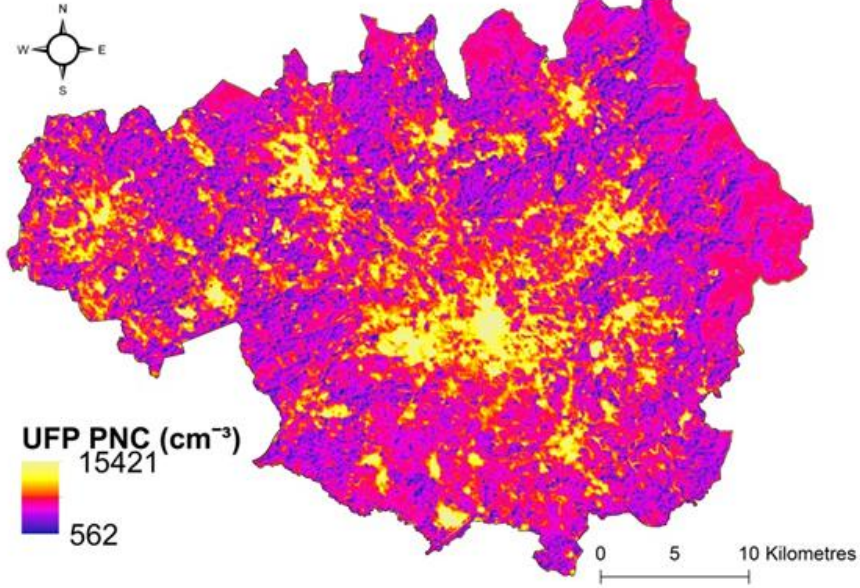
Modelled influence of GI increase/intervention: Central Manchester

Significant GI predictors
(reduced UFP numbers):

1. Ground layer vegetation

2. Field layer vegetation

3. Land-cover diversity (SHDI)

Current modelled UFP PNCs
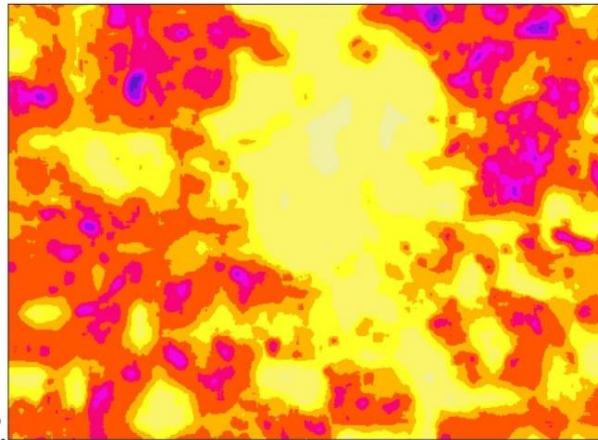
With 10% vegetation cover
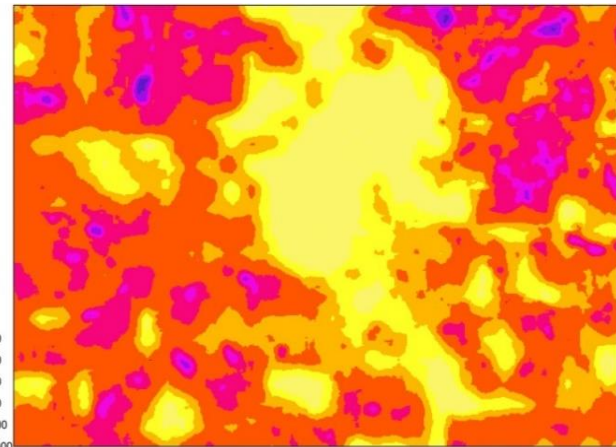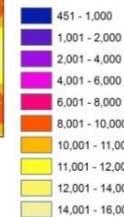
With 20% vegetation cover

Summary:

- GI associated with locally reduced numbers of UFPs

- Seasonal nature of GI influence supports promotion of year-round vegetation

- Field-layer vegetation and/or diversity of green land-cover has strongest association with better air quality in urban areas

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