

The Tellus Project: Geochemical and Geophysical Surveys in Northern Ireland

Mike Young

'Contaminated Land: Opportunities and Challenges in Northern Ireland'

*Environment and Heritage Service
&
Contaminated Land: Applications In Real Environments (CL:AIRE)*

Belfast, 16 January 2007

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Acknowledgements

Funding

- Department of Enterprise, Trade and Investment
- Rural Development Programme for
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Images

Preliminary

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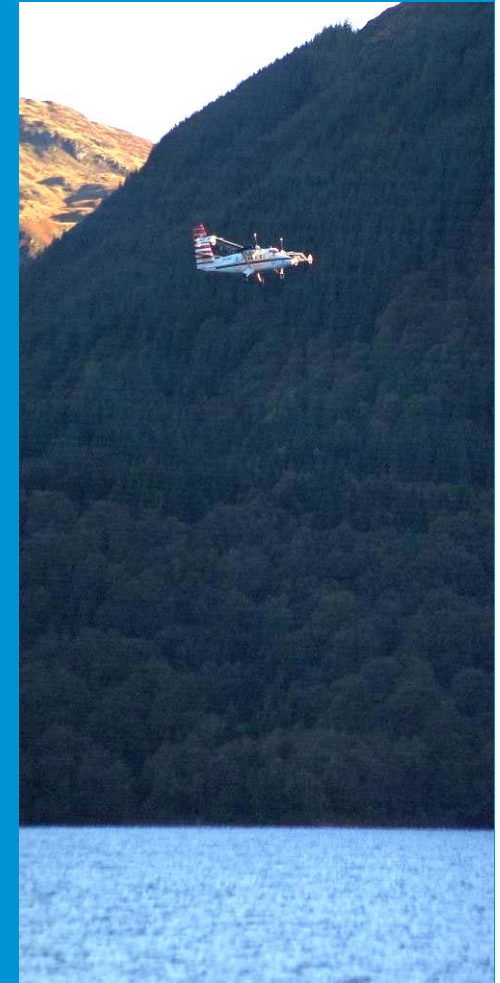
Technical tasks and objectives

Tasks

- National regional geochemistry survey
- National airborne geophysical survey

Objectives

- Refine existing geological and soils maps
- Image and model concealed geology
- Map rural and urban geochemical conditions
- Provide baseline geoscience data for land-use planning and environmental monitoring



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Extent of surveys

Geochemistry – site locations

• Urban soils	1,080
• Rural soils	7,160
• Stream water and sediment	<u>6,700</u>
<i>Total</i>	<i>14,940</i>

Geophysics

• Line km	81,000 kms
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Geochemistry - soils

- Rural soils:
 - 7,160 sites sampled in 2004-06
 - Sampling density 1 per 2km²
 - Two depths, 20cm and 50cm
 - Inorganic chemical analysis by XRF and ICP



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Geochemistry – streams

- 3,400 sites sampled, 1995-6
- 3,300 sites sampled, 2005-6
- Sampled at 1 site per 2.15km²
- Sediments and waters
- Inorganic chemical analysis by XRF, ICP and ion chromatography



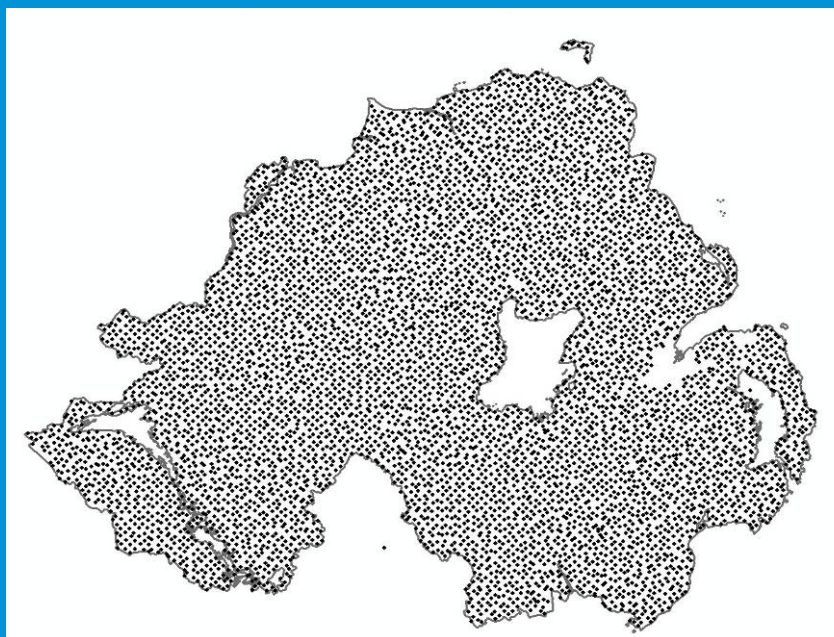
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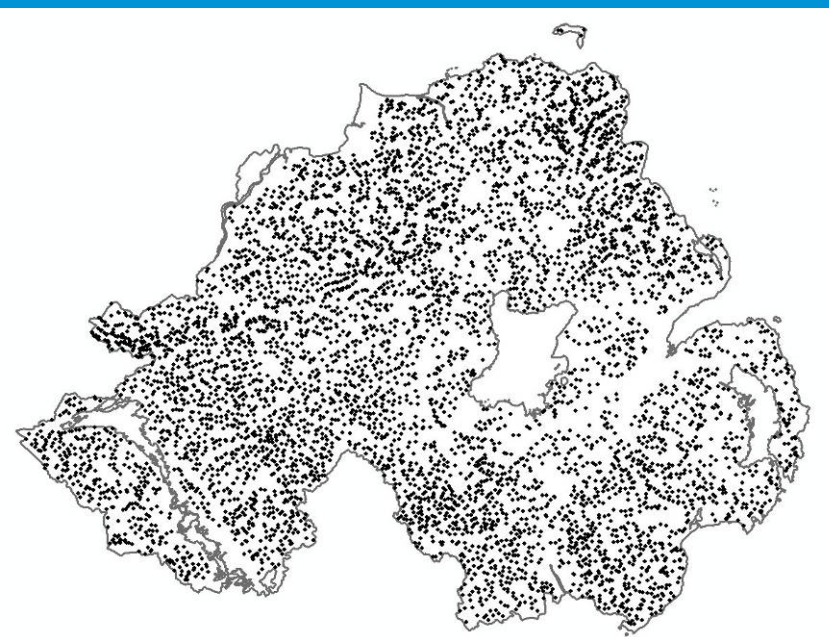
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Geochemistry - rural sample locations



Soils



Waters & Stream Sediments

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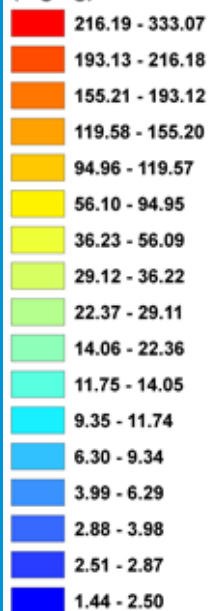


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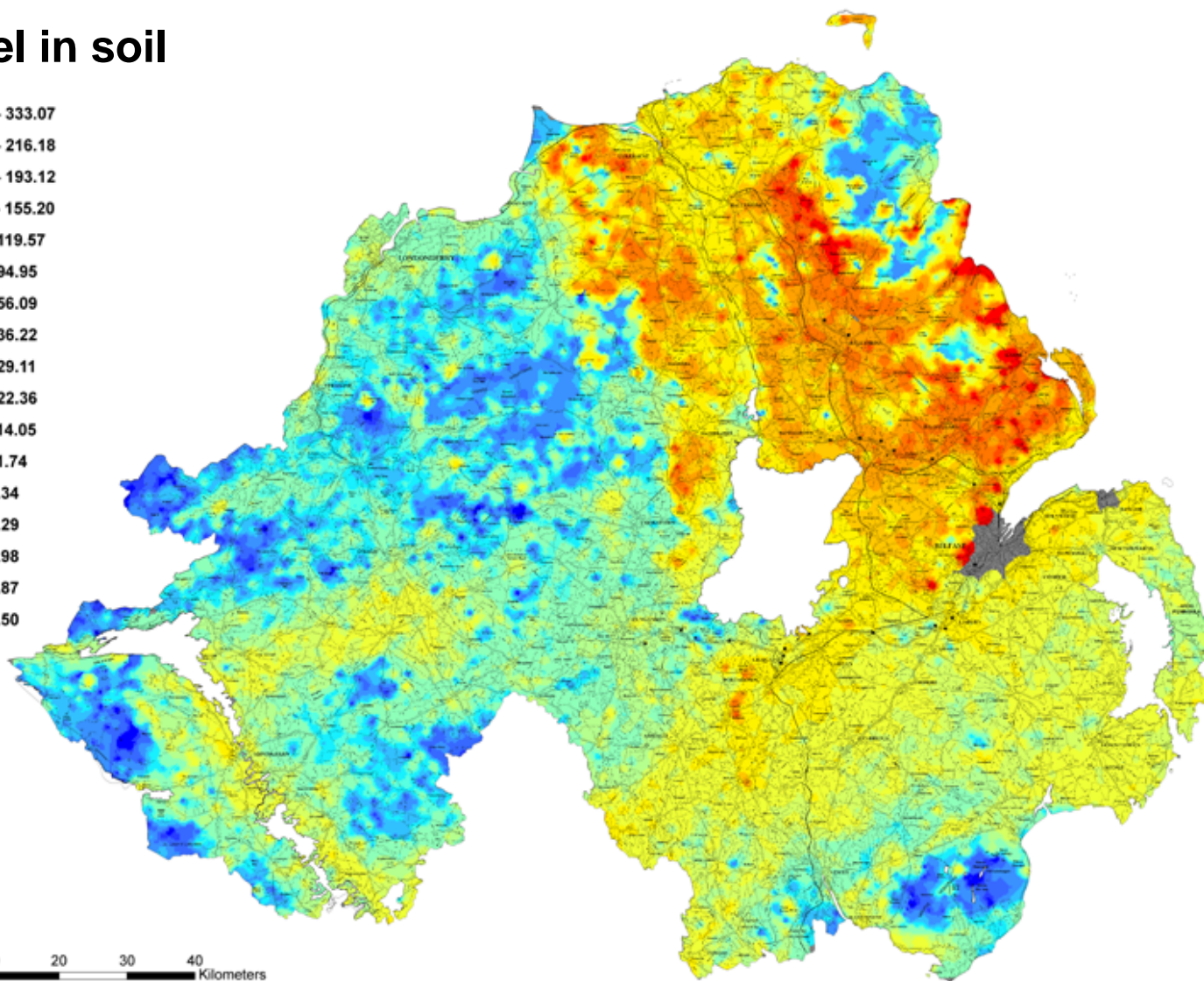
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Nickel in soil

(mg/kg)



0 5 10 20 30 40 Kilometers



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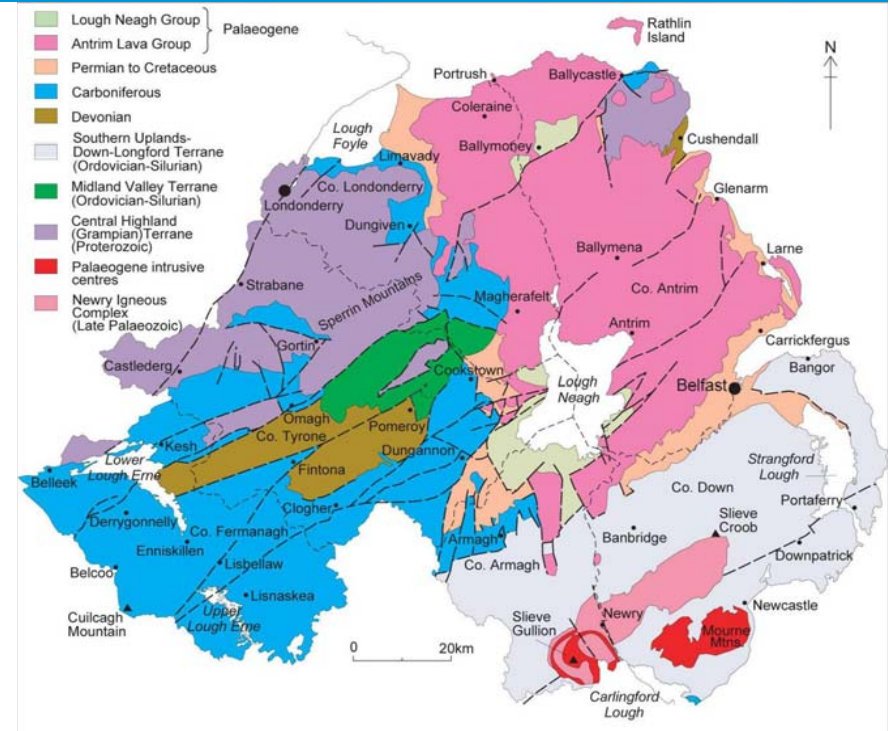
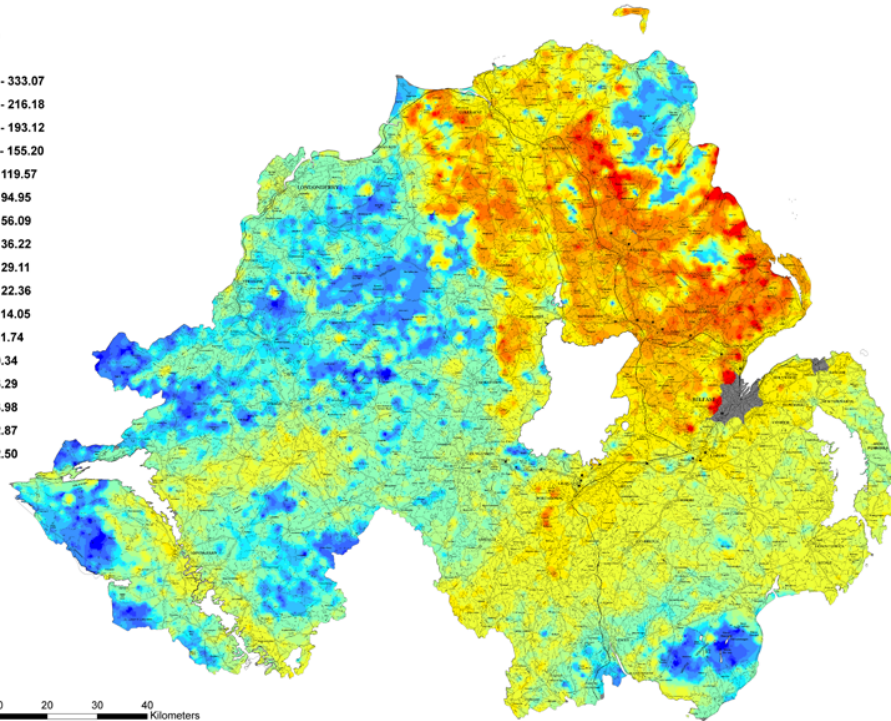
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Nickel in soil

Legend

Nickel (Ni) (mg/kg)



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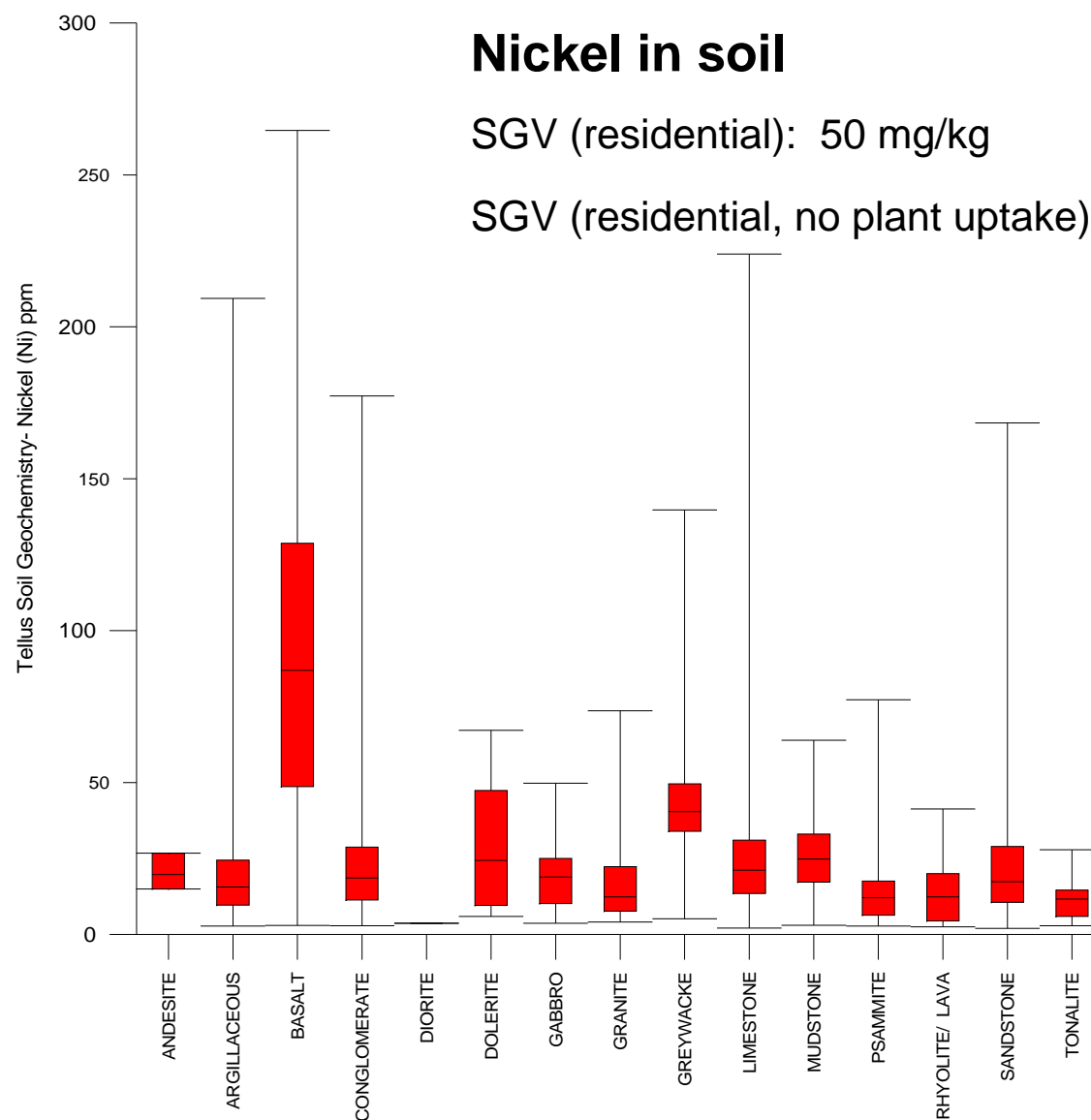
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Nickel in soil

SGV (residential): 50 mg/kg

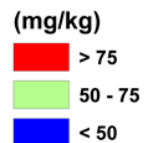
SGV (residential, no plant uptake): 75 mg/kg



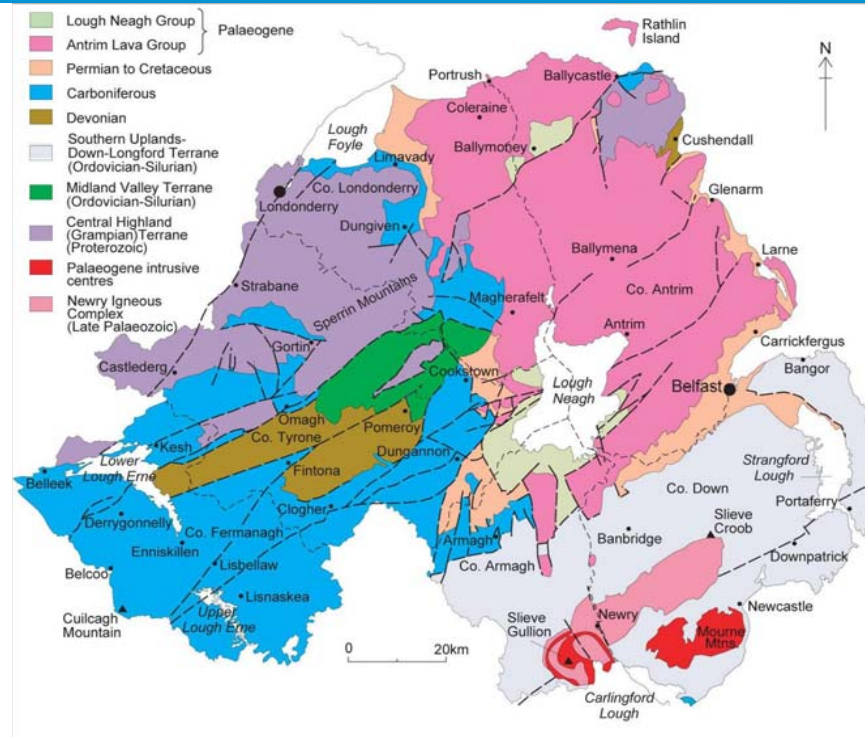
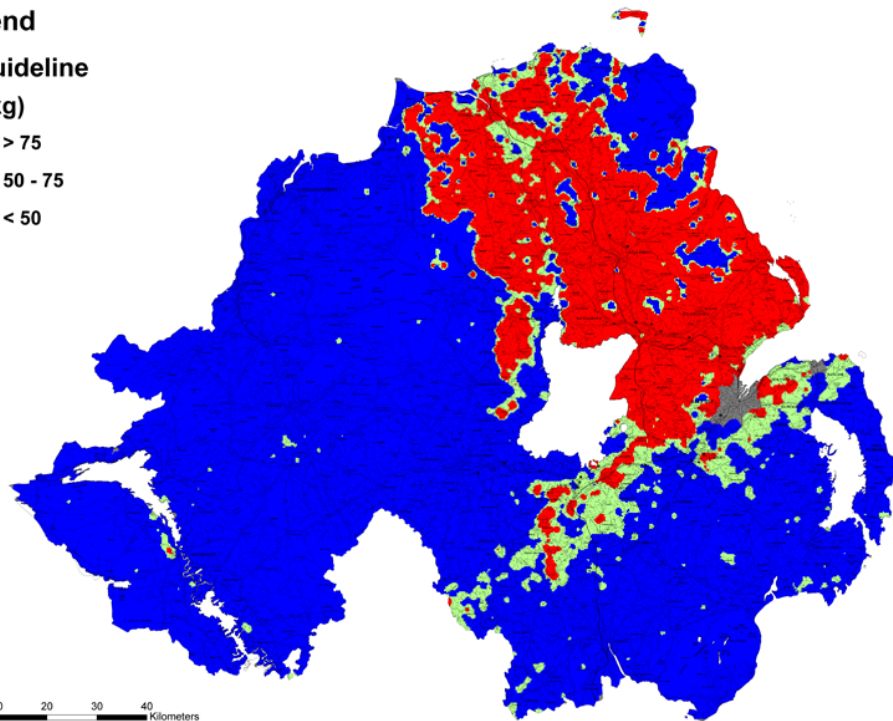
Nickel above SGV

Legend

Ni Guideline (mg/kg)



0 5 10 20 30 40 Kilometers



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Chromium above SGV

Legend

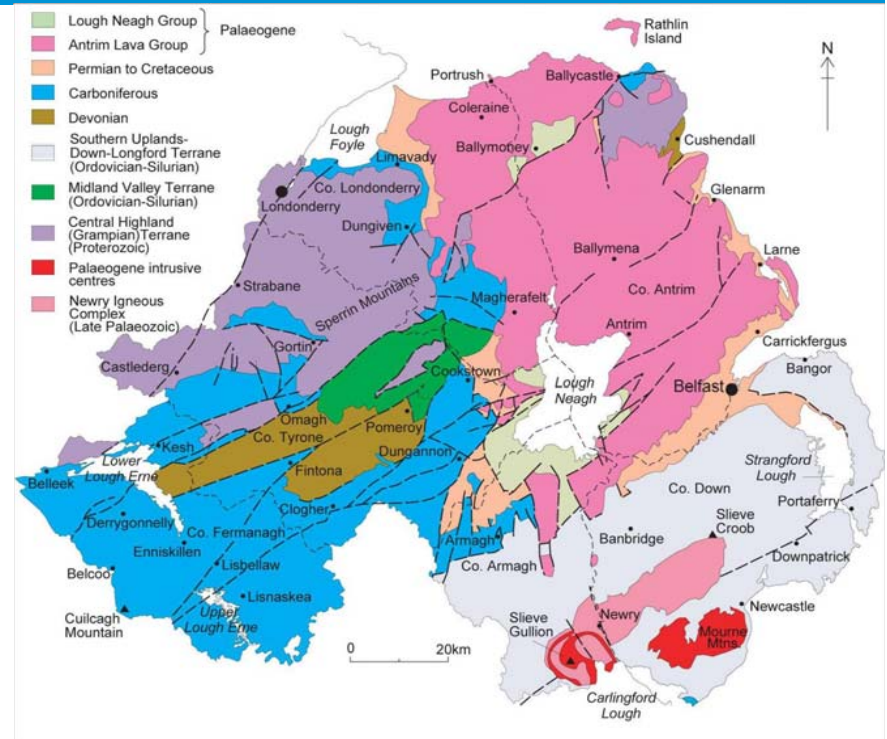
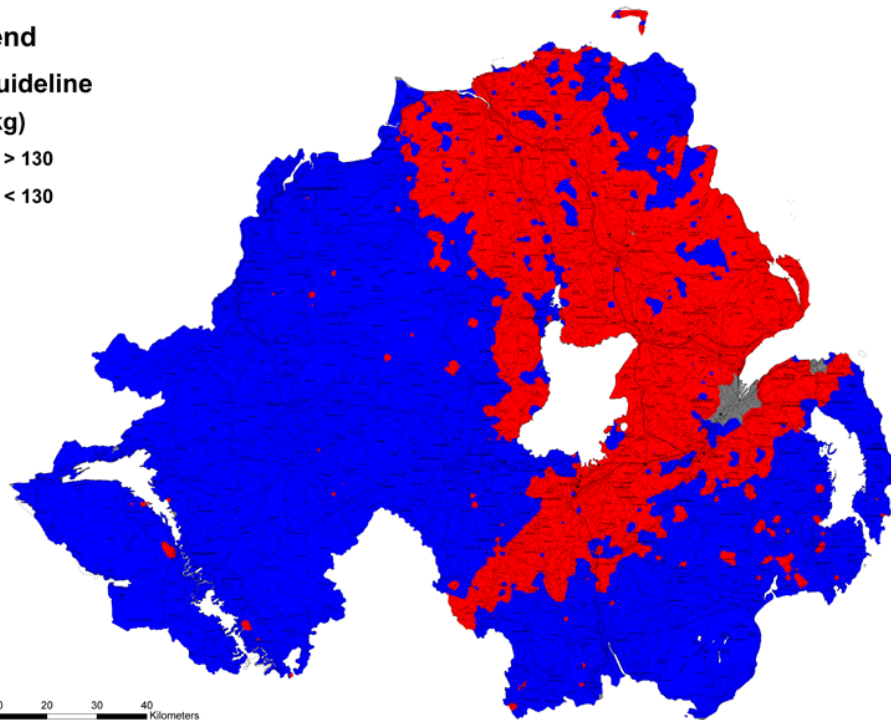
Cr Guideline

(mg/kg)

Red > 130

Blue < 130

0 5 10 20 30 40 Kilometers



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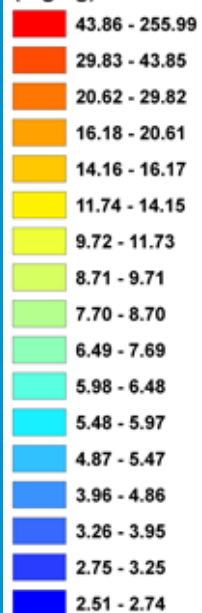


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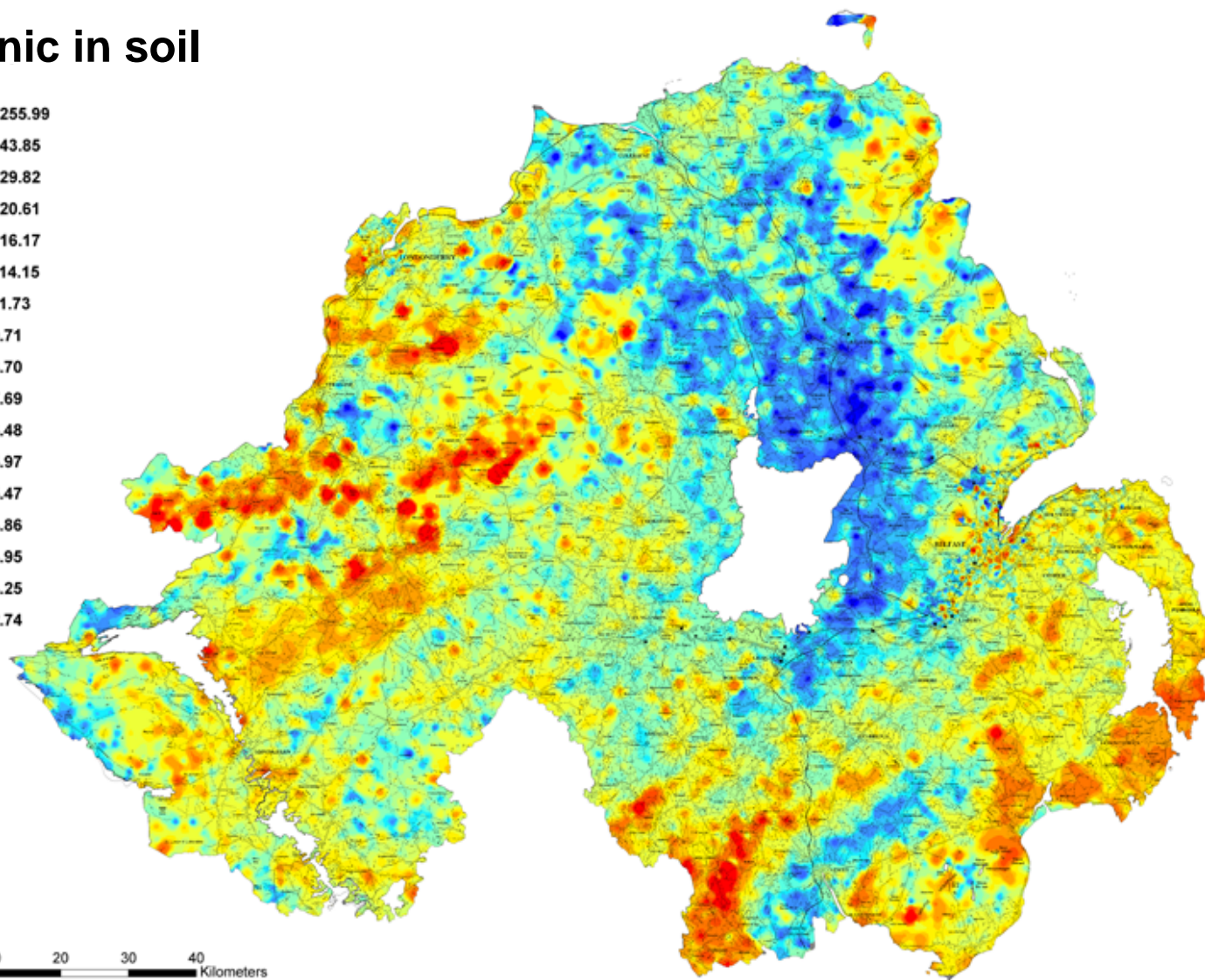
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Arsenic in soil

(mg/kg)



0 5 10 20 30 40 Kilometers



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Arsenic above SGV

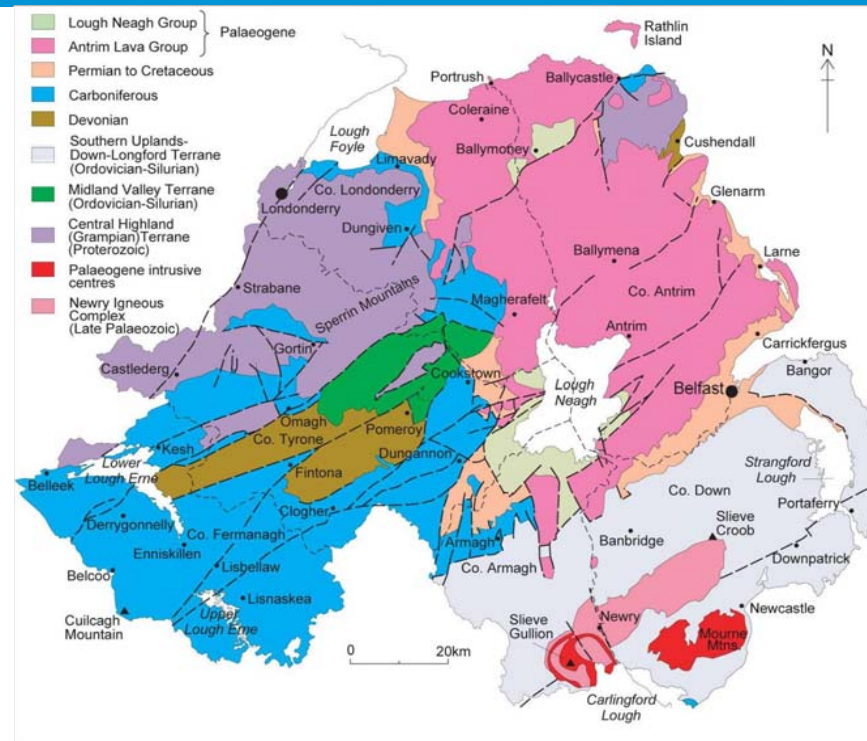
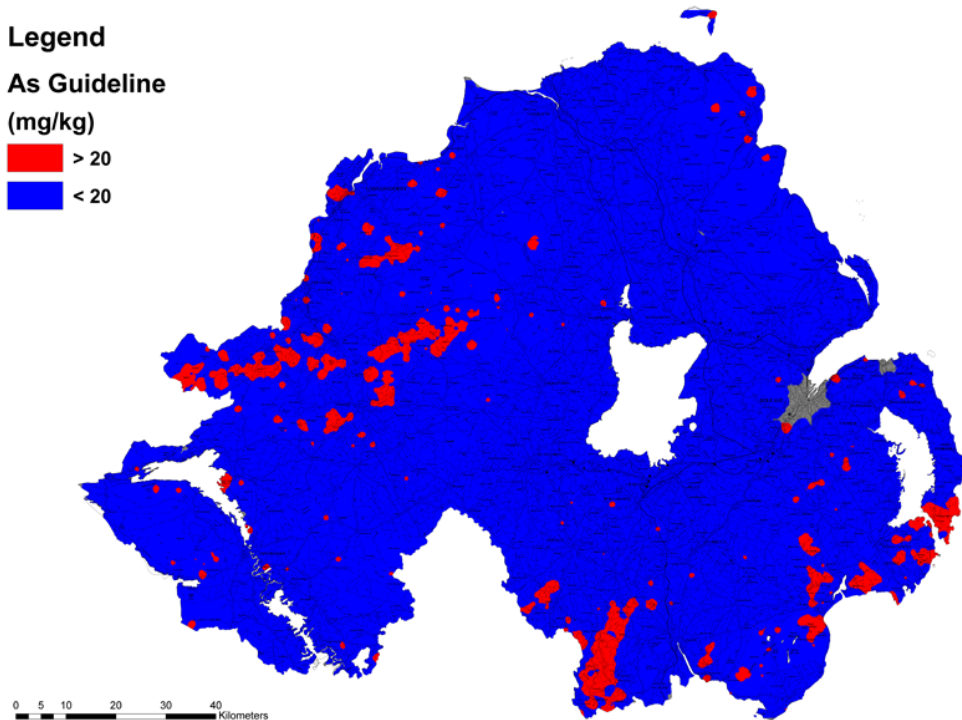
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As Guideline

(mg/kg)

Red > 20

Blue < 20



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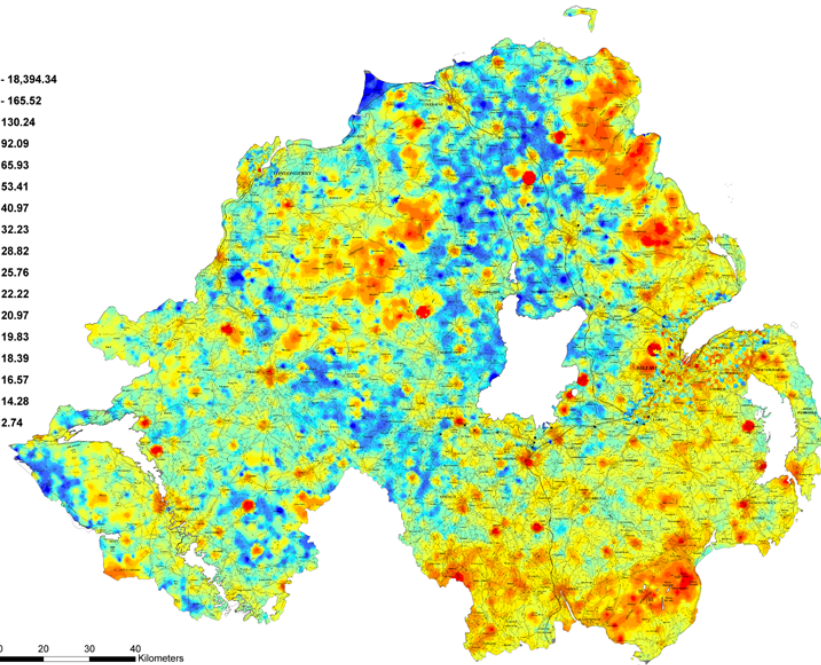
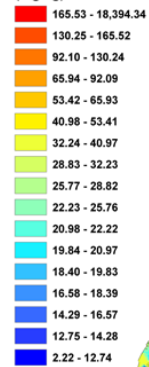
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Lead above SGV

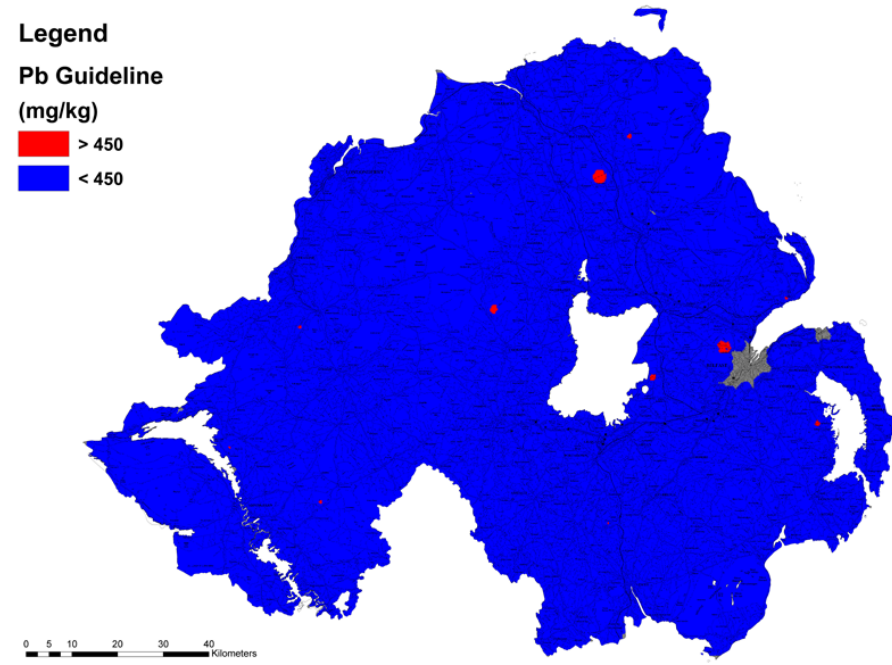
Legend

Lead (Pb)
(mg/kg)



Legend

Pb Guideline
(mg/kg)



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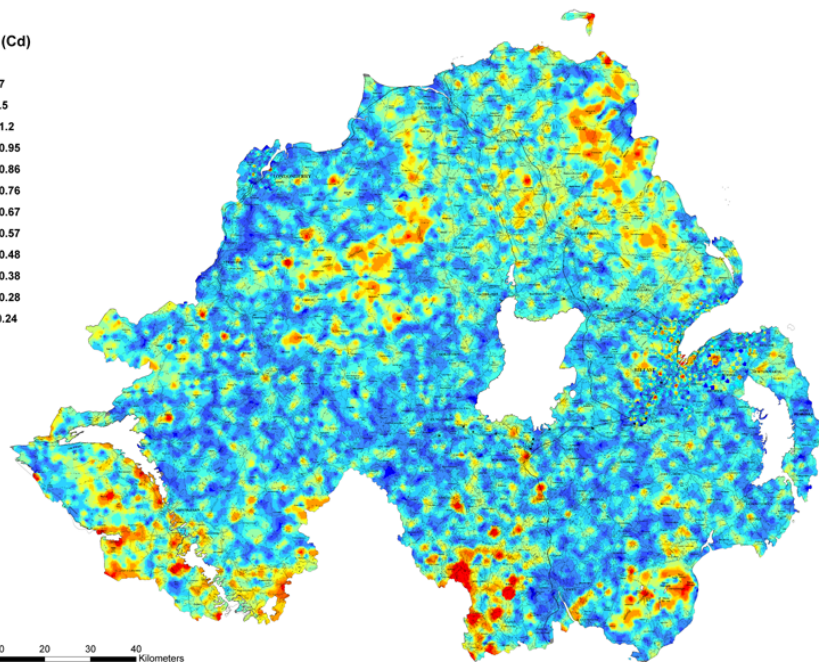
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Cadmium above SGV

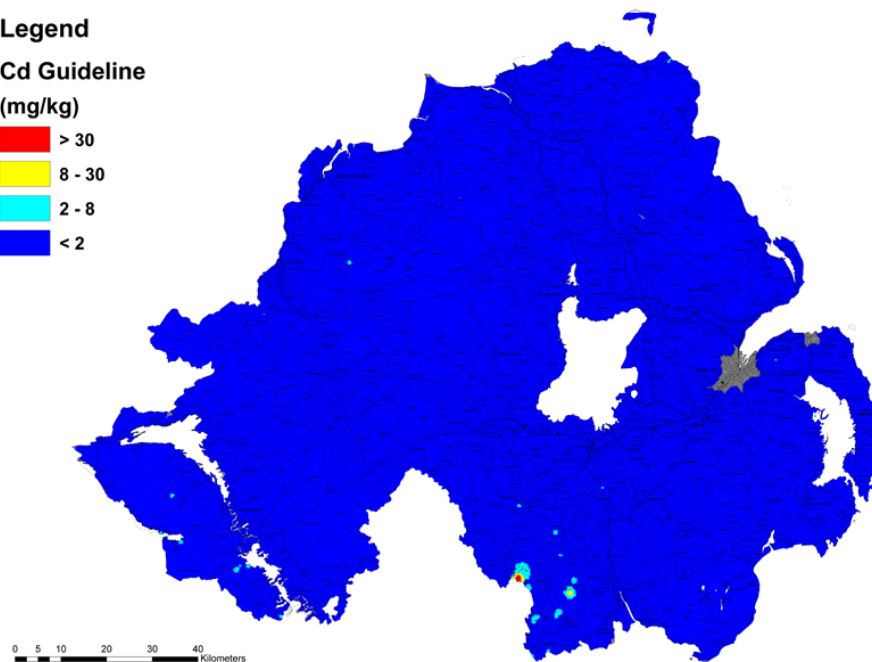
Legend

Cadmium (Cd)
(mg/kg)



Legend

Cd Guideline
(mg/kg)



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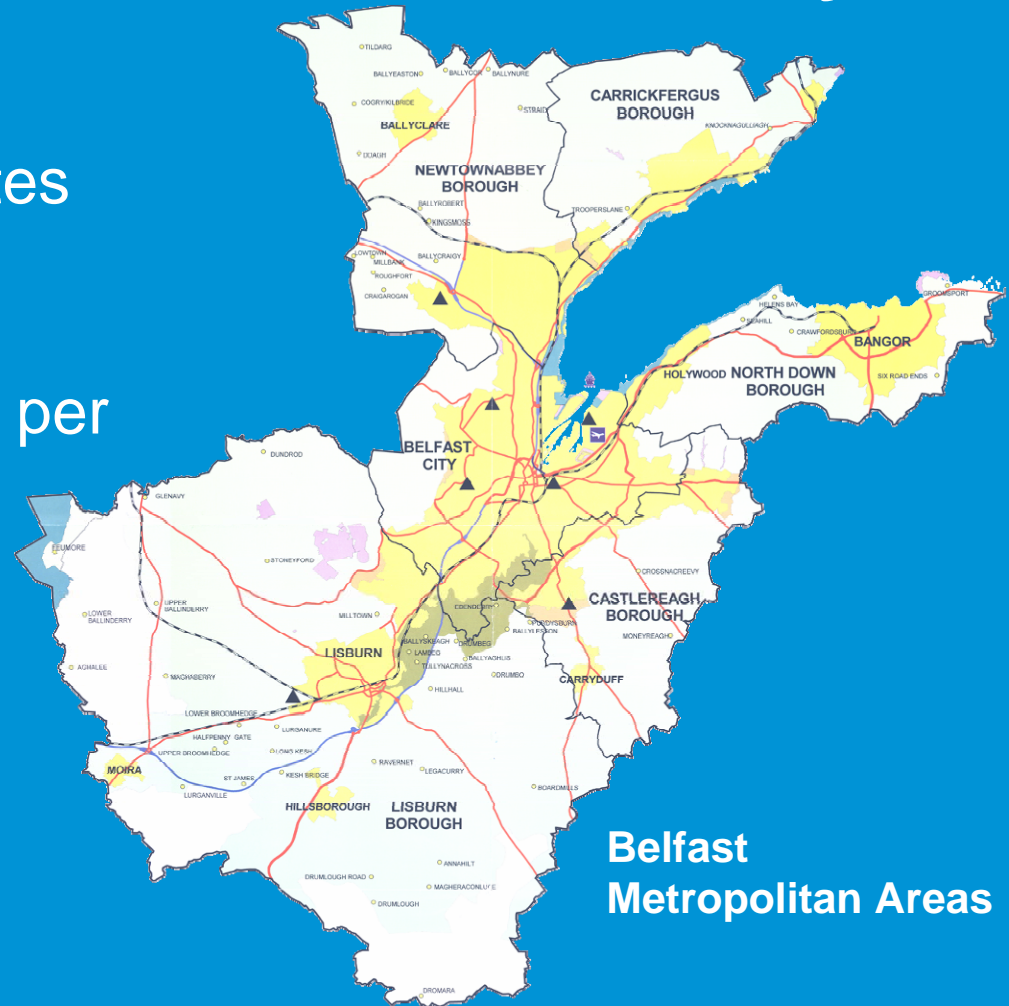


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Urban soils in Belfast and Londonderry

- Inorganic sampling at 4 sites per km²
- Organic sampling at 1 site per km²



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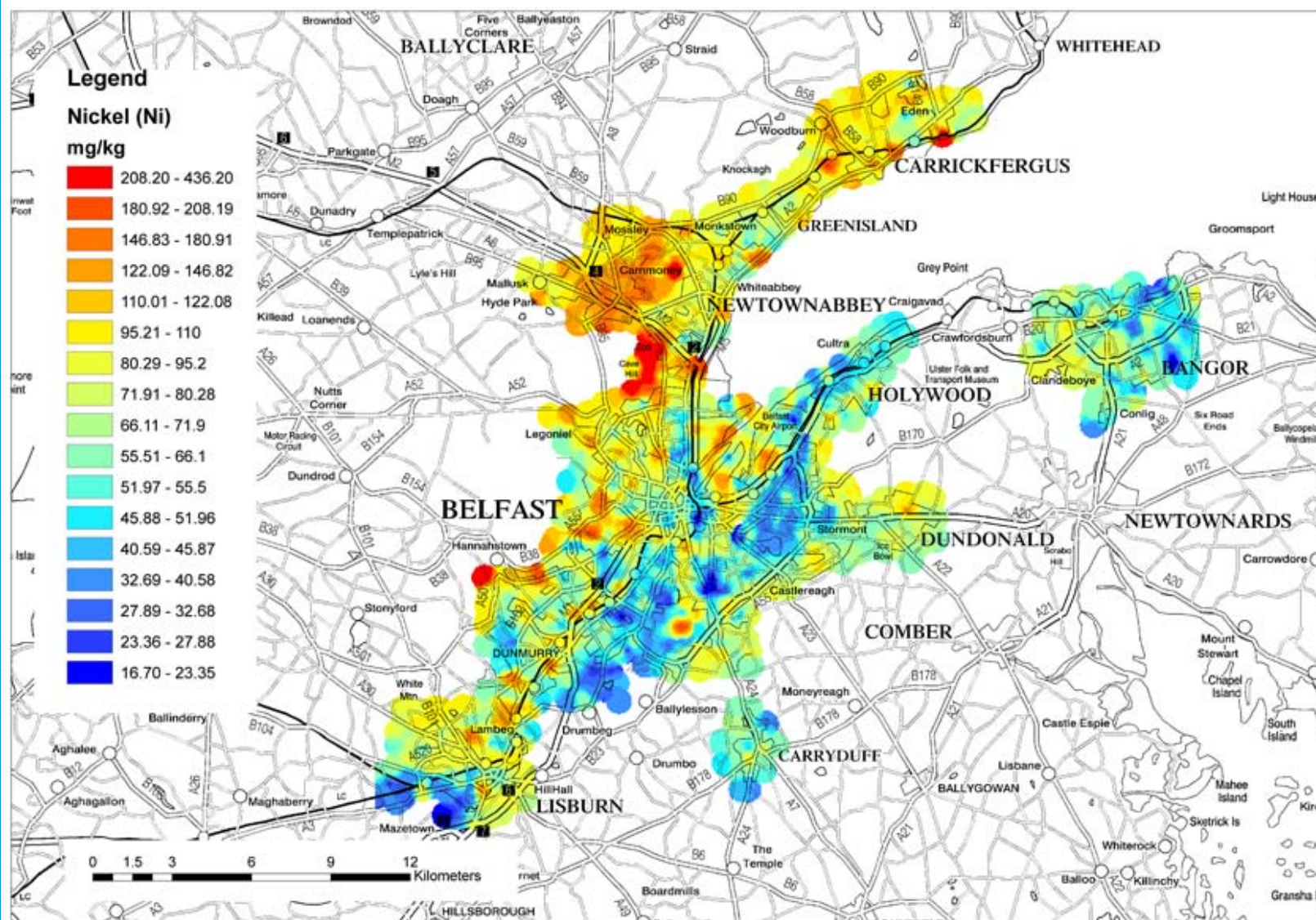


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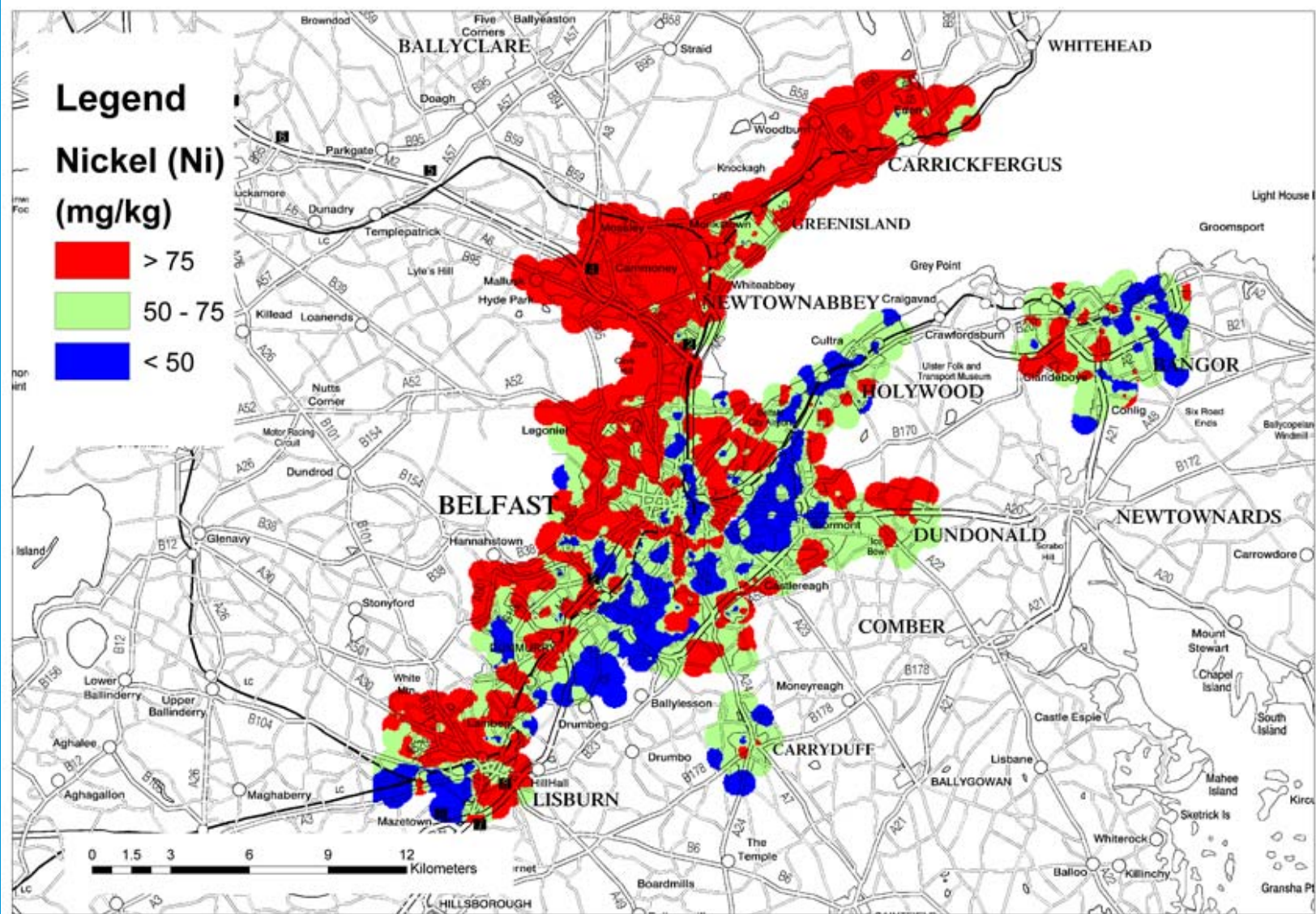


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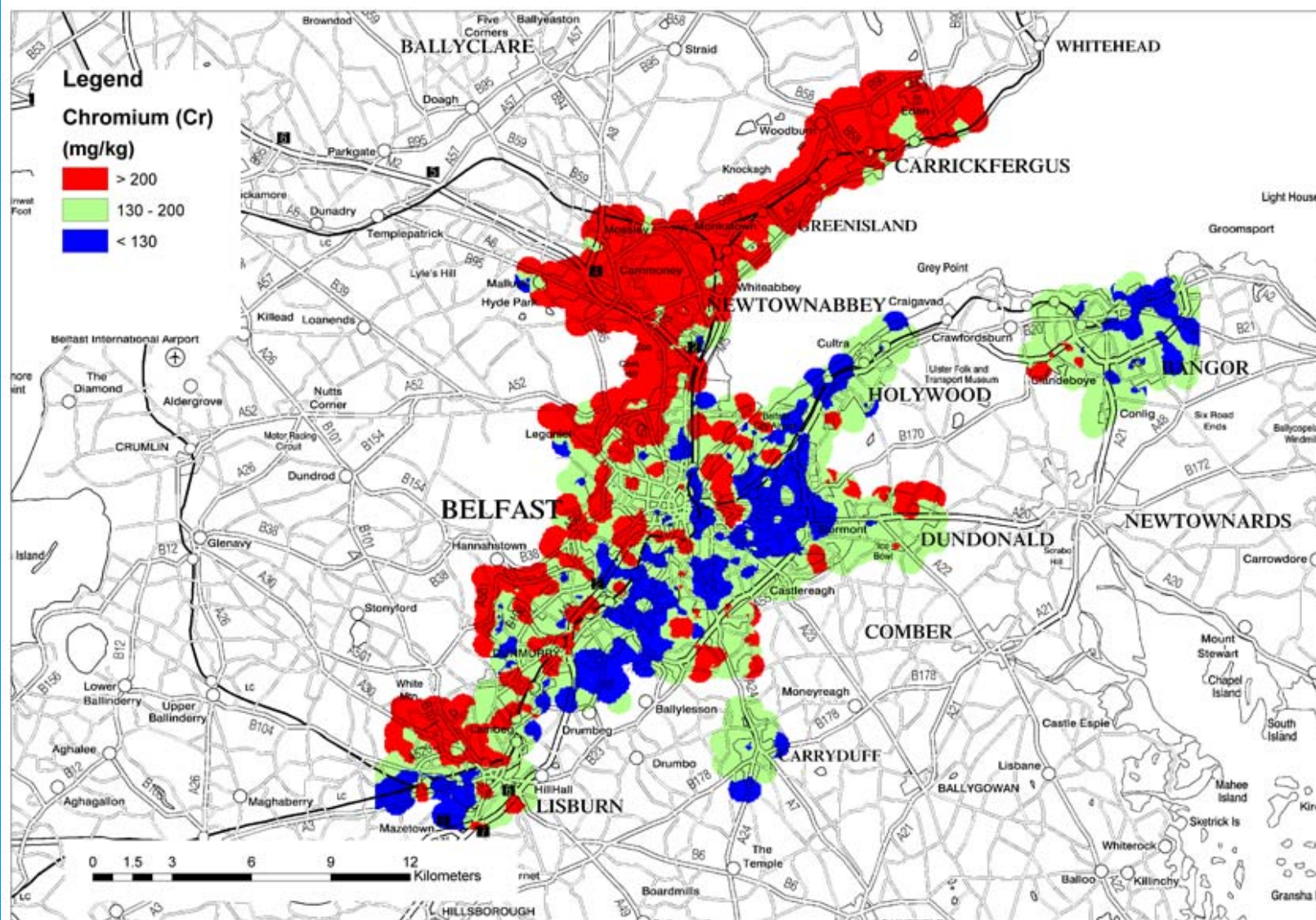


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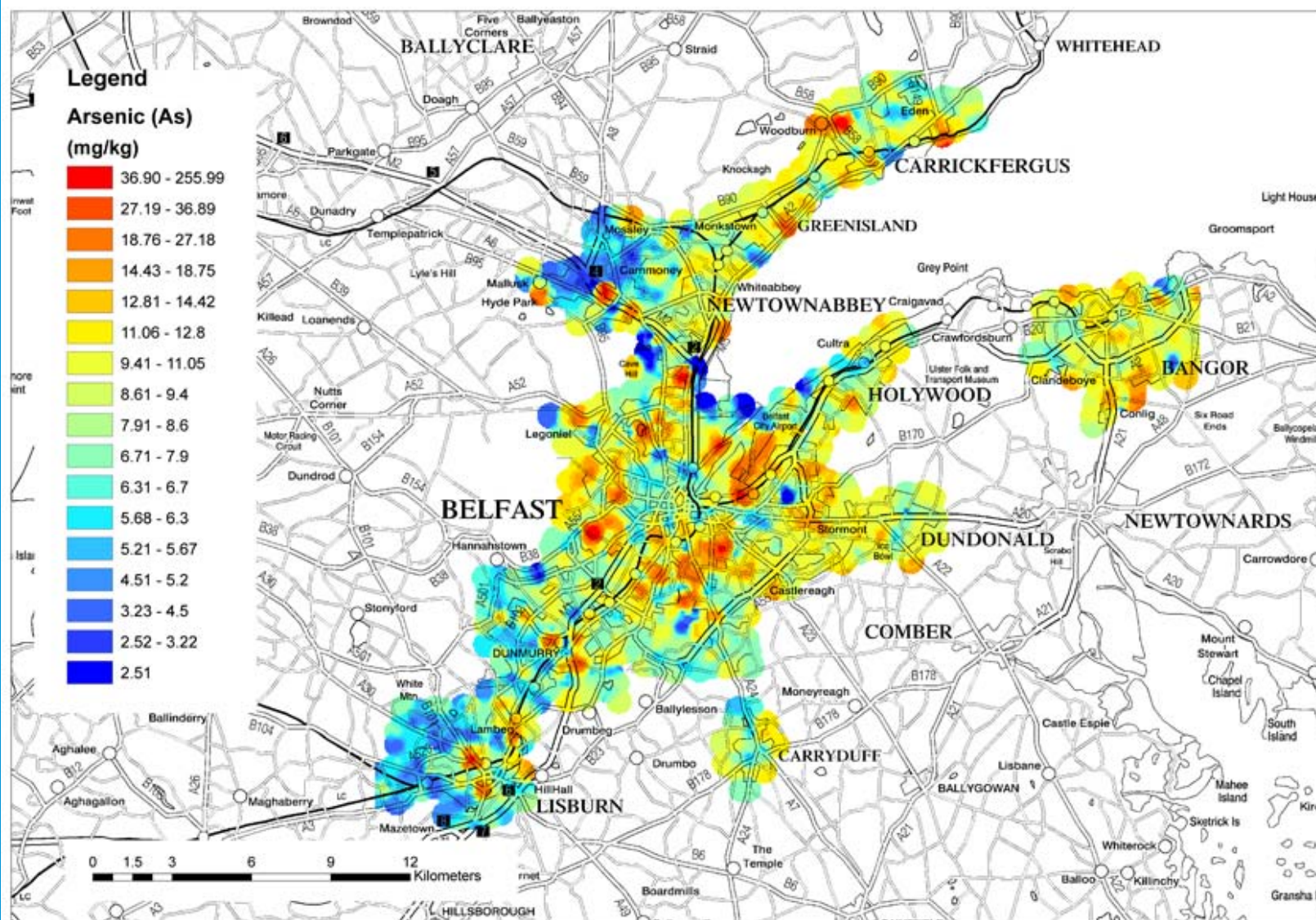


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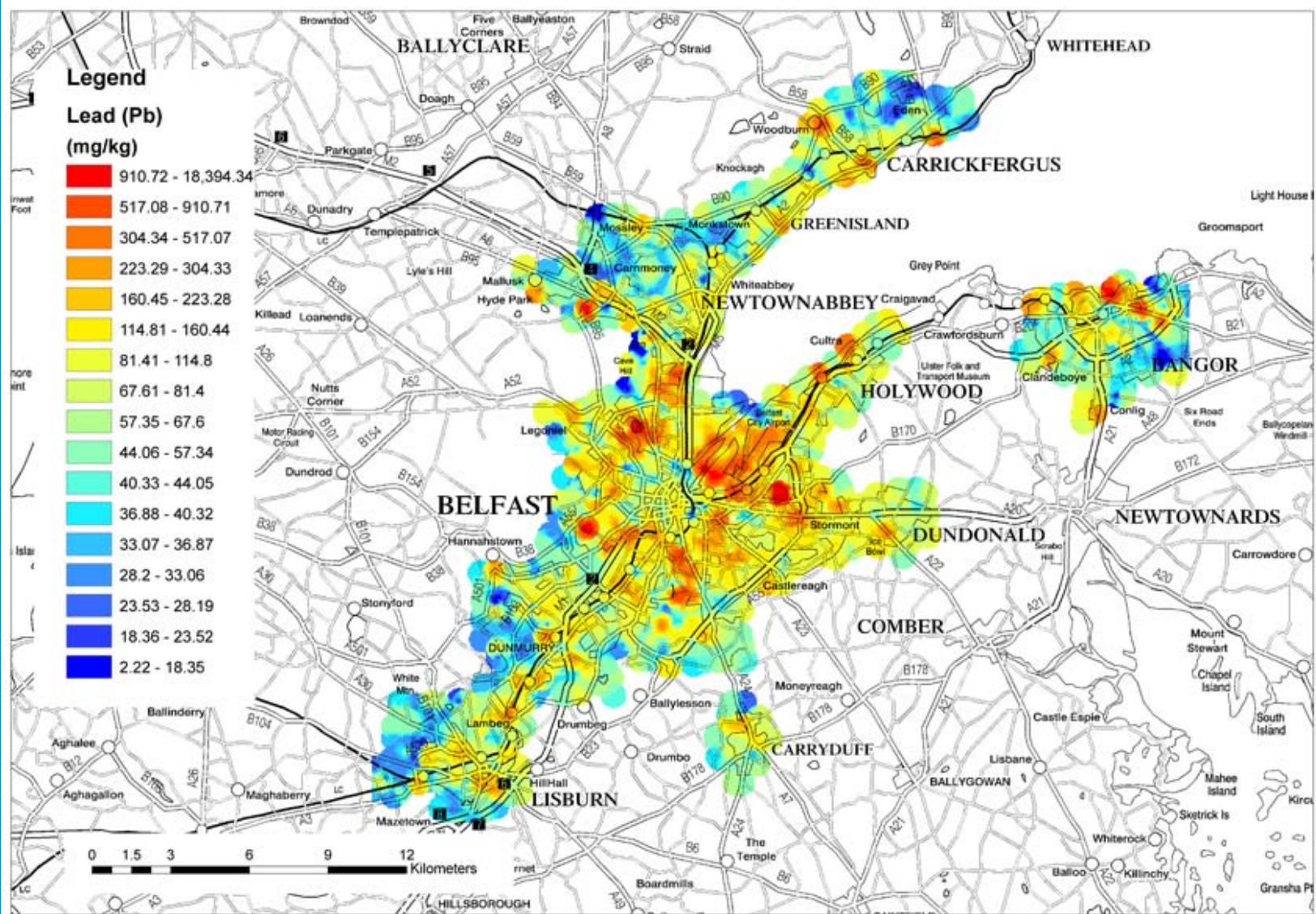


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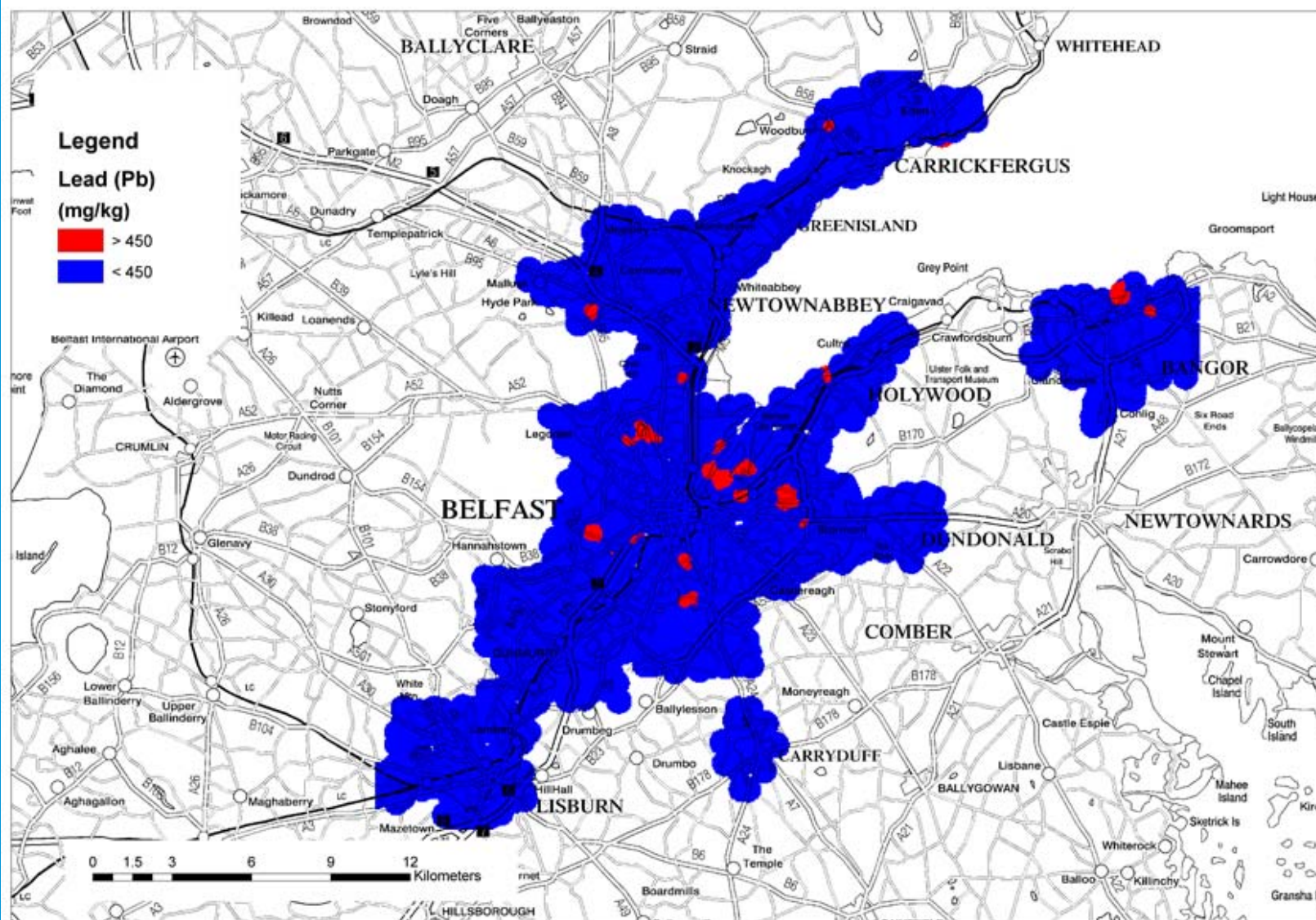


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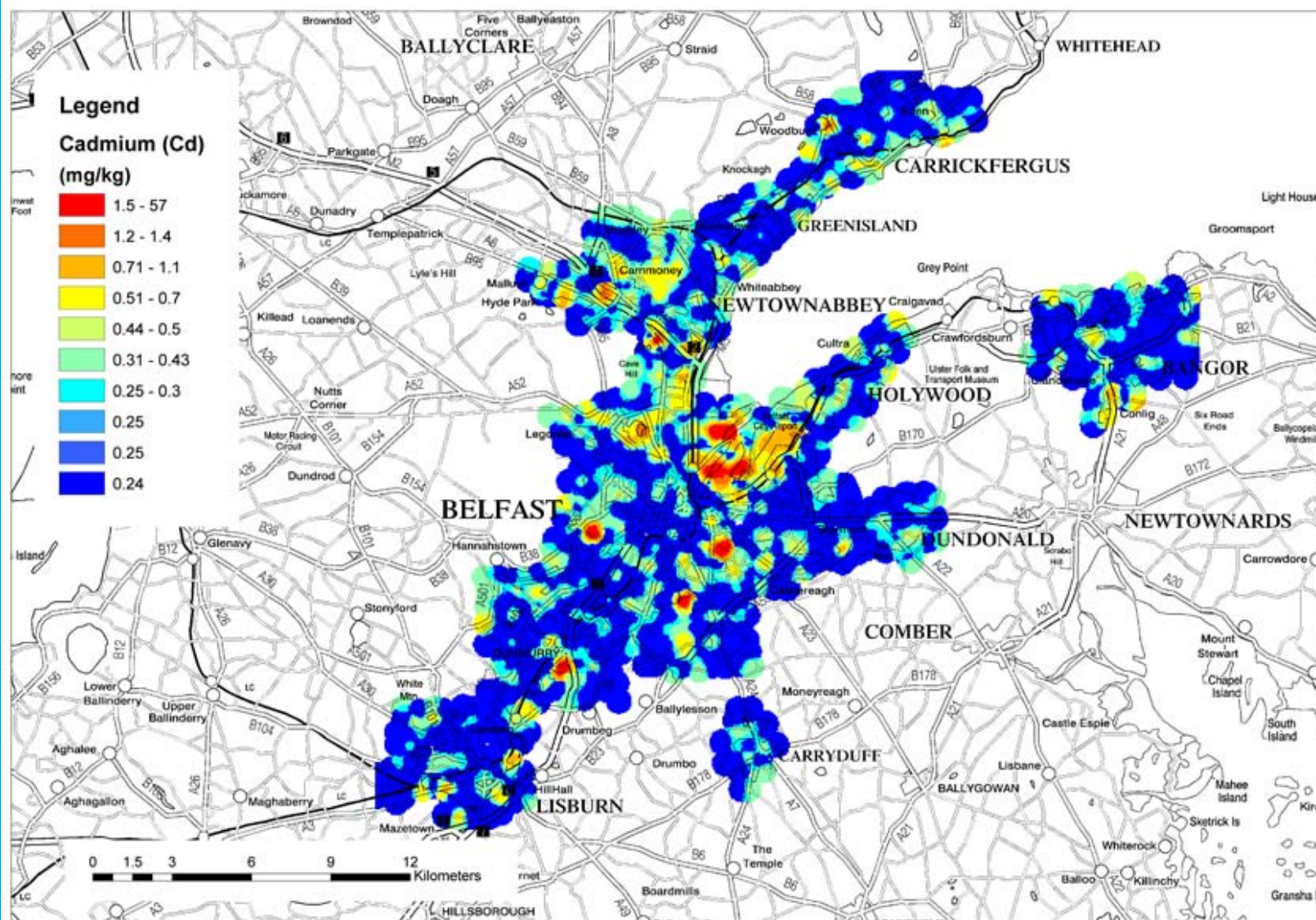


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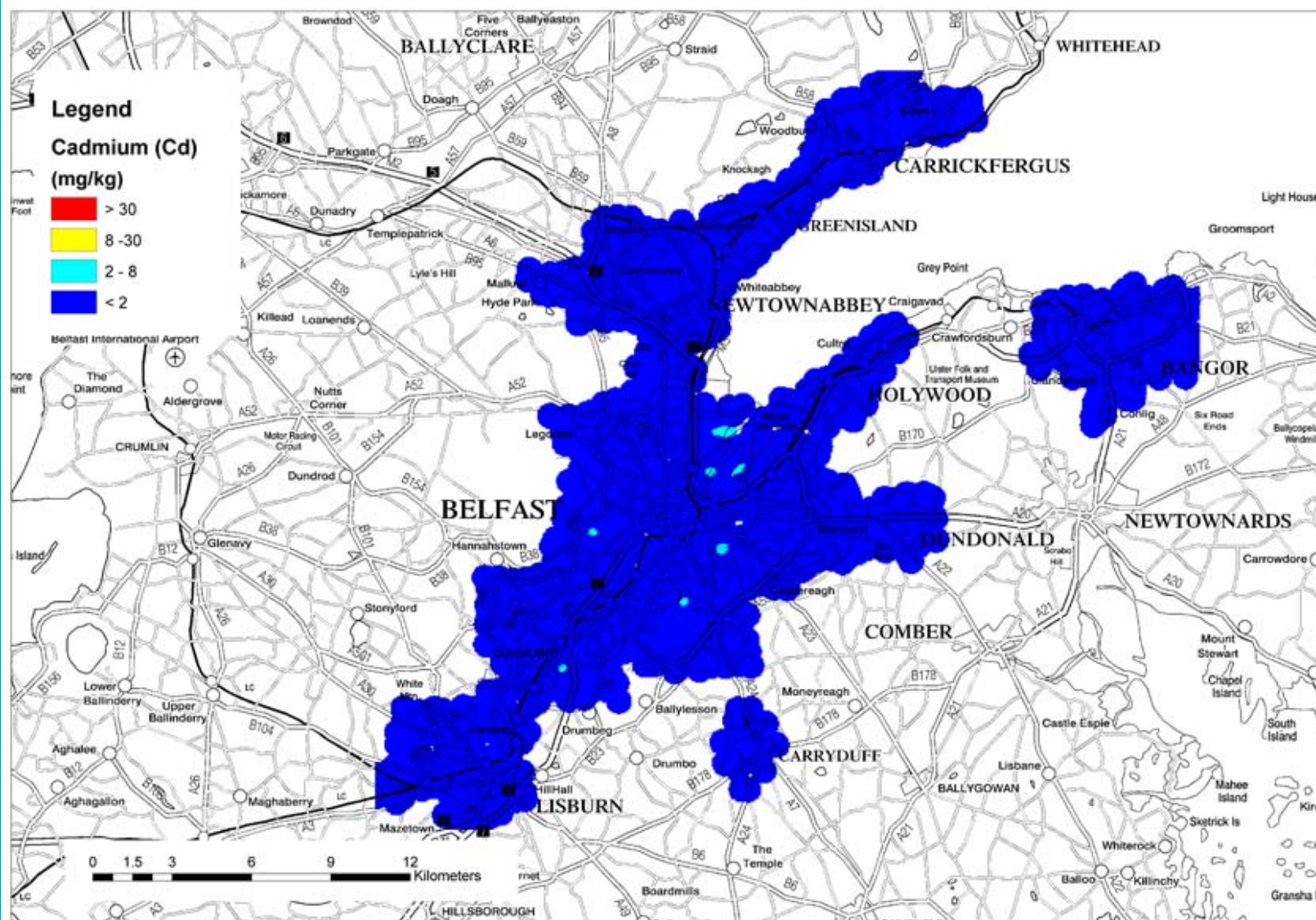


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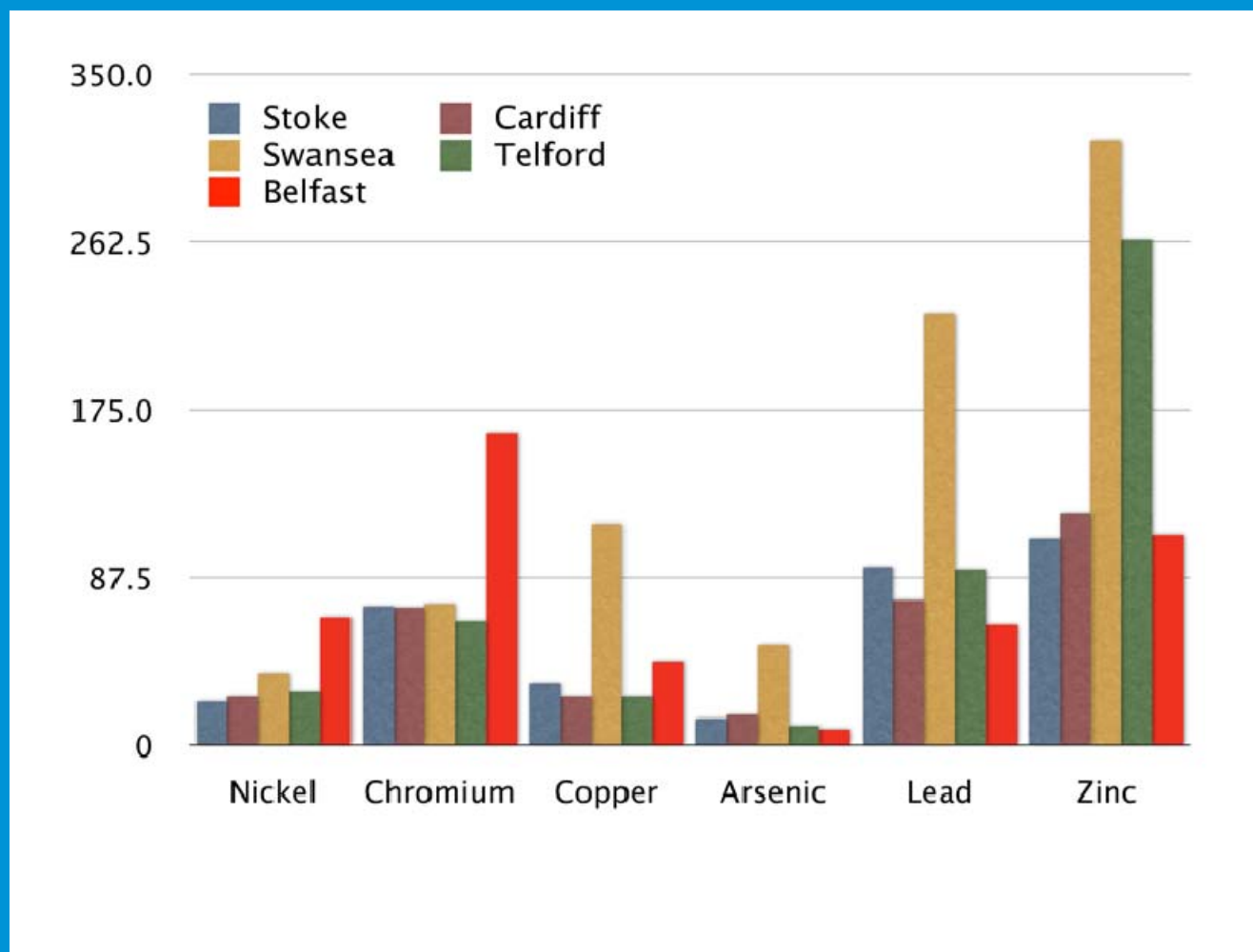
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Metals (median concentrations) in selected cities



Organic analytes (by GC-MS)

PAHs	18
PCB congeners	7
Heteroaromatics	3
Phenols	12
Phthalates	6
Anilines	4
Benzenes	5
Others	12



Belfast Metropolitan Areas

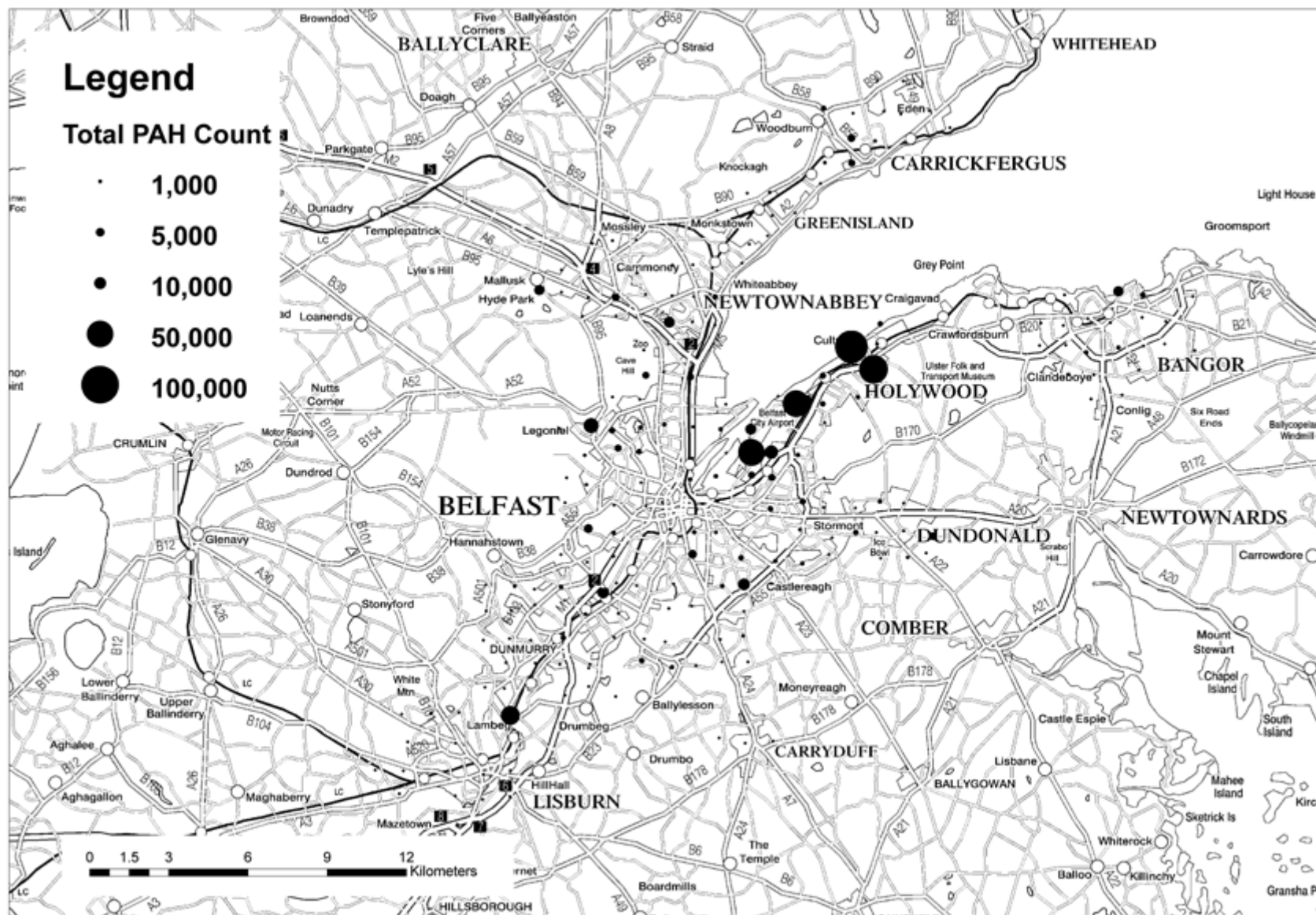
Organics summary

	Belfast	Derry
Number of sites	329	56
Sites with contaminants > detection limit*	112	11
Mean total PAH (16 USEPA), $\mu\text{g/kg}$	2474	1541
Sites with total PAH > 40,000 $\mu\text{g/kg}$	5	0
Sites with benzo-a-pyrene > 1,000 $\mu\text{g/kg}$	10	1

* 100 $\mu\text{g/kg}$



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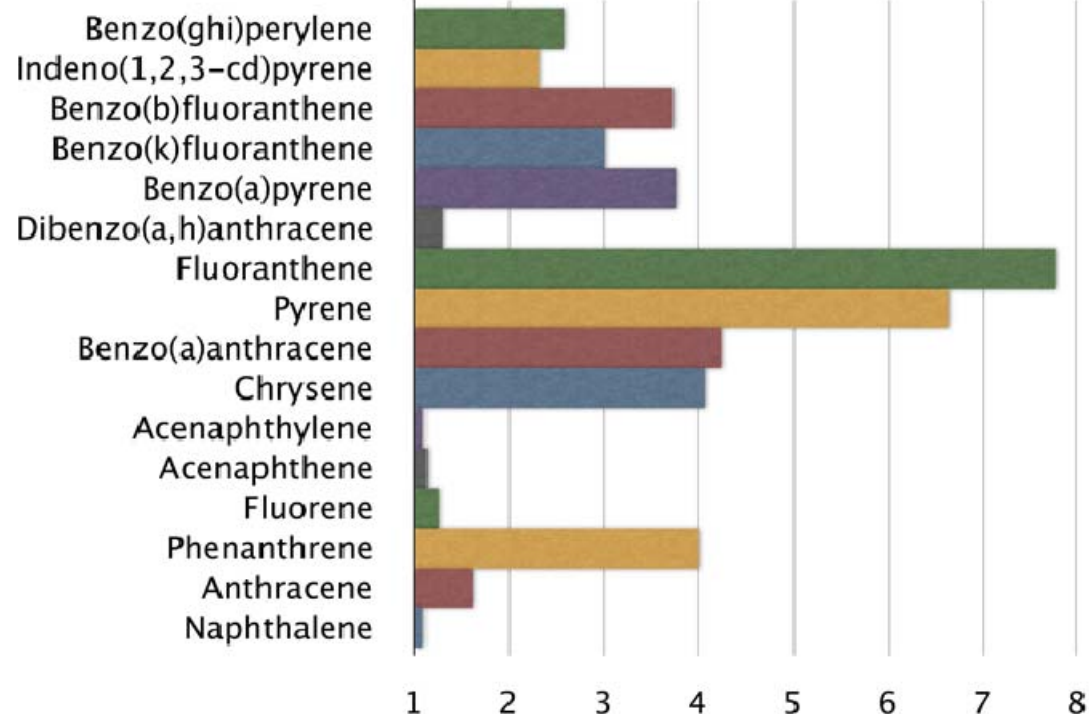
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PAHs in Belfast – relative abundance



Tellus - delivery

Delivery

- Preliminary data – available now for consultation
- Fully processed data - available March 2007

Licences

- Academic - for research and teaching
- Standard - for government and commercial users



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