

# The Tellus Effect

**Mike Young**

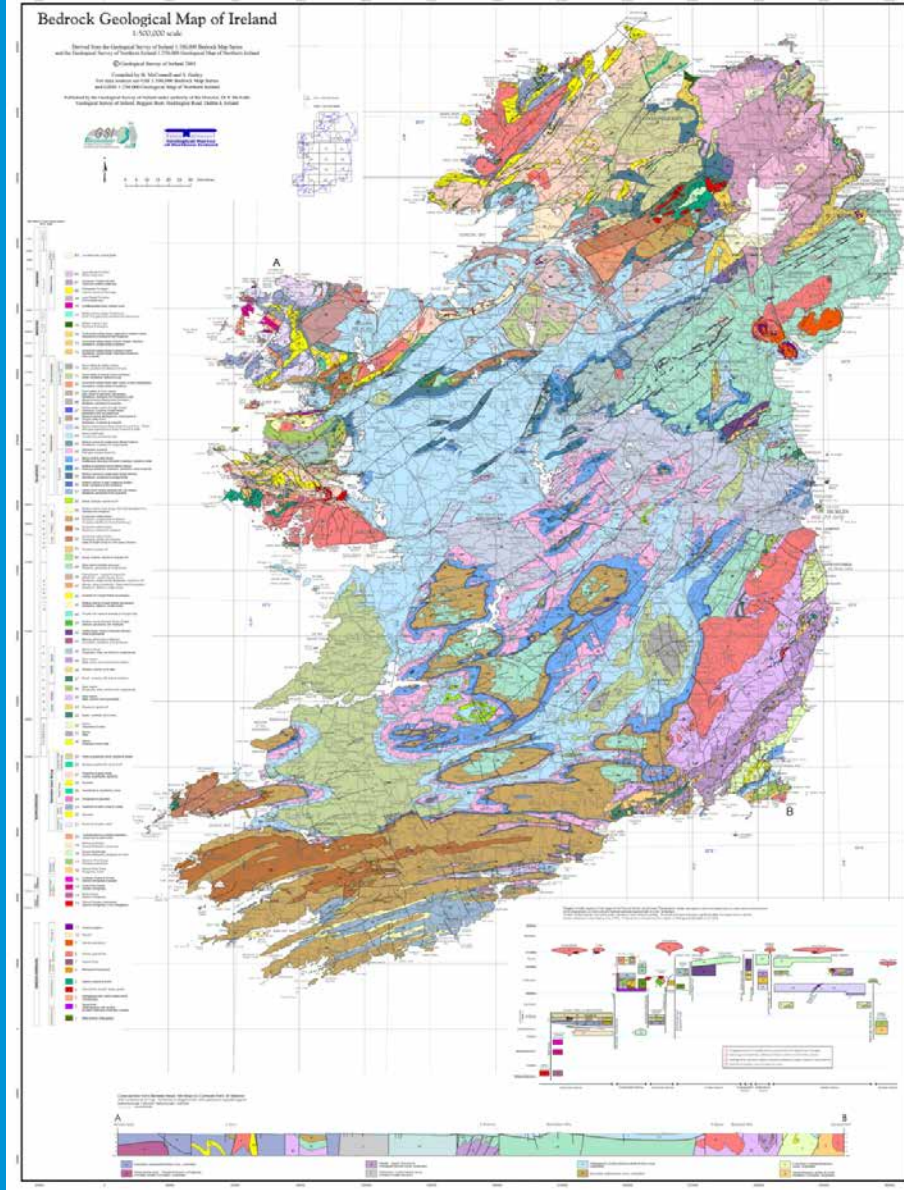
*Geological Survey of Northern Ireland*



*NERC Tellus South West Stakeholder Conference, 31 October 2013*

# Tellus in Northern Ireland and Ireland

1. Project rationale
2. 'Tellus Project' , 2004-08
3. 'Tellus Border', 2010-13
4. Economic effects
5. Environmental benefits

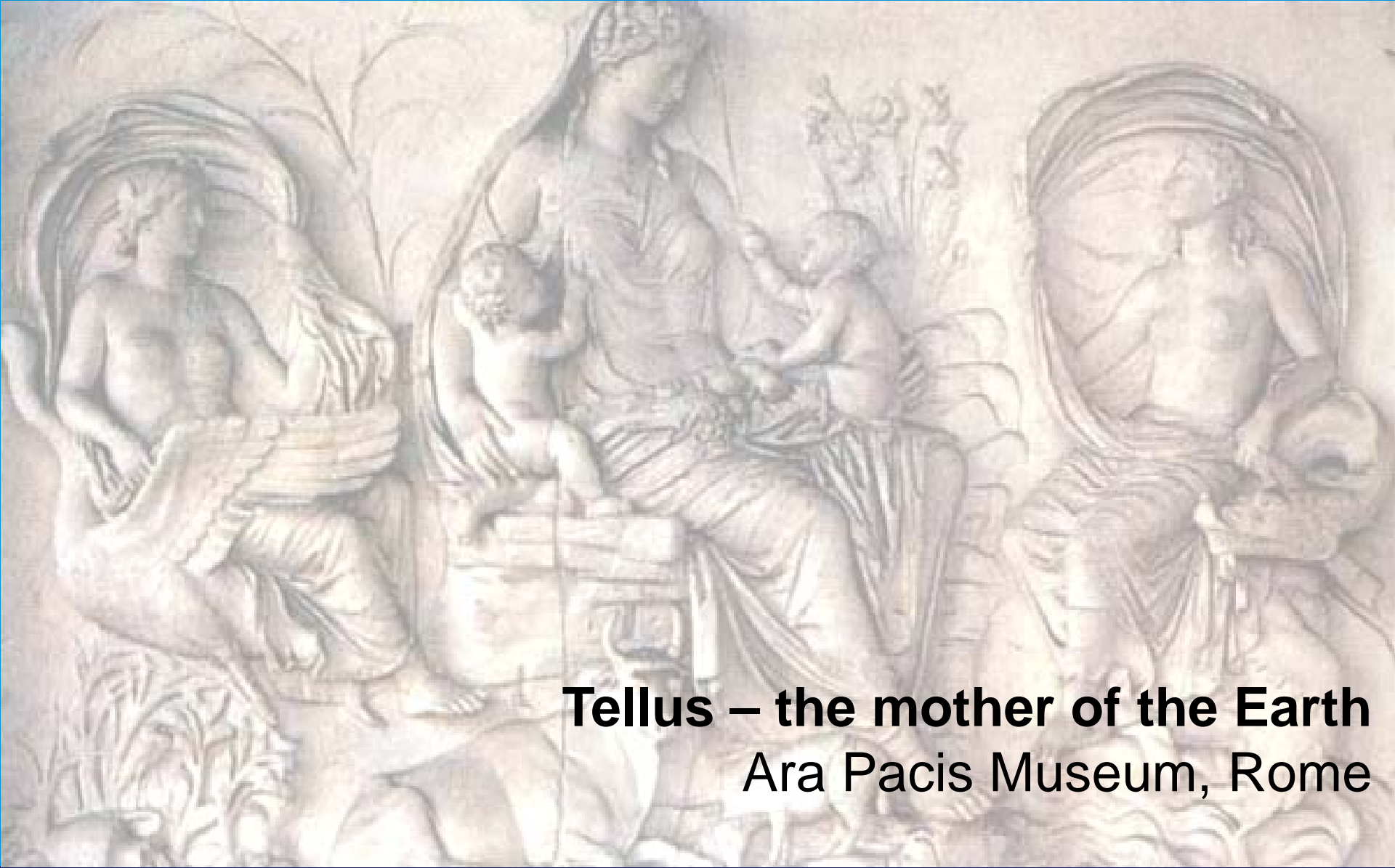


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**Tellus – the mother of the Earth**  
Ara Pacis Museum, Rome



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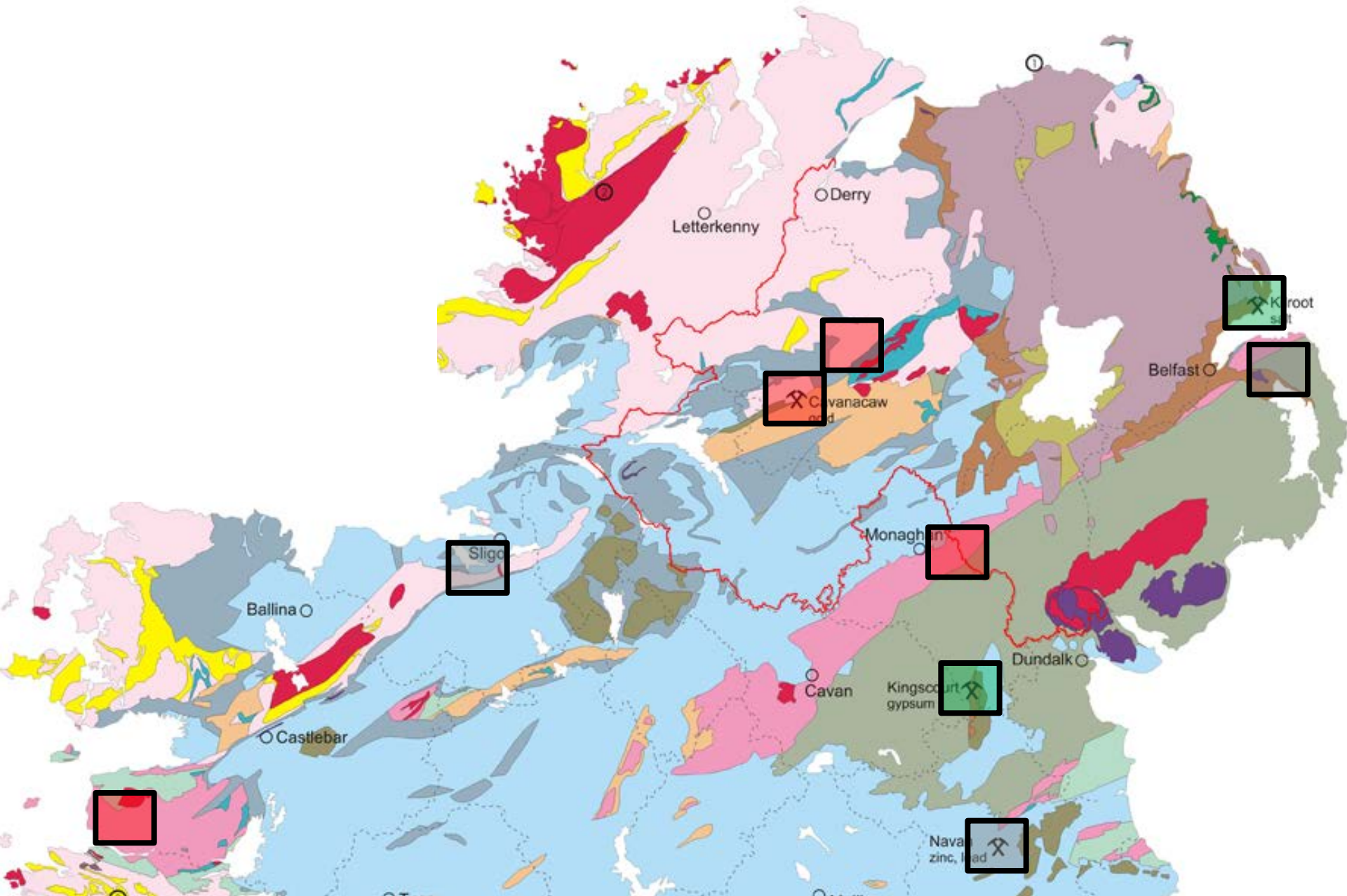
# Old Irish gold



*Photographs courtesy of the National Museum of Ireland*



# Geology and active mines



# EC Directives

- Nitrates
- Soils (pending)
- Water Framework
- Habitats and Species
- Environmental Assessment
- Sewage Sludge in Agriculture
- Framework Directive on Waste
- Integrated Pollution Prevention and Control



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# Stakeholder Interests - 1

- **Mineral and energy exploration**
  - regional data
  - baseline data for regulation
- **Environment**
  - baseline geochemistry for monitoring and planning
  - pollution monitoring
  - carbon in soils



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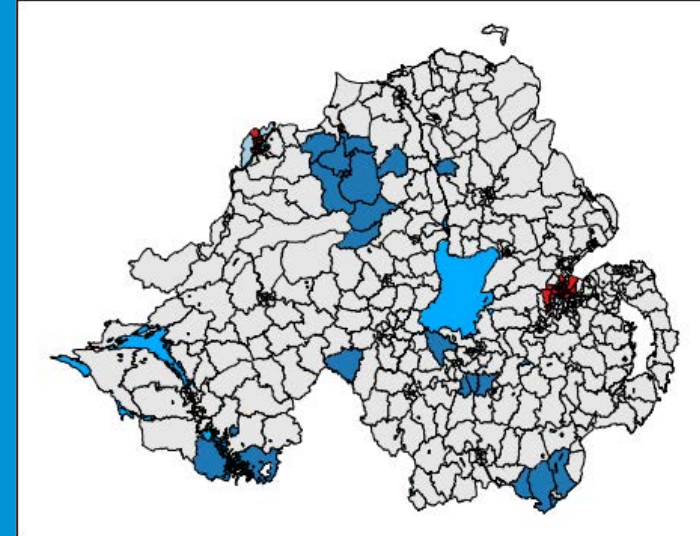
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# Stakeholder Interests - 2

- **Agricultural**
  - trace element levels
  - regional monitoring of pollution
- **Medical**
  - spatial correlation of geochemistry with disease
  - radon and radioactivity
- **Planning and roads**
  - urban redevelopment
  - geohazards



# The Tellus Projects

## Tasks

- National regional geochemistry survey
- National airborne geophysical survey

## Objectives

- Image and model concealed geology
- Refine geological and soils maps
- Produce environmental geochemistry baseline maps
- Encourage environmental research
- Stimulate mineral exploration



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**TELLUS**



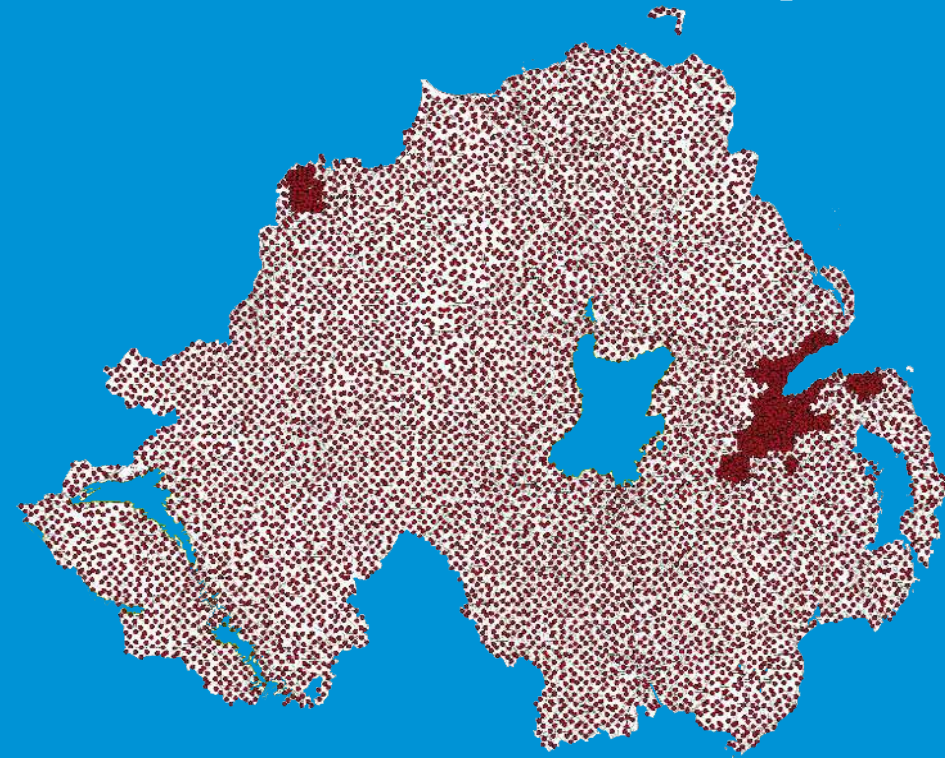
# Geochemistry surveys

- Stream waters and sediments
  - Sampling density 1 site per 2.15km<sup>2</sup>
- Rural soils
  - Sampling density 1 per 2km<sup>2</sup>
  - Analysis by XRF and ICP

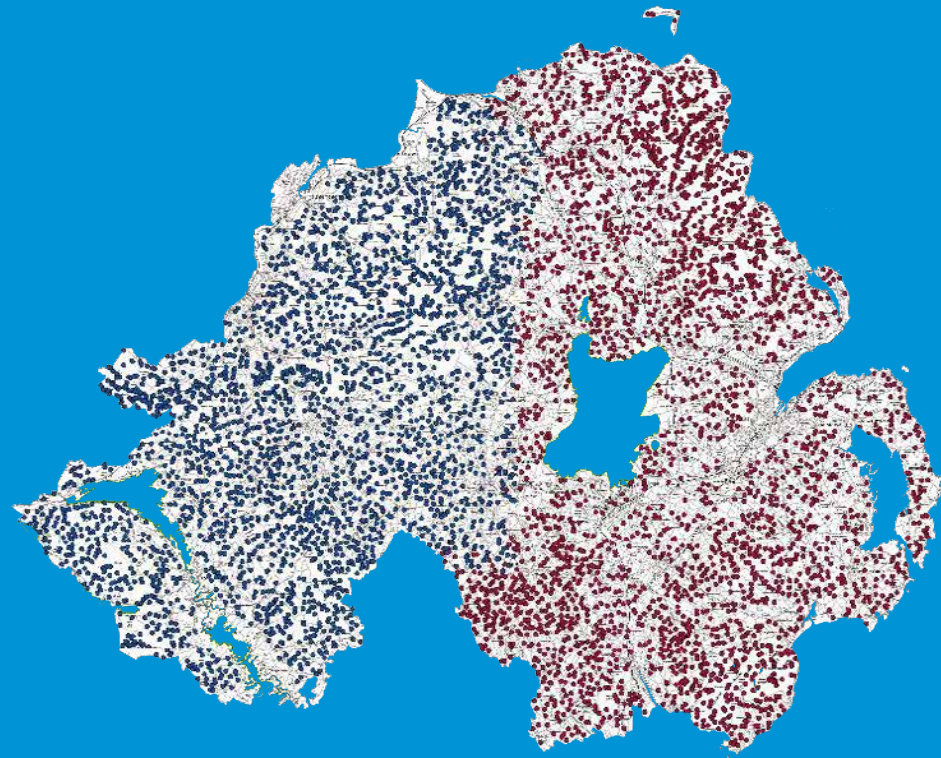




# Tellus geochemistry – Sample Locations



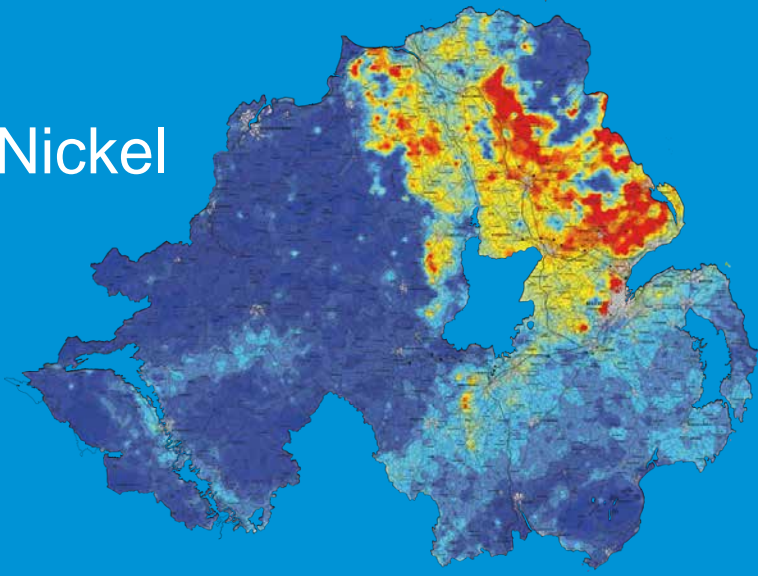
Soils



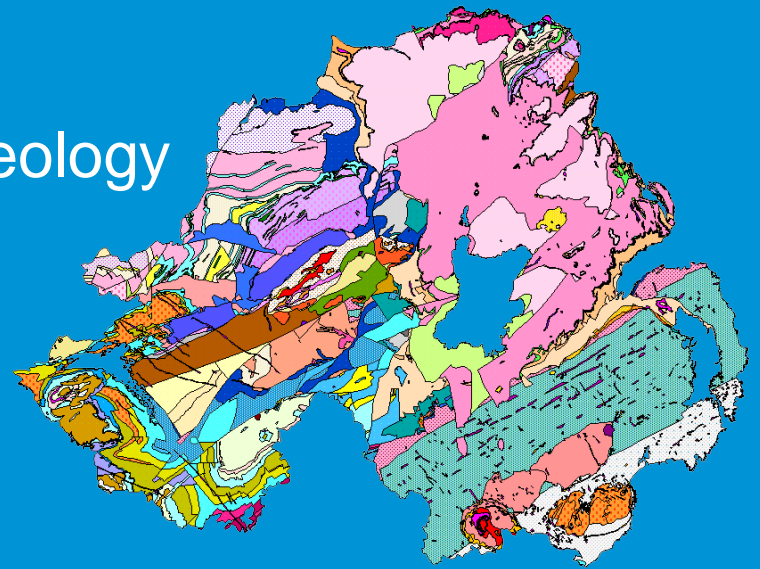
Waters & Stream Sediments



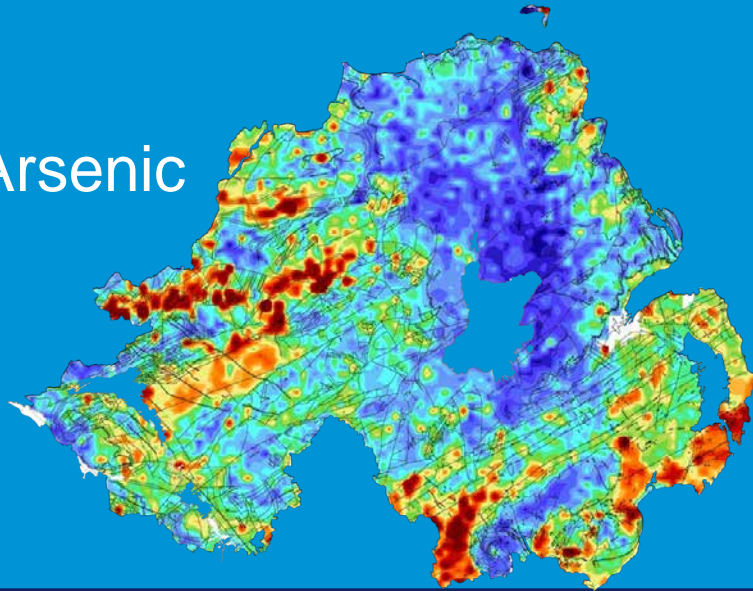
Nickel



Geology



Arsenic



Gold



# Geophysical survey



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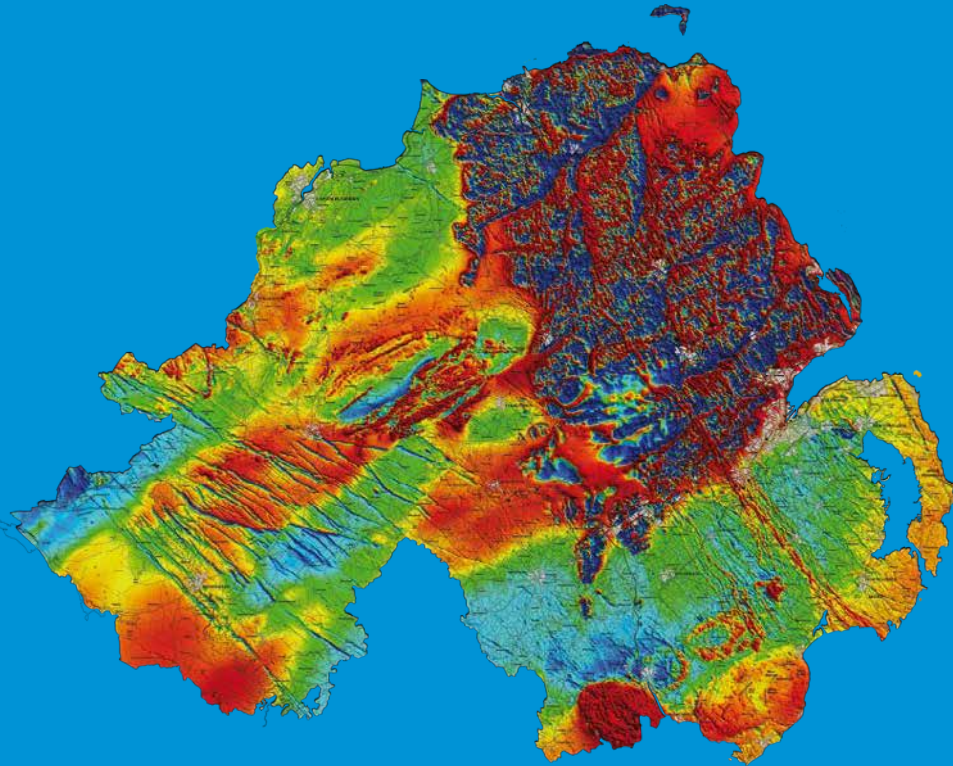


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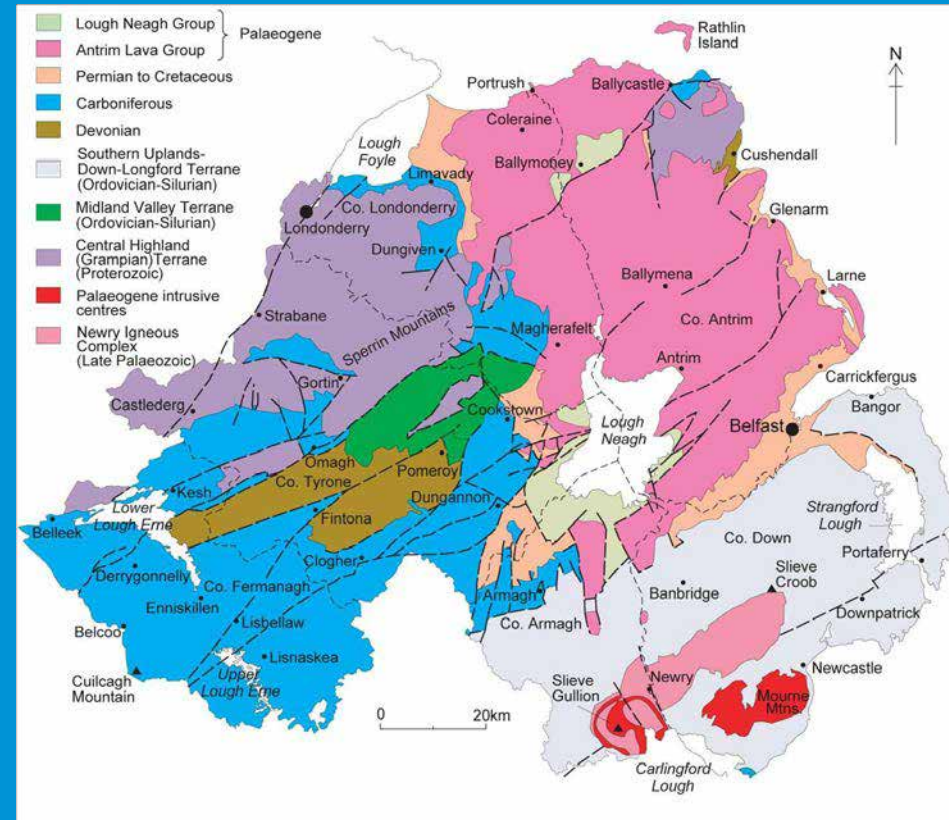
**TELLUS**



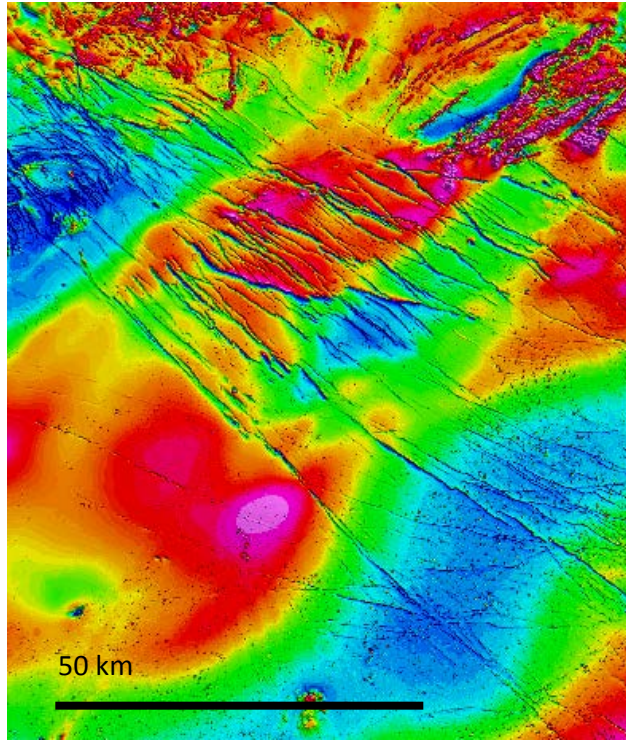
# Geophysical results - 1



Magnetic anomaly

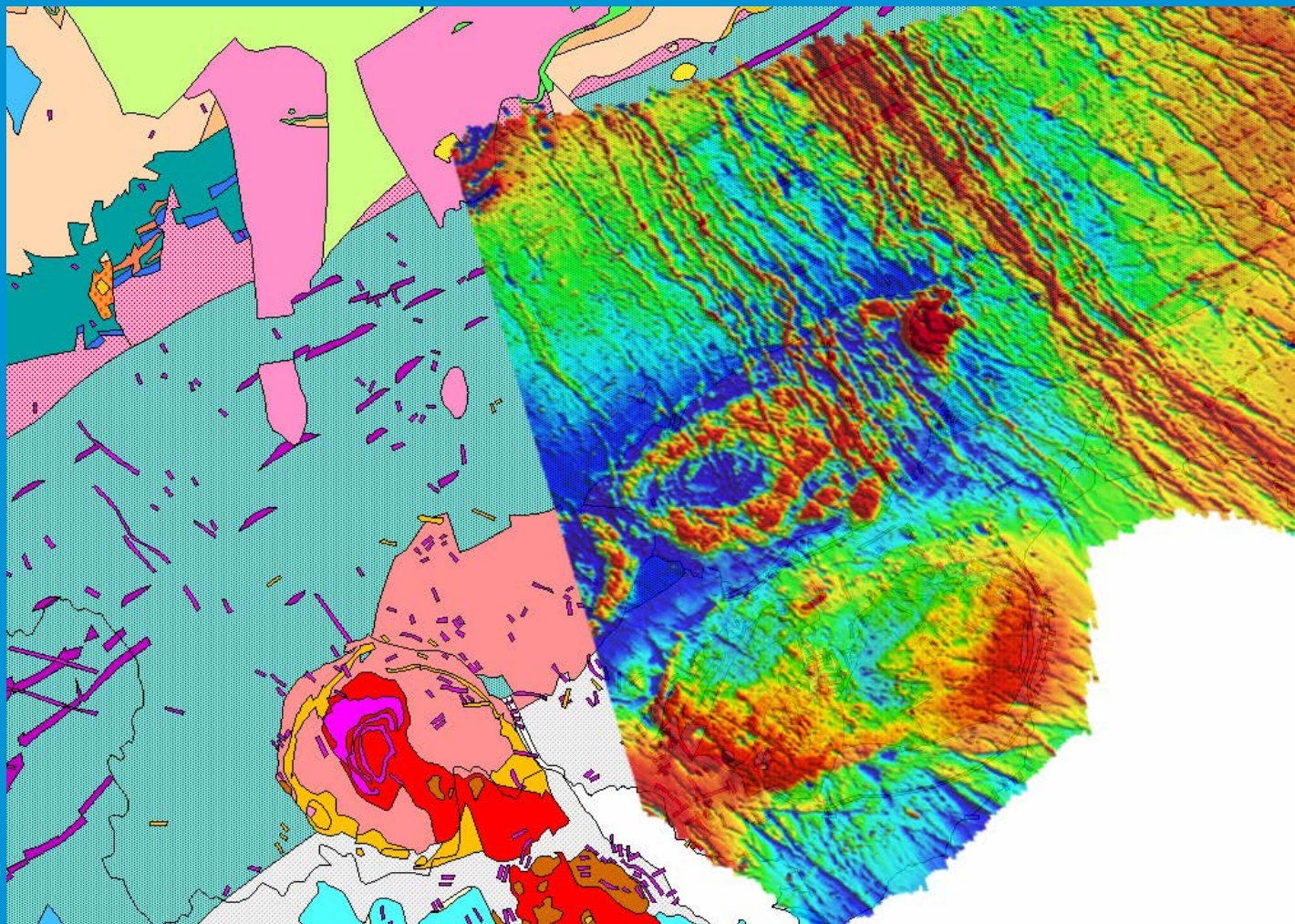
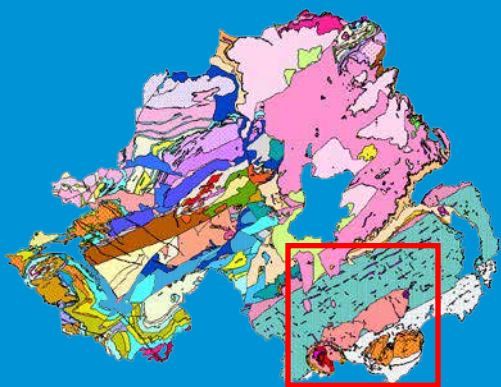


# Basalt Dykes



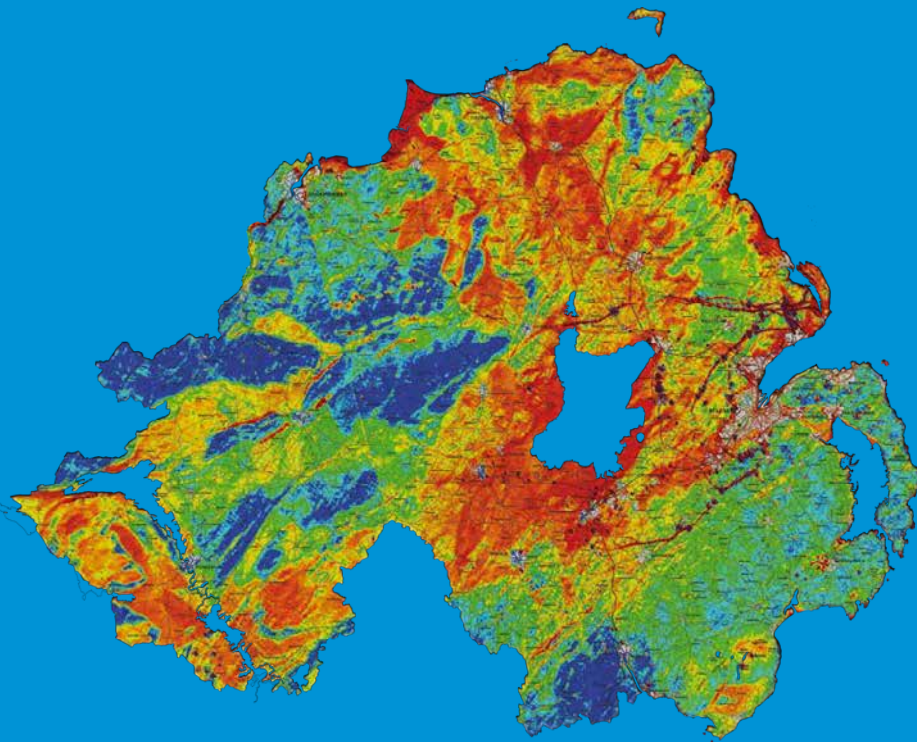


# Revising geological mapping

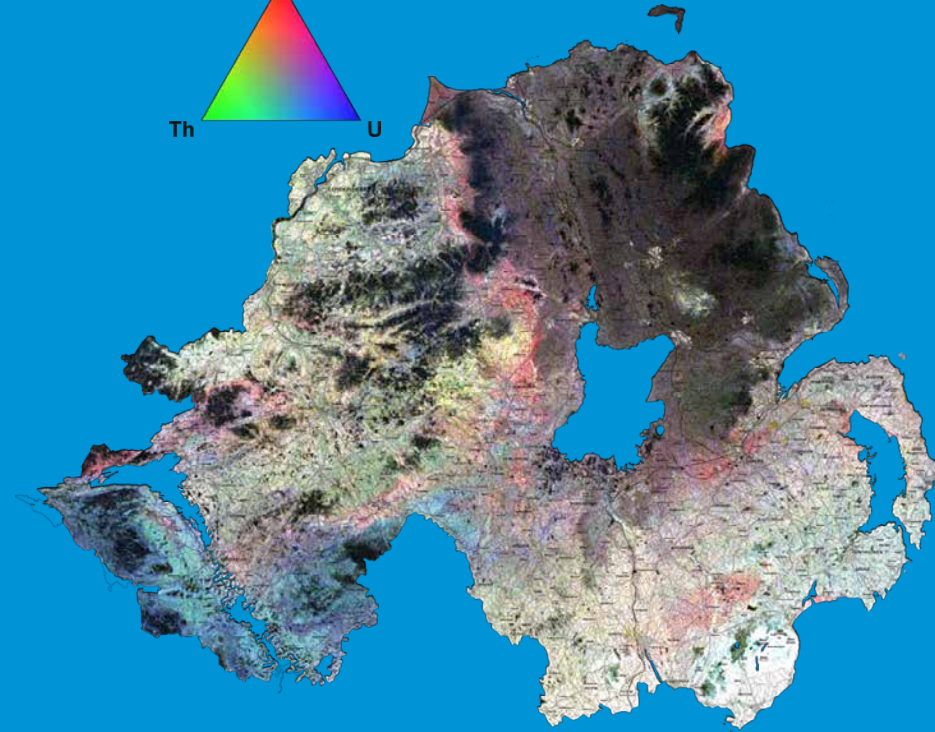
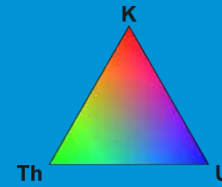




# Geophysical results - 2



Electrical conductivity

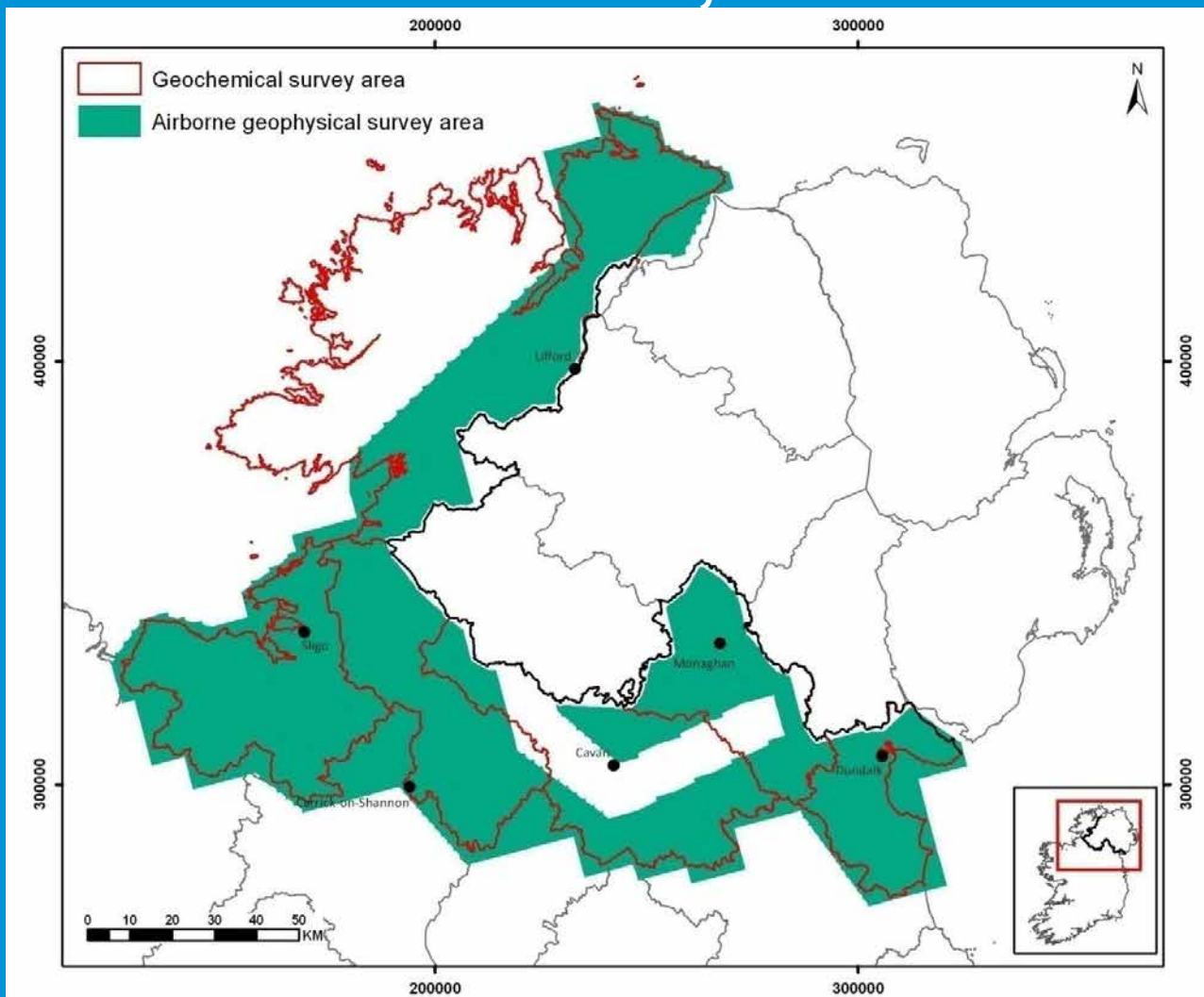


Gamma radiation





# Tellus Border, 2010-13



Department of  
**Enterprise, Trade  
and Investment**  
[www.detini.gov.uk](http://www.detini.gov.uk)

**Geological Survey  
of Northern Ireland**



Queen's University  
Belfast





# Economic impacts

## Tellus

- Cost £5.8 million
- Investment since 2007, £32 million

## Tellus Border

- Cost £4 million
- 6 year commitment since Feb 2013: £885k



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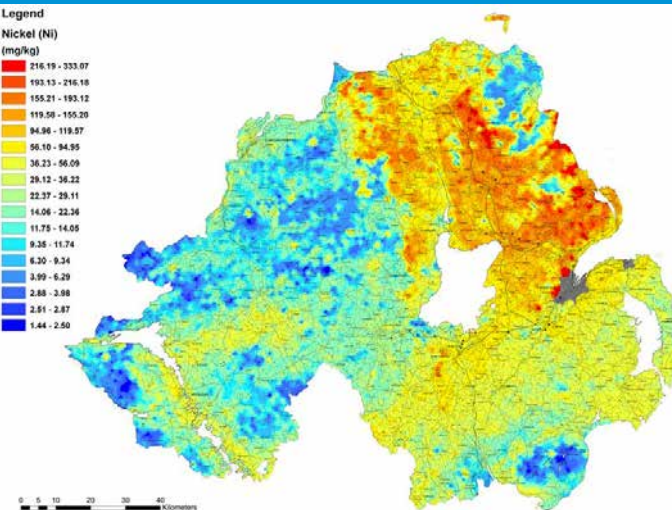
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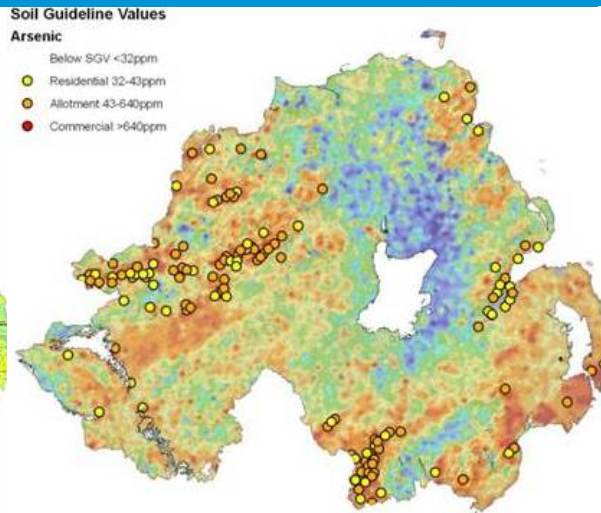
# Environmental mapping

- Environmental geochemical baselines
- Agriculture – trace element deficiencies
- Distribution of toxic elements in soils and streams
- Stream water chemistry (eg NPK)
- Electrical conductivity of landfill plumes

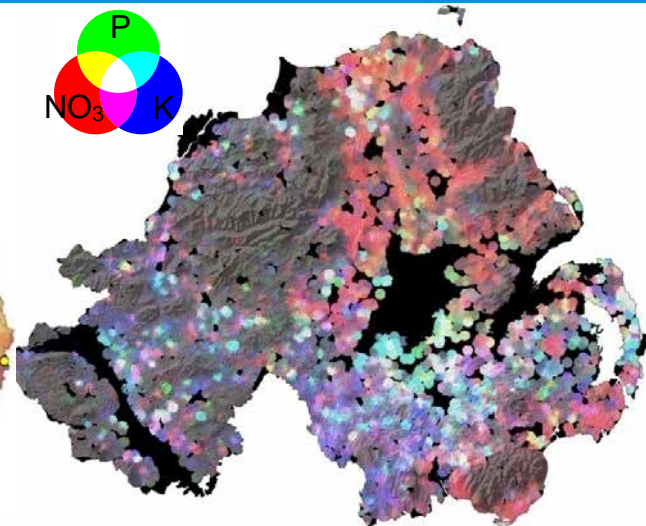
## Nickel in soil



## Arsenic - SGVs



## NO<sub>3</sub> /P/K Stream Water

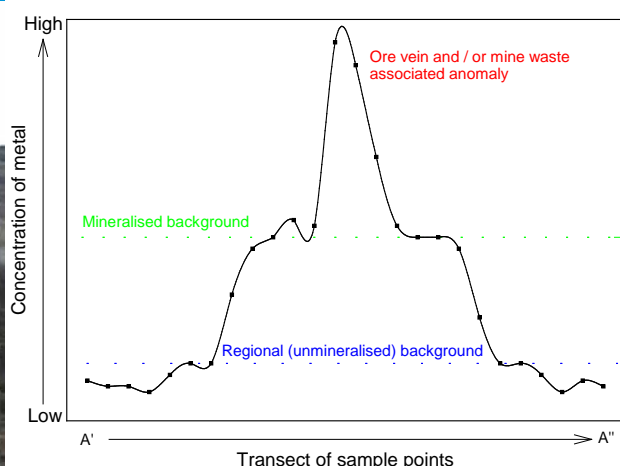
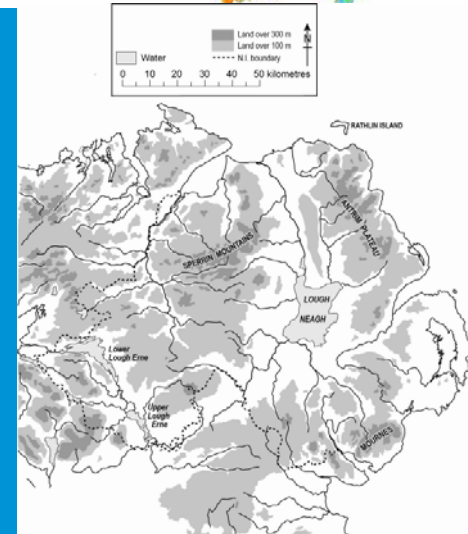
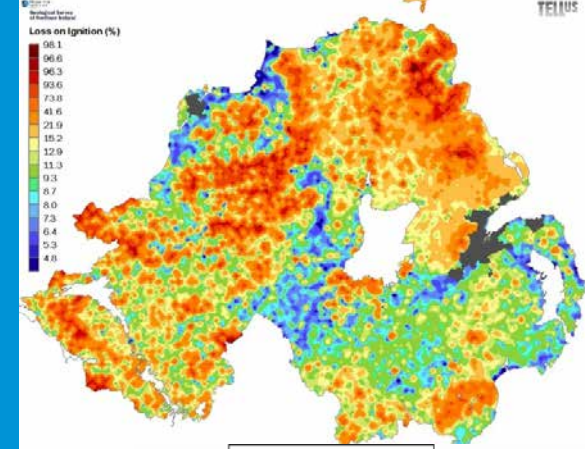






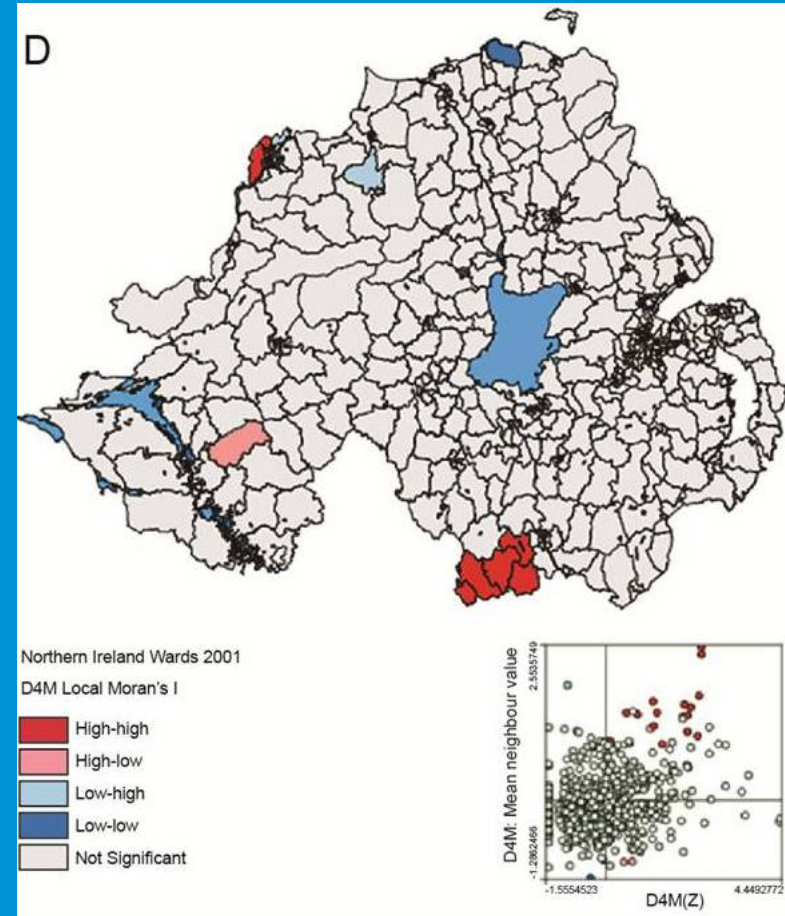
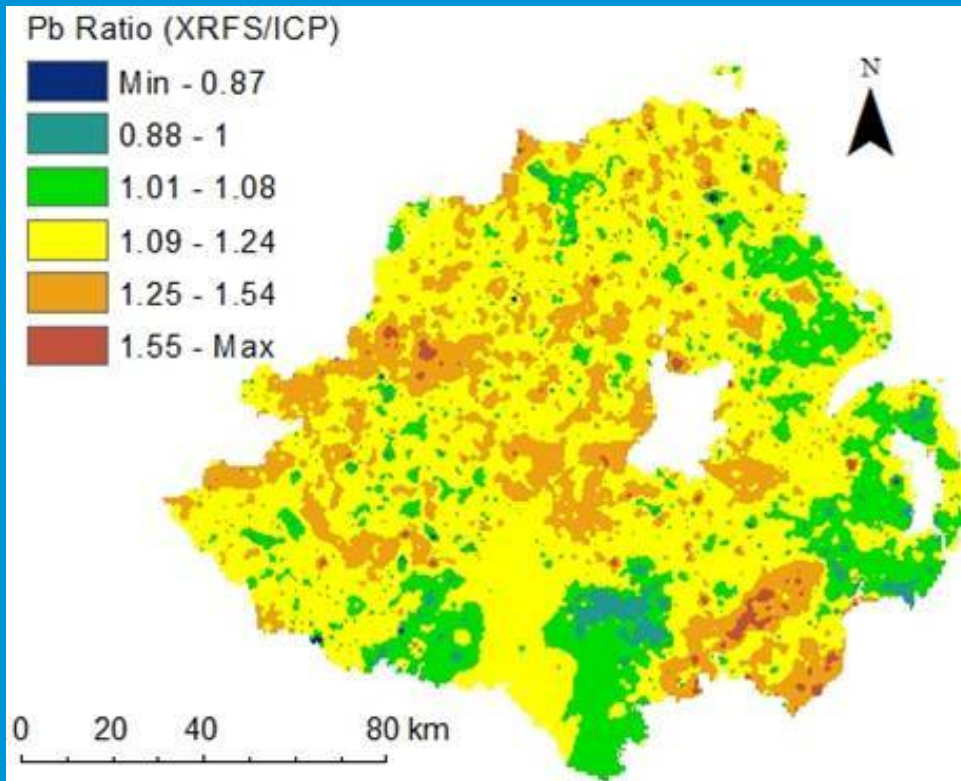
# New research - environmental

- Soil carbon
- Peat depth assessment
- Slurry spreading and airborne nitrogen
- Impacts of historical mining
- Wetlands hydrology



# New research – health

## Oral bio-accessibility of toxic elements



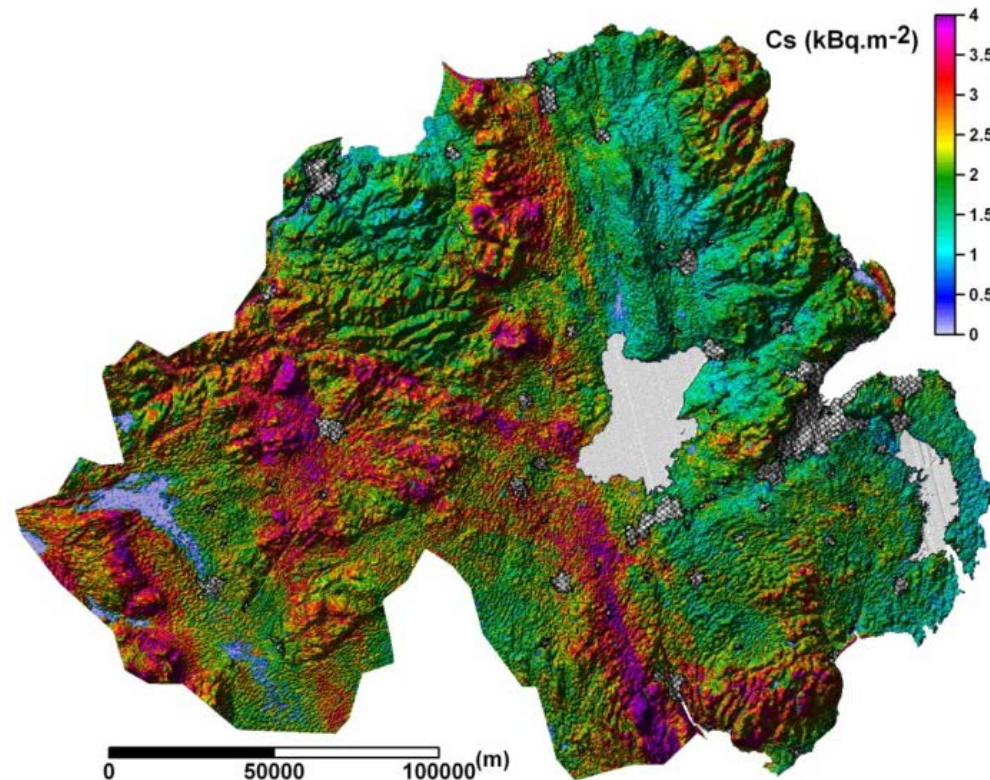
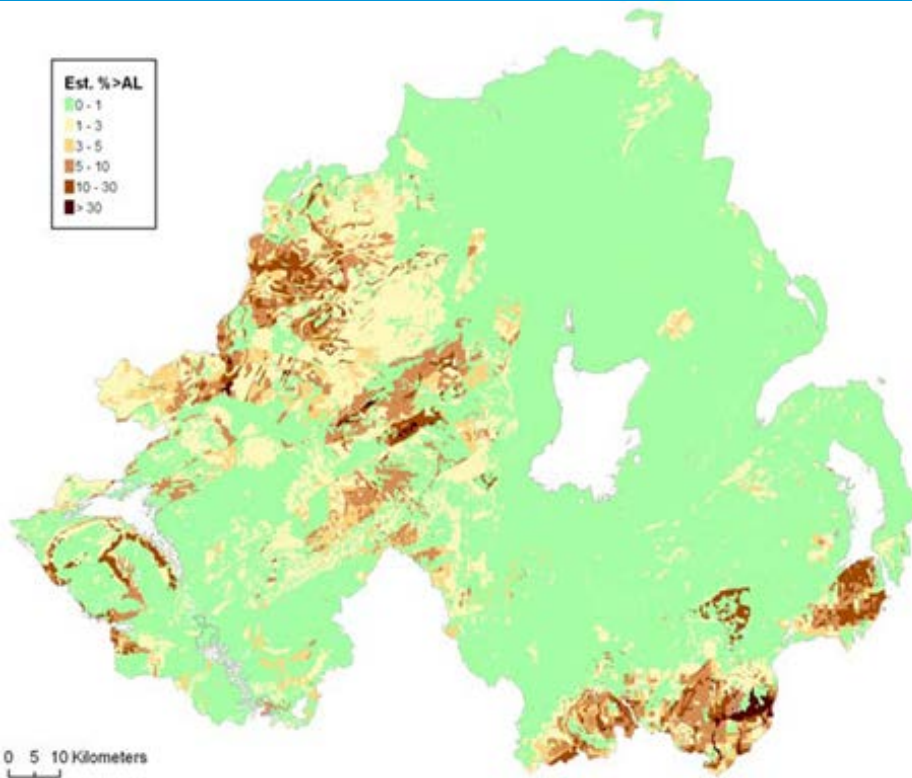
Soil chemistry and cancer correlations



# New research – radioactivity

In-house radon risk

$^{137}\text{Cs}$ -Caesium fallout



# Linkages and engagement

- To government – events, seminars, research collaboration
- To the public – media, open days, schools events
- To industry – trade shows, trade publications
- National and international scientific participation
- Research links with universities – data exchange
- Exhibitions and publications





# Gold-panning days



# School debates



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# Impacts

1. Inward investment in base metals and gold exploration.
2. Good return on initial government investment.
3. EU investment.
4. Environmental benefits - baseline data; geology; agriculture; health.
5. Public engagement.
6. New research.





# Sponsors

## Tellus, 2004-08

- Department of Enterprise, Trade and Investment (NI)
- 'Building Sustainable Prosperity' fund of the EU Regional Development Programme

## Tellus Border, 2010-13

- INTERREG IVA programme of the ERDF
- Department of Environment (NI)
- Department of Environment, Community and Local Government (RoI)



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