



British  
Geological Survey

NATURAL ENVIRONMENT RESEARCH COUNCIL

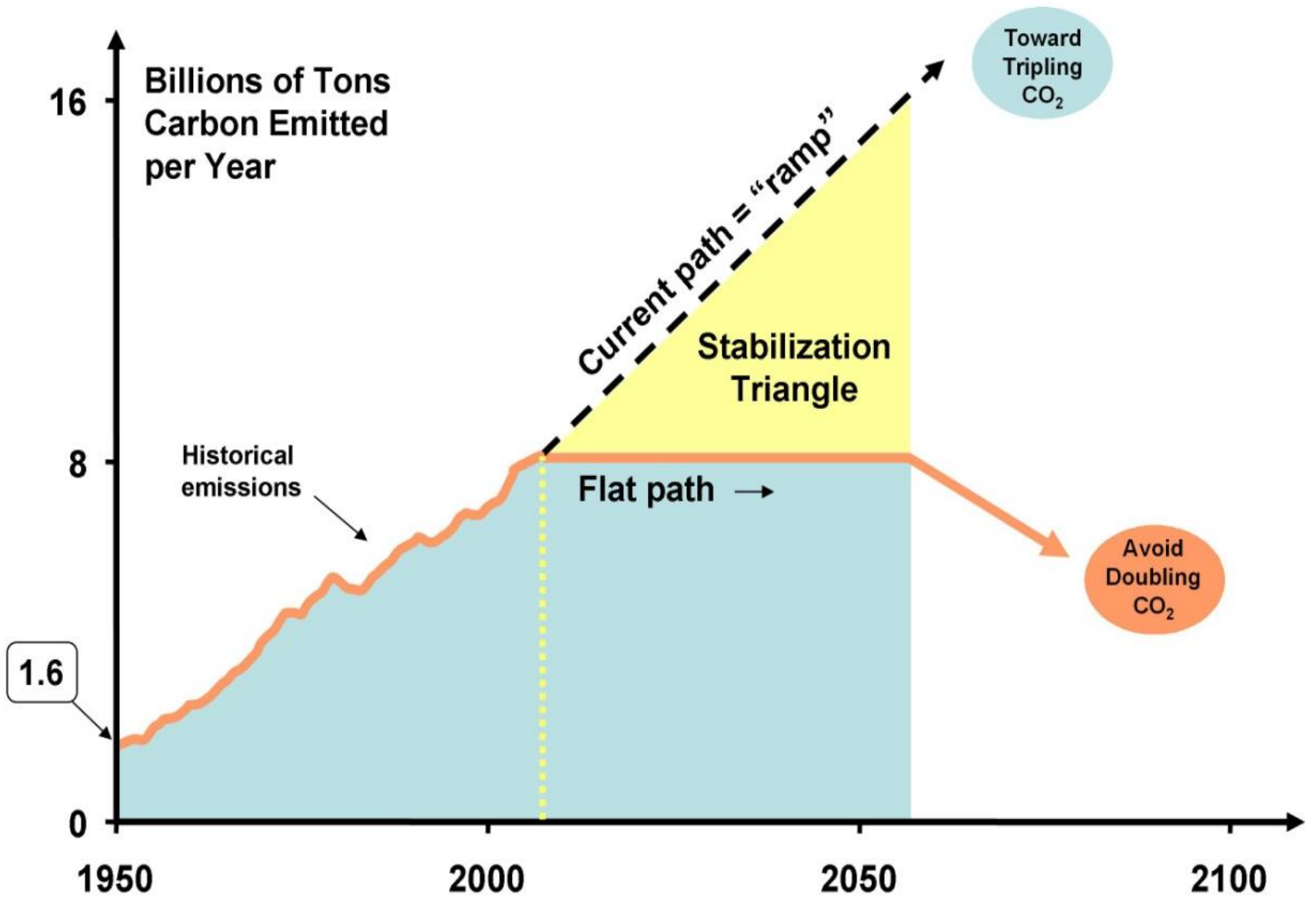
A horizontal banner at the top of the slide featuring four distinct images: a volcanic landscape with glowing lava, a colorful mountain valley, a close-up of a dark rock formation, and a modern city skyline. The text 'Gateway to the Earth' is overlaid in white on the right side of the banner.

Gateway to the Earth

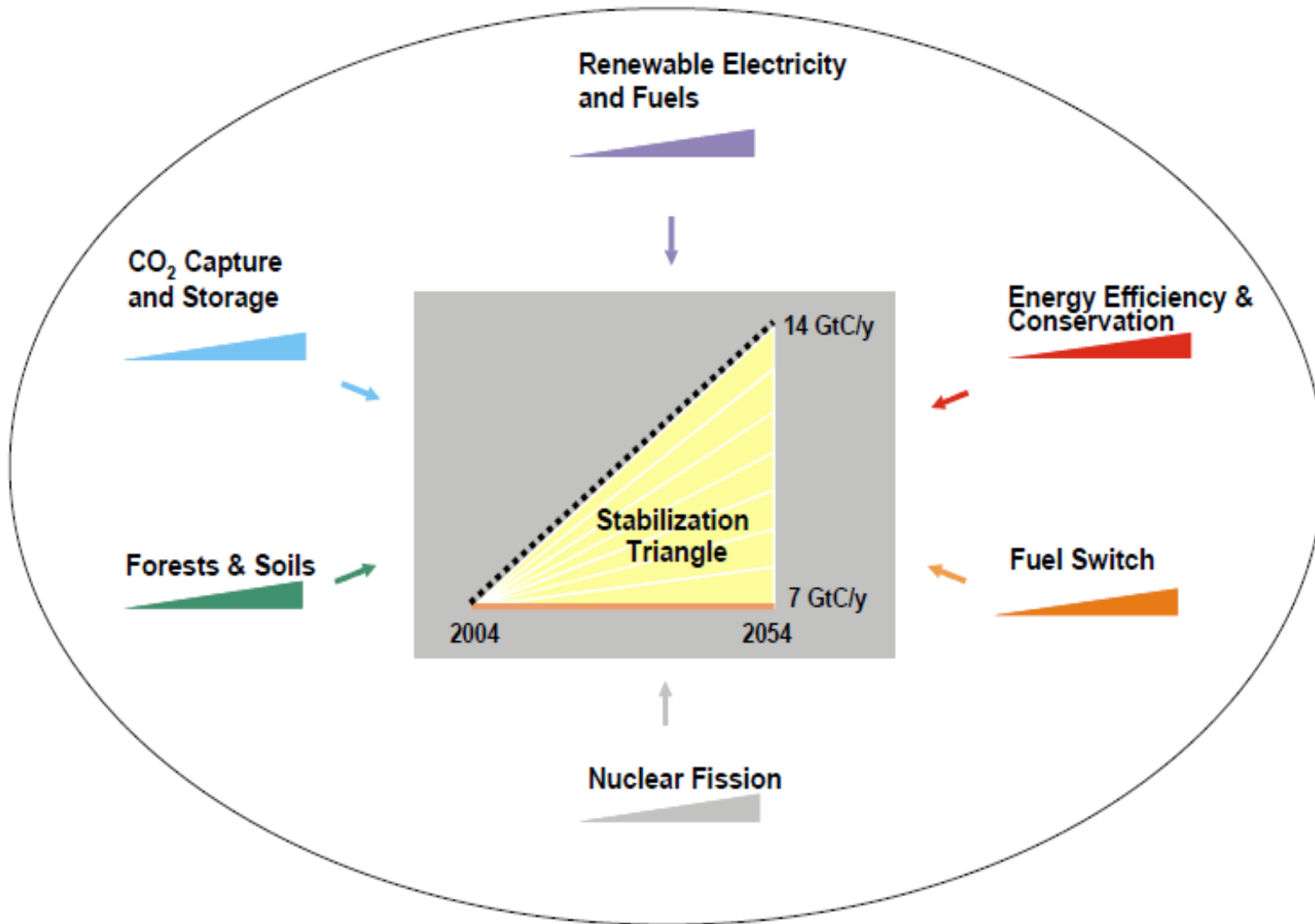
# Lighting up the underworld

John Ludden

British Geological Survey, UK.



Pacala S., Socolow R. 2004. Stabilization wedges: solving the climate problem for the next 50 years with current technologies. *Science* 305, 968-972.



Several of these wedges are in the geoscience remit  
 So we must invest in research

# BUT

## We have a problem

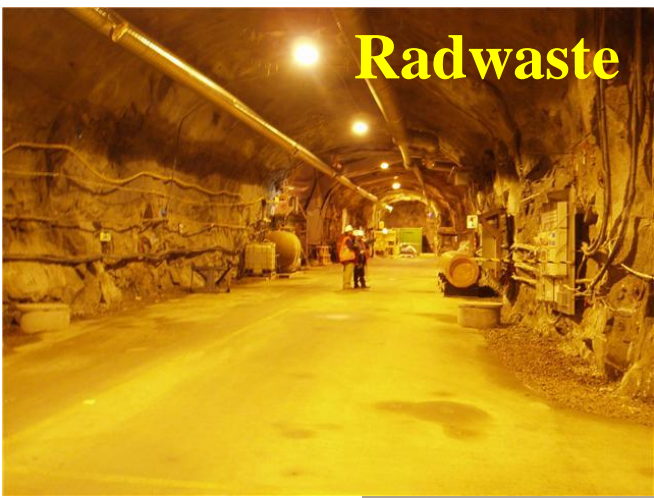
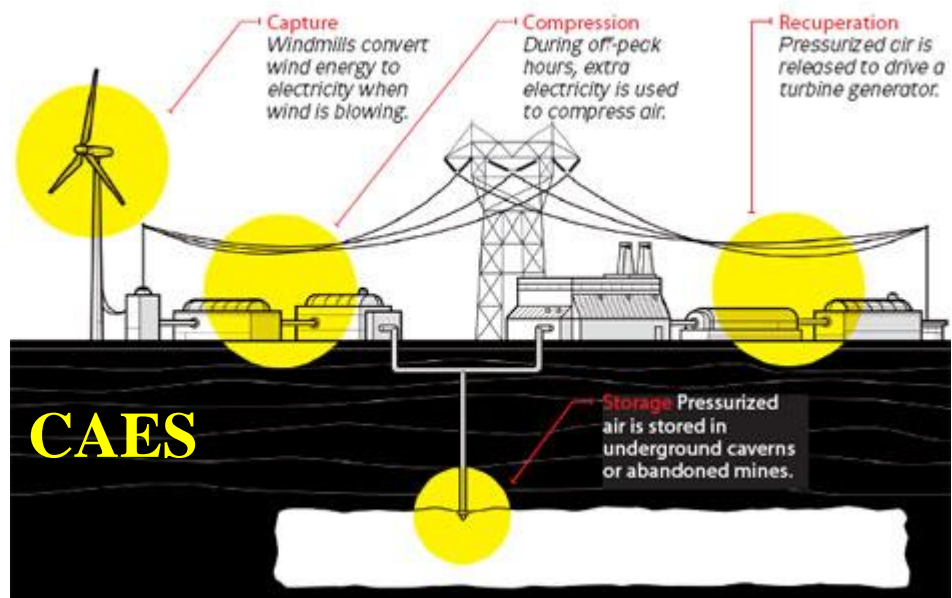
Several of our lower carbon solutions are 'geological' but the public needs to develop confidence in our ability to solve them...

Many of these require metal resources and we are increasingly required to show that we mine responsibly



CCS

# Low(er) C solutions



Radwaste



Shale gas

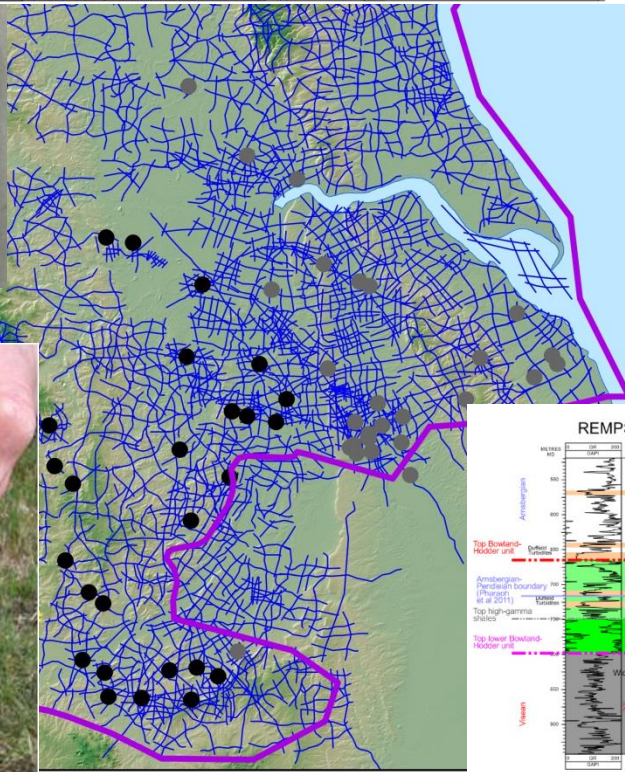
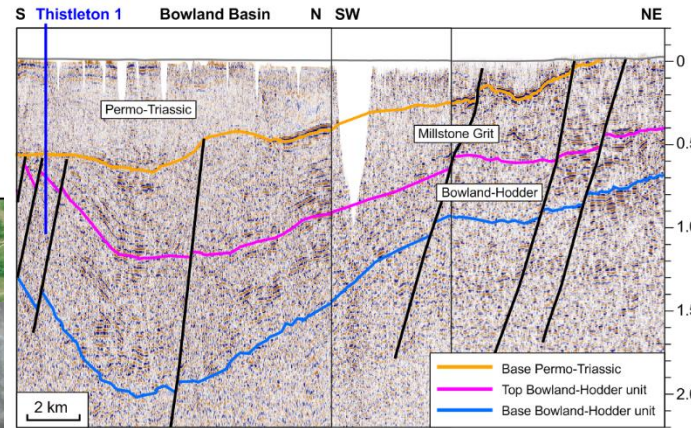







Geothermal

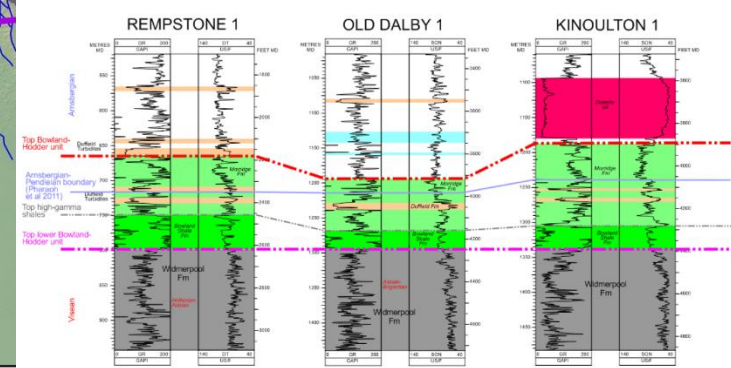
Even though we are researchers, we are seen by some as part of the problem



# Data sources



-  2D seismic used
-  Key well with 50+ft shale
-  Non-released well (as of early 2013)
-  Other key well
-  BGS/DECC study area

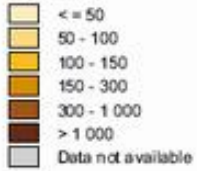


Outcrop studies, 64 key wells, 15,000 miles of seismic data

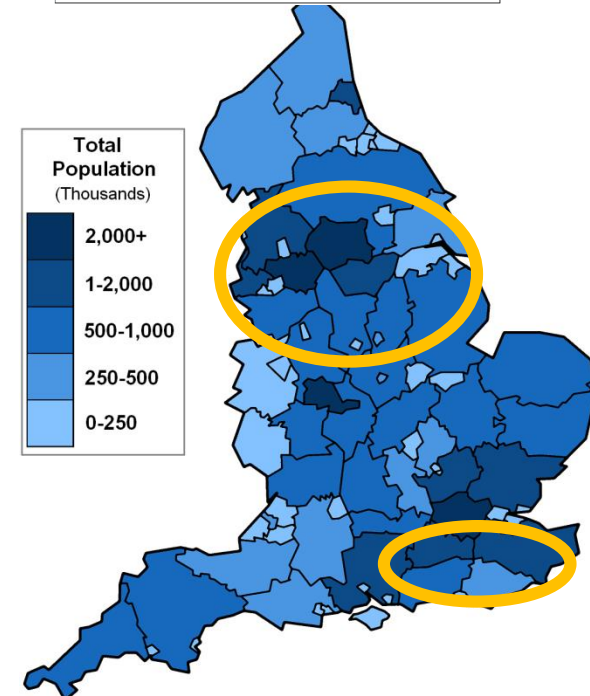
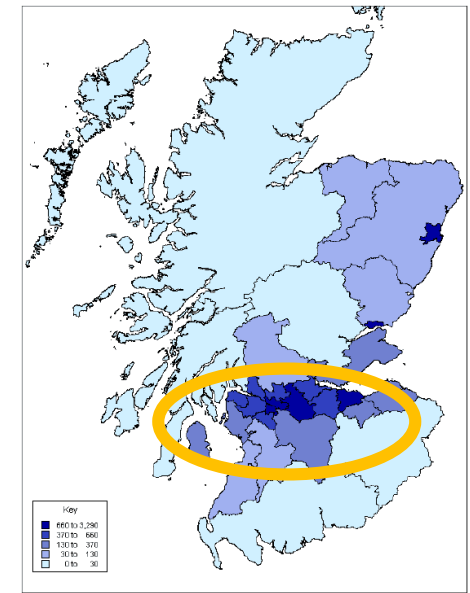
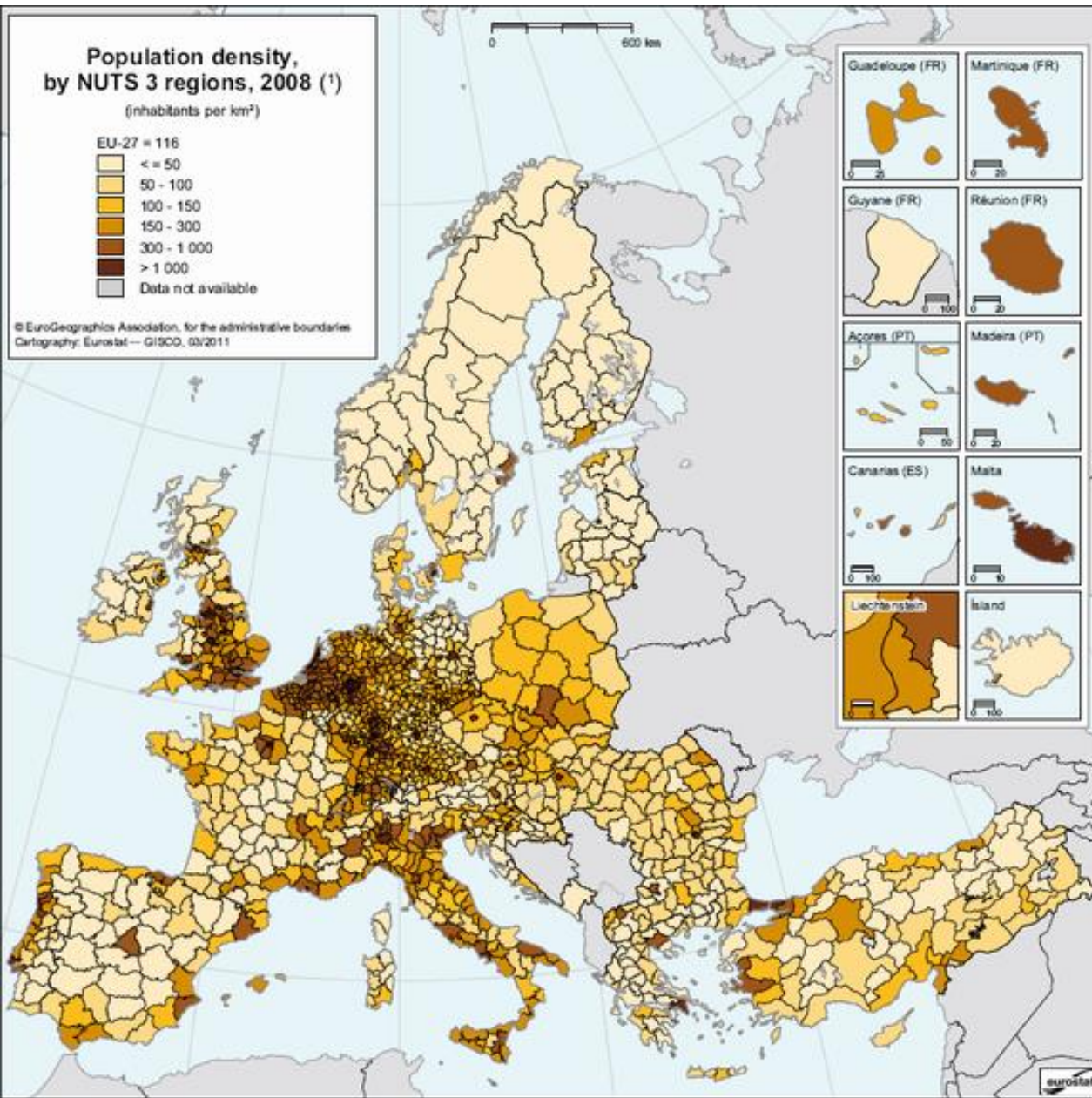
# Population density, by NUTS 3 regions, 2008 (\*)

(inhabitants per km<sup>2</sup>)

EU-27 = 116



© EuroGeographics Association, for the administrative boundaries  
Cartography: Eurostat — GISCO, 03/2011



(\*) Population density is calculated as ratio between (annual average) population and surface (land) area. Land area is a country's total area, excluding area under inland water. Bulgaria, Denmark, Germany, France, Cyprus, Poland and Portugal, total area has been used instead of land area; Poland, by NUTS 2 regions, United Kingdom; 2007.



We need the public to be confident about our ability to manage the subsurface and to feel they can find out information when they need it

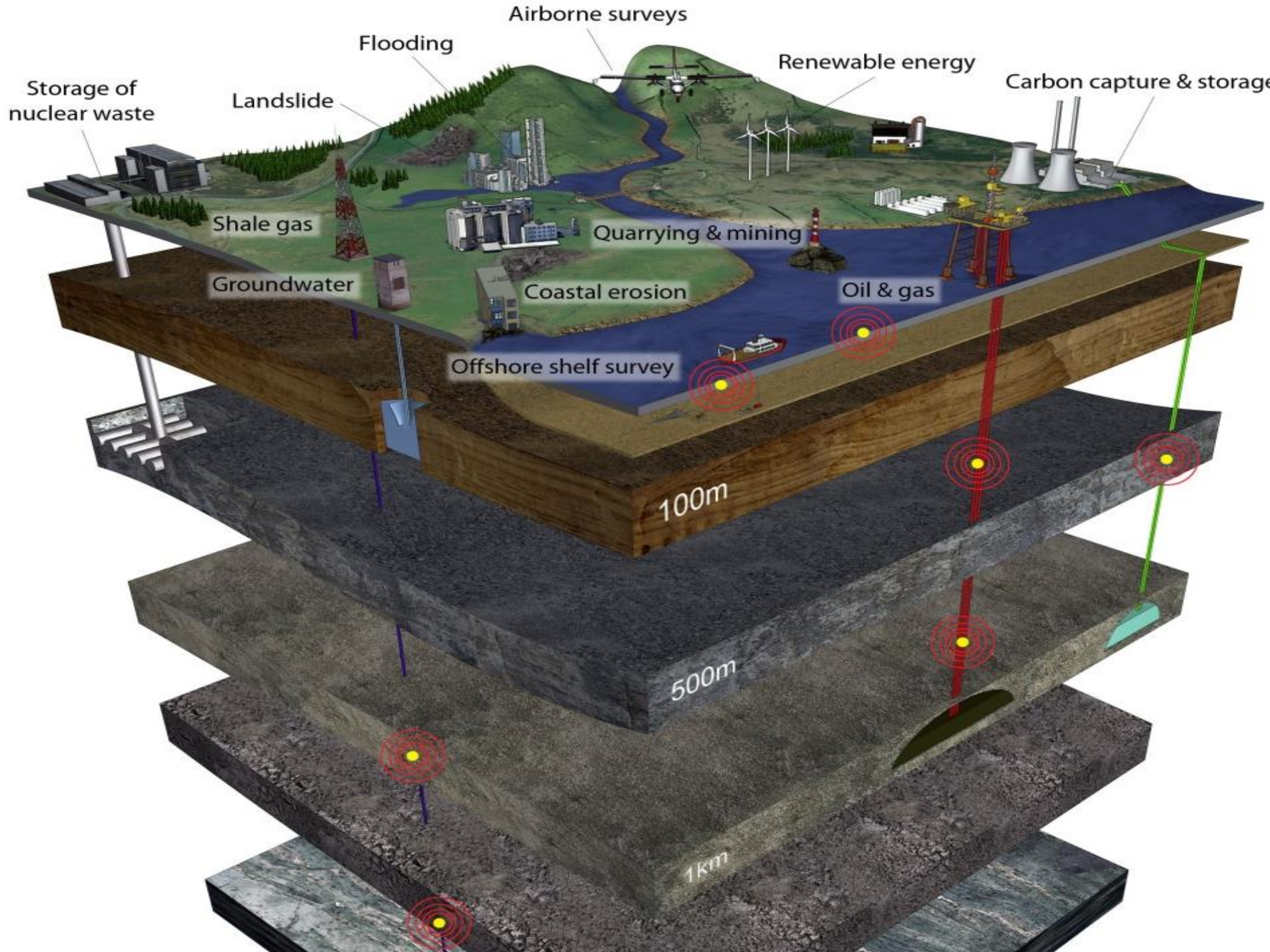


© Mandy Barrow

# Introducing The Energy Test Bed

A unique package of monitoring and research capability at the surface and in the **critical zone** coupled with **deep borehole** monitoring of variables such as pressure, temperature, heat flow, seismicity, tilting, strain accumulation, fluid, rock and mineral chemistry, pH and biological properties.

Initial investment by UK Government through NERC-UK £31 million for two research sites with expected leverage



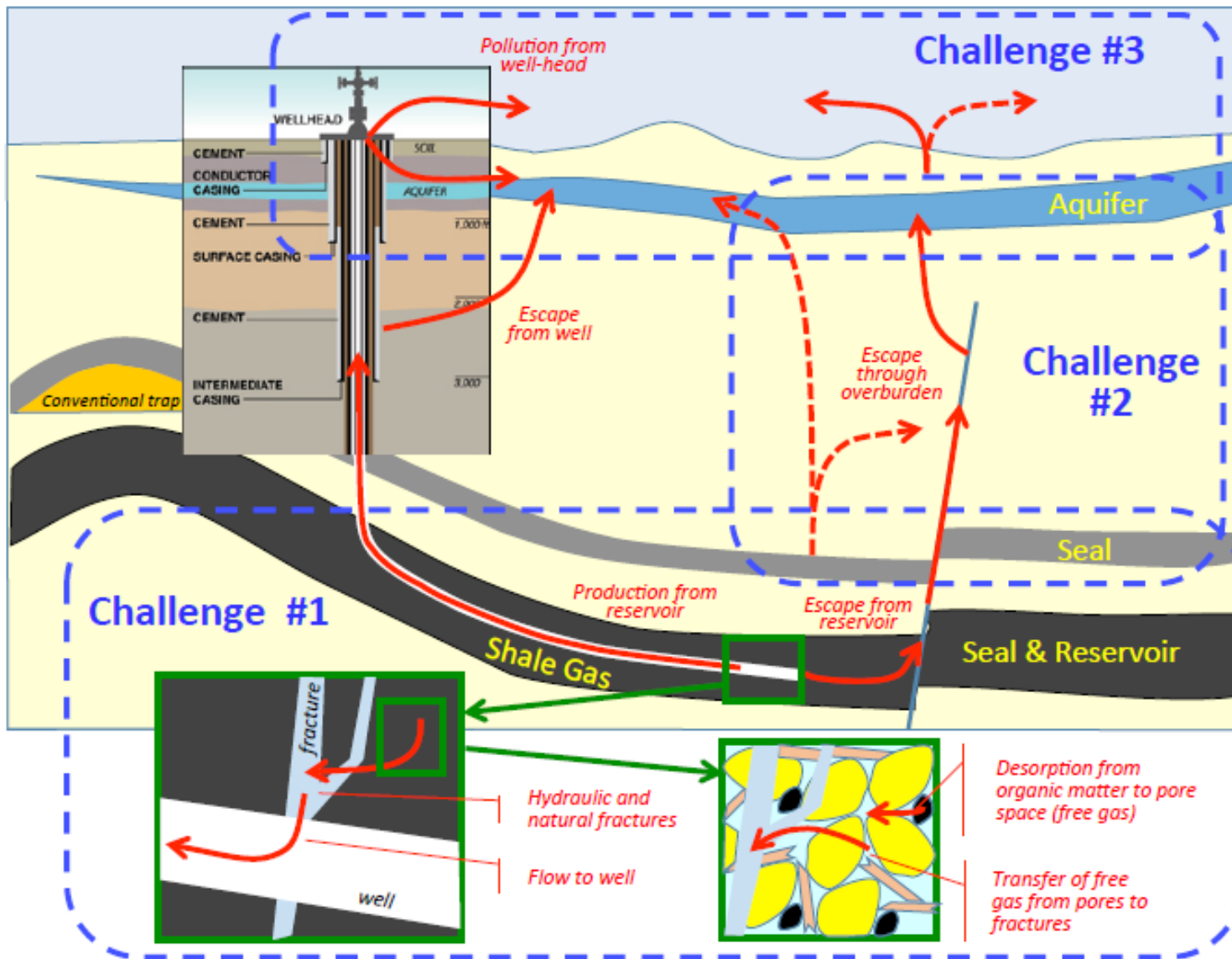
An opportunity to reconnect applied earth science research with discovery science.

Act as a catalyst for industry both onshore and offshore and in the minerals sector to stimulate investment and speed new technology options to commercialisation.

Open industry data to the public and develop a transparent energy and mining industry.

An opportunity to export this technology globally

An opportunity to collaborate scientific globally in sensor technology and scientific application



# Is this an enabler for industry or a safeguard against potential adverse environmental impacts?

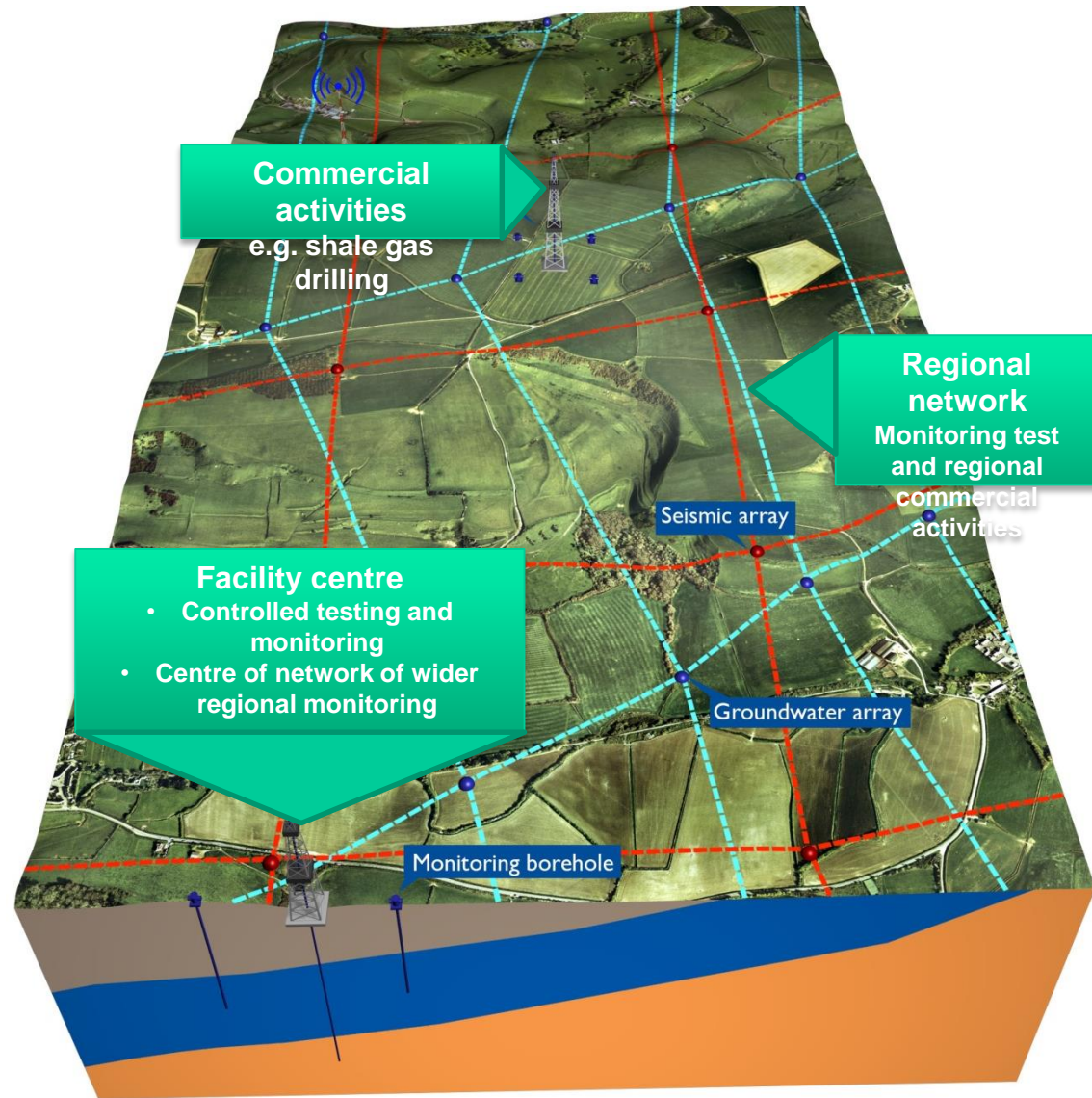
So we have to articulate very carefully why we are spending public money on this research

- key messages are agreed and made clear throughout and critical to supporting project operations, managing stakeholder engagement and mitigating reputational damage.
- activities and outcomes of the research will be communicated, both internally and externally, in an open and transparent manner.
- staff involved in the research provided with the tools and capability to enable them to communicate the research to all stakeholders.

# The first site .....



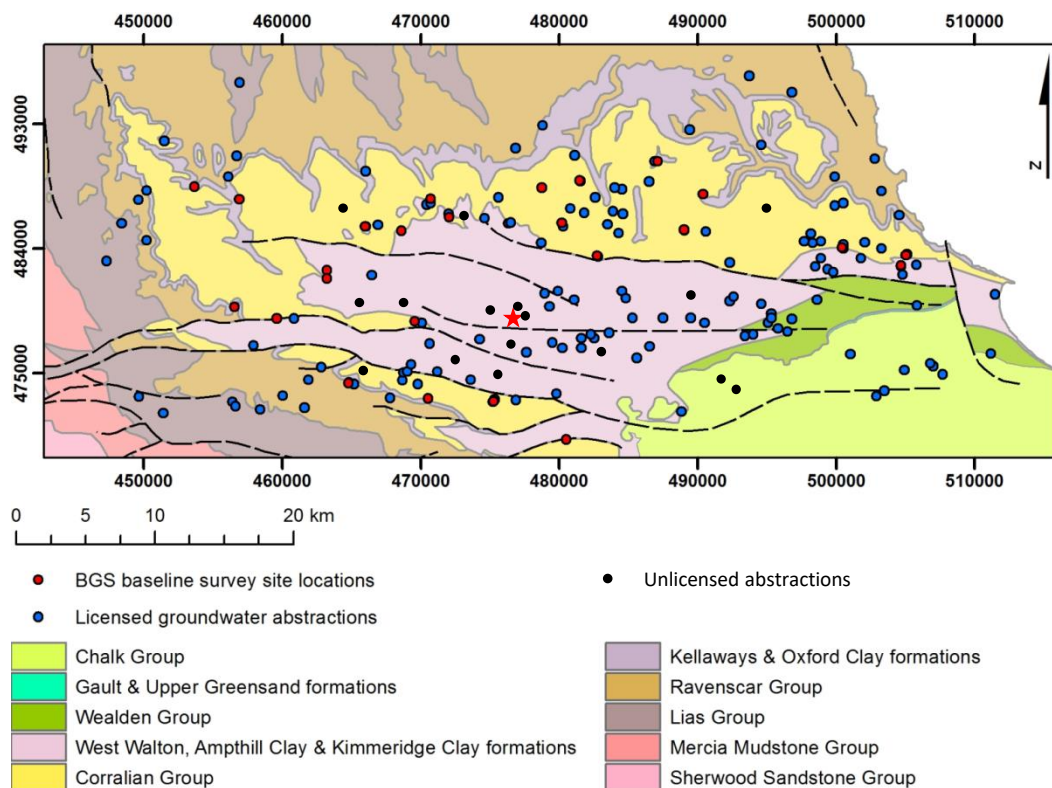
**First site: Thornton**



Combined testing/experiment and monitoring

# Lancs/Yorks water quality monitoring

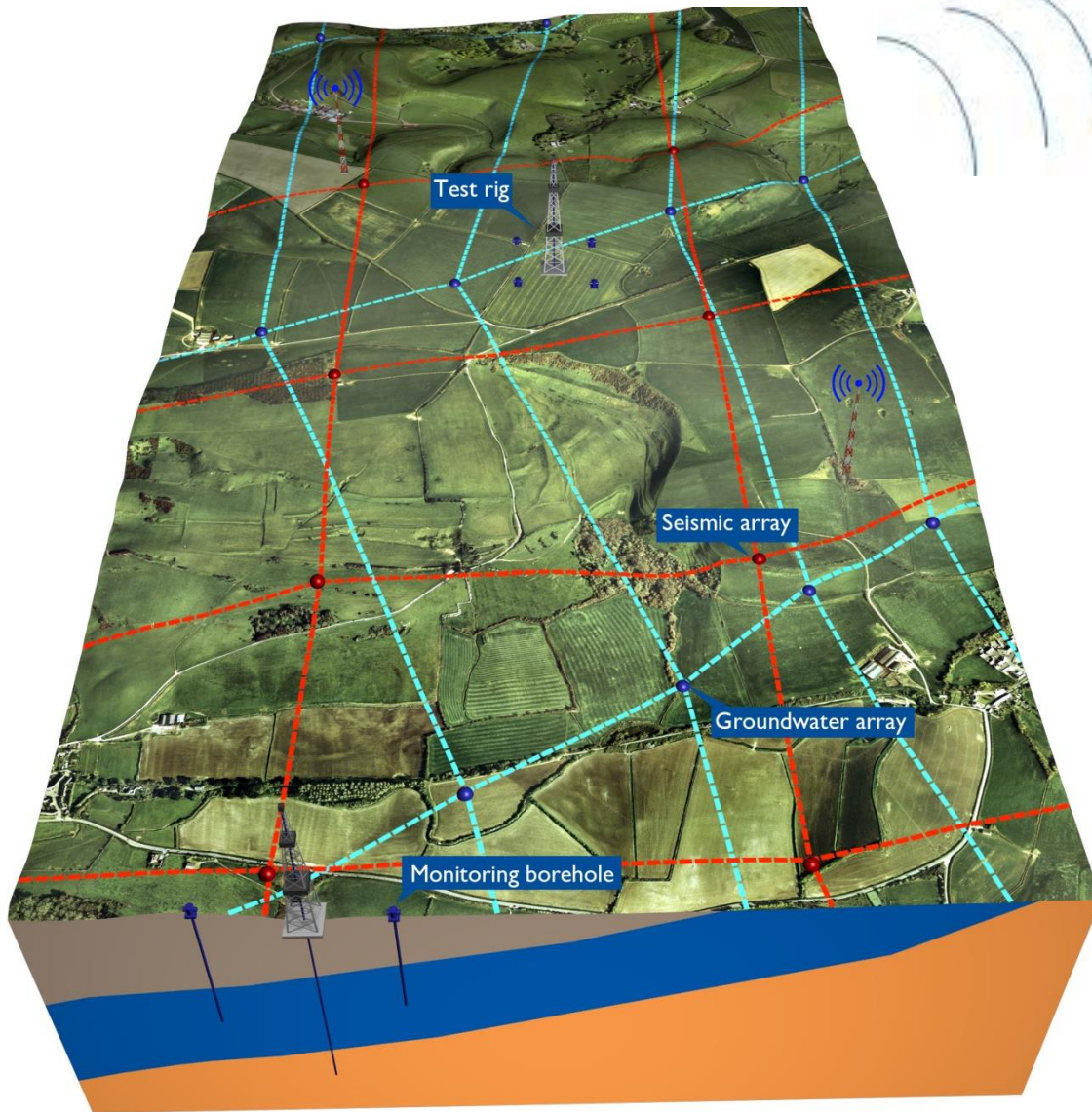
## Vale of Pickering, N. Yorks



- Existing boreholes
  - Public/private water supply boreholes, EA boreholes
- New boreholes
  - 6 x pairs shallow (<40m) and 2 x deep (c 250 m)
  - Third Energy monitoring boreholes?
- Sampling/analysis for:
  - Inorganic and organic chemistry,
  - Dissolved gases (incl. CH<sub>4</sub>, noble gases)
  - Stable isotopes and residence time indicators tracers
  - NORM

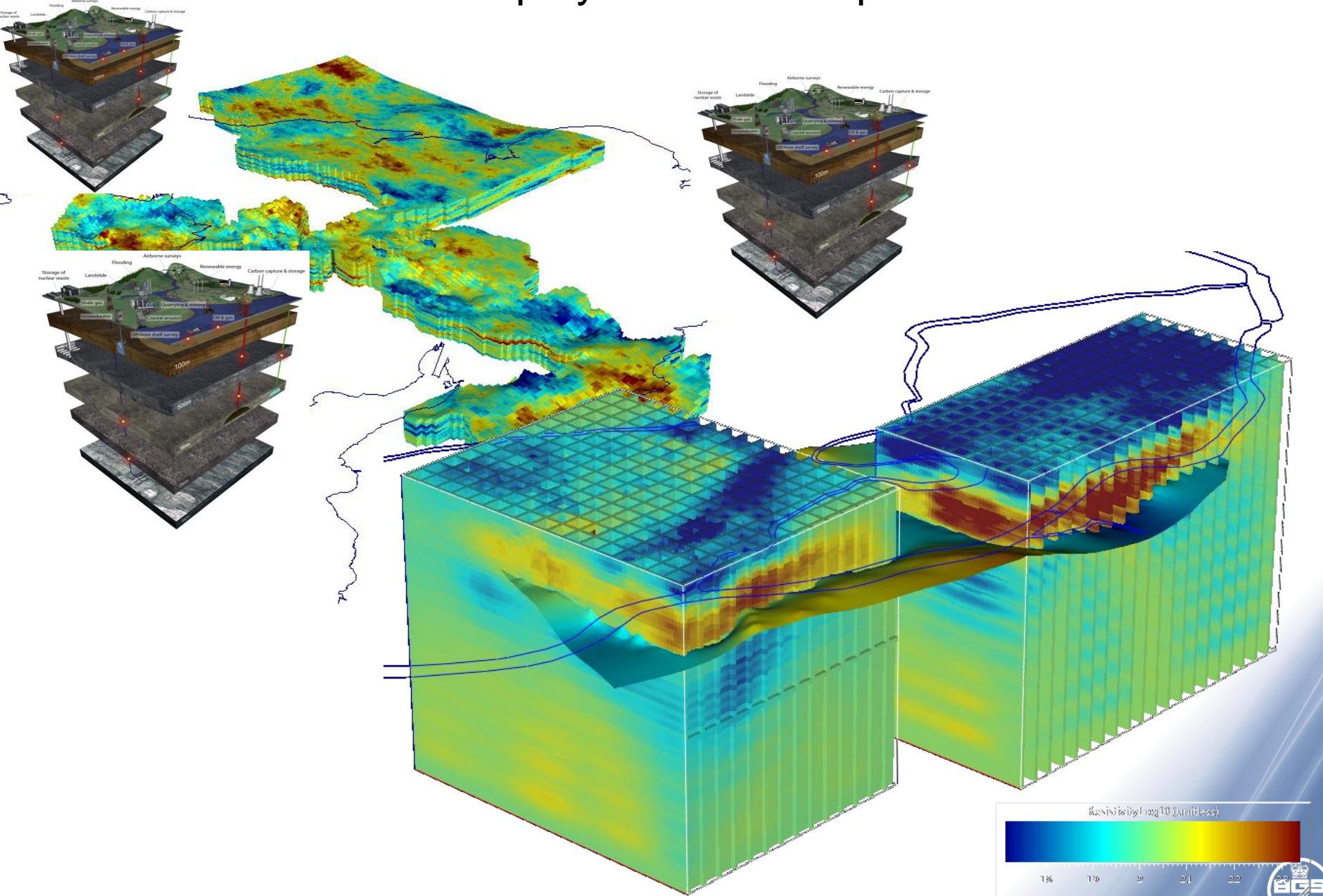


# Communication



Full, open disclosure of all data, often in real time

# Multi-site deployment at multiple scales



# Conclusions

In GeoEnergy and resources in general we work in a controversial space

- We have to articulate the reason for our science
- We have to ensure that the science is given a fair hearing by remaining even-handed

The Energy Test Bed is funding for a 'national facility' with international links and an opportunity to join applied and fundamental science questions

