Autumn Biannual in Sheffield

UKCCS RESEARCH CENTRE

Session F, 12 Sept 2017

Greenhouse Gas Removal

Introduction to GGR programme *Phil Williamson*

Comparative assessment & region-specific optimisation of GGR
Niall MacDowell

Assessing the mitigation deterrence effects of GGR
Nils Markusson

Greenhouse gas removal in the iron and steel industry
Phil Renforth

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Introduction to Greenhouse Gas Removal programme

Phil Williamson

UK Natural Environment Research Council
& University of East Anglia

NERC SCIENCE OF THE ENVIRONMENT

EPSRC Investing in research for discovery and innovation

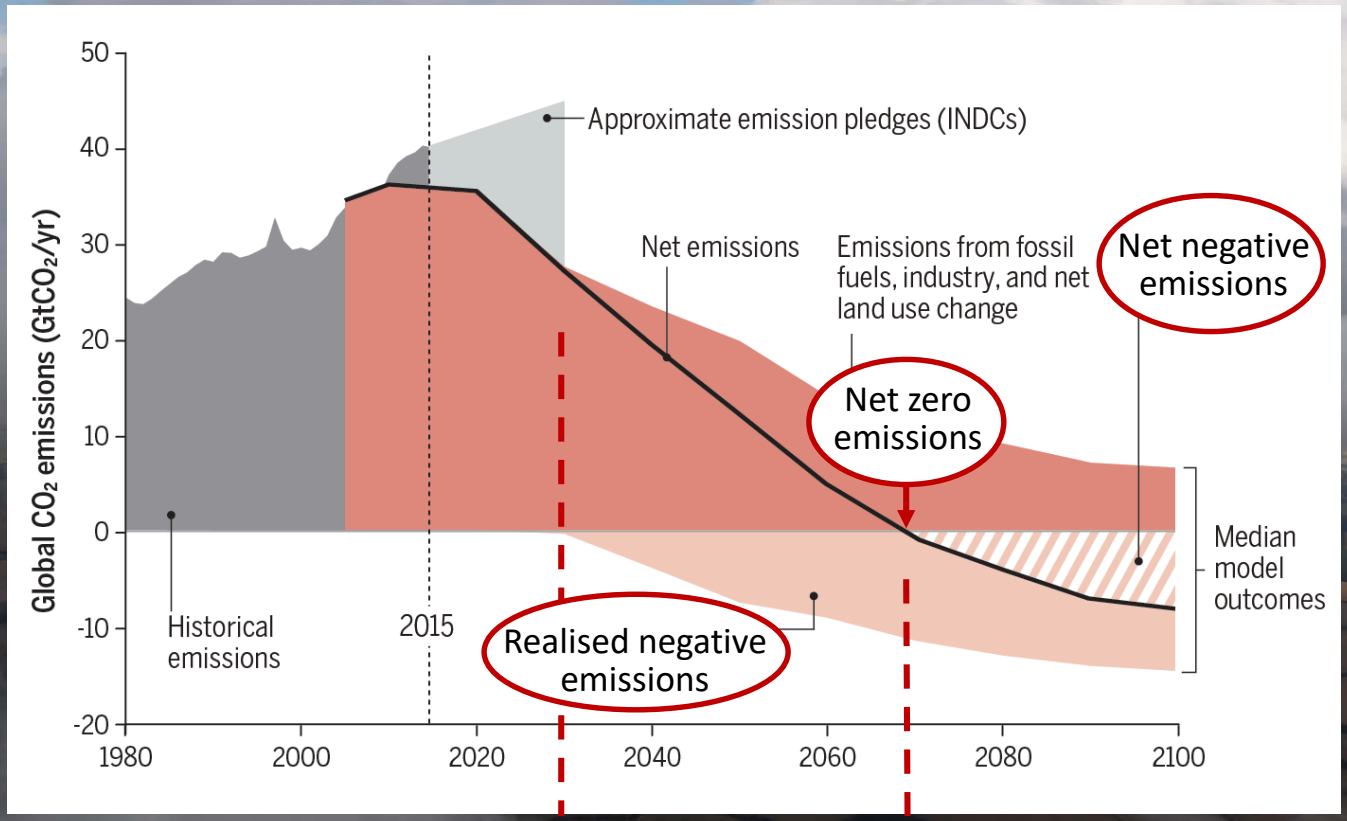
GREENHOUSE GAS REMOVAL RESEARCH PROGRAMME

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

Department for Business, Energy & Industrial Strategy

Rationale for GGR programme

It is near-impossible to meet climate change commitments without 'negative emissions' (= GGR)

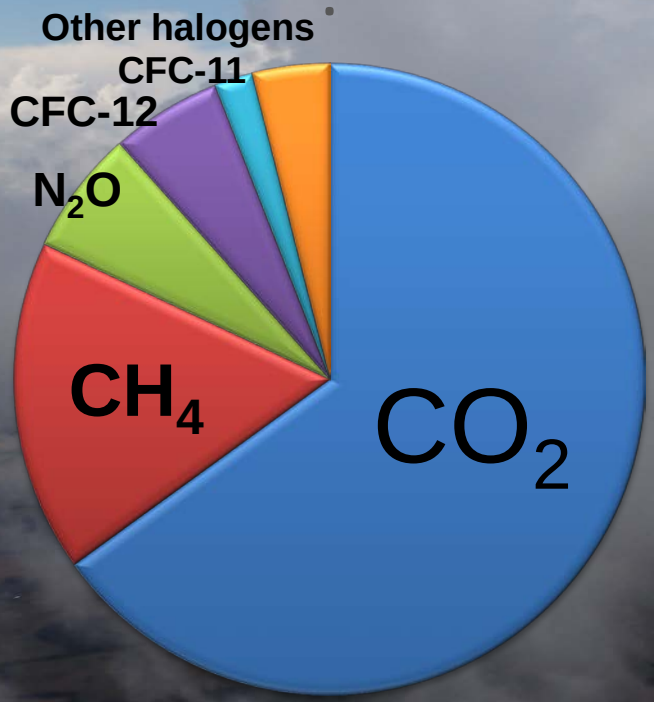


IPCC AR5 scenarios that keep warming below 2°C: Anderson & Peters (2016)

GGR needs to be at Gt scale by ~2030 and achieve net zero emissions by ~2070

Key issues for GGR programme: #1

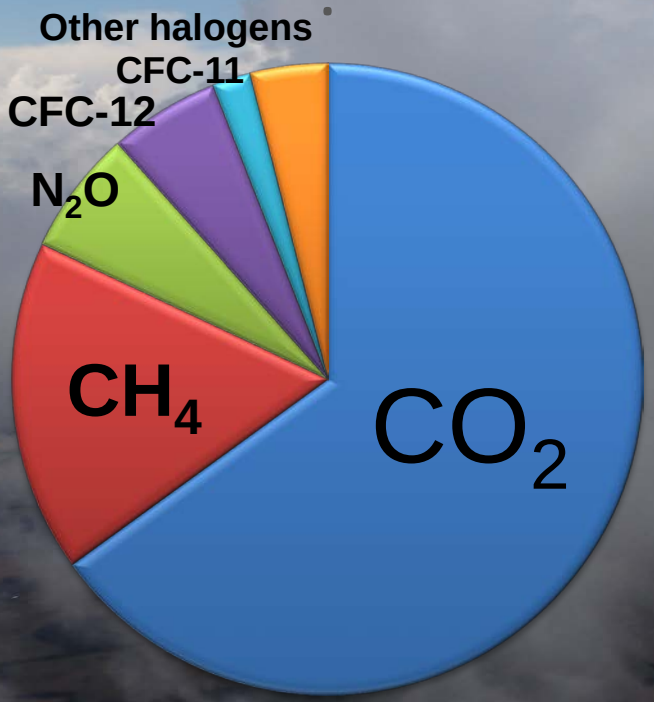
EU -28



There are other gases, not just CO_2, that drive climate change

Key issues for GGR programme: #2

EU -28

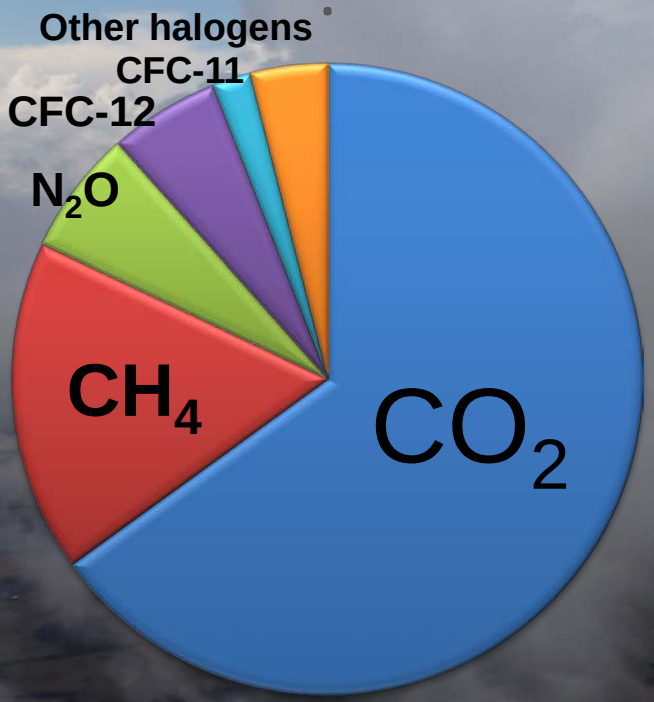


There are other gases, not just CO_2, that drive climate change

IPCC AR4

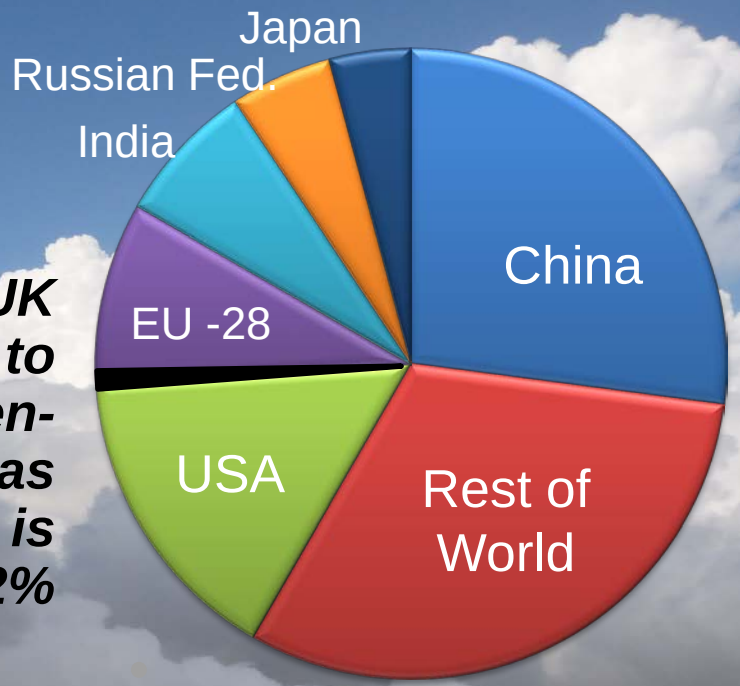
There are many other sources of greenhouse gases, not just fossil-fuel power plants

Key issues for GGR programme: #3



There are other gases, not just CO_2, that drive climate change

The UK contribution to global green-house gas emissions is only ~1.2%

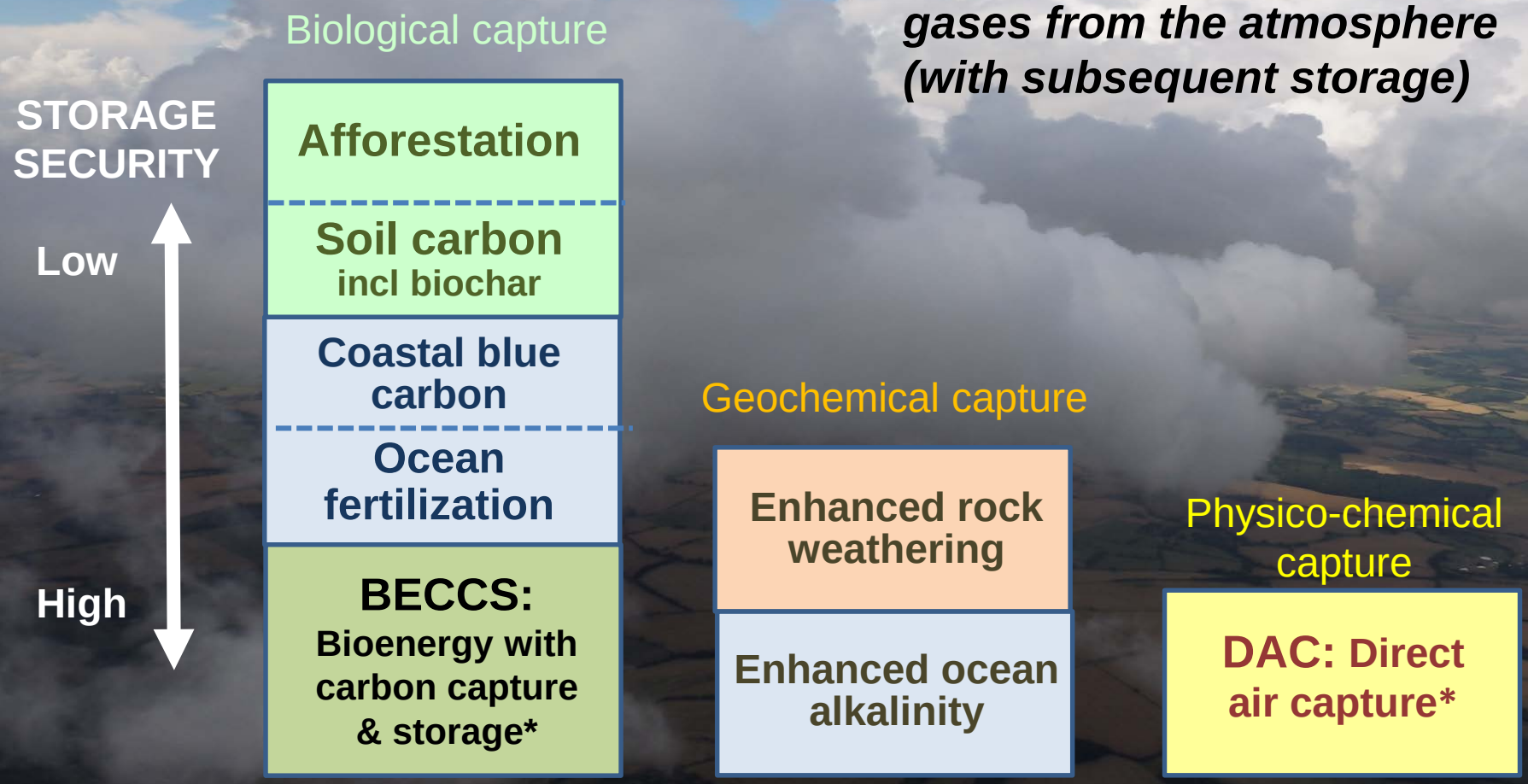


IPCC AR4

There are many other sources of greenhouse gases, not just fossil-fuel power plants

Key issues for GGR programme: #4

There are very many ways of removing greenhouse gases from the atmosphere (with subsequent storage)



** with geological CO_2 sequestration*

Feasibility of GGR:
What are the research issues?

- **Effectiveness** – will a particular technique deliver intended climatic benefits?
- **Scalability** - can the technique be deployed at the scale envisaged? in which countries/regions?
- **Unintended impacts** – for biodiversity/environment, also food and water security
- **Socio-economic consequences -** costs, acceptability and governance
- **Full life cycle analyses** – what are the weakest links?

GGR research programme: four consortium awards

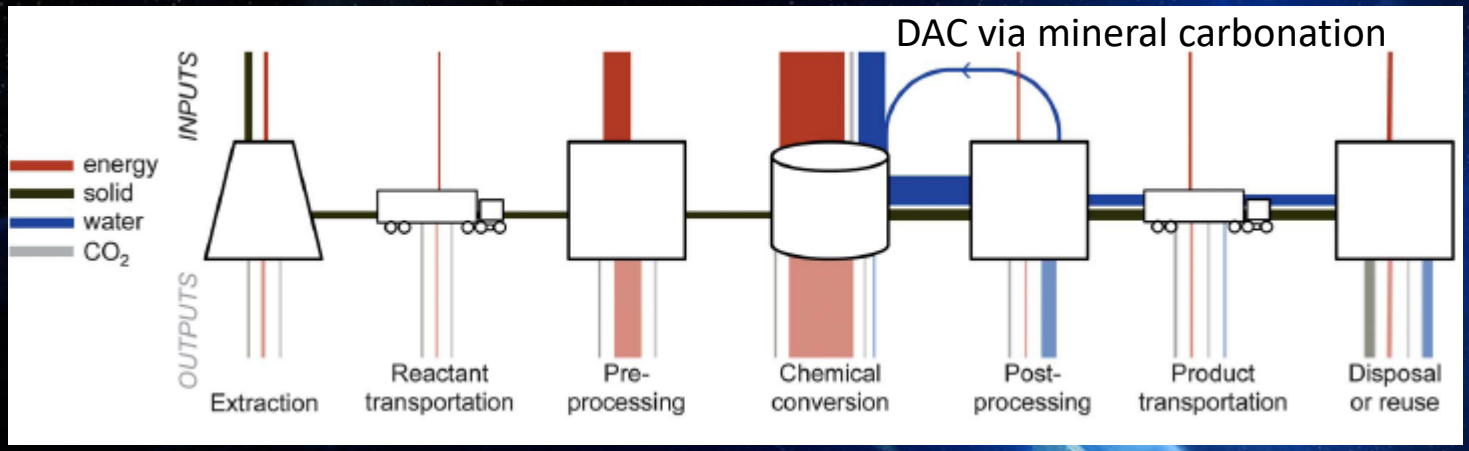
Soils research to deliver greenhouse gas removals and abatement technologies. *Led by Pete Smith (Aberdeen)*
Feasibility of afforestation and biomass energy with carbon capture storage for greenhouse gas removal. *Led by Nem Vaughan (UEA)*
Releasing divalent cations to sequester carbon on land and sea. *Led by Gideon Henderson (Oxford)*
Comparative assessment and region-specific optimisation of greenhouse gas removal. *Led by Niall Mac Dowell (Imperial College)*

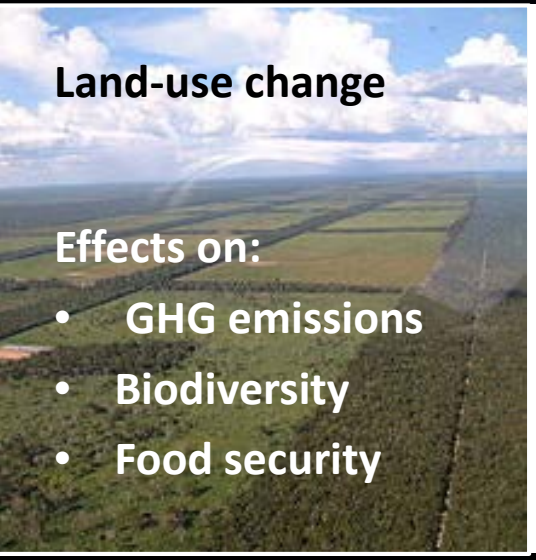
… and seven topic-specific projects

GGR in the land sector - *Jo House (Bristol)*
GGR in the iron and steel industry - *Phil Renforth (Cardiff)*
Co-delivery of food and climate regulation by temperate agroforestry *Martin Lukac (Reading)*
New methodologies for removal of methane from the atmosphere *Euan Nisbet (Royal Holloway)*
Metrics for emission removal limits for nature - *Simon Tett (Edinburgh)*
Harmonising and upgrading GGR consequential life cycle assessment *Pietro Goglio (Cranfield)*
Assessing the mitigation deterrence effects of GGR - *Nils Markusson (Lancaster)*

Life cycle analyses – to identify knowledge gaps & weakest links

DAC via mineral carbonation





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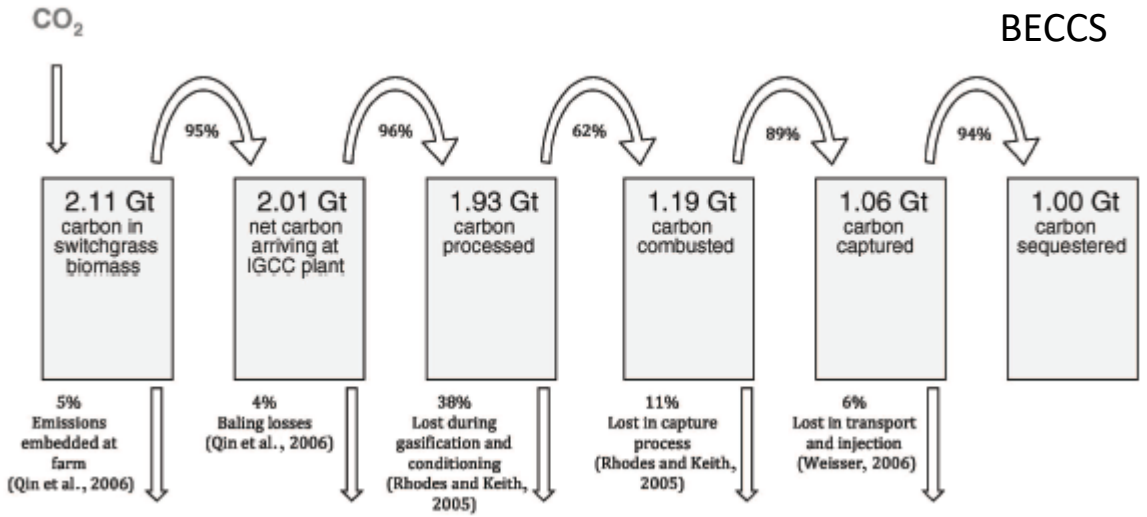

NRC (2015) Carbon dioxide removal and reliable sequestration

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Over to the experts to tell you more…
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