

Cambridge Zero Research Symposium 2

Carbon Capture & Climate Repair: what, where, when, how, by whom and for whom?

Tuesday 8th November, Pavilion Room, Hughes Hall

1.00pm **Lunch**

1.50pm **Keynote: Why do we need more than emissions reduction? And what are the options?**

Shaun Fitzgerald, Director of Research in the Centre for Climate Repair, Department of Engineering

This session will summarize where we are today in terms of potential scenarios going forwards that have been considered by IPCC in AR6. None of them keep the global average below 1.5C. We will therefore explore what we can do to actually remove greenhouse gases from the atmosphere, and the options for potentially reducing the amount of incoming solar energy. These options need more research and development involving different communities, and serious consideration as to how some of the concepts could ever be deployed in a just way.

2.05pm **The way to Net-Zero and Beyond: Understanding Stakeholder Perceptions of Negative Emission Technologies and Practices**

Lucrezia Nava, Visiting Research Associate, Judge Business School

The quantitative potential, effectiveness and impacts of negative emission technologies and practices (NETPs) are not so well understood. NEGEM is an Horizon2020 project funded by the European Union that aims at assessing the realistic potential of NETPs, technologies and practices able to remove CO₂ from the atmosphere, and their contribution to achieving climate neutrality. The preliminary results suggest that stakeholder perceptions and interaction is affected by the frames adopted in the discussion (i.e. based on emotional or on scientific arguments). However, trade-offs and tensions characterize the decisions regarding NETPs, as they produce negative externalities on other important socio-ecological objectives.

2.15pm **Building carbon sequestration solutions through education in the rural Global South**

Kevin Martin, Centre Manager, Digital Education Futures Initiative

Carbon sequestration programmes focused on tree planting in rural communities of the Global South are often limited in scope, transparency, and effectiveness because of inadequate approaches to participant education. An ongoing Design Based Research project, done in partnership with The International Small Group and Tree Planting (TIST) programme, a carbon sequestration and afforestation initiative in East Africa and India, addresses this deficit. This project aligns indigenous traditions of dialogic small group learning with common technological affordances to support a mobile learning platform that equips smallholder farmers with the knowledge to participate in carbon sequestration schemes and join in the global carbon market.

Implications from this research demonstrate how reinterpretations of learning approaches can increase educational access in rural communities of the Global South whilst supporting climate change mitigation.

2.25pm Q&A

2.55pm Keynote: Capture carbon dioxide with batteries and supercapacitors
Alex Forse, University Assistant Professor, Department of Chemistry

Here I will introduce the field of electrochemical carbon dioxide capture, where a battery or supercapacitor is used to capture carbon dioxide while storing energy. This all-electric technology promises to be more efficient than traditional solvent-based carbon capture, but a number of challenges remain. I will review recent progress from our research group on this topic and discuss the outlook for this emerging technology.

3.10pm Thermal effects of CO₂ injection into depleted reservoirs
Lucy Tweed, Postdoctoral Research Associate, Department of Earth Sciences

Depleted oil and gas reservoirs represent voluminous, well-characterised, and potentially low-cost sites for CO₂ sequestration. However, the low pressures within some depleted reservoirs lead to Joule Thomson cooling -- which arises due to the adiabatic expansion of CO₂ into the reservoir. There is concern that this could jeopardise injectivity, through formation of gas hydrates and freezing of pore water, and long-term CO₂ containment, through thermal stress-induced fracturing. I will present work developing a series of reduced thermo-hydrological models of the Joule-Thomson cooling effect in the near wellbore region, with the aim assessing these risks for different reservoir conditions and injection schemes.

3.20pm The "Real Deal": Team formation processes in early-stage climate technology ventures
Ariel de Fauconberg, PhD Candidate, Cambridge Judge Business School

Impact-focused climate technology venture founders engage in team formation processes which involve not only evaluating the skills and professional experience of potential team members, but also the extent to which those individuals affirm identity-based commitments to social and environmental performance. This 18-month ethnographic study examined how entrepreneurs in a Net Zero-focused venture accelerator programme evaluate potential team members' expressed versus actual values to ensure team alignment over time. We find that the process of evaluating and authenticating (mis)alignments takes place first through "gut categorizations" followed by iterative, evidence-based evaluations across three layers of public and private social areas.

3.30pm Q&A

3.55pm Break

4.00pm Keynote: Microalgae for sustainable solutions

Alison Smith, Professor of Plant Sciences, Department of Plant Sciences

There is enormous potential to use microalgae as feedstocks for everything from biofuels to recombinant proteins and high value chemicals, but to implement this technology in a sustainable and economic manner, it will be necessary to optimize many parameters. At the Algal Innovation Centre in Cambridge, we are investigating ways to incorporate algal production into the valorisation of waste streams from agriculture, generating several products including biogas, (more) potable water and biomass for animal feed. The processes can reduce overall energy and input costs and aim to be circular. In parallel, we are developing microalgae as production platforms for high value compounds and as food/feed ingredients with enhanced vitamin content.

4.15pm The right trees in the right place: how does the type of forest restoration impact carbon sequestration?

Charlotte Wheeler, Research Associate, Department of Plant Sciences

The restoration of forest landscapes is widely seen as a means to help mitigate the effects of climate change, with ambitious targets for restoration globally, and many countries including restoration in their plans to reach net zero. However, forest restoration can take many forms each with different carbon sequestration outcomes. Here we discuss the different forms of forest restoration available, and how they influence carbon sequestration.

4.25pm Innovative approaches to sustainable land use in Øvre Dividal National Park, Norway

Olga Tutubalina, Royal Society Wolfson Visiting Fellow, Scott Polar Research Institute
Sophie Weeks, Vice President, Polar Educators International

Biodiversity and carbon sequestration in ecosystems, as well as human capital (enabled by education and capacity building for all ages) are some of the most precious resources for the future. Øvre Dividal is a well-established 750 sq.km national park in arctic Norway. It protects significant ecosystems and cultural heritage and has multiple and diverse land users. We present a pre-project, designed as a collaborative study with multiple stakeholders through co-production of knowledge and aimed to develop a new scientific understanding of how people, animals, vegetation and technological developments interact in the context of climate change.

4.35pm Q&A

5.05pm Drinks Reception

6.00pm End