

Solving major societal crises through cross disciplinary actions – the example of capturing, storing and utilizing carbon

A reading and discussion-based PhD course

Date and time:

Starting date: 23. October, 2024, 13:00-16:00 - One session each Wednesday afternoon to follow

8 sessions total

Description

Society faces several major challenges related to climate, biodiversity, pandemics, food supply and security. The solutions to these ‘wicked problems’ are far from trivial and involve a complex mix and interactions of knowledge from many different disciplines, spanning from scientific and technological to economic, regulatory and public policy intervention, humanitarian and societal understanding.

Traditionally, universities are organized around disciplines giving students and candidates a strong and deep understanding of a particular field, while often overlooking cross-disciplinary understanding and solutions.

The Green Solution Centre GSC at UCPH is focused on solutions to major societal challenges and is establishing the interdisciplinary research and teaching activities needed to unfold a comprehensive understanding of such challenges. Scientists and students from UCPH’s 6 faculties and 4x departments collaborate to provide a holistic understanding and viable solutions.

In this PhD course we will focus on the climate crisis as an example of such a major societal challenge. The course aims to demonstrate and discuss how solutions to this crisis depend on a fundamental shift in our approach to the use and management of carbon in society, and how this shift is dependent on inputs and understanding of basically every scientific discipline at the university.

For many decades we have used fossil carbon to gain energy, releasing carbon from deep geological deposits into the atmosphere as CO₂. As a result, the Earth’s climate is changing drastically, with a multitude of severe consequences for human life on Earth. The solution is simple in theory: stop emissions of fossil CO₂ into the atmosphere and reverse the carbon flow by reclaiming CO₂ from the atmosphere to store it.

But as simple in theory, as complicated in practice. The society will have to reduce the use of fossil carbon drastically by transforming energy supply to renewables, move from linear to circular thinking in carbon use, develop technologies to capture and store CO₂, develop alternative ways to provide the carbon needed for materials and chemicals based on atmospheric carbon capture, ensure coordination and collaboration across carbon handling sectors such as our food production. And we have to develop laws, markets and regulatory instruments concerning CO₂ to facilitate this transition, change human behavior, ensure

public involvement, ownership and acceptance of solutions. A complex and truly interdisciplinary mix of efforts.

This PhD course will cover all the diverse aspects of the carbon problem and its solutions as part of the climate crisis. The course is therefore looking for PhD students from all scientific disciplines with an interest in solutions to major societal crises. Because of the breadth and complexity of the climate problem, no student will be familiar with all aspects – all students will have a “home turf” as well as areas of limited knowledge and understanding. This is the intention. The course will introduce all the scientific directions, allowing everyone with a keen interest in the field to participate, and provide the participants with a deeper understanding of both the technological and societal/humanitarian aspects.

Furthermore, tackling the climate crisis requires collaboration with civil society actors. Therefore, in each session, we will also host a guest lecturer from societal entities, who will provide an “on-the-ground” perspective on the discussion topic, together with the respective faculty member(s).

Learning outcomes

Knowledge:

A student who has met the objectives of the course will be able to

1. Understand how the climate crisis is linked to the societal development and especially the use and management of carbon.
2. Understand the fundamentals of the global carbon cycle”
3. Understand how solutions to the climate crisis requires a fundamental change in use and management of carbon and how this may interact and compete with biological carbon and food production and biodiversity.
4. Understand how solutions to the climate crisis requires a systemic and holistic approach to energy and consumption and a move from linear to circular thinking.
5. Understand how solutions are dependent on societal and humanitarian interactions supporting economic incentives, governmental regulations and laws to manage carbon, change in citizen behavior, democratic processes to engagement and ownership and actions to protect the environment and biodiversity.
6. Understand the interfaces between academic work and civil-society actors, including how the two can jointly contribute to solving the above-mentioned global challenges

Skills:

A student who has met the objectives of the course will be able to

1. Explain how climate change and the solutions to the climate crisis relates to the use and management of carbon, and how a switch in energy production/consumption and the complex biological carbon production and land use play significant roles in the climate solutions.
2. Explain how a carbon neutral society leads to competition for carbon across sectors and uses, exploration and competition for land and requires societal prioritizations.
3. Explain how carbon neutrality requires societal solutions through laws, regulatory instruments, the establishment of a coordinated carbon market and democratic participation and decision making.

4. Be able to engage in the public debate about the importance of societal and humanitarian interaction in the development of solutions to complex societal challenges.

Competencies:

A student who has met the objectives of the course will be able to

1. Competently outline and discuss the complex challenge and solution of carbon management in the climate crisis and the need for technological as well as societal and humanitarian approaches in developing solutions

Course form and activities

To cover a wide range of academic fields and knowledge, all faculties of UCPH are represented in this reading and discussion-based course. Each UCPH lecturer selects readings on how academic knowledge can be translated into understanding and acting to the carbon-driven climatic challenges we currently face and the solutions needed to counteract them. The lecturer will facilitate the session, and the course participants will have read and reflected on the paper beforehand. Each session will be facilitated by an academic host supported by a civil-society actor of relevance in each session. Each UCPH lecturer and each civil society actor prepares key questions for the readings, which the students have thought about/prepared answers to for beforehand. By having an academic host and a civil-society actor in each session, we are going beyond a purely academic discussion and ask what we can do to transition towards a more socio-ecological just future.

ETCS credits: 3

[Please register here](#) before 27th September, 2024.

Teachers:

- [Dr. Claus Beier](#), Professor, Department for Geosciences and Natural Resource Management (SCIENCE)
- [Dr. Emil Engelund Thybring](#), associate Professor, Department for Geosciences and Natural Resource Management (SCIENCE)
- [Dr. Niclas Scott Bentsen](#), associate Professor, Department for Geosciences and Natural Resource Management (SCIENCE)
- [Dr. Dorette Müller-Stöver](#), associate Professor, Department of Plant and Environmental Sciences (SCIENCE)
- [Dr. Kresten Anderskov](#), associate Professor, Department for Geosciences and Natural Resource Management (SCIENCE)
- [Dr. Jiwoong Lee](#), associate Professor, Department for Chemistry (SCIENCE)
- [Dr. Henrik Vejre](#), Professor, Department for Geosciences and Natural Resource Management (SCIENCE)
- [Dr. Lone Søderkvist Kristensen](#), Professor, Department for Geosciences and Natural Resource Management (SCIENCE)
- [Dr. Lars Gårn Hansen](#), Professor, Department of Food and Resource Economics, (SCIENCE)
- [Dr. Peter Kjær Kruse-Andersen](#), Assistant professor, Department of Economics (SAMF)
- [Dr. Simon Westergaard Lex](#), associate professor, Department of Anthropology, (SAMF)

- [Dr. Lars Tønder](#), Professor, Department of Political Science (SAMF)
- [Dr. Beatriz Martinez Romera](#), associate professor, Centre for Climate Change Law and Governance (JUR)

Course Organisers:

- [Dr. Claus Beier](#), Professor, Department for Geosciences and Natural Resource Management (SCIENCE)

The course is organized by the [GSC thematic solution CCUS](#)

Eligibility

The course will be open to 24 participants and we aim for representation of PhD-students across all six UCPH Faculties. No qualification is required beyond an interest in the topics and commitment to meaningful participation. Participants are expected to write a brief text (max 500 words) explaining their motivation to join the course and how the topic might come to bear on their academic activities (as far as possible). UCPH PhD candidates receive priority. Seats to PhDs from other Danish universities will be allocated according to applicable rules. PhD candidates have first priority but applications from other (non-PhD) participants will be considered, space pending.

Regular seats: 24

Course fee: None

Teaching language: English

Exam form: All participants submit an essay of 1500-2000 words summarizing and reflecting on their learning outcomes and the applicability to their future research.

Grading scale: Pass / fail

How to prepare for each session

Before each session, students are expected to:

- read the scientific paper(s) / all materials assigned by the lecturers
- write and submit in advance ½ - 2 page(s) summarizing the paper(s) for the session
- reflect on the questions posed by the lecturer and the civil society actor

Workload

Preparatory readings	42 hours
Total course hours/presence	21 hours
Field trip	7 hours
Written preparation	12 hours
Total	82 hours

Programme:

Session	Topic & session titles
<p>1</p> <p>23. October</p> <p>Responsible Claus Beier (SCI)</p> <p>External e.g. Karsten Capion CONCITO</p>	<p>Basics: Solving the carbon and climate crises – a broad interdisciplinary societal challenge</p> <ul style="list-style-type: none"> • Sustainability and planetary boundaries • The carbon cycle and the role of carbon in a societal and climatic context – the problem and the principles and dilemmas of solution • Technological and nature based carbon solutions • CCUS and Societal transformations - carbon, energy, food and life styles • The role of politicians • Wicked problems and inter- and cross disciplinarity
<p>2</p> <p>30. October</p> <p>Responsible Emil Thybring, Niclas Scott Bentsen, Dorette Müller-Stöver</p> <p>External e.g. Jesper Ahrenfeldt (Stiesdal - biochar)</p>	<p>Challenge 1: Nature-based solutions to capture and store carbon</p> <ul style="list-style-type: none"> • The global carbon cycles, the greenhouse gas problem and the role of biology • Nature based solutions – carbon farming to reclaim CO₂ from the atmosphere for storage and utilization of carbon. • Carbon storage in nature – plants, soils, sediments (e.g. forestry, soil carbon, biochar). • Use of bioresources to replace fossil materials and store carbon • Environmental aspects and biodiversity
<p>3</p> <p>6. November</p> <p>Responsible Kresten Andershou & Jiwong Lee</p> <p>External e.g. Morten Stage (Total & INNOCCUS)</p>	<p>Challenge 2: Technological solutions to replace fossils, reduce CO₂ emissions and store carbon</p> <ul style="list-style-type: none"> • Technological CO₂ capture from hard-to-abate industries • Geological storage of carbon (CCS) • Technological CO₂ capture from the atmosphere (DAC) • Renewable technological alternatives to utilizing fossil carbon (CCU) • Need for infrastructure, energy demands and sector coupling • Environmental impacts of CCUS
<p>5</p> <p>13. November</p> <p>Responsible: Lars Gårn Hansen, Peter Kjær Kruse-Andersen</p>	<p>Challenge 3: Incentivizing the change</p> <ul style="list-style-type: none"> • Economy as a driver for investments and behavior • An economy-wide perspective on carbon pricing and the green transition. • Carbon leakage concerns. • Should we subsidize DAC, CCS, and CCUS?

<p>External e.g. Simon Bager, Klimate.co Asger Strange Olsen, IWC Lars Villadsgaard Toft, SEGES</p>	
<p>4</p> <p>20. November FULL DAY</p> <p>Responsible Henrik Vejre, Lone Søderkvist</p> <p>External e.g. Municipal planner at field site</p>	<p>Challenge 4: Land use planning for green transition (field trip)</p> <ul style="list-style-type: none"> • The need for multi purpose land strategies and planning • Land competition with relevance for carbon balances; food, biomass, rewetting and biodiversity • The need for multipurpose spatial planning including infrastructure needs
<p>6</p> <p>27. November</p> <p>Responsible Simon Lex, Lars Tønder</p> <p>External e.g. demokrati-aktørerne (Teknologirådet/DeltagerDanmark eller We Do Democracy)</p>	<p>Challenge 5: Democracy and governance</p> <ul style="list-style-type: none"> • Democratic models for citizen engagement • Multilevel governance and organization • The role of time, scale and resources • Community building and democratic citizenship • Creating ownership and cross-cutting collaboration • Reasons for opposition and conflict • Inclusion and diversity
<p>7</p> <p>4. December</p> <p>Responsible Lars Tønder, Beatriz Romera, Simon Lex</p> <p>External e.g. ??</p>	<p>Challenge 6: Ensuring a just transitions</p> <ul style="list-style-type: none"> • Legal and policy frameworks for global environmental justice • Representation and Legitimacy • Distributive and restorative justice • Processual and recognition justice
<p>8</p> <p>11. December</p> <p>Responsible Claus Beier</p>	<p>Summing up and discussing key points and consequences</p> <ul style="list-style-type: none"> • Panel presentations and discussions • Revisiting key points • Summing up

Details

Time: Wednesdays at 13.00-16.00 from October 23rd– December 11th 2024.

Place: Multiple UCPH campuses

Organizer: Green Solution Centre – CCUS thematic initiative. Coordinator/responsible: Claus Beier, IGN. cbe@ign.ku.dk

Session	Topic & session titles
28. October, 13.00-16.00 Lecturer: Claus Beier (SCI)	The Basics about climate and carbon: Solving the carbon and climate crises – a broad interdisciplinary societal challenge
30. October – 13.00-16.00 Lecturers: Emil Thybring, Niclas Scott Bentsen, Dorette Müller-Stöver	Challenge 1: Nature-based solutions to capture and store carbon
6. November, 13.00-16.00 Lecturers: Kresten Andershou & Jiwong Lee	Challenge 2: Technological solutions to replace fossils, reduce CO2 emissions and store carbon
13. November, 13.00-16.00 Lecturers: Lars Gårn Hansen, Peter Kjær Kruse-Andersen	Challenge 3: Incentivizing the change
20. November, 9.00-16.00 Lecturers: Henrik Vejre, Lone Søderkvist	Challenge 4: Land use planning for green transition (field trip)
27. November, 13.00-16.00 Lecturers: Simon Lex, Lars Tønder	Challenge 5: Democracy and governance
4. December, 13.00-16.00 Lecturers: Lars Tønder, Beatriz Romera, Simon Lex	Challenge 6: Ensuring just transitions
11. December, 13.00-16.00 Lecturer: Claus Beier	Summing up: Key learning points for handling the climate crisis, and general learnings for major societal challenges