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Researching and Shaping Climate Futures

J. Baehr, J. Behrens, L. Borchert, M. Brüggemann, L. Kutzbach, K. Linscott, A. Oberg

1st course day – April 9th, 2026

Moderator: Lars Kutzbach

Course coordination: Michael Brüggemann, Lars Kutzbach, Kat Linscott
Contact: Kat Linscott (katherine.linscott@studium.uni-hamburg.de)

Today's Schedule

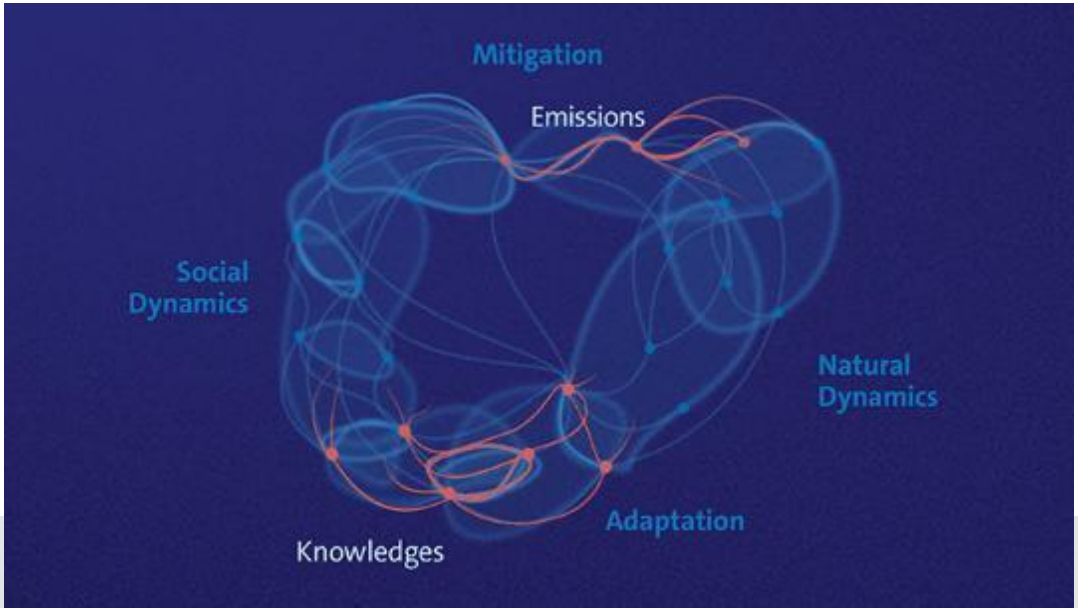
- Introduction to the course (L. Kutzbach), 35 min
  - Idea, overarching question and aims of the course
  - Learning objectives and course activities
  - Requirements to pass the course
  - Preliminary session plan
- Introduction to the course blog (J. Behrens), 20 min
- Introduction of lecturers and students (10 min)
- Introduction to climate futures (L. Kutzbach), 20 min
- Homework (A. Oberg), 5 min

Introduction to the course

Lars Kutzbach

Idea of the course

- Course started in 2024 based on previous course "**Uncertain Climate Futures**"
- Combines previous focus on **uncertainty** with the new topic of **climate futures**
- Aims to connect students of **M.Sc. ICSS** early with the research program of the **Cluster of Excellence Climate, Climate Change, and Society (CLICCS)**



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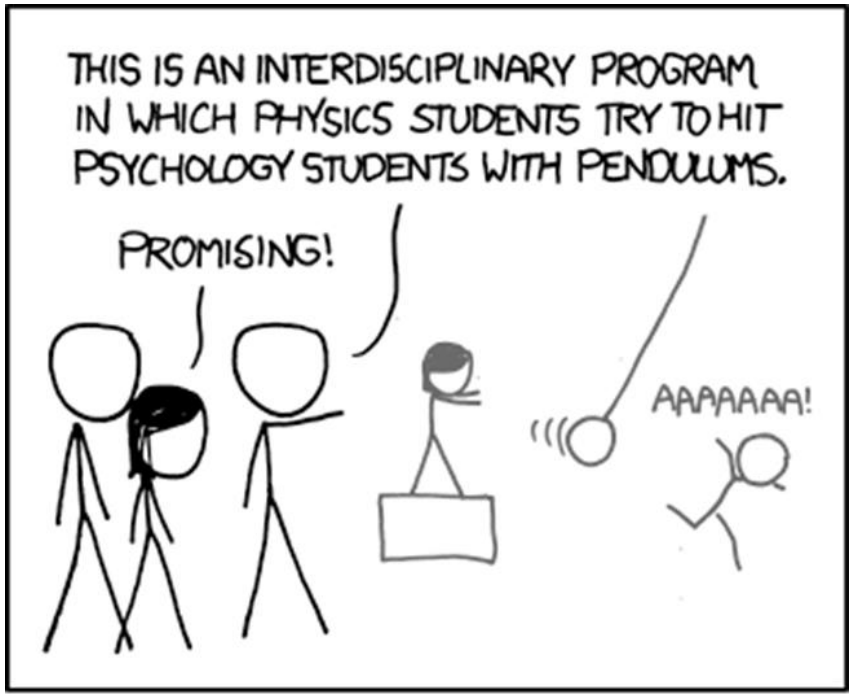
An experiment in interdisciplinary education



Source: http://imgs.xkcd.com/comics/interdisciplinary.png

- Team-taught by six lecturers from six different academic fields.
- The course is a 'live'-experiment in interdisciplinary teaching and learning.
- Controversy and some confusion are expectable, and the experiment outcomes are uncertain.

Overarching question for the course

How can we research and shape the complex web of natural and societal dynamics constituting climate futures?

Who is “we”?

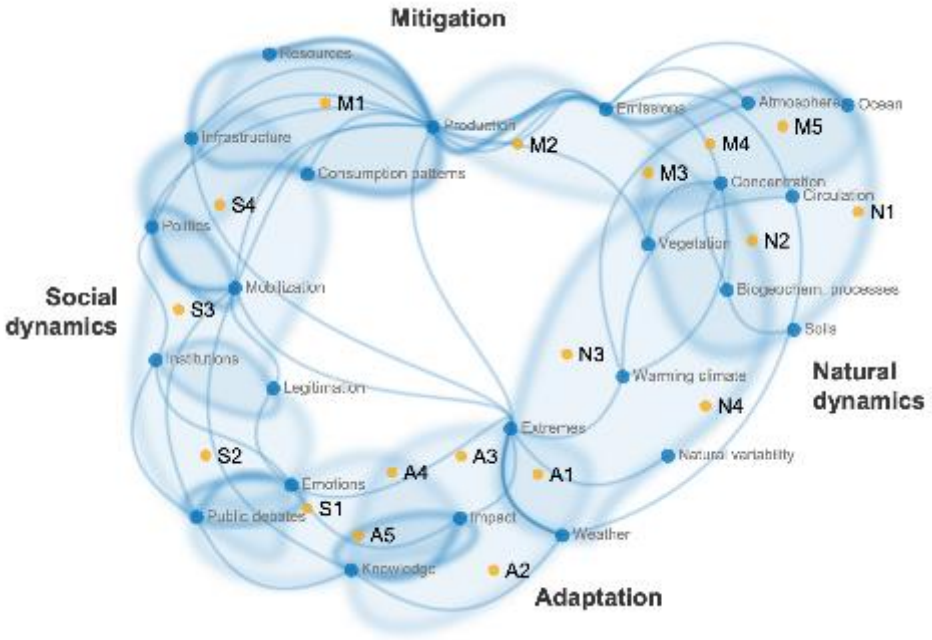
→ For the time being, individuals or groups within the extended CLICCS and SICCS community.

Overarching aims of the course

(1) Understanding **interactions**, **feedbacks**, and **(broken) couplings** constituting climate futures

(2) Reflecting our **roles** and aims in researching and shaping climate futures

➢ Case study:
Cluster of Excellence
„Climate, Climate Change, and Society (**CLICCS**)“



Learning objectives: knowledge

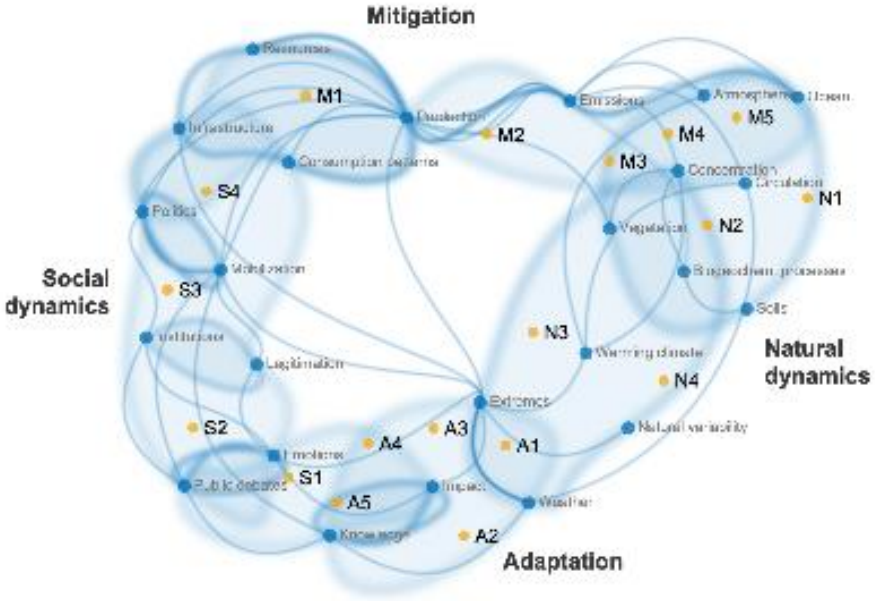
Students and lecturers will

- Update their understanding of the state of the art in integrated climate sciences and will be aware of diverse approaches to researching and shaping climate futures.
- Evaluate the complex interactions, feedbacks and (broken) couplings that drive the dynamics of the climate system and social systems.
- Discuss and understand how to think about possible, plausible and desired climate futures.
- Discuss the variety of approaches, perspectives and role understandings of scientists in integrated climate system sciences.
- Explore what YOU - the young generation of climate scientists - find interesting and relevant within integrated climate sciences.

Learning objectives: interdisciplinarity

Students and lecturers should

- gain a **more integrated view** of the changing climate system and its relations with society;
- Identify, articulate and reflect challenges that occur when working **across disciplines**.



Learning objectives: skills

Due to your interactive participation, you will

- gain empathy, reflection, and discussion skills (also on controversial questions);
- engage in self-organized, self-responsible, and creative work as individuals or in teams;
- document the processes, progresses, and results of your study and learning;
- work with scientific texts and write, present, and discuss your insights;
- get insights in how to organize a scientific event;
- learn how to communicate scientific knowledge in a condensed form on a research poster.

Course activities

- Input presentations by CLICCS researchers (and Kat)
- Literature research and reading
- Discussions in the class and on the course blog
- Role-plays
- Poster design – form and content
- Poster session event

- For more information see: https://uncertain2degrees.blogs.uni-hamburg.de/

Requirements to pass the course and grading

- **Presence and active oral participation.** Do not miss more than two classes.
- Conduct all **homework exercises.**
- **Participate in role-playing.**
- Contribute to **poster session self-organised by students**.
- Prepare a **research poster on the overarching course question** and give feedback to poster drafts of your fellow students.
- **The poster will be graded for your final grade of this course (overall class participation +/- 0.3).** More details on the grading criteria will follow on April 16th.

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Selection of 3 poster awards

- 2 awards for the 2 top posters with the **best grades from group of lecturers**.
- 1 award for the poster winning the **popular vote**

➢ The 3 poster award winners are invited to the **CLICCS Retreat on September 30th to October 2nd, 2026**, in Bremen, and will present their posters there.

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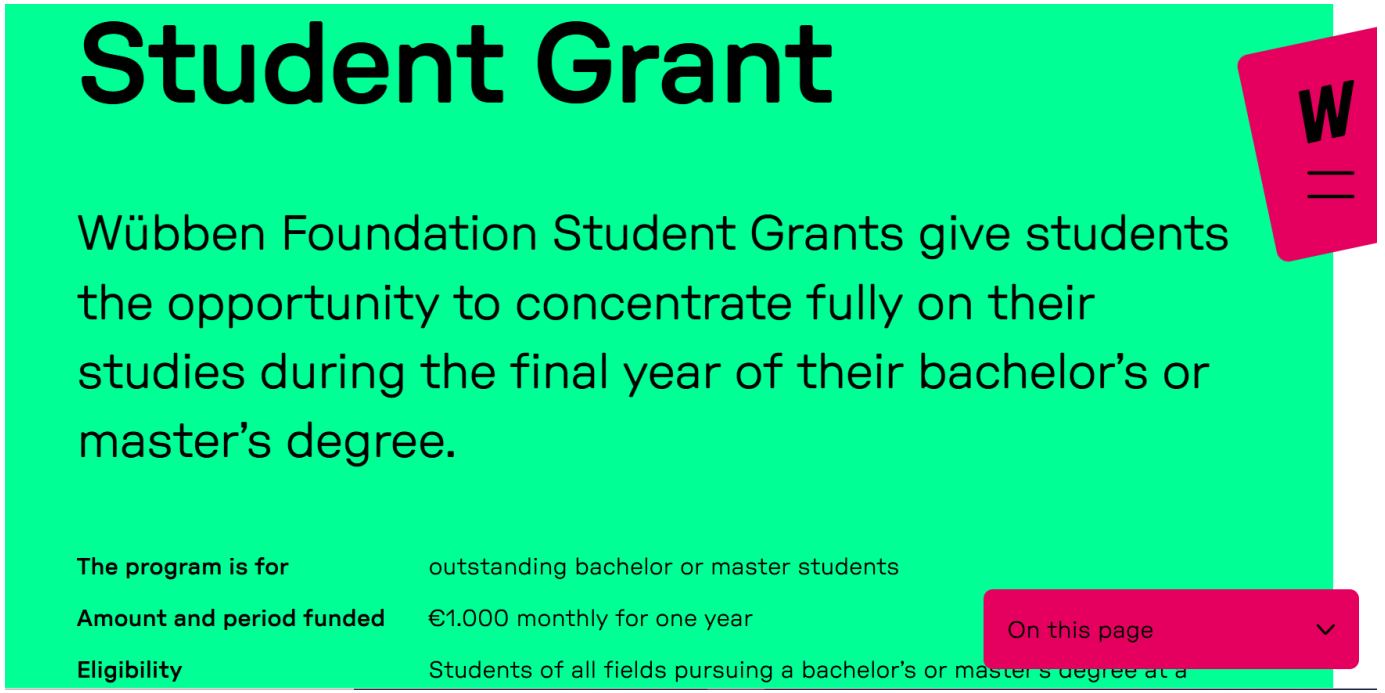
Nomination for Wübben Foundation Student Grants

→ The group of lecturers will propose two students for nomination for a scholarship by the Wübben Foundation to the CLICCS leadership based on their excellent performances in the course.



https://www.wuebben-stiftung-wissenschaft.org/en/program/student-grant

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Preliminary session plan

09.04.	Introduction to the course (L. Kutzbach); Introduction to the course blog (J. Behrens); Introduction to *Climate Futures* (L. Kutzbach)
16.04.	Mapping natural and societal dynamics constituting climate futures (A. Oberg); Introduction to poster task and grading criteria; poster session task (L. Kutzbach)
23.04.	Climate Agency: Our Role in the system (M. Brüggemann); Input on Diverse Ways of Knowing (K. Linscott et al.), organisation of self-organized poster session
30.04.	Mathematical perspectives on climate futures (J. Behrens); Introduction to poster design (K. Linscott); Introduction to roles and role-playing (M. Brüggemann, K. Linscott)
07.05.	Can we predict climate? (Johanna Baehr); 1st role-play (students)
21.05.	The changing Arctic in a warmer world - combining observations, experiments and modelling (L. Kutzbach); Poster session organization (K. Linscott)
28.05.	Communicating climate futures (Michael Brüggemann); 2nd role-play (students)
04.06.	Narrative-based near-term prediction of climate futures (Leo Borchert); Q&A poster task
11.06.	Poster drafts feedback - speed dating
18.06.	Organisation of poster session
25.06.	Poster clinic; preparation of poster session
02.07.	Poster Session event I
09.07.	Poster Session event II
16.07.	Feedback and Conclusions (students and lecturers)

Introduction to the course blog

Jörn Behrens

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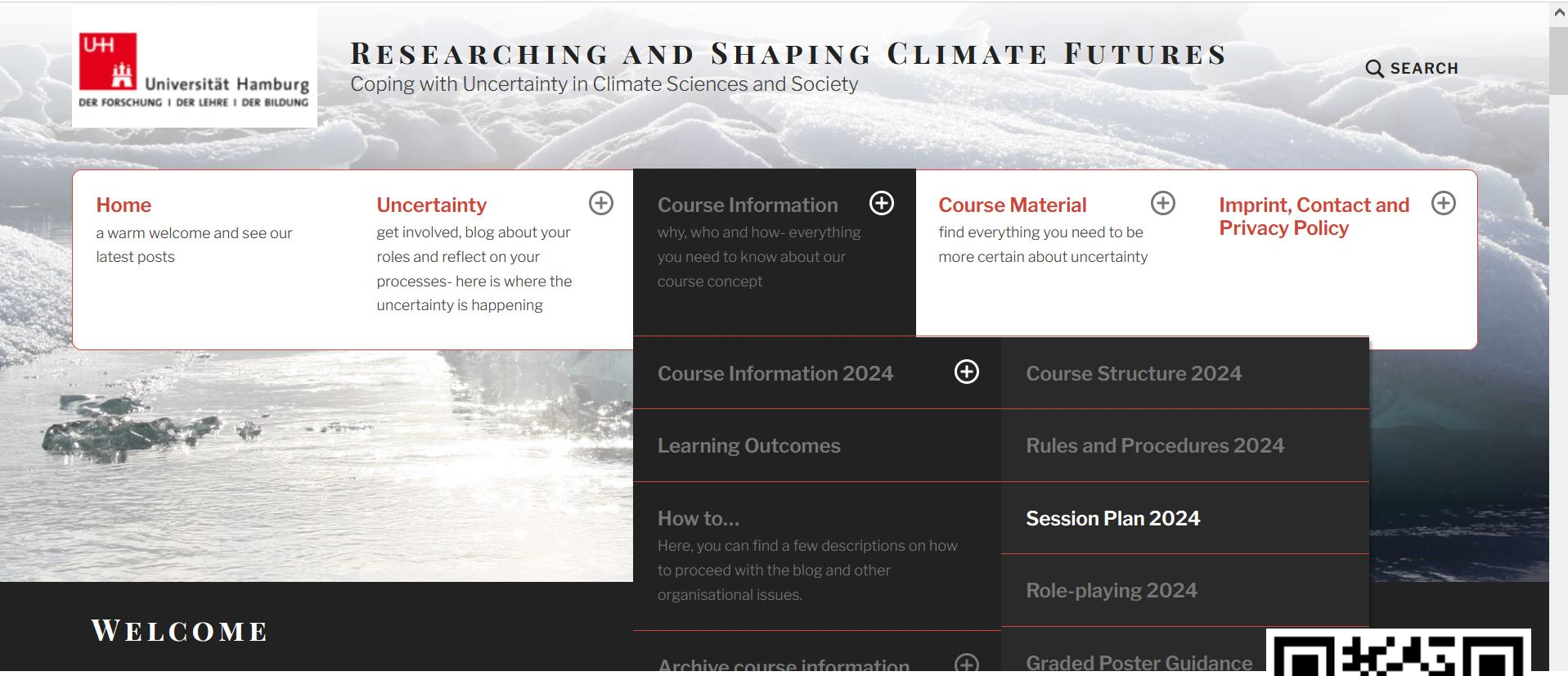
Introduction to the course blog



https://uncertain2degrees.blogs.uni-hamburg.de/

→ **Jörn's tutorial to the course blog**

Introduction of lecturers and students

Lars Kutzbach

Introduction to Climate Futures

Lars Kutzbach

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CLICCS foundation: *Climate futures*

We jointly consider the futures of climate and society:

- Future of **climate**
- Future of **society** in a changing climate

Climate futures:
The joint futures of **climate** and **society**.




Future Climates vs. Climate Futures

- ***Future climates:*** anticipated changes in climate conditions over time, such as temperature increases, changes in precipitation patterns, changes in ocean currents, or the frequency of extreme weather events.

- ***Climate futures*****:** defined by CLICCS (Hamburg Climate Futures Outlook 2021, Stammer et al., 2021) as:
  "future joint developments of climate and society"

Overarching research question of first phase of CLICCS (2019-2025):

Which climate futures are possible and which are plausible?

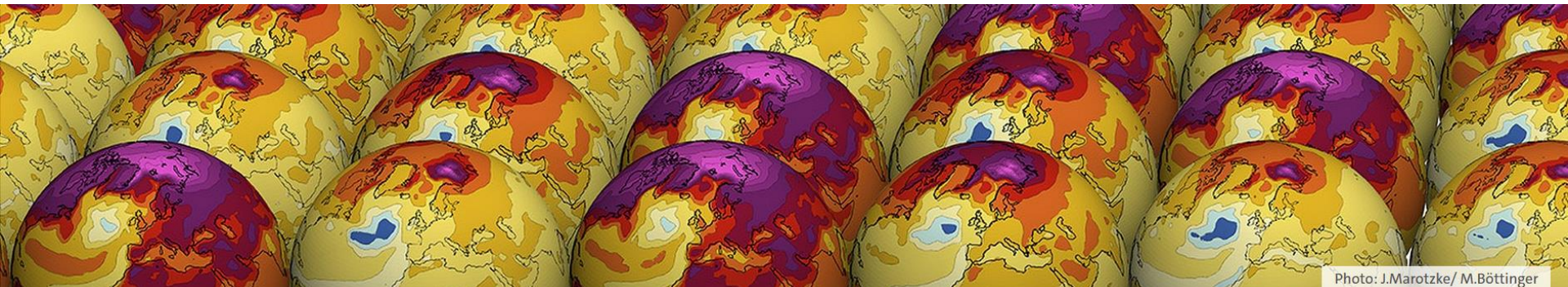
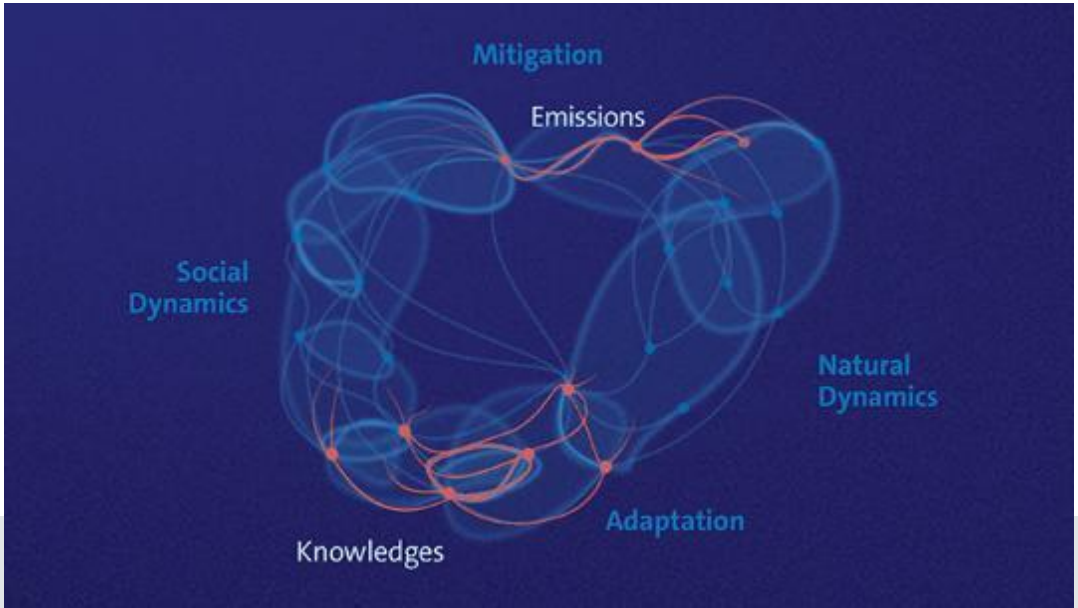


Photo: J.Marotzke/ M.Böttinger

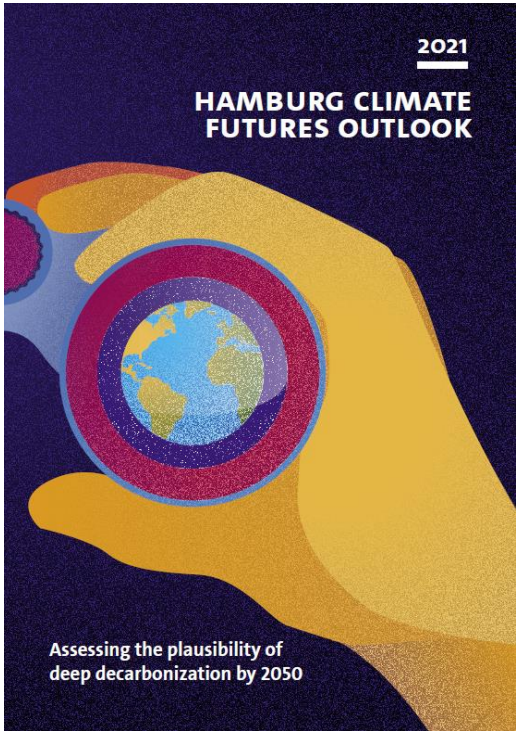
Overarching research question of CLICCS II (2026-2032):

Which climate futures are plausible, and how can desired climate futures be realized?

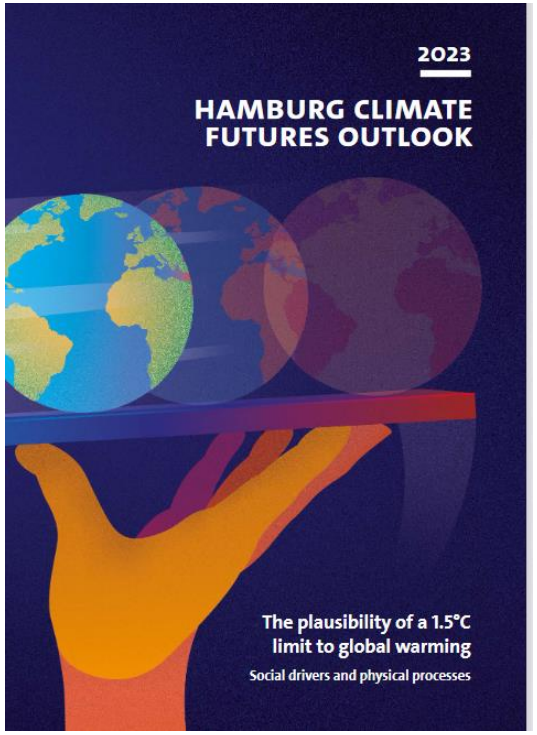


Hamburg Climate Futures Outlook

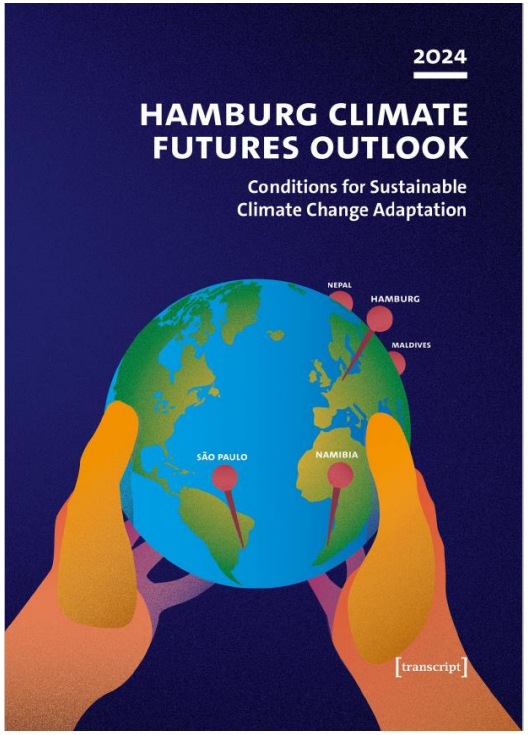
- Plausibility Assessments of Climate Futures



Stammer et al. (2021)



Engels et al. (2023)



Engels et al. (2024)

Hamburg Climate Futures Outlook

- **Climate futures** defined as: "**future joint developments of climate and society**"
- "The **social** and the **physical systems** are closely **interlinked**."

- "Toward which future is the Earth's climate moving?
- What might the climate look like in 2050, or in 2100?
- And what type of society might evolve together with the changing climate?"

- "We cannot accurately predict this future, but we can use our **joint understanding** of the physical and the social worlds to identify **which climate futures are plausible**."

Possible vs. plausible climate futures

Hamburg Climate Futures Outlook 2021:

- "We understand **possible climate futures** as those future states that are consistent with our joint understanding of climate and social dynamics.
- "**Plausible climate futures** denote the subset of those possible future states that we expect to unfold with appreciable probability, given the existing evidence from the physical and social worlds."

Hamburg Climate Futures Outlook 2021 (Stammer et al., 2021)

Possible vs. plausible climate futures

Hamburg Climate Futures Outlook 2023:

- "Lacking the feasibility of a robust probabilistic assessment, we have developed an alternative framework to assess the plausibility of climate futures…".
- "Our understanding of plausibility assessment is based on theoretical or mental models of social dynamics and physical processes. Once these models are established, we hold available empirical evidence against the main assumptions of these models and come to a conclusion whether the world is moving toward or away from a predefined climate future. In light of this conclusion, we provide a conjecture on the plausibility of the climate future."

Hamburg Climate Futures Outlook 2023 (Engels et al., 2023)

Hamburg Climate Futures Outlook 2021

Photo: CLICCS/Universität Hamburg

Climate Protection: Deep Decarbonization by 2050 Currently not Plausible

CLICSS publishes a new, essential study on climate futures. The study represents the first systematic attempt to investigate whether a climate future with net-zero carbon emissions is not only possible but also plausible. The authors examine plausibility from a technical-economic perspective, but also with regard to the societal changes necessary for such a future. They conclude that deep decarbonization by 2050 is currently not plausible – the current efforts to bring about societal transformation need to be far more ambitious.

Hamburg Climate Futures Outlook 2021 (Stammer et al., 2021)

Hamburg Climate Futures Outlook 2023

Photo: CLICCS/Universität Hamburg

1.5-degree goal not plausible: social change more important than physical tipping points

Limiting global warming to 1.5 degrees Celsius is currently not plausible, as is shown in a new, central study released by Universität Hamburg's Cluster of Excellence "Climate, Climatic Change, and Society" (CLICCS). Climate policy, protests, and the Ukraine crisis: the participating researchers systematically assess to what extent social changes are already underway – while also analyzing certain physical processes frequently discussed as tipping points. Their conclusion: social change is essential to meeting the temperature goals set in Paris. But what has been achieved to date is insufficient. Accordingly, climate adaptation will also have to be approached from a new angle. To press release

Hamburg Climate Futures Outlook 2023 (Engels et al., 2023)

Hamburg Climate Futures Outlook 2024

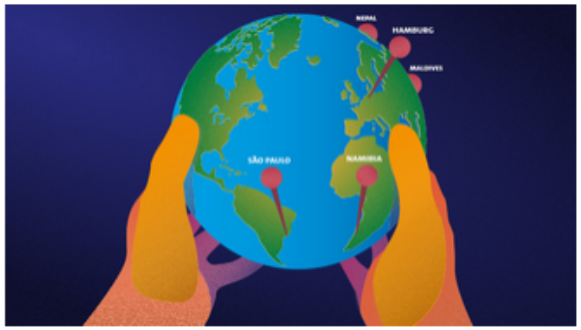


Photo: CLICCS/University of Hamburg

Global assessment: How to make climate adaptation a success

Climate change is forcing people to adapt to changed environmental conditions. But the key factor is how they do so. The recently released Hamburg Climate Futures Outlook 2024 shows that, in the long term, only sustainable adaptation can succeed. The central study produced by the University of Hamburg's Cluster of Excellence for climate research CLICCS also provides practical recommendations.

→ Long-standing political conflicts, social inequalities, and other structural problems ought to be addressed for sustainable adaption to become plausible.

Hamburg Climate Futures Outlook 2024 (Engels et al., 2024)

Homework 1

Achim Oberg

Homework # 1a

1. Think about what are important **components** of the **climate system** and of the **social system(s)** that in their interaction shape **climate futures**.
2. Draw a **conceptual map** of these components and their interactions on a paper. Bring it with you to the next class on April 16th.

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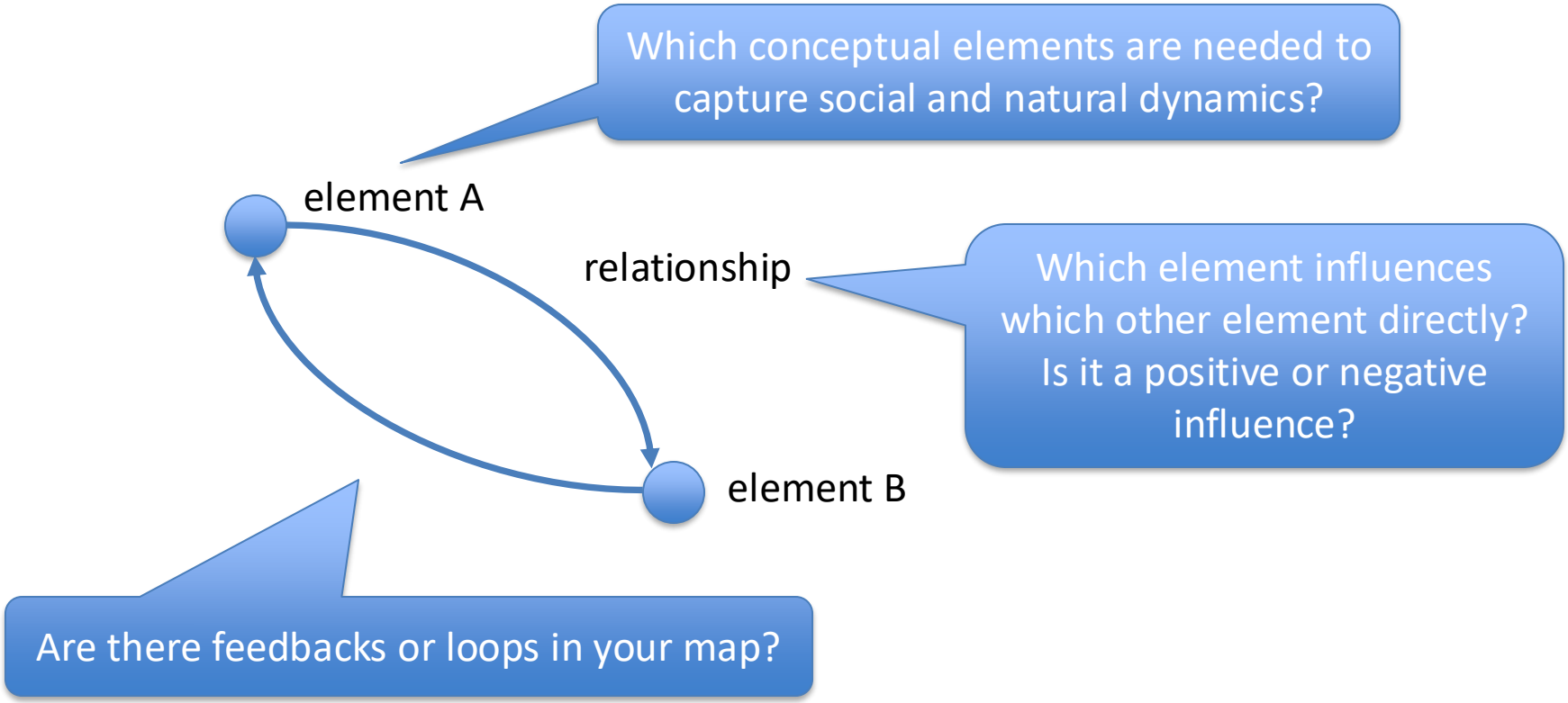
Homework # 1a
Drawing a conceptual map



Özesmi, U., & Özesmi, S. L. (2004). Ecological models based on people's knowledge: a multi-step fuzzy cognitive mapping approach. *Ecological modelling*, *176*(1-2), 43-64.

Homework # 1b

1. We have sent you an invitation to your STINE email address.
2. Accept the invitation to the blog (click on the *Invitation Accepted* link).
3. Change your passwort.

   Please be aware: **to edit the blog, you need to be in the VPN of the University of Hamburg.**

If you run into any problems, please contact Kat Linscott (katherine.linscott@studium.uni-hamburg.de)

Literature

Engels, A., Marotzke, J., Gonçalves Gresse, E., López-Rivera, A.; Pagnone A., Wilkens, J. (eds.) (2023): *Hamburg Climate Futures Outlook 2023. The plausibility of a 1.5°C limit to global warming—Social drivers and physical processes*. Cluster of Excellence Climate, Climatic Change, and Society (CLICCS). Hamburg, Germany. https://www.fdr.uni-hamburg.de/record/11230

Engels, A., Marotzke, J., Ratter, B., Gresse, E. G., López-Rivera, A., Pagnone, A., & Wilkens, J. (2024). Hamburg Climate Futures Outlook 2024. Conditions for Sustainable Climate Change Adaptation. Cluster of Excellence Climate. Climatic Change, and Society (CLICCS). transcript Verlag, Bielefeld (Germany). https://doi.org/10.1515/9783839470817

Özesmi, U., & Özesmi, S. L. (2004). Ecological models based on people's knowledge: a multi-step fuzzy cognitive mapping approach. Ecological modelling, 176(1-2), 43-64. https://doi.org/10.1016/j.ecolmodel.2003.10.027

Stammer, D., Engels, A., Marotzke, J., Gresse, E., Hedemann, C., Petzold, J. (eds.) (2021): *Hamburg Climate Futures Outlook 2021. Assessing the plausibility of deep decarbonization by 2050*. Cluster of Excellence Climate, Climatic Change, and Society (CLICCS). Hamburg, Germany. https://www.fdr.uni-hamburg.de/record/9104