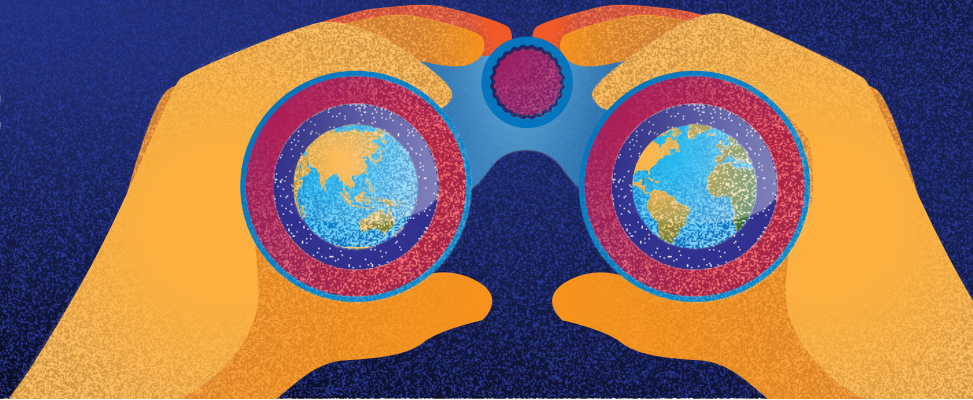




2021

HAMBURG CLIMATE FUTURES OUTLOOK

Assessing the plausibility of
deep decarbonization by 2050



Frequently asked questions (1/2)

FAQ 1: What does CLICCS mean by “climate futures”?

How will our lives and those of coming generations change under the conditions of a changing climate? What climate and what types of societies will shape human existence in the coming decades? The Hamburg Cluster of Excellence Climate, Climatic Change, and Society (CLICCS) investigates *climate futures*, defined as potential future developments of the combined physical and social systems. The social and the physical systems are closely interlinked. Societal developments, for example, determine the extent of greenhouse gas emissions, which drive changes in the physical climate system. In turn, climate change affects living conditions on Earth. With a multidisciplinary perspective, CLICCS aims to improve the scientific understanding of which climate futures are possible and which are plausible.

FAQ 2: What are possible and plausible climate futures?

The *Hamburg Climate Futures Outlook* presents a novel attempt to distinguish between possible and plausible climate futures. *Possible* climate futures are those that are consistent with the scientific understanding of the climate system 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 (see Figure 1). Natural sciences evaluate plausibility in light of physical laws and rules of cause and effect. Social sciences can provide conjectures about plausibility that build on understandings of how social systems change and also how they resist change. By bringing together knowledge from

different fields to assess which futures are plausible, CLICCS helps to narrow down the multitude of future scenarios, in order to inform political and individual decision-making.

FAQ 3: How does CLICCS assess the social plausibility of climate futures?

To assess the plausibility of certain climate futures, CLICCS scientists developed the Social Plausibility Assessment Framework, a methodology that captures key aspects of climate-related transformations, including crucial drivers of societal dynamics, their enabling and constraining conditions, and observed changes in these drivers and conditions. Based on this, a conjecture about the plausibility of specific climate futures is derived.

In the 2021 *Hamburg Climate Futures Outlook*, the methodology is applied to answer the guiding research question: Is it plausible that the world will reach deep decarbonization by 2050? Deep decarbonization describes a net-zero balance of carbon dioxide emissions, where the amounts of emitted and absorbed carbon dioxide approximately cancel. The following social drivers of decarbonization are examined as part of this assessment: United Nations climate governance, transnational initiatives, climate-related regulation, climate protests and social movements, climate litigation, corporate responses, fossil fuel divestment, consumption patterns, journalism, and knowledge production.



Frequently asked questions (2/2)

FAQ 4: What evidence does the Social Plausibility Assessment Framework provide for achieving deep decarbonization by 2050?

According to the social plausibility assessment conducted for the 2021 *Hamburg Climate Futures Outlook*, there is only sufficient evidence to support the plausibility of a partial decarbonization by 2050. The observed dynamics of the social drivers are currently inadequate to bring about the rapid, wide-ranging social transformations that would be needed to achieve deep decarbonization by 2050. However, the social plausibility assessment also indicates which changes could make such a future plausible. Actors from different fields shape a range of political, normative and economic resources—the *global opportunity structure*—that are able to influence social processes worldwide. This structure is flexible and provides essential elements for societal transformations toward a specific climate future scenario, such as deep decarbonization by 2050.

International climate governance initiatives, for example, provide opportunities for the establishment of political agreements and norms as well as the production and communication of crucial knowledge. Climate litigation, social movements, and journalism are able to mobilize wider support for climate action. Regulations and corporate decisions can further strengthen the process. Such change builds on four main conditions: the global momentum for climate action, the implementation of climate-friendly laws, policies and infrastructures, the combination of societal pressure and inclusion of deep decarbonization in political agendas, and fossil fuel divestment and financial support for climate change mitigation.

FAQ 5: Are the very low and the very high emissions scenarios used in current climate models plausible?

The major scenario frameworks in use have been created without intentions to develop probabilistic interpretations. They aim to describe a variety of development pathways and their implications, but cannot be interpreted as forecasts or predictions.

To improve information for climate change mitigation and adaptation planning, CLICCS assesses whether very low and very high CO₂ emissions scenarios are plausible from social-dynamic and techno-economic points of view. Very low emissions scenarios that would maintain global warming below 1.5°C rely on

negative emissions—the active removal of carbon dioxide from the atmosphere. However, some evidence speaks against the plausibility of implementing the necessary technology at a sufficient scale. The social plausibility assessment also finds that there is currently insufficient societal momentum to drive the rapid emissions cuts necessary for the very low emissions scenario. On the other hand, global warming in the high emissions scenario is thought to cause damages and consumption losses that would slow down economic growth and, as a consequence, limit potential emissions. The falling cost of clean energy and limitations on recoverable coal reserves could also prevent the high emissions necessary for this scenario. According to these lines of reasoning, the very low and the very high emissions scenarios are currently not plausible.

FAQ 6: How do climate change mitigation goals and other sustainable development goals interact and how might this influence plausible climate futures?

Climate change adaptation, mitigation, and sustainable development goals sometimes come into conflict with one another, but sometimes they also support each other. These situations are described respectively as *trade-offs* and *synergies*. While the *IPCC Special Report on Global Warming of 1.5°C* sees fewer challenges for climate change mitigation in scenarios that also emphasize sustainable and equitable development, newer literature highlights potential trade-offs between mitigation strategies, which include large-scale negative emissions technologies, and food security or biodiversity protection.

Deep decarbonization scenarios become more plausible if there are synergies between the Sustainable Development Goal (SDG) 13 *Climate Action* and other SDGs. However, synergies and trade-offs play out differently in different contexts and on different time scales. For example, cities are on the frontline of climate change mitigation and adaptation, and present many challenges in the form of trade-offs. Decentralized settlement makes cities more climate-resilient—but it also increases land use and infrastructure needs, and, as a consequence, increases greenhouse gas emissions. Denser cities, on the other hand, help reduce internal material and energy demands and therefore support climate change mitigation—but this also creates new dependencies between cities and their hinterlands.