Series of online discussions

Charting a roadmap towards deep decarbonisation

The world is not on track to become environmentally sustainable. While the growth rate in global emissions has been slowing down, this is far from sufficient. In fact, emissions need to annually decrease by at least 5**%** in the next ten years, with higher rates in the following decades, to stay within 1.5 °C threshold of global warming (IEA, 2021). Decarbonisation needs to accelerate!

While the magnitude of the challenge is beyond doubt, as well as the fact that inaction now drastically increases the costs of decarbonisation in the future, decision-makers around the world are shying away from determined action. While this is partly due to political opportunism (established high-carbon industries tend to have more lobbying power than the nascent low-carbon industries, and a majority of consumers and voters value current convenience higher than negative long-term consequences), it also reflects a lack of clarity on the potential roadmaps towards deep decarbonisation and their inherent economic and social costs.

What is needed to overcome such patterns of inaction is thus a socially convincing and evidence-based narrative showing

a. the short- and medium-term social and economic co-benefits of decarbonisation (not just the obvious ones accruing in 20-30 years, which are heavily discounted by most); and
b. the right mix of policy instruments for achieving decarbonisation with the maximum co-benefits and political buy-in, which in turn requires ways for compromising with established interests and smart sequencing of reforms.

The G7 Summit in June 2022 is a big opportunity for advancing this discussion. The German Presidency aims “to ensure this group of states takes on a pioneering role – dedicated to climate neutrality and a just world”. The German Development Institute (DIE) is, together with the Global Solutions Initiative, co-chairing the G7-Think Tank Group providing inputs to this process.

We therefore invite for a series of online discussions with the aim of **charting the convincing and actionable roadmap towards deep decarbonisation policymakers are looking for**. Our main aim is to provide an overview of research that identifies policy solutions for a wide range of decarbonisation challenges. The first four events are dedicated to the policy levers we consider most important, from carbon pricing and financial system reform to technology push strategies and incentives for low carbon lifestyles. For each of these "big levers", we present key aspects, policy priorities and practical approaches. Following these four events, the contributors will jointly develop an integrated policy document exploring synergies and trade-offs between the four policy levers and how they can be incorporated into a holistic, convincing and actionable narrative for deep decarbonisation. This will be presented in a final online event.

Online discussion 1

Carbon pricing and complementary incentives

22 March, 14.00 – 16.30

Please register here: https://www.teilnehmermanagement.die-gdi.de/roadmap-to-decarbonisation-online-discussion-1/

Most emitters do not pay for the harm they are doing. Arguably, the single most important measure for decarbonisation is to introduce a carbon price that is high enough to curb emissions below internationally agreed thresholds for global warming. One of the big advantages of carbon pricing over other policies is the following: It creates an incentive for market actors to seek the lowest-cost solutions for any specific emissions challenge. While carbon prices cover an increasing part of the overall emissions, the current prices are far too low (Green, 2021). Policymakers thus need to find ways to increase prices against pressure from vested interests. This entails decisions about the economically, socially and politically most appropriate pricing mechanisms, e.g. weighing the pros and cons of carbon taxes vs. emissions trading systems, as well as about exceptions and necessarily sequenced introduction to allow industries and households to adapt (Edenhofer et al. 2021). At the same time, policy research suggests that pricing is not enough to enable the required change in "sociotechnical systems", such as those of energy, transport or industrial production (Rosenbloom et al. 2020). This is due to a wide range of market failures and the need to change deeply entrenched socio-cultural practices. Complementary measures are thus needed, such as regulation of sector-specific maximum permissible emissions, technical standards, and R&D subsidies (Penasco, Anadón and Verdolini, 2021; Tvinnereim and Mehling 2018). Designing such policy packages, however, is anything but trivial, as industry-specific complementary incentives may distort the price signals of carbon markets (Martin/ van den Bergh 2019; van den Bergh et al. 2021). Furthermore, there are political economy issues, in particular opposition against additional taxes or policies to phase out carbon-intensive practices, as societal groups are affected differently and tend to prioritise immediate economic gains over long-term sustainability and intergenerational justice. Solutions thus need to be found to make carbon pricing politically acceptable for, or even garner support by, national citizens (Klenert et al. 2018), and enterprises. This need can be

addressed through a second big advantage of carbon pricing, namely that it creates revenues to be used. For economies that are highly dependent on fossil fuels, such as the OPEC countries, strategies are needed to prepare for a low carbon economy with minimal disruptions while avoiding incentives to increase extraction in fear of rising carbon prices. Last but not least, climate policies need to be internationally harmonised to avoid carbon leakage – the shift of industries to countries with less stringent standards – which may occur when trading partners apply different carbon prices (Bataille et al., 2018).

- Overview of carbon pricing challenges, title tbd
  Michael Grubb, University College London (UCL)
- Challenges and opportunities of introducing a uniform, credible and durable carbon price across all sectors – the case of the EU
  Michael Pahle, Potsdam Institute for Climate Impact Research (PIK)
- Carbon pricing and industrial transformation
  Olga Chiappinelli, German Institute for Economic Research (DIW)
- Making carbon pricing socially acceptable: distributive effects and revenue recycling
  Daniele Malerba, German Development Institute (DIE)
- How can carbon pricing be harmonised internationally? Would “carbon clubs” work, and what is the role of measures that seek to address carbon leakage (CBAM)?
  Clara Brandi, German Development Institute (DIE)

Moderator: *Karsten Neuhoff, German Institute for Economic Research (DIW)*

Online discussion 2

Low carbon technology solutions and transitions

7 April, 14.00 – 16.30

Please register here: https://www.teilnehmermanagement.die-gdi.de/roadmap-to-decarbonisation-online-discussion-2/

A wealthy low-carbon economic development is hardly conceivable without technological innovation and changes in socio-technical systems (Rosenbloom et al 2020). Achieving net-zero emissions while not jeopardizing efforts to reduce poverty requires innovation and a fast transition towards zero emissions across all sectors including energy, transport, buildings, and industry. It involves (technological) solutions such as scaling up renewable energy generation at low cost, ensuring energy storage and transport with minimal losses, decarbonising energy-intensive heavy industries, and end-uses such as transport and heating, sequestrating carbon, improving smart grids and a variety of other ICT solutions as well as new technologies and practices that allow for high-productivity, low-emissions agriculture, and dietary change.

Electrification and hydrogen have emerged as key options as costs for solar and wind are rapidly decreasing. The decarbonisation of energy-intensive industries requires large amounts of electricity and hydrogen but also creates opportunities for flexible demand and economic development in renewable resource rich regions in the global south. The world may progress from shipping and using fossil fuels to make electricity to use renewable electricity to produce fuels such as ammonia and methanol, as well as energy intensive materials such as iron and polymers, and ship these to markets.

Technologies also need to be combined in a smart way to achieve decarbonisation at the lowest cost, harness potential chances of the (locational) changes driven by decarbonisaton of value chains and enable opportunities for regions, workers and sectors affected by the transition. To accelerate the transition, i.e. the development and deployment of key solutions for decarbonisation in an integrated way, policymakers need to understand and utilise the full menu of options, be able to assess alternatives taking abatement potential and economic co-benefits as well as technological readiness and comparative advantages into account (Australian Government, 2020). They need to mitigate the risks involved, and design the right incentive packages; all this amidst high uncertainty about technological progress and future market conditions. Moreover, requirements and policy options differ across countries, depending on resource endowments and levels of development. Key questions are if and how developing countries can benefit from a paradigm shift to low carbon technologies and solutions (Altenburg/Pegels 2021). Last but not least, as some mitigation options are costly and climate technologies address a global public good, issues of burden-sharing, intellectual property rights, nurturing green markets, and new global value chains call for new international collaboration and mechanisms of research governance (OECD 2012; de Coninck/ Revi 2018).

- Which key options and technologies still need to be developed, or substantially improved, for a deep decarbonisation?
  Chris Bataille, Institute for Sustainable Development and International Relations (IDDRI)
- What are the pathways to decarbonising energy and emissions intensive industries and their policy implications?
  Stefan Lechtenböhmer, Wuppertal Institute
- How can we best organise and accelerate directed technological change towards low-carbon solutions without suppressing market-led entrepreneurial experimentation?
  Rainer Kattel, University College London
- Challenges and opportunities for developing /emerging countries when world markets shift towards carbon-neutrality
  Tilman Altenburg, German Development Institute (DIE)
- Challenges for international climate technology cooperation
  Heleen de Coninck, Eindhoven University of Technology
- How can international governance and the climate regime be organised and adjusted to allow for the decarbonisation of heavy industry and transports?
  Gökçe Mete, Stockholm Environment Institute

Moderator: *Lars. J Nilsson, Lund University*

Online discussion 3

Aligning the financial system with net-zero emissions

26 April, 14.00 – 16.30

Please register here: https://www.teilnehmermanagement.die-gdi.de/roadmap-to-decarbonisation-online-discussion-3/

Finance is critical to achieving deep decarbonisation by 2050. Article 2.i.c of the 2015 Paris Agreement sets out the goal of "making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development". Across the financial system, banks and investors need not only to analyse and mitigate physical and transition risks, they also need to align their portfolios with net-zero. Investment in and lending to carbon-intensive activities need to be rapidly phased out, while investment in new, low-carbon infrastructure – especially in the energy and transport sectors –, the retrofitting of the existing building stock, sustainable land use, and the development and deployment of low carbon technology needs to be scaled up. This will not happen by itself. Monetary and financial authorities need to set the framework conditions that will ensure that banks and financial markets integrate climate in all decision-making processes. Prudential supervisors should make net-zero a core element of supervisory practice at micro and macro levels, aligning supervisory expectations and prudential instruments with net-zero (Dikau, Robins, Volz 2021). Financial policymakers need to consider strategies for supporting a just transition to net-zero, harnessing the capacity of public as well as private financial institutions and of new financial technologies (Robins and Rydge, 2019; Robins et al., 2020; Volz et al., 2020). Last but not least, policies need to be devised to scale up international climate finance to support adaptation and a just transition in developing and emerging economies.

- Which actions should central banks and financial supervisors take to align financial flows with climate goals and support a scaling up of investment in the low-carbon economy?
  Irene Monasterolo, EDHEC Business School and EDHEC-Risk Institute
- What policies are needed to boost climate finance?
  Barbara Buchner, Climate Policy Initiative (CPI)
- What is the role of public financial institutions in accelerating the low-carbon transition?
  Stephany Griffith-Jones, Columbia University
- How can the financial sector contribute to a just transition?
  Nick Robins, Grantham Research Institute on Climate Change & the Environment, London School of Economics (LSE)
- What is the role of FinTech in facilitating investment in the net-zero transition?
  Marianne Haahr, Green Digital Finance Alliance (GDFA)

Moderator: *Ulrich Volz, SOAS - University of London and German Development Institute (DIE)*

Online discussion 4

Decarbonising lifestyles, scaling up behavioural innovations

6 May, 14.00 – 16.30

Please register here: https://www.teilnehmermanagement.die-gdi.de/roadmap-to-decarbonisation-online-discussion-4/

Even with better incentives and faster green tech innovation, deep decarbonisation is almost impossible to achieve as long as carbon-intensive lifestyles prevail; and even more so, when rising purchasing power increases and consuming middle classes expand at the scale witnessed in the past two to three decades. Since efficiency improvements are often associated with cost savings for consumers, these tend to spend the freed-up income to consume more of the same or other products and services that may generate carbon emissions (rebound effects; Jackson 2016). The fourth big lever is therefore change of lifestyles, ideally unleashing a virtuous circle in which decarbonisation of production and consumption reinforce each other (Creutzig et al. 2018). On the positive side, we can observe a lot of citizen engagement for low carbon lifestyles, from cycling to work to buying organic and local, sharing services, recycling, or paying voluntary compensation for flight emissions. These social innovations play an important role, as they show to what extent personal carbon footprints can be reduced, thereby setting examples for sustainable lifestyles and business models. They are, however, in most cases limited to small pockets of green consumers, mainly in wealthy and well-educated societal groups in high-income countries, and they are mostly limited to a small range of low carbon behaviours (Newell et al. 2021). So far, hardly any of these voluntary and bottom-up initiatives has gotten anywhere near the level of decarbonisation required in the respective sector (Capstick et al. 2015). Public policies are thus needed to support their outreach and help to scale them up - including a political push to regulate products (e.g. eco-design, packaging) and infrastructure (e.g. for sustainable mobility initiatives to become convenient for all).

- Where have we seen successful lifestyles changes towards decarbonisation, especially in areas with the highest potential for consumer carbon footprint reduction (transport, energy use, meat) and what can we learn about their genesis and spread in societies?
  Ulf Jaeckel, Federal Environment and Consumer Protection Ministry (BMUV)
- How can low-carbon behavioural change be scaled up and what are the wider benefits of adopting low-carbon lifestyles?
  Felix Creutzig, Technical University, Berlin
- Whose lifestyles need to change? How does inequality and fairness relate to social transformation to address climate change?
  Peter Newell, University of Sussex
- What are the prospects for lifestyles changes in countries with rapidly emerging consuming middle classes?
  Manisha Anantharaman, Saint Mary's College of California

- How can public policy support and upscale bottom-up decarbonisation initiatives? Insights from a review of living labs and citizen science
  Carolin Baedeker, Wuppertal Institute
- How can we engage the public in a roadmap towards deep decarbonisation?
  Lorraine Whitmarsh, Centre for Social and Climate Transformations (CAST)

Moderator: *Babette Never, German Development Institute (DIE)*

Online discussion 5

Integrating the levers

Early June, invitation follows.

All levers discussed in the previous sessions are complements. Combining them smartly can greatly accelerate decarbonisation. In fact, we expect the levers to reinforce each other in multiple ways. Consequently, pricing carbon and aligning bank portfolios with net-zero emission targets, for example, undoubtedly incentivizes low carbon-technology development and deployment as well as low-carbon lifestyles. Yet, trade-offs need to be considered as well. The availability of low-carbon technologies may, for example, lead to rebound effects as freed-up resources are channelled to other unsustainable behaviours (Jackson 2009), and trigger psychological reactions undermining low-carbon behaviour ("moral licensing"). Interest groups may use thriving green consumerism to claim less stringent environmental regulation (Akenji 2019).

In the final session, we will present key elements of a roadmap towards deep decarbonisation that takes synergies and trade-offs between the various policy actions into account. We will present how policy packages may be optimised to maximise the former and mitigate the latter – and invite for critical feedback.

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