



Technology Executive Committee

05 September 2023

Twenty-seventh meeting

19–21 September and 22 September 2023 (TEC-CTCN Joint session)

Cover note: Preliminary results of the survey on future needs of climate technology RD&D

Cover note

I. Background

1. At TEC 26, the TEC considered a draft concept note presented by Future Clean Architects (FCA) for conducting a survey on future needs of research, development and demonstration for high impact emission-reduction technologies.
2. The concept note aimed to achieve a comprehensive overview of the current and future global RD&D needs to fundamentally decarbonize human activity in line with the targets of the Paris Agreement. The TEC provided suggestions to improve the concept note and requested the open-ended activity group that will support the implementation of this activity to incorporate the suggestions and present the findings at TEC 27.
3. The open-ended activity group, revised and agreed on the methodologies and questions for the survey, including target audience and specific questions on energy supply. The survey was conducted online by the FCA between 6 June to 18 August 2023.

II. Scope of the note

4. The annex to this note contains the preliminary results of the survey on future needs of climate technology RD&D.

III. Expected action by the Technology Executive Committee

5. The TEC will be invited to consider the preliminary results of the survey and provide guidance to the activity group for further work on this matter, including further analysis and identify possible opportunities to showcase this work.



United Nations
Climate Change

FCA Future
Cleantech
Architects



**Future needs
in RD&D
2023**



Impressum

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Background

The IEA's 2019 report on "Innovation Gaps – Key long-term technology challenges for research, development and demonstration" estimates that more than 50% of technical innovations needed to reach net-zero by 2050 either do not yet exist or are not on track. The acceleration of RD&D in critical sectors is imperative to ensure these tech gaps are closed on time.

Future Cleantech Architects is a multi-disciplinary climate innovation think tank with a focus on high-impact R&D, targeting technologies that carry the potential to drive down greenhouse gas emissions in key sectors massively. The focus on promoting and developing technologies to close the innovation gaps needed to reach net-zero by 2050 led FCA to complete a first comprehensive expert survey on the future needs of climate technology R&D in 2021, which included structured feedback from 114 expert participants worldwide. Experts were specifically asked to identify gaps remaining in the development of technologies and processes that have the potential to help reduce emissions quickly, thereby effectively tackling the climate challenge.

Based on the results of 2021, the following survey has been jointly conceptualized by the Technology Executive Committee and Future Cleantech Architects as part of the Rolling Workplan of the Technology Executive Committee for 2023–2027, activity A.2 "Stimulate climate technology RD&D through partnerships, strengthening the roles of innovators and incubators and accelerators, and the participation of developing country Parties in collaborative approaches to RD&D":

Activity A.2.1 - RD&D: Building on the TEC's work on collaborative RD&D, analyse the needs for RD&D for high-impact emission-reduction technologies to help countries implement their NDCs and other mitigation strategies, and ensure long-term environmentally sustainable energy supply. Identify ways to increase participation of developing country Parties in collaborative approaches to RD&D.

Objective

The objective of the survey is to achieve a comprehensive overview of the current and future global RD&D needs to fundamentally decarbonize human activity in line with the targets of the Paris Agreement.

The results of the TEC's 2021 Compilation of Good Practices and lessons learned on international collaborative research, development and demonstration initiatives of climate technology identify 5 key recommendations for strengthening collaborative RD&D. Recommendation 2 is to "facilitate flexible and evolving participation of countries in line with national needs and capacities" (p. 59). One of the goals in designing survey was to do so in such a way that the results can help provide a needs-assessment for current and future RD&D both on a global, but importantly also on a regional, national scale. By enabling a differentiated analysis of global vs. specific regional needs, the survey hopes to contribute to "identifying (and regularly updating) thematic areas in line with member country priorities" (p. 55).



Methodology

Participants were first asked not only to indicate their location by country, but also their field of profession and the main focus of their work, allowing for an analysis of the responses not only by region but also by sector. Before starting the survey, participants were informed that their answers would be anonymous and asked to answer only those questions which they felt confident answering. Additionally, they were notified that many of the questions would ask them to rate RD&D needs for the same technologies in different timeframes, both in their own country and globally. Finally, each multiple-choice and ranking question included an “other” option, allowing participants to add answer options they felt were missing from the pre-selected choices.

In addition to the questions asking survey participants to choose and rank the technology segments in which RD&D must be accelerated most urgently, the survey included questions focusing on the stakeholders and tools most qualified to do so. These were complimented by questions aimed at identifying the biggest roadblocks and challenges in advancing RD&D on a global and regional scale.

The survey was made available in English, French, and Spanish.

Target Respondants

In order to identify specific needs and priorities on both a global and regional scale, the survey was directed to experts globally. Participants were asked to indicate the country in which they are located, allowing the answers to be aggregated both by individual countries and by regions.

The respondent groups targeted by the survey included:

- Policy-Makers from local and national governments
- National Designated Entities (NDEs) and other planners and implementers
- Innovators
- Researchers
- NGOs and Think Tanks
- CTCN members that are research organizations

Distribution of the Survey

The survey was distributed to the above identified respondents via both the Future Cleantech Architects’ and the TEC’s networks. Due to the nature of the organizations, Future Cleantech Architects largely targeted European private sector respondents of the innovator, researcher, and industry representative groups, while the TEC mainly focused on those belonging to the policy-maker and NDE group on a global scale.

The survey was distributed via a number of channels, including targeted mailings, subject matter newsletters, the organization’s respective social media channels, and to expert audiences attending relevant events and discussions organized by both parties.



Included Technologies

Respondants were asked to rank a number of climate mitigation technologies pertaining to their RD&D needs. The IPCC's 2023 Climate Change report has once more highlighted the need for short- and medium-term implementation of climate action. Therefore, the survey focuses on the assessment of RD&D needs between now and 2030 – 2035.

The included technology segments were determined to reflect the expertise and focus of the work of both the Technology Executive Committee and Future Cleantech Architects. Two sets of specific categories were chosen, the first including more established technologies (wind energy, solar energy, forest and ecosystem conversion, carbon sequestration in agriculture, ecosystem restoration, fuel switching in industry), the second including less developed cleantech (storage, CCUS, CDR, zero carbon fuels, clean electricity generation, industrial processes).

Recognizing the intrinsic relationship between adaptation and mitigation, it is suggested that the survey be repeated annually, with the focus shifting from adaptation to mitigation technologies on a bi-annual basis.

Additional Question: Energy Supply

In accordance with the Technology Executive Committee's focus on ensuring long-term environmentally sustainable energy supply, an additional question was added to the survey for all respondents indicating that the main focus of their work was in storage and clean electricity generation. The question asked participants to rank the the following areas by where RD&D needs to be accelerated most urgently: energy system integration, energy storage, energy transport and transmission, resilient energy systems.



Overview



Participant Overview

307 participants
5% Female, 70% Male, 5% Other
73% completion rate
>70 hours of expert knowledge



Regions

All continents/regions represented
Participants from 59 countries
26.4% from developing economies
73.6% from developed economies



Most urgent RD&D acceleration

Energy Storage as key global priority
until 2030 and 2035



Development valley of death*

>70% selected large-scale deployment
as a key area where promising
developments are lost



Key Stakeholder

Public sector is considered the key
stakeholder for accelerating RD&D
globally

- Within the public sector, governments (29%) and international bodies (11%) are considered key stakeholders



The three main wishes

More financing: 22%
Internalize CO2 costs: 18%
Reduce Bureaucracy: 16%

*"Valleys of death" are critical (often financial) phases that innovations face from which many fail to progress.



Key takeaways

The current RD&D environment is seen as slightly favorable

The public sector is considered as the key stakeholder in accelerating RD&D globally

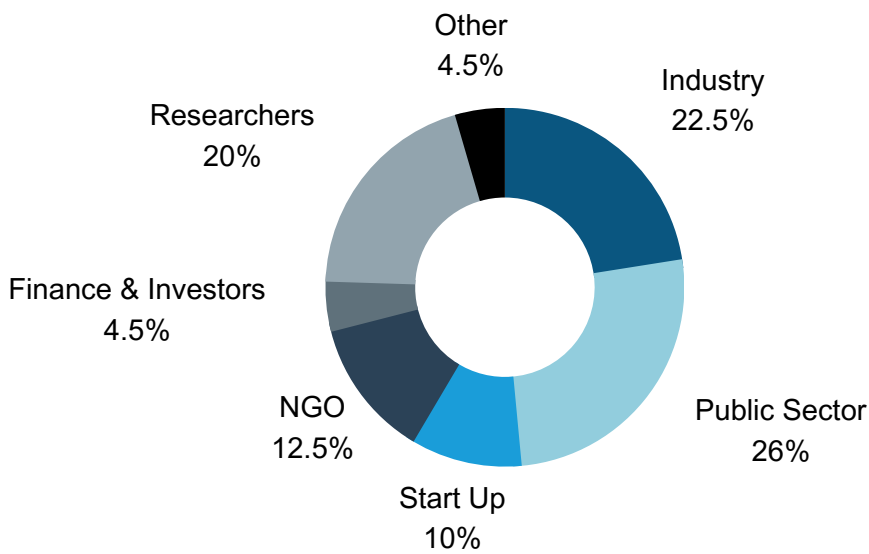
The biggest roadblocks in advancing breakthrough climate technology are institutional and economic

More attention to later stages of development (large-scale deployment and finance) is needed, as these are the key stages where promising developments stagnate

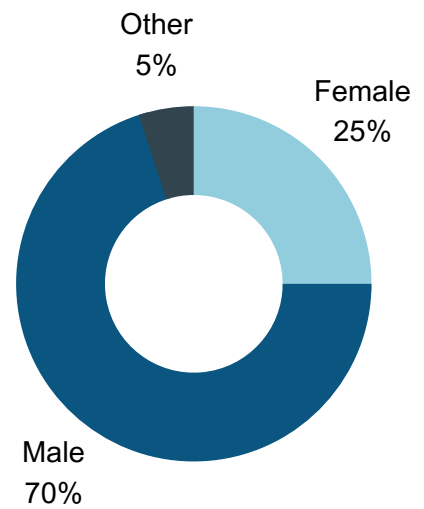
Participants

The survey was completed by 307 participants, who on average spent 14 minutes completing the survey, with an overall 73% completion rate. In total, the survey collected >70 hours of expert knowledge from:

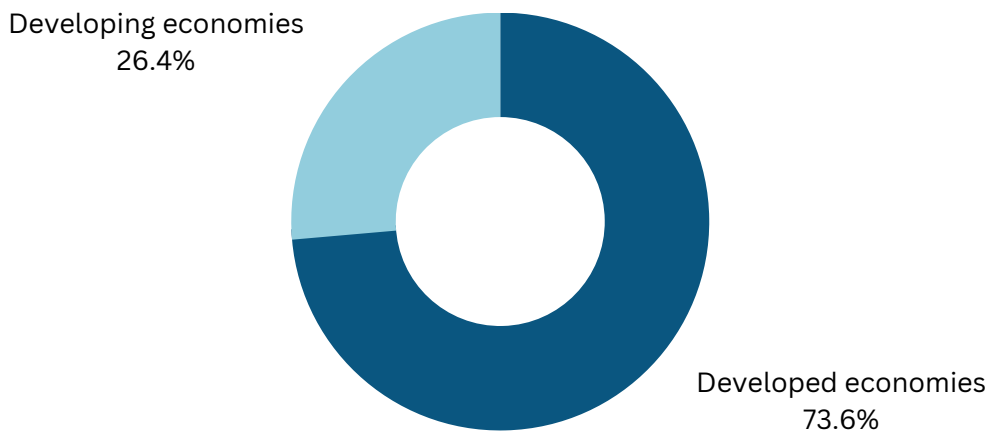
Participants by profession



Participants by gender

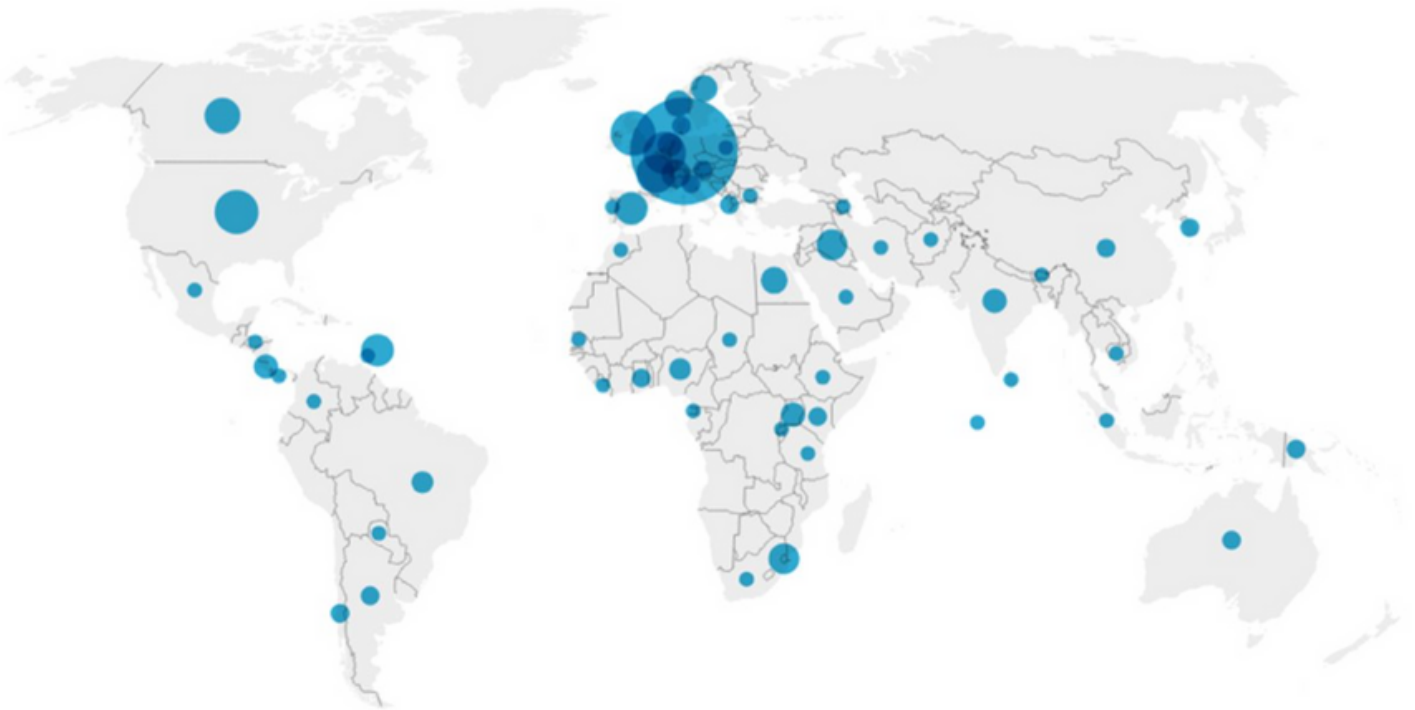


Participants from developing vs. developed economies



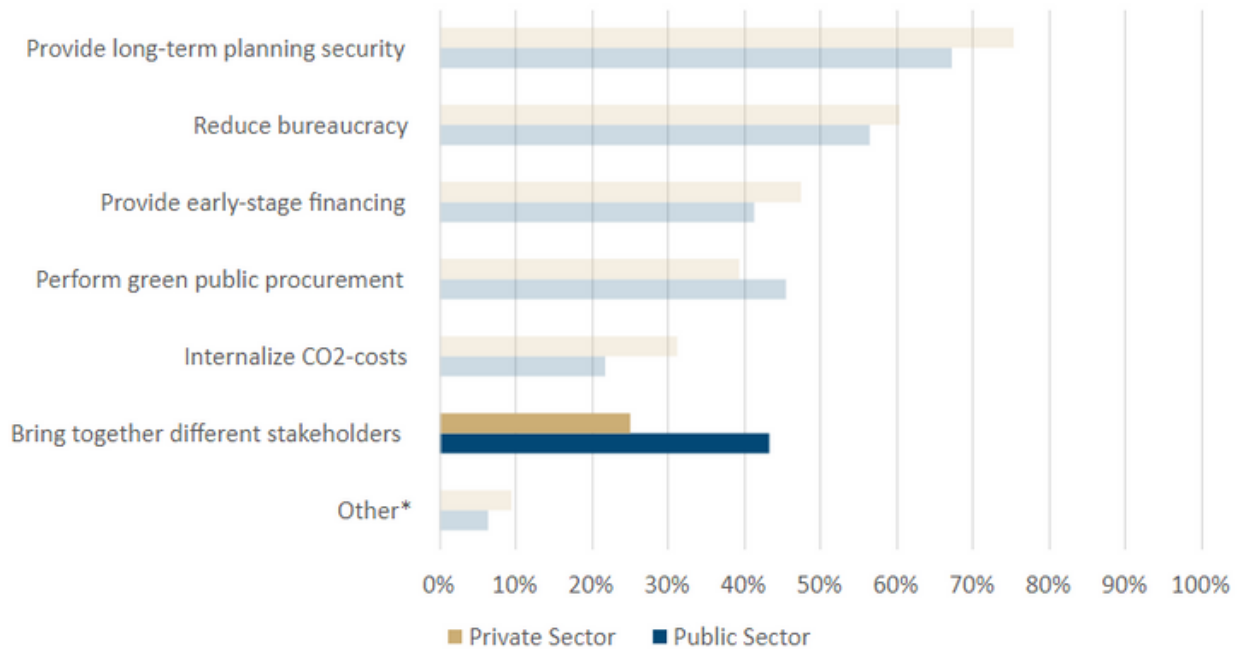
Participants

The survey reached participants from 59 different countries from all regions of the world. There was especially strong participation from Western European countries.



Key stakeholders

These numbers stay similar when dividing respondents between private and public sectors. When attributing the role of bringing together different stakeholders, public sector respondents attributed the role to themselves higher than the private sector respondents did.



Key measures

Based on the qualitative analyses of the open-ended questions, the three main measures respondents wished for to speed up the development of breakthrough climate technology in their respective countries were:



More financing

22%



Internalize CO₂ costs

18%

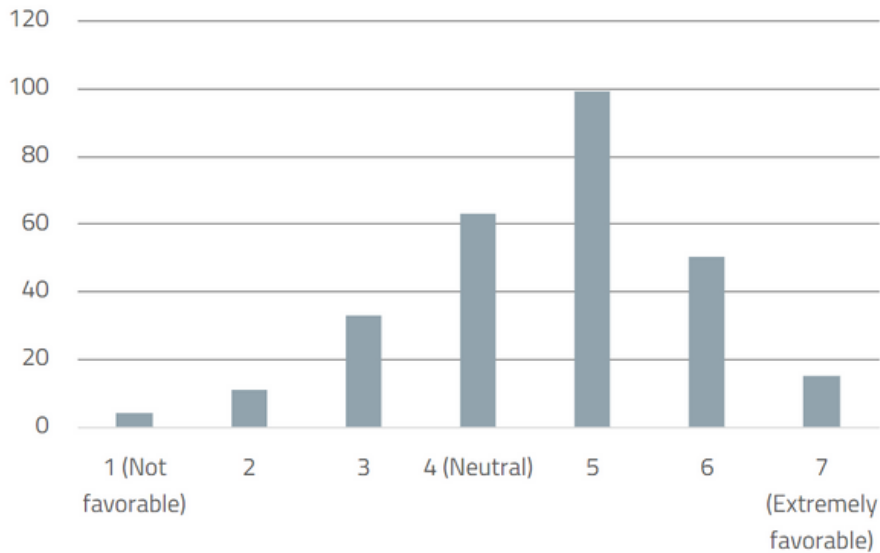


Reduce bureaucracy

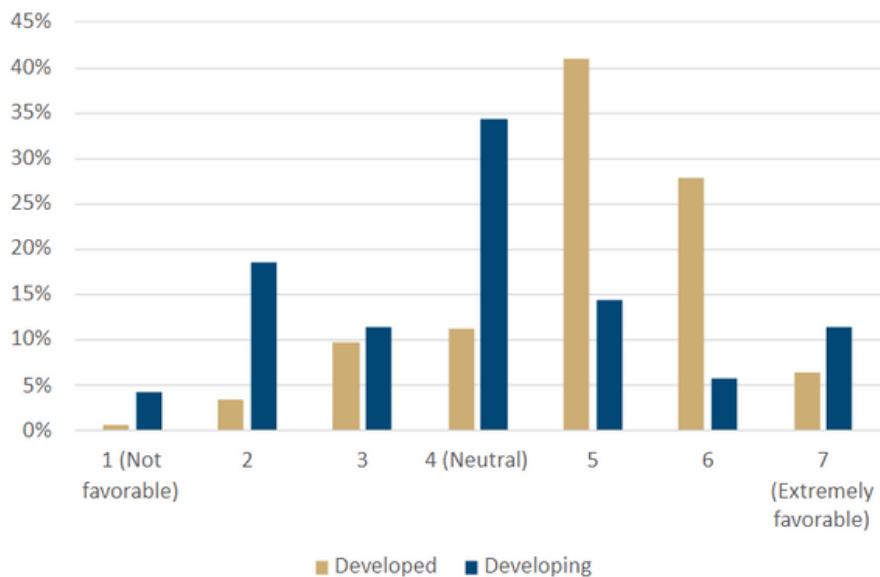
16%

Status of RD&D

Globally, the current RD&D environment is seen as **slightly favorable**, with more than 80% of survey participants rating the global RD&D environment as neutral or higher.

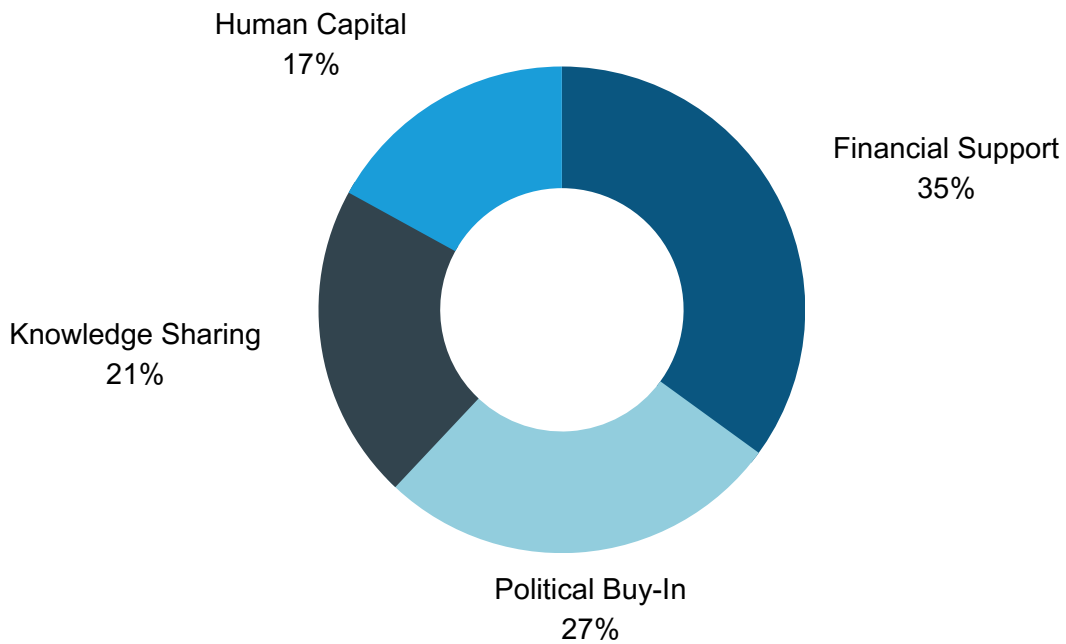


However, when comparing developed and developing countries, the average perception of developed economies is 4.98, while the average of developing economies is lower at 3.99. It is worth noting that 75% of respondents in developed economies rated the RD&D environment as higher than neutral as opposed to only 31% respondents from developing economies.

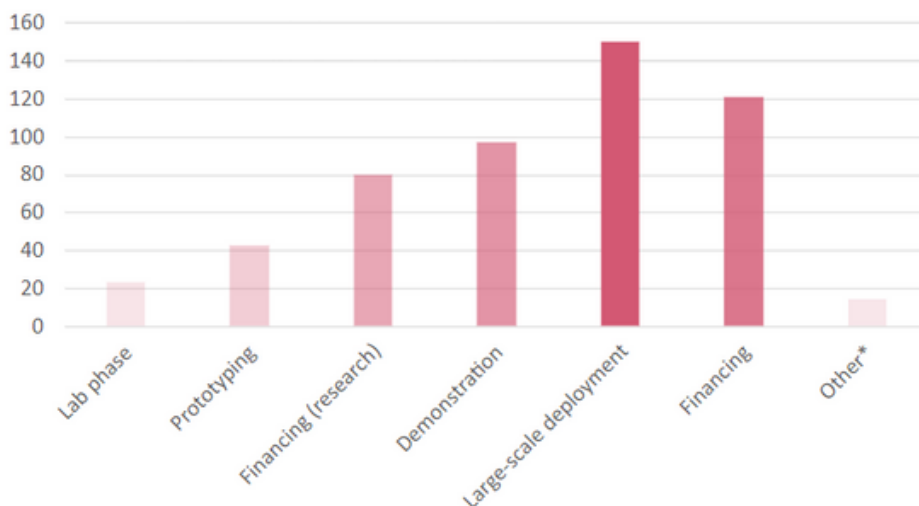


Status of RD&D

Additionally, the key element for successful climate technology in RD&D for 89% of respondents was **financial support**, followed by **human capital** for <50% of respondents (respondants were asked to choose up to three options). The overall share of priorities can be seen below:

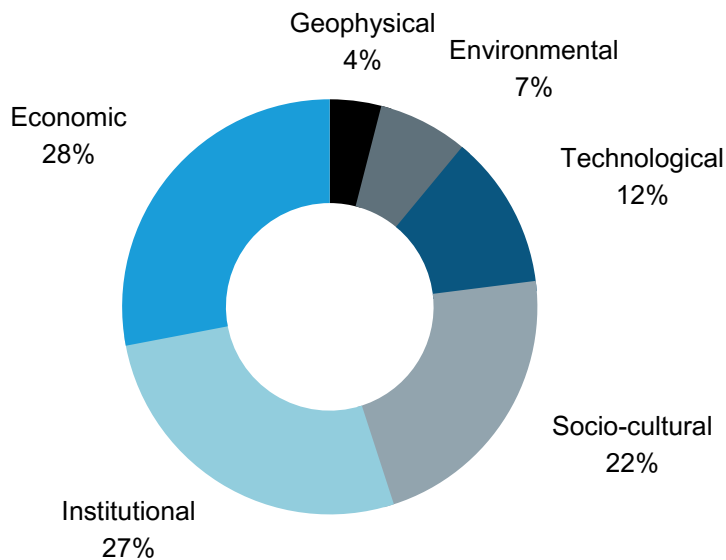


When asked about the stages in which cleantech developments are currently most likely to fail, the participants pointed out later stages such as **large-scale deployment** and **financing**.



Status of RD&D

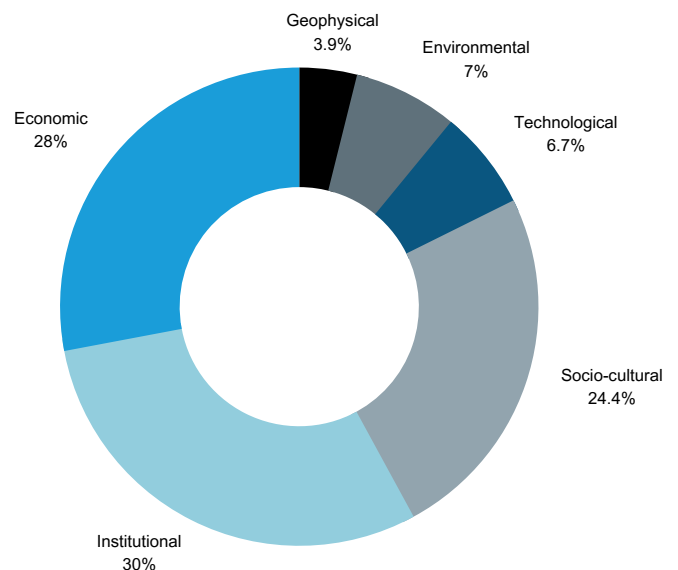
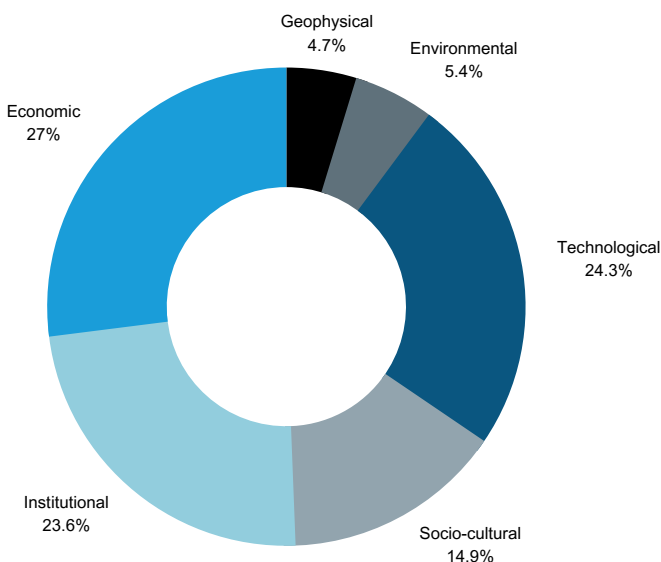
The biggest roadblocks in advancing breakthrough climate technology were **institutional and economic roadblocks**, as selected by participants (given the option to choose up to three categories). The problem does not seem to be the know-how, as geophysical, environmental, and technological barriers are not perceived as the main roadblocks.



When comparing developed and developing countries, the biggest roadblocks in advancing breakthrough climate technology had some differences. Although economic and institutional barriers were relevant in both developed and developing economies, the technology roadblock was much more significant for developing economies (24%) than for developed economies (6%). Additionally, it is worth noting that in both cases the economic roadblocks were rated equally.

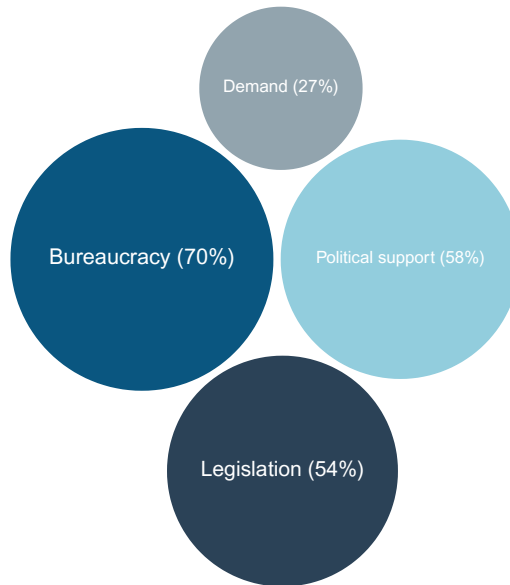
Developing economies

Developed economies



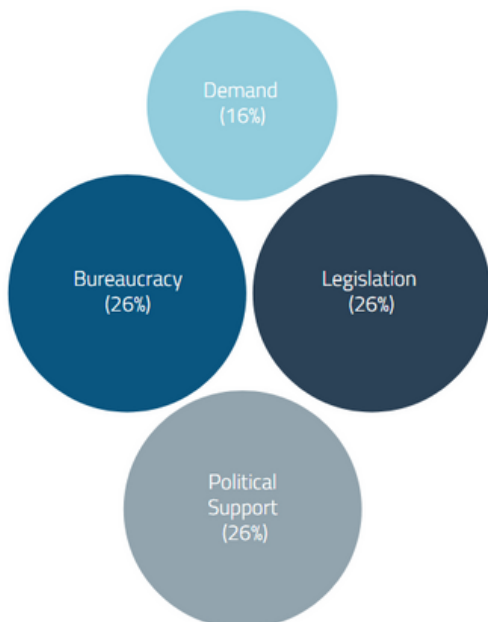
Status of RD&D

Zooming in on the regional barriers, European countries pointed out bureaucracy, political support, and legislation as top barriers to scaling RD&D, while the expected demand seems to be considered less of an issue.

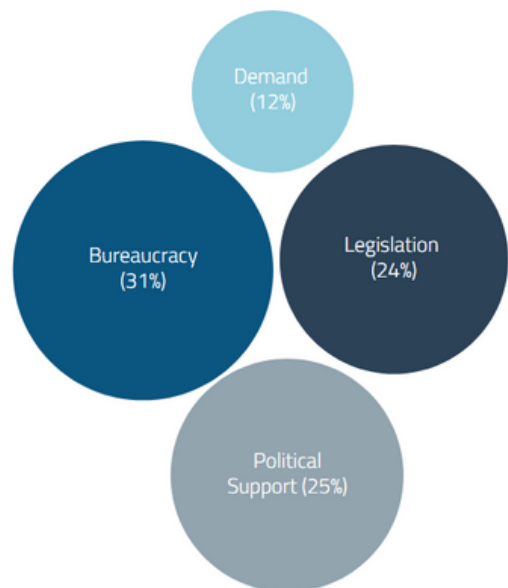


When comparing developing and developed economies, respondents had similar experiences with the barriers to scale RD&D, as seen below:

Developing economies

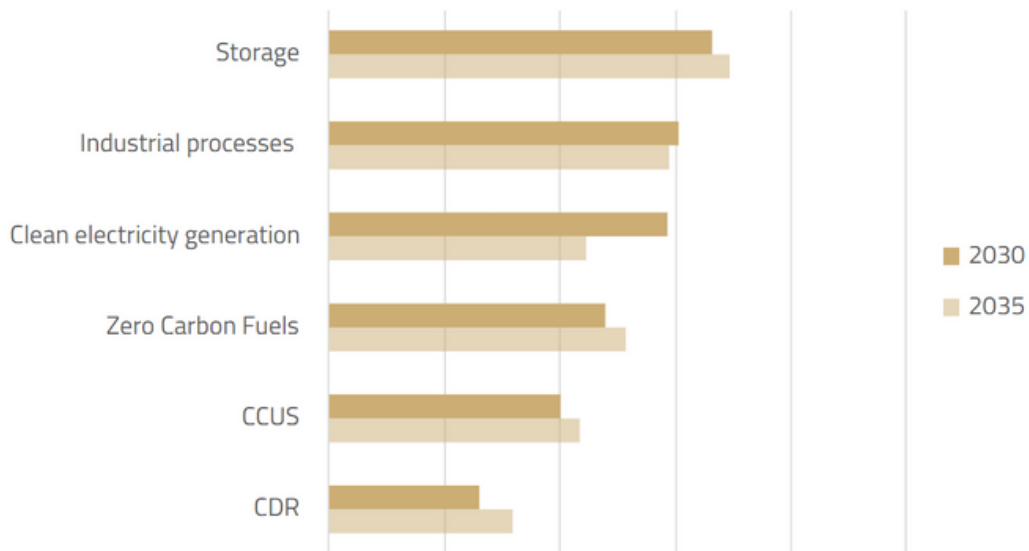


Developed economies

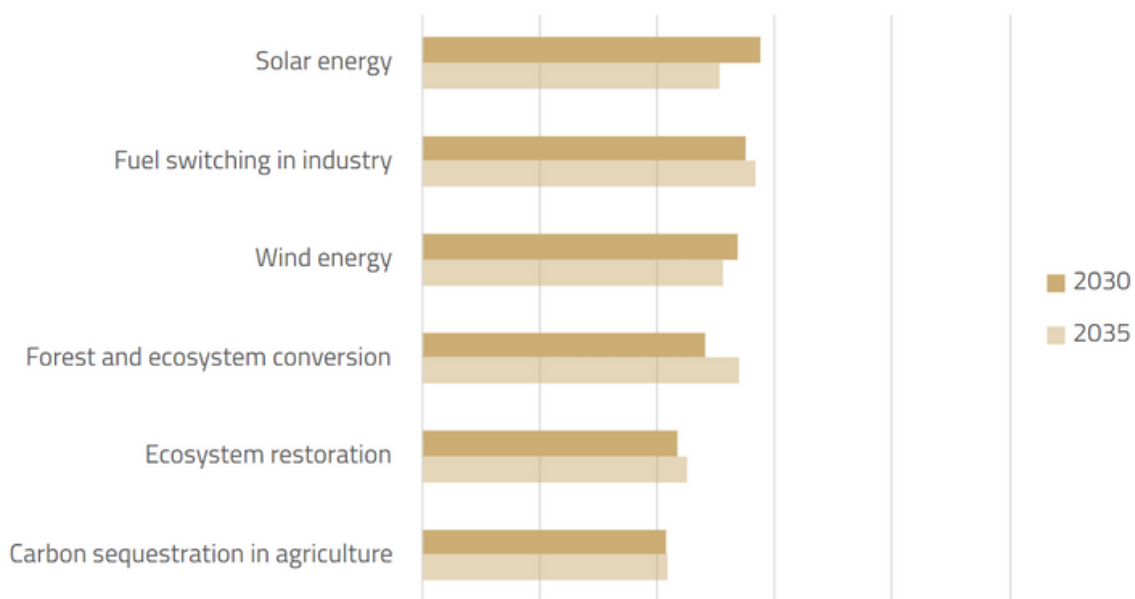


Global Cleantech Priorities

Energy storage was globally ranked the most urgent RD&D acceleration area until 2030 & 2035, followed by industrial processes, and clean electricity generation.



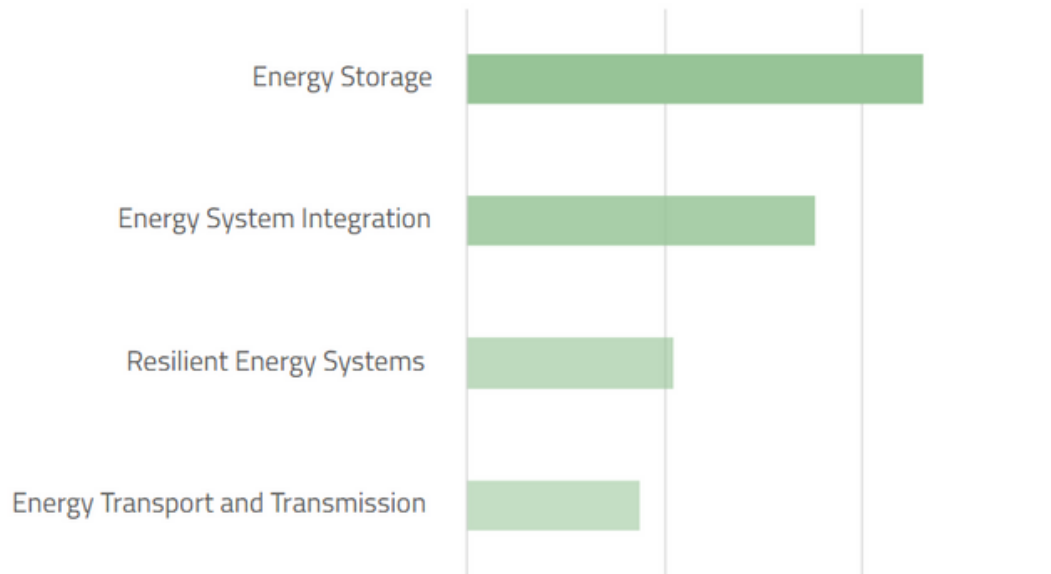
And for the most urgent **mature** RD&D acceleration until 2030 & 2035, the highest ranked technologies were solar energy, followed closely by fuel switching in industry, and wind energy.





Global Cleantech Priorities - Energy Supply

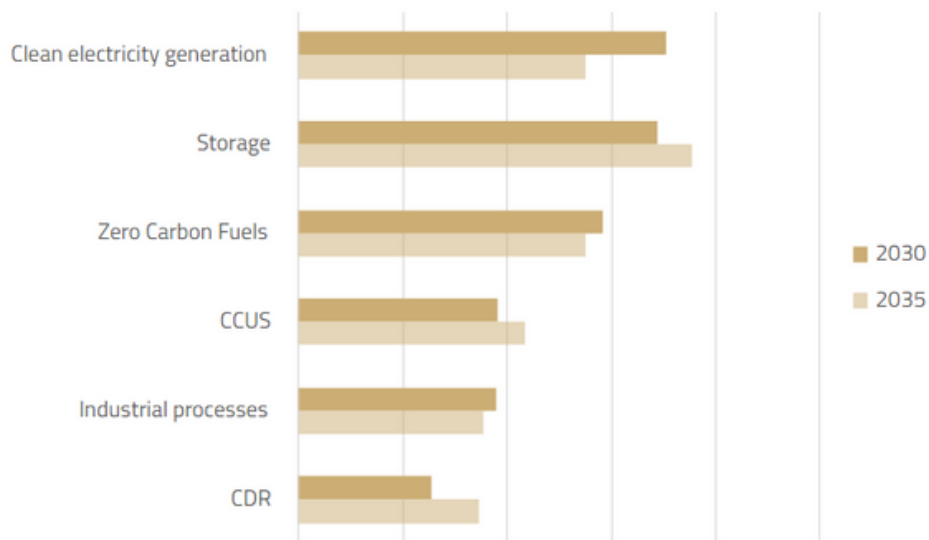
In terms of the most urgent RD&D acceleration for **long term environmentally-friendly energy supply**, energy storage was again ranked as the highest priority, with 56,25% of respondents selecting it.



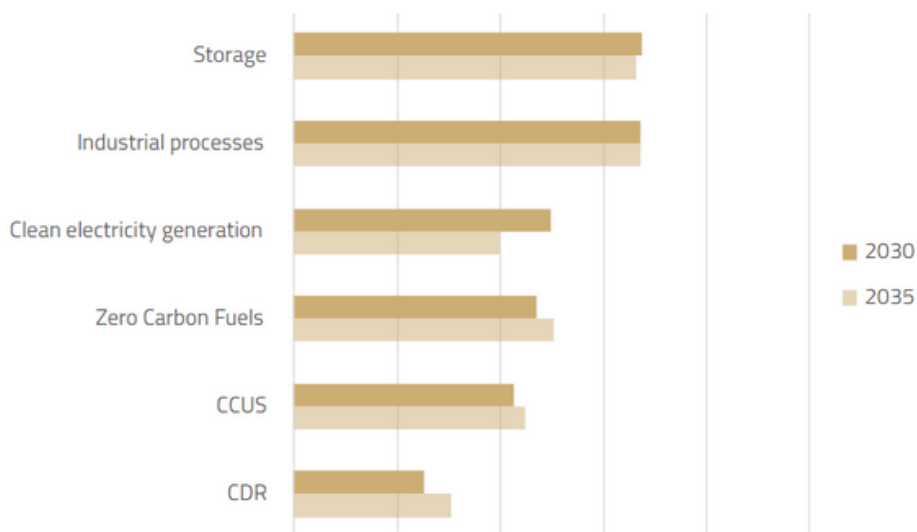
Cleantech priorities for developed and developing economies

Zooming in to some differences across developing and developed economies, the technologies ranked as the most urgent RD&D acceleration until 2030 and 2035 in developed economies were storage and industrial processes, while developing countries highlighted clean electricity generation as key priority until 2030 and energy storage from 2030 to 2035.

Developing economies:



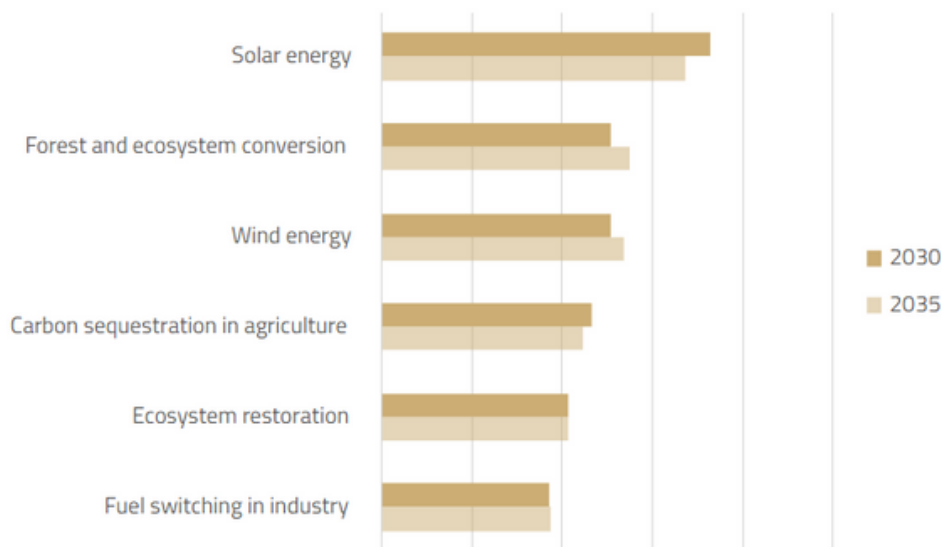
Developed economies:



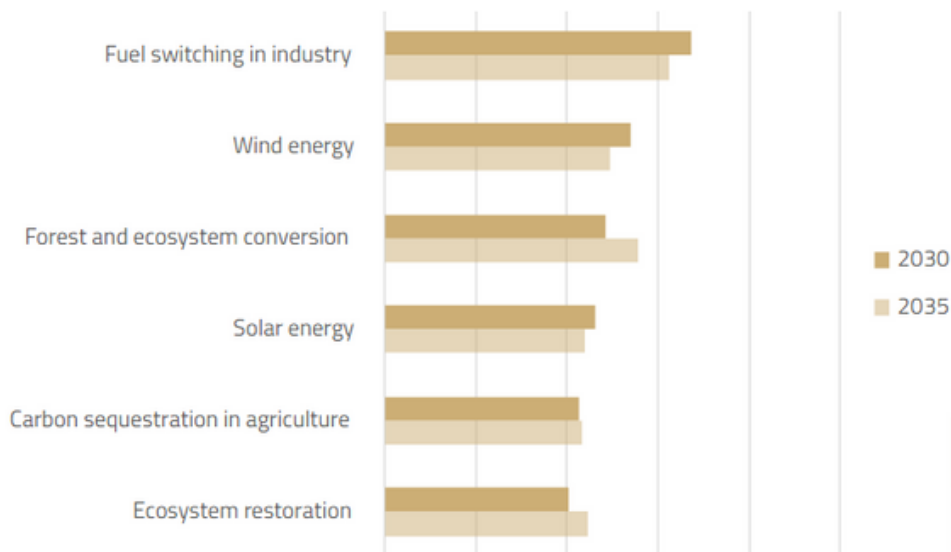
Cleantech priorities for developed and developing economies

As for the most urgent mature RD&D acceleration until 2030 and 2035, developed economies ranked fuel switching as top priority until 2030 and 2035, while developing economies ranked fuel switching to be the lowest priority until 2030 and 2035. Developing economies instead highlighted solar energy as top priority until both 2030 and 2035.

Developing economies:

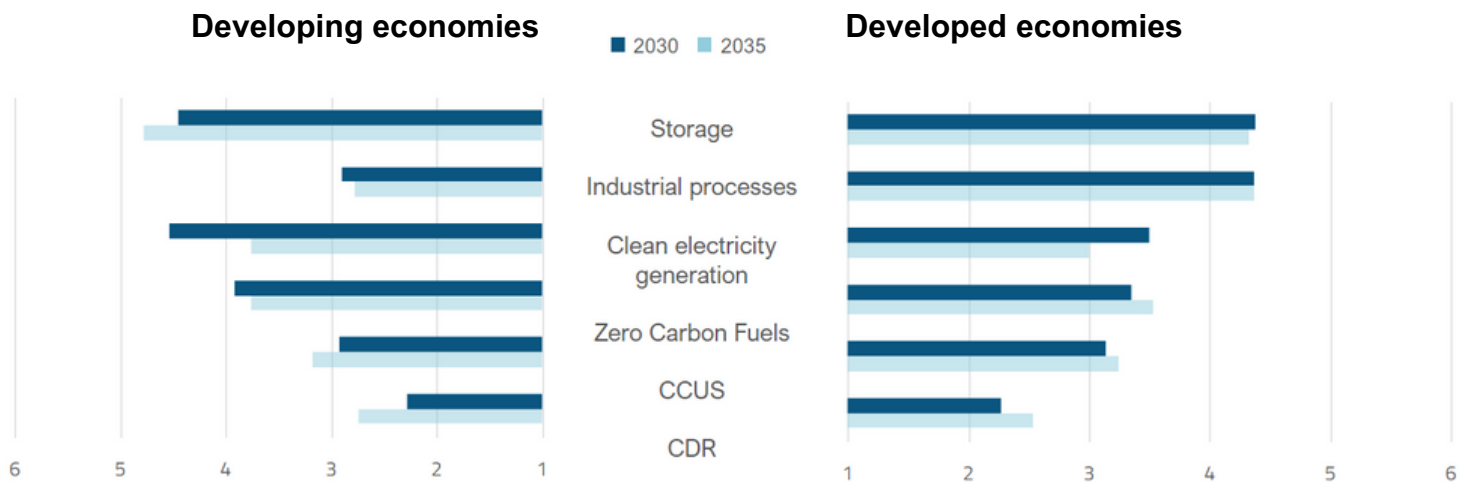


Developed economies:

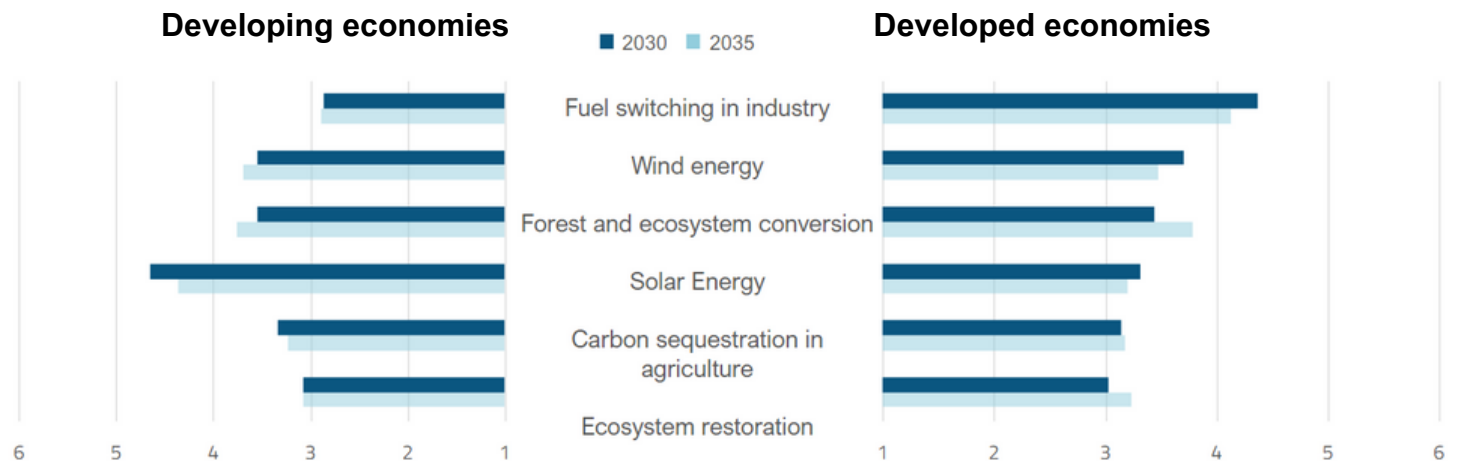


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Next steps

- Further analysis of regional differences
- Analysis of the qualitative questions
- Global and regional barriers in advancing the development of critical breakthrough climate technology
- Analysis of differences according to public vs. private sector
- Analysis of differences according to professional field and main focus of work