von Lüpke, Heiner; Marchewitz, Catherine; Neuhoff, Karsten; Aebischer, Charlotte; Kröger, Mats

Article

Carbon contracts for difference as an instrument for strengthening climate cooperation between industrialized and emerging economies

DIW Weekly Report

Provided in Cooperation with:
German Institute for Economic Research (DIW Berlin)

Suggested Citation: von Lüpke, Heiner; Marchewitz, Catherine; Neuhoff, Karsten; Aebischer, Charlotte; Kröger, Mats (2022) : Carbon contracts for difference as an instrument for strengthening climate cooperation between industrialized and emerging economies, DIW Weekly Report, ISSN 2568-7697, Deutsches Institut für Wirtschaftsforschung (DIW), Berlin, Vol. 12, Iss. 38, pp. 229-235, https://doi.org/10.18723/diw_dwr:2022-38-1

This Version is available at:
https://hdl.handle.net/10419/265833

DIW Weekly Report 38 2022

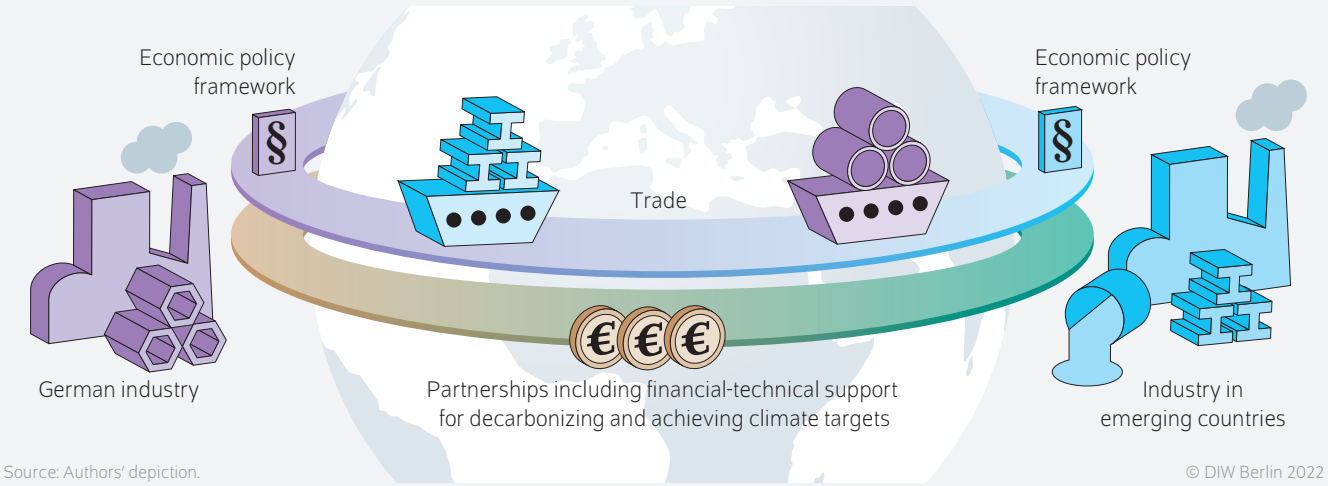
AT A GLANCE

Carbon contracts for difference as an instrument for strengthening climate cooperation between industrialized and emerging economies

By Heiner von Lüpke, Catherine Marchewitz, Karsten Neuhoff, Charlotte Aebischer, and Mats Kröger

- Decarbonization of industry and achieving climate targets are only possible if industrialized countries and emerging countries work together
- An effective policy framework and financing is missing for green investments in heavy industry, especially in emerging countries
- Carbon contracts for difference are a suitable instrument to hedge investments in climate-neutral production processes in emerging countries and thus make them more attractive
- Expert interviews show that successful cooperation requires political dialogue, trust, and a common understanding of industrial climate policy

Decarbonization of emerging countries is only possible with the financial and technical aid of industrialized nations



Source: Authors' depiction.

FROM THE AUTHORS

"The Paris climate targets can only be reached if industry is decarbonized globally. Industrialized countries must financially support developing and emerging countries to make this happen."
— Catherine Marchewitz —

MEDIA

Audio Interview with Heiner von Lüpke (in German)
www.diw.de/mediathek

Carbon contracts for difference as an instrument for strengthening climate cooperation between industrialized and emerging economies

By Heiner von Lüpke, Catherine Marchewitz, Karsten Neuhoff, Charlotte Aebischer, and Mats Kröger

ABSTRACT

Industrialized countries and emerging economies must cooperate in order to decarbonize the emissions-intensive industrial sector and to limit global warming to 1.5 degrees Celsius. While Germany and the other G7 countries have committed to supporting emerging economies in their efforts to combat climate change via international climate finance, it remains to be seen how this support can be implemented successfully. A wide variety of cooperation initiatives that could form a foundation for climate financing—such as climate clubs, partnerships, and alliances—are currently being discussed. However, the incentives to cooperate are not the same for industrialized and emerging countries. As of 2022, the climate club discourse centers on carbon prices, a carbon border adjustment mechanism, incentives for club membership, and sanctions for non-compliance. Financial-technical support for emerging countries has not been discussed sufficiently. Building on interviews with steel sector representatives, international organizations, the financial sector, and think tanks from both the European Union and emerging and developing countries, this paper analyzes existing gaps in cooperation. Moreover, it discusses how international carbon contracts for difference (CCfDs) can support the decarbonization of the steel industry.

To achieve the Paris Agreement's goal of limiting global warming to 1.5 degrees Celsius and to drive global decarbonization forward, Germany financially supports developing and emerging countries in their transition from coal, oil, and gas.[1,2] Despite the German government announcing a 126-million euro increase in climate finance,[3] the amount reserved for decarbonization is still too little. This is especially true for the industrial sector, for which only seven billion USD are earmarked.[4] Throughout 2022, the G7 has announced various forms of support, such as the Industrial Deep Decarbonisation Initiative (IDDI),[5] which aims to stimulate demand for low-carbon products; the G7 Berlin Roadmap on Resource Efficiency and Circular Economy[6] to expand the circular economy; and the proposal to establish climate clubs "to support the effective implementation of the Paris Agreement by accelerating climate action and increasing ambition, with a particular focus on the industry sector."[7]

However, the numerous initiatives are still very unspecific with regard to how industrialized and emerging countries can cooperate on global climate action and which instruments would be most helpful.

Using the steel sector in both emerging countries and Europe as an example, this Weekly Report examines the interplay of policy instruments and analyzes the significant contribution that carbon contracts for difference (CCfDs) can make.

1 BMWK, "Die G7-Route zur grünen Industrie. Schlaglichter der Wirtschaftspolitik," *Monatsbericht* 08/2022 (in German; available online).

2 On the other hand, the ambivalence of European and German energy policy, which considers gas to be sustainable, has certainly been noted by emerging countries.

3 "Habek: 'Mehr denn je, jommt es jetzt auf die globale Energiewende an,'" Federal Ministry for Economic Affairs and Climate Action press release from July 8, 2022 (in German; available online).

4 Climate Policy Initiative, *Global Landscape of Climate Finance 2021* (2022) (available online).

5 See the communiqué of the G7 on the industrial decarbonization agenda.

6 See the communiqué of the G7 on the Berlin Roadmap on Resource Efficiency and Circular Economy.

7 See the G7 statement on climate clubs.

DOI: https://doi.org/10.18723/diw_dwr:2022-38-1

Emerging economies[8] are important for achieving global climate targets

The steel sector serves as a prime example of how complex climate cooperation between industrialized and emerging countries can be. In 2020, 1.19 billion tons of steel were produced worldwide. In light of the growing need for infrastructure in developing and emerging countries, it is forecast that overall demand will continue to increase until 2050. However, under the current political and technological conditions, meeting this growth in demand is not compatible with achieving the Paris climate goals.[9] Indeed, as of 2022, the steel sector is responsible for around eight percent of global carbon emissions.[10]

While a significant number of countries have now declared their intent to decarbonize the steel sector, actual implementation varies greatly between industrialized countries—especially the European Union (EU)—and emerging economies. For example, over 60 percent of the low-carbon steel production projects currently underway are in the EU. However, the bulk of future demand will come from countries and regions outside the EU (Figure 1).[11] This discrepancy can be credited to insufficient access to finance and technologies as well as to the fact that the decarbonization of industry sectors in emerging and developing countries has not ranked very high in the policy agenda setting thus far.[12] This is reflected in the varying scope of measures for decarbonizing the steel sector as described in countries' long-term strategies and the nationally determined contributions (NDCs).[13,14]

However, compliance with the Paris Agreement can only be achieved if the steel sector is fully decarbonized worldwide. To do this, industrialized countries must provide emerging and developing countries with financial support, which is vital as they lack national financing options. Overall, there is an immense gap between actual climate financing and the demand (Figure 2).

In addition, the steel sector is involved in international trade to an extent hardly matched by any other sectors. Thus, the effect on other regions must be considered when designing the regulatory framework for individual countries.[15] While the differing baseline conditions in individual countries complicate a unified approach, they also provide opportunities for leveraging different natural resources. For example, it has been proposed that South Africa use its domestic wind and solar potential to manufacture carbon-neutral iron, which would then be exported to Europe to produce green steel.[16] When designing the measures, it should be considered whether a shift in primary production for basic materials—and for which ones—is economically and socio-politically desirable. Alternatively, cooperative measures could focus on supporting the transition to carbon-neutral production processes in developing and emerging countries for the domestic use of basic materials.

The signing of the Glasgow Breakthroughs[17] at the 2021 United Nations Climate Change Conference (COP26) shows that in principle, countries want to cooperate: Over 42 countries have declared their willingness to produce and trade nearly climate-neutral steel. What form this cooperation should take and which instruments and factors should be used to promote it does remain largely unclear. In addition, it remains to be seen how the—sometimes considerable—additional costs compared to conventional production processes will be covered in developing and emerging countries.

Cooperation incentives differ for emerging and industrialized countries

Industrialized, developing, and emerging countries have fundamentally different incentives for partaking in initiatives such as climate clubs, sectoral alliances like the Glasgow Breakthroughs, or climate partnerships.[18] This is not least due to their different pre-conditions for the energy transition, which in turn affect the decarbonization of the steel industry. Emerging countries face a challenge: They must meet increasing electricity demand while also decarbonizing the electricity and industrial sectors.[19] In addition to climate action and poverty reduction, their focus lies on increasing competitiveness, technological improvements, and energy efficiency in the steel sector. Any potential cooperation should

8 The term emerging economies is used here as this study focused on this group of countries, but the wider group of developing countries are not ruled out as partners for CCfDs.

9 International Energy Agency (IEA), *Direct CO2 intensity of steel production in the Net Zero Scenario, 2018–2030* (2021) (available online).

10 IEA, *World Energy Outlook 2021* (2021) (available online).

11 Valentin Vogl et al., *Green Steel Tracker* (2021) *Green Steel Tracker, Version 11/2021* (2021) (available online).

12 Timo Gerres et al., *Green steel production: How G7 countries can help change the global landscape,* LeadIT (2021) (available online).

13 Nationally determined contributions (NDCs) are "are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change" (Paris Agreement, Article 4). See also the UNCC (available online).

14 Authors' research using the UNFCCC Long-term strategies portal (available online) and the NDC Registry (available online).

15 BMWK, "Die G7-Route zur grünen Industrie. Schlaglichter der Wirtschaftspolitik," *Monatsbericht* 08/2022 (in German; available online); Peng Wang et al., "Efficiency stagnation in global steel production urges joint supply- and demand-side mitigation efforts," *Nature Communications* 12 (2021): 2066 (available online).

16 See, for example, Hilton Trollip, Bryce McCall, and Chris Bataille, "How green primary iron production in South Africa could help global decarbonization," *Climate Policy* 22, no. 2 (2022) (available online).

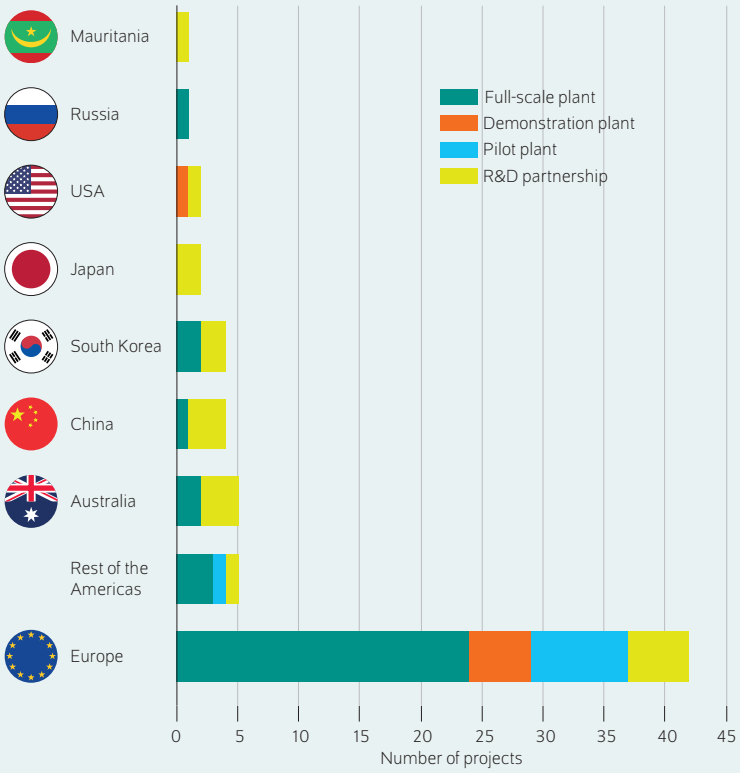
17 Through the Glasgow Breakthroughs, signatory countries have joined together to drive forward the decarbonization of the steel, energy, agriculture, hydrogen, and transportation sectors.

18 For a detailed comparison of the three forms of initiatives (climate clubs, sectoral alliances, and climate partnerships), see: Heiner von Lüpke, Karsten Neuhoff, and Catherine Marchewitz, "Bridges over troubled waters: Climate clubs, alliances and partnerships as safeguards for effective international cooperation?" *Politikberatung kompakt*, no. 179 (2022).

19 Shoibal Chakravarty and Massimo Tavoni, "Energy poverty alleviation and climate change mitigation: Is there a trade off?" *Energy Economics* 40, no. 1 (2013): 67–73.

Figure 1

Number of projects for low-carbon steel in various regions/ countries



Notes: The innovation stage of the project was estimated based on available sources according to company reports. Four innovation stages were considered: R&D partnership, pilot project, demonstration, and full-scale plant. The classifications vary from company to company, meaning a plant with a certain capacity may be called a pilot plant by one company and a demonstration plant by another (analogous for demo/full scale).

Source: Valentin Vogl et al., Green Steel Tracker v.6 (2022) (available online).

The majority of the current projects for the manufacturing of low-carbon steel is based in the EU.

therefore also create economic benefits, compensate for dwindling revenues, and create new jobs.[20]

For industrialized countries, on the other hand, it is the provision of financial support for emerging and developing countries, as stipulated in Article 9[21] of the Paris Agreement, that stands out next to general obligations to global climate action.

Carbon leakage must be avoided; current carbon border adjustment mechanism is insufficient

Should carbon prices come to play a central role in the EU's transition to climate neutrality, there is the risk that this could lead to a shift of production sites, a phenomenon known as carbon leakage. In the EU, this risk is to be addressed through the introduction of a carbon border adjustment mechanism, which also assigns a comparable carbon price to imports. The EU Commission has proposed that importers of steel products, cement, and fertilizers must prove which emissions were generated during production by submitting CO_2 certificates for these emissions—much like the European raw materials manufacturers are compelled to do.

Yet proving product-specific emissions entails a high administrative burden. This results in additional carbon costs for imports not being levied for basic chemicals or more complex products.[22] Thus, there is still a risk of production and emissions being shifted abroad.

Despite this flaw, an EU carbon border adjustment mechanism based on the emissions and carbon prices in non-EU countries has been proposed to incentivize implementing carbon prices and emissions reductions in partner countries. However, interviews with representatives from the steel sector, politics, and international organizations have shown that doing so often generates political headwind rather than a willingness to cooperate. At the same time, the incentives are insufficient for supporting investments in carbon-neutral technologies in non-EU countries. A more serious concern, however, is that further delaying the introduction of effective carbon prices will delay the overall transition to climate neutrality.[23]

This is why an EU carbon border adjustment mechanism (CBAM) should focus on incentivizing carbon-neutral production as well as selecting, using, and recycling basic materials within the EU—even if this does not initially creative incentives for emissions reductions or carbon pricing in non-EU countries. This could be achieved through a flat-rate climate contribution that would be levied per ton of basic material (e.g., steel) on top of the EU emissions trading system. Imports along the value chain would then be covered and the climate contribution waived for exports. This would ensure that the carbon price creates all of the necessary incentives for transitioning to carbon neutrality without creating carbon leakage. At the same time, CO_2 emission allowances can be issued free of charge to basic material manufacturers if they implement a transition strategy towards climate neutrality. Part of the 35-billion-euro annual

20 Hilton Trollip, Bryce McCall, and Chris Bataille, "How green primary iron production in South Africa could help global decarbonization," *Climate Policy* 22, no. 2 (2022): 236–247 (available online).

21 Article 9 of the Paris Agreement stipulates that industrialized countries must provide financial support to developing and emerging countries for climate action. More information can be found here.

22 Karsten Neuhoff et al., "Addressing export concerns in the CBAM file," Climate Strategies Policy Brief (2022) (available online).

23 For more on CBAM reform options and an instrument mix for the decarbonization of European industry, see: Karsten Neuhoff et al., "Closing the Green Deal for Industry," *Climate Strategies Position Paper* (2022) (available online).

proceeds (at 60 euros/ton of carbon)[24] can then be used to support developing countries in transitioning to climate neutrality. However, the discussion on the carbon border adjustment mechanism emphasizes the fact that currently, there are no effective, internationally applicable instruments for supporting decarbonization in the steel sector.

CCfDs in industry are key to effective climate partnerships and climate clubs

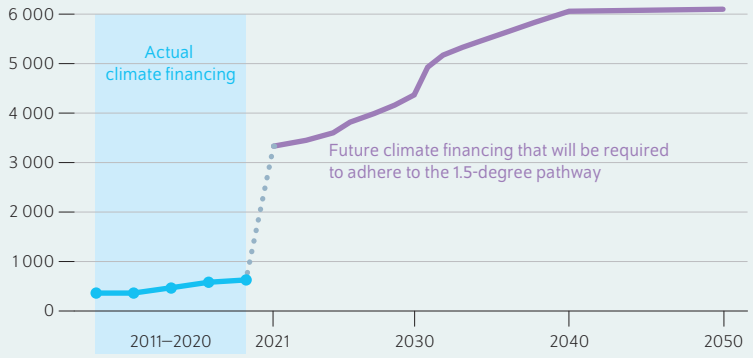
Due to the required investment volume and additional costs for decarbonizing the steel industry, the process can only be successfully initiated in developing and emerging countries if industrialized countries contribute financing mechanisms and funding. According to Mission Possible Partnership[25] calculations, an additional 200 billion USD in investment funds will be required by 2050 to successfully decarbonize the steel sector. CCfDs, which are concluded between a government and a commercial business, could contribute here. In a CCfD, a contract price for carbon (in euros/ton of CO_2 equivalent) is set for a specific period of time. If the actual variable reference price is lower than the contract price every year during the period, the state pays the company the difference between the contract and reference prices (for example, the average price for EU emissions trading certificates). If the actual reference price is higher than the contract price, the situation is reversed and the company pays the difference to the government. CCfDs have been proposed as a risk-reducing instrument for carbon-neutral investments in heavy industry in industrialized countries and are currently in the implementation phase in several EU countries. The contracts thus hedge the uncertainties of future carbon price developments and help cover the additional costs incurred when switching production from conventional, carbon-intensive technologies to low-carbon or carbon-neutral technologies (transition costs).[26] In turn, this secures revenue streams for the companies and supports the necessary investments.

Looking at the bigger picture of climate cooperation, there is the question of whether CCfDs can also finance transition costs as well as mitigate risks, and thereby provide a framework for private sector investment in the decarbonization of industry in emerging countries. If so, this would make it possible for donor and recipient countries to design the industrial transition together (Figure 3).

The expert interviews revealed that the high financing costs on the domestic capital markets and exchange rate risks when using the international capital markets must be taken into account, especially in an international context. Such exchange rate risks could be avoided by, for example, designing CCfDs in a way that partially hedges additional costs in euros, thus reducing the overall additional costs to be covered.

Figure 2

Actual climate financing from 2011 to 2020 and future requirements for achieving the 1.5-degree target
In billions of dollars



Note: The figures refer to the total climate financing sum, not to the guaranteed 100 billion USD per year in aid to developing countries according to the Paris Agreement.

Quelle: Climate Policy Initiative (2022). Global Landscape of Climate Finance 2021 (available online).

The gap between actual climate financing and real demand is immense.

Existing SNAPFI Project[27] research argues that national political measures, not international support or pressure, determine the speed of emerging countries' decarbonization pathway.[28] Therefore, it is important that international CCfDs are not negotiated as a stand-alone instrument, but rather as one aspect of climate cooperation to be developed jointly. At the same time, the remaining framework conditions for a successful transition to carbon neutrality must also be defined—how the exchange rate risk can be mitigated effectively, for example. The situation where international support for a country's transition decreases if carbon prices are suddenly introduced must be avoided, and the cost savings due to CCfDs should be used to fund further domestic transition measures.

Overall and in an international context, CCfDs are a promising instrument to cover the additional financing required for the transition of industrial sectors, such as the steel industry. By effectively covering the commercial risk of a green steel mill versus investing in a conventional plant, CCfDs reduce the risk of such a program significantly. However, introducing international CCfDs has a series of further implications, which will be discussed in the following section.

24 Jan Stede et al., "Carbon pricing of basic materials: Incentives and risks for the value chain and consumers," *Ecological Economics*, vol. 189 (2021) (available online).

25 The Mission Possible Partnership (MPP) is a coalition of the Energy Transitions Commission, the Rocky Mountain Institute, the We Mean Business Coalition, and the World Economic Forum. Its purpose is to accelerate the decarbonization of industry. More information can be found on its website.

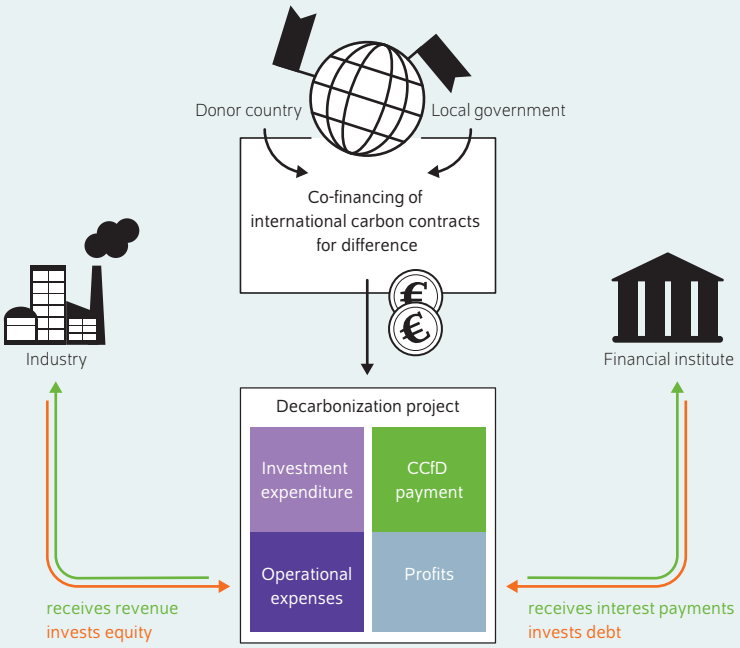
26 Jörn Richstein und Karsten Neuhoff, "Carbon contracts-for-difference: How to de-risk innovative investments for a low-carbon industry," *iScience* 25, no. 8 (2022) (available online).

27 More information on the SNAPFI project (Strengthen national climate policy implementation: Comparative empirical learning & creating linkage to climate finance) is available here.

28 Tamiksha Singh et al., *Transitoning India's Steel and Cement Industries to Low Carbon Pathways (SNAPFI Country Study)* (2020) (available online).

Figure 3

Structure of international carbon contracts for difference



Source: Authors' depiction.

When local governments and international donors invest jointly in the CCfD program, this creates ownership and incentives to reduce costs in the country of production.

Intergovernmental cooperation: Donor and recipient countries should work together to implement international CCfDs

To cooperate successfully, donor countries should provide the financial resources, while recipient countries should provide co-financing and ensure other policy instruments are in place to support a sector-wide transition. For example, the recipient government could cover the gap between the supply and demand sides of green steel (through sustainable public procurement standards) or set standards for steel production processes.[29]

However, the expert interviews revealed that deficits remain in the area of international climate financing, particularly in regard to mutual trust between donor and recipient countries. This issue should also be addressed in the context of CCfDs. In donor countries, governments are concerned about recipient countries honoring their co-financing agreements and implementing policy instruments for the transition. In recipient countries, they are concerned certain financing conditionalities could have negative effects, such as debt or currency exchange disadvantages. Some of these concerns could be addressed by implementing specific mutual contractual commitments to payments and savings in a CCfD.

Discussions between donor and recipient countries clarifying whether and under what conditions international interference in national policy processes is legitimate could offer another solution to these issues and improve cooperation. Unlike existing dialogues, these political dialogues would be organized in accordance with the characteristics of the global climate commons, i.e., based on the rationale that energy and industry sector policies are not only of concern to any single country, but are important for the global climate. Such policy dialogues could be organized to provide the legitimacy to speak about aspects of global concern in domestic policy situations such as GHG emission trends and mitigation policy options. Such dialogues may ultimately help create trust if donor countries open up their climate and energy policies to a mutual evaluation process, as is done, for example, in OECD peer review processes in sectors such as education.[30] Furthermore, such processes could make it clear how donor and recipient countries stand according to their common but differentiated responsibilities. This would create legitimacy to discuss policy and reforms, as both donor and recipient country policy programs are critical for the future of the climate.

Conclusion: Use CCfDs to create framework conditions for cooperation on equal terms

The current proposals for international climate cooperation recognize the importance of industrialized and emerging countries working together to decarbonize industry. However, the instruments to be used to support the transition and which cross-border conditions are needed to be successful must still be clarified.

The current goal of encouraging non-EU countries to reduce emissions and to introduce carbon prices via the EU's carbon border adjustment mechanism must be viewed critically. Introducing such a policy unilaterally contradicts the principles of effective climate cooperation. At the same time, incentives for reducing emissions in the EU are diminished. However, both disadvantages could be avoided with a flat-rate approach, such as a climate contribution, which would complement emissions trading.

However, other instruments could be more effective for international cooperation. For example, international CCfDs could partially cover costs for decarbonizing processes in raw materials production. For this to succeed, new forms of political dialogue, trust, a common understanding of industrial policy, and cross-border institutionalization are needed.

A cautious political approach to using CCfDs to decarbonize the steel industry in emerging countries is needed due to the fact that their use requires donor countries to manage

29 Singh et al., *Transitioning India's Steel and Cement Industries*.

30 OECD peer review processes are described as "the systematic examination and assessment of the performance of a state by other states, with the ultimate goal of helping the reviewed state improve its policy making, adopt best practices and comply with established standards and principles" in F. Pagani, "Peer review as a tool for co-operation and change: An analysis of an OECD working method," *African Security Review* 11, vol. 4 (2002).

their own emissions. Mutual evaluation processes of donor and recipient countries' policy programs could be one instrument for creating trust and political legitimacy. OECD peer review processes in sectors such as education could serve as an example here. Climate partnerships, as currently planned by the German government, could serve as a further suitable instrument for international political dialogue. This is especially true, as these partnerships allow for more focused—and over time more intensive—collaboration with partner governments.

Heiner von Lüpke is a research associate in the Climate Policy Department at DIW Berlin | hluepke@diw.de

Catherine Marchewitz is a research associate in the Climate Policy Department at DIW Berlin | cmarchewitz@diw.de

Karsten Neuhoff is Head of the Climate Policy Department at DIW Berlin | kneuhoff@diw.de

Charlotte Aebischer is a student research assistant in the Climate Policy Department at DIW Berlin | caebischer@diw.de

Mats Kröger is a research associate in the Climate Policy Department at DIWBerlin | mkroeger@diw.de

JEL: Q40, Q41, Q42, Q48, F3, F63, F65

Keywords: climate policy; international climate finance; cooperation; decarbonisation

LEGAL AND EDITORIAL DETAILS

DIW Berlin — Deutsches Institut für Wirtschaftsforschung e. V.
Mohrenstraße 58, 10117 Berlin
www.diw.de
Phone: +49 30 897 89–0 Fax: –200
Volume 12 September 27, 2022

Publishers
Prof. Dr. Tomaso Duso; Sabine Fiedler; Prof. Marcel Fratzscher, Ph.D.; Prof. Dr. Peter Haan; Prof. Dr. Claudia Kemfert; Prof. Dr. Alexander S. Kritikos; Prof. Dr. Alexander Kriwoluzky; Prof. Dr. Stefan Liebig; Prof. Dr. Lukas Menkhoff; Prof. Karsten Neuhoff, Ph.D.; Prof. Dr. Carsten Schröder; Prof. Dr. Katharina Wrohlich

Editors-in-chief
Prof. Dr. Pio Baake; Claudia Cohnen-Beck; Sebastian Kollmann; Kristina van Deuverden

Reviewer

Editorial staff
Marten Brehmer; Rebecca Buhner; Dr. Hella Engerer; Petra Jasper; Kevin Kunze; Sandra Tubik

Layout
Roman Wilhelm, Stefanie Reeg, Eva Kretschmer, DIW Berlin

Cover design
© imageBROKER / Steffen Diemer

Composition
Satz-Rechen-Zentrum Hartmann + Heenemann GmbH & Co. KG, Berlin

ISSN 2568-7697