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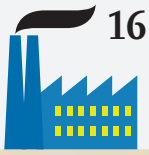
AT A GLANCE

Green Deal for industry: a clear policy framework is more important than funding

By Karsten Neuhoff, Olga Chiappinelli, Mats Kröger, Frederik Lettow, Jörn Richstein, Franziska Schütze, Jan Stede, and Xi Sun

- A rapid implementation of the Green Deal in the basic materials industry can allow climate and economic goals to be reached at the same time
- For this, short-term funding is necessary, but creating the necessary regulatory frameworks is even more important
- A reform of the EU ETS and Carbon Contracts for Differences make low-emission technologies economically viable in the long term
- Sustainable finance and CO_2 product requirements ensure a timely implementation of investments
- Setting clear targets for expanding climate-neutral production enables coordination of necessary regulatory approaches

A package of measures is necessary for climate-neutral basic material production



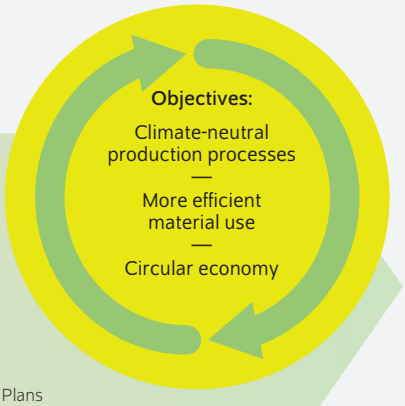
16 %
of EU greenhouse gas emissions are generated by basic material production

1. Make climate-neutral options economically viable
- Climate contribution for effective carbon prices
- Carbon Contracts for Differences to hedge against regulatory risks

2. Ensure industry implements climate-neutral options
- Forward-looking reporting in risk management
- Ban on sales of basic materials from emission-intensive processes

3. Further framework conditions
- Provide strategic infrastructure
- Make public procurement sustainable
- Frameworks for circular economy and material efficiency

4. Ensure timely and coordinated implementation of frameworks by the government
- Define a target: how much climate-neutral production by 2030
- Integration in the National Energy and Climate Plans and EU 2030 Governance



Source: Authors' own depiction.

FROM THE AUTHORS

"When it comes to industry's transition to climate neutrality, it is always discussed how investment possibilities can be funded. But regulatory frameworks are just as important. Without them, industry will not implement climate-neutral options."
— Karsten Neuhoff —

MEDIA

Audio Interview with Karsten Neuhoff (in German)
www.diw.de/mediathek

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ABSTRACT

The European Commission is facing the challenge and opportunity of implementing the Green Deal while simultaneously initiating the recovery of the economy following the coronavirus crisis. Investments in the basic materials industry's transition to climate neutrality play a central role in this, as the sector is responsible for 16 percent of the EU's CO_2 emissions and is key to downstream value chains. While funding for investment opportunities is often discussed, what is needed above all for the transition is a clear policy framework that makes investments in climate-friendly technologies economically viable and ensures that companies actually implement the investments in the transition. The necessary infrastructure and institutions must then be provided in the meantime. For these measures to be implemented in a timely and coordinated manner, it is important to set targets for climate-neutral production at national and European levels and to anchor them in the National Energy and Climate Plans and in the EU governance structure.

In 2019, the European Commission presented the Green Deal, its plan to make the European Union climate-neutral by 2050.[1] Since then, the Commission has drafted legislative proposals that it will present to the European Parliament and European Council in 2021. At the same time, the EU and EU member states like for example Germany launched economic stimulus packages worth 750 billion and 141 billion euros, respectively, in response to the coronavirus crisis.[2] Around 37 percent of EU[3] and 30 percent[4] of the German stimulus packages are earmarked for climate action.

Using the example of the production and use of basic materials such as steel, basic chemicals, and cement, this report investigates which instruments are required to jump-start the industry's transition, thus simultaneously achieving climate and recovery targets.[5] The production of basic materials is responsible for 16 percent of EU emissions[6] and the sector forms the basis for the majority of other industrial processes and products.

Climate neutrality only possible with the transformation of basic material production and use

Achieving climate neutrality in the basic materials sector requires a shift away from conventional production

1 European Commission, *Communication from the Commission to the European Parliament, the European Council, the Council, The European Economic and Social Committee and the Committee of the Regions.* The European Green Deal (COM/2019/640 final).

2 Wuppertal Institute and E3G, *Green Recovery Tracker Report: Germany* (available online; accessed on February 23, 2021. This applies to all other online sources in this report unless stated otherwise).

3 Ursula von der Leyen, *State of the Union Address by President von der Leyen at the European Parliament Plenary* (Brussels: September 16, 2020) (available online).

4 Wuppertal Institute and E3G, *Green Recovery Tracker Report.*

5 For earlier studies on policies for a climate-friendly basic materials sector, see Karsten Neuhoff et al., "Building Blocks for a Climate-Neutral European Industrial Sector," *Climate Strategies Report* (2019). (available online).

6 Of this, about a third are indirect emissions from power generation for the basic materials industry. Authors' calculations based on EEA, "End user GHG emissions from energy: reallocation of emissions from energy industries to end users, 2005–2010," *Technical report* no. 19 (2011) (available online) and EEA, National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism (available online).

DOI: https://doi.org/10.18723/diw_dwr:2021-10-1

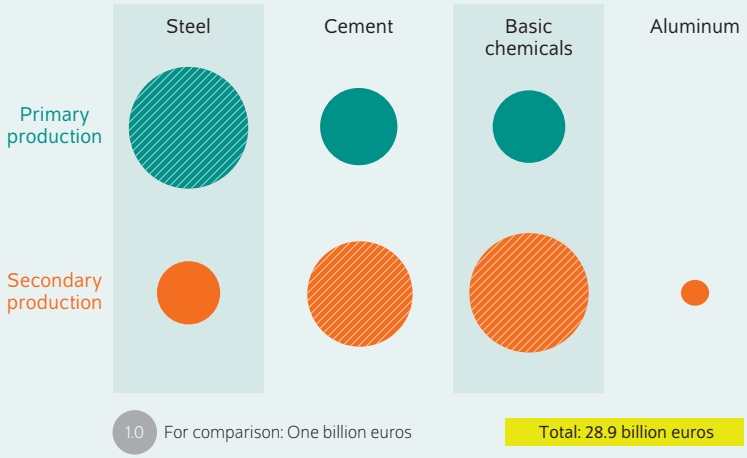
processes.[7] Innovative, climate-neutral technologies—typically based on electrification, green hydrogen, or the use of biomass—already exist. However, there are currently two challenges: First, the new technologies are and will likely remain more expensive than conventional production processes, both in terms of investment and operation.[8] Second, they require large amounts of energy. For example, converting the current production of steel to electricity-based hydrogen production would increase Germany's electricity demand by 18 percent.[9] For this reason, and because of the limited availability of renewable energy potentials,[10] a successful transition requires material efficiency and a circular economy to reduce the demand for primary production of basic materials. This reduces the energy requirements and the costs of primary production while simultaneously strengthening the resilience of value chains through lower resource requirements.

The transition of the basic materials sector will fulfill the "three t"criteria for effective stimulus measures:[11] First, *targeted additional* investments are triggered by focusing on novel production processes, recycling technologies, and strategic infrastructure. Second, many of these projects can be implemented *in a timely manner*. Europe-wide, there is an investment potential of around 30 billion euros by 2025. This means that around 20 percent of the basic materials in the EU will be converted to low-emission primary production processes or replaced by high-quality recycling (Figure 1).[12] Third, the need for funding to jump-start the transformation is *temporary*. However, this requires companies to be able to recover the additional costs of climate-neutral basic material production in the long-run.

So far, customers in the basic materials industry, such as the construction or automotive sectors, have not been willing to pay a sufficient price premium for green materials, one reason being that it is unclear how much of the premium would be paid by the final consumers.[13] Therefore, a policy framework is needed in which the higher costs of climate-neutral production processes can be covered.

Figure 1

Investment volume in the EU until 2025 to replace basic material production with climate-friendly processes
In billion euros



Note: Cost data based on literature values or (striped circles) estimations from interviews the authors conducted with industry stakeholders.

Legend: With an investment volume of around 30 billion euros, around 20 percent of basic materials in the EU could be produced with low-emission primary production processes or substituted by additional high-quality recycling by 2025 using technologies that are already commercially available or in the pilot phase.

Source: Olga Chiappinelli et al., "A Green COVID-19 Recovery of the EU Basic Materials Sector."

The green transition of the basic materials industry requires significant investments.

Reform of EU ETS necessary to make climate-neutral investments economically viable

A reform of the EU Emissions Trading System (EU ETS) is currently under discussion in order to align the reduction targets and market stability reserve with the new emissions reduction target of at least 55 percent by 2030.[14] Two further objectives should be achieved as well: First, the carbon costs of conventional basic material production must be reflected in the value chains so that climate-neutral production processes can recover additional costs and create incentives for efficient material use and choice. This goal is currently not being achieved, as material producers who compete internationally receive free emission allowances to prevent carbon leakage, i.e., the relocation of production and thus emissions

7 See, among other climate-friendly sectoral strategies, European Aluminium, *Vision 2050: A vision for Strategic, low carbon and competitive aluminium* (EA Report, 2020) (available online); CEMBUREAU, *Cementing the European Green Deal: reaching climate neutrality along the cement and concrete value chain by 2050* (CEMBUREAU Report, 2020) (available online); EUROFER, *Low Carbon Roadmap: Pathways to a CO2-Neutral European Steel Industry* (EUROFER Report, 2019). (available online); Verband der chemischen Industrie, *Roadmap Chemie 2050 auf dem Weg zu eitner treibhausgasneutralen chemischen Industrie in Deutschland: eine Studie von DECHEMA und FutureCamp für den VCI* (VCI Report, 2019) (in German; available online).

8 Olga Chiappinelli et al., "A Green COVID-19 Recovery of the EU Basic Materials Sector: Identifying Potentials, Barriers and Policy Solutions," *DIW Discussion Paper* no. 1921 (available online).

9 These are the authors' calculations based on power consumption of green hydrogen-based steel production of 3.48 MWh/t steel, power consumption of primary steel production of 27.8 Mt in Germany in 2019, and overall power consumption of 538.4 TWh in 2019. Valentin Vogl, Max Ahman, and Lars Nilsson, "Assessment of hydrogen direct reduction for fossil-free steelmaking," *Journal of Cleaner Production* 203 (2018): 736–745; Bundesverband der Energie- und Wasserwirtschaft, *Stromerzeugung und -verbrauch in Deutschland* (2020) (in German; available online); World Steel Association, *World Steel in* Figures *2020* (2020) (available online).

10 Depending on acceptance and available space, cf. Pablo Ruiz et al., "ENSPRESO—an open, EU-28 wide, transparent and coherent database of wind, solar and biomass energy potentials," *Energy Strategy Reviews* 26 (2019): 100379.

11 Douglas W. Elmendorff and Jason Furman, *Three Keys to Effective Fiscal Stimulus* (Brookings Institution, 2008).

12 Chiappinelli et al., "A Green COVID-19 Recovery of the EU Basic Materials Sector."

13 Experience with households choosing green electricity tariffs also suggests that the potential for improvement may be limited. So far, only a fraction of consumers select a green electricity tariff and is not ready to pay a significant premium.

14 European Commission, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Stepping up Europe's 2030 climate ambition Investing in a climate-neutral future for the benefit of our people* (COM/2020/562 final) (available online).

abroad.[15] Due to this, however, only a small part of the carbon costs of the EU ETS is passed on.[16]

Second, investors require a perspective on how the carbon price in the EU ETS can reach the necessary level to make climate-neutral production processes economically viable. To achieve this, the current conflict of objectives must be resolved: On the one hand, the free allocation of emission allowances should be reduced so that carbon costs are better reflected along the value chain and the necessary incentives and revenue are created. On the other hand, free allocation is necessary to prevent relocation of production and emissions from the basic material sector to third countries.

This conflict cannot be solved by the design of free allocation provisions alone. Against this background, the EU Commission has proposed a carbon border adjustment mechanism. The Council Decision provides for implementation in January 2023.[17] The Commission is examining various options, including the proposal of adding a climate contribution (excise charge).

Adding a climate contribution to EU ETS for effective carbon pricing

One challenge faced by the EU ETS is the current lack of carbon cost pass-through to basic materials prices. This can be solved by adding a climate contribution to the EU ETS.[18] This is an excise charge imposed on every ton of produced or imported basic materials.[19] The extra charge would be passed along the value chain and paid upon final consumption. The charge is then waived when exporting basic materials or products made of basic materials (Figure 2).

The climate contribution is based solely on the weight of the material multiplied with a material-specific emissions benchmark (reference value). No distinction is made by production processes or locations. This ensures the charge is WTO-compatible and simplifies the administration. At the same time, it ensures that the full carbon costs are included in the basic materials price and that the carbon price incentivizes material efficiency and choice as well as recycling.

In contrast to the incentive effect in industry, the cost increases resulting from the climate contribution for consumers of final products would be low, as the costs of basic materials play a very minor role here. For example, household expenditure would only increase by around 0.2 percent at a carbon price of 30 euros (without taking demand effects into account). The effect is slightly progressive, as higher-income households spend a greater share of their income on material-intensive end products such as cars.[20]

As the climate contribution ensures carbon price incentives along the value chains, the conflicting objectives in free allocation between effective carbon prices and carbon leakage protection are no longer relevant. The free allocation of allowances can thus be continued and, with clear rules, offer carbon leakage protection even with rising carbon prices.[21]

Using Carbon Contracts for Differences to hedge against regulatory risks

A significant investment barrier is carbon price uncertainty, which poses a financial risk for low-emission projects. Carbon Contracts for Differences (CCfDs) issued by governments can hedge investors in climate-friendly production and recycling processes against this uncertainty.[22] Based on a contractually guaranteed strike price for emission reductions, investors are guaranteed a fixed revenue per ton of emission reductions relative to a conventional reference technology. As long as the EU ETS price is below the strike price, the difference between the strike and market prices is reimbursed by the state. However, if the CO_2 prices exceed the strike price, investors pay the difference to the state.

By eliminating the carbon price risk, CCfDs facilitate investments in clean technologies at lower expected carbon prices than, for example, a carbon price floor.[23] In the case of steel, the required expected carbon price would fall from around 140 to 77 euros per ton[24] (Figure 3). CCfDs can also significantly reduce the need for public funding to support the transition, as periods with high carbon prices lead to

15 Preventing carbon leakage through free allocation has worked well so far. Cf. Helene Naegele and Aleksandar Zaklan, "Does the EU ETS cause carbon leakage in European manufacturing?" *Journal of Environmental Economics and Management* 93 (2019): 125–147.

16 Karsten Neuhoff and Robert A. Ritz, "Carbon cost pass-through in industrial sectors," *Cambridge Working Papers in Economics* no. 1988 (2019) (available online).

17 Building upon the Council decision, the Commission committed in the inter-institutional agreement signed with the European Parliament and the Council on December 16, 2020, to present a proposal by June 2021.

18 Christoph Böhringer et al., "Robust policies to mitigate carbon leakage," *Journal of Public Economics* 149 (2017): 35–46. To compare with other reform options, see Roland Ismer, Karsten Neuhoff, and Alice Pirlot, "Border Carbon Adjustments and Alternative Measures for the EU ETS. An Evaluation," *DIW Discussion Paper* no. 1855 (2020) (available online).

19 For analyses of the administrative, economic, and legal questions regarding the design, cf. Climate Friendly Materials Platform (available online). For a more recent characterization, see Krzysztof Brzeziński and Aleksander Śniegocki, *Climate Contribution and its role in European industrial decarbonisation*, Climate Strategies Report (2020) (available online).

20 Jan Stede et al., "Carbon pricing of basic materials: Incentives and risks for the value chain and consumers," *DIW Discussion Paper* 1395 (2021) (available online).

21 Free allocation for conventional basic materials production would continue to be based on an emissions benchmark derived from the CO_2 intensity of the top ten percent of conventional plants. Together with a stronger linkage of free allocation to current production levels and input factors, this counteracts carbon leakage risks even as CO_2 prices rise. A clearly defined benchmark should ensure that, for example, higher proportions of steel scrap in individual plants do not reduce the benchmark. See Vera Zipperer, Misato Sato, and Karsten Neuhoff, "Benchmarks for Emissions Trading – General Principles for Emissions Scope," *DIW Discussion Paper* no. 1712 (available online).

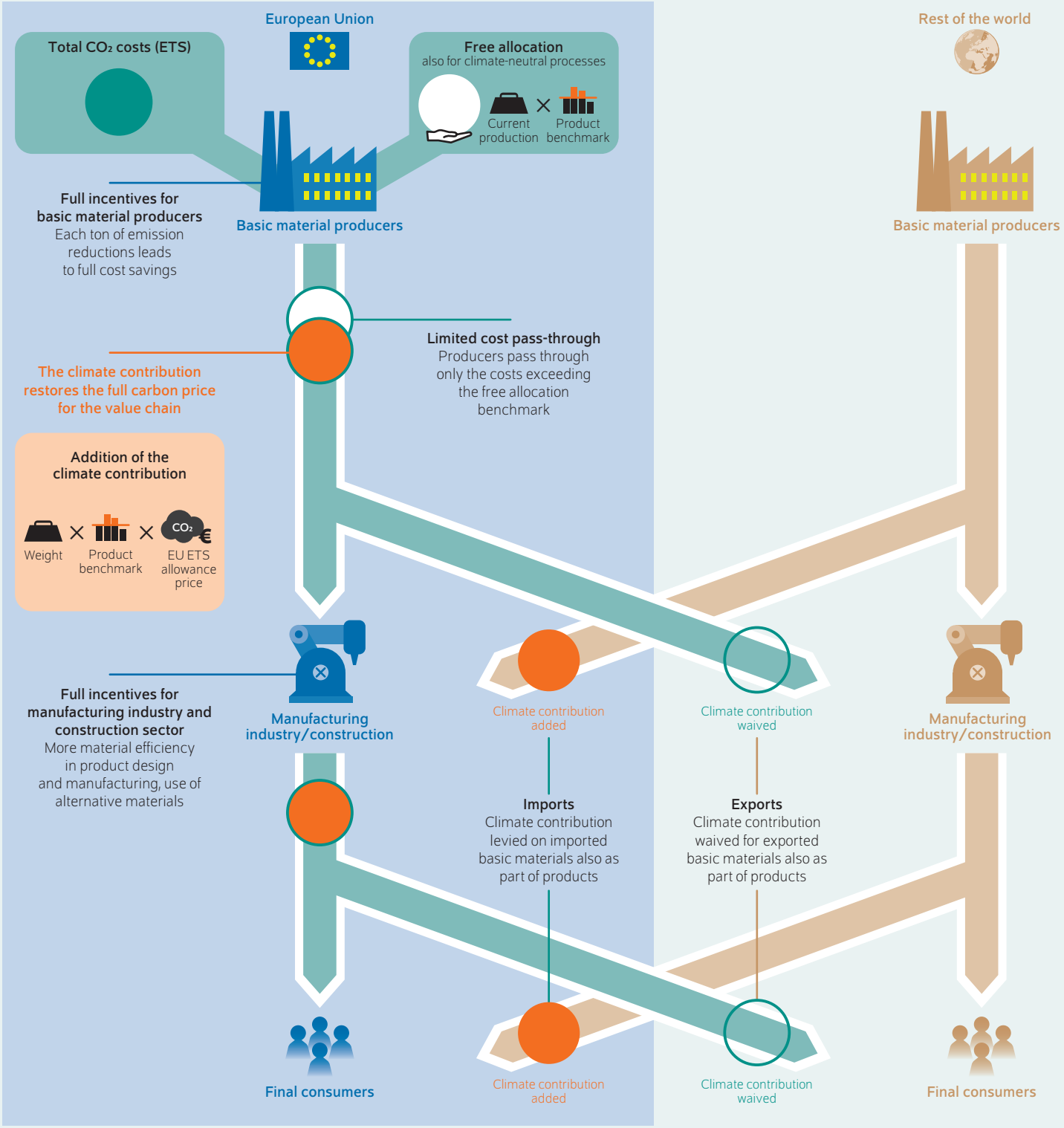
22 Jörn C. Richstein, "Project-Based Carbon Contracts: A Way to Finance Innovative Low-Carbon Investments," *DIW Discussion Paper* no. 1714 (2017) (available online); Timo Gerres and Pedro Linares, *Carbon Contracts for Differences: their role in European industrial decarbonsation*, Climate Strategies Report (available online).

23 Jörn Richstein et al., "Project-based Carbon Contracts for Differences or Price Floors: how to derisk innovative low-carbon investments," *DIW Discussion Paper* (2021, forthcoming).

24 Additional uncertainties besides the carbon price are not depicted in the analysis and would not increase the required carbon price. These could be hedged via reference indices, or separate instruments such as RES-CfDs (see below in the text).

Figure 2

How does a climate contribution work?

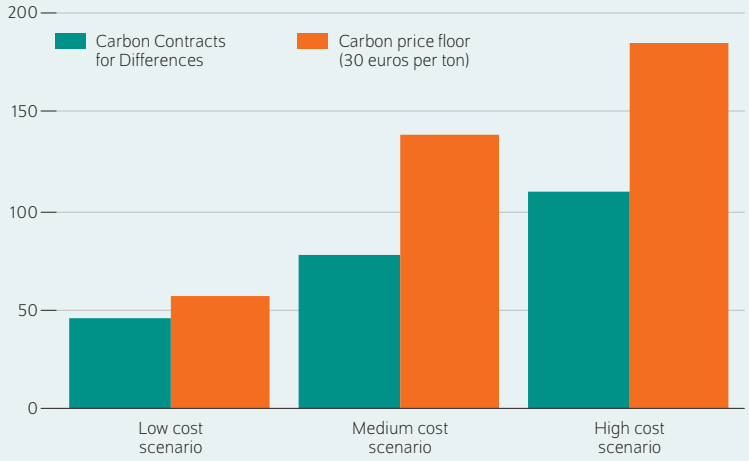


Source: Authors' own depiction in cooperation with partners of the Climate Friendly Materials Platform (available online).

Adding a climate contribution to the EU ETS with free allocation creates incentives to reduce emissions for the entire value chain and avoids carbon leakage risks.

Figure 3

Effect of Carbon Contracts for Differences and a carbon price floor on CO_2 reduction costs of hydrogen-based steel production
In billions of euros



Notes: Other input risk factors are not considered. Low costs: 35 euros per megawatt hour electricity costs, 80 percent investment costs. Medium costs: 50 euros per megawatt hour electricity costs, 100 percent investment costs. High costs: 65 euros per megawatt hour electricity costs, 120 percent investment costs.

Sources: Authors' own depiction, Richstein, "Project-Based Carbon Contracts: A Way to Finance innovative Low-Carbon Investments."

Carbon Contracts for Differences can result in significantly lower costs compared to CO_2 price floors.

positive revenue for the state.[25] If CO_2 prices rise, government cash flows would even assume a positive expected value.

As processes are expected to be electrified, a sufficient volume of wind and solar energy at internationally competitive and stable prices is also essential for the transition. This can be achieved through public tendering of Contracts for Difference for renewable energy (CfDs). They hedge investors in wind and solar projects against long-term uncertainties in electricity prices that are largely linked to regulatory uncertainties. CfDs reduce such financing costs and thus the costs for renewable electricity by around 30 percent.[26] The prices from the long-term public tenders can be passed on to industrial electricity customers, which decreases the price volatility and reduces the required carbon price when hedging investments with CCfDs (Figure 3).

A package of measures consisting of CCfDs, CfDs for renewables, and a reform of the EU ETS that combines continued free allocation with a climate contribution can provide a robust mechanism to ensure effective and stable carbon price incentives for all relevant actors (Figure 4). This increases political support and thus regulatory stability.[27]

Ensure implementation of climate-neutral options

In the early years, wind and solar energy were developed primarily by new technology companies and utilities. This was possible thanks to small-scale investments and was driven by enthusiasm and sometimes by very attractive support mechanisms. The production of basic materials, on the other hand, takes place in large plants and is often integrated with their further processing. This raises the question of how to ensure that established companies convert these structures to new production processes.

Sustainable finance can align investment decisions with longer-term goals

For established companies, for example, new technologies such as climate-neutral production processes entail the risk of losing competitive advantages, as they have years of experience with existing technologies already, or of losing customers due to incorrect implementation of new technologies. This is why companies often only hesitantly adopt new technologies. For this to change, transition risks for companies not preparing for planned climate neutrality must be identified.

By increasing transparency for investors and stakeholders, sustainable finance can make an important contribution to identifying and mapping these transition risks. To this end, the Sustainable Finance Advisory Board of the German Federal Government recommends a stress test scenario, "Climate Neutrality 2035:"[28] What would happen if industrialized countries suddenly implement measures to achieve climate neutrality as early as 2035 rather than 2050 in order to limit the temperature increase to 1.5 degrees Celsius? Larger companies and investors should report how such a scenario would impact their sales, profit margins, and investments.

Using this information, companies' transition risks can be determined and incorporated into the risk management of financial institutions, which is necessary to ensure the stability of financial institutions and the financial market in such a scenario.[29] At the same time, companies can use the stress test scenario to show how well they are prepared for climate neutrality. If they can show that they are exposed to lower transition risks, they can likely obtain better financing conditions.

25 For Germany, the net present value (r = 0.08) of government expenditures of 33 billion euros would fall to around eight billion euros for the middle cost scenario to decarbonize 30 percent of the production of select materials (steel, cement, and ammonia). Neuhoff, May, and Richstein, "Renewable energy policy in the age of falling technology costs."

26 Karsten Neuhoff, Nils May, and Jörn C. Richstein, "Renewable energy policy in the age of falling technology costs," *DIW Discussion Paper* no. 1746 (available online).

27 Olga Chiappinelli and Karsten Neuhoff, "Time-consistent carbon-pricing: the role of carbon contracts for differences," *DIW Discussion Paper* no. 1859 (2020) (available online).

28 Sustainable Finance Committee of the Federal Government, *Shifting the Trillions – Ein nachhaltiges Finanzsystem für die Große Transformation* (2021) (available online).

29 The ECB announced that the next supervisory stress test in 2022 will also focus on climate-related risks; see ECB, *ECB publishes final guide on climate-related and environmental risks for banks* (press release, 2020) (available online) .

Ban on sales of basic materials from emission-intensive processes

Analogous to the coal phase-out date set by various countries, a long-term target for the basic materials industry would provide clarity for companies and investors about the need to switch to new technologies and practices. However, unlike coal-based power generation, a European ban on emission-intensive production of basic materials without international coordination could lead to the relocation of production and emissions to other regions.

Therefore, the sale of basic materials produced using emission-intensive processes should also be banned. This could be achieved by implementing product carbon requirements (PCRs).[30] PCRs would set near-zero emission limits for basic materials such as steel, cement, aluminum, plastics, or pulp and paper. Only products manufactured using basic materials from climate-neutral production processes would be allowed to be sold and the requirement would apply to both domestic and imported products.

If large markets introduce PCRs, companies without access to climate-neutral basic materials, for example, will no longer be able to sell cars in these regions. Avoiding such a risk is a strong incentive for companies to convert to climate-neutral production processes at an early stage or to work towards this with suppliers.

Which further measures are necessary?

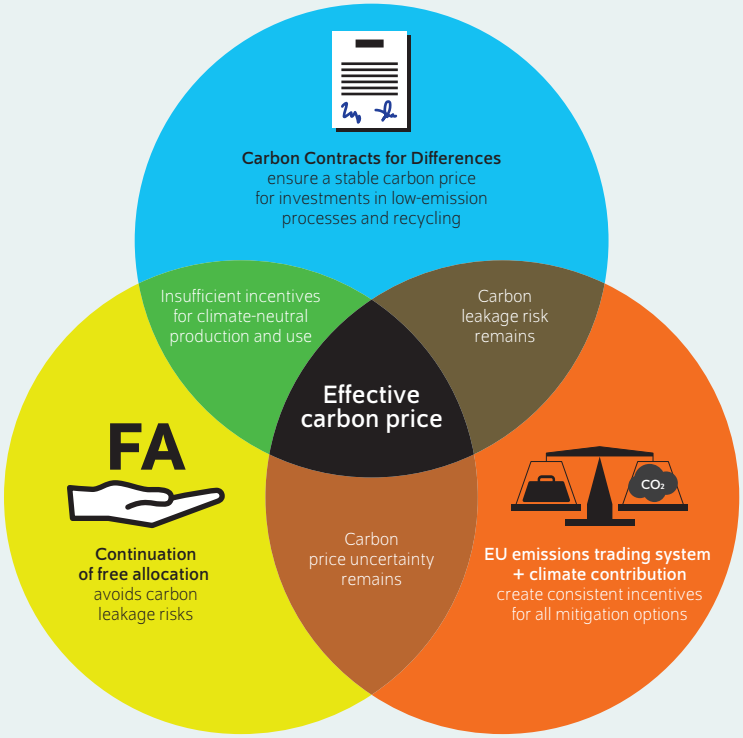
The success of private actors' low-emission strategies will depend not only on their own actions, but also on whether policymakers succeed in establishing frameworks in four key areas.

Structures for more and higher-quality recycling

It is necessary that recycled materials reach the quality level that allows them to replace materials manufactured via primary production processes as inputs to industrial processes.[31] The availability of feedstock for recycling processes could be improved by pricing the CO_2 emissions of waste incineration and landfill disposal or charging the potential emissions embedded in final products. This contributes to fair competition among materials and at the same time creates incentives for the application of improved sorting and recycling technologies.[32] Complementary measures could include quotas for companies to use an increasing share of recycled materials (recyclates) in their production processes.

Figure 4

Package of policy measures to ensure effective and stable carbon price incentives for all relevant actors



Source: Authors' own depiction in cooperation with partners of the Climate Friendly Materials Platform (available online).

A package of measures consisting of Carbon Contracts for Differences and a reform of the EU ETS can create a robust mechanism for effective carbon price incentives for climate-neutral production processes, efficient material use, low-carbon material choice, and recycling.

Measures for increasing material efficiency

A more efficient material use includes product design optimization, the reduction of waste during manufacturing and construction, and the use of alternative basic materials.[33] Existing regulations on product design, such as the EU Eco-design Directive, need to be revised and aligned with policy objectives of a circular economy and enhanced repair and reuse.[34] This includes stricter rules for the product's life-span, repairability, and material use.[35] Further possibilities to reduce the need for basic materials would require consumers to share, repair, and reuse material-intensive products more. Various

30 Timo Gerres et al., "Can Governments Ban Materials with Large Carbon Footprint? Legal and Administrative Assessment of Product Carbon Requirements," *DIW Discussion Papers* no. 1834 (available online).

31 European Commission, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Region A European Strategy for Plastics in a Circular Economy* (COM/2018/028 final) (available online).

32 Eugenie Joltreau, "Pricing products' negative externalities at end-of-life using eco-modulation: Discussion from case studies," *Economics and Policy of Energy and the Environment* 1 (2018): 149–172.

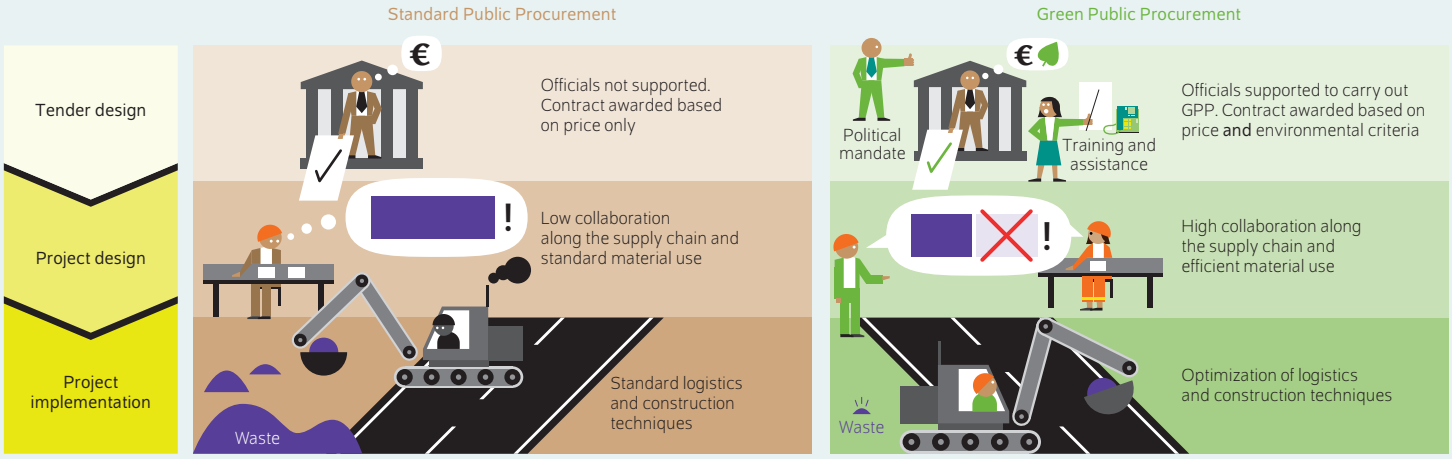
33 Edgar Hertwich, Reid Lifset, Stefan Pauliuk, and Niko Heeren, *Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future.* (Nairobi, Kenya: International Resource Panel, United Nations Environment Programme, 2020) (available online).

34 Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (available online).

35 For example, standardizing the use of materials for certain applications, such as packaging, can facilitate the sorting of waste streams and their use as inputs to industrial production processes while avoiding downcycling. Chiappinelli et al., "A Green COVID-19 Recovery of the EU Basic Materials Sector."

Figure 5

How can green public procurement reduce emissions from conventional materials and processes?
Example of an infrastructure project



Source: Authors' own depiction.

Green public procurement can facilitate collaboration along the supply chain, allowing measures with greater mitigation potential, including more efficient material use, to be identified and implemented.

types of pilot projects and adaptive regulatory frameworks can facilitate such transition in consumption behaviors.[36]

Make public procurement sustainable

Given the strong leveraging function of public procurement spending,[37] green public procurement (GPP) can not only reduce emissions of public sector activities, but can also create lead markets, stimulate demand for climate-friendly and recycled materials, and strengthen incentives for material efficiency in product design.[38] Internationally, several approaches to GPP have been successfully implemented for infrastructure projects.[39] Equally important may be the role of GPP in facilitating coordination along the value chain. For example, a collaborative GPP contracting model in the United Kingdom has enabled early coordination between project designers and contractors, which allowed the identification and implementation of measures with greater mitigation potential, including more material-efficient construction. In the end, this model led to emission reduction of around 50 percent (Figure 5).[40]

Given the large share of European funds in the financing public investments in many countries[41], the EU can have a relevant role in the process of promoting GPP. EU level dedicated funding and standardization of practices might be appropriate to catalyze the implementation of effective climate-friendly procurement and address capacity constraints in procurement offices.[42]

Provision of strategic infrastructure

Without the necessary infrastructure for the transportation and storage of hydrogen, electricity, and CO_2, companies will not invest in changing production processes. The availability of recovery funding offers the possibility to commission and to finance projects that help to establish the necessary infrastructure and thereby send a credible signal to investors. Recovery funding opportunities, such as those accessible to Member States through coronavirus recovery funds, could be especially suited for this aim in combination with EU-level

36 Land use regulation, for example, could encourage higher intensity residential uses through shared and smaller dwellings. Edgar Hertwich et al., *Resource Efficiency and Climate Change.*

37 In Germany, for example, public sector orders account for 27 percent of the German construction industrys sales. Hauptverband der Deutschen Bauindustrie, *Struktur des baugewerblichen Umsatzes im deutschen Bauhauptgewerbe 2019* (2019) (in German; available online).

38 Olga Chiappinelli, Friedemann Gruner, and Gustav Weber, "Green public procurement: climate provision in public tenders can help reduce German carbon emissions," *DIW Weekly Report* no. 51/52 (2019) (available online).

39 For a comprehensive, international overview of approaches to procuring low-emission infrastructure, see Anna Kadefors et al., "Designing and implementing procurement requirements for carbon reduction in infrastructure construction-international overview and experience," *Journal of Environmental Planning and Management* (2020): 1–24.

40 Kadefors et al., "Designing and implementing procurement requirements for carbon reduction in infrastructure experience."

41 European Commission, *Data on European Structural Investment Funds* (2020) (available online).

42 Chiappinelli et al., "Green public procurement: climate provision in public tenders can help reduce German carbon emissions,"

Figure 6

Summary of recommendations

What ensures that policymakers will create the necessary frameworks?

1. Target definition: How much climate-neutral production by 2030
2. Integration into National Energy and Climate Plans under EU 2030 Governance

What ensures that industry will use climate-neutral options?

1. Product carbon requirements show from when conventional products may no longer be sold
2. Forward-looking reporting shows risks for companies failing to shift to climate-neutral options

What policies make climate-neutral options economically viable?

1. An EU ETS reform that includes a climate contribution for effective carbon prices in industry
2. Avoiding regulatory risks via Carbon Contracts for Differences

What structures are necessary for climate-neutral options?

1. Structures for more and higher-quality recycling
2. Measures to increase material efficiency
3. Green Public Procurement
4. Provision of strategic infrastructure

Source: Authors' own depiction

funding windows, such as the bolstered EU Just Transition Fund as well as REACT-EU and InvestEU.[43]

Ensure timely and coordinated government action

The multitude of often small-scale activities that need to be initiated and coordinated in the public sector require a governance structure that ensures the proper timing and coordination of government activities.

Uncertainty about the required timing and focus of action could still arise from the fact that the emission reduction target by 2030 can be achieved with different combinations of climate-neutral production processes, efficiency improvements and shifts to renewable energy in a broader industrial context. It will be valuable to reduce this uncertainty for the coordination of the various activities relevant for the transition to climate-neutral production processes. This calls for the establishment of a minimum proportion of climate-neutral production capacities on the way to 2030, analogous to the targets for expanding renewable energy. The target could thus be reflected in the EU 2030 Governance.[44] Mechanisms such as the European Semester for economic policy coordination can support governments in implementing the necessary measures to achieve the climate and economic objectives.

Conclusion: policy measures to unlock synergies urgently needed

Actions in 2021 will determine whether the EU can live up to its commitment to both meet the 2050 climate targets and lead the economy out of the crisis caused by the coronavirus pandemic. To this end, the economic recovery strategy and the implementation of the Green Deal can complement each other. In the case of basic materials, four policy requirements emerge (Figure 6).

First, a policy framework is necessary through which climate-neutral options for private actors become economically viable. This can be achieved by supplementing the EU ETS with a climate contribution. At the same time, regulatory risks must be minimized through policy measures such as the CCfDs.

Second, it needs to be ensured that private companies implement the climate-neutral options. Sustainable finance with forward-looking reporting of real economy firms and the use of the information in financial sector risk management can strengthen incentives while also improving the investment framework for climate-neutral options. Preparing the future introduction of product carbon requirements can also provide clarity at an early stage, for example that basic materials produced via CO_2-intensive processes can no longer be sold in the EU in the late 2030s.

Third, many further individual actions are necessary. For example, green public procurement can improve coordination along value chains, thereby contributing to more

43 The Just Transition Fund has an overall budget of 17.5 billion euros, 7.5 billion of which come from the Multiannual Financial Framework (MFF) and ten billion from the NextGenerationEU fund. European Commission, *Commission welcomes the political agreement on the Just Transition Fund* (2020) (available online); REACT-EU has a total of 47.5 billion euros and InvestEU 5.6 billion euros. European Commission, *Recovery plan for Europe* (2020) (available online).

44 Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action.

efficient material use in the construction sector. At the same time, it must be ensured that the plans for expanding renewable energy and networks are sufficient to cover future additional demand from basic material producers.

Fourth, companies can and will only implement investments in climate neutrality if they trust that all of the necessary frameworks are being established. Therefore, clear policy targets and structures for implementation are necessary. At the EU level, it should be ensured that the respective targets are reflected in the EU 2030 Governance Directive and in the Recovery and Resilience Plans of EU Member States.

Public funding available as a part of EU and national recovery packages in response to the coronavirus crisis create a unique opportunity to jump-start the transition of the basic materials industry. This can ensure that the EU is on the right path to achieving its Paris targets. A window of opportunity is open: For the first time, there is increasing agreement between the major economies (such as the USA and China), the public, and businesses on a commitment to address climate change. Therefore, the Green Deal must be implemented now.

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