Global carbon pricing: The rocky road to an effective global response to climate change

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Under the Paris Climate Agreement, the international community committed to limiting global warming to not more than 1.5°C above preindustrial levels. So far, however, measures adopted globally are nowhere near sufficient to reach this goal. Shortly before COP27, the United Nations Environment Programme (UNEP) issued the stark warning that the world was now heading for a 2.8°C temperature increase.[1] This development highlights the increasing urgency of stepping up global climate cooperation. Russia's war of aggression against Ukraine underscores the need for the world to end its dependence on fossil energy sources.

Putting a price on carbon is the most efficient policy instrument for directing private investment away from fossil energy to climate-friendly alternatives. Still, many countries are hesitating to use carbon pricing systems as political levers. Unfavourable distribution effects hamper the instrument's social acceptance. The current high energy prices and international competitiveness concerns are additional stumbling blocks. Developing and emerging economies that are poised to contribute substantially to global emissions in the future face particularly large challenges with respect to the introduction of carbon prices. Here, too, carbon prices can create efficient decarbonisation incentives.

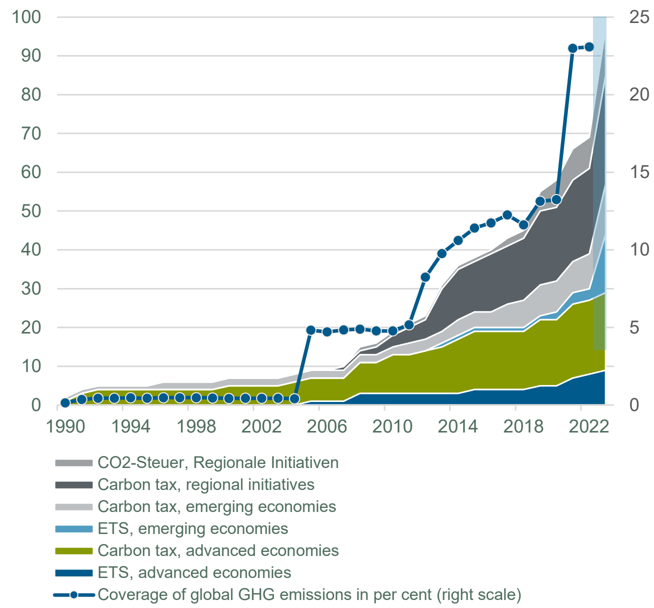
Climate change is being driven jointly by all countries and cannot be solved at the level of individual states. The question is, rather, how an effective, joint commitment to greenhouse gas reduction can be achieved at global level. A uniform global minimum carbon price would be the ideal instrument for effectively coordinating worldwide climate efforts. However, current geopolitical challenges are making it increasingly difficult to reach a solution at global level. It is therefore necessary to focus more closely on bilateral and plurilateral cooperation approaches. As such, international climate finance can be understood as a lever to enable the joint effort of transitioning to climate neutrality in donor and recipient countries. The most recent agreement among the G7 states to create a climate club can contribute to making inroads on climate action and embedding the global coordination of climate policy more effectively at an institutional level.

Carbon pricing: An effective instrument

Effective climate action will require a drastic reduction in global greenhouse gas emissions and thus an all-encompassing transformation of energy supply systems away from the currently dominating fossil fuels. It is a monumental undertaking that cannot be accomplished without a strategic policy direction and guidance and one that can succeed only with ahigh input of economic resources. Cost efficiency therefore plays a crucial role in the climate transition. The centrepiece of an instrument mix for energy and climate policy should therefore be a carbon price that sets an economically sound, robust and long-term framework for the clean energy transformation (see Box 1).

Figure 1: New momentum in carbon pricing systems

Number of carbon pricing systems by instrument and group of countries (left scale) and coverage of global emissions (right scale).



Note: Light blue area represents future planned or discussed initiatives. The figure for the coverage of global emissions for 2022 is provisional.
ETS: Emissions Trading System

Sources: World Bank Carbon Pricing Dashboard, KfW Research

Around the world, 47 countries have implemented carbon prices as an instrument of climate policy by launching nearly 70 initiatives since the year 1990 (Figure 1). Since the coming into effect of the Kyoto Protocol in 2005, the instrument has gained importance around the world and initially established itself mainly in advanced economies, but, in recent years, also – and increasingly – in emerging economies. Direct pricing of greenhouse gas emissions, especially carbon dioxide (CO_2), can be implemented using two approaches: through an emissions trading system (ETS), which defines the admissible quantity of greenhouse gas emissions, resulting in a carbon price, or through a carbon tax, in which the quantity of emissions is regulated by way of an agreed carbon pricing level. The regulation of both prices and quantities generally leads to a carbon price and thereby creates incentives for emission reduction measures. Therefore, both forms of implementation are theoretically equivalent. From a political economy perspective, however, different obstacles need to be considered.[2]

Box 1: The carbon price as a guiding instrument of successful climate policy

Greenhouse gas emissions can be reduced in an economically efficient way when the next unit of emissions is removed where it is most cost-effective, irrespective of the location, technology, sector of economic activity concerned or party causing such emissions. According to this principle, the lowest hanging fruit is to be harvested first – in accordance with the technological state of the art. Over time, technological progress makes it possible to achieve necessary reductions more cost-effectively.

Unlike with the use of regulatory measures such as stipulations, prohibitions, conditions or limit values, a carbon price requires no information as to where the reduction of the emissions is most cost-effective. Instead, a carbon price sends out price signals that guide stakeholders' individual actions, thereby ensuring the coordination of all individual decisions. This is particularly important because the socially agreed transformation process will extend over a prolonged period of time. The great strength of the instrument is that a rising carbon price continuously provides market actors with incentives to follow the path of transformation. A carbon price also provides a valuable source of revenue for the state that can be used to achieve social equity.

Various empirical studies have demonstrated a clear causal link between the imposition of carbon prices and greenhouse gas emissions reduction.[3] For example, the European Emissions Trading System (EU-EHS) brought about a 3.8% drop in EU-wide emissions between 2008 and 2016 although the market covered just 50% of carbon emissions.[4] Studies on ETS-regulated production facilities in France and Germany and on carbon trading in the north-eastern US have also documented positive effects.[5]

Imposing a carbon price is a political challenge

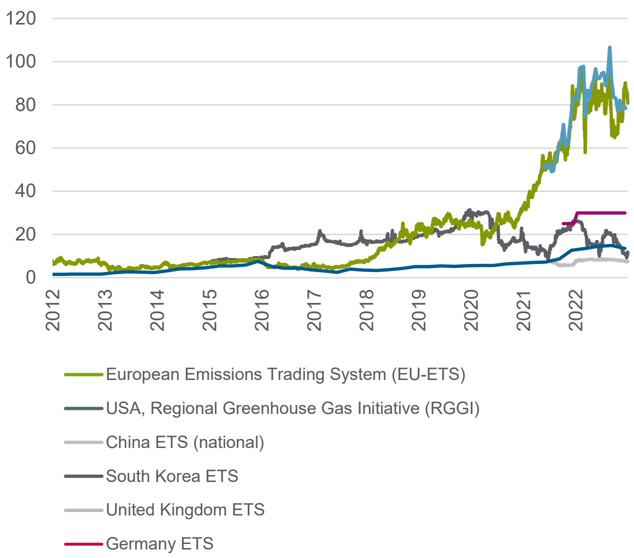
Despite the considerable added value which a carbon price would provide as an effective and efficient climate policy instrument, a number of barriers hamper its implementation in the political process. On closer inspection, many of these purported disadvantages can be refuted. But they likely explain why some countries are slower to introduce carbon prices than others.

First, surveys show that carbon prices as a climate action instrument are significantly more unpopular among citizens (and thus potential voters) than regulatory climate action measures such as the promotion of renewable energy and efficiency mandates, which receive broad support.[6] One likely explanation is the different visibility of costs associated with energy and climate policy instruments.[7] Under an emissions trading system or a carbon tax, the costs of the climate policy are immediately visible. That is clearly not the case with many regulatory measures, in which the price label for the reduction of carbon emissions is simply missing – even though in general they actually cause higher carbon avoidance costs.[8] Regulatory law with high implicit costs is therefore given preference here over market economy instruments with lower but explicit costs.

Second, the acceptance and political feasibility of energy and climate policy measures depend on the associated distribution effects. Carbon pricing initially has a regressive burden on households.[9] Lower income groups have to spend a higher share of their income on carbon prices. Regulatory climate measures have unfavourable distribution effects as well.[10] However, these are more difficult to quantify and therefore rarely the topic of public debate. Empirical studies have even revealed that progressively structured carbon prices are better able to take income inequality into account than, for example, energy standards. However, that is true only when the additional state revenue generated by a carbon price is redistributed in a precise and targeted manner to ease the burden on low-income households. The way in which a carbon price reform is implemented overall ultimately decides how the instrument's redistribution effect compares with the alternative of legal regulations.

Figure 2: Carbon prices are volatile and have risen in many places

In EUR per tonne.



Sources: International Carbon Action Partnership, KfW Research

Third, fears are sometimes voiced that introducing a carbon price could affect the competitiveness of the domestic economy. In principle, this is correct and must play a role in designing policy approaches. Unless climate action efforts are coordinated at multilateral level, emissions from carbon-intensive manufacturing could be moved to areas with weaker regulations, which is known as 'carbon leakage'.[11] Nonetheless, regulatory climate policies, too, lead to an (implicit) carbon price which is not only likely to be much higher even while achieving the same reduction. For another, explicit pricing tends to facilitate international coordination, making it easier to reduce or even eliminate any competitive disadvantages.[12] And finally, in an emissions trading scheme, compensation mechanisms already established (for example the free allocation of certificates) can provide relief.

In many places the persistently high energy prices and higher global inflation currently represent an additional obstacle to the imposition of carbon prices. Most recently, the war in Ukraine and the energy crisis triggered by it have caused considerable price increases and fluctuations in various carbon pricing systems (Figure 2). As energy prices have already risen significantly there is a risk of climate action activities being scaled back in many countries. Indonesia, for example, delayed the introduction of a carbon tax planned for April 2022 in response to global increases in energy prices.[13] In Germany the increase in the national carbon price from EUR 30 to 35 per tonne scheduled for early 2023 was put off for a year to ease the burden on households.[14] The reason given for both measures was that households and businesses were already under great pressure. Nevertheless, the current high prices of fossil fuels cannot replace a sustainable and reliable carbon price. Rather, such decisions are likely to undermine the long-term credibility of climate policy overall.

Status Quo: a patchwork of national systems instead of a globally uniform carbon price

Although a carbon price is one of the most effective policy instruments for directing expenditure and investment away from fossil energy to climate-friendly alternatives, the implementation of carbon prices around the world remains patchy.

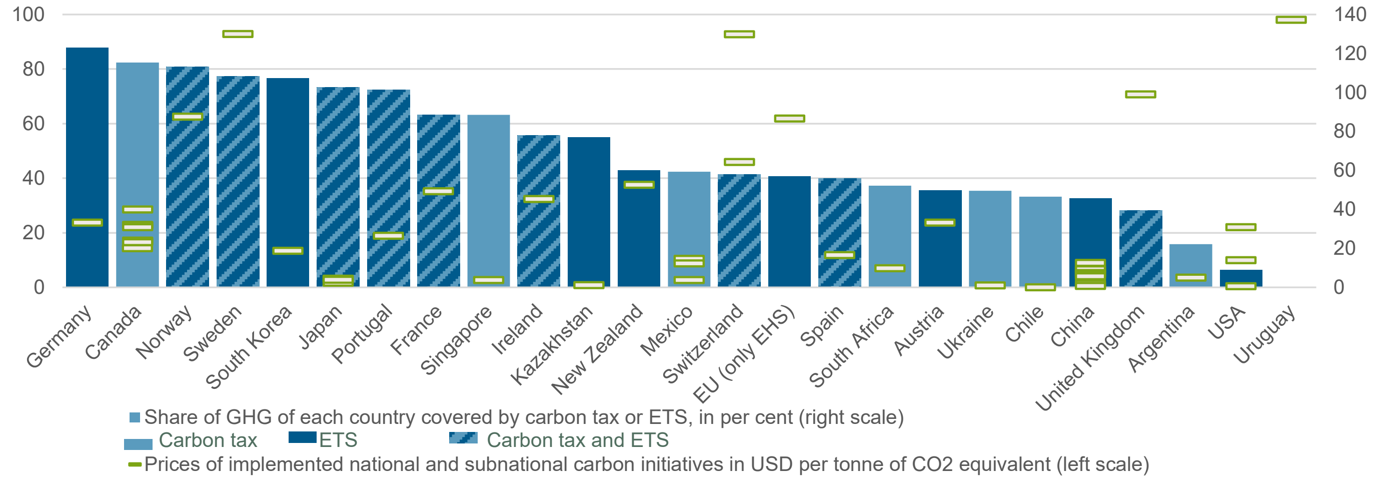
At the same time, there is great heterogeneity in the price levels set per tonne of carbon, the inclusion and exemption of individual economic sectors and, not least, the share of greenhouse gas emissions captured by a carbon price (Figure 3). We are currently far from a first-best solution in which a globally uniform and cross-sectoral price for carbon emissions ensures that emissions are always avoided in cases when avoiding them is more cost-effective than paying their price. The World Bank currently counts 70 direct carbon pricing initiatives around the world.[15] At national level, 30 carbon control systems and eight emissions trading systems are in place and some countries have hybrid systems. Additionally, the EU Emissions Trading System operates in all EU member states as well as Iceland, Lichtenstein and Norway, making it the only trans-national pricing system. Subnational initiatives such as California's Cap and Trade programme also exist.

Also noteworthy is the fact that numerous emerging economies have launched carbon pricing initiatives. As the world's largest greenhouse gas emitter, China has had a nationwide ETS since 2021. With just under 10% of the existing systems, it covers the largest share of global greenhouse gas emissions. Apart from China, Kazakhstan is the only emerging country to have implemented an ETS, while Mexico is running a pilot project that is to come fully into force in 2023. Most emerging economies with carbon prices, however, have implemented the instrument in the form of a tax. Numerous other initiatives are in the planning stage. In low-income countries, direct pricing systems are still an exception.

Table 1 in the annex provides an overview of implemented carbon prices in the top 10 carbon emitting countries and in selected emerging economies. According to the OECD, in 2021 around 25% of global greenhouse gas emissions were covered by an emissions trading system, a carbon tax or a combination of both.[16] If we take into account the price effect that additionally results from implicit forms of pricing such as fuel excises, on balance just under 41% of global emissions actually carry a price label. Instruments with a negative price effect such as fossil fuel subsidies are counted against this Net Effective Carbon Rate. Conversely, this also means that 60% of global GHG emissions have a carbon price of zero or are negatively priced.

Figure 3: Great heterogeneity between systems

Percentage share of GHG emissions covered by carbon taxes or ETS; prices of implemented initiatives in USD per tonne of CO_2 equivalent.



Note: Share of GHG emissions covered by a positive carbon price refers to all explicit national and supranational (EU ETS) instruments. Prices presented cover only national or, where they exist, subnational systems. Prices can be compared between countries to a limited extent only because of differences in the number of sectors covered and specific exemptions. The last available data apply: Share of GHG emissions in 2021, nominal prices: April 2022. No current data on the share of GHG emissions is available for Uruguay because its carbon tax came into effect only in 2022.

Source: World Bank Carbon Pricing Dashboard, OECD, KfW Research

Some of the discrepancies between the systems are considerable, particularly with regard to the share of emissions covered by carbon prices and the level of carbon prices imposed (Figure 3). In the EU ETS the price in 2022 averaged EUR 89 (USD 86.40) per tonne of CO_2, in China it was the equivalent of EUR 8.30 (USD 8.70) per tonne of CO_2.[17] At the same time, it must be taken into account that global avoidance costs are also likely to be heterogeneous across different countries. According to studies, a carbon price would have to average at least USD 75 per tonne at global level by 2030 in order to set the necessary incentives to limit global warming in line with the Paris Agreement.[18]

Low-income countries will become relevant greenhouse gas emitters in the medium term

The economic and social costs associated with climate change are putting particular pressure on low-income countries. This group of countries also carries the highest risk of future GDP losses due to climate change.[19] Advanced economies are currently the main drivers of global emission increases. But middle-income emerging economies are also contributing significantly to carbon emissions, with China as the world's largest greenhouse gas emitter. In the future, developing and emerging economies that previously did not belong to the group of relevant carbon emitters will make considerable contributions to total global emissions (Figure 4). The share of global carbon emissions released by the EU and the US has been on the decline since the beginning of the 2000s. At the same time, the share of developing and emerging economies in total global emissions has increased.[20] The emissions of India and the rest of the world will likely have caught up with those of the heavyweight emitters US, China and the EU by the year 2027. More than in high-income countries, increases in emissions from low- and medium-income countries will be attributable to strong growth in per-capita GDP in the years ahead.[21] As the population is growing, increasing per-capita GDP will lead to a steep increase in absolute emission levels. It is important to incorporate these countries into global climate policy with a view to act towards climate neutrality at global level.

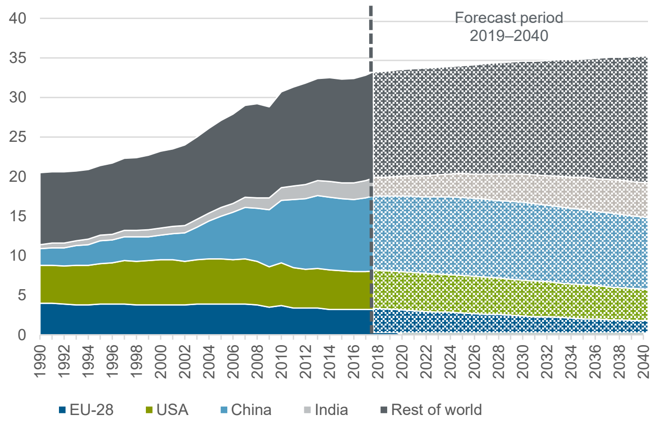
Globally heterogeneous economic structures offer decarbonisation potential and challenges

In order to limit global warming it will be essential that all countries leverage their respective carbon reduction potentials. Globally, there are major differences in the causes of high emissions between different states. There are significant disparities in the carbon intensity of value added and per-capita carbon emissions (Figure 5). Advanced economies tend to have a lower carbon intensity of value added but higher per-capita carbon emissions. This difference can be explained in part by different economic structures but is mainly due to the use of production technologies or processes with varying emissions intensity in the economic sectors from one country to another.[22]

The US and China have a crucial role to play in global decarbonisation. The US is historically the largest emitter and responsible for around 26% of all carbon emissions ever released into the atmosphere, while China is responsible for 14% of all cumulative historic emissions. In absolute figures, however, China is the largest present-day emitter, with around 26% of all the world's greenhouse gas emissions.[23] But this is mainly due to the size of its population. China's per-capita emissions are relatively moderate compared with those of the US. However, the emissions intensity of value added is notably higher in China than in advanced economies. If the carbon intensity of value added in the individual economic sectors were on the same level as in the corresponding ones in Germany, the carbon intensity of China's entire economy in the given economic structure would be more than 60% lower, or around 6.2 billion tonnes of carbon less.[24]

Figure 4: India and the rest of the world will have a higher share in global emissions in the future

Share of global carbon emissions from the burning of fossil fuels by countries in billions of tonnes.



Note: Forecast based on Stated Policies Scenario of the IEA.

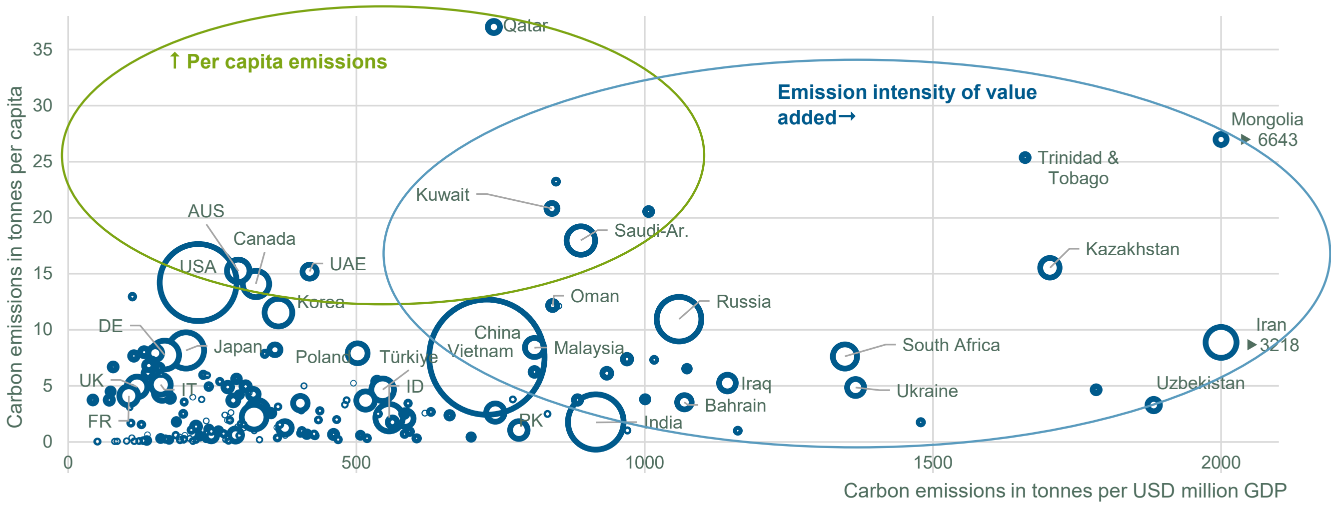
Sources: International Energy Agency (IEA), German Council of Economic Experts

Globally, the carbon intensity of value added has fallen steadily over time, although the decline has been much slower in the past 10 years than in the preceding decade. In the long term, countries will have to make varying degrees of adjustments to their value creation as they decarbonise. It will be crucial to further reduce the carbon intensity of value creation to be able to achieve the goal of decarbonisation while at the same time increasing global prosperity.

The most efficient way to reduce carbon intensity depends on, among other things, the structure of value creation and energy supply, technological progress and consumer preferences. External incentives that promote climate-neutral innovation and the conversion of emissions-intensive production processes can make a critical contribution to decarbonisation particularly in developing and emerging economies. Carbon pricing also offers numerous advantages for low- and medium-income countries, particularly for mobilising domestic resources (see Box 2). How revenues are then redistributed, however, plays an even more crucial role in these countries.

Figure 5: Potential for emissions reductions also exists outside the 'heavyweights'

Carbon intensity per capita (vertical axis) and per value added (horizontal axis); bubble: absolute carbon emissions in millions of tonnes of CO_2 equivalents (2020).



Note: Refers to carbon emissions from the burning of fossil fuels (including cement and ship fuels).

Sources: KfW Research, ClimateWatchData based on UNFCCC data.

Box 2: Potentials for carbon pricing in emerging economies

Introducing carbon prices not only benefits the global climate, it can also be in the interests of the emerging and developing countries themselves. Benefits from positive secondary effects alone, such as a reduction in mortality rates from local air pollution, would substantially exceed the costs of other carbon reduction measures in countries such as China, Indonesia and Türkiye (assuming a price of USD 50 per tonne of CO_2).[25] In emerging countries as well, innovation in low-carbon technologies helps local businesses hold their own in international competition over the long term and is key to enabling poorer regions to catch up economically without releasing the same carbon emissions as the advanced economies have done historically. After all, carbon prices are a core element of a credible climate action policy that, when accompanied by supportive governments, standards and fiscal policy, creates an overarching framework and, thus, incentives for mobilising private (domestic and foreign) investment.[26]

Not least, carbon pricing offers the potential for generating considerable revenues that may support domestic climate action measures, develop social protection systems and improve access to technologies. An OECD study has revealed that developing and emerging economies could generate revenues averaging around 1% of GDP if they imposed a carbon tax on fossil fuels at a benchmark of EUR 30 per tonne of CO_2.[27] The revenue potential, however, varies greatly from country to country and reflects differences in existing tax levels and energy usage patterns. Among the emerging economies, only Colombia, South Korea and Poland state environmental protection as the sole purpose of the revenues.[28] A targeted redistribution of revenues to provide relief for low-income households remains crucial not just in advanced economies but in emerging economies as well.

A global carbon price requires and presupposes global coordination of climate action

Climate action is a global challenge that requires global responses, ideally through a globally uniform carbon price.[29] A globally uniform price would be an ideal signal for limiting the global cost of the transformation while being the best tool for effectively achieving and monitoring the global coordination of climate action.[30] However, multilateral climate negotiations face enormous challenges because of the heterogeneity of the states – particularly the vast differences in regard to the opportunities and risks of climate policy and the resulting different negotiating positions. The experiences of COP27 in November 2022 highlighted this most recently. Besides, there is no institutional framework for jointly designing a carbon pricing mechanism at international level. The need to create such a framework is highlighted by the fact that it is a challenge even for the relatively strong EU institutions to make clear policy decisions on the EU ETS.

In responding to the political-economic realities, proposals have been put forward to agree on a single uniform minimum price for greenhouse gas emissions at global level.[31] It would then be up to each region to decide whether to implement such a uniform price in the form of a tax or through an emissions trading system. The only condition would be that the average burden from CO_2 within the region would have to match at least the agreed global price. The revenues could remain within the respective state, and there would be no need for a difficult global allocation of admissible emission quantities to different states, for example in international agreements or emissions trading systems. Despite the global character of the climate problem, it appears to be particularly expedient to configure carbon prices as a national (and, wherever possible, supranational) regulation also in the medium term and, in the framework of global climate cooperation, to focus work on two things in parallel:

1. Motivate and empower further countries to implement national carbon pricing systems
2. Work towards achieving agreement on a global minimum price of carbon

This approach comes with the challenge that the burdens from emission reductions would at least initially be very unevenly distributed at global level because of the different avoidance costs. Here, targeted financial transfers from the international community may possibly provide relief. Proposals have also been put forward for different minimum prices for low- and high-income countries that may provide temporary relief.[32] Developing and emerging countries in particular will find it difficult to quickly raise carbon prices to a level that would be necessary for achieving global emissions targets because these countries often lack options for substituting carbon-intensive with low-carbon goods. A corresponding offer needs to be created to complement the introduction of national carbon prices in developing and emerging economies, as only then will it be possible to achieve rapid decarbonisation even with lower carbon prices. For example, a recent study has shown that even a high carbon tax in India would initially generate hardly any emissions reductions in the short term because there would not be sufficient climate-friendlier energy generating capacity to replace coal, the dominant fuel.[33]

Bilateral and plurilateral cooperation more likely to generate consensus

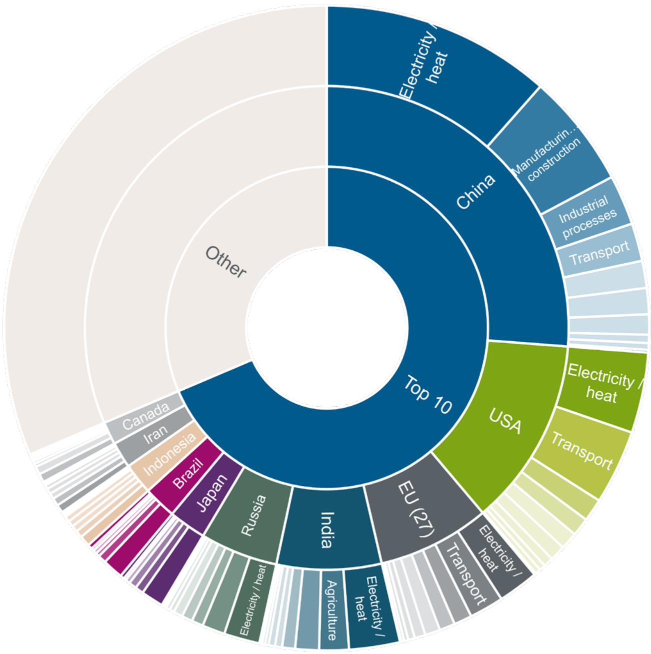
Partnerships between a small number of states tend to be less efficient than multilateral partnerships, but they should nonetheless be seen as an important complement to multilateral efforts. Closer coordination within a small group improves the effectiveness of national climate policy if it generates additional incentives for climate action for cooperating states. Furthermore, plurilateral agreements can set an example for other states as they demonstrate how climate policy can be successfully reconciled with trade. Not least, green technologies can be quickly upscaled when states jointly improve the conditions for their use and initiate technology partnerships. This can reduce the cost of the transformation for the international community.

Bilateral partnerships also form the basis for financial and technological transfers to developing and emerging economies. Public climate finance mobilised by advanced economies can raise only a portion of the funds required for the transformation – even if the mobilisation of the funds were to be better coordinated in the future. Nonetheless, it can serve to mobilise private investment in developing and emerging economies. This can succeed especially when transfers from advanced economies to developing and emerging economies are used strategically to deliberately reduce climate policy uncertainty in the target countries and thereby mobilise private investment – for example, by linking transfer payments to emission reduction or climate action measures. Phasing out the use of coal must be seen as a priority in this regard because the coal-fired power plants in operation and in the planning stage worldwide release such high levels of emissions throughout their economic life that the climate targets remain out of reach. The Just Energy Transition Partnerships (JEPS) is a model for international cooperation developed by the G7 in the area of energy and climate action that can lead to significant progress in the energy transition. South Africa, Vietnam and Indonesia have now agreed to begin phasing out coal-fired power generation in return for financial assistance from industrial nations.

Bilateral partnerships can probably unfold their greatest leverage effect by contributing to the geographic expansion of an effective carbon pricing regime. At the heart of this must always be reciprocity, which means that both donor and recipient countries should link financial support with climate action of their own.[34] In establishing pricing systems in developing and emerging economies, advanced economies can provide further guidance. Financial transfers can contribute to mitigating unfavourable distribution effects from carbon pricing.[35] Advisory services on the development of the necessary governance structure can also be expanded.

Figure 6: Important potential cooperation partners: 10 largest emitters account for two thirds of global GHG emissions

Share of greenhouse gas emissions by country and sector in per cent, 2019



Note: comprises all greenhouse gases except those occurring as a result of land use, land-use change and forestry (LULUCF) as these can also be negative.

Sources: ClimateWatchData, KfW Research

The climate club as a framework for plurilateral cooperation – US, China, India and EU as key actors

A climate club is debated time and again as an option for the plurilateral coordination of climate policy.[36] The G7 states recently agreed in a joint declaration to set up an open and cooperative climate club with the aim of more closely coordinating climate policy measures at international level in the future.[37] It will focus primarily on decarbonising the industrial sector. The precise details of the club have yet to be agreed, and international partners are called upon to join and participate in the further development of its design and structure. The foundation for a coalition aimed at bolstering joint climate ambitions, however, was laid with the establishment of the G7 climate club.

In a climate club, states join forces in order to agree on climate targets or measures in each of those states. Coordinating climate action can reduce the challenges of carbon leakage and distortion of competition. This reduces the cost of climate action for the members.[38] Not least, the possibility of being admitted to the club generates incentives for states that would otherwise pursue a less ambitious climate policy to introduce climate action measures. Establishing a climate club requires a club good, that is, a good that benefits member states of the climate club but not non-members. The benefit obtained from such good then creates an incentive for joining and continuing membership in the club. At its outer borders, the newly created climate club could introduce a carbon border adjustment mechanism to promote accession.[39] The agreement on an EU Carbon Border Adjustment Mechanism reached within the European Union has been an important first step in this direction.[40]

A bottom-up approach that initially seeks to establish a climate club through a small group of ambitious states, as has now been done via the G7 group of the leading industrial nations, offers the benefit that negotiations on the precise club design can be faster and more efficient.[41] The climate club can be successful even with few member states but ones that have strong economic performance and are among the relevant carbon emitters (Figure 6).[42] Nevertheless, the aim must be to set an effective incentive for other states to join so that the club grows and global emissions are ultimately reduced on a broad scale. That, in turn, would strengthen the stability of the club in the long term. The G7 climate club would have the greatest chance of success if it could get China and India to join.[43]

The greatest milestone in the fight against climate change could be achieved if the climate club succeeded in coordinating carbon prices and its members agreed on a minimum carbon price. Coordination of carbon prices would be most likely among states that are already using pricing systems as a climate policy instrument. Particularly with a view to the US, however, which is not expected to introduce an explicit carbon price at national level any time soon, cooperation in the form of implicit carbon prices, for example the recognition of regulatory climate policy measures, should also be taken into consideration. The US Inflation Reduction Act provides potential starting points for this. It is true that a subsidy-oriented programme also provides potential for reducing carbon emissions but direct carbon pricing generates incentives for shifting to climate-friendly energy sources and consumer goods – while maintaining a flexible choice of technology – and makes the consumption of fossil fuels less attractive. Another challenge posed by implicit carbon prices is the effort involved in setting them and the broad range of measures they need to cover.[44] Such an approach is therefore much less efficient than the coordination of explicit carbon prices. Nevertheless, the determination to recognise only price-based instruments as equivalent would gamble away the opportunity to strengthen the common goal of climate neutrality at international level – irrespectively of the tools used. That approach could thus pragmatically pave the way to a globally coordinated pricing of greenhouse gas emissions.

Table: Overview of carbon pricing systems / share of greenhouse gas emissions of selected countries covered by carbon prices

		Share of carbon emissions covered, by price level, instrument and sector, in per cent, >60, green >30, blue >15, grey >0								**Implemented direct initiatives**	**Sector coverage**	**Revenues**
Carbon price in EUR / t CO_2 equivalent		Net ECR*	Explicit rate**	Road transport	Industry	Agriculture	Buildings	Electricity	Other GHG			Purpose
71 countries, weighted average	>0	41	25	22	20	13	20	54	4	Of which 47 countries with explicit carbon pricing		
	>30	17	5	3	6	1	5	7	2			
	>120	4	0	0	0	0	0	0	0			
Top emitters, by share in global GHG emissions***												
China	>0	40	33	0	10	0	3	88	5	National ETS, supplemented by 8 subnational carbon markets	Initially coal and gas power plants (national ETS)	Proposal: for climate action
	>30	5	0	0	0	0	0	0	0			
	>120	0	0	0	0	0	0	0	0			
USA	>0	32	6	10	3	5	5	10	0	4 subnational systems, ETS Washington planned for 2023	Electricity sector (RGGI), transport, buildings, industry	Budget, transfers, Climate action
	>30	21	0	0	0	0	0	0	0			
	>120	0	0	0	0	0	0	0	0			
India	>0	55	0	0	0	0	0	0	0	No explicit instruments; fuel excises in effect		
	>30	8	0	0	0	0	0	0	0			
	>120	8	0	0	0	0	0	0	0			
Russia	>0	9	0	0	0	0	0	0	0	No explicit instruments; fuel excises in effect		
	>30	7	0	0	0	0	0	0	0			
	>120	0	0	0	0	0	0	0	0			
Japan	>0	75	73	100	52	0	95	95	0	2 subnational systems: Tokyo C&T, Saitama	Buildings, industry	Climate action
	>30	17	0	0	0	0	0	0	0			
	>120	9	0	0	0	0	0	0	0			
Brazil	>0	6	0	0	0	0	0	0	0	No explicit instruments, ETS under discussion		
	>30	0	0	0	0	0	0	0	0			
	>120	0	0	0	0	0	0	0	0			
Indo-nesia	>0	0	0	0	0	0	0	0	0	Carbon tax planned for April 2022, postponed to 2025; ETS (C&T) planned for 2024	Planned: only coal power plants	National budget
	>30	0	0	0	0	0	0	0	0			
	>120	0	0	0	0	0	0	0	0			
Germany	>0	90	88	100	90	100	98	100	30	EU ETS (aviation, industry, electricity), nat. ETS (buildings, transport)	Aviation, Industry, electricity Transport, buildings	Climate action
	>30	87	50	0	74	0	0	100	30			
	>120	19	0	0	0	0	0	0	0			
Canada	>0	84	82	100	100	37	100	99	31	Federal system with national backstop from fuel excise and ETS (OBPS)	Emissions-intensive industrial plants exposed to trade	Tax reduction, climate action
	>30	33	9	0	2	10	74	0	0			
	>120	1	0	0	0	0	0	0	0			
South Korea	>0	91	77	0	100	0	62	100	48	EHS (implemented in 2015)	Industry, electricity, aviation Buildings, public sector, waste	Climate action
	>30	53	0	0	0	0	0	0	0			
	>120	12	0	0	0	0	0	0	0			
Selected emerging economies												
Mexico	>0	42	42	100	30	100	90	49	0	Pilot ETS (to come into full effect in 2023;, 2 subnational (carbon tax): Zacatecas, Tamaulipas	ETS: Industry, electricity; tax: all sectors	National budget
	>30	22	0	0	0	0	0	0	0			
	>120	0	0	0	0	0	0	0	0			
South Africa	>0	38	37	100	90	100	38	0	0	Carbon tax (implemented in 2019)	Industry, electricity, transport (specific exemptions)	National budget
	>30	12	0	0	0	0	0	0	0			
	>120	11	0	0	0	0	0	0	0			
Argentina	>0	39	17	89	13	98	1	14	0	Carbon tax (implemented in 2018)	Liquid fuels and some solids (hard coal, petroleum coke)	National budget
	>30	14	0	0	0	0	0	0	0			
	>120	0	0	0	0	0	0	0	0			
Türkiye	>0	30	0	0	0	0	0	0	0	No explicit instruments; fuel excises in effect, bill for pilot ETS presented in 2020		
	>30	18	0	0	0	0	0	0	0			
	>120	1	0	0	0	0	0	0	0			
Egypt	>0	19	0	0	0	0	0	0	0	Fuel excises in effect, subsidies recently reduced		
	>30	0	0	0	0	0	0	0	0			
	>120	0	0	0	0	0	0	0	0			

Note: Table presents the 'coverage rates' under different assumed minimum carbon prices, i.e. the share of carbon emissions covered by a particular carbon price level (>0, >30, >120). Data current as at 2021. * Net effect including effect from sales taxes on fuels, prices for approvals and less the effect from fuel subsidies. Sales taxes and subsidies on electricity not included; ** Effect exclusively from emissions trading system and carbon taxes. *** Iran and Saudi Arabia are also among the top 10 GHG emitters (as at 2019) but are not listed owing to lack of data.

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