9 Climate Policy at an Impasse

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Global greenhouse gas emissions must decrease if climate change is to be slowed. Yet they are increasing and at an ever-faster pace. Despite the global economic crisis over the last decade, the growth rate of emissions has never been higher (IPCC, 2014b). At the same time, global population growth and the economic ambitions of emerging markets are proving to be a continually increasing challenge for climate policy. More than 20 years of negotiations and numerous summits have done little to reduce greenhouse gas emissions. Unfortunately, the UN Climate Change Conference in Paris in 2015 is no exception (Cooper et al., chapter 1, this volume), and a major breakthrough is hardly in sight.

Climate change policy is at an impasse, and getting out of it will require an effective international climate agreement. For this to happen, policymakers must first agree on a realistic assessment. In the first part of this chapter, we present the climate problem and expose common misconceptions regarding climate policy. In the second part, we propose solutions to overcoming the impasse, focusing in particular on Germany's and Europe's perspective.

Climate Change

Greenhouse gas emissions that have accumulated in the atmosphere are driving up the global mean temperature due to the greenhouse effect. The fact that this phenomenon is caused by the burning of coal, oil, and gas and deforestation (that has been ongoing since the onset of industrialization) is

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no longer scientifically disputed (IPCC, 2013). This global increase in temperature has negative impacts. However, considerable uncertainties exist as to how these impacts are distributed across different regions, as well as their frequency and severity. This means that science does not know exactly what will happen. Some argue that, deeming certain findings to be too unreliable to allow for definitive conclusions, climate policy should abstain from recommending any and all courses of action. Yet such an approach is imprudent. Climate policy is inherently risk management; although a given scenario may be too pessimistic, it could just as well be too optimistic. Thus, a more rational approach would be to take precautions to attenuate the risk of catastrophic damage (Edenhofer et al., 2015a). In that sense, climate policy could be seen as a type of insurance, such as disability, fire, or health insurance.

One can distinguish between two classes of uncertainty in the climate debate. The first concerns uncertainty about the consequences of climate change, the frequency and intensity of which increases gradually. Weather events such as droughts, floods, and crop failures belong to this class. The second class concerns uncertainty about how or when the climate may trigger more abrupt types of damages to the Earth system—damages that, once triggered, are irreversible for any length of time and can impact the human species (Edenhofer et al., 2015a). The melting of the Antarctic and the Greenland ice sheet, the loss of the Amazon rainforest and its transformation from a net carbon sink into a carbon source, and the change in the monsoon dynamics in China and India are all examples of events that have potentially irreversible physical, social, and economic consequences (IPCC, 2014a).

The amount of CO_2 stored in the atmosphere is contributing to the increase in the global mean temperature and thereby to irreversible climate change. This can be expressed in terms of fundamental atmospheric scarcity.

The Atmosphere and the Fundamental Scarcity Problem

Humankind uses the atmosphere as a dumping ground for greenhouse gases. This is understandable because the use of the atmosphere is still free of charge. Yet as a storage site, the atmosphere is limited. Because its storage space has thus far been free, it has been overused, resulting in increased climate change. The same overuse phenomenon can be observed in traditional local commons in the mountains or with protected fisheries.

From this follows a fundamental insight: climate policy must be judged above all by whether it succeeds in limiting greenhouse gas emissions, thereby protecting the limited space remaining in the atmosphere from overuse. The scale of this challenge becomes evident when considering how small the atmosphere's capacity to absorb additional greenhouse gases actually is. The world may only emit roughly another 1,000 gigatons of CO_2 if it is to—with a probability of at least 66%—meet the goal of staying below a 2°C global mean temperature increase (IPCC, 2014c). If annual emissions stay at their present levels, then the remaining carbon budget will be exhausted within the next 20 to 30 years. To use the remaining budget in a cost-efficient way, annual greenhouse gas emissions would have to be reduced by between 40% and 70% by 2050. Toward the end of the century, emissions would have to decrease approximately to zero. Eventually, the world will probably have to rely on technologies that are able to withdraw more carbon from the atmosphere than they emit (IPCC, 2014c).

The significance of these figures, beyond indicating the limited carbon storage capacity of the atmosphere, reaches another dimension altogether when juxtaposing them to the approximately 16,000 gigatons of CO_2 that the Earth still has in the form of fossil resources and reserves. In other words, the supply of carbon is many times greater than the capacity of the atmosphere to absorb it. This fact is of critical importance, even if rising prices for carbon fuels may slow the pace at which these resources are extracted from the ground.

The European environmental movement and the public at large appear to believe that (1) there is an impending shortage of fossil fuels, and (2) this could solve the climate problem and justify or even force the restructuring of the energy supply. From a climate change perspective, the opposite is true. The supply of fossil fuels is not only large but it has even increased in the last two decades. Rising oil and gas prices have made investments in the exploration of new oil and gas fields profitable. The currently low price of oil is slowing such investments temporarily. However, this will not lead to a permanent restriction of further investments in exploration because fossil fuel prices are anticipated to increase in the long run. At the same time, technological progress in the exploration and production of fossil fuels has been dramatically underestimated. The so-called shale gas revolution in the United States has contributed to an additional supply of gas and a decline in the price of coal. As a result of such developments, the global economy is in the midst of the largest coal renaissance since the beginning of industrialization.

The Coal Renaissance

The community concerned with climate change sometimes hopes that zero-emission technologies will become cheap so quickly that it will no longer be worthwhile to continue extracting fossil fuels, especially coal, in large quantities. This hope is deceptive. Renewable energies are not cost-efficient to the point that the extraction of coal would be no longer attractive. It is true that wind power, when generated in locations with a strong resource, has already reached the same cost level as electricity generated from coal. However, when the fluctuation of wind power is factored in, additional system costs make wind more expensive. The costs of fluctuation increase as larger shares of wind power are integrated in the grid (Hirth et al., 2015; Ueckerdt et al., 2013). The same is true for solar energy. Thus, although further breakthroughs in renewable energies can be expected, they are unlikely to make the use of coal unprofitable in one fell swoop.

Instead, the world is witnessing a breathtaking coal renaissance (Steckel et al., 2015). Between 2005 and 2013, three times as many coal power plants were built worldwide than in any previous decade. Since 2010, five Chinese provinces alone built more new coal power facilities than any other country. The focus on coal in China has since slowed. However, in India and other rapidly emerging countries such as Vietnam and Indonesia, the construction of new coal power plants is in full force. Even in Europe, including Turkey, additional new coal capacities are planned. Africa is also investing in this form of energy. Worldwide, about 1,000 gigawatts of coal power capacity are currently in the planning stage (Edenhofer, 2015). If only one-third of this capacity is built, then an additional 100 gigatons of CO_2 would be dumped into the atmosphere over the lifespan of these facilities in the next 40 years. The existing infrastructure will already emit more than 700 gigatons of CO_2 in the coming decades. These figures show how incongruous climate policy targets can be with reality: the coal renaissance alone threatens to use up all of the atmosphere's remaining carbon storage capacity (Edenhofer, 2015).

A Reasonable Climate Protection Target

This enormous challenge raises the question of whether the 2°C target is a reasonable and achievable goal. The answer is yes. Given the uncertainties about the costs and benefits of avoiding emissions, and the evaluation of those uncertainties in terms of distribution and discounting issues, the 2°C target corresponds to the precautionary principle. Many studies that attempt to quantify the various risks arrive at temperature targets between 2°C and 3°C. There are also analyses that argue—in light of the irreversible risks—for a limit well below 2°C. Given that climate change may also trigger abrupt and catastrophic damage to the Earth's system, robust and meaningful cost–benefit analyses are hardly possible (Weitzman, 2011).

Commitment to the 2°C target appears to be a precautionary and pragmatic compromise that considers both the normative conflicts and the scientific uncertainties. It calls for the rapid adoption and implementation of an effective climate policy, although care must be taken that achieving the 2°C target does not put an intolerable burden on present and future generations. This can be done but only if an appropriate climate policy is adopted and the necessary technologies are sufficiently available.

According to current knowledge, the 2°C goal can be achieved through substantial improvements in energy efficiency, a three- to four-fold increase in the share of low-carbon technologies by 2050 (including renewable energy and nuclear energy), the use of carbon capture and storage (CCS), and the use of bioenergy with carbon capture and storage (BECCS). Reforestation and the use of BECCS are important measures for removing CO_2 from the atmosphere over the long term. Some of these technologies are controversial and not without risks (Edenhofer et al., 2015a; IPCC, 2014b).

With such packages of mitigation options, the cost of remaining below the 2°C threshold can be kept in check even without major technological breakthroughs in the next few decades. The IPCC has assessed all cost studies on climate change in recent years and concluded that reaching the 2°C target would most likely decelerate economic growth by only 1.5% per year from now until 2050.

An Effective Climate Policy

Thus far, the use of the atmosphere as a dumping ground has been largely free of costs, although this causes damages. The overuse of this space could be prevented if its use were associated with a fee. There is a broad consensus among economists and beyond that emission fees are the best climate policy instrument because they make low CO_2-emitting technologies more profitable and the burning of fossil fuels less attractive. In this way, emissions can be effectively avoided at little cost. Such a price on carbon could be implemented through emissions trading or taxation. It creates scarcity where there was none and eliminates inefficiencies as well as the injustice of cost-free CO_2 emissions. Carbon pricing is all the more pressing as fossil fuels are subsidized in many parts of the world today, to the extent that the average global carbon price is negative (Edenhofer, 2015). With such prices, there is no hope that global temperature rise can be kept within acceptable bounds.

Much of the climate debate revolves around indirect and complicated instruments. In Germany, renewable energies in the electricity sector are generously subsidized with feed-in tariffs. However, this path leads in the wrong direction as countless opportunities to advance efficient climate protection are missed. A carbon price that increases over the long term would impact all relevant decisions in an effective, transparent, and fair manner. Every measure in favor of climate protection—from a homeowner's decision to install a new heating system, to investments in renewables, to pioneering research in battery technology—is equally encouraged with a carbon price and the resulting incentives and market forces. With subsidies, by contrast, politics determines the winners and losers. Renewable energy subsidies in the German electricity sector do not avoid any CO_2 emissions beyond what is already accomplished by the EU Emissions Trading System. In an emissions trading scheme, a fixed number of allowances for emitting one ton of CO_2 are traded. For example, if a coal power plant emits one ton of CO_2 less due to additional power supplied by a wind power plant, the overall system is left with an allowance to emit one ton of CO_2. This allowance is sold at a profit to another user, whereby the total amount of emissions remains the same throughout Europe. Because the supply of allowances within the market is capped by means of political regulations, the demand for allowances dropped because of the additional supply of renewables, which has in part led to a decline in prices in the European emissions market.

The price in the emissions trading scheme is also influenced by many other factors. After 2008, the main reason for the drastic CO_2 price decline was primarily the financial crisis: actual emissions have since even been below the permitted ceiling. Because the European Commission could not decide to take the surplus of permits off the market, traders began assuming that the European emissions market would not necessarily experience significant shortages until 2020. Traders were even skeptical of European Commission announcements that the upper ceiling would be continuously lowered in the long term, with the consequence that future European emissions allowance prices for 2020 have collapsed as well (Edenhofer et al., 2015b).

One consequence of this price collapse is that the relatively clean but expensive gas power plants have been pushed out of the electricity market, whereas the relatively cheap but environmentally harmful coal power plants have proliferated. This and other undesirable consequences of low CO_2 prices and indirect climate policies have led to an unmanageable patchwork of politically motivated attempts at reform and many other costly subsidies. Despite all efforts and financial expenditures, the German energy transition has not effectively taken place to date. The share of renewable energy has risen, but this has not led to a significant decline in greenhouse gas emissions.

It is often argued that a carbon price creates undue competitive disadvantages when compared with measures implemented in the German energy transition. The opposite is true. A carbon price not only reduces costs but also generates revenues that could be used to offset politically undesired outcomes and burdens. As we shall see, a carbon price will also likely be a condition in any agreement that seeks to protect participants against free-riders at the international scale. As a result, a carbon price can massively reduce the competitive disadvantages arising in Germany from subsidizing renewables.

Without a substantial carbon price, effective climate protection is unthinkable, and the German energy transition will fall short of its goal. To avoid any misunderstandings, renewable energy will surely play an important role in climate protection, and research in this area is certainly recommendable. The problem arises in the conviction that the large-scale subsidization of renewables is equally justified and effective in mitigating greenhouse gas emissions as the direct pricing of greenhouse gas emissions. The German energy transition is a showcase of this phenomenon.

Paris and the Climate Policy Challenge

It is undisputable that unabated climate change is likely to have dramatic consequences for humanity. Governments are striving for a reasonable climate target, and the economic instruments with which such a target can be effectively and efficiently achieved without causing unwarranted burden are well understood. What, then, is the problem? The central challenge of climate policy is to discipline free-riders throughout the world in their use of the atmosphere as a dumping ground (MacKay et al., 2015; Cramton et al., chapter 4, this volume; Cramton, Ockenfels, and Tirole, 2017). Why should one country spend major sums of money on climate protection if it stands to gain only a fraction of the benefits of those efforts? Let the others do some work! Canada intends to continue exploiting the tar sands in Alberta; many African countries are hoping to become net exporters of oil within the next decade; China and India are building new coal power plants to keep up with growth, challenged only by local environmental protests; and the United States is focusing on shale gas, which may reduce domestic emissions but will lead to rising coal exports.

In Europe, greenhouse gas emissions generated from domestic production have dropped (IPCC, 2014b). However, emissions generated from European consumption have risen due to its net imports of emissions from China. China has become the workshop of the world, as well as the largest net exporter of CO_2 emissions (Jakob and Marschinski, 2012; Jakob et al., 2014; Peters et al., 2007). Thus, although decreasing greenhouse gas emissions in Europe may ease the European conscience, this plays no significant role at the global scale.

International cooperation has not made significant progress thus far (Cramton et al., chapter 12, this volume). At present, climate talks are based on the principle that each state defines for itself what efforts it wants to contribute to climate protection. However, the climate challenge cannot be solved with a patchwork of nonaligned commitments.

In Paris, many countries announced their respective climate commitments for the 2030 time horizon. These pledges, despite being delivered with strategic optimism, are sobering. Calculations show that the various countries' pledges, taken together, will continue to lead to rising emissions and miss the efficient path to 2°C target by far. Not surprisingly, politicians and climate diplomats sketch more positive pictures of the outcome of Paris, but those pictures are almost entirely based on assumptions about what happens after 2030. Because there are no pledges for the period after 2030, many scenarios are conceivable. Although the aim of the Paris climate conference was to insist that each country also commit to gradually increase individual contributions after 2030, it remains completely unclear how this may be actually negotiated and implemented. The only serious hint about what comes after 2030 that is not based on speculation and wishful thinking comes from cooperation research. This research suggests that without a shared commitment, cooperation would be rather fragile and eventually collapse even if it were to start out with several forceful contributions (Brosig et al., 2003; Ledyard, 1995; Ostrom, 1990, 2009). Anyone who has ever participated in climate negotiations and monitored the developments after Kyoto would realistically agree. New mechanisms are needed to solve the cooperation problem.

Toward a Common Price Target

There are two underlying principles that are put forward throughout most of this book and explained in more detail in other chapters: (1) pricing carbon is the most effective policy to curb emissions, and (2) reciprocity is the most effective policy to promote international cooperation. The good news is that these two fundamental principles, which are concluded from two different research agendas, can be knotted together to fix the broken climate negotiations.

The key to understand this is that a shared commitment is needed to promote cooperation among countries. Only if countries have a common understanding of what can be expected from others and from themselves can they be protected against exploitation by free-riders. The common commitment binds a country only to the extent that other countries also live up to the agreement. This kind of reciprocity creates incentives for cooperation and, ultimately, mutual trust (Bolton and Ockenfels, 2000; Bowles and Gintis, 2013; Fudenberg and Tirole, 1991; Kosfeld et al., 2009; Kraft-Todd et al., 2015; Ostrom, 1998, 1990).

As explained thoroughly elsewhere in this book, a quantity commitment, which distributes the global carbon budget across countries, has proved infeasible. Although it is relatively easy to agree on a global emissions target, the breakdown of this global goal into national obligations is simply impossible. Entitlement to a higher carbon budget essentially represents money in the form of valuable carbon credits. In such a context, during negotiations about the global emissions target, countries try to find ways to maximize their respective budgets, which leads to an inflation of the overall carbon budget—producing the opposite of the expected outcome. In practice, at no point in time were participating countries able to agree on a distribution of the carbon budget or even a distribution principle. The underlying reasons for the failure of quantity commitments have nothing to do with uncertainty about the carbon budget: Even if the "optimal" carbon budget would be known with certainty in the future, negotiators would be unable to distribute the budget among all countries because of inherent free-riding and fairness issues. That is, what might seem obvious from a climate science perspective can be a complete failure from the perspective of incentive and negotiation design.

A global price target such as an internationally agreed minimum carbon price, however, can do the trick. A carbon price could be negotiated such that it is consistent with the 2°C objective. It could also be flexibly adapted as uncertainties about costs and damages are resolved. At the national level, the price target could then be achieved in a flexible way, for example, by means of emissions trading schemes or fuel taxes.

An international minimum price target has many advantages, most of which are described in various chapters in this book. For instance, because the burden created by a price target is proportional to the emissions produced, it is also proportional to a country's level of development. Compared with quantity targets, a price target carries fewer financial risks for individual countries because business-as-usual emissions and abatement costs are both highly uncertain. A price instrument such as a global minimum price for CO_2 also allows the efforts of different countries to be measured and made comparable. In this way, shared commitment allows for a system of reciprocal rewards and punishments that are essential for stable cooperation: "I will cooperate for as long as the others are also sticking to our shared commitment." All experiences with negotiations concerning climate protection (as well as countless other field and laboratory contexts) strongly demonstrate the ubiquitous importance of the principle of reciprocity for stable cooperation. Only when the international community can agree on a shared and comparable benchmark of climate protection efforts can cooperation be rewarded and free-riding disciplined.

How the Burden Could Be Distributed

Although a price target reduces the barriers to a joint international commitment, not all countries will want to agree on an ambitious price target. Some poorer countries are, for understandable reasons, focused on poverty alleviation or rapid growth, whereas other countries stand to lose considerable revenues from the sale of coal, oil, and gas. Thus, we support the proposal to implement the Green Climate Fund, which collects money with the purpose of realizing an international climate policy, generating incentives for ambitious price targets. In this way, the Fund could reward cooperation while taking into account differences in costs and willingness to pay for greenhouse gas emission reductions. Recent research suggests that strategically selected distribution mechanisms of the Green Climate Fund could allow the establishment of an ambitious global minimum price target on which all countries would voluntarily agree (Cramton and Stoft, 2012). This global minimum price is associated with transfer payments that induce a politically acceptable redistribution of funds from rich to poor (Cramton et al., chapter 12, this volume; Kornek and Edenhofer, 2015; Roolfs et al., 2015).

A global minimum carbon price that is implemented by national governments (e.g., as tax or an emissions trading system) leads to revenues that can be used to invest in local infrastructure, lower distortionary taxes (especially for low-income groups), and reduce government debt. Even without consideration of the climate, it would be better to generate revenue for a country through the correction of inefficient scarcity indicators than through distortionary taxes on labor income. This would also invalidate the frequently made objection that climate protection and poverty reduction are mutually exclusive. Especially in emerging markets, carbon pricing could mobilize means with which to make investments in the provision of clean water, sanitation, roads, and mobile networks.

An ambitious carbon price drives a wedge between the revenues generated by countries supplying fossil fuels and the revenues generated by consumer states. Essentially, profits generated by those who produce fossil fuels are funneled to countries with carbon prices (Franks et al., 2015). Could carbon prices give supplier states an incentive to get coal, oil, and gas out of the ground more quickly to circumvent the impending loss of revenues from their own resources? This so-called Green Paradox effect can be prevented if the rate at which the carbon price increases is slower than that of the long-term interest rate in the capital market (Edenhofer and Kalkuhl, 2011). Countries with coal, oil, and gas reserves would then no longer have an incentive to extract resources more quickly and profitably invest the proceeds in the capital market. In this way, a carbon price would ensure that these resources are kept in the ground. A global carbon price gives nation-states, but also cities and communities, the leeway to design their own flexible climate policy. With a global minimum carbon price, additional efforts of a wide range of players would actually lead to global emissions reductions. These reductions would not be feasible in a global emissions trading scheme, where local efforts would not affect the global carbon budget and the corresponding certificate quantity—instead leading merely to additional emissions elsewhere. In other words, a minimum carbon price does not induce a shift of emissions. The price remains unchanged by additional unilateral efforts.

Although climate policy requires global governance, it needs local solutions as well. Technical and social innovations are not made at mega-conferences. International negotiations should provide a regulatory framework that ensures local efforts and innovations are not meaningless or, worse, counterproductive. A commitment to a carbon price will accomplish this goal.

The European Emissions Trading Scheme and National Preferences

Should an agreement on a global minimum carbon price be made, to comply with international obligations, common European climate policy would need to be reformed to adopt a minimum price within the EU Emissions Trading System. However, such a minimum price in the European emissions market would be beneficial even prior to the introduction of a global carbon price agreement. First, the price decline in the European emissions market would not persist because traders can count on an increasing minimum price for their carbon-free investments. Second, a minimum price would give member states more leeway to implement their own climate policies. Countries with a greater willingness to pay for climate protection could express their preference for a more ambitious national climate policy without it leading to a mere shift of emissions. In Europe, Germany is pursuing its own climate change targets and is promoting renewable energy, but Sweden also has a national carbon tax, and the United Kingdom promotes nuclear power plants. At present, these unilateral efforts only lead to a shift of emissions—a minimum price would ensure that additional emissions are avoided (Edenhofer et al., 2015b).

Targeted transfer payments can facilitate ambitious international climate policy (including a minimum carbon price) in both international climate negotiations and the European Union. Transfer payments across European countries can even facilitate the implementation of a European-wide minimum CO_2 price (Edenhofer et al., 2015b). Of course, the goal is to achieve a shared commitment beyond European borders. However, as a first step, this policy restructuring would get Europe out of its climate policy impasse. At the same time, Europe could demonstrate, as a multilateral laboratory, how to implement effective global climate protection. On the basis of this proposed structure, Europe could operate a smart, reciprocal pricing policy that would also help to get an international price target on its feet.

What's Left to Do?

On the path to an ambitious, effective, and politically feasible global climate policy, many questions remain unanswered. For example, international climate negotiations will not be able to persuade all countries to back a given outcome. It would be a terrific breakthrough if, for a start, the largest emitters could agree on an initially modest carbon price target. This would constitute an effective climate policy instrument that would allow the community to act, gradually increase the carbon price, and adapt it to newly obtained knowledge. For this, it will be necessary for the public and governments to stand up against strong interest groups that benefit from the failure of international cooperation and the inefficiency of massive redistribution programs.

The basic principle of effective climate policy is simple, direct, and indispensable: those who emit CO_2 have to pay. A carbon price generates adequate incentives for innovation and effectively reduces greenhouse gas emissions. Luckily, this principle is fully in line with the basic principle of effective cooperation: reciprocity. A price target (unlike a quantity target) is an agreeable common commitment of the international community, which in turn is necessary for any reciprocity to evolve, thereby breaking the deadlock of failed climate negotiations. The international community is now facing perhaps the greatest dilemma of human history. Whether it can learn to collaborate and build trust or whether it will lose itself in an ineffective patchwork of self-centered actions will depend on whether it chooses to utilize or ignore these two fundamental principles of effective climate policy and human cooperation.

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