TARGETING NET ZERO EMISSIONS

A NEW FOCUS FOR A MORE EFFECTIVE CLIMATE POLICY

February 2019

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INTRODUCTION

In less than four years after the historic United Nations (UN) climate summit in Paris, the enthusiasm has largely evaporated. The Paris Agreement and its core target—holding the mean global temperature increase within a corridor of 1.5–2 degrees Celsius (2.7–3.6 °F) above pre-industrial levels—is still seen as a major diplomatic breakthrough. But since 2015, there have not been many signs of progress in climate change mitigation. While the deployment of renewable energy is clearly accelerating, it has been outpaced by total growth in energy demand, still mainly fueled by oil, gas, and coal.

Hence, the year 2018 is projected to set a new record in global greenhouse gas emissions (Jackson et al. 2018). Even in the unlikely event that all the Paris Agreement signatories fulfill their voluntary national pledges, emissions would still be expected to rise a little further until 2030. The UN's Environment Programme predicts a temperature rise of 3.2°C by 2100—in other words, well above the politically agreed thresholds—unless the current climate policy course is changed drastically (UNEP 2018).

The widening gap between emissions scenarios compatible with the target of 1.5–2°C and real-world emissions trajectories calls for a re-examination of climate policy fundamentals (Victor & Jones 2018). One major problem lies in the global nature of temperature targets, which are ill-suited for generating concrete (sub-)national action plans and prove inappropriate for evaluating emissions reduction measures implemented by governments, cities, or businesses. Focusing on reaching net zero emissions would be a better approach to guide climate policy effectively.

Temperature targets have advanced the climate policy debate, but failed to catalyze appropriate action—net zero emissions targets can deliver on both ends.

INTERNATIONAL CLIMATE TARGETS

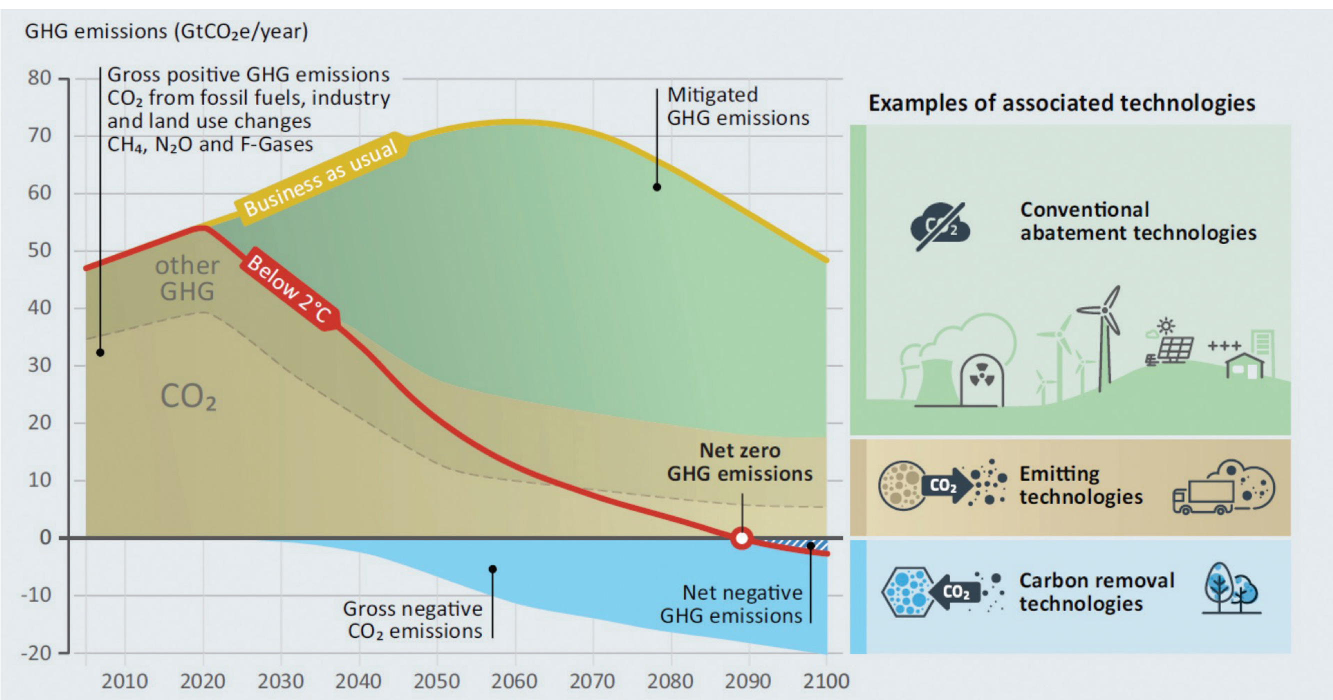
The 1992 UN Framework Convention on Climate Change (UNFCCC) does not set a clear target but only the rather abstract objective to achieve a stabilization of greenhouse gas concentrations in the atmosphere to prevent dangerous anthropogenic interference (DAI) into the climate system. Since then, several attempts to operationalize this overarching goal have been made. In the 1990s, rates of decadal temperature change or equilibrium atmospheric concentration of greenhouse gases have been most prominent. In the 2000s, temperature thresholds—notably 2°C—became much more prominent (Randalls 2010). Since the 2009 Copenhagen climate summit temperature targets have dominated the international climate debate. With its 2015 Paris Agreement, the UNFCCC finally adopted the 1.5–2°C range as its core mitigation target.

Furthermore, the Paris Agreement introduced an additional formula in order to further operationalize the new temperature target. Based on the scientific understanding that any temperature level can be translated into a remaining global emissions budget, albeit with broad uncertainty ranges (Peters 2018), it can be said that net emissions need to be zero at some point in the future. Accordingly, the UNFCCC stipulates the goal "to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century" (UNFCCC 2015). This rather ambiguous formula is generally interpreted as targeting "greenhouse gas neutrality" or "net zero emissions" (Fuglestvedt et al. 2018).

The term "net" here refers to the fact that even under the most stringent mitigation policy a certain amount of residual emissions—assumed to be too expensive or even impossible to eliminate—would remain, mainly in sectors like long-distance and heavy-duty transport, industry, or agriculture (Davis et al. 2018; Luderer et al. 2018).

These residual emissions would need to be offset by using methods able to extract already emitted carbon dioxide from the atmosphere, so-called "negative emissions technologies" (see Figure 1). While less costly biological options like afforestation, biochar, or soil carbon sequestration are closer to deployment, the stored carbon

FIGURE 1: RESIDUAL EMISSIONS AND CARBON DIOXIDE REMOVAL FOR LIMITING TEMPERATURE INCREASE TO 2°C



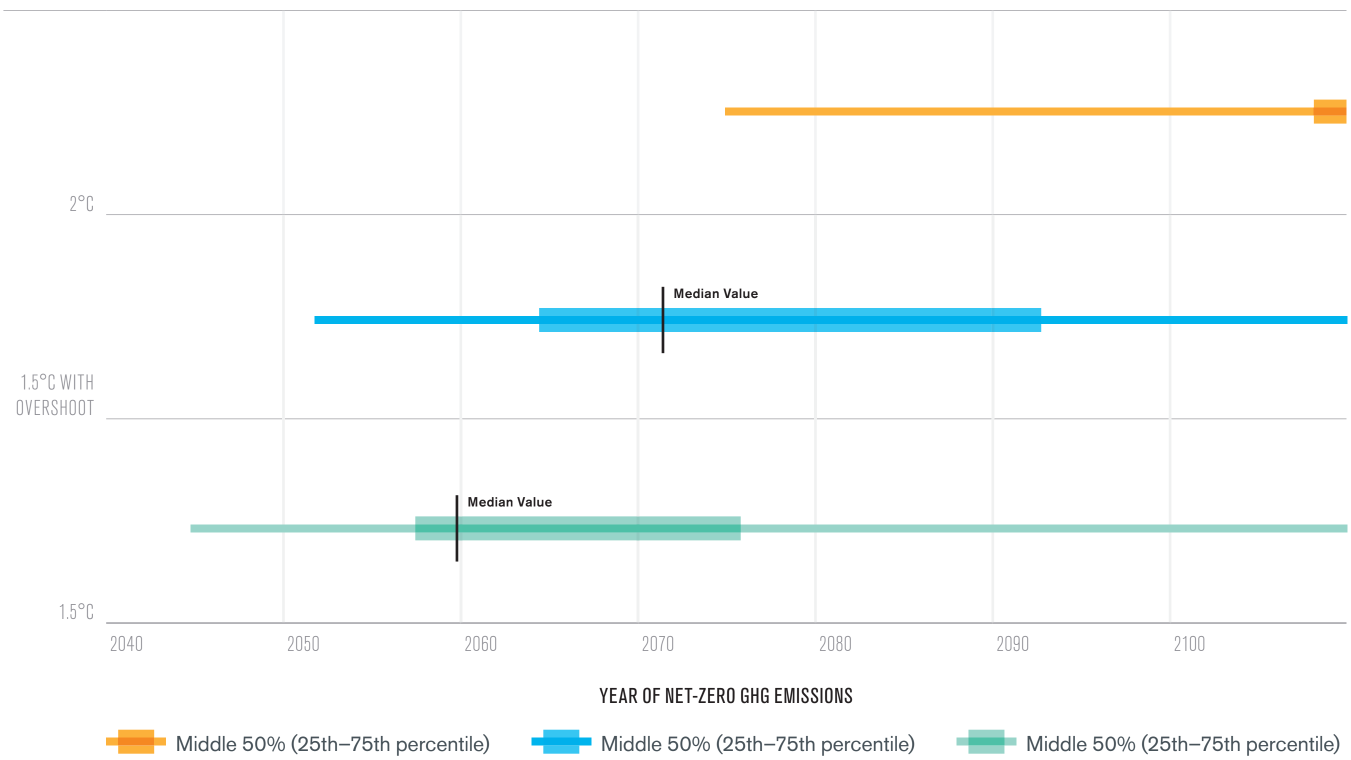
Source: UNEP 2017

is more vulnerable to reversal. More costly engineered options like direct air capture or bioenergy with carbon capture and storage are still in their infancy but the geologically stored CO_2 could be safely put away on much longer timescales (UNEP 2017; Fuss et al. 2018).

Both types of targets—temperature thresholds and net zero emissions—are usually presented as deeply intertwined. Temperature stabilization is impossible without reaching net zero emissions, and for very ambitious targets like 1.5–2°C the net emissions curve even needs to go below the zero line afterwards (see Figure 1). For 1.5–2°C, net zero greenhouse gas emissions would probably have to be reached in the second half of this century, as has been recently confirmed by the Intergovernmental Panel on Climate Change (IPCC), in its Special Report on 1.5°C (IPCC 2018) (see Figure 2).

Yet, the global climate policy debate is still dominated by the symbolically more powerful temperature target, leaving much room for interpretation. For example, whether reaching 1.5°C is technically still feasible critically depends on the way temperature targets are defined. Whereas 2°C has always been seen as a strict "not-to-exceed" limit, this would not have been possible for 1.5°C any more. Mean global temperature has already risen by about 1°C above pre-industrial levels, with a current rate of 0.2°C per decade (IPCC 2018). The vast majority of scenarios assessed by the IPCC are therefore in need of more flexibility in achieving 1.5°C, by allowing for a temporary "overshoot" of the threshold, albeit disagreeing about its maximum extent and duration (Geden & Loeschel 2017).

FIGURE 2: NET ZERO YEARS FOR DIFFERENT PATHWAYS TO STAY BELOW 1.5°C OR 2°C



Bars show the full range of scenarios, thickened areas indicate the middle 50 percent of scenarios (25th to 75th percentile), black lines the median values. Note that for 2°C, almost 75 percent of scenarios report a net zero year beyond 2100.

Source: IAMC 1.5°C scenario explorer; figure by Glen Peters, CICERO.

INHERENT INCONSISTENCY OF POLICYMAKING

The main purpose of the UNFCCC mitigation targets is to regulate the behavior of the key actors responsible for anthropogenic climate change. Nevertheless, whereas much effort has been put into defining a threshold for DAI, surprisingly little attention has been paid to the mindset of policymakers who are tasked with preventing dangerous climate change. The problem-centered approach pursued by physical scientists assumes that appropriate policy action will follow from an accurate definition of DAI more or less automatically. But the underlying assumption of comprehensive rationality and consistency is rarely met in climate policymaking—even if politicians, government officials, and diplomats often pretend otherwise (Geden 2016). There is of course the fundamental difficulty of effective international coordination (Victor & Jones 2018).

But even on a national level, everyday governance is usually not primarily driven by objectively defined problems that require specific solutions. More often, policymakers' preferred solutions are chasing fitting problem descriptions (Cairney 2016). Although policymaking ostensibly adheres to the cultural norm of consistency, its daily practices are characterized by a fundamental inconsistency between talk, decisions, and actions. Political and administrative actors typically treat talk, decisions, and actions as relatively independent products, in order to satisfy a diverse set of stakeholders and to maximize external support (Brunsson 2002).

This is particularly problematic in climate policy, a public domain that is characterized by long-term scenarios and optimal policy designs, enabling politicians to make bold promises about the far-away future without the immediate need to deliver on them (Geden 2016). Unfortunately, in climate policy most governments choose a more progressive stance when talking and deciding, but a more modest one when acting.

Given the lack of comprehensive rationality driving policymaking processes, we cannot expect any mitigation target to guarantee the decisive action that is urgently needed. Thus, when assessing such goals, we cannot seriously expect these goals to fulfill all the ideal functions of a policy target—that is, that they are simultaneously precise, evaluable, attainable and motivating (Edvardsson Bjoernberg 2013). Nevertheless, these functions can serve as useful benchmarks. Furthermore, we should watch out for factors that help to hedge inconsistency in climate policymaking, and, more general, enhance actors' accountability (Karlsson-Vinkhuyzen et al. 2018).

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DIFFUSING POLITICAL RESPONSIBILITY

During the last 15 years, temperature targets have worked quite well as a focal point for global policy formulation (Geden 2013). A problem-centered target such as 2°C can easily be communicated as a threshold to dangerous climate change, although it is not entirely clear when we would consider the threshold crossed. This is because there is more than one definition of global mean temperature, more than one global temperature record, and no common political understanding on the exact period of time global mean temperature would need to be beyond the threshold to declare the target to be missed (Rogelj et al. 2017).

Furthermore, temperature targets lack the necessary characteristics to actually guide the mitigation actions of individual governments and companies. Even if temperature targets were defined more precisely—for instance, if no temporary overshoot was allowed for—

it would not change the fact that they are directed at the earth system as a whole. Temperature targets cannot define the amount of emissions reductions any individual country is supposed to provide. It is therefore relatively easy for governments to support ambitious global targets while doing little to cut emissions at home.

Since the IPCC declines, with good reason, to deliver a scientific formula for fairly distributing mitigation obligations among nation states, every government is able to declare within the UNFCCC process that its own pledge is fair and ambitious. When focusing on temperature targets, mitigation efforts can only be critically evaluated at the global level and no single country can be held responsible for the looming breach of the 1.5–2°C target.

The attainability of climate policy objectives is generally neglected as a factor, not the least because the scientific validation of climate targets makes it difficult for governments and companies to disclose their pragmatic cost–benefit calculations. However, as in every other policy area, governments tacitly reduce their efforts in climate policy as soon as the economic and—often more importantly—the political costs of consistent target achievement seems too high (Victor 2011). In a world where problem processing trumps problem solving and where a vast and diverse range of problems or targets are being processed simultaneously (Cairney 2016), it makes sense for a government to focus on achievable targets and pay less attention to the extent of failure when missing others.

Temperature targets are particularly problematic since they create an “either–or” situation: a 1.5–2°C range can be either hit or missed. If climate research showed that failure is highly likely, this would probably reduce the motivation of policymakers, companies, non-governmental organizations and the public (Geden 2013). Since policymakers cannot afford to pursue objectives that scientists have declared to be infeasible, this would probably lead to the adoption of a less ambitious target.

To avoid such a make-or-break situation in the face of rising emissions, climate researchers have gradually shifted critical assumptions in recent years, for instance on maximum annual decarbonization rates, deliberate temperature overshoot or, most importantly, the inclusion of vast amounts of negative emissions into modeled scenarios. The volumes of carbon dioxide removal (CDR) assumed by climate economists—up to 800 gigatons CO_2 throughout the 21st century, 20 times the current annual emissions—look like a risky bet on payback by future generations, given that CDR technologies are barely researched and are leading only a peripheral existence in climate policy.

The aggregate effect of all these interventions is a masking of inappropriate climate action by extending the remaining emissions budget, keeping the clock for 1.5–2°C constantly at “five minutes to midnight” (Geden 2018). CDR would also be needed to reach net zero emissions, but only to a limited extent, approximately one third of the volumes assumed for reaching 1.5°C (van Vuuren et al. 2018). Researching, developing, and deploying negative emission technologies to balance residual emissions that are obviously too expensive or even impossible to eliminate could be better integrated into national climate policy programs than using CDR as a magic bullet to make up for inappropriate mitigation around the globe (Geden et al. 2018).

TARGETING HUMAN BEHAVIOR

In contrast to temperature thresholds, a target of net zero emissions tells policymakers, business leaders, and the public fairly precisely what needs to be achieved, and it directly addresses human behavior; something organizations have a better chance to influence than global temperature (Victor 2011). A net zero emissions target is more precise, easier to evaluate, politically more likely to be attained, and ultimately more motivating.

Since this goal directly tackles the actions perceived as problematic, its effectiveness at steering policy can be expected to be much greater than 1.5–2°C. If global greenhouse gas neutrality in the context of the Paris Agreement is interpreted to mean that all signatories have to gradually reach net zero between 2050 and 2099, then they must all be measured against the same yardstick. Any differentiation between these obligations—for instance, between industrialized nations, emerging economies, and developing countries—can only occur along the time axis. Under the bottom-up approach of the Paris Agreement, governments make that decision for themselves.

Each country's net emissions must first peak (which is already the case for 49; Levin & Rich 2017), then continually decrease, and finally attain zero. Measured against this target, it is easy to make mitigation action transparent—not just of national governments, but of cities, economic sectors and individual companies as well (Vallejo et al. 2018). Whoever ignores the target will not be able to deceive others: it is relatively easy to ascertain whether the respective emissions are going up or down.

Wherever greenhouse gas neutrality becomes the socially accepted norm, new fossil-fueled infrastructure would be very hard to justify. If the goal is to reach net zero, then why, for example, still build a coal power plant and risk further carbon lock-in? Given that substantial differences among key emitters exist (e.g. regarding geography, climate, energy supply, core economic activity), it would not be necessary that every government, city, or company reach zero completely on its own. If some countries are able to go one step further and even achieve net negative emissions, they should be allowed to sell credits to others—e.g. airlines or steel companies—to enhance overall economic efficiency. But to ensure the environmental integrity and political acceptability of offsetting schemes for "negative carbon," we need regulatory oversight (Honegger & Reiner 2018) that includes volume limits on traded removals (Geden et al. 2018).

Some countries have already taken up the challenge, albeit using different interpretations of net zero (Rogelj et al 2015). In Europe, Sweden plans to reach net zero by 2045. The United Kingdom has declared its willingness to announce a net zero emissions target in 2019. The European Commission recently started pushing for a "net zero by 2050" vision for the whole European Union (EU), but it remains to be seen if EU member states are willing to commit to such a target.

In the U.S., the state of Hawaii was the first to decide on a bill setting a net zero target, to be reached by 2045. California followed with a sectoral target of zero emissions electricity, also by 2045. Around the globe, we find similar initiatives and plans, for example by the government of New Zealand or the Australian state of Victoria, but also in cities like Copenhagen or companies like Maersk, the world's largest container shipper.

Obviously, bold net zero emissions or climate neutrality announcements as such cannot guarantee that all the necessary emissions reduction measures will really be implemented. A zero emissions target is not immune to failure. There are several cases where such announcements had no other effect than giving respective countries, cities, or companies a more climate-friendly reputation. Long-term targets will only be effective in guiding policymaking if governments are held accountable by interested stakeholders, e.g. through peer review within the UNFCCC, by national institutions, and through direct civil society engagement (Karlsson-Vinkhuyzen et al. 2018). Furthermore, internal government processes regarding long-term planning and delivery will have to be improved (Ross & Fransen 2017; Duwe et al. 2017).

Given the time horizon of several decades, even the best political intentions and the best governance structures cannot guarantee success. But since a net zero emissions target sets a very clear direction of travel, rather than positing an imaginary border between "acceptable" and "dangerous" climate change, its attainability is not a question of either–or, but of sooner-or-later. A net zero target thus avoids definitive failure, which might have a demoralizing political effect.

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SEQUENTIAL STRATEGY

Comparing the two types of mitigation targets incorporated into the Paris Agreement, the net zero emissions target is clearly the preferable one when it comes to the much needed capacity to guide appropriate action. Thresholds for temperature increase can still be useful in climate policy, but they would better be treated as environmental quality objectives that indicate a desirable end stage that the world should strive for. Policymakers clearly lack the capacity to process the full range of environmental problems at one time (Cairney 2016).

Net zero emission targets allow for a sequential climate policy strategy, since they can only be reached by a combination of conventional mitigation and some amount of carbon dioxide removal to offset residual emissions. Only when key emitters are able to prove that pathways to net zero are feasible in the real world, based on a much higher and hopefully actionable level of understanding, it would make sense to plan and prepare for huge amounts of carbon dioxide removal to go “net negative,” as an integral part of a climate recovery strategy that aims to secure the politically agreed temperature range of 1.5–2°C (Meadowcroft 2013; Peters & Geden 2017).

Differentiation between environmental quality objectives and policy action targets has the potential to change the way climate researchers look at policymaking. On the one hand, researchers will have to accept their relatively limited role in the process of policy formulation and even more limited role in policy action. On the other hand, they should not feel pressured to make pragmatic concessions when formulating long-term environmental objectives that are worth pursuing, as originally happened in case of the 2°C temperature target (Morseletto et al. 2017).

MORE AMBITIOUS, MORE PRAGMATIC

Setting and pursuing net zero emissions targets will conceptually shift climate policy in two ways: it will—obviously—become both more ambitious but—paradoxically—also more pragmatic. Current long-term reduction targets do not reach 100 percent, and many climate progressive countries still use some version of the 80–95 percent range (by 2050) introduced in the IPCC’s Fourth Assessment Report in 2007. Such a target allows many governments and companies to locate a substantial share of their emissions within the remaining 5–20 percent, suggesting they are only partially affected by current climate policy pathways.

This is especially true where very ambitious reduction measures encounter substantial technological, economic, or political obstacles. This constellation is also advantageous for climate progressive governments and environmental NGOs in that they can focus their proposed solutions essentially on expanding renewables and economy-wide electrification while increasing energy efficiency. They do not need to discuss unpopular and costly measures, such as capturing and storing CO_2 in the steel and cement industry, producing synthetic fuels for long-distance and heavy-duty transport, using negative emissions technologies of building the necessary infrastructure for the widespread use of hydrogen as a potential zero-carbon feedstock in the chemical industry—challenges to be tackled to create zero emissions energy systems (Davis et al. 2018). Emission reduction targets of 100 percent, whether deployed nation-, city-, or company-wide would therefore push all parties out of their comfort zones and greatly increase the level of seriousness in climate policy.

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