The role of international carbon markets in a decarbonising world

Aligning Article 6 with long-term strategies

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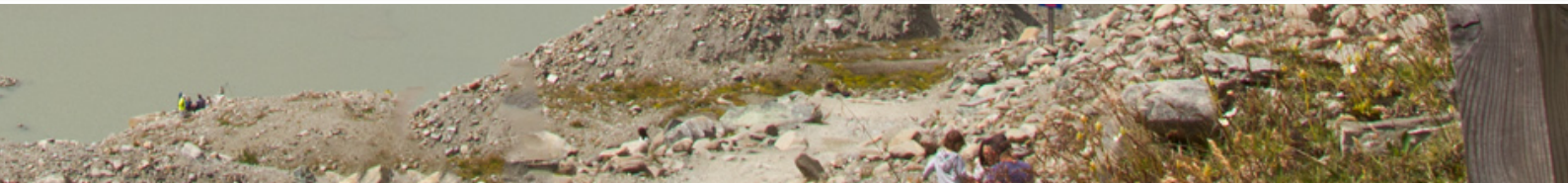

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Summary

The world has collectively committed to hold global average temperature increase to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C. This requires not only for global emissions to peak as soon as possible and to decrease rapidly to net-zero, but also for emissions to significantly decline by 2030, and quickly become net-negative thereafter.

The Nationally Determined Contributions (NDCs) that countries have put forward toward this objective are insufficient, but a number of countries have set long term targets and commitments some of which target net-zero emissions. Such long term planning exercises, or long term low greenhouse gas emission development strategies (LTS) in the context of the Paris Agreement, have the potential to serve as an important visioning exercise for a country to chart out the most ambitious decarbonisation pathway possible for all emitting sectors. A number of LTS keep open the option of using emissions reductions from abroad to fulfil net-zero targets, leaving the actual level of future emissions unclear.

Article 6 of the Paris Agreement provides the framework for the transfer and use of such emission reductions under the new regime. The new Paris context however demands a new and different approach to international transfer than from the erstwhile Kyoto Protocol. The Kyoto Protocol mechanisms were conceived of as “flexibility” mechanisms to make the achievement of climate mitigation goals cheaper in a static environment. The mandate of Article 6 in contrast is not to make achieving NDCs cheaper, but rather to further ambition in a new dynamic context with an overall temperature goal, universal commitments, a regular ratchet mechanism, and importantly provisions for LTS. In order for Article 6 to fulfil its ambition mandate, it must be used to accelerate technology access towards decarbonisation in potentially transferring countries, and at the same time not be used to delay full decarbonisation in acquiring countries.

For potential transferring countries, the development of an LTS is important to chart sectoral decarbonisation pathways to net-zero on the way to net-negative emissions, inform future NDC updates, and identify inaccessible technologies for which a country could seek international support. Critically, an LTS is important to identify the emission reductions that the country needs to fulfil their own targets and avoid overselling.

For potential acquiring countries, an LTS should chart out the fastest decarbonisation pathway technically feasible. However, even this pathway may not be fast and steep enough to represent a “fair share” contribution of developed countries. Taking capacity and responsibility into consideration, any use of Article 6 should come in addition to and on top of, not instead of rapid decarbonisation. Misuse of Article 6 could severely undermine the ambition and meaning of a net-zero target so that in terms of domestic emissions, net-zero could be used to hide or distract from continued business as usual emissions patterns. The use of Article 6 to reach net-zero and net-negative goals comes at the risk of continued carbon lock-in of fossil fuel infrastructure and stranded assets; forgoing important benefits of decarbonisation, a risk of not achieving targets because of the potential future lack of availability of emission reductions; not to mention reputational risks for the country and Article 6 itself.

Depending on the sector and technology, Article 6 may however have a role in accounting for efforts towards non-land based global carbon dioxide removals. Some removal technologies may not face the same challenges as reductions in that they may not depend on what others might have done otherwise, but also face questions surrounding large scale feasibility and sustainability. While removals are essential, and efforts to protect and enhance sinks of all kinds, especially natural ecosystems, are necessary, efforts to achieve them should be separated from emission reduction efforts at the risk of allowing for reduced effort for rapid and far-reaching transitions in energy, land, urban and rural infrastructure, and industrial systems.

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Abbreviations

AAU	Assigned Amount Unit
AFOLU	Agriculture, Forestry, and Other Land Use
BaU	Business as Usual
BECCS	Bio-energy with carbon capture and storage
CCGT	Combined Cycle Gas Turbine
CDM	Clean Development Mechanism
CDR	Carbon Dioxide Removal
CO_2	Carbon Dioxide
COP	Conference of the Parties
EC	European Commission
EU	European Union
GHG	Greenhouse Gas
IET	International Emissions Trading
IPCC	Intergovernmental Panel on Climate Change
ITMO	Internationally Transferred Mitigation Outcome
JI	Joint Implementation
LTS	Long-term low greenhouse gas emission development strategies
LULUCF	Land Use Land Use Change and Forestry
MRV	Monitoring Reporting and Verification
NDC	Nationally Determined Contribution
NET	Negative Emission Technology
PPA	Power Purchase Agreement
QELRO	Quantified Emission Limitation or Reduction Objective
R&D	Research and Development
SBSTA	Subsidiary Body for Scientific and Technological Advice
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

1 Introduction

The world has collectively committed to hold global average temperature increase to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C. For this to happen, Article 4.1 of the Paris Agreement calls for global emissions to peak as soon as possible and to decrease rapidly to reach "a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases" (i.e. net-zero emissions) in the second half of the century. The Intergovernmental Panel on Climate Change (IPCC) found that in scenarios consistent with limiting global warming to 1.5°C, all Parties must bring about rapid and far reaching transitions in all emitting sectors so that CO_2 emissions decline by about 45% from 2010 levels by 2030, reaching net-zero around 2050, and quickly become net-negative thereafter (IPCC, 2018a).

Working towards this objective, the Paris Agreement provides for Parties to develop and submit two kinds of documents: Nationally Determined Contributions (NDCs), and long-term low greenhouse gas (GHG) emission development strategies or "long-term strategies" (LTS). The current round of NDCs, developed and submitted before the Paris Agreement was adopted are collectively insufficient and set the world on a pathway to deliver a global average temperature pathway to between 2.4 and 4.3°C by 2100 (Climate Action Tracker, 2019). Although it was already clear in Paris 2015 that the NDCs submitted were insufficient, the 2018 IPCC Special Report on Global Warming of 1.5°C underlines that point, clearly lays out that the danger posed by climate change, and calls for vastly more ambitious NDCs and an immediate pathway towards rapid decarbonisation. Limiting warming to 1.5°C reduces expected damage in terms of extreme temperatures, droughts, heavy precipitation, global sea level rise and impacts on biodiversity and ecosystems (IPCC, 2018a). Two subsequent IPCC reports – one on land, and one on the ocean and cryosphere – further highlight the urgency (IPCC, 2019a, 2019b). As a complement to NDCs, an LTS itself and the development thereof has the potential to serve as an important visioning exercise for a country to chart out the most ambitious decarbonisation pathway possible for all emitting sectors, and when it will reach net-zero around 2050 on the way to net-negative emissions.

Article 6 of the Paris Agreement provides a framework for the use of internationally transferred mitigation outcomes (ITMOs) towards NDCs under the new Paris regime. Exactly how this framework should work, however, was largely left out of the "Paris Rulebook" agreed in Katowice in 2018. As negotiations on the rules for Article 6 continue and a growing number of countries and non-state actors move to formulate LTS and targets for net-zero emissions, it is important to reconsider what role the ability to transfer mitigation outcomes should have and what shift is necessary from the approach of mechanisms for international trading under the Kyoto Protocol. These mechanisms, namely International Emissions Trading (IET), the Clean Development Mechanism (CDM) and Joint Implementation (JI) were conceived of as "flexibility" mechanisms to make the achievement of climate mitigation goals cheaper. The mandate of Article 6 on the other hand spells out that its purpose is to further ambition. Importantly, this means that its purpose is not to help achieve NDCs more cheaply, but rather provide an additional tool to go above and beyond the fastest technically feasible decarbonisation pathway within a country's borders. This paper aims to highlight the new role of Article 6 in the Paris Agreement regime and in relation to countries' mid- and long-term decarbonisation strategies. It furthermore aims to explore options and scenarios for Article 6 to contribute to the goals of the Paris Agreement rather than delay decarbonisation and undermine the necessary and rapid transition.

To structure the issue, we start with a discussion of the Paris Agreement's ambition mechanisms, the role of long-term planning, and what role Article 6 can play in the Paris context in keeping with its ambition mandate. Here we examine the dynamic nature of the Paris Agreement and what it means for LTS and NDCs. With this perspective in mind, we then analyse the potential role of Article 6 in the international transfer of reductions for both potential transferring and potential acquiring countries. Trading carbon dioxide removals may have the potential to address some, but not all, of the challenges

associated with transferring reductions from a baseline under Article 6. We discuss to what extent this is the case with regard to trading as well as broader limitations for dependency on removals.

2 Decarbonisation strategies and Article 6

Acknowledging that the first round of NDCs is not enough to reach the overall goals, climate negotiators in Paris at COP 21 included a number of 'ambition raising' measures in the Paris Agreement to increase efforts towards the overall temperature goals. These include an NDC ratchet mechanism and long-term strategies. The Paris Agreement text further explicitly identifies Article 6 as a tool to increase ambition.

Ratchet mechanism

The Paris Agreement's Articles 3 and 4.3 call for a "progression" of countries' NDC efforts over time, each contribution should reflect a country's "highest possible ambition", and each successive NDC should go "beyond" the previous NDC. Countries can update and improve on their NDCs at any time (Article 4.11) but are expected to communicate a new NDC at least every five years (Article 4.9) as informed by a regular global stocktake of collective progress towards the objectives of the Paris Agreement, starting in 2023 (Article 14).

The potential of long-term strategies

Further, Article 4 of the Paris Agreement calls on Parties "to formulate and communicate long-term low greenhouse gas emission development strategies", mindful of the temperature goals, and submit these to the UNFCCC. Although the Paris Agreement does not give guidance on exactly what an LTS is or one should look like, coming up with one presents a country with an important opportunity. The process of defining and implementing decarbonisation and sink enhancement pathways as part of an LTS has the potential to be as important as the LTS itself. If pursued earnestly, the process requires countries to develop a clear vision of what their Paris compatible pathway looks like and should build on robust analysis and engagement.

The LTS submission itself can be a concise, strategic document but should provide an overview and summarise other domestic processes and strategies. LTS should include pathways for all emitting sectors that a country has influence over, including international aviation and shipping, domestic sink enhancement, and imported deforestation driven by domestic consumption. These pathways should provide a clear trajectory to net-zero and beyond towards net-negative emissions in line with the long-term temperature goal of the Paris Agreement. Including quantified pathways for each sector individually provides a clear indication to actors in the country of where the sector is heading, shows what opportunities decarbonisation can bring, and allows stakeholders to develop a common vision. The process of charting out a Paris compatible pathway is an important element needed to trigger the radical rethink that is required across the entire economy. This helps avoid both locking-in carbon intensive technologies and stranded assets by sending a clear signal to the private and public sectors to plan investments (Roeser, 2018; van Tilburg *et al.*, 2019).

Current long-term strategies

Despite the important role LTS can play in policy making and decarbonisation efforts, they have so far generally not yet realised their full potential. As of September 2019, only 13 countries had submitted an LTS under the Paris Agreement.[1] Further, only three countries – Fiji, the Marshall Islands, and Portugal - explicitly state that they aim to reach net-zero emissions by 2050. In parallel however, various countries (see Table 1) and a large number of non-state actors have adopted medium to long-term net-zero targets.

[1] LTS submitted to the UNFCCC can be found here: https://unfccc.int/process/the-paris-agreement/long-term-strategies

These net-zero commitments vary in clarity, legal status, their target year, their coverage (all GHGs or only CO_2), and the extent to which the commitment reflects an actual domestic decarbonisation strategy, the expected role of removals, or if they expect to use international offsets. Norway explicitly mentions it intends to use international offsetting to reach its target (Nelsen, 2016), while the United Kingdom (UK Prime Minister's Office, 2019) and Sweden (Regeringen, 2018) retain the right to do so. This contrasts with Finland and Portugal, which do not expect to make use of offsets in their LTS (Government of Portugal, 2019b; Henley, 2019).

Table 1: Selected neutrality targets

Country / Jurisdiction	Year	Coverage	International offsets?	Source
California	2045 (net-negative thereafter)	GHGs	Unclear	Executive Order B-55-18 (California, 2019)
Chile	2050 (tbc)	CO_2	Unclear	(Gobierno de Chile, 2019)
Costa Rica	2050	GHG	Unclear	(Gobierno de Costa Rica, 2019)
Denmark	2050	GHGs	Unclear	(Frederiksen *et al.*, 2019)
EU28	2050 (tbc)	GHGs	Unclear	(European Commission, 2018)
Fiji	2050	GHGs	Unclear	(Fiji, 2018)
Finland	2035	GHGs	No	(Government of Finland, 2019)
France	2050	GHGs	No	(Ministère de la Transition écologique et solidaire, 2017, 2018)
Marshall Islands	2050	GHGs	No	(The Republic of the Marshall Islands, 2018)
New York	2050	GHG	No	(New York State, 2019)
New Zealand	2050 (tbc)	All GHGs except methane from agriculture and waste	Unclear	(Government of New Zealand, 2019)
Norway	2030	GHGs	Yes	(Government of Norway, 2017)
Portugal	2050	GHGs	No	(Government of Portugal, 2019a, 2019b)
Sweden	2045 (net-negative thereafter)	Unclear	Yes	(Regeringen, 2018)
United Kingdom	2050	GHGs	Yes	(UK Prime Minister's Office, 2019; United Kingdom, 2019)

The process to develop an LTS can inform NDC updates, complemented by shorter-term targets and measures for immediate implementation and provide predictability for ambition raising. Both short- and long-term planning need to be synchronised and in line with the temperature goals of the Paris Agreement. As such, an LTS should be dynamic – progressively informing more ambitious NDC updates but should also itself be regularly revisited to gauge what has been accomplished, what more could be done to push even more rapid transition based on progress so far, as well as technological progression. The European Commission has started this process (See Box 1: The European Union's deliberations on a long-term strategy), but planning has some way to go, will need more clarity, and further debate before the European Council can approve for the EU and for submission to the UNFCCC.

Box 1: The European Union's deliberations on a long-term strategy

The EU plays a pivotal role in the design of and expectations for Article 6 and international carbon markets. Although historically the largest source of demand for international emission reductions, the EU set the NDC target of reducing GHG emissions by at least 40% by 2030, compared to 1990 levels purely through domestic means (Latvia, 2015). The role of Land Use, Land Use Change and Forestry (LULUCF) was left open but was specifically to be clarified before 2020.

More recently, the European Commission published "A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy" (EC, 2018). The document omits the specificity of the NDC and avoids setting clear quantified goals for absolute gross emissions, carbon dioxide removal, or any reference to a role – or exclusion of a role - for international transfers. Although the document has climate neutrality in the title, it does not explicitly lay out that the 2009 reduction goal of 80-95% by 2050 needs ratcheting and rather ends by suggesting that a "wide informed debate should allow the EU to adopt and submit an ambitious strategy by early 2020". A target for 80% renewable energy is cited, together with circa 15% nuclear – with the assumption that this will get the backbone of the EU's power system to be "carbon free". No reference is made to the remaining circa 5%. "Essential carbon sinks" are highlighted along with a growing role for biomass, but it is left unspecified if the LULUCF sector is expected to be a net sink or a net source through biomass use. An unquantified amount of remaining CO_2 emissions are to be "tackled" with carbon capture and storage. Such flexibility and lack of specificity in an LTS lead to a lack of clarity, transparency, and understanding and means that the document does not live up to its full potential for international partners, national policy planners or private sector investors. In future iterations of an EU LTS, the EU's climate ambition could be improved upon with a clearer discussion of how sectors are to be fully decarbonised, what emissions from what sectors are expected to remain, what is expected to be done to minimise residual emissions, and a separate target to enhance sinks and promote removals.

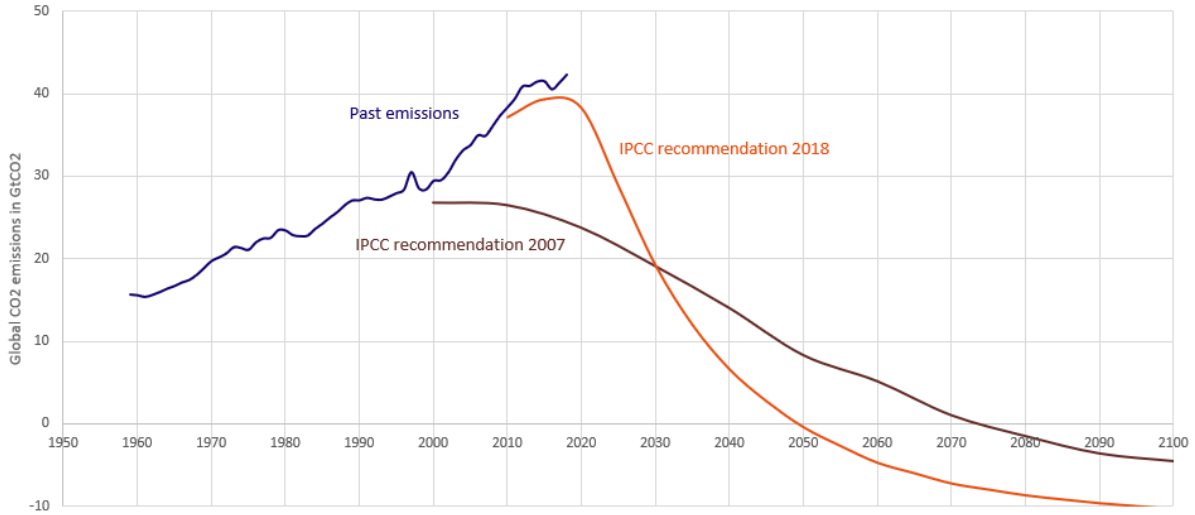
Article 6

The Paris Agreement text also explicitly identifies Article 6 as a tool to increase ambition. Article 6.1 of the Paris Agreement recognises that Parties can engage in voluntary cooperation to facilitate "... the implementation of their nationally determined contributions to allow for higher ambition in their mitigation and adaptation actions...". Paris COP decisions for the mechanism established in Article 6.4, recommend that the modalities and procedures for the mechanism build on experience gained with and lessons learned from existing mechanisms (1/CP.21 para 37(f)). Article 6 however operates in a very different context. The Kyoto mechanisms were focussed on flexibility in "assisting" developed countries in reaching their targets. The overall mandate of Article 6, in contrast, is for it to allow for higher mitigation and adaptation ambition, while also promoting sustainable development and environmental integrity (Article 6.1). Raising ambition means increasing a country's overall emissions reduction target, continuously scaling-up efforts towards decarbonisation of all sectors, as well as maximising removals.

The flexibility element of international market-based approaches in the Kyoto regime was directly linked to the static nature of the Kyoto Protocol targets. Targets were set for a specified commitment period and translated into "Assigned Amount Units" (AAUs) for countries with targets. This framework assumed that emission reductions are fungible in that it does not matter where emissions are reduced, leading to a conclusion that flexibility can lead to cost savings on the global scale.

While the effect of a tonne of GHG emissions on the atmosphere may be the same wherever it is emitted, when it comes to the urgency of global efforts to decarbonise, the particular emitting source and its individual local technical, social, and political context is highly relevant (McLaren *et al.*, 2019). ***Reduced effort from one emissions source cannot be compensated through 'easier' reductions or indeed removals elsewhere.***

In setting the overall temperature goal, the Paris Agreement demands that Parties' efforts, expressed in the first round of NDCs, become dynamic: plans and strategies must constantly be updated and improved. Previous insufficient mitigation action has led to continued growth in global emission levels. This has drastically reduced the remaining carbon budget to stay within the Paris Agreement's temperature limits and requires us to reduce emissions even more drastically and rapidly than previously thought (see Figure 1 from (Höhne *et al.*, 2019)). At the same time, science presents us with new evidence that potential tipping points and changes in the climate system make overshooting temperature targets more likely at lower than expected CO_2 concentrations – and that we can expect more severe consequences at lower temperatures (IPCC, 2018a). Against this background, it becomes evident that the Paris Agreement goals must be highly dynamic with the consequence that many previous assumptions about efficiency no longer exist and require reinterpretation.



Source: (Höhne *et al.*, 2019)

Figure 1: Pathways of global CO_2 emissions recommended by IPCC in the 2007 Fourth Assessment Report for scenarios compatible with 2.0°C (the at that time agreed global limit) and by the 2018 IPCC Special Report on 1.5°C for low and no overshoot scenarios aiming at 1.5°C (the currently agreed global limit) (only average ranges shown).

Article 6 of the Paris Agreement provides a voluntary framework for Parties to cooperate in the implementation of their NDCs but does not explicitly mention how Article 6 relates to the long-term. NDCs represent Parties' near-term contribution towards the Paris Agreement's generally with a target year of 2025 or 2030. As mentioned, the first round of NDCs were formulated before the Paris Agreement was adopted, are collectively insufficient, and set the world on a pathway to grossly overshoot the Paris Agreement goals. In particular, a number of countries have NDC targets that will be achieved – or overachieved with no additional effort (den Elzen et al., 2016; Meinhausen and Alexander, 2016; Climate Action Tracker, 2019a). If these countries do not ratchet their targets, and rather measure reductions from inflated BaU baselines, using international transfers from such countries, instead of reducing emissions domestically would lead to an overall increase in global emissions – in other words emissions levels would be higher with trading than without (Kollmuss, Schneider and Zhezherin, 2015; Schneider and La Hoz Theuer, 2018).

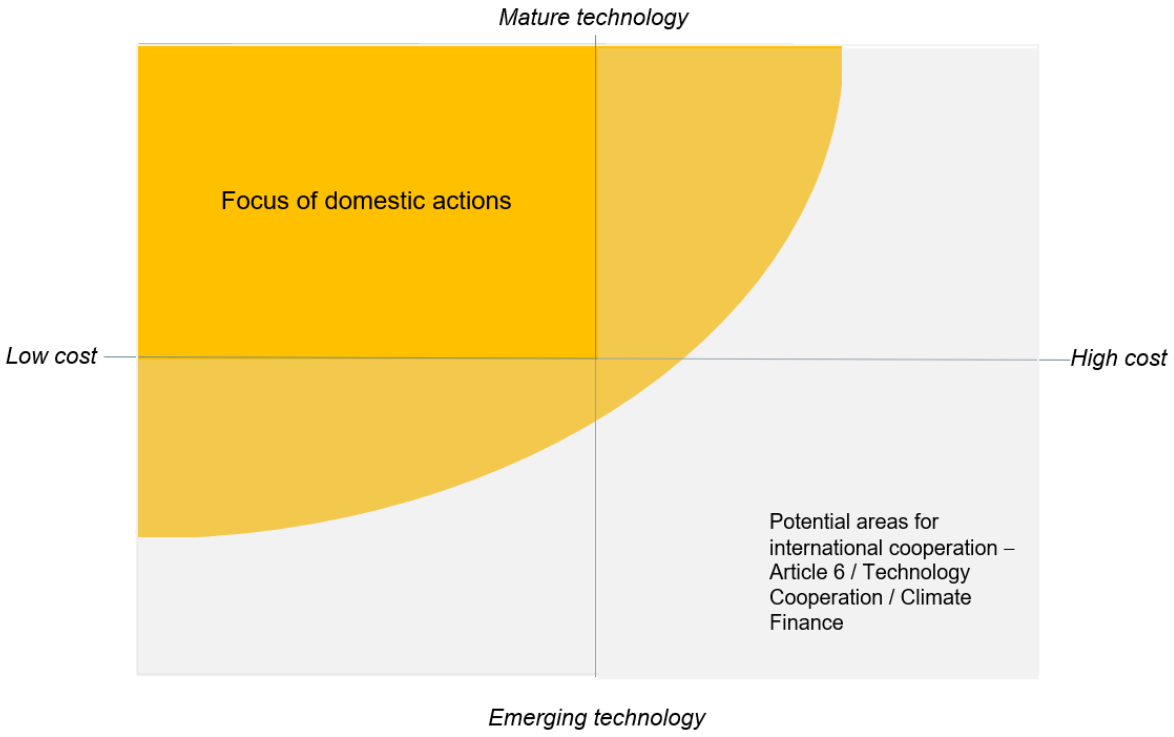
Instead, Article 6 can only serve the Paris Agreement and fulfil its ambition raising mandate if considerations for its design and use are synchronised with ambitious NDCs, which themselves must be in line with Paris-compatible LTSs. As more and more countries and non-state actors go through planning processes for the mid- and long-term, it is important to understand the limited, niche role that trading can play when everyone has committed to - and must - do everything possible to decarbonise

as fast as possible. ***The real potential of using Article 6 is the quality of the mitigation action and rapid and far reaching transformational change it can trigger, not the quantity of reductions bought and sold.***

In the following sections we examine the issue from both a potential transferring and potential acquiring country perspective and discuss what this means for the implementation and remaining potential role of Article 6. Expectations, planning, and use of Article 6 will have important ramifications for global rapid transition efforts and progress towards the overall temperature goal.

3 The potential transferring country perspective

In addition to developed countries, a growing number of ambitious developing and upper middle-income countries have already set out strategies looking towards the middle of the century. In doing so, such documents and planning strategies are useful to determine support needs in terms of international support through finance, capacity building, and technology transfer. Such an exercise can also highlight areas that are inaccessible for the country and outline areas where there is a danger of overselling emission reductions that the country needs for itself to reach its own ambitious targets. Inaccessibility in this context can be defined as technologies where capacity limitations due to prevailing barriers of technology, know-how and finance limit independent uptake in specific country contexts or which are nascent/novel worldwide (Warnecke *et al.*, 2018). The identification of currently inaccessible technologies therefore requires a reflection of the country's current technological capacities and innovation potential and is ideally formed on the basis of processes to develop or update countries' long-term strategies. The amount of time that the inaccessibility assessment is valid is a critical element. Since it is Article 6's aim to make inaccessible areas accessible for independent uptake in the country, assessments should be revisited on a regular basis to confirm or cease Article 6 support for technologies in order to avoid overselling reductions from mature technologies in the future.



Source: (Warnecke et al., 2018)

Figure 2: Two-dimensional technology mapping related to Article 6

Warnecke et al. (2018) depict a simple two-dimensional approach where technologies are mapped according to their costs and maturity (Figure 2). Low-cost measures with good returns or other positive impacts (cost-savings and co-benefits) are good candidates for a country to increase its own ambition while high-cost, emerging technologies are likely those that are assessed by countries to be inaccessible under current conditions. Other areas ('grey zones') are less obvious and require governments to be able to judge what should be eligible for investment through Article 6. Regular in-country processes for defining and re-defining decarbonisation strategies are therefore essential to inform such decisions. In Box 2 we examine Tunisia, as a potential transferring country example and discuss why such processes have a pivotal role for informed decision making.

Box 2: Potential transferring country Tunisia

Like many countries, Tunisia has submitted an NDC, but not yet an LTS. Tunisia's NDC sets an unconditional target of lowering carbon intensity by 41% by 2030, compared to 2010 levels (Tunisia, 2015). Further, in the energy sector, Tunisia aims to decrease carbon intensity by 46% by 2030 compared to 2010 levels. Quantifying and accounting for international transfers with countries that set carbon intensity targets, such as Tunisia, is problematic because the absolute amount of emissions is not fixed. In its NDC, Tunisia states it would like to use carbon market mechanisms to reach its mitigation objective, in particular for: (1) the Tunisian Solar Plan; (2) mitigation in the cement industry, and (3) energy efficiency and renewable energies in the building sector.

Developing an LTS should include sectoral decarbonisation pathways for all sectors. Notably, going through such an exercise for the electricity, cement, and building sectors could help identify key technologies that are otherwise inaccessible to Tunisia. Such an exercise could include technology roadmaps, which could also highlight technology needs and investment opportunities to mobilise finance as well as options for resource efficiency and substitution to reduce the total amount of a product that is produced. While some sectors are harder to decarbonise than others, some general technology trends and developments both globally and in North Africa already provide an indication of accessibility of some of these programmes and opportunities to ramp up ambition.

Renewable energy projects are likely to be accessible for Tunisia without the use of Article 6. IRENA (2019) found that solar PV is likely to consistently offer a less expensive source of new electricity than the cheapest fossil-fuel alternative from 2020 onwards. Recent analysis shows that even solar PV with battery storage is cheaper than the most efficient combined-cycle gas turbines (CCGTs) in several countries in the Middle East and North Africa (Deign, 2019; Wood Mackenzie, 2019). In low financing cost environments, onshore wind is equally competitive with CCGT (UNDP, 2018). The construction of electricity interconnections between Tunisia and Italy mean that Tunisia will have access to large back-up power capacity which could facilitate the integration of intermittent solar and wind energy into the Tunisian grid without battery backup (Bellini, 2019). Such grid interconnections could also allow European utilities to support commercial renewable development in Tunisia through Power Purchase Agreements (PPAs). Other alternative tools to "derisk" investment can mobilise private investment flows (UNDP, 2018). The sale of emission reductions from the power sector in Tunisia would likely represent a threat to environmental integrity and lead to an increase in global emissions.

Mitigation in the cement industry however is likely to be more challenging for Tunisia on its own and could be an area where further consideration is useful whether there are inaccessible technologies that would make sense for Tunisia to address through an Article 6 approach. Considerations for international cooperation including Article 6 for the Tunisian cement sector should be based on an overall long-term vision of what is necessary to decarbonise cement production, and what can be done to substitute other materials and reduce demand for cement in construction. Some approaches are likely to be accessible for Tunisia by itself, while for others international cooperation, possibly through Article 6 may be needed.

No planning process however can definitively foresee the development and maturation rates of technologies or new approaches that might be useful for decarbonisation. This is one reason why it is important to regularly revisit LTS and update NDCs. At the same time, it is within this niche that in the best case, cooperation through Article 6 could be used to harness the innovative potential of the private sector, civil society, and academia to identify and develop inaccessible mitigation options otherwise beyond the reach of the country. Here, it is important that a potential transferring country be able to respond, evaluate and react to propositions to ensure that only otherwise inaccessible mitigation options come into question for Article 6. These should be targeted to help the country bring about transformative change and allow for an even steeper and more rapid decarbonisation pathway than was charted out in the LTS planning process.

At the same time, there is a danger that Article 6 could undermine ambition in potential transferring countries. In the short-term, especially in the absence of a longer-term vision, an NDC sets an implicit budget for the number of emission reductions from a baseline a country can sell. This number stands in an inverse relation to a country's ambition: ***the more ambitious a country is, the smaller the number of reductions the country can sell***. Equally, the ability to sell mitigation outcomes sets incentive structures to *not* set ambitious targets – the less ambitious a target is, the more emission reductions a country can sell. This incentive structure can also be broken down to incentives to both: (1) Implement policies that give comparative advantage to more emission intensive technologies or fuels (also known as E+ policies); and (2) Not to introduce policies that give comparative advantage to less emission intensive technologies or fuels (E- policies) – in order to create an inflated baseline to sell more units through Article 6.

From the transferring country perspective therefore, if the country submits an ambitious NDC, in keeping with what Article 4.3 requires, it should be reluctant to sell emission reductions except for those that may otherwise be inaccessible and that contribute to a paradigm shift in a certain sector's emission pathway (Warnecke *et al.*, 2018).

If a country sells its cheapest mitigations to others, this leaves only comparatively expensive abatement options for itself which makes domestic efforts harder and more expensive undermining ambition in the present and in the future. The danger of such a scenario underlines the necessity of aligning use of Article 6 with a clear Paris compatible LTS to help avoid shifting around reductions on paper with no change in emission trends, or what negotiators have called "moving the deckchairs around on the Titanic while ignoring the iceberg".

4 The potential acquiring country perspective

The Paris Agreement calls for countries to peak and rapidly reduce their emissions to net-zero based on best available science (Article 4.1). Although all countries must do so, developed countries have emitted more and for longer than developing countries. Having emitted so much in industrialising, they are under an increased obligation based on both capacity and historical responsibility to undertake the steepest possible domestic reduction pathway to net-zero and beyond to net-negative that is technologically feasible. Current NDCs are not sufficient whether it be from a perspective of a managed decarbonisation pathway to avoid shocks, nor with regard to capacity, nor historical responsibility. It is important that the formulation of developed country LTS chart out this pathway towards net-zero to inform the next NDC ratchet – the sooner the better.

Even the steepest possible domestic reduction pathway to net-zero may not represent a "fair share" contribution of developed countries, considering capacity and historical responsibility (Höhne *et al.*, 2019). In such cases, Article 6 could represent an opportunity to increase ambition above and beyond the most ambitious domestic decarbonisation pathway technically feasible, though this could also be done through climate finance without the associated transfer of carbon reductions.

Cooperation between Parties in general will play an important role in working towards rapid transitions and the historical responsibility and capacity of developed countries implies that they must play a significant role in supporting developing countries through finance, capacity building, and technology transfer. The zero-sum nature of using emission reductions from abroad however, cannot be counted as support if the country receiving the support cannot count the resulting emission reductions towards their own targets.

Further, ignoring the ambition imperative and the important role that LTS should play by reaching net-zero not through domestic reductions, but rather through Article 6, introduces uncertainty and ambiguity regarding actual emissions levels and the pathway an economy will take. This means that reaching net-zero could mean anything from full decarbonisation of an economy - or it could represent a continuation of business as usual and large emissions growth with respect to a country's actual domestic emissions.

In addition to undermining transparency, this poses a number of risks including carbon lock-in and stranded assets resulting from a reduced focus on the urgent need to reduce domestic emissions; important opportunity costs of not decarbonising; a future lack of reductions available to buy; and reputational risks. We explore each below:

Delayed decarbonisation, carbon lock-in and stranded assets: The ability to flexibly avoid emission reductions at home through the acquisition of emission reductions from abroad may delay rapid and far-reaching transitions, leading to continued fossil fuel lock-in and stranded assets. In other words, short-term flexibility though Article 6 in the name of cost reductions will likely lead to sub-optimal resource allocation in the longer-term (Acworth *et al.*, 2017; McLaren *et al.*, 2019). Smith et al (2019) find that although the collective existing global fossil fuel capital stock in 2018 did not yet commit the world to 1.5°C, immediate emission reductions are required across all sectors to still be able to reach the 1.5°C goal. This implies that all current fossil fuel infrastructure must be phased out at the end of its design lifetime everywhere - delayed effort in some sectors cannot be compensated with effort elsewhere but would rather considerably reduce the likelihood that 1.5˚C is attainable.

Opportunity costs of not decarbonising: The danger of carbon lock-in also has important implications for unrealised co-benefits of ambitious climate action including reduced air water and soil pollution levels and foregoing economic opportunities of cleantech innovation. As the average mean temperature increases, and extreme weather events become more prevalent the pressure to address climate change will increase – creating demand for advanced cleantech innovation. The use of reductions acquired from abroad to avoid investments in domestic decarbonisation undermines domestic signals for research, development, and deployment in key zero-carbon technologies in the domestic market. This is likely to undermine economic competitiveness and reduce employment.

Lack of available reductions: Planning with an expected number of reductions to acquire at a certain time point, implies the assumption that such reductions will be available. The global rapid and far-reaching transitions in energy, land, urban and rural infrastructure, and industrial systems that are necessary to reach the global temperature goals (IPCC SR 1.5) would, however, imply that there are steadily fewer mitigation opportunities to buy and indeed none when the world has decarbonised. For example, a country that sets a neutrality target that it expects to achieve through 85% domestic reductions and 15% international units may find that such units are not available in 2050 because the rest of the world has largely already decarbonised and therefore be forced to miss its target.

Reputational risks: A country that intends to reach or reaches a net-zero target while continuing to invest in fossil fuels or fossil fuel emitting infrastructure domestically suggests a fundamental contradiction. If a country makes little progress in reducing domestic emissions but reaches a net-zero target primarily or significantly through reductions acquired from abroad, this would fundamentally undermine both the ambition mandate that Article 6 was meant to support and the world's ability to reach the Paris Agreement goals. The IPCC report underlines the necessity for global decarbonisation, the primary or significant use of reductions from abroad could lead civil society and international partners to

focus exclusively on gross inventory emissions – ignoring any effort, engagement, or contribution made through engagement in Article 6.

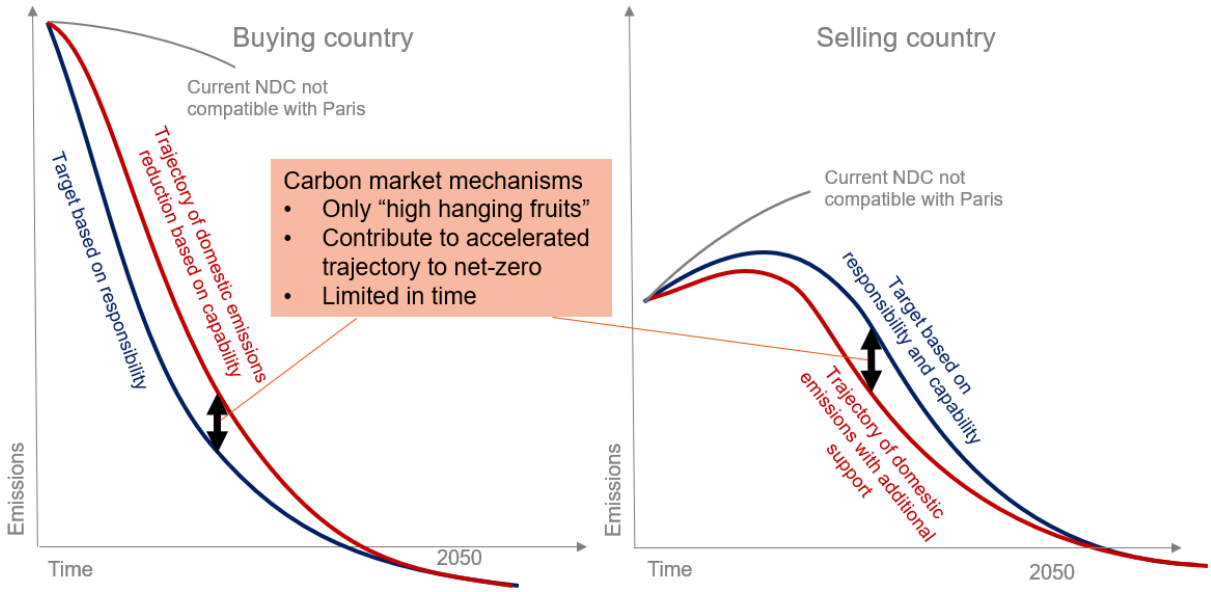


Figure 3: Article 6 transfers "on top" of fastest possible decarbonisation pathway

A positive and constructive role of a transfer of ITMOs can only be seen as supplemental effort – *not in the sense that most* emission reductions should occur domestically, but rather that they *must come on top* of the most ambitious and rapid decarbonisation pathway technically feasible (See Figure 3). They can then, together with domestic reductions, be move towards to a pathway that would fairly represent the country's capability and responsibility.

Box 3: Potential acquiring jurisdiction, New York State

One innovative piece of legislation and important precedence can be found in New York State, and its "New York State Climate Leadership and Community Protection Act". The law, enacted in June 2019, sets legally binding targets to reduce GHG emissions by 40% from 1990 levels by 2030; to reduce GHG emissions from electricity by 100%; and to reach net-zero emissions by 2050. The overall 2050 net-zero target allows for a maximum of 15% of 1990 level emissions to be offset "through an alternative compliance mechanism" but only if the source can "sufficiently demonstrate" that it is not "technologically feasible" to reduce on its own and has already implemented "best available technology" to reduce emissions. Either emission reductions or carbon sequestration can be used to offset emissions through the alternative compliance mechanism, but any such offsets must come from within the same county and within a 25-mile radius of the emitting source (New York State is divided into 62 counties or administrative subdivisions). The electricity sector has the target of decarbonising by 2040 and is specifically prohibited from using "the alternative compliance mechanism" (New York State, 2019). Given existing technology options for electrification in various sectors (buildings, road and rail transport), access to "alternative compliance" through offsetting is minimised and the alternative compliance mechanism poses a greatly reduced risk to critical efforts to decarbonise.

In addition to going beyond the necessary rapid decarbonisation pathway with increased efforts through Article 6 with ITMOs counted towards the acquiring country's efforts, the framework provided by Article 6.2 and 6.4 could also be used to MRV support in the form of finance, capacity building, and

technology transfer without the reductions being transferred as suggested under the SBSTA 50 Work Programme for Article 6.8 (UNFCCC, 2019). Alternatively, units could be transferred with a corresponding adjustment applied and then cancelled to achieve an overall mitigation in global GHG emissions.

Regardless, trading reductions through Article 6 can only have a limited, temporary role in the interim on the way to net-zero and net-negative emissions in order to help bring about transformative change in the transferring country. Box 3 examines New York State as an example for a potentially acquiring jurisdiction and how it foresees a limited role for offsetting to avoid risks critical for decarbonisation.

5 Article 6 and removals

As mentioned, there are a number of risks associated with the use of international transfer of emission reductions – from the incentives they set for counterparties to their limited availability in the longer-term as the world reaches its decarbonisation goals. Article 6 mechanisms are however not necessarily limited to emission *reductions* (compared to a baseline) but could in theory be used to transfer ITMOs based on carbon dioxide *removals* from the atmosphere.

Different technologies to remove CO_2 from the atmosphere vary greatly in their costs, maturity, mitigation potentials, timeframes, environmental impacts, and levels of public acceptability. Although Integrated Assessment Models mostly focus on Bioenergy with Carbon Capture and Storage (BECCS), Fuss et al (2018) highlight that no single removal technology is likely to sustainably reach the level of carbon uptake required for 1.5°C-compatible pathways. This means that they will also play different roles in reaching the objectives of the Paris Agreement, and will each need to be considered individually with regard to any possible inclusion in Article 6 mechanisms.

To the extent that actual CO_2 emissions are removed from the atmosphere and can accurately be measured, reported, verified; are additional (would not have happened anyway); are permanent; and do not lead to increased emissions elsewhere - Article 6 could provide a longer-term accounting system for non-land based removals carried out in other countries.

5.1 Land based removals

Article 5 of the Paris Agreement calls for Parties to take action to conserve and enhance, as appropriate, sinks and reservoirs of GHG. That the Paris Agreement also calls for a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases (Article 4) suggests that net-zero is sufficient. The IPCC however finds that pathways limiting global warming to 1.5°C with limited or no overshoot require the use of negative emissions on a scale from 100 to 1000 $GtCO_2$ over the course of the century (IPCC, 2018a). Average net anthropogenic land-based emissions from AFOLU from 2007-2016 are however estimated to be 5.8 ± 2.6 $GtCO_2$ (IPCC, 2019a). To reach the overall temperature objective, it is important to end deforestation and land degradation and thereby to change the land sector from a net-source to a net-sink. LTS planning – not only in forested countries but also in countries driving global demand for the commodities that cause deforestation – should also take this into consideration.

There are however a number of challenges in using removals from the land sector in markets, or indeed in using land sector emissions to net-out other emissions in general. The IPCC says with very high confidence that because land is both a source and a sink of CO_2 due to both anthropogenic and natural drivers, it is very hard to determine what are anthropogenic versus natural drivers for these fluxes (IPCC, 2019a). This contributes to challenges in the MRV, baseline setting, and additionality of anthropogenic activities in general (Fyson and Jeffery, 2019), for the purpose of NDCs, and especially for markets (Schneider *et al.*, 2018). Land-based removals are further vulnerable to reversal. The IPCC Special Report on Climate Change and Land (2019) finds that climate change creates additional stresses on

land, exacerbating existing risks to livelihoods, biodiversity, human and ecosystem health. Bastin *et al.* (2019) warn that the climate is already reducing the land area that can support forests and that even if global warming is limited to 1.5°C, the area available for forest restoration could be reduced by a fifth by 2050. Most afforestation and reforestation projects to date concentrate on fast growing monoculture plantations including exotics that may store more carbon in the short-term, but are less resilient to changing conditions and disturbances aggravated by climate change (Hulvey *et al.*, 2013; Seddon *et al.*, 2019). Displacement or leakage of emitting activity away from land that is set aside for afforestation, reforestation or conservation is inevitable and impractical to detect or fully quantify (Lambin and Meyfroidt, 2011).

For these reasons, global efforts to reduce land-related emissions and enhance sinks should be kept separate from other anthropogenic emissions (Fyson and Jeffery, 2019). Measure-based targets may further increase the clarity, transparency, and stringency of LULUCF mitigation (Fyson and Jeffery, 2019).

5.2 Removal constraints and trade offs

It is also important to note that even non-land-based technologies for carbon dioxide removals have constraints and problems related to trade-offs. Various negative emission technologies require large amounts of land conversion with likely negative consequences for development and well-being, including water scarcity and land degradation and associated consequences for food security and biodiversity (IPCC, 2018b, 2019a). Some removal technologies, such as Direct Air Capture and Storage require large amounts of energy (Realmonte *et al.*, 2019), which would need to come from zero carbon sources. Other technologies such as ocean alkalinisation (or fertilisation), have, in addition to high costs and technical concerns, a problem of public acceptability and global governance, which would need to be resolved before further R&D can be conducted (Bellamy, 2018). While urgently needed, the feasibility and sustainability challenges of technologies for carbon dioxide removals mean that reliance on future negative emissions should not supplant efforts towards the rapid and far-reaching transitions necessary to reach the overall temperature goals (McLaren *et al.*, 2019).

These constraints and trade-offs highlight the urgency to decarbonise as fast as technically possible. Every tonne of GHG that is not added to the current stock of GHG in atmosphere now is a tonne that does not need to be removed to keep within the Paris Agreement's temperature limit in the future. The more decarbonisation is delayed, and the slower that countries reduce their emissions, the greater the need for net-negative emissions in the mid- and longer-term future. Though the general conception of Article 6 is currently primarily focussed on accounting for transfers of reductions and for some actors to move towards net-zero, Article 6 may shift increasingly to account for efforts for net-negative emissions in the future.

6 Conclusions

The Paris Agreement sets out a new dynamic regime to combat climate change that notably includes a number of ambition raising measures, namely, a ratchet mechanism for increased NDC ambition, and LTS for countries to plan for medium- to long-term decarbonisation, and a new ambition mandate for international transfers of mitigation outcomes. The IPCC provides the scientific basis for policy makers to act to bring about global rapid and far-reaching transitions in energy, land, urban and rural infrastructure, and industrial systems. Contrary to the conventional "flexibility" focused approach towards carbon markets, this new context means that if Article 6 is to fulfil its ambition mandate, it can only play a niche, complementary role to accelerate technology access and uptake in potentially transferring countries, and to go above and beyond the fastest technically feasible decarbonisation pathway for potential acquiring countries.

For potential transferring countries, the development of an LTS can provide an important visioning and policy planning tool to chart sectoral decarbonisation pathways to net-zero on the way to net-negative emissions and identify inaccessible technologies for which a country could seek international support. As a dynamic, iterative process, an LTS should inform future NDC updates, and themselves be updated on a regular basis. An ambitious updated NDC means that it is no longer in the national interest to transfer emission reductions that the country needs to fulfil their own targets and that the country could unlock itself. If a country sells its cheapest mitigations to others, this leaves only the more expensive abatement options for itself. Increasing the cost of such mitigation carries important risks for domestic climate ambition. Without safeguards, Article 6 runs the risk of setting incentives against ambition, delaying decarbonisation, and undermining the objectives of the Paris Agreement.

Appropriate safeguards could however help Article 6 to promote the rapid transformational change needed to further ratchet ambition in the future – in doing so, it's potential must be measured in the quality of the mitigation action that is unlocked rather than in the quantity of units bought and sold. When targeting otherwise inaccessible mitigation actions, using Article 6 has important potential to trigger rapid and far reaching transformational change. A positive and constructive role of a transfer of ITMOs can be seen as supplemental effort that enables a country to go beyond the most ambitious and rapid decarbonisation pathway technically feasible if it were acting alone.

For potential acquiring countries, it is important that Article 6 is not abused to obscure a lack of decarbonisation efforts, especially when a country purports to aspire to a target of "net-zero". Setting a net-zero target that allows for the use of Article 6 – or not - means fundamentally different things in terms of domestic emission patterns, effort towards decarbonisation, and consistency with emissions pathways in line with the Paris temperature goals. Historical responsibility and capacity mean that developed countries have the responsibility to both decarbonise faster and support developing countries with finance, capacity building, and technology transfer. If, in addition, Article 6 is used to provide additional support on top, developed countries should target the more challenging emission reductions that other transferring (developing) countries need help with, at correspondingly higher prices per tonne. Alternative uses of Article 6 include its use to support MRV if reductions stay with the host country as currently foreseen as an option under Article 6.8 or be cancelled to achieve an overall mitigation of greenhouse gas emissions. If units acquired through Article 6 are counted towards the acquiring developed country targets, they should come on top of and in addition to the fastest possible domestic decarbonisation pathway technically feasible.

Targeting net-zero emissions through emission reductions outside of national borders implies a number of risks including delayed decarbonisation, continued carbon lock-in of fossil fuel infrastructure and stranded assets; the potential lack of availability of emission reductions as the world decarbonises; reputational risks for the country and Article 6 itself; and a general undermining of environmental integrity if acquiring units from countries that do not have ambitious targets.

Depending on the sector and technology, as the world moves towards net-zero on the way to net negative emissions, Article 6 may however have a new and different niche role in a decarbonising world when it comes to accounting for efforts towards global carbon dioxide removals from the atmosphere. Land-based approaches pose challenges in terms of MRV, additionality, permanence, and leakage that likely make them inappropriate for markets – these could be supported by measures-based targets to end deforestation, land degradation, and enhance natural sinks. However, other removal technologies may not face the same challenges, but also face questions surrounding large scale feasibility and sustainability. While removals are essential, and efforts to enhance sinks of all kinds are necessary, they should be supported with separate targets, rather than allowing for reduced effort for rapid and far-reaching transitions in energy, land, urban and rural infrastructure, and industrial systems. Article 6 could potentially play an important role on the way to and in a 'net-zero' or 'net-negative' world, however this requires a shift from offsetting continued emissions to rapidly avoiding and reducing all emissions possible and going still further to draw carbon out of the atmosphere.

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