



Options for fostering a net-zero GHG emission world under the Paris Article 6.4 Mechanism

Discussion Paper

Umwelt 
Bundesamt

DEHSt
Deutsche
Emissionshandelsstelle

Editorial information

Publisher

German Emissions Trading Authority (DEHSt)
at the German Environment Agency
Bismarckplatz 1
D-14193 Berlin
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Internet: www.dehst.de/EN

Status: September 2019

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On behalf of the German Environment Agency
Completion date 2019

Environmental Research of the Federal Ministry for the Environment, Nature Conservation,
Building and Nuclear Safety
Project number: 3717 42 504 0

Cover image: Tkemot/Shutterstock.com

Abstract

The new mechanism defined under Article 6.4 of the Paris Agreement is supposed to allow for international cooperation with regard to climate change mitigation and thereby enable an increase in overall mitigation. Nevertheless, the design of the mechanism under Article 6.4 should also make sure that it is not be in conflict with the long-term goal of net-zero GHG emissions but even better foster national pathways leading to this objective. Building this into the mechanism requires to shift the focus from short- and mid-term considerations to the long-term perspective in one way or another.

This discussion paper explores three different approaches that may help to foster the long-term objective of net-zero GHG emissions in the operationalization of Article 6.4, namely positive and negative lists, additionality with regard to a baseline consistent with both, NDCs and long-term targets, as well as adaptation of existing instruments and criteria from climate finance. The detailed discussion of the approaches shows that the approaches should not be seen as mutually exclusive but rather as complementary to each other. From the analyses, two storylines emerge how to combine aspects of the different approaches in a reasonable way to foster the long-term objective of net-zero GHG emissions under Article 6.4.

Kurzbeschreibung

Der in Artikel 6.4 des Paris-Abkommens (PA) definierte neue Mechanismus soll eine internationale Zusammenarbeit bei der Eindämmung des Klimawandels ermöglichen und damit einen Beitrag zur Gesamtminderung erbringen. Nichtsdestotrotz sollte die Ausgestaltung des Mechanismus nach Artikel 6.4 ebenfalls sicherstellen, dass die Aktivitäten nicht im Widerspruch zum langfristigen Ziel von netto-null THG-Emissionen stehen, sondern nationale Strategien, die zu diesem Ziel führen, noch untermauern. Um diese Aspekte in den Mechanismus zu integrieren, muss der Fokus auf die ein oder andere Weise von kurz- und mittelfristigen Maßnahmen auf die langfristige Entwicklung verlegt werden.

In diesem Diskussionspapier werden drei Ansätze untersucht, die dazu beitragen können, das langfristige Ziel von netto-null THG-Emissionen bei der Operationalisierung von Artikel 6.4 zu erreichen, nämlich Positiv- und Negativlisten, die Zusätzlichkeit in Bezug auf eine Baseline, die sowohl mit den NDCs auch mit den langfristigen Zielen vereinbar ist, sowie die Übernahme bestehender Instrumente und Kriterien aus der Klimafinanzierung. Die ausführliche Diskussion der verschiedenen Ansätze zeigt, dass die Ansätze nicht als sich gegenseitig ausschließend, sondern als komplementär anzusehen sind. Aus den Analysen geht hervor, wie in zwei Handlungssträngen Aspekte der verschiedenen Ansätze auf sinnvolle Weise kombiniert werden können, um das langfristige Ziel von netto-null THG-Emissionen über Artikel 6.4 zu unterstützen.

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Abbreviations

AFOLU	Agriculture, forestry and land use
CCS	Carbon capture and storage
CCU	Carbon capture and utilisation
CDM	Clean Development Mechanism,
CER	Certified emission reductions
CMA	Conference of the Parties serving as the Meeting of the Parties to the Paris Agreement
EU	European Union
GHG	Greenhouse gas
IF	Innovation fund
ITMO	Internationally transferred mitigation outcome
LT-DC	Long-term determined contribution
LT-LEDS	Long-term low-emissions development strategy as under Article 4 of the Paris Agreement
NDC	Nationally determined contribution
NET	Negative emissions technology
PA	Paris Agreement
PoA	Programme of activities
TCAF	Transformative Carbon Asset Facility
TEG	Technical Expert Group

Summary

The objectives of the Paris Agreement (PA) in its Article 4 require a global balance of greenhouse gas (GHG) emissions and sinks in the second half of the 21st century in order to limit temperature increase well-below 2°C above pre-industrial levels. The parties of the PA are required to define and implement ambitious short- and long-term climate change mitigation measures that contribute to achieve this objective. The new mechanism defined under Article 6.4 of the PA is supposed to allow for international cooperation with regard to climate change mitigation and thereby enable an increase in overall mitigation. This means that all mitigation activities eligible under Article 6.4 need to demonstrate additionality with regard to the Nationally Determined Contributions (NDCs) of the countries involved, which is challenging given the requirement to continuously increase the ambition of NDCs. Nevertheless, the design of the mechanism under Article 6.4 should also make sure that it is in line with other objectives of the PA. In particular, the activities under Article 6.4 should at least not be in conflict with the long-term goal of net-zero GHG emissions but even better foster national pathways leading to this objective. Building this into the mechanism requires to shift the focus from short- and mid-term considerations to the long-term perspective in one way or another. Setting the focus on long-term emission reduction strategies is necessary, in particular, for avoiding technological lock-ins that would hinder a full decarbonisation in the long run.

This discussion paper explores three different approaches that may help to foster the long-term objective of net-zero GHG emissions in the operationalization of Article 6.4, namely:

- ▶ **Positive and negative lists:** Positive and negative lists may be a simple tool to, on the one hand, enable easier eligibility of certain activity types known to be compatible, and, on the one hand, classify certain activity types that are very likely to be incompatible with the long-term objective as ineligible. Nevertheless, there remain certain activity types, for which a more detailed consideration is necessary. Therefore, a three-tiered approach reflecting these three groups of activity types has been identified to be most compelling here. This approach mirrors similar approaches applied to the alignment of investments with the objectives of the PA, classifying them as Paris-aligned, misaligned or conditional.
- ▶ **Additionality with regard to a baseline consistent with both, NDCs and long-term targets:** The use of baselines to demonstrate additionality with regard to NDCs will only foster net-zero emissions in case of an ambitious NDC and even then may partially entail lock-in of GHG emissions the long-term perspective. To tackle the net-zero objective, the baselines need to incorporate long-term targets as well. This long-term perspective can be based on a detailed national pathway to net-zero emissions or on science-based targets independent of the detailed situation in the country. As both approaches have advantages and disadvantages, it seems most promising to combine them in a way such that science-based targets guarantee the required level of ambition, while compatibility with the country's long-term low emissions development strategy is also ensured.
- ▶ **Adaptation of existing instruments and criteria from climate finance:** The net-zero objective is also relevant for some existing funding instruments linked to climate finance. The Innovation Fund (IF) of the European Union (EU) focuses on support for technologies that are needed for net-zero emissions but are often not part of mitigation pathways due to being highly innovative. Moreover, the EU classification system for environmentally sustainable economic activities ("EU Taxonomy") defines threshold criteria with regard to sustainability for a broad set of technology fields. Some further instruments apply the concept of transformational change to address the long-term perspective of the funded programs. While the concept of transformational change has some links to the use of baselines and positive lists, it adds some softer criteria about the long-term impact, in particular about the avoidance of discontinuation due to finance and/or acceptance issues.

The detailed discussion of the approaches shows that they should not be seen as mutually exclusive but rather as complementary to each other. In addition, although the approaches are at least partially addressing additionality as well, they cannot be a full replacement for checking additionality. Working with baselines instead of positive/ negative lists has the benefit that there is no need to explicitly “pick technologies”. On the other hand, developing baselines in line with long-term zero emissions may be cumbersome, if no science-based target approach is used. From the analyses in this report, two story-lines emerge how to combine aspects of the different approaches in a reasonable way to foster the long-term objective of net-zero GHG emissions under Article 6.4:

- ▶ If politically feasible, the most straight-forward approach would be to use the three-tiered approach corresponding to negative and positive lists in the first step. This means to sort out certain activity types in the beginning by establishing positive and negative lists, while the eligibility of activity types that are neither on the positive list nor on the negative list will be conditional to the application of further criteria. In the next step, the remaining activity types would be assessed based on comparison with a baseline that should demonstrate both additionality and compatibility with a long-term mitigation pathway in line with the net-zero objective. In a third step, buyers with particular high standards could in addition apply further relevant criteria for transformational change, thereby reducing the risk of discontinuation and supporting a sustainable transition of the host country.
- ▶ However, positive and negative lists will face high political barriers and are also in danger of experiencing strong influence from lobbying organisations. Therefore, such kind of lists are more likely to be established as buying criteria by individual buyers. In this case, they would be still complementary to the other approaches but the ordering would be changed. In this case, the starting point would be the inclusion of baselines compatible with the long-term targets in the proof of additionality, thereby excluding activities with only short-term effects in addition to NDCs and/or activities becoming the reference case in the longer term. Nevertheless, some of the remaining eligible activities may still be seen to be not in line with the long-term objective or contradict the requirements of transformation change. Then, individual buyers could classify these based on positive and negative list, but also apply additional criteria for policy and financial sustainability to foster a transformational change.
- ▶ Looking ahead, it will probably be rather difficult to establish mechanisms that foster the long-term objective of net-zero GHG emissions in the operationalisation of Article 6.4, at least in the short term because the Article 6 negotiations are currently highly contentious even without consideration of the long-term aspects discussed here. Nevertheless, there is the need to at least have a clear roadmap of how to achieve compliance of the mechanism with the net-zero objective in the longer term. The options discussed here provide some potential avenues. Given the unclear political feasibility of each of the approaches, it seems important not to stick to one approach only, but to be flexible in establishing any of it, whenever a window of opportunity turns up. In this context, an implementation under a club approach by a group of countries seems more feasible as the first step for now, while recognizing that robust rules to assure environmental integrity for all parties must form the basis for all participants in the mechanism.

Zusammenfassung

Die Ziele des Pariser Abkommens (PA), wie im Artikel 4 definiert, sehen ein globales Gleichgewicht der Treibhausgas-(THG-)Emissionen und Senken in der zweiten Hälfte des 21. Jahrhunderts vor, um den globalen Temperaturanstieg deutlich unter 2°C gegenüber dem vorindustriellen Wert zu begrenzen. Die Vertragsparteien des PA sind dazu aufgefordert ehrgeizige kurz- und langfristige Klimaschutzmaßnahmen, die zur Erreichung dieses Ziels beitragen, zu definieren und umzusetzen. Der in Artikel 6.4 des PA definierte neue Mechanismus soll eine internationale Zusammenarbeit bei der Eindämmung des Klimawandels ermöglichen und damit einen Beitrag zur Gesamtinderung erbringen. Dies bedeutet auch, dass alle unter Artikel 6.4 zulässigen Aktivitäten die Zusätzlichkeit in Bezug auf die national festgelegten Beiträge (Nationally Determined Contributions, NDCs) der beteiligten Länder nachweisen müssen. Angesichts der stetig wachsenden Ambitionen der NDCs stellt dies jedoch eine Herausforderung dar. Dennoch soll die Ausgestaltung des Mechanismus nach Artikel 6.4 ebenfalls sicherstellen, dass die Kompatibilität mit anderen Zielen des PA gewährleistet bleibt. Insbesondere sollten die Aktivitäten nicht im Widerspruch zum langfristigen Ziel von netto-null THG-Emissionen stehen, sondern nationale Strategien, die zu diesem Ziel führen, noch untermauern. Um diese Aspekte in den Mechanismus zu integrieren, muss der Fokus auf die ein oder andere Weise von kurz- und mittelfristigen Maßnahmen auf die langfristige Entwicklung verlegt werden. Der Fokus auf langfristige Emissionsminderungsstrategien ist insbesondere erforderlich, um technologische Lock-ins zu vermeiden, die eine vollständige Dekarbonisierung auf lange Sicht verhindern würden.

In diesem Diskussionspapier werden drei Ansätze untersucht, die dazu beitragen können, das langfristige Ziel von netto-null THG-Emissionen bei der Operationalisierung von Artikel 6.4 zu erreichen:

- ▶ **Positiv- und Negativlisten** können ein einfaches Werkzeug darstellen, um einerseits die Zulassung bestimmter, als kompatibel bekannter Aktivitätstypen zu vereinfachen und andererseits bestimmte Aktivitätstypen zu klassifizieren, die mit hoher Wahrscheinlichkeit mit dem langfristigen Minderungsziel unvereinbar und somit nicht zulässig sind. Dennoch gibt es Aktivitätstypen, für die eine detailliertere Betrachtung erforderlich ist. Daher wird für die Betrachtung der drei Gruppen von Aktivitätstypen ein dreistufiger Ansatz diskutiert. Dieser Ansatz spiegelt ähnliche Ansätze wider, die für die Ausrichtung von Investitionen hinsichtlich der PA-Ziele gelten und stuft sie entsprechend als mit dem PA kompatibel, inkompatibel, oder bedingtcompatibel ein.
- ▶ **Zusätzlichkeit in Bezug auf eine Baseline, die sowohl mit den NDCs auch mit den langfristigen Zielen vereinbar ist:** Die Verwendung von Baselines zum Nachweis der Zusätzlichkeit in Bezug auf die NDCs wird nur dann netto-null THG-Emissionen fördern, wenn der zugrundeliegende NDC bereits ambitioniert ist. Doch selbst in diesem Fall können Lock-ins in der langfristigen Perspektive nicht ausgeschlossen werden. Um das Netto-Null-Ziel zu erreichen, müssen Baselines auch langfristige Ziele berücksichtigen. Diese langfristige Perspektive kann entweder auf einem nationalen Netto-Null-Emissionspfad oder auf (länderun-spezifischen) wissenschaftsbasierten Zielen beruhen. Da beide Ansätze Vor- und Nachteile haben, erscheint es am erfolgversprechendsten, sie so zu kombinieren, dass wissenschaftsbasierte Ziele das geforderte Maß an Ambition gewährleisten und gleichzeitig die Kompatibilität mit der langfristigen Strategie des Landes zur Entwicklung emissionsarmer Emissionen gegeben ist.
- ▶ **Übernahme bestehender Instrumente und Kriterien aus der Klimafinanzierung:** Das Netto-Null-Ziel ist auch für einige bestehende Instrumente im Zusammenhang mit der Klimafinanzierung relevant. Der Innovationsfonds der Europäischen Union (EU) konzentriert sich auf die Unterstützung von Technologien, die für netto-null THG-Emissionen benötigt werden, aber aufgrund ihrer hohen Innovativität oft nicht Teil der Minderungspfade sind. Weiterhin definiert das EU-Klassifizierungssystem für umweltverträgliches Wirtschaften („EU-Taxonomie“) Kriterien und Schwellenwerte für Nachhaltigkeit für ein breites Spektrum von Technologiefeldern. Einige weitere Instrumente wenden das Konzept des transformativen Wandels an, um die langfristige Perspektive der finanzierten Programme zu berücksichtigen. Während das Konzept einige Verknüpfungen zur Verwendung von Baselines und Positivlisten enthält, nutzt es noch weiche Kriterien zur Berücksichtigung langfristiger Auswirkungen, insbesondere für die Vermeidung der Stilllegung von Aktivitäten aufgrund von Finanzierungs- und/oder Akzeptanzproblemen.

Die ausführliche Diskussion der verschiedenen Ansätze zeigt, dass die Ansätze nicht als sich gegenseitig ausschließend, sondern als komplementär anzusehen sind. Darüber hinaus können sie, obwohl sie zumindest teilweise Zusätzlichkeit adressieren, keinen vollständigen Ersatz für die Überprüfung dieser darstellen. Das Arbeiten mit Baselines anstelle von Positiv-/Negativlisten hat den Vorteil, dass nicht explizit Technologien ausgewählt werden müssen. Andererseits kann die Entwicklung von Baselines im Einklang mit langfristigen netto-null THG-Emissionen umständlich sein, wenn ein auf wissenschaftsbasierten Zielen gründender Ansatz ausgeschlossen wird. Aus den Analysen in diesem Bericht geht hervor, wie in zwei Handlungssträngen Aspekte der verschiedenen Ansätze auf sinnvolle Weise kombiniert werden können, um das langfristige Ziel von netto-null THG-Emissionen über Artikel 6.4 zu unterstützen:

- ▶ Im Falle politischer Machbarkeit wäre die geeignetste Vorgehensweise zunächst den dreistufigen Ansatz zur Erstellung der Positiv- und Negativlisten anzuwenden. Dies bedeutet, dass zu Beginn bestimmte Aktivitätstypen durch die Erstellung von Positiv- und Negativlisten einsortiert werden, während die Zulässigkeit von Aktivitätstypen, die weder auf der Positivliste noch auf der Negativliste stehen abhängig von weiteren definierten Kriterien sind. Im nächsten Schritt würden die verbleibenden Aktivitätstypen auf Grundlage eines Vergleichs mit einer Baseline bewertet, die sowohl die Zusätzlichkeit als auch die Kompatibilität mit einem langfristigen Emissionsminderungspfad, der mit dem Netto-Null-Ziel im Einklang ist, aufzeigen sollte. In einem dritten Schritt könnten die Abnehmer mit besonders hohen Standards zusätzliche Kriterien für transformativen Wandel anwenden und somit das Risiko einer Aktivitätseinstellung mindern und zugleich eine nachhaltige Transition des betroffenen Landes fördern.
- ▶ Allerdings werden Positiv- und Negativlisten mit hohen politischen Hindernissen konfrontiert sein und es besteht die Gefahr, dass Lobbyorganisationen starken Einfluss ausüben könnten. Daher ist es wahrscheinlicher, dass solche Listen eher von einzelnen Käufern zum Festlegen von Kaufkriterien verwendet werden. In diesem Fall blieben sie komplementär zu den anderen Ansätzen, aber die Vorgehensweise müsste sich ändern. Ausgangspunkt wäre zunächst die Einbeziehung von mit langfristigen Zielen vereinbaren Baselines, um Zusätzlichkeit nachzuweisen. Dadurch würden solche Aktivitäten ausgeschlossen, deren THG-Minderungen nur kurzfristig zusätzlich zu NDCs sind und/oder die längerfristig zum Referenzfall werden. Einige der verbleibenden zulässigen Aktivitäten stimmen jedoch möglicherweise noch nicht mit dem langfristigen Ziel überein oder widersprechen den Anforderungen des Konzepts des transformativen Wandels. Dann könnten einzelne Käufer diese anhand von Positiv- und Negativlisten klassifizieren, aber auch zusätzliche Kriterien für die politische und finanzielle Nachhaltigkeit zur Förderung von transformativen Wandel anwenden.

Mit Blick nach vorn wird es vermutlich zumindest kurzfristig schwierig sein, Mechanismen zu etablieren, die das langfristige Ziel von netto-null THG-Emissionen bei der Umsetzung von Artikel 6.4 unterstützen, da die Verhandlungen zu Artikel 6 derzeit auch ohne Berücksichtigung der hier diskutierten langfristigen Aspekte äußerst verfahren sind. Dennoch muss zumindest eine klare Strategie vorliegen, wie die Kompatibilität des Mechanismus mit dem Netto-Null-Ziel auf lange Sicht erreicht werden kann. Die hier diskutierten Optionen bieten einige Möglichkeiten. Angesichts der unklaren politischen Realisierbarkeit der einzelnen Ansätze scheint es wichtig, nicht nur an einem Ansatz festzuhalten, sondern die Flexibilität beizubehalten. In diesem Zusammenhang erscheint eine Umsetzung unter einem Club-Ansatz durch eine Gruppe von Ländern als erster Schritt praktikabler, obgleich robuste Regeln zur Gewährleistung der Umweltintegrität für alle Vertragsstaaten die Grundlage für alle Teilnehmer am Mechanismus bilden müssen.

1 Introduction and problem formulation

The objectives of the Paris Agreement (PA) in its Article 4 require a global balance of greenhouse gas (GHG) emissions and sinks in the second half of the 21st century in order to limit temperature increase well-below 2°C above pre-industrial levels. The parties of the PA are required to define and implement ambitious short- and long-term climate change mitigation measures that contribute to achieve this objective. The parties are furthermore required to progressively raise their ambition by enhancing their targets or intensifying their mitigation actions.

The new mechanism defined under the Article 6.4 is required to address GHG emission reductions that are more ambitious than national reduction goals that are portrayed in the parties' Nationally Determined Contributions (NDCs). Demonstrating this additionality of mitigation actions in relation to an NDC baseline that already has a progressive character will therefore pose a key challenge.

Ambition raising can be differentiated from the concept of “overall mitigation”, which is also applied for the new mechanism (Art. 6.4(d)). Overall mitigation refers to the net climate benefits of measures undertaken under the new mechanism without any explicit reference to the NDCs. In practical terms, this differentiation means a shift of focus on the particular actors: while ambition raising refers to mitigation actions by individual parties, overall mitigation results from the collaborative action of parties through the design of the carbon market established under the new mechanism. The conceptual distinctions of ambition raising and overall mitigation are further elaborated in Fuessler et al. (2019).

The objective to reach a global balance of GHG emissions and sinks means that GHG emissions are reduced to net-zero (“net-zero objective”). Some residual emissions may still be allowed if compensatory negative emission approaches are deployed as, for example, afforestation measures, modified agricultural practices that store carbon and negative emission technologies (NETs) for capture and storage of carbon. Moving towards the net-zero target requires international cooperation to facilitate the transfer of mitigation technologies at lower costs.

Taking into account also the net-zero objective introduces new challenges to the design of the new mechanism of Article 6.4. The new mechanism is expected not only to contribute to ambition raising and overall mitigation, but to reach toward the target of a net-zero world, which especially asks for long-term emission reduction strategies.

Setting the focus on long-term emission reduction strategies is necessary, in particular, for avoiding technological lock-ins that would hinder a full decarbonisation in the long run. Such lock-ins may, for example, be caused by investments in new coal-fired power plants with higher efficiency, or insulation measures and heating renewal in fossil-fueled buildings, which would lead to reductions in emissions in the short term, but would foster a continued dependence on fossil fuels and prevent the roll-out of the full potential of renewables.

The Clean Development Mechanism (CDM), the predecessor mechanism that was defined in the Kyoto Protocol, fell short in addressing long-term emission reductions. Up until now, over 7,805 CDM projects and 319 programmes of activities (PoAs) are registered worldwide, which have resulted in more than 1.98 billion certified emission reductions (CERs) being issued. The CDM was effective in mobilizing mitigation projects in developing countries, with the highest share of projects in renewable energy generation from wind, hydro and biomass. Many CDM projects have been centered on avoidance of methane emissions, other CDM projects targeted energy efficiency on either the supply or the demand side¹. However, an estimated share of about 4% of registered CDM projects are related to fossil fuel infrastructure. Among those are ten “clean coal” plants. It's arguable if those kind of projects should be covered by the new mechanism as they would contribute to fossil fuel lock-ins. On the other side, AFOLU activities (agriculture, forestry and land use) that enhance carbon sinks, made up only 0.9% of the total CDM projects (72 projects in absolute terms) and played a minor role under the CDM.

¹ CDM and PoA Pipeline overview, www.cdmpipeline.org/cdm-projects-type.htm

Another challenge was the question of additionality. Additionality of emission reductions is a key pre-condition for making any kind of contribution to achieving the international community's climate objectives. Over the years, critics repeatedly claimed that large shares of registered CDM projects might not be additional (e. g. Schneider 2009, Haya 2009, Cames et al. 2016). Another problem from the long-term perspective is that some CDM projects turned out to be vulnerable to the discontinuation of emission reductions, in particular those related to N₂O, CH₄ and F-gases. Projects at risk of discontinuation usually ceased to generate revenues after the funding ended. At lower risk were projects for renewable energy generation due to revenues from electricity sales. However, even renewable energy projects can lead to only a short-term mitigation effect, for example in the case of biomass usage, when after the discontinuation of the CDM project activity the biomass resources are used for other purposes, such as selling the biomass to third parties, and own electricity and heating demand are met through grid power and other fuels (Warnecke et al. 2017).

Taking into account the similarity of the Article 6.4 mechanism to the existing CDM, it can be assumed that the mechanism is also more likely to incentivize short-term emission reductions. However, unlike to the CDM, the new mechanism must “deliver an overall mitigation in global emissions” (Art. 6.4.d), meaning that it needs to go beyond offsetting and have a net positive mitigation effect. Moreover, it has to support sustainable development, and contribute to achieving NDCs.

A further important aspect of the design of the mechanism to consider will be the relation of the emission mitigation under the new mechanism and the NDCs. To achieve the objectives of the PA, the NDC target development should follow a trajectory towards a zero emission world. However, measures under Article 6.4 should go beyond those targets. Countries are already obliged to reflect the highest possible level of ambition in their NDCs (PA Art. 4.3). Therefore, only measures that the countries cannot address on their own should be promoted under the new mechanism. This situation seems to be inconsistent with the aspiration of the new mechanism to be extensive in the long run, given that carbon trading is only possible while there is a mitigation potential present. There is a quite legitimate objection that the new mechanism might become obsolete in a net-zero world in the long run. However, many reasons speak in favor that a carbon market will be necessary or might even enhance ambition and that the new mechanism will have its validation in the long-term perspective. An acceleration of the carbon market might exhaust cost-effective mitigation measures first, leaving more expensive or high-risk abatement measures including NETs for later. In addition, a net-zero world does not imply full decarbonization everywhere, and in all sectors. Most of the mitigation scenarios of the IPCC SR1.5 database show remaining GHG emissions in the energy, industry or transport sector, which are compensated by negative emissions. Negative emissions are seen as part of the solution that can either be included in national mitigation strategies and NDCs or be additional measures required to reach global mitigation targets if those efforts are not sufficient. Furthermore, differences in wealth distribution, local circumstances and capabilities among countries lead to different possible distribution of mitigation options. Effort sharing approaches discussed in literature assume global mitigation while considering national circumstances such as capability or historical obligation. Several effort sharing approaches suggest negative emission targets for countries with high capability and responsibility and more lenient targets for countries with low capability and responsibility. Such effort sharing approaches often indirectly require the presence of a carbon market in practical terms. Furthermore, a meta-analysis of scenarios in (Hermwille and Samadi 2016) has revealed that unequal distribution of wealth and emissions still will be present in 2050. The regional breakdown indicates per capita emissions are expected to be higher in wealthy countries as Europe and in the USA compared to the global average. Remaining regional differences in wealth would mean that opportunities for carbon trading will not cease in the long-term.

In order to maintain a fit with long-term emission reduction targets, additional incentives may have to be set or measures must be taken to ensure compatibility. Possible starting points are e. g. to limit or incentivize eligible activities along a positive list that include certain project types or mitigation activities. “Clean coal” technologies should not qualify as a clean energy option, because those contribute to a lock-in of fossil fuel infrastructure. On the other hand, NETs have the potential to contribute towards achieving net-zero emissions. Those technologies could be promoted under the new mechanism as suggested by Honegger und Reiner (2017): additionally to providing credits for each ton of GHG avoided, the new mechanism could also credit each ton of GHG removed. Incentives for investments in technologies that are compatible with the long-term goal of decarbonization could be provided e. g. through longer crediting periods or other price signals that cover long periods of time. Nevertheless, measures that are viable for a host country without international cooperation should not be implemented under Article 6.4. This also has a temporal perspective. Certain measures may not be viable for a host country without support at the moment, but may become viable later, at which point support should be re-moved. Another important factor especially in the context of certain NETs is the permanence of mitigation measures. Addressing permanence is key for all activities where emission reductions or removals could be temporary. Permanence can either be ensured through the characterization of the mitigation measure itself or be complemented by a measure that addresses non-permanence.

In this report, a closer look is provided into some possible options and criteria that enable a transition to a low-carbon economy that might fall under the new mechanism of Article 6.4. In particular, possible ways to design the implementation of Article 6.4 that may foster the net-zero objective in the long-term are explored.

2 Options for fostering a net-zero GHG emissions world under the Article 6.4 Mechanism

2.1 Screening of options for an integration under the Paris Article 6.4 Mechanism

2.1.1 Overview

Emission reductions under Article 6.4 are required to be additional to what would have occurred in the absence of the crediting mechanism. Additionality could be considered and evaluated on the level of existing technologies and policies of parties. However, the key challenge is the adequate selection of a baseline that is used to assess the additionality of a certain measure (Fuessler et al. 2019)

Experiences made with the CDM mechanism have shown the importance of assuring that mitigation effects go beyond the business-as-usual. Nevertheless, the CDM allowed to learn about the assessment of additionality in a situation where no national mitigation targets for host countries were considered. With the requirements of the Paris Agreement, additionality now needs to be assessed in the context of the mitigation targets of NDCs that have to continuously increase their mitigation ambition.

One of the most important issues in designing the new mechanism is how it will relate to the countries' existing mitigation targets, and how it will impact the ambition of the future revision of NDCs. It must be ensured that the mechanism does not provide any incentives for host countries to minimize their own ambitions towards climate change mitigation to rather sell more of their emission reduction potential on the carbon markets.

In the following, we discuss additionality only under the aspect of compatibility with a net zero world, which does not mean that other effects such as environmental integrity are not relevant as well. For additionality with respect to emissions reduction, reference to the long-term GHG development strategy and/or a baseline compatible with the host countries' targets may be suitable (see Section 2.1.3.)

In some cases, it might be worth to consider in which way principles as transformational impact towards a low-carbon economy or a paradigm shift of a host country are related to the concept of additionality. Similar principles are already applied in climate finance mechanisms and might be adapted in the context of Article 6.4 (see Section 2.1.4).

Finally, eligible mitigation activities might differ by the role of a country – in host countries only certain measures could receive credits, whereas measures might be creditable only in certain sectors in receiving countries. This would probably require to distinguish between avoidable and unavoidable emissions of the receiving country that will benefit from mitigation activities resulting in emission reductions. For example, unavoidable emissions occur in agriculture and the industry sector (in particular cement production), while emissions in the transport sector are avoidable. Therefore, the use of credits in the receiving country might be limited to agriculture and industry (see Section 2.1.5).

2.1.2 Establishing positive/negative lists

While in the history of the CDM the term positive list has been associated with the concept of automatic additionality, it could also mean an exclusive list whereby all activity types/technologies that are not on the list are not eligible. For example, in the negotiations on the Marrakesh Accords, the European Union (EU) had initially suggested to limit eligibility under the CDM to renewable energy, energy efficiency and demand-side management projects (UNFCCC 2000). In the context of the Paris Agreement, a similar approach could be taken to only allow activity types under Article 6 that are fully compatible with the goal of long-term decarbonisation. Clear candidates are activity types that generate zero emissions, for example demand-side energy efficiency and most renewable energy technologies, or carbon sink projects. Here, the permanence of the mitigation would need to be addressed in the setting of rules. A negative list would exclude certain activity types/technologies from eligibility. Under the CDM, Parties are to refrain from using nuclear power projects (UNFCCC 2002). Further discussions on banning certain technologies were triggered by the early dominance of HFC and adipic-acid N₂O projects in the CDM, which gave rise to concerns that these very inexpensive mitigation options would crowd out other project types. Later on, it became apparent that crediting of such activities could create perverse incentives. In the context of the Paris Agreement, negative lists could exclude activity types that are clearly incompatible with the goal of decarbonisation, such as unabated coal power projects.

However, in the history of the CDM, calls to completely ban certain project types always encountered strong opposition from Parties who argued that the mechanism should be technology neutral. Suggestions for positive or negative lists under Article 6 would likely encounter similar opposition. Nevertheless, positive/negative lists were successfully implemented by clubs of acquiring countries, such as the EU.

Both approaches, negative and positive lists, come at the price of reduced coverage of the instrument. Here, an adequate balance between coverage and risk management should be aimed at.

While the concept of negative lists provides some clear benefits with regard to avoiding lock-ins, it lacks a way to address the long-term comparability with net-zero GHG emissions. On the contrary, positive lists can be targeted quite directly to this issue. Therefore, possible ways to make use of positive lists could be explored in more detail in the following work.

2.1.3 Defining compatibility with low-emission development strategies and/or a baseline consistent with NDCs and long-term targets as eligibility criterion

The Paris Agreement calls on countries to formulate low greenhouse gas emission development strategies, mindful of the Agreement's long-term goals (Art. 4.19). Given the risks of locking in future emissions by current investment decisions, long-term planning is indeed essential for achieving the Agreement's long-term objectives. In the context of the COP in Marrakech, a "2050 pathways platform" was founded which aims to support countries seeking to develop long-term, deep decarbonization strategies and build coalitions of cities, states, and companies engaged in long-term low carbon planning (UNFCCC 2016).

Under Article 6, activities taking place in countries that have established such long-term strategies could be required to demonstrate that they are in line with the respective host country's long-term strategy. At the same time, host countries could be requested to evaluate activity proposals in the light of their strategies. However, as there is no pre-defined format for the long-term strategies, it may be difficult to establish a pre-defined format for such a demonstration and evaluation. A basic approach would consist of requiring activity proponents to provide narrative text explaining how the activity fits in which part of the host country's long-term strategy.

A more promising approach would be to require the activities under Article 6.4 to be additional with regard to a suitable baseline that is both consistent with the host countries current NDC and longer-term trend and targets. However, such a baseline is difficult to obtain, in particular it might have to be changed when targets are updated. The feasibility of such an approach will therefore need to be explored in more detail.

2.1.4 Adaptation of existing instruments and criteria

Criteria for determining additionality in terms of a net-zero world still need to be described. Several climate finance mechanisms, as the Transformative Carbon Asset Facility (TCAF), the Green Climate Fund (GCF), the NAMA Facility or other multilateral organizations choose funding activities that are additional in a sense of a transformational impact towards a low-carbon economy or a paradigm shift, and therefore aim at reaching beyond project finance and achieving permanent emission reductions.

The TCAF by the World Bank supports developing countries by providing results-based finance for verified emission reductions. The facility has been developed in consideration of the mechanisms that fall under Article 6. The TCAF uses crediting at sectoral or policy level. Thereby it goes beyond crediting projects in contrast to the CDM, which focused on projects and programs of activities. The TCAF framework defines certain criteria for the assessment of transformational change that is used for selecting programs. Hereby important is the demonstration of the lasting and large volume emission reduction of the activity. Furthermore, the TCAF operations are expected to enable the host country to increase its domestic ambition over time. They also have to incentivize domestic carbon pricing policies and catalyze a new and scaled-up international carbon market building on Article 6 through piloting of innovative approaches to scaled-up carbon crediting. The orientation for baseline setting under the TCAF is mainly provided by the countries unconditional NDC target. Accordingly, emission reductions associated with unconditional targets cannot be credited. The unconditional target trajectory is compared to a Business-as-Usual trajectory based on model projections. The more conservative of the two is used as the crediting baseline. Crediting will be then applied to the resulting difference between the crediting baseline and the actual emission reduction through the TCAF supported program (World Bank 2018). Hereby the supported program would reduce emissions beyond the unconditional NDC target. Whether and how the emission reductions are to be credited under Article 6 is currently open.

Another approach is offered by the Innovation Fund (IF) that has an embedded aim of long-term emission reductions as stated in the “Commission Delegated Regulation establishing the Innovation Fund”². The IF sets a focus on innovative technologies that have the potential to contribute to GHG emission reductions substantially. Illustrative projects that might be funded under the IF are innovative solutions for energy storage, full or part chain carbon capture and storage (CCS) projects, or the electrification in industry³. The projects for designated funding are selected based on criteria as defined in the Delegated Regulation. These criteria include the potential to avoid GHG emissions, degree of innovation, maturity, readiness level, business model, financial and legal structure, potential for widespread application and cost efficiency in terms of emissions avoidance.

While the IF focusses on bringing technologies important for reaching net-zero GHG emission reductions into the market, all the other instruments above have in common that they use the concept of transformational change for the selection of programs to go beyond the project based approach. Transformational change includes by definition a long-term orientation where the focus lies mainly on the implementation of this approach in national activity or policy design that uses sustainable financial models to channel climate finance effectively. Nevertheless, those instruments do not explicitly focus on fostering the net-zero objective. Against this background, ways to adapt the criteria of the IF and a selected instrument focusing on transformational change may be explored in further detail.

² https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-3157624_sk

³ https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=PI_COM%3AC%282019%291492

2.1.5 Focussing on the demand side of internationally transferred mitigation outcomes

While addressing the net-zero objective will definitely be linked to the activities in the host country in some way, one additional approach might also be to focus on the demand side of internationally transferred mitigation outcomes (ITMOs). An key issue here is the supplementarity of Article 6.4 activities, as Buyer countries might choose to achieve their NDCs mostly through use of market mechanisms, neglecting the transformation of their own economies and thereby creating domestic lock-ins. The most straight forward restriction in this regard is to couple the use of ITMOs to a sufficient degree of successful implementation of domestic mitigation measures. However, here the question arises how to avoid that some important domestic mitigation potentials remain untapped. One approach would be to limit the use of credits to sectors with limited mitigation potential. Particular options might be aviation and shipping, industrial process emissions and agriculture.

Such an approach would be complimentary to the approach of establishing positive lists for activities, as it can be interpreted as positive lists for the use of credits. On the contrary, there is no link to the compatibility with net-zero emissions in the host country at all. Therefore, it is insufficient to look at it in isolation from the host country. We will, hence, not consider it as a separate option in the following, but discuss it as a complement to selected approaches to be explored in more detail.

2.1.6 Intermediary conclusion

In view of the qualitative comparison of the strengths and weaknesses of the various approaches, we suggest to explore the feasibility of three approaches in more detail in the following, namely:

- ▶ Establishing positive and negative lists for the eligibility of activities
- ▶ Using a crediting baseline consistent with NDCs and long-term targets
- ▶ Adapting the criteria of two selected financing instruments as eligibility criteria for Article 6.4

The detailed analysis of the three approaches along the line of several guiding questions can be found in the following subsection.

2.2 Explorative analysis of selected options for an integration under the Paris Article 6.4 Mechanism

2.2.1 Guiding questions for the analysis of selected approaches

The explorative analyses of each of the three different approaches for a possible integration of the net-zero objective into an implementation of Article 6.4 will be carried out along the long lines of the following guiding questions:

- ▶ Instrument description: What are the targeted sectors or types of activities?
Who are the relevant actors and how are they related?
- ▶ How does the instrument allow to foster net-zero GHG emissions in the long-term?
- ▶ Is the instrument compatible with all the relevant aspects of Article 6.4, in particular additionality?
In which way?
- ▶ Which are the benefits and drawbacks of the instrument?
- ▶ What would an implementation of the instrument look like in detail (incentives, restrictions, selection criteria)?
- ▶ Can the implementation of the instrument be expected to be politically feasible?
How is the success of the instrument's objectives determined (assignment of credit to the impacts over time)?

2.2.2 Detailed consideration of the option “positive and negative lists”

2.2.2.1 Basic instrument description

Positive or negative lists could in theory provide a straightforward way to limit activities under Article 6 to activity types that are compatible with the long-term net zero emissions objective. One could simply decide that activity types that are not compatible with the long-term objective will not be eligible. Alternatively, a positive list could be used to especially promote activity types that are clearly compatible with the long-term objective, but leaving the door open for activities of other types to demonstrate their compatibility. It is important to note that the considerations here only apply to the long-term objective of net-zero emissions, but should not replace the need to provide evidence for the additionality of the activities.

In this vein, positive lists for compatibility with long-term net zero emissions could take a “hard” or a “soft” approach:

- ▶ In the “hard” approach, only activity types would be eligible for the mechanism that are 100% compatible with the net zero emissions objective. This approach would follow the logic of the original EU suggestion to limit the CDM to renewable energy, energy efficiency and demand-side management projects. However, the list of activities compatible with the long-term objective would certainly be different, e. g. dropping energy efficiency of fossil technologies but maybe including also activity types related to natural and technical carbon sinks.
- ▶ In the “soft” approach, there would not be a predefined eligibility list, but all activity proposals would need to perform an analysis to demonstrate that they are aligned with the long-term objective. However, the requirement to perform this analysis could be waived for certain activity types where it is clear that they are always 100% compatible with the long-term objective. This approach follows the logic of the existing positive lists in the CDM and other offset mechanisms. While in principle all activities need to demonstrate their additionality, the CDM Executive Board has developed a list of small-scale and micro-scale project types that are deemed to always be additional. Several other offset mechanisms have also developed positive lists of activity types that are automatically deemed to be additional (Kachi et al. 2014, Kollmuss and Füssler 2015).

This approach could in principle be mirrored for negative lists:

- ▶ A “hard” approach would completely ban certain activity types.
- ▶ A “soft” approach could consist of defining additional requirements for activity types that would normally be assumed to be incompatible with the long-term objective.

Positive and negative lists could also be combined to form a tiered approach:

- ▶ Tier 1 could consist of activity types that are always deemed to be compatible with the long-term objective.
- ▶ Tier 2 could consist of activity types that need to demonstrate their compatibility with the long-term objective.
- ▶ Tier 3 could consist of activity types that are banned as they are incompatible with the long-term objective.

The lists should be reviewed regularly to capture economic and technological developments. Some technologies that may be relevant for achieving the long-term objective may not be known yet (Schneider et al. 2015).

This basic concept could be adopted by various actors. Such lists could in theory be defined multilaterally under the Paris Agreement to apply to all activities under Article 6. Alternatively, buyers could develop such lists to determine which activities to select for their own purchases. Such lists may also be developed by governments to determine eligibility of Article 6 units for use in domestic emission trading systems.

2.2.2.2 Categorising activity types

The discussion on which activity types to assign to which tier can be informed by the discussions that have been triggered by the objective in Art. 2.1(c) of the Paris Agreement to align all financial flows with the objectives of the Agreement. Currently, there is an intensive discussion on what exactly this objective should mean for the multilateral development banks (MDBs), that is, which activities should be funded by the MDBs and which should not. This discussion shows that the question of what is compatible with the long-term objectives of the PA is easy to answer for some sectors and activity types, but not so easy to answer for others. For example, for the transport sector, Larsen et al. (2018) consider that only transport infrastructure that is built solely for the transport of fossil fuels can clearly be seen as misaligned. For transport infrastructure in general they consider that it depends on the characteristics of the individual activity whether the spending is aligned or misaligned.

Germanwatch & NewClimate Institute (2018) develop a typology where they classify investment areas into three categories: “Paris-aligned”, “misaligned” and “conditional”, which reflect the three tiers suggested above. “Paris-aligned” means investments in this area fully support the achievement of the Paris Agreement’s temperature goal. “Misaligned” means investments in this area undermine achievement of the long-term objective. Whether investments that are classified as “conditional” can be considered Paris-aligned depends on the circumstances and characteristics of a specific activity. Such investments therefore need decision-making tools on the level of activities to determine whether or not a specific activity is aligned or misaligned (e. g. baseline comparisons as described in Section 2.2.3). The following table applies this typology to investments in transport and energy supply infrastructure. It bears noting that these categories may shift over time. For example, building new gas power plants may be Paris-aligned in the short term but will over time become increasingly incompatible with the objective to fully decarbonise electricity generation. As noted above, positive/negative lists would therefore need to be dynamic and updated regularly.

Table 1: Categorization of investment areas in energy supply and transport infrastructure

	Paris-aligned	Conditional	Misaligned
Energy Supply Infrastructure	Renewable energy (solar, wind, small hydro, tidal, wave and ocean)	Energy transmission and distribution infrastructure	Coal-fired power plants with unabated emissions over their lifetime
	Electricity system flexibility option	Geothermal 2)	New upstream oil and gas production and exploration
		Gas (power plants, transport of gas) 1)	Coal mining
		Large hydropower 3)	Oil power plants
		Biomass, incl. bio energy carbon capture & storage 3)	
		Coal with carbon capture and storage 1)3)	
		Nuclear 3)	
Transport infrastructure	Zero-carbon transport fueling infrastructure (electricity, hydrogen, alternative fuels)	Road infrastructure including tunnels and bridges	New road, rail, water-way and port infrastructure for fossil fuel transport
	Non-motorised transport infrastructure (sidewalks and bikelanes, bike sharing infrastructure)	Diesel rail and rolling stock	New airports/ airport expansion 4)
	Integrated transport and urban development planning	Port expansion for transport of non-fossil fuel freight	
	Electric rail and rolling stock		
	Electric public transport		
	Inland waterways		
	Transport and travel demand management measures		

- 1) This investment area causes direct GHG emissions
- 2) This investment area can cause direct GHG emissions
- 3) This investment area is subject to critical sustainability and/or security concerns
- 4) Alternatives to air travel are more limited compared to other areas, there is therefore a need to investigate fuel alternatives.

Source: Germanwatch & NewClimate Institute 2018

2.2.2.3 Advantages and disadvantages of an approach based on positive/negative lists

Establishment of positive or negative lists would set a clear direction for Article 6 use towards the long-term net-zero emission objective. Activity types that are clearly incompatible with the long-term objective could simply be disallowed, avoiding lock-in effects that would make achievement of the long-term objective more difficult.

Technical feasibility and ease of implementation would among other factors depend on the actor using the instrument. Individual buyers using their own money may find it relatively simple to rule out or prioritise certain activities. By contrast, development of such lists for the entire mechanism at the level of the CMA or of the supervisory body, or for use in domestic emission trading systems, would probably require detailed technical assessments of mitigation scenarios in order to satisfy all stakeholders that the lists are robust and well-founded. A key difficulty herein is that the role of individual activity types may vary strongly among scenarios. In addition, different countries may have different preferences for which technologies to choose for their long-term climate strategies (Schneider et al. 2015). For example, one may consider carbon capture and storage to be a viable option for the electricity sector, but one may also consider that the limited storage potential should be reserved for emissions where currently no other abatement options exist, such as certain industrial process emissions, e. g. in cement production.

Another related difficulty is the overall level of ambition. The PA aims at achieving net-zero emissions in the second half of the century. However, the IPCC special report on the 1.5°C limit has highlighted that CO₂ emissions should be reduced to net zero already by around 2050 in order to maintain a relevant chance of limiting global temperature increase to 1.5°C (IPCC 2018). Whether emissions should arrive at net zero already in 2050 or only later, for example 2070, makes a strong difference for the assessment of which current investments are Paris-aligned. Given the IPCC special report's conclusion that every bit of warming matters, the aim should be to reduce emissions to net zero as soon as possible.

Given these complexities, political feasibility for broad application at a CMA or supervisory body level is probably also low. Related to positive lists for additionality, du Monceau and Brohé (2011) note that attempting to define such lists would probably be subjected to intensive lobbying by Parties and private companies to have their favourite activity types included. The same can be expected for lists on compatibility with the long-term objective. And as noted above, in the history of the CDM many Parties strongly advocated for keeping the mechanism technology neutral.

On this basis, positive/negative lists may be a useful instrument for individual buyers, but are probably difficult to agree on for the mechanism as a whole.

Finally, it needs to be kept in mind that positive lists for compatibility with the long-term objective must not be taken as substitute for additionality testing. While, for example, solar PV and wind power technologies generate zero GHG emissions during their operation, they are increasingly cost competitive and may hence in many cases nowadays constitute the baseline rather than being additional. Selection of activities therefore needs to carefully assess both angles, which activities are additional and which ones contribute to the long-term objective.

2.2.3 Detailed consideration of the option “using a crediting baseline consistent with NDCs and long-term targets”

This section further explores approaches that require the activities under Article 6.4 to be additional with regard to a suitable baseline that is consistent with both the host countries current NDC and longer-term trends and targets, in particular the long-term objective of net-zero GHG emissions.

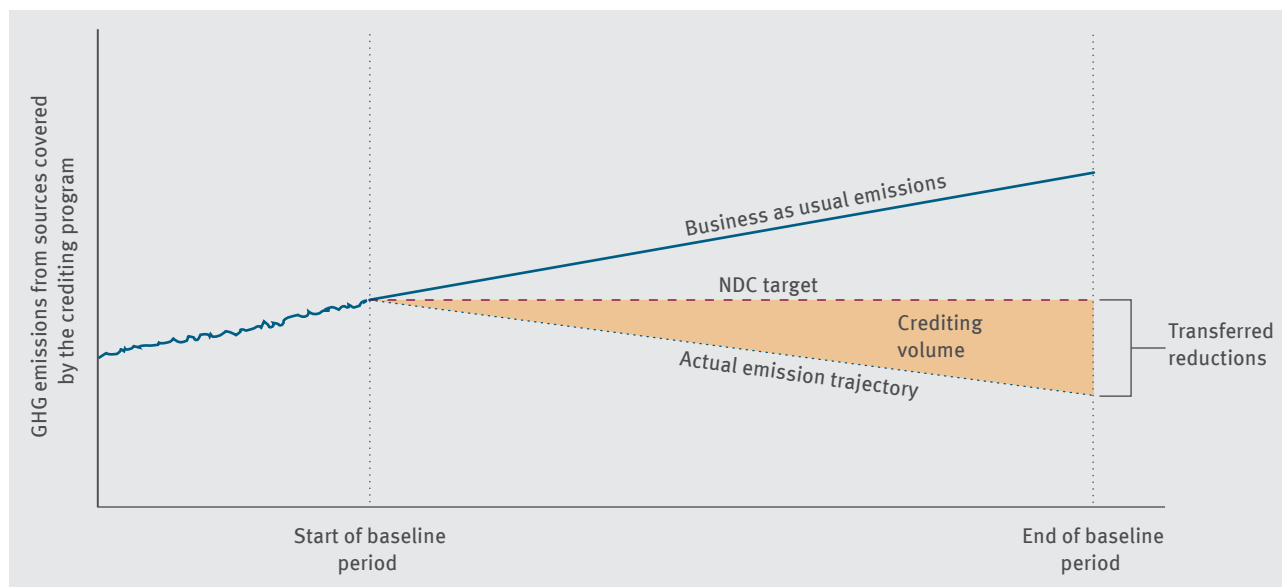
Three options are identified on how to determine baselines (and additionality) in a way that is in line with longer-term trends and targets:

- ▶ Baselines in line with (ambitious) NDC targets
- ▶ Baselines defining a new long-term view
- ▶ Baselines with science-based targets

These three options are discussed in detail in the following.

2.2.3.1 Baselines in line with (ambitious) NDC targets

Baselines can be defined in line with the NDC target for any sector and type of activity. Applying this approach assures that only emission reductions beyond the country's NDC targets can be credited and internationally traded (cf. figure below). The advantage of this approach is that it minimizes the risk for over-transferring of emission reductions and at the same time maximizing the potential amount of transferrable emission reductions. The baseline needs to be set below the NDC target emission pathway. In this case, the country would not fully exploit the opportunity to transfer mitigation outcomes and therewith the potential revenues of the crediting program (Broekhoff et al. 2017).



Source: Broekhoff et al. 2017

Figure 1: Example of a baseline derived from NDC targets

NDCs represent the country's interpretation on what its ability and commitment is to contribute to the overall long-term goal of the Paris Agreement. If the country's NDC ambition is in line with the long-term goal, the use of Article 6 with crediting baseline that is in line with the NDC target may help to prevent lock-in but cannot fully exclude it. If ambition is insufficient (as is the case with many NDCs – see UNEP 2018) this leads to lock-in (as described in section 1).

A challenge in many host countries for defining a baseline trajectory is that many NDCs are not quantified in discrete sectoral GHG emission pathways. The translation of NDC targets in such pathways for covered sources can require considerable preparatory work. An additional problem is the issue whether crediting mechanisms can be used to achieve conditional NDCs. It is an open question whether the conditionality of NDC targets has to be taken into account in the baseline definition, particularly in cases when countries have conditional as well as unconditional targets (Broekhoff et al. 2017).

The lack of discrete emission pathways for covered sources in many countries NDCs is a problem, as demonstration of additionality and baseline setting in line with NDC targets is considered to be easiest on a sector level. The definition on a activity or program level appears more difficult. In order to capture potential future ambition increases of NDC targets, crediting periods have either to be limited or additionality demonstration or baseline setting should be updated regularly (Schneider et al. 2017).

Under the assumption that a host country has an ambitious NDC target that is in line with a global net-zero pathway, will achieve them, and double counting is avoided, this approach leads to additional contributions of a crediting program and can help to achieve net-zero GHG emissions in the long-term by ensuring only additional mitigation outcomes are traded. Although there is no international agreement on what ambitious means, there are different approaches including the Climate Action Tracker (CAT⁴) that provides independent research on countries ambition levels. In terms of market dynamics, it should be noted that host countries that decide to have more ambitious NDC targets reduce their potential of “low hanging fruits”, as this mitigation potential is required for domestic action to achieve the NDC target, and as a result face the international market with an offer of higher priced units that may not be able to compete. In that sense the market mechanism do not create a level playing field for host countries with different ambition levels (see Fuessler et al. 2019).

2.2.3.2 Baselines independent of NDC targets

If the NDC target is ambitious enough and thereby in line with the long-term goals of the Paris Agreement, the baseline based on the NDC target can be used to estimate transferrable mitigation outcomes that are additional (see section 2.2.3.1). However, there are several cases where the baseline cannot be set in line with NDC targets. The NDC target may not be sufficient to provide an adequate contribution in fulfilling the long-term goals of the Paris Agreement, or the mitigation activity (to be transferred) may not be quantified or not covered by the scope of the NDC target. In these cases, the baseline cannot be estimated, or the additionality of a transferred mitigation outcome is not ensured when setting a baseline in line with the NDC target. Two alternative approaches may be used to determine a baseline that is in accordance with the long-term goals of the Paris Agreement and that allow for estimating transferrable reductions which are additional: (a) defining a new long-term view (what might be called a “Long-Term Determined Contribution” or “LT-DC”) and (b) “science-based targets”. These two options are discussed below.

- ▶ **Defining a new Long-Term Determined Contribution (“LT-DC”):** A new LT-DC is defined for the sector that the considered mitigation activity is in. This may e. g. be carried out by an independent research organization in a mandate from both the acquiring and host country. The approach to reach at the LT-DC is similar as the approach for the NDC, including an analysis of capacities, capabilities and responsibilities, modelling and long-term emissions and development strategies (LT-LEDS), but is not carried out by the government. The boundary condition is that the LT-DC target has to be in line with reaching the long-term goals of net-zero GHG emissions.
- ▶ **Science-based target:** This simple approach follows a method that is often used in the context of the so called “science-based targets” for financial investments, e. g. in the context of green bonds certification. Similar to the LT-DC, the science-based target can also be defined for the sector that the considered mitigation approach is in⁵. The baseline is assumed as a straight line. It starts at actual average emissions before the implementation of the mitigation action and descends to a target which is in line with the long-term goals of the Paris Agreement.

E. g., if a new building of a specific size emits on average 60 tonnes of CO₂ per year, the baseline for an energy efficient building newly built in 2020 would start at 60t/a, reach 40t in 2030, 20t in 2040 and 0t in 2050. In addition, science-based targets would need to address the renovations of the existing building stock but also the stock built up until 2050.

2.2.3.3 Advantages and disadvantages of using baselines based on long-term targets

Defining a new LT-DC is the more comprehensive approach of the two, taking into account emission models and LT-LEDS and building on a country’s specific capacity and capability. The approach may be particularly cumbersome in countries with an insufficient data lacking a quantified NDC target. In case of very limited national and international resources, the approach with a science-based target is very simple to apply and can be used similarly for all mitigation activities and sectors.

If the LC-DC is defined ambitious enough and is achieved, this approach will lead to contributions of a crediting program additional to the host country meeting its NDC target – similar to the baseline in line with the NDC target.

⁴ <https://climateactiontracker.org/>

⁵ E. g.: sciencebasedtargets.org

However, all approaches that use ambitious crediting baselines, be it based on an ambitious NDC, new long-term view or a simple science based target approach, indirectly incentivize mitigation activities with very low emissions, but are not sufficient to rule out the implementation of technologies which lead to a lock-in of higher carbon intensity over decades and are not in line with the long-term zero emissions objective.

2.2.4 Detailed consideration of the option “Adaptation of existing instruments and criteria”

This subsection further explores how existing instruments try to foster the long-term objective of net-zero GHG emissions and whether it is possible to adapt some of the criteria they use for an application in the context of Article 6.4 of the Paris Agreement. First, the Transformative Carbon Asset Facility and its concept of transformational change are assessed. Afterwards, the approach and criteria of the EU Innovation Fund and the EU classification system for environmentally sustainable economic activities (“EU Taxonomy”) of the European Commission are scrutinized.

2.2.4.1 Transformative Carbon Asset Facility (TCAF)

The TCAF is a multilateral World Bank fund that was launched in 2016 and is meant to implement market-based climate change mitigation mechanisms and provide results-based finance for proven emission reductions achieved on sectoral level. For this purpose, the facility funds emissions reductions achieved through large scale programs (e. g. phase-out of fossil fuel subsidies or the simplification of renewable energy regulations) in sectors as renewable energy, transport, energy efficiency, solid waste management, and low carbon cities⁶. The following assessment of the TCAF (if not stated otherwise) is based on the currently available general principles presented in “Core parameters for TCAF operations” (World Bank 2018).

The TCAF refers to the concept of transformational change towards a low carbon sustainable development path in the host country. Transformational change indicators are for example derived from country/sector-specific long-term decarbonisation pathways consistent with a global least-cost path-way to a achieve the “well-below” 2°C climate target, or through a preferred alternative approach, based on best practice with regard to transformational mitigation measures. Thereby, the concept of transformational change may provide a link to the net-zero objective.

Transformational change can also be understood as a activity’s potential to transform the development path of a sector and lead to a substantial deviation from the baseline scenario, linking it to the discussion of baselines in Section 2.2.3. The concept is used for selecting programs for finance and to monitor the program according to pre-defined criteria and indicators.

The TCAF defines transformational change as the “required structural change” to achieve net zero emissions in the second half of the century. TCAF programs are supposed to be policy-based or target sector transformation. The TCAF framework defines four criteria to assess transformational impact of a financed program:

- a) achieve large volume of emission reductions (at least 5 Mt CO₂e over 5–7 years)
- b) emission reductions have to be sustainable over time
- c) enabling the host country to increase its domestic ambition over time
- d) contribute to the development and implementation of domestic carbon pricing policies and catalyze a new and scaled-up international carbon market under Article 6

The volume constraint a) originates from the large-scale program focus of the TCAF and refers to a dimension of transformational change not directly relevant to the net-zero objective.

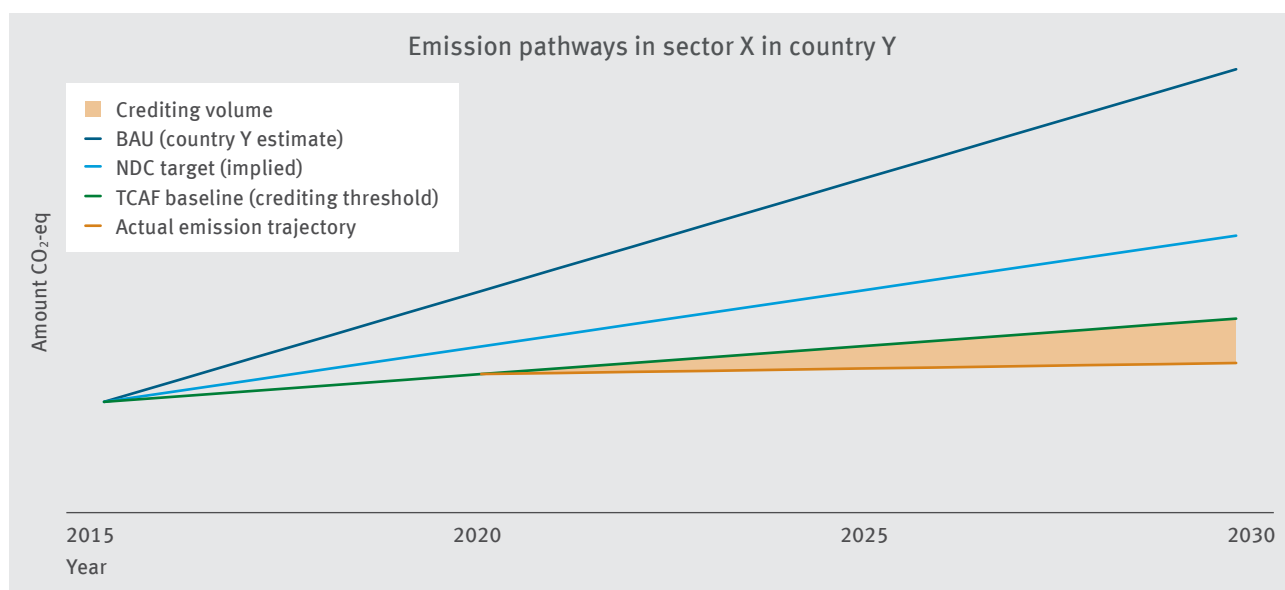
⁶ www.worldbank.org/en/news/press-release/2015/11/30/new-500-million-initiative-to-boost-large-scale-climate-action-in-developing-countries

The TCAF assesses sustainability (as named under b) of an activity based on the technology, policy and financing metrics. Technology sustainability would be assured if the TCAF program uses a technology that is consistent with long-term decarbonisation pathways. The decarbonization pathways on country/sector level are developed through modelling long-term pathways that take a least-cost perspective and avoidance of lock-in effects into consideration. The extent of the transformational impact of a technology should demonstrate a contribution to a system change towards a net-zero development. Pathway consistency is determined by technology specific indicators. Sustainability with regard to the policy dimension is measured by the acceptance of the TCAF supported policy in the host country. Financial sustainability is assessed through the long term strategy that allows mitigation of GHG emissions to continue at a similar or higher level after the public funding has ceased.

The TCAF can be thought of as two-layered. It applies a market mechanism layer by providing verified emission reductions that could be credited under the Article 6 mechanism, but at the same time also applies a climate finance logic by providing results-based climate finance for eligible programs. The TCAF is committed to ensure additionality in both layers. As a crediting mechanism on the sectoral level the TCAF considers the host country to contribute towards domestic mitigation efforts in a particular sector aligned with the countries unconditional NDC target. Only by permitting activities in sectors that are covered by an unconditional NDC would demonstrate in what way additionality could be achieved through the TCAF activity. Furthermore, a second crediting baseline is established. Emissions that are achieved below this more stringent baseline are considered additional and, hereby, creditable. Through this methodology the TCAF wants to ensure additionality in a way that only activities are credited which surmount the current ambition of the host countries and would not appear in the absence of a TCAF intervention.

According to the outline of the TCAF, the increase of ambition can be linked to the creation of a secondary market. The transformational impact is then determined by the ability to mobilize additional public and private finance. It is not clear how the private sector is integrated. The mechanism is designed to be policy-driven in the first place (and less incentives are provided to encourage a secondary market). To generate creditable emission reductions requires using conservative baselines, stringent monitoring and accounting practices.

At the current stage, however, the question whether achieved emissions reductions with support of the TCAF are supposed to be credited under Article 6.2 or Article 6.4 remains open, but it is more likely that the policy-scale design of the activities funded by the facility as well as the orientation along the unconditional target of the host country rather correspond with activities that would fall under Article 6.2. In any case, TCAF activities require a close collaboration with the host countries governments.



Source: own diagram based on World Bank (2018)

Figure 2: TCAF baseline and crediting threshold

2.2.4.2 Advantages and disadvantages of adapting criteria from the TCAF

The question here is in which way Article 6.4 is suitable to allow for sectoral emission crediting and/or to specifically integrate criteria of transformational change as a form of considering long-term emission reductions. Currently, only the general principles of the TCAF baseline methodology are made available. So only general conclusions could be derived if the concept of transformational change can be integrated into the design of Article 6.4. In addition, no information on the role of AFOLU sector was available, which may play an important role to foster net-zero GHG emissions.

Sectoral crediting has the potential to incentivize more ambitious mitigation efforts in the host country by triggering action on a larger scale than a project-based approach. Depending on the setting of the crediting threshold, it would assure additionality and could have a transformational impact on the respective sector hereby leading to long-term impacts in terms of emission reductions. A concern would be for example the definition of the scope of the sector in question, which can be complex and hetero-geneous on the sublevel. The overarching drivers of transformational change refer to processes that scale-up clean technologies, economic incentives that support the transformative processes, involved agents (e.g. governments, private sector, networks), change of societal norms and practices. The assessment of sectoral transformation requires performance criteria that would highly depend on local circumstances and are context specific, but may not be suitable for a carbon market that operates globally. On the other hand, the definition of internationally viable criteria would pose limitations on the assessment of creditable emissions as they would be defined too broadly to determine additionality of an activity. As an additional method an assessment of transformational change could be part of an integrated context specific approach for the selection of activities under Article 6.4. For example the out-comes of a transformative action could be determined through achieving GHG mitigation and sustainable development at a large scale that is sustained over time.

By focusing on technologies in line with long-term decarbonisation and targeting a lasting impact of programs, emphasizing that a credible path that ensures sustainability of emission reductions after the end of financial support should be evident, the TCAF establishes a link towards long-term GHG emissions reduction goals. However, this link remains vague and it is unclear whether there are objective criteria that foster the net-zero objective. If so, these will probably be based on the positive and negative lists for technologies and/or baselines, thereby aligning with the approaches discussed in the preceding section. The other criteria for transformational change can then be seen as soft criteria, making sure the long-term viability of the supported programs. This could be an additional criterion to apply to activities under Article 6.4. However, this would make the hurdles for the eligibility of an activity even higher, which entails the risk of a very limited market volume.

2.2.4.3 Innovation Fund (IF)

The IF has been established by the EU to facilitate the rapid introduction of new low-carbon technologies to enable the low-carbon transition of the EU's economy and to reach its long-term decarbonization goals. The idea is to derisk validated innovative low-carbon technologies that would otherwise not attract commercial finance, and follow them through the pilot, demonstration, and scale-up stages. The legal basis for the operation of the Innovation Fund is Article 10a(8) of the EU ETS Directive (Directive 2003/87/EC, as amended by the Directive 2018/410), supplemented by the Commission Delegated Regulation (EU) 2019/856. The regulation sets the framework for the operation of the fund. The first call for proposals will be launched in 2020⁷.

The financial support will be mainly distributed through grants and the IF intends to cover 60% of relevant costs. The relevant costs are defined as the difference in costs and revenues that arise in a 10 years period after the beginning of operation of the project compared to the same calculation for a conventional technology. In terms of adaptability of the methodology to Article 6.4, it might be an option to choose a reference technology that is referred to in the NDC baseline of a host country and to provide finance for technologies with higher emission reduction potential or even more innovative technologies that are assessed on similar criteria applied in the IF. For example, if the NDC baseline foresees a substitution of coal by gas, a substitution by renewable gases could be credited under Article 6.4 with avoided emissions and relevant costs split based on the comparison with use of natural gas.

⁷ https://ec.europa.eu/clima/policies/innovation-fund_en

The IF shall foster net-zero GHG emissions in the EU in the long-term by targeting cutting-edge technologies with a high long-term abatement potential. Projects eligible under the IF will be selected based on their level of innovation according to pre-defined selection criteria. Projects are assessed on their level of effectiveness of GHG emissions avoidance, innovation, maturity, scalability and cost efficiency. The project pipeline is supposed to support a variety of technologies in various eligible sectors as low-carbon technologies in energy intensive industry, innovative renewable energy generation, energy storage, carbon capture and utilisation (CCU) and CCS, which are meant to be required for long-term decarbonisation. Due to the technological focus, the AFOLU sector does not play a major role under the IF. Accordingly, the list of expected project types may serve as an input to the creation of positive lists described in Section 2.2.2, but will need to be extended, in particular with regard to the AFOLU sector. The latter may play a key role in fostering the net-zero objective by providing carbon sinks, e. g. via afforestation. Illustrative examples of potential projects as outlined in the Commission Delegated Regulation with regard to the operation of the IF (European Commission, 2019) are presented in Table 2.

Table 2: Illustrative examples of potential projects under the Innovation Fund

Category of sectors	Sectors eligible under Article 10a(8) of Directive 2003/87/EC	Examples of potential projects
Renewable energy	Wind energy	<ul style="list-style-type: none"> ▶ Floating off-shore wind power plants ▶ Next generation turbines
	Solar energy	<ul style="list-style-type: none"> ▶ Concentrated solar power plants ▶ Flexible organic cells ▶ Floating photovoltaics installations ▶ Hybrid photovoltaic, concentrating solar power and storage technologies
	Geothermal energy	<ul style="list-style-type: none"> ▶ Enhanced geothermal systems
	Bioenergy	<ul style="list-style-type: none"> ▶ Advanced biofuels
	Ocean energy	<ul style="list-style-type: none"> ▶ Tidal and wave energy technologies
Energy storage	Energy storage	<ul style="list-style-type: none"> ▶ Product innovation (e. g. thermal storage, pumped heat electricity storage, flow batteries, lithium ion or post lithium technology, compressed air and liquid air energy storage) ▶ Process innovation (e. g. block chain technologies and artificial intelligence) ▶ System innovation (e. g. energy management systems and charging stations at ports) ▶ Large scale demonstration of renewable hydrogen production and its use for energy storage (e. g. electrolysis of water coupled with hydrogen storage systems)
Carbon Capture and Storage (CCS)	Carbon Capture and Storage (CCS)	<ul style="list-style-type: none"> ▶ Full chain CCS projects ▶ Part chain CCS projects, with secured storage contracts
Carbon capture and utilisation (CCU)	Carbon Capture and Utilisation	<ul style="list-style-type: none"> ▶ Capturing CO₂ and other carbon containing gaseous effluents and converting them to useable fuels or products

Category of sectors	Sectors eligible under Article 10a(8) of Directive 2003/87/EC	Examples of potential projects
Industry	Manufacture of coke and refined petroleum products	<ul style="list-style-type: none"> ▶ Switching to low carbon hydrogen ▶ Use of alternative sustainable feedstocks
	Manufacture of basic ferrous metals	<ul style="list-style-type: none"> ▶ New smelting reduction technologies ▶ Direct reduction technologies, based on low-carbon hydrogen ▶ Electricity-based steel production ▶ Top gas recycling
	Manufacture of basic non-ferrous metals	<ul style="list-style-type: none"> ▶ Low emission electrolysis ▶ Inert anodes/wetted drained cathodes ▶ Magnetic billet heating ▶ Waste heat recovery
	Cement and concrete product manufacturing	<ul style="list-style-type: none"> ▶ Less carbon cement ▶ Low carbon cement ▶ Changes in concrete composition
	Lime and gypsum product	<ul style="list-style-type: none"> ▶ Increase of CO₂ concentration e. g. by looping ▶ Combination with oxygen-fuel process
	Glass and glass product manufacturing	<ul style="list-style-type: none"> ▶ Electric furnaces ▶ Oxygen-fuel combustion (incl. heat recovery) ▶ Fuel switch to biofuels or low carbon hydrogen ▶ Batch reformulation and batch palletisation (e. g. non-carbonated materials or glass with lower melting temperature)
	Clay product and refractory manufacturing	<ul style="list-style-type: none"> ▶ Electric furnaces and dryers ▶ Design of non-fired or low-fired products ▶ Other product innovations
	Manufacture of paper and paper products	<ul style="list-style-type: none"> ▶ New drying techniques ▶ Foaming of fibrous materials ▶ Black liquor gasification ▶ Enzymatic pre-treatment ▶ Heat recovery; ▶ Electrochemical depolymerisation of lignin.
	Manufacture of chemicals and chemical products	<ul style="list-style-type: none"> ▶ Utilisation or better utilisation of alternative sources of carbon: CO₂, biomass, waste, exhaust gases, residues and recycled materials ▶ Materials “breakthroughs” (e. g. high performance functional materials including lightweight materials for low-carbon energy, mobility and housing) ▶ Utilisation of renewable electricity ▶ Production and use of low carbon hydrogen ▶ Electrified processes including through non-conventional energy forms
Other sectors covered by Annex I to Directive 2003/87/EC	<ul style="list-style-type: none"> ▶ Production of low carbon hydrogen with renewable electricity or with CCS ▶ Innovative low-carbon tyre production 	
Cross-cutting	Cross-cutting projects and industrial symbiosis	<ul style="list-style-type: none"> ▶ Any combination of the above ▶ Carbon capture from several industrial plants, transport of CO₂, utilisation and storage ▶ Production and demonstration of new chemistry large-scale batteries ▶ Low-carbon hydrogen use and storage, and infrastructure projects ▶ Electric charging ▶ Hybrid renewable energy systems ▶ Industrial heat systems using heat pumps

Source: European Commission (2019)

2.2.4.4 EU classification system for environmentally sustainable economic activities

To enhance sustainable finance, the EU Commission’s Technical Expert Group (TEG) on sustainable finance published a draft of an EU classification system for environmentally sustainable economic activities (“EU Taxonomy”) in June 2019 (EU TEG, 2019). This report is intended to set the taxonomy for decisions in future EU legislation. The EU Taxonomy contains an EU classification system and provides guidance on how to screen environmental sustainable activities. According to the EU Taxonomy an economic activity is listed as sustainable if it at least contributes to one of the six defined environmental objectives (climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, transition to a circular economy, waste prevention and recycling, pollution prevention and control, protection of healthy ecosystems), not to undermine the other objectives, and to comply with minimum social safeguards and technical screening criteria. The first report on the EU Taxonomy focuses only the objectives on climate change mitigation and adaptation, but it is supposed to be gradually complimented. The current version of the EU Taxonomy includes eight macro-sectors with corresponding economic activities that are considered to substantially contribute to the mitigation objective. Table 3 shows the macro-sectors and activities that are currently included in the EU Taxonomy.

Table 3: Macro-sectors and economic activities that contribute to the climate change mitigation objective, as selected by the TEG and outlined in the EU Taxonomy

NACE macro-sector	Activities
Agriculture, forestry and fishing	<ul style="list-style-type: none"> Growing of perennial crops Growing of non-perennial crops Livestock production Afforestation Rehabilitation, Restoration Reforestation Existing forest management
Manufacturing	<ul style="list-style-type: none"> Manufacture of Low carbon technologies Manufacture of Low carbon technologies Manufacture of Cement Manufacture of Aluminium Manufacture of Iron and Steel Manufacture of Hydrogen Manufacture of other inorganic basic chemicals Manufacture of other organic basic chemicals Manufacture of fertilizers and nitrogen compounds Manufacture of plastics in primary form

NACE macro-sector	Activities
Electricity, gas, steam and air conditioning supply	<ul style="list-style-type: none"> Production of Electricity from Solar PV Production of Electricity from Solar PV Production of Electricity from Concentrated Solar Power Production of Electricity from Wind Power Production of Electricity from Ocean Energy Production of Electricity from Hydropower Production of Electricity from Geothermal Production of Electricity from Gas Combustion Production of Electricity from Bioenergy Transmission and Distribution of Electricity Storage of Energy Manufacture of Biomass, Biogas or Biofuels Retrofit of Gas Transmission and Distribution Networks District Heating/Cooling Distribution Installation and operation of electric heat pumps Cogeneration of Heat/cool and Power from Concentrated Solar Power Cogeneration of Heat/Cool and Power from Geothermal Energy Cogeneration of Heat/Cool and Power from Gas Combustion Cogeneration of Heat/Cool and Power from Bioenergy Production of Heat/Cool from Concentrated Solar Power Production of Heat/Cool from Geothermal Production of Heat/Cool from Gas Combustion Production of Heat/Cool from Bioenergy Production of Heat/Cool using Waste Heat
Water, sewerage, waste and remediation	<ul style="list-style-type: none"> Water collection, treatment and supply Centralized Wastewater treatment systems Anaerobic Digestion of Sewage sludge Separate collection and transport of non-hazardous waste in source-segregated fractions Anaerobic digestion of bio-waste Composting of bio-waste Material recovery from waste Landfill gas capture and energetic utilization Direct Air Capture of CO₂ Capture of Anthropogenic Emissions Transport of CO₂ Permanent Sequestration of captured CO₂
Transportation and storage	<ul style="list-style-type: none"> Passenger rail transport (inter-urban) Freight rail transport Public transport Infrastructure for low carbon transport Passenger cars and commercial vehicles Freight transport services by road Interurban scheduled road transport Inland passenger water transport Inland freight water transport Construction of water projects
ICT	<ul style="list-style-type: none"> Data processing, hosting and related activities Data-driven solutions for GHG emissions reductions
Construction and real estate activities	<ul style="list-style-type: none"> Construction of new buildings Renovation of existing buildings Individual renovation measures, installation of renewables onsite and professional, scientific and technical activities Acquisition of buildings

Source: EU TEG (2019)

The process for the development of technical screening criteria by the TEG follows three major steps. First, priority sectors were selected based on the amount of GHG emissions and using the EU NACE code industry classification system. Second, the TEG identified and categorized activities within each sector that have a potential to substantially contribute to climate change mitigation. The definition of “substantial” contribution to climate change mitigation was used as provided under Article 6.1, as well as EU’s aim for net-zero in 2050. The EU Taxonomy excludes activities that might result in lock-in into carbon intensive assets. Furthermore, a distinction between economic activities was made based on their contribution to net-zero objective:

- (1) Activities that are already low-carbon with stable and long-term technical screening criteria (“green activities”)
- (2) Activities that contribute to net-zero in 2050, but do not currently achieve a net-zero carbon emissions level with technical screening criteria that will be revised over time as the technology evolves towards net-zero (“greening of” activities)
- (3) Activities that enable low carbon performance or enable substantial emissions reductions (“greening by” activities)

Finally, technical screening criteria were developed consisting of three components: principles (under-lying rationale of the selected activity), metrics, and thresholds.

In the EU Taxonomy, the TEG recognizes the net-zero target for 2050 and acknowledges the need for zero carbon and sequestration technologies. For example, according to the current version of the EU Taxonomy the threshold for passenger cars and commercial vehicles would be eligible as “green” if their emission intensity does not exceed 50g CO₂/km until 2025 and 0g CO₂/km thereafter. Production of electricity from gas combustion is included but only facilities operating at life cycle missions lower than 100g CO₂e/kWh while declining to 0g CO₂e/kWh by 2050 (which would require the use of CCS and/or so-called green gas, i. e. gas produced from renewable energies). Accordingly, the EU taxonomy might be adapted to an application to activities that will fall under Article 6 of the PA.

2.2.4.5 Advantages and disadvantages of adapting criteria from the IF and the EU Taxonomy

Selecting specific innovation criteria for technologies that foster long-term emission reductions is a challenge that is also encountered by the IF. A low threshold for innovation criteria would enable more available options, but neglect to set the focus on impact prioritization, while a high threshold would narrow down the available technologies for selection and define a certain technology pathway (Duwe and Ostwald, 2018). Although not explicitly referred to as additionality in the framework of the IF, the aspect of additionality is met by the definition of the relevant costs that are determined compared to a baseline technology.

The IF has a predominantly European perspective. Therefore, the technologies considered may not be comprehensive. In particular, the AFOLU sector which is important in the context of net-zero GHG emission is not covered. This may limit the potential to transfer the criteria and the methodologies. However, proven innovative technologies that pass the deployment phase have a potential to be transferred and adopted internationally. So the project types expected under the IF may at least form a starting point for the creation of the positive lists to be applied under Article 6.4.

The methodology of splitting avoided emissions and relevant costs has already been established under the NER300 mechanism, which preceded the IF as a funding mechanism for highly innovative technologies on the EU level. With the IF, it is extended to a large a set of sectors and technologies, thereby providing a good data base for applying a similar methodology in the context of Article 6.4. However, the focus of the approach on additional costs with regard to a reference case might also entail a risk of discontinuation in some cases. Therefore, the mechanism design has to ensure that appropriate measures to counteract discontinuation are established in order to support the long-term orientation of emission reductions.

The EU Taxonomy is designed as a tool to increase common understanding among investors, companies, issuers, and political representatives whether an economic activity is environmentally sustainable or “green”. This way investment is supposed to be channeled to have the most impact on sustainable development. The taxonomy also emphasizes the net-zero objective by selecting activities that would substantially contribute to climate mitigation and considers the concurrent development of other sustainable development goals. Once the taxonomy regulation is legislatively implemented, future “green” investments will need to be accompanied by an explanation on how the taxonomy criteria were applied. Established or emerging financial instruments will have to adapt to the proposed taxonomy. By setting ambitious thresholds for what is a substantial contribution, the establishing the economy has a potential to considerably enhance climate mitigation action.

However, the EU taxonomy tries to cover a wide range of economic activities and therefore the current outline of activities in the taxonomy is extensive. The challenge of the taxonomy is that it needs to find a balance between defining eligible activities by the criteria provided above, and not to be too restrictive in the promotion of green investments. Furthermore, for the taxonomy to be successful it is necessary to ensure that it is dynamic and integrates all new advancements in green technologies.

3 Conclusions

The new mechanism defined under Article 6.4 of the PA is supposed to allow for international cooperation with regard to climate change mitigation and thereby enable an increase in overall mitigation. This means that all activities eligible under Article 6.4 need to demonstrate additionality with regard to the NDCs of the countries involved, which is challenging given the continuous increase of ambition of NDCs. Nevertheless, the design of the mechanism under Article 6.4 should also make sure that it is in line with other objectives of the PA. In particular, one of the central objectives of the PA is to reach global net-zero GHG emissions in the second half of the 21st century. So the activities under Article 6.4 should at least not be in conflict with this objective but even better foster national pathways leading to net-zero GHG emission. Building this into the mechanism requires to shift the focus from short- and mid-term considerations to the long-term perspective in one way or another. In the optimal case, this is part of designing the rulebook for Article 6 or CMA rules, but could alternatively be fostered through action by individual host and acquiring countries. Setting the focus on long-term emission reduction strategies is necessary, in particular, for avoiding technological lock-ins that would hinder a full decarbonisation in the long run.

This discussion paper has explored three different approaches that may help to foster the long-term objective of net-zero GHG emissions in the operationalization of Article 6.4, namely:

- ▶ **Positive and negative lists:** Positive and negative lists may be a simple tool to, on the one hand, enable easier eligibility of certain activity types known to be compatible, and, on the one hand, classify certain activity types that are very likely to be incompatible with the long-term objective as ineligible. Nevertheless, there remain certain activity types, for which a more detailed consideration is necessary. Therefore, a three-tiered approach reflecting these three groups of activity types has been identified to be most compelling here. This approach mirrors similar approaches applied to the alignment of investments with the objectives of the PA, classifying them as Paris-aligned, misaligned or conditional.
- ▶ **Additionality with regard to a baseline consistent with both, NDCs and long-term targets:** The use of baselines to demonstrate additionality with regard to NDCs will only foster net-zero emissions in case of an ambitious NDC and even then may partially entail lock-in of GHG emissions the long-term perspective. To tackle the net-zero objective, the baselines need to incorporate long-term targets as well. This long-term perspective can be based on a detailed national pathway to net-zero emissions, e.g. taking into account a country's LT-LEDS, or on science-based targets independent of the detailed situation in the country. As both approaches have advantages and disadvantages, it seems most promising to combine them in a way such that science-based targets guarantee the required level of ambition, while compatibility with the country's LT-LEDS is also ensured.
- ▶ **Adaptation of existing instruments and criteria:** The net-zero objective is also relevant for some existing funding instruments linked to both carbon markets and climate finance. The World Bank's TCAF applies the concept of transformational change to address the long-term perspective of the programs funded by the TCAF. While the concept has some links to the use of baselines and positive lists, it adds some softer criteria about the long-term impact, in particular about the avoidance of discontinuation due to finance and/or acceptance issues. While the EU Taxonomy defines threshold criteria with regard to sustainability for a broad set of technology fields, the EU's Innovation Fund focuses on support for technologies that are needed for net-zero emissions but are often not part of mitigation pathways due to being highly innovative. The costs eligible for funding under the IF are calculated with regard to a reference technology. This concept might be transferred to the mechanism under Article 6.4 to split both the avoided emissions and the relevant costs between a reference mitigation technology and an innovative one to be traded via the mechanism. Moreover, the project types expected under the IF and the EU Taxonomy may serve as an input to the compilation of positive lists for Article 6.4.

The detailed discussion of the approaches has shown that the approaches should not be seen as mutually exclusive but rather as complementary to each other. In addition, although they are at least partially addressing additionality as well, they cannot be a full replacement for checking additionality. Working with baselines instead of positive/ negative lists has the benefit that there is no need to explicitly “pick technologies”. On the other hand, developing baselines in line with long term zero emissions may be cumbersome, if not science based target approach is used. Another important observation is that there is not much information on the AFOLU sector yet, which may play a key role for fostering net-zero GHG emissions. From the analyses in this report, two storylines emerge how to combine aspects of the different approaches in a reasonable way to foster the long-term objective of net-zero GHG emissions under Article 6.4:

- ▶ If politically feasible, the most straight-forward approach would be to use the three-tiered approach corresponding to negative and positive lists in the first step. This means to sort out certain activity types in the beginning by establishing positive and negative lists, while the eligibility of activity types that are neither on the positive list nor on the negative list will be conditional to the application of further criteria. The positive list could make use of the list of project types expected under the IF and the EU Taxonomy. In the next step, the remaining activity types would be assessed based on comparison with a baseline that should demonstrate both additionality and compatibility with a long-term mitigation pathway in line with the net-zero objective. In a third step, buyers with particular high standards could in addition apply further relevant criteria of transformational change, thereby reducing the risk of discontinuation and supporting a sustainable transition of the host country.
- ▶ However, as has been argued in Section 2.2.2, positive and negative lists will face high political barriers and are also in danger of experiencing strong influence from lobbying organisations. Therefore, such kind of lists are more likely to be established as buying criteria by individual buyers. In this case, they would be still complementary to the other approaches but the ordering would be changed. In this case, the starting point would be the inclusion of baselines compatible with the long-term targets in the proof of additionality, thereby excluding activities with only short-term effects in addition to NDCs and/or activities becoming the reference case in the longer term. The split of avoided emissions and relevant costs between the activities and reference cases could follow the methodology of the IF, at least for those project types covered by the IF as well. Nevertheless, some of the remaining eligible activities may still be seen to be not in line with the long-term objective or contradict the requirements of transformation change. Then, individual buyers could classify these based on positive and negative list, but also apply additional criteria for policy and financial sustainability to foster a transformational change.

Looking ahead, it will probably be rather difficult to establish mechanisms that foster the long-term objective of net-zero GHG emissions in the operationalisation of Article 6.4, at least in the short term because the Article 6 negotiations are currently highly contentious even without consideration of the long-term aspects discussed here. In particular, the long-term aspects would pose an additional burden for a transfer of the existing mechanisms to the new context. Nevertheless, there is the need to at least have a clear roadmap of how to achieve compliance of the mechanism with the net-zero objective in the longer term. The options discussed here provide some potential avenues. Given the unclear political feasibility of each of the approaches, it seems important not to stick to one approach only, but to be flexible in establishing any of it, whenever a window of opportunity turns up. In this context, for higher ambitious an implementation under a club approach by a group of countries seems more feasible as the first step, while taking into account that robust rules to assure environmental integrity must apply to all participants of the mechanism.

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