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Design Options for the New International Market Mechanism under Article 6.4 of the Paris Agreement

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Design Options for the New International Market Mechanism under Article 6.4 of the Paris Agreement

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Kurzbeschreibung

Artikel 6 des Pariser Abkommens legt drei Ansätze fest, nach denen die Vertragsparteien bei der Erreichung ihrer national festgelegten Beiträge (NDCs) zusammenarbeiten. Einer dieser Ansätze ist ein neuer Mechanismus gemäß Artikel 6.4, der zur Minderung der Treibhausgasemissionen und zur Unterstützung einer nachhaltigen Entwicklung beitragen soll. Die detaillierten Regeln, Modalitäten und Verfahren zur Umsetzung des Mechanismus werden derzeit noch verhandelt. Ziel dieses Projekts war es, durch die Analyse einer Reihe von Ausgestaltungsfragen zur Entwicklung der Regelungen für den neuen Mechanismus beizutragen:

- Welche Optionen existieren, um eine allgemeine Minderung der globalen Emissionen zu erreichen, wie es in Art. 6.4(d) des Pariser Abkommens vorgeschriebenen ist?
- Inwieweit können Baselines auf der Grundlage von Werte für beste verfügbare Technologien (BVT) festgelegt werden?
- Wie kann der neue Mechanismus genutzt werden, um die Ambition der NDCs zu erhöhen, wie in Art. 6.1 des Pariser Abkommens gefordert wird?
- Welche Rolle kann der freiwillige Kohlenstoffmarkt bei der Erhöhung der Ambitionen spielen?
- Welche Anreize können für private Unternehmen geschaffen werden, sich an dem neuen Mechanismus zu beteiligen?
- Welche Rolle kann Artikel 6 auf dem Weg zu einer (netto) emissionsfreien Welt spielen?

Im Verlauf des Projekts wurden diese Fragen und mögliche Lösungen in sechs Arbeitspapieren analysiert. Darüber hinaus wurden die wichtigsten Ergebnisse des Projekts in einem Workshop am 30. Oktober 2018 diskutiert. Der vorliegende Bericht fasst die Ergebnisse aus den Arbeitspapieren und dem Workshop zusammen und setzt sie in Beziehung zum Stand nach den Verhandlungen nach der Klimakonferenz in Madrid (CoP 25) im November 2019.

Abstract

Article 6 of the Paris Agreement establishes three approaches for Parties to cooperate in achieving their nationally determined contributions (NDCs). One of these approaches is a new mechanism “to contribute to the mitigation of greenhouse gas emissions and support sustainable development” (Art. 6.4(a)). The detailed rules, modalities and procedures (RMP) for the operationalization of this mechanism are currently being negotiated. The aim of this project has been to contribute to the development of the RMP for the new mechanism by analysing a range of design questions:

- What are options for achieving an overall mitigation of global emissions, as mandated by Art. 6.4(d) of the Paris Agreement?
- In how far can baselines be established on the basis of best available technology (BAT) values?
- How can the new mechanism be used to raise the ambition of nationally determined contributions (NDCs), as mandated by Art. 6.1 of the Paris Agreement?
- What role can the voluntary carbon market play in raising ambition?
- Which incentives can be created for private companies to participate in the new mechanism?
- What role can Article 6 play on the way towards a (net) zero emissions world?

Over the course of the project, these questions and possible solutions were analysed in six working papers. In addition, key findings of the project were discussed in a workshop on 30 October 2018. This report synthesises the findings from the working papers and the workshop and relates them to the status after the negotiations after the climate conference in Madrid in November 2019 (CoP 25).

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List of Abbreviations

ACCUs	Australian carbon credit units
AFOLU	Agriculture, forestry and land use
BAT	Best Available Technology
BAU	Business as usual
BF	Blast furnace
BOD	Biological Oxygen Demand
BOF	Basic oxygen furnace
BREF	Best Available Techniques Reference Documents
CAFE	Corporate Average Fuel Economy
CBA	Cost-benefit analysis
CBDRC	Common but differentiated responsibilities and respective capabilities
CCAP	Center for Clean Air Policy
CCS	Carbon Capture and Storage
CCU	Carbon capture and utilisation
CDM	Clean Development Mechanism
CDM EB	CDM Executive Board
CDP	Carbon Disclosure Project
CERs	Certified emission reductions from the CDM
CHP	Combined heat and power
CLI	Climate Ledger Initiative
CMA	Conference of the Parties serving as Meeting of the Parties to the Paris Agreement
CO_2	Carbon dioxide
CO_2eq	CO_2 equivalent
COD	Chemical oxygen demand
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CSI	Cement Sustainability Initiative
CSR	Corporate Social Responsibility
DCC	Domestic Climate Contribution
DDPP	Deep Decarbonisation Pathway Project
DEHSt	Deutsche Emissionshandelsstelle
DRI	Direct reduced iron
EAF	Electric arc furnace
ERU	Emission Reduction Units
ETS	Emission Trading System

EU	European Union
EU ETS	European Union Emission Trading Scheme
EUA	EU Allowance Unit
GHG	Greenhouse Gases
GNR	Getting the numbers right
GWP	Global Warming potential
HBEFA	Handbook Emission Factors for Road Transport
HFC-23	Fluoroform
IED	Industrial Emissions Directive
IF	Innovation fund
IMO	International Maritime Organization
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control
IRR	Internal Rate of Return
ITL	International Transaction Log
ITMO	Internationally Transferred Mitigation Outcomes
JI	Joint Implementation
LCTPI	Low Carbon Technology Partnerships initiative
LDCs	Least developed countries
LEDS	Low Emission Development Strategies
LT-DC	Long-term determined contribution
LT-LEDs	Long-term Low Emissions Development Strategies
LULUCF	Land use, land-use change and forestry
MAPS	Mitigation Action Plans and Scenarios
MOs	Mitigation Outcomes
MRV	Measurement, Reporting, Verification
N_2O	Nitrous oxide
NC	National Communication
NDC	Nationally determined contribution
NET	Negative emissions tehcnology
PA	Paris Agreement
PDDs	Project Design Documents
PFC	Perfluorcarbon
PMR	World Bank's Partnership for Market Readiness

PoA	Programme of activities
RCCs	Regional Collaboration Centres
REDD+	Reducing Emissions from Deforestation and Forest Degradation, and the Role of Conservation of Forest Carbon Stocks, Sustainable Management of Forests and Enhancement of Forest Carbon Stocks
RMP	Rules, modalities and procedures (for the new mechanism under Article 6.4)
SBSTA	Subsidiary Body for Scientific and Technological Advice
SIDS	Small island developing states
TCAF	Transformative Carbon Asset Facility
TEG	Technical Expert Group
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCU	Verified Carbon Unit
WSA	World Steel Association
WWTP	Wastewater treatment plants

Zusammenfassung

Hintergrund und Umfang des Projekts

Artikel 6 des Pariser Abkommens etabliert drei Ansätze, nach denen die Vertragsparteien bei der Erreichung ihrer national festgelegten Beiträge (NDCs) zusammenarbeiten können. Einer dieser Ansätze ist ein neuer Mechanismus, der darauf gerichtet ist "die Minderung der Emissionen von Treibhausgasen zu fördern und gleichzeitig die nachhaltige Entwicklung zu unterstützen" (Art. 6.4(a)). Das Nebenorgan der UNFCCC für wissenschaftliche und technologische Beratung (SBSTA) wurde beauftragt, Entwürfe von Regeln, Modalitäten und Verfahren (rules, modalities and procedures, RMP) für diesen Mechanismus zu entwickeln, die von der als Tagung der Vertragsparteien des Pariser Abkommens (CMA) fungierenden Konferenz der Vertragsparteien der UNFCCC geprüft und angenommen werden sollen.

Das Ziel dieses Projekts war es, durch die Analyse einer Reihe von Designfragen zur Entwicklung der Regelungen für den neuen Mechanismus beizutragen:

- Welche Optionen gibt es, um eine allgemeine Minderung der globalen Emissionen zu erreichen, wie in Art. 6.4(d) des Pariser Abkommens vorgeschriebenen?
- Inwieweit können Baselines auf der Grundlage von Werten für beste verfügbare Technologien (BVT) festgelegt werden?
- Wie kann der neue Mechanismus genutzt werden, um die Ambition der NDCs zu erhöhen, wie in Art. 6.1 des Pariser Abkommens gefordert wird?
- Welche Rolle kann der freiwillige Kohlenstoffmarkt bei der Erhöhung der Ambitionen spielen?
- Welche Anreize können für private Unternehmen geschaffen werden, sich an dem neuen Mechanismus zu beteiligen?
- Welche Rolle kann Artikel 6 auf dem Weg zu einer (netto) emissionsfreien Welt spielen?

Im Verlauf des Projekts wurden diese Fragen und mögliche Lösungen in einer Reihe von Arbeitspapieren analysiert, eines für jede der genannten Fragen. Die Untersuchung wurde hauptsächlich als Recherche vom Schreibtisch durchgeführt. Zusätzlich wurde für die Frage zum freiwilligen Markt eine Reihe von Marktakteuren befragt. Darüber hinaus wurden die wichtigsten Ergebnisse des Projekts in einem Workshop am 30. Oktober 2018 diskutiert. Der vorliegende Bericht fasst die Ergebnisse aus den Arbeitspapieren und dem Workshop zusammen und setzt sie in Beziehung zum Stand nach den Verhandlungen nach der Klimakonferenz in Madrid (COP 25) im November 2019.

Erreichen einer allgemeinen Minderung der globalen Emissionen

Definition der allgemeinen Minderung

Das Ziel, "eine allgemeine Minderung der weltweiten Emissionen zu erreichen" (Art. 6.4(d)) ist eine Schlüsselinnovation des Mechanismus nach Artikel 6.4. Der neue Mechanismus soll damit nicht das "Nullsummenspiel" der Kyoto-Mechanismen fortsetzen, bei denen jede Tonne der erzielten Emissionsminderung vom Käufer der jeweiligen Emissionsgutschriften zur Erfüllung seiner Kyoto-Verpflichtung verwendet werden kann. Mit dem neuen Mechanismus sollen weltweit mehr Emissionsreduktionen erreicht werden, als ohne den Einsatz des Mechanismus' erreicht worden wären.

Allerdings ist das Konzept der allgemeinen Minderung bisher von den Parteien nicht klar definiert worden. Insbesondere muss es klar von der Anforderung in Artikel 6.1 abgegrenzt werden, den klimapolitischen Ehrgeiz zu erhöhen. Dieser Bericht schlägt die folgende Begriffsabgrenzung vor:

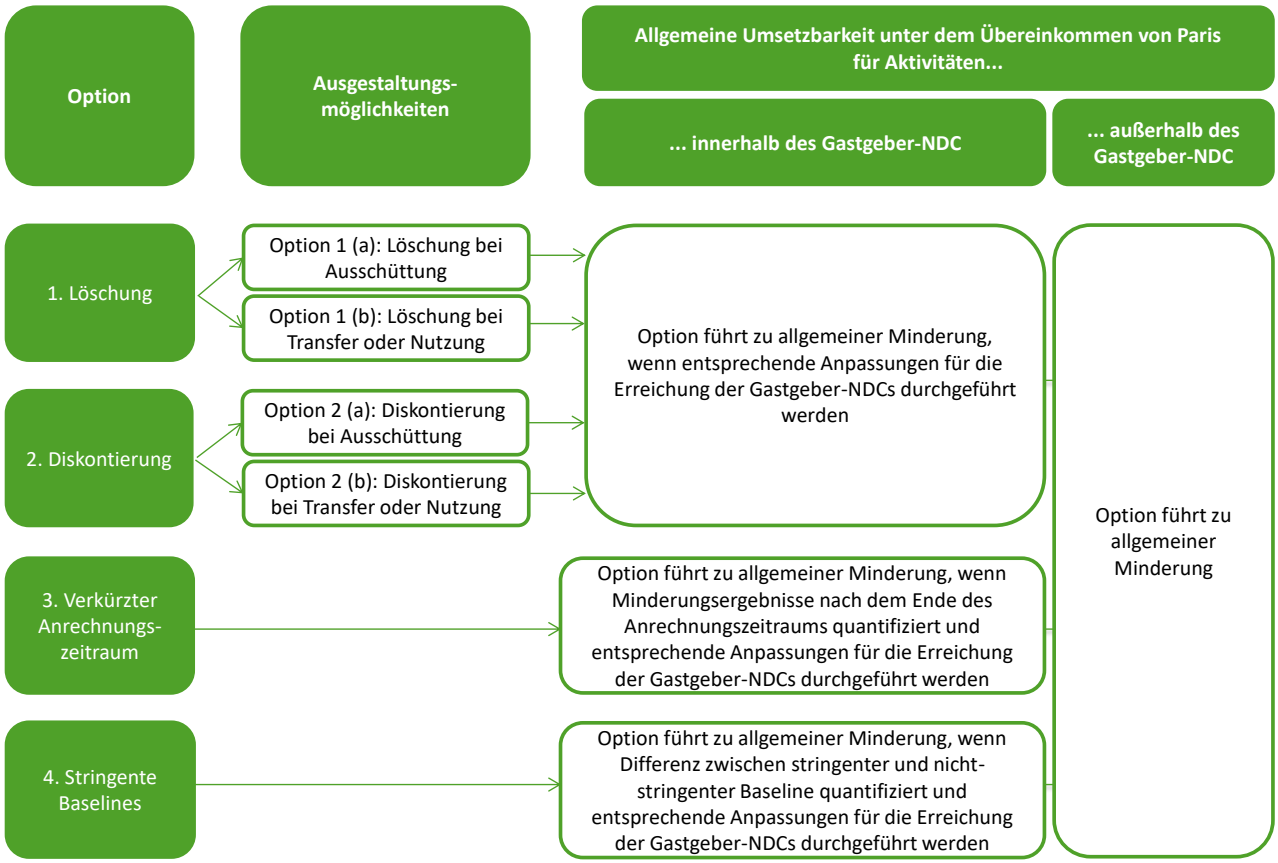
- Das Konzept der **Anhebung der Ambitionen** umfasst die Ziele *und* Maßnahmen der Parteien, die diese auf eigene Initiative ergreifen.

- Das Konzept der **allgemeinen Minderung** umfasst den Netto-Klima-Nutzen von Aktivitäten unter Artikel 6.4, der sich aus den Regelungen des Mechanismus ergibt.

Optionen zur Erzielung einer Gesamtreduzierung globaler Emissionen und ihre Anwendbarkeit im Rahmen des Pariser Abkommens

Auf dieser Grundlage liefert der Bericht einen Überblick darüber, welche Optionen zur Verfügung stehen, damit der Mechanismus nach Artikel 6.4 zu einer allgemeinen Minderung beiträgt. Abbildung 1 gibt einen Überblick über die Optionen, die in dem Bericht betrachtet werden.

Abbildung 1: Überblick über die Gestaltungsoptionen und ihre allgemeine Durchführbarkeit im Rahmen des Pariser Abkommens



Quelle: Eigene Zusammenstellungen, Wuppertal Institut.

Es ist anzumerken, dass nach der Literatur, die für diesen Bericht ausgewertet wurde, kein großer Unterschied zwischen Diskontierung und Löschung besteht, wenn sie bei der Übertragung oder Nutzung von Einheiten umgesetzt werden. In beiden Fällen wird die Gesamtminderung durch die Herausnahme von Einheiten aus dem System erreicht. Der SBSTA-Verhandlungstext aus Katowice sah die "Löschung" in der Transferphase und die "Diskontierung" in der Nutzungsphase vor. Wir beschlossen jedoch, die Definitionen der Begriffe, wie sie in der Literatur verwendet werden, beizubehalten. Im aktuellen Verhandlungstext findet Diskontierung keine Erwähnung.

Es muss auch festgestellt werden, dass es noch keine Einigung darüber gibt, wie entsprechende Anpassungen vorgenommen werden sollen. Würden sie nur für internationale Transfers und nicht direkt

bei der Ausgabe angewandt, würden Löschung und Diskontierung bei der Ausgabe nicht zu einer Gesamtminderung führen; stattdessen käme die Minderungsleistung dem Gastgeberland zugute.

Differenzierung: Alle diese Optionen können entweder gleichermaßen auf alle emissionsmindernden Aktivitäten angewandt werden oder sie können differenziert werden, um bestimmte Arten von Aktivitäten oder Sektoren oder Aktivitäten innerhalb bestimmter geographischer Grenzen zu begünstigen. Während es möglich sein mag, in internationalen Verhandlungen über Artikel 6 einen politischen Konsens über die geographische Differenzierung zu erzielen, kann sich eine unterschiedliche Behandlung bestimmter Arten von Aktivitäten oder Sektoren als politisch schwierig zu vereinbaren erweisen, insbesondere im Hinblick auf Diskontierung und Löschung.

Schließlich kann die ausführende Stelle die Gesamtminderung der globalen Emissionen erheblich beeinflussen. Es ist noch nicht entschieden, ob das Gastgeberland oder das Empfängerland oder ein Verwalter des Anrechnungsmechanismus auf UN-Ebene die Option(en) zur Erreichung der Gesamtreduzierung umsetzen würde(n).

Bewertung von Optionen

Die Bewertung der in diesem Bericht diskutierten Optionen zur Erzielung einer globalen Gesamtreduzierung der globalen Emissionen geht davon aus, dass die Modalitäten und Verfahren des Mechanismus gewährleisten können, dass nur tatsächliche Emissionsreduktionen angerechnet werden. Der Bericht bewertet die Optionen auf der Grundlage der folgenden Kriterien:

- Die Einfachheit der Implementierung
- Die Anwendbarkeit auf verschiedene Aktivitäten und Sektoren
- Die Transparenz der Option
- Das Potenzial für eine allgemeine Minderung
- Die Auswirkungen der Option auf den internen Zinsfuß
- Die Sicherheit, dass eine allgemeine Minderung erreicht wird

Die Bewertung zeigt, dass alle diskutierten Optionen klare Vor- und Nachteile haben.

- Alles in allem scheint die **Umsetzung auf UN-Ebene** die positivsten Ergebnisse zu bringen. Sie würde am ehesten ein hohes Maß an Transparenz gewährleisten und das Risiko von Doppelzählungen verringern, da sie in der Lage ist, relevante Buchhaltungsaufgaben zu zentralisieren. Eine Umsetzung auf UN-Ebene würde auch eine leichtere Überwachung und durchgängige Anwendung von Standards und Verfahren gewährleisten, was die technische Anwendbarkeit erleichtern würde.
- **Eine Differenzierung** der Optionen nach Aktivitäten, Sektoren oder geographischen Regionen kann die Wirksamkeit des Mechanismus' erhöhen, indem sie Möglichkeiten zur Bevorzugung von Aktivitäten bietet, die sonst nicht durchgeführt würden, z.B. Aktivitäten in benachteiligten Sektoren oder geographischen Regionen. Sie verringert jedoch die Kostenwirksamkeit des Mechanismus' und erschwert die technische Umsetzung. Darüber hinaus kann es sehr schwierig sein, eine politische Einigung über bestimmte Aktivitäten oder zu begünstigende Sektoren zu erzielen. Die Bevorzugung bestimmter geographischer Regionen wie der am wenigsten entwickelten Länder und der kleinen Inselstaaten ist dagegen im Rahmen der UNFCCC bereits gängige Praxis und möglicherweise praktikabler. Eine Differenzierung nach Aktivitäten ist vermutlich politisch am ehesten durchführbar, wenn sie auf der Ebene der Methoden erfolgt, da in diesem Fall die Diskussionen über die wirtschaftliche Tragfähigkeit der jeweiligen Aktivitäten auf einer sachlichen Grundlage stattfinden könnten.
- **Löschung und Diskontierung** bei Ausgabe, Übertragung oder Nutzung ohne Differenzierung sind die am einfachsten umzusetzenden und anzuwendenden Optionen.
- **Verkürzte Anrechnungszeiträume** haben viele Vorteile, darunter eine hohe Transparenz, eine relativ einfache Umsetzung und Anwendbarkeit und ein hohes Potenzial für eine allgemeine

Minderung sowie ein Backloading von Mindereinnahmen, was die positiven Auswirkungen auf den internen Zinsfuß einer Aktivität erhöht, wenn die Gutschriftfristen am Ende des Lebenszyklus' einer Aktivität verkürzt werden. Die Verschiebung der Vorteile für die Atmosphäre ist jedoch ein schwerwiegender Nachteil dieser Option. Darüber hinaus haben Anlagenbetreiber keinen Anreiz, die Überwachung und Verifizierung nach dem Ende des Anrechnungszeitraums fortzusetzen. Die Überwachungs- und Verifizierungskosten müssten daher wahrscheinlich aus anderen Quellen gedeckt werden, z.B. aus den Einnahmen des Aufsichtsgremiums. Eine Verkürzung der Anrechnungszeiträume zu Beginn eines Projekts würde diese Probleme beseitigen, aber den internen Zinsfuß und damit die Wirtschaftlichkeit der Aktivitäten ernsthaft verringern.

- **Strenge Baselines** können dort am nützlichsten sein, wo Anreize für innovative Technologien geschaffen werden können, da dieser Vorteil den hohen Arbeitsaufwand, der für die Umsetzung dieser Option erforderlich wäre, übertreffen könnte.

Letztendlich hängt es von der Gewichtung der verschiedenen Kriterien ab, welche Option man wählt und wie man sie gestaltet. Wenn eine einfache Umsetzung und Anwendbarkeit auf alle Arten von Aktivitäten im Vordergrund stehen, sind Löschung und Diskontierung ohne Differenzierung eindeutig die geeignetsten Optionen. Wenn dagegen Transparenz und die Option, bestimmte Minderungsaktivitäten, Sektoren oder geographische Regionen zu bevorzugen, als wichtig erachtet werden, sind differenzierte Anrechnungszeiträume und strenge Baselines die günstigsten Optionen.

Nach dem letzten Textentwurf aus Madrid (UNFCCC 2019b) würde die allgemeine Minderung dadurch umgesetzt, dass der Verwalter des Registers des Mechanismus' einen Prozentsatz der vergebenen A6.4ERs auf ein Löschungskonto im Register transferiert. Dieser Ansatz stünde im Einklang mit den in diesem Bericht verwendeten Definitionen, nach denen die allgemeine Minderung aus der Konstruktion des Mechanismus' resultiert und obligatorischer Natur ist. Die Löschung bei der Ausgabe ist auch die als am einfachsten identifizierte Option. Die Diskussionen über diesen Punkt waren jedoch höchst umstritten, es bleibt abzuwarten, ob sich die Parteien am Ende auf diesen Ansatz einigen werden.

Benchmarks zur Bestimmung von Baselines für Minderungsmaßnahmen gemäß dem Mechanismus nach Artikel 6.4

Hintergrund

Die Festlegung von Baselines mit weltweit anwendbaren und strengen Benchmarks kann ein wichtiges Instrument für die Ausweitung der Marktmechanismen nach Artikel 6 sein. Die Festlegung von Baselines auf der Grundlage von Business-as-usual (BAU)- und NDC-Zielen ist eine Herausforderung, da die Ziele ungewiss, manchmal unklar oder nur von begrenzter Reichweite sind. Benchmarks können eine effiziente und einfache Lösung darstellen. Dies beruht auf dem Grundsatz, dass stringente Benchmarks zu Baselines führen, die automatisch unter den BAU liegen und zu einem Emissionsverlauf führen, der mit dem NDC-Ziel des jeweiligen Landes vereinbar ist. Die Analyse in diesem Bericht konzentriert sich auf globale Benchmarks im Sinne von einfachen Referenzwerten für bestimmte Produkte und Dienstleistungen, die unabhängig von einem bestimmten Land sind und global oder auf der Ebene von Ländergruppen (z.B. Länder mit niedrigem/mittleren/hohem Einkommen) angewandt werden können.

Benchmarking ist ein weit verbreiteter Begriff und beschreibt einen Standard oder eine Reihe von Standards, die als Bezugspunkt für die Bewertung der Leistung oder des Qualitätsniveaus verwendet werden können. Im Zusammenhang mit Artikel 6.4. betrachten wir Benchmarking als einen Vergleich in Bezug auf THG- oder CO_2-Emissionen und in einigen Fällen auch in Bezug auf Energie.

Für die Definition eines Benchmarks können verschiedene Ebenen verwendet werden. Beispiele sind das durchschnittliche Leistungsniveau, der Durchschnitt der besten 20%/10%/ x% der besten Per-

former (z.B. angewandt im Rahmen des EU-ETS (10%) und teilweise im CDM (20%)), das beste erreichte Niveau oder das beste verfügbare Niveau (siehe z.B. pmr 2017).

Benchmarks werden häufig als Managementinstrument zur Überwachung der Unternehmensleistung eingesetzt, aber auch in der Energie- und Klimapolitik finden sie immer häufiger Verwendung. Das bekannteste Beispiel dafür ist das EU-ETS, für das 59 Produktbenchmarks entwickelt wurden. Diese Benchmarks dienen dazu, die kostenlose Zuteilung von Zertifikaten an Betreiber von Industrieanlagen zu bestimmen. Es wurden auch Fallback-Benchmarks für Emissionen aus dem Wärme- und Brennstoffverbrauch entwickelt. Auch andere Länder wie Südkorea und die Schweiz verwenden Benchmarks in ihren Emissionshandelssystemen.

Verwendung von Benchmarks für Gutschriftensysteme

Im Gegensatz zum Emissionshandel, bei dem ein Benchmark verwendet wird, um die Anzahl der zugeteilten Zertifikate zu bestimmen, wird in einem Gutschriftensystem der Benchmark zur Definition der Baseline-Emissionen verwendet. Die Menge der Gutschriften, die ausgegeben werden können, wird anschließend durch die Differenz zwischen dem Benchmark und der Leistung der Anlage (die überwacht werden muss) bestimmt. Die Tatsache, dass Benchmarks verwendet werden, um die Baseline zu definieren (und nicht den Standard, der erreicht werden sollte), bedeutet auch, dass einige der bestehenden Benchmarks in diesem Zusammenhang nicht geeignet sind. Beispielsweise bietet ein auf der besten verfügbaren Technologie basierender Benchmark möglicherweise nicht genügend Spielraum, um weitere Emissionsreduktionen im Vergleich zu diesem Benchmark anzurechnen.

Paragraph 48c der Modalitäten und Verfahren für den CDM erlaubt heute ausdrücklich den Einsatz von Benchmarking. In der Realität wird es jedoch nur selten angewendet. Doch im Gegensatz zum CDM, bei dem jedes Projekt seine eigene Baseline auf der Grundlage der Spezifikationen innerhalb der Methodik bereitstellt, könnte die Verwendung von Benchmarks für die Definition einer Baseline die Transparenz erhöhen, die Verwaltungskosten senken und dazu beitragen, die ökologische Integrität des Anrechnungssystems zu erhöhen, indem eine Überkreditierung verhindert wird.

Es können mehrere verschiedene potenzielle Quellen für Referenzwerte in Betracht gezogen werden:

- Referenzdokumente für die besten verfügbaren Techniken, die sowohl im Rahmen der IPPC-Richtlinie (2008/1/EG) als auch später im Rahmen der Richtlinie über Industrieemissionen (IED, 2010/75/EU) angenommen wurden.
- Daten aus CDM-Projekten für die relevanten Sektoren.
- Produkt-Benchmarks im Zusammenhang mit dem EU-ETS.
- Energieeffizienzstandards für bestimmte Rechtsgebiete.
- Daten zur Kohlenstoffintensität, wie sie von sektoralen Organisationen gesammelt werden, wie z.B. in der *Cement Sustainability Initiative* oder Daten über vorgelagerte Emissionen der Ölindustrie.

Für die Entwicklung von Benchmarks im Rahmen des EU-ETS wurden im Vorfeld 11 Leitprinzipien entwickelt (Ecofys und ISI 2008). Sie beschreiben, was - aus theoretischer Sicht - gute Benchmarks beachten sollten. Während jedoch die EU-ETS-Benchmarks und damit die zugrundeliegenden Leitprinzipien auf den ersten Blick einen guten Ausgangspunkt für die Diskussion zu bieten scheinen, stößt man im Detail auf Schwierigkeiten bei der Anwendung von Benchmarks im Zusammenhang mit internationalen Gutschriften (im Gegensatz zur Verknüpfung von ETS). Erstens werden nicht alle Anlagen, sondern nur einige, entweder neue oder erheblich verbesserte Anlagen, den Benchmark auf freiwilliger Basis anwenden (Selbstauswahl der Anlagen). Zweitens ist die Anwendung ähnlicher Benchmarks in allen Ländern nicht unbedingt die beste Lösung. Für Produkte, die auf dem globalen Markt konkurrieren, scheinen zwar gleiche Wettbewerbsbedingungen angemessen zu sein, im internationalen Kontext können jedoch Unterschiede in den nationalen Gegebenheiten und das UNFCCC-Prinzip der gemeinsamen, aber differenzierten Verantwortlichkeiten und der entsprechenden Fähig-

keiten es erforderlich machen, den nationalen Kontext bei der Festlegung der Benchmarks zu berücksichtigen.

Kriterien für die Auswahl von Benchmarks

Ausgehend von DEHSt (2013) sind die folgenden allgemeinen Kriterien für die Entwicklung eines Benchmarking-Ansatzes im internationalen Kontext notwendig:

- Klare Definition der Systemgrenzen
- Angemessene Definition des Leistungsindikators/Benchmark
- Verfügbarkeit von Daten zur Bestimmung des Benchmark-Niveaus
- Ähnliche Benchmarks für ähnliche Produkte in ähnlichen Ländern
- Benchmark-Niveaus sollten Anreize für Investitionen in kohlenstofffreie und kohlenstoffarme Technologien schaffen
- Verschärfung im Laufe der Zeit
- Verfügbarkeit von Daten für die Leistungsbewertung

Zusätzlich zu diesen allgemeinen Kriterien erfordert die Verwendung von Benchmarks nach Artikel 6.4 auch spezifische Anforderungen. Insbesondere muss die Anrechnungsbasis nicht nur unter den BAU-Emissionen, sondern auch in Übereinstimmung mit den nationalen NDC-Zielen liegen. Der Benchmark muss auch mit dem Pariser Abkommen in Einklang stehen, was bedeutet, dass der Benchmark keinen Anreiz für den Bau von Anlagen bieten sollte, die nicht mit dem zur Erfüllung der Pariser Vereinbarungen erforderlichen Emissionsminderungspfad in Einklang stehen. Darüber hinaus sollte der Benchmark auch auf ein breites Spektrum von Ländern anwendbar sein, oder es werden unterschiedliche Benchmarks für verschiedene Kategorien von Ländern (z.B. nach Einkommen) entwickelt. Und schließlich sollte es einen transparenten und wissenschaftlich fundierten Prozess zur Festlegung von Benchmarks geben.

Kapitel 3.2 dieses Berichts befasst sich mit den Datenquellen und erörtert mögliche Arten von Benchmarks für die wichtigsten Bereiche (Industrie einschließlich Energieverbrauch, Energieerzeugung, Wohnungsbau, Verkehr und Abwassermanagement). Darüber hinaus gibt es drei detaillierte Fallstudien zu Zement, Stahl und Abwasserbehandlung (Kapitel 3.4).

In der folgenden Tabelle werden wichtige Kriterien bewertet, die die Eignung von Benchmarks für ausgewählte Sektoren definieren. Die Kriterien sind: die Verfügbarkeit von Daten (für Aktivitätsniveaus und Benchmark-Daten); die Verfügbarkeit globaler Benchmarks (im Vergleich zur Notwendigkeit, sie für bestimmte Länder oder Regionen zu differenzieren); und der Beitrag des Kohlenstoffmarktes zur Rentabilität (um sich auf Projekte zu konzentrieren, die im Vergleich zu dem, was normalerweise eintreten würde, zusätzlich sind). Ein angemessenes Niveau der Datenverfügbarkeit ist von entscheidender Bedeutung, sei es für Benchmarks, die rein regelbasiert (durch Verwendung einer Formel, z.B. als ein bestimmtes Perzentil der Marktleistung) oder durch Expertenurteil (unter Berücksichtigung von Ambition und Technologiesprüngen) bestimmt werden. Im Allgemeinen ist die Datenverfügbarkeit in Entwicklungsländern, in eher informellen Industrien und im Privatsektor eingeschränkt. Das Pariser Abkommen verlangt auch die regelmäßige Aktualisierung von Benchmarkwerten, z.B. synchron zum 5-Jahres-NDC-Zyklus, um zu verhindern, dass sich Technologien, die möglicherweise nicht mit dem langfristigen Ziel des Pariser Abkommens in Einklang stehen, festsetzen.

Tabelle 1: Bewertung von Kriterien, die die Eignung von Benchmarks für ausgewählte Sektoren definieren

(Sub-)Sektor	Verfügbarkeit von Aktivitätsdaten	Verfügbarkeit von Benchmark-Daten	Verfügbarkeit von globalen Benchmarks	Beitrag des Kohlenstoffmarktes zur Rentabilität
Energieverbrauch der Industrie - Produkt-Benchmarks	***	**	**	*
Energieverbrauch der Industrie - andere Benchmarks	**	*	*	*
Prozessemissionen der Industrie	***	**	***	***
Energieerzeugung	***	**	**	*
Wohnen	**	*	*	*
Transport - allgemein	*	*	*	*
Verkehr - Kraftstoffeffizienznormen	**	**	**	*
Abwasser	**	*	*	***

Quelle: Eigene Analyse. Schlüssel: * = niedrig, ** = mittel, *** = hoch

Empfehlungen

Der Beitrag der Kohlenstoffmärkte zur Rentabilität eines Projekts ist in den verschiedenen Sektoren sehr unterschiedlich. Bei Windprojekten trugen die Auswirkungen der Kohlenstoffeinnahmen im Rahmen des CDM im Durchschnitt weniger als drei Prozentpunkte zu dessen Rentabilität (interner Zinsfuß) bei. Im Gegensatz dazu liegt z.B. bei Deponiegasprojekten, bei denen das hohe globale Erwärmungspotential des vermiedenen Methans zu wesentlich höheren Einnahmen aus Kohlenstoffmärkten führt, der Einfluss auf die Rentabilität im Durchschnitt in der Größenordnung von 14 bis 15 Prozentpunkten (Cames et al. 2016). Dieses Problem ist nicht benchmarking-spezifisch. Bei der Identifizierung von Sektoren, die sich am besten für die Verwendung von Benchmarks nach Artikel 6.4 eignen, ist jedoch die wirtschaftliche Attraktivität ein wichtiger Faktor.

Während die Analyse auf ein insgesamt begrenztes Potenzial für globale Benchmarks hinweist, könnten einige *quick wins* in Form von globalen Benchmarks in Bezug auf die Emissionen von Industrieprozessen erzielt werden. Hier hat der CDM robuste und strenge Benchmarks für die Festlegung von Ausgangswerten festgelegt, z.B. für die Verringerung von N_2O bei der Herstellung von Salpetersäure oder Adipinsäure oder für die Verringerung von HFC23-Emissionen bei der Herstellung von Kältemitteln. Es kann auch davon ausgegangen werden, dass bei diesen stark klimaschädlichen Gasen die Einnahmen aus dem Transfer von Emissionsreduktionen einen wesentlichen Beitrag zur Gesamtrentabilität eines Projekts leisten und daher zu Minderungsmaßnahmen über BAU ohne Minderung hinaus führen können.

In unseren Fallstudien kamen wir zu dem Schluss, dass einige Branchen für ein Benchmarking geeignet sein könnten, darunter Zement oder Eisen und Stahl. Die damit verbundenen Emissionen hängen jedoch von lokalen Faktoren (wie der Qualität der Rohstoffe) ab und sind daher auf globaler Ebene schwer umzusetzen. Hier kann die Festlegung von Baselines mit Ansätzen mittlerer Komplexität mög-

lich sein, die auf vorgeschlagenen oder genehmigten CDM-Methoden und den EU-ETS-Leitlinien für Produktbenchmarks aufbauen. In der Praxis werden die erwarteten Kohlenstoffpreise möglicherweise nicht auf einem Niveau liegen, das *zusätzliche* Maßnahmen in diesen Sektoren auslösen würde.

Auch der Prozess, der zur Definition von Benchmarks führt, kann sich im Rahmen des Mechanismus nach Artikel 6.4 als schwierig zu implementieren erweisen. Die Erstellung von Benchmarks kann Schlupflöcher oder zu wenig strenge Werte zur Folge haben. Ein strenges und wissenschaftlich fundiertes Verfahren innerhalb des Aufsichtsorgans nach Artikel 6.4 sollte die Festlegung angemessener globaler Benchmarks erleichtern. In einem Umfeld schwacher staatlicher Aufsicht kann die Verwendung von Benchmarks weniger angemessen sein als herkömmliche Methoden der Festlegung von Baselines, bei denen Baselines auf der Grundlage projektspezifischer Parameter festgelegt werden, die von unabhängigen Dritten validiert werden.

Zusammenfassend: Auch wenn es Subsektoren mit mittlerem bis großem Benchmarking-Potenzial gibt, können die meisten Emissionsquellen nicht durch globale Benchmarks erfasst werden, da die Güter und Dienstleistungen heterogen sind (z.B. "Schuhe", "Tonnenkilometer") und die Emissionen tendenziell auch von exogenen lokalen Faktoren abhängen. Benchmarking ist daher kaum der Königsweg zur Lösung der Probleme bei der Festlegung der Anrechnungbaseline im Rahmen des Pariser Abkommens.

Geht man jedoch von globalen Benchmarks zu standardisierten Ansätzen für die Festlegung von Baselines über, so gibt es einen großen Bestand an methodischen Ansätzen und Referenzwerten aus dem ETS und dem CDM, die zur effizienteren und robusteren Festlegung von Gutschrift-Baselines verwendet werden können. Ihre Verwendung gemäß Artikel 6 erfordert ihre Weiterentwicklung einschließlich umfassender Datenerhebungen, die standardisierte Ansätze ermöglichen würden, die zumindest einige regionale, lokale oder projektspezifische Faktoren berücksichtigen.

Der aktuelle Verhandlungstext enthält keinen ausdrücklichen Verweis auf Benchmarks. Er legt lediglich allgemeine Anforderungen fest, wie z.B., dass jede Methodik „die Auswahl eines transparenten und vertrauensvollen Ansatzes, der Annahmen, der Parameter, der Datenquellen und der Schlüsselfaktoren erfordert“ (UNFCCC 2019b, Anhang, Abschnitt V B, Absatz 35). Der Text sieht auch die Entwicklung von standardisierten Baselines vor, die „auf der höchstmöglichen Aggregationsebene im relevanten Sektor der betreffenden Vertragspartei“ zu erstellen sind (UNFCCC 2019b, Anhang, Abschnitt V B, Absatz 37). Sollte der Text in seiner jetzigen Form angenommen werden, würde er insofern keine Klarheit darüber schaffen, ob die Verwendung von Benchmarks möglich sein wird oder nicht.

Optionen zur Förderung steigender Ambitionen unter dem Pariser Artikel 6.4-Mechanismus

Hintergrund

Das kollektive Ambitionsniveau der NDCs bleibt bisher weit hinter den Zielen des Pariser Abkommens zurück, "den Anstieg der globalen Durchschnittstemperatur auf deutlich unter 2°C über dem vorindustriellen Niveau zu halten" (Artikel 2) und "ein Gleichgewicht zwischen den anthropogenen Emissionen von Treibhausgasen aus Quellen und dem Abbau von Treibhausgasen durch Senken in der zweiten Hälfte dieses Jahrhunderts zu erreichen" (Artikel 4). Daher ist es besonders wichtig, dass das Pariser Abkommen einen eingebauten Mechanismus zur schrittweisen Anhebung des individuellen und kollektiven Ambitionsniveaus enthält.

Die Anhebung der Ambitionen ist auch ein Bestandteil der Kooperationsansätze, die in Artikel 6 des Pariser Abkommens festgelegt sind. Die Anreize, die durch den Mechanismus nach Artikel 6.4 gesetzt werden, unterstützen jedoch nicht unbedingt die Notwendigkeit der Ambitionssteigerung oder stehen sogar im Widerspruch dazu, je nach Ergebnis der laufenden Verhandlungen über die detaillierten Regeln und Modalitäten. Die folgenden Beispiele sind Schlüsselfragen, die in den Verhandlungen erörtert werden: Einerseits kann die Festlegung ehrgeiziger Ziele den Umfang der Minderungsergebnisse, die

über das NDC-Ziel hinausgehen und die ein Gastgeberland ins Ausland transferieren (und verkaufen) kann, direkt verringern. Wenn andererseits der Mechanismus nach Artikel 6.4. die Anrechnung von Aktivitäten erlaubt, die über den Geltungsbereich des NDC hinausgehen, ohne vom Gastgeberland zu verlangen, über die exportierten Minderungsergebnisse aus solchen Aktivitäten Buch zu führen, besteht kein Anreiz, den Geltungsbereich des NDC auszuweiten, da dies das Potenzial des Gastgeberlandes zur Beschaffung externer Finanzmittel verringern würde.

Der Bericht stellt vier Optionen vor, wie den oben skizzierten Risiken begegnet werden könnte, so dass Artikel 6.4 zur Anhebung der Ambitionen beitragen könnte:

Option 1: Stärkung der Berichterstattung, Transparenz und Vergleichbarkeit

Diese schwächste Option zur Förderung der Ambitionssteigerung baut auf den umfassenden Anforderungen des Pariser Abkommens zu Transparenz, Berichterstattung und Überprüfung sowie den entsprechenden Richtlinien auf. Die Vertragsparteien können sich für eine umfassende und strenge Umsetzung entscheiden, um die Vergleichbarkeit der Anstrengungen und damit die Anhebung der Ambitionen zu fördern.

Vorabinformationen: Jede Vertragspartei ist verpflichtet, über ihre NDCs Vorabinformationen zu liefern, inklusive zur Anwendung des Mechanismus nach Artikel 6, welche die Ziele und die Ambitionsniveaus zwischen verschiedenen Ländern und über die Zeit hinweg vergleichbar machen können.

Transparenzrahmen und Überprüfung: Der Transparenzrahmen für Maßnahmen und Unterstützungsleistungen ist der wichtigste Mechanismus, um Staaten für die Umsetzung ihrer NDCs zur Rechenschaft zu ziehen. Die Richtlinien sind noch nicht sehr spezifisch, was die Berichterstattung über die Anwendung von Artikel 6.4 betrifft, daher sind weitere Leitlinien wichtig.

Globale Bestandsaufnahme: Die globale Bestandsaufnahme über die Umsetzung des Pariser Abkommens bewertet den kollektiven Fortschritt und ist ein Schlüsselelement des Mechanismus zur Steigerung der Ambitionen im Laufe der Zeit. Auch wenn dies im Regelwerk nicht spezifiziert ist, könnte die Globale Bestandsaufnahme Erkenntnisse und bewährte Praktiken von Parteien aufzeigen, die den Mechanismus nach Artikel 6.4 zur Ambitionssteigerung genutzt haben.

Einhaltungsmechanismus: Das Pariser Abkommen sieht einen Mechanismus zur "Erleichterung der Umsetzung" und "Förderung der Einhaltung" (Artikel 15) vor. Die Entscheidungen von Katowice enthalten die Modalitäten und Verfahren für diesen Mechanismus, aber es bleibt abzuwarten, inwieweit er sich auf Artikel 6 und die Ambitionssteigerung auswirken kann.

Option 2: Die Gestaltung des Mechanismus nach Artikel 6.4 in Einklang bringen mit Ambitionssteigerungen der Gastgeberländer

Diese Option konzentriert sich auf Möglichkeiten, die Regeln, Modalitäten und Verfahren, die den Mechanismus nach Artikel 6.4 operationalisieren, so zu gestalten, dass Länder ihre Ambitionen erhöhen können, ohne in ihrer Rolle als Gastgeberländer negativ beeinträchtigt zu werden.

- Verpflichtung der Gastgeberländer durch die Anwendung entsprechender Anpassungen auch Buch zu führen über exportierte Minderungsergebnisse, die außerhalb des Geltungsbereichs ihres NDC erzielt wurden;
- Beschränkung der Anrechnungszeiträume und Anpassung der Baselines in Übereinstimmung mit dem 5-jährigen NDC-Zyklus;
- Forderung konservativer Baselines;
- Definition der Auswahlkriterien für den Artikel 6.4-Mechanismus (in Bezug auf die NDC-Ziele): Geltungsbereich der NDC-Ziele, Erarbeitung langfristiger Strategien, Einschränkung der Wählbarkeit von Technologien oder Arten von Maßnahmen, Forderung ehrgeiziger und quantifizierter NDC-Ziele;

- Verpflichtung, die Emissionen aus Tätigkeiten gemäß Artikel 6.4 in künftige NDC einzubeziehen;
- Sicherung der Qualität der Minderungsergebnisse.

Option 3: Unterstützung des Gastgeberlandes bei der Erhöhung der Ambitionen durch den Mechanismus nach Artikel 6.4

Vertragsparteien, bi- und multilaterale Institutionen und Initiativen können Gastgeberländer bei der Erfüllung der im vorigen Abschnitt dargelegten Anforderungen unterstützen.

Unterstützung ehrgeiziger Zielsetzungen und langfristiger Planungsaktivitäten: Begrenzte und unvollständige Planungsprozesse können ein Grund für wenig ambitionierte und unklare NDCs sowie unvollständige langfristige Strategien sein. Daher könnte die Unterstützung von Ländern, die diese benötigen, dazu beitragen, das Ambitionsniveau zu erhöhen.

Erleichterung von Investitionen in neue kohlenstoffarme Technologien: Der Artikel 6.4-Mechanismus sollte Investitionen in Technologien in einem Gastgeberland erleichtern, das nicht in der Lage wäre, solche Investitionen eigenständig zu tätigen. Es könnte Positivlisten für (kostenintensive) neue Technologien und Negativlisten für kostengünstige, ausgereifte Technologien geben.

Option 4: Erhöhung der Ambitionen des Käuferlandes durch den Mechanismus nach Artikel 6.4

Ein Käuferland kann die gekauften Minderungsergebnisse verwenden, um sein NDC-Ziel zu erreichen, aber auch, um (einen Teil der) Minderungsergebnisse zu annullieren, um seine Ambitionen zu erhöhen.

Verwendung niedrigerer Einhaltungskosten zur Anhebung der Ambitionen: Das Land senkt seine Kosten für die Einhaltung seines NDC-Ziels, wenn die Umsetzung von Politiken, die zur Erreichung des NDC notwendig wären, höhere Grenzvermeidungskosten verursacht als der Kauf der Minderungsergebnisse aus dem Artikel 6.4-Mechanismus. Wenn das Käuferland die Einsparungen in inländische Reduktionen oder internationale Klimafinanzierung investiert, kann dies zu höheren Ambitionen führen.

Steigerung der Ambitionen durch langfristige Strategien: Die Einbettung des Kaufs von Minderungsergebnissen in langfristige Strategien und eine klare Kommunikation dieser Strategien kann dazu beitragen, die Ambitionen zu erhöhen.

Steigerung der Ambitionen durch Risikominderung: Das Land trägt das Risiko, sein NDC-Ziel aufgrund finanzieller oder technischer Einschränkungen nicht erreichen zu können. Zur Absicherung des Risikos werden Minderungsergebnisse gekauft.

"Insetting" oder Verknüpfung der Nutzung von Minderungsergebnissen mit inländischen Minderungsmaßnahmen: Länder, die Minderungsergebnisse aus dem Ausland nutzen wollen, um ihre NDC zu erreichen, könnten sich freiwillig verpflichten, zusätzliche inländische Minderungsmaßnahmen durchzuführen.

Empfehlungen

Die ersten beiden Optionen können auf verschiedenen Ebenen umgesetzt werden, je nach dem wie weit man sich international einig ist hinsichtlich der Notwendigkeit, perverse Anreize durch die Anwendung des Mechanismus nach Artikel 6.4 zu verhindern. Die folgende Kaskade kann in Betracht gezogen werden:

- CMA/Richtlinien (internationale Governance erforderlich)
- Aufsichtsorgan für Artikel 6.4
- "Club" gleichgesinnter Länder
- Einzelne Käuferländer definieren Kriterien für den Kauf von Minderungsergebnissen

Die dritte Option ist die Unterstützung der Gastgeberländer, die Ambitionen zu erhöhen. Dies ist eine Rolle, die viele (potenzielle) Käuferländer und multilaterale Institutionen in der Vergangenheit bereits in den Kyoto-Zeiträumen wahrgenommen haben und dies im Rahmen des Pariser Abkommens wahrscheinlich auch weiterhin tun werden.

Die vierte Option ist die Förderung von Maßnahmen, die die Ambition auf Seiten des Käuferlandes erhöhen. Dies ist wesentlich zur Erreichung der Ziele des Pariser Abkommens und wird hauptsächlich individuell erreicht.

Der Madrider Verhandlungstext der Konferenzpräsidentschaft sieht entsprechende Anpassungen vor, unabhängig davon, ob die übertragenen Minderungsergebnisse innerhalb oder außerhalb des NDC des Gastgeberlandes liegen (UNFCCC 2019b). Es könnte eine Opt-out-Periode eingeführt werden, in der entsprechende Anpassungen nicht vorgenommen werden müssen. Dennoch würde eine solche Regelung Artikel 6 als Mechanismus zur Anhebung der Ambitionen unterstützen.

Der freiwillige Kohlenstoffmarkt: Welche Rolle kann er in Zukunft spielen und welche potenziellen Beiträge kann er zur Ambitionssteigerung leisten?

Hintergrund

Mit dem Pariser Abkommen wird sich die Rolle des freiwilligen Kohlenstoffmarktes und seine Beziehung zu verbindlichen Kohlenstoffregulierungssystemen grundlegend ändern. Dies ist auf zwei große Paradigmenwechsel zurückzuführen: Erstens wird das Pariser Abkommen durch die Verpflichtung aller Vertragsstaaten, NDCs zu unterhalten, das so genannte "*uncapped environment*", d.h. die Emissionen, die nicht unter die Kohlenstoffregulierung fallen und die bisher die wichtigste Bezugsquelle für freiwillige Kohlenstoffmarktaktivitäten waren, erheblich verringern. Zweitens verpflichtet das neue Abkommen alle Vertragsstaaten dazu, ihre Ambition bei der Zusammenarbeit unter Artikel 6 zu erhöhen und damit die Ära des "reinen Offsetting" zu beenden.

Vor diesem Hintergrund untersucht der vorliegende Bericht die künftige Rolle des freiwilligen Marktes und sein Potenzial, zur Anhebung der Ambition beizutragen. Zu diesem Zweck wurde Schreibtischforschung durch Interviews mit Vertreter/-innen des freiwilligen Kohlenstoffmarktes ergänzt. Die Interviews ermöglichten es, erste Ideen und Konzepte weiter auszuarbeiten und die Meinungen der Vertreter/-innen des freiwilligen Marktes zu einigen der identifizierten Schlüsselthemen einzuholen.

Potenzielle Rollen des freiwilligen Marktes

Der Bericht betrachtet den freiwilligen Markt als Investor und als Zertifizierer von ambitionierten Aktivitäten und zeigt verschiedene Rollen auf, die er in Zukunft spielen könnte, wobei besonderes Augenmerk auf sein Potenzial gelegt wird, zur Steigerung der Ambitionen beizutragen.

Für die Zukunft des **freiwilligen Marktes als Investor** wurden drei potenzielle Rollen identifiziert:

- Der Markt könnte seine derzeitige Rolle als Käufer von CO_2-neutralen Zertifikaten beibehalten,
- er kann zu einem Unterstützer der NDC-Implementierung werden, oder
- er kann durch den Ankauf von Ambitionssteigerungseinheiten zu einem Treiber der Ambition werden.

Die Ergebnisse der Studie deuten darauf hin, dass die derzeitige Rolle des freiwilligen Investors als Käufer von CO_2-Ausgleichszertifikaten (Rolle 1) durch die mit dem Pariser Abkommen eingeführten Änderungen erheblich beeinträchtigt wird, da das "*uncapped environment*" in Zukunft stark begrenzt sein wird. Das Potenzial des freiwilligen Marktes, diese Rolle weiterhin wahrzunehmen, wird weitgehend von den Anforderungen an die Gastgeberstaaten abhängen, die exportierten Minderungsergebnisse in die Bilanzierung (Accounting) einzubeziehen. Transparente und leicht zugängliche Bilanzierungsinstrumente werden für die Fortführung des Klimaneutralitätskonzepts in der Zukunft entschei-

dend sein, ebenso wie die Kapazitäten und die Bereitschaft der Länder, entsprechende Anpassungen vorzunehmen. Trotz dieser Herausforderungen kann die Fortführung des Klimaneutralitätsmodells als die vielversprechendste zukünftige Rolle des freiwilligen Marktes angesehen werden. Wenn CO_2-Ausgleichszertifikate im Rahmen ehrgeiziger NDCs generiert und durch einen robusten Bilanzierungsansatz, der die NDCs als Bezugspunkt verwendet, berücksichtigt werden, birgt dieses Modell ein erhebliches Potenzial, um die Vertragsparteien bei der Steigerung ihrer Ambitionen zu unterstützen. Dies gilt auch für CO_2-Ausgleichszertifikate, die außerhalb des Geltungsbereichs von NDCs generiert werden, wenn sichergestellt ist, dass die Aktivitäten wirklich zusätzlich sind.

Die Rolle des freiwilligen Investors als Förderer der NDC-Implementierung (Rolle 2) wird von den Teilnehmern des Kohlenstoffmarktes zunehmend befürwortet. Private Zertifizierungsstandards erkunden die Möglichkeiten, entsprechende Produkte zu entwickeln, und die Anbieter setzen sich mit den Endkunden in Verbindung, um das Vermarktungspotenzial zu bewerten. Obwohl diese neue Rolle hinsichtlich der Nachfrage ein gewisses Potenzial zu haben scheint, ist sie auch mit erheblichen Herausforderungen verbunden: Diese Rolle erfordert nicht nur die Entwicklung eines neuen Produkts, sondern es sind auch einige Umweltrisiken mit seiner Verwendung verbunden, wenn es dem zugrunde liegenden NDC an Ambition mangelt. Daher sollte dieser Ansatz sorgfältig weiter erforscht werden, um Lösungen für die wichtigsten Herausforderungen zu finden.

Die Rolle des freiwilligen Investors als Treiber der Ambitionssteigerung durch Investitionen in Ambitionssteigerungseinheiten (Rolle 3) erwies sich als die Rolle mit dem geringsten Gesamtpotenzial. Sie könnte zwar eine direkte Auswirkung auf die Anhebung der Ambition haben, leidet aber darunter, dass sie sowohl die Schaffung eines neuen Produkts als auch die Notwendigkeit erfordert, entsprechende Anpassungen vorzunehmen.

Im Hinblick auf die **zukünftige Rolle privater Zertifizierungsstandards** wurden drei Optionen identifiziert:

- Private Standards könnten als bloße Anbieter von Methoden und innovativen Ansätzen für den Artikel 6.4-Mechanismus fungieren,
- sie könnten als Standards innerhalb von Artikel 6.2 verwendet werden,
- oder sie könnten außerhalb von Artikel 6 angewandt werden.

Die Analyse ergab, dass die Integration privater Standards in Artikel 6.2 die vielversprechendste Option sein dürfte: sie würde die Nutzung der gesamten Architektur der Standards ermöglichen, während das Accounting nach den Vorgaben des internationalen Accountingrahmens unter Artikel 6.2 erfolgen würde.

Empfehlungen

Die Ergebnisse deuten darauf hin, dass der freiwillige Markt über das Potenzial verfügt, zur Anhebung der Ambition beizutragen. Ob dieses Potenzial tatsächlich freigesetzt wird, hängt davon ab, wie das Konzept der Ambitionssteigerung im Rahmen des Pariser Abkommens operationalisiert wird. Eine weitere Determinante wird die Fähigkeit des freiwilligen Marktes sein, vom gegenwärtigen, auf Kohlenstoffneutralität basierenden Modell zu neuen Ansätzen überzugehen, die die mit dem Pariser Abkommen geschaffenen neuen Rahmenbedingungen berücksichtigen. Die Verhandlungsführer in der UNFCCC sind derzeit dabei, diese Rahmenbedingungen in Bestimmungen umzusetzen, um das Pariser Abkommen und seinen Artikel 6 anwendbar zu machen. Einige dieser Bestimmungen könnten für die künftige Einbeziehung des freiwilligen Kohlenstoffmarktes von Bedeutung sein: Paragraph 58 des Entwurfs der RMPs beispielsweise sieht die freiwillige Löschung von Emissionsreduktionen auf Antrag von Aktivitätsteilnehmern vor, während Paragraph 71 die Grundlage für die Anwendung von entsprechenden Anpassungen liefert, wenn Emissionsreduktionen für "andere internationale Minderungszwecke" (UNFCCC 2019b, Anhang, Paragraph 71) verwendet werden. Der letztgenannte Absatz stellt eine Verbindung zu den Modalitäten, Verfahren und Richtlinien des Transparenzrahmens her, der

2018 in Katowice verabschiedet wurde. Die Vertragsstaaten hatten hier vereinbart, dass die "Verwendung von Minderungsergebnissen für internationale Minderungszwecke" (UNFCCC 2018, Abs. 77 d)) den gleichen Regeln folgen muss wie die Verwendung von MOs zur NDC-Umsetzung. Dies wird zwar in erster Linie als Hinweis auf die Verwendung von Minderungsergebnissen im Rahmen von CORSIA und anderer künftiger verbindlicher Klimaschutzinstrumente verstanden, könnte aber auch als Hinweis darauf gesehen werden, dass "unilaterale Anpassungen" im Zusammenhang mit freiwilligen Aktivitäten auf dem Kohlenstoffmarkt durchgeführt werden könnten. Es bleibt jedoch abzuwarten, ob diese Bestimmungen verabschiedet werden und wie sie operationalisiert werden. Dieser Prozess wird Zeit in Anspruch nehmen, und es kann nicht erwartet werden, dass dieser alle Fragen beantworten wird, die für das derzeitige Funktionieren des freiwilligen Marktes und seine künftige Rolle relevant sind. Wenn sich der freiwillige Markt mit solchen Governance-Lücken konfrontiert sieht, sollte er eine progressive Haltung einnehmen, indem er sich für robuste Lösungen einsetzt, die zu einer Steigerung der Minderungsambition beitragen und die Umweltintegrität des Pariser Regimes sicherstellen. Auf diese Weise kann der freiwillige Markt seiner Rolle als Innovator und Entwickler von Lösungen gerecht werden, die zu einem späteren Zeitpunkt in Aktivitäten des verpflichtenden Kohlenstoffmarktes unter dem Pariser Abkommen umgesetzt werden könnten.

Anreize für die Beteiligung des privaten Sektors am Artikel 6.4-Mechanismus

Hintergrund

Der private Sektor ist nicht nur ein großer Emittent von Treibhausgasen, sondern bietet auch das Potenzial für innovative Lösungen zur Bekämpfung des Klimawandels. Diese vielfältigen Funktionen wurden von den Vertragsparteien bei der Verabschiedung des Pariser Abkommens und seines Artikels 6.4 anerkannt, der ausdrücklich darauf abzielt, Anreize für die Beteiligung privater Unternehmen an der Minderung der Treibhausgasemissionen zu schaffen und diese zu erleichtern (Art. 6.4 (b)).

Im Rahmen des CDM hatten Akteure des Privatsektors die Möglichkeit, an einem neuen und schnell wachsenden Markt teilzunehmen, sahen sich aber auch mit schwierigen Investitionshürden konfrontiert. Angesichts der heterogeneren Architektur des Pariser Abkommens und der stärkeren Rolle, die den Regierungen (des Gastgeberlandes) unter dem neuen Regime eingeräumt wurde, scheint es, dass privatwirtschaftliche Akteure unter einem noch komplexeren Regime operieren und sich noch mehr Herausforderungen stellen müssen, insbesondere in Ländern mit schwächeren Institutionen und Behörden (z.B. bei der Erlangung der Genehmigung).

Für die folgende Analyse unterscheiden wir zwischen nachfrageseitigen Faktoren, Regeln und Standards für Marktmechanismen und angebotsseitigen Faktoren.

Schlüsselfaktoren für die Beteiligung des privaten Sektors

Die Nachfrage nach Einheiten aus dem EU-ETS war die wichtigste Triebfeder für den früheren Markt im Rahmen des CDM. Die Regeln und Standards von CDM und Joint Implementation (JI) waren jedoch von begrenzter Robustheit und erlaubten die Verwendung von Einheiten, die zu einem großen Teil ein hohes Risiko in sich bargen, nicht aus zusätzlichen Emissionsreduktionen zu stammen. Infolgedessen blieben die CER- und ERU-Preise viel zu niedrig und lieferten im Vergleich zu anderen Cash-Flows bei einer typischen Investitionsanalyse von energiebezogenen Projekten keine nennenswerten Einnahmen. Infolgedessen wurde der Privatsektor durch inländische Subventionen (wie z.B. Einspeisetarife) stimuliert, aber ob der flexible Mechanismus eine Quelle für zusätzliche Aktivitäten darstellte, ist in vielen Fällen fraglich.

Bislang ist die durch die Vertragsparteien angekündigte Nachfrage nach handelbaren Emissionsreduktionen im Rahmen des Pariser Abkommens minimal. Nur sehr wenige Vertragsparteien haben Pläne zum Kauf von ITMOs in ihren NDCs angegeben, während viele Vertragsparteien den Verkauf von Ein-

heiten beabsichtigen. Einige Parteien wie die Schweiz und Schweden haben ihr Interesse bekundet, mit dem Kauf von Minderungsergebnissen aus Artikel-6-Pilotprojekten zu beginnen.

Eine gewisse Nachfrage nach Einheiten kann auch vom Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) der Internationalen Zivilluftfahrt-Organisation der UNO (ICAO) erwartet werden. Diese Nachfrage nach neuen Artikel-6-Aktivitäten wird jedoch in hohem Maße von den Regeln abhängen, die den Übergang von CDM-Projekten und alten CERs begrenzen, da die bestehenden alten CERs die erwartete CORSIA-Nachfrage möglicherweise um ein Vielfaches abdecken.

Auf der anderen Seite können die sich abzeichnenden Pilotprojekte zu einer gewissen Nachfrage nach qualitativ hochwertigen ITMOs führen. Dies könnte etwas verstärkt werden, wenn solche Kaufprogramme ausgeweitet würden, z.B. in Form von Clubs gleichgesinnter Parteien, die höhere Ambitionen anstreben.

Regeln und Standards für Marktmechanismen sind ein weiterer Schlüsselfaktor für die Beteiligung des privaten Sektors. Die dynamische Entwicklung und einige anhaltende Unklarheiten bei den Regeln und Standards der flexiblen Mechanismen (z.B. in Bezug auf das Konzept der Zusätzlichkeit und die Festlegung von Baselines) haben zu komplizierten und zeitaufwändigen Prozessen und Unsicherheiten für Investoren im Rahmen des CDM geführt. Diese Unsicherheiten führten zu erheblichen Risiken für Akteure des Privatsektors im Zusammenhang mit der Projektgenehmigung, der Ausstellung von CERs und den Zertifikatspreisen, die negativ für Investitionen in zusätzliche Projekte zu Buche schlugen.

Unter dem Artikel-6-Mechanismen des Pariser Abkommens könnte die Situation für Akteure des Privatsektors noch schwieriger werden. Der Artikel-6-Text selbst scheint nicht frei von Unklarheiten zu sein. Zu den Schlüsselthemen, die zu Unklarheiten führen, gehören die einjährige vs. mehrjährige Abrechnung von Emissionen, die Terminierung und Operationalisierung entsprechender Anpassungen und die Vermeidung von Doppelzählungen im Allgemeinen. Es ist abzuwarten, inwieweit sie durch das erwartete Regelwerk zu Artikel 6 gelöst werden. Mit der relativen Schwäche der zentralisierten Governance für die Artikel-6-Mechanismen im Vergleich zu der Situation mit dem CDM EB als zentralisiertem Regulierungsgremium im CDM ist zu erwarten, dass die Unsicherheiten für den privaten Sektor im Vergleich zur Situation unter Kyoto tendenziell zunehmen werden.

Betrachtet man die *angebotsseitigen Faktoren*, so brauchen die Gastgeberländer förderliche Investitionsbedingungen, um Maßnahmen des Privatsektors zu erleichtern. Die Aktivitäten nach Artikel 6 unterscheiden sich nicht grundlegend von allen anderen ausländischen Direktinvestitionsprojekten. Solche Investitionen werden z.B. durch einen soliden institutionellen Rahmen, einen soliden regulatorischen Rahmen, Transparenz und ein wettbewerbsfähiges steuerliches Umfeld gefördert.

Mit dem Pariser Abkommen ändern sich diese innenpolitisch definierten Herausforderungen auf der Angebotsseite im Allgemeinen nicht. Wenn Gastgeberländer jedoch beispielsweise im Rahmen ihrer langfristigen Niedrigemissions-Entwicklungsstrategien (LT-LEDs) Sektoren definieren, in denen sie sich Aktivitäten nach Artikel 6 wünschen, können sie im Rahmen ihrer nationalen Minderungsplanung Anreize für den Privatsektor schaffen, in diesen Sektor zu investieren.

Überblick über die Optionen zur Abschwächung oder Überwindung von Barrieren

Auf der *Nachfrageseite* besteht die Hauptoption in der Stimulierung der Nachfrage nach zusätzlichen Einheiten, die sowohl in den Käufer- als auch in den Gastgeberländern die Anhebung der Ambitionen fördern. Akquirierende Länder, die sich verpflichten, ihre Ambitionen zu erhöhen und die Nachfrage nach ITMOs zu stärken, sind für die Errichtung eines Kohlenstoffmarktes von entscheidender Bedeutung (siehe Abschnitt über die Anhebung der Ambitionen weiter oben).

Mögliche Instrumente zur Förderung der ITMO-Nachfrage von Unternehmen in den Käuferländern sind zum Beispiel inländische Emissionshandelssysteme (ETS) oder Kohlenstoffsteuern, die den Einsatz von ITMOs zur Erfüllung eines Teils der Verpflichtungen ermöglichen. Dazu kann der so genannte

"Insetting"-Ansatz gehören, bei dem Unternehmen in Minderungsmaßnahmen innerhalb ihrer eigenen Lieferkette investieren.

Was die *Gestaltung der Regeln und Standards des Mechanismus nach Artikel 6.4* zur Unterstützung der Nachfrage und zur Erleichterung der Beteiligung des Privatsektors betrifft, so sollten die Regeln einen klaren Rahmen bieten, um die Rolle der nationalen Regierungen zu erleichtern und nationale Systeme und Kapazitäten zu ermöglichen. Darüber hinaus ist die Definition klarer und eindeutiger Regeln und Standards für die Beteiligung privater Akteure an den Kohlenstoffmärkten von entscheidender Bedeutung. Die Beteiligung des Privatsektors und die Nachfrage nach ITMOs kann durch Regeln unterstützt werden, die ein Up-Scaling von Projekten ermöglichen. Darüber hinaus haben die Digitalisierung von MRV- und Distributed-Ledger-Technologien das Potenzial, Effizienzgewinne zu erzielen und das Vertrauen in Register und Unit-Tracking zu erhöhen.

Auf der *Angebotsseite* ist es wichtig, förderliche Rahmenbedingungen in den Gastgeberländern zu fördern, um Maßnahmen des privaten Sektors zu erleichtern. Viele Länder erhalten bereits Unterstützung (z.B. durch die Weltbank, Entwicklungsagenturen usw.). Diese Unterstützung muss im Rahmen des Pariser Abkommens fortgesetzt und ausgeweitet werden. Um die Investitionsbedingungen in den Gastgeberländern zu verbessern, sind solide institutionelle und regulatorische Rahmenbedingungen und Transparenz von entscheidender Bedeutung. Was die Investitionsbereiche betrifft, so ist es günstig, auf den inländischen Stärken des spezifischen Marktkontextes eines Gastgeberlandes aufzubauen. Aus diesem Grund könnten Gastgeberländer bei der Entwicklung von Strategiestudien zu den Mechanismen nach Artikel 6 unterstützt werden, z.B. in Kombination mit ihrer LT-LEDS-Entwicklung.

Spezifische Optionen zur Förderung der Beteiligung des privaten Sektors

Auf der Grundlage des gegebenen Überblicks liefert die Studie eine explorative Analyse, die sich auf drei Themen konzentriert: die Gestaltung und Unterstützung nationaler Systeme und Kapazitäten, die Ermöglichung eines Up-Scaling von Projekten und die Untersuchung des Potenzials durch die Digitalisierung von MRV.

Jede Aktivität des Privatsektors hängt von gut *konzipierten und unterstützten nationalen Systemen und Kapazitäten* ab. In Ländern, die ihre "Hausaufgaben in Bezug auf Transparenz" nicht machen, kann die Umsetzung von Aktivitäten des Privatsektors nach Artikel 6 früher oder später auf Hindernisse stoßen, z.B. wenn der internationale Transfer in ein Käuferland nicht durchgeführt werden kann oder verzögert wird, weil die Tracking- und Registerinformationen nicht verfügbar sind, um entsprechende Anpassungen zu gewährleisten, oder wenn ein Gastgeberland die Genehmigung eines Transfers zurücknimmt, weil die Reduktionsmaßnahmen im nationalen Treibhausgasinventar nicht sichtbar sind.

Innerstaatliche Regeln für die Teilnahme an Kohlenstoffmärkten, wie in Artikel 6 des Pariser Abkommens dargelegt, müssen von den Regierungen der Gastgeberländer festgelegt werden. Länder mit schwächeren Regierungen werden Unterstützung bei der Definition und Einführung dieser Regeln benötigen. Bilaterale Prozesse oder Partnerschaften sind mögliche Wege, um dies zu fördern. Ein effizientes und robustes nationales System zur Genehmigung der Verwendung und des Transfers von Emissionsreduktionsgutschriften an andere Länder ist notwendig, das Transparenz und vorhersehbare Einnahmen für private Investoren ermöglicht.

Die Diskussion über die *Ermöglichung eines Up-Scaling von Projekten* wird hauptsächlich durch die Notwendigkeit einer schnellen Reduzierung der globalen Treibhausgasemissionen und die wahrgenommenen Mängel des Mechanismus für umweltverträgliche Entwicklung (CDM) vorangetrieben. Es wird davon ausgegangen, dass das Upscaling zu einer Vereinfachung des Verfahrens für die Registrierung einzelner Projekte und die Ausstellung von Gutschriften führt und die Transaktionskosten reduziert. Durch das Upscaling wird die Ebene der Ausstellung der Gutschriften an die nationale oder sektorale Politikebene angepasst. Auf diese Weise kann die Beteiligung des privaten Sektors weiter gefördert werden, da die meisten Aktivitäten des privaten Sektors durch die Einführung neuer nationa-

ler/sektoraler Politiken ausgelöst werden. Upscaling könnte auch die Investitionsrisiken und die regulatorische Unsicherheit für den privaten Sektor verringern. Die internationale Registrierung von nationalen Politiken als Aktivitäten gemäß Artikel 6.4 kann eine gewisse Sicherheit gegen plötzliche Veränderungen auf nationaler Ebene bieten.

Auf der anderen Seite stellt das Scaling-up neue Herausforderungen. Transaktionskosten und -risiken werden vom privaten Sektor auf die nationale Regulierungsbehörde verlagert. Gleichzeitig bleiben die Herausforderungen im Zusammenhang mit der Kausalität von Emissionsreduktionen bestehen, da auch bei einem hochskalierten Ansatz sichergestellt werden muss, dass die eigentlichen Minderungsaktivitäten tatsächlich durch die neu eingeführten Politiken ausgelöst werden.

Um den Umfang der Minderungsaktivitäten unter Artikel 6.4 zu erhöhen, kann ein erster Schritt darin bestehen, sicherzustellen, dass die Bestimmungen und Definitionen des Mechanismus diese Art von Aktivitäten nicht ausschließen. In ähnlicher Weise sollten die Regulierungsfunktionen des Mechanismus nach Artikel 6.4 mit Blick auf politikbasierte Minderungsaktivitäten konzipiert werden. Das Zulassen der Ausstellung von Gutschriften für hochskalierte Maßnahmen erfordert darüber hinaus einen völlig neuen Satz von Methoden für den Nachweis der Zusätzlichkeit, die Baselineberechnung sowie Monitierung und Verifizierung. Die „top-down"-Entwicklung solcher Methoden sowie Maßnahmen zum Aufbau von Kapazitäten, die die Gastgeberstaaten bei der Entwicklung politikbasierter Anrechnungsaktivitäten unterstützen, könnten das Entstehen hochskalierter Maßnahmen fördern.

In den laufenden Verhandlungen scheint es keine große Betonung auf Up-Scaling zu geben, der jüngste Textentwurf aus Madrid enthält keine expliziten Bezüge. Gleichzeitig beschränkt er den Anwendungsbereich von Artikel 6.4 nicht auf Projekte und Programme, da er dem Aufsichtsorgan das Mandat erteilt, auch andere Arten von Aktivitäten zu genehmigen (UNFCCC 2019b, Abs. 31a). Es gibt jedoch einige Bereiche, die möglicherweise nicht vollständig mit einer politikbasierten oder sektoralen Anrechnung vereinbar sind, wie z.B. die Regulierungsstruktur, die es den Gastgeberstaaten erlauben würde, Art. 6.4 Aktivitäten zu registrieren (UNFCCC 2019b, Anhang, Absatz 27c). Dies kann Bedenken hinsichtlich von Interessenkonflikten aufwerfen, wenn die Regierung des Gastgeberstaates direkt an der jeweiligen Aktivität beteiligt ist.

Der Einsatz *digitaler Werkzeuge und Prozesse für die Messung, Berichterstattung und Verifizierung (MRV)* hat das Potenzial, viele der damit verbundenen Herausforderungen und Hindernisse während des gesamten Projektzyklus anzugehen und deutlich zu reduzieren:

Die Datenabdeckung, -genauigkeit und -zuverlässigkeit kann durch den Einsatz von Technologien wie Sensoren oder Mobiltelefonen zur Datenerfassung drastisch verbessert werden. Die Datenerfassung und -verarbeitung kann automatisiert werden, z.B. durch die Nutzung des Internet der Dinge (Internet of Things, IoT). Die Kombination der Fernerkundung mit neuen Datenverarbeitungsansätzen einschließlich künstlicher Intelligenz ermöglicht potenziell die automatisierte Überwachung von Waldgebieten und Landnutzungsmustern. Die aufkommende Blockchain-Technologie (oder "distributed ledger technologie, DLT") kann zur sicheren Datenerfassung beitragen, indem sie die aufgezeichneten Daten unveränderlich macht.

Was die Wirkungsquantifizierung und -berichterstattung anbelangt, so haben "*smart contracts*" (d.h. kleine Programme auf einer Blockkette, die bestimmte Berechnungen sicher ausführen) und Online-Anwendungen, die mit der automatisierten Datenerfassung und -verarbeitung verbunden sind, viele Vorteile gegenüber dem Zählen von Hand mit Hilfe komplexer Tabellenkalkulationen. Eine automatisierte Wirkungsberechnung, die auf gesammelten Daten und vorgegebenen methodischen Ansätzen beruht, würde die Zuverlässigkeit verbessern, die Effizienz dieses Prozesses steigern und das Vertrauen in die Ergebnisse fördern.

Im Prozess der Wirkungsüberprüfung könnten Technologien wie zertifizierte Sensoren und Datentransfer sowie smart contracts auf Blockketten den Prozess durch Echtzeitüberprüfung beschleunigen

und erleichtern. Solche Systeme, die eine automatisierte Qualitätssicherung und Qualitätskontrolle ermöglichen, können durch die Überprüfung von Monitoring-Daten auf Plausibilität, Konsistenz und Ausreißer implementiert werden. Künstliche Intelligenz kann helfen, potenzielle Unregelmäßigkeiten und Bereiche mit höherem Risiko zu erkennen.

Für die endgültige Ausgabe von Gutschriften ermöglichen Technologien wie Register, die auf Blockchain- oder anderen DLT aufbauen, vertrauenswürdige Registrierungssysteme, die von allen Beteiligten akzeptiert werden. Die Anwendung der Blockchain-Technologie macht jegliche Änderungen unveränderlich und ermöglicht eine vollständige Transparenz bei der Verfolgung von ITMO-Transaktionen. Neben Informationen über Kohlenstoff-Assets können solche Register auch Attribute der Nachhaltigkeitsauswirkungen der Minderungsmaßnahmen enthalten. Diese Art von digitalen Systemen kann auch die Verknüpfung mit anderen Registrierungssystemen ermöglichen und damit eine Verknüpfung von Kohlenstoffmärkten über spezifische Registrierungssysteme hinaus ermöglichen. Dies kann auch die automatische Umrechnung von Einheiten der Emissionsminderung erfordern.

Die Digitalisierung von MRV ist erst im Entstehen und bedarf weiterer Forschung, Entwicklung und Feldversuche von Ansätzen. Aktuelle Fragen reichen von technischen Aspekten der Datenerfassung wie Geschwindigkeit und mangelnde Konnektivität, über Kosten für Überwachungsgeräte oder benötigte Kapazitäten zur Schulung von Personal, Schnittstellen für die Datenberichterstattung, Anpassung der methodischen Ansätze zur Digitalisierung von MRV bis hin zur Notwendigkeit von Strategien und harmonisierten Implementierungsrahmen und Governance für digitales MRV.

Optionen zur Förderung einer Welt mit Netto-Null-Treibhausgasemissionen im Rahmen des Pariser Artikel 6.4-Mechanismus

Hintergrund

Die Ziele des Pariser Abkommens in Artikel 4 erfordern ein globales Gleichgewicht der Treibhausgasemissionen und -senken in der zweiten Hälfte des 21. Jahrhunderts, um den Temperaturanstieg auf deutlich unter 2°C gegenüber dem vorindustriellen Niveau zu begrenzen. Die Vertragsparteien sind unter dem Abkommen verpflichtet, ehrgeizige kurz- und langfristige Maßnahmen zur Eindämmung des Klimawandels zu definieren und umzusetzen, die zur Erreichung dieses Ziels beitragen. Der neue Mechanismus, der in Artikel 6.4 definiert ist, soll eine internationale Zusammenarbeit bei der Bekämpfung des Klimawandels ermöglichen und dadurch eine Erhöhung der Gesamtminderung ermöglichen. Dies bedeutet, dass alle nach Artikel 6.4 in Frage kommenden Minderungsaktivitäten die Zusätzlichkeit in Bezug auf die NDCs der beteiligten Länder nachweisen müssen, was angesichts des Erfordernisses, die Ambitionen der NDCs kontinuierlich zu erhöhen, eine Herausforderung darstellt. Dennoch sollte bei der Ausgestaltung des Mechanismus nach Artikel 6.4 auch sichergestellt werden, dass er mit anderen Zielen des Pariser Abkommens im Einklang steht. Insbesondere sollten die Aktivitäten nach Artikel 6.4 zumindest nicht im Konflikt mit dem langfristigen Ziel von Netto-Null-Treibhausgasemissionen stehen, sondern noch besser nationale Wege fördern, die zu diesem Ziel führen. Um dies in den Mechanismus einzubauen, muss der Schwerpunkt auf die eine oder andere Weise von kurz- und mittelfristigen Überlegungen auf die langfristige Perspektive verlagert werden. Die Fokussierung auf langfristige Emissionsreduktionsstrategien ist insbesondere notwendig, um technologische Lock-ins zu vermeiden, die eine vollständige Dekarbonisierung auf lange Sicht behindern würden.

Ansätze zur Förderung einer Welt mit Netto-Null-Treibhausgasemissionen

In diesem Bericht werden drei verschiedene Ansätze untersucht, die dazu beitragen können, das langfristige Ziel von Netto-Null-Treibhausgasemissionen bei der Operationalisierung von Artikel 6.4 zu fördern, nämlich

- *Positiv- und Negativlisten:* Positiv- und Negativlisten können ein einfaches Instrument sein, um einerseits die Zulassung bestimmter als kompatibel bekannter Aktivitätstypen zu erleichtern und andererseits bestimmte Aktivitätstypen, die mit hoher Wahrscheinlichkeit nicht mit dem langfristigen Ziel vereinbar sind, als nicht zulässig einzustufen. Dennoch bleiben bestimmte Aktivitätstypen bestehen, für die eine detailliertere Betrachtung notwendig ist. Daher hat sich hier ein dreistufiger Ansatz, der diese drei Gruppen von Aktivitätstypen widerspiegelt, als am überzeugendsten erwiesen. Dieser Ansatz spiegelt ähnliche Ansätze wider, die bei der Ausrichtung von öffentlichen Investitionen auf die Ziele des Pariser Abkommens angewandt werden, und klassifiziert sie als "Paris-aligned", "misaligned" oder "conditional".
- *Zusätzlichkeit im Hinblick auf eine Baseline, die sowohl mit den NDCs als auch mit den langfristigen Zielen vereinbar ist:* Die Verwendung von Baselines zum Nachweis der Zusätzlichkeit in Bezug auf die NDCs wird nur im Falle eines ehrgeizigen NDCs Netto-Null-Emissionen begünstigen und kann selbst dann in der langfristigen Perspektive teilweise einen Lock-in der Treibhausgasemissionen nach sich ziehen. Um das Netto-Null-Ziel zu erreichen, müssen die Baselines auch langfristige Ziele beinhalten. Diese langfristige Perspektive kann auf einem detaillierten nationalen Pfad zu Netto-Null-Emissionen oder auf wissenschaftlich fundierten Zielen basieren, unabhängig von der detaillierten Situation im Land. Da beide Ansätze Vor- und Nachteile haben, erscheint es am vielversprechendsten, sie so zu kombinieren, dass wissenschaftlich fundierte Ziele das erforderliche Anspruchsniveau garantieren und gleichzeitig die Kompatibilität mit der langfristigen Entwicklungsstrategie des Landes für niedrige Emissionen gewährleistet ist.
- *Anpassung bestehender Instrumente und Kriterien aus der Klimafinanzierung:* Das Netto-Null-Ziel ist auch für einige bestehende Finanzierungsinstrumente im Zusammenhang mit der Klimafinanzierung relevant. Der Innovationsfonds (IF) der Europäischen Union (EU) konzentriert sich auf die Förderung von Technologien, die für Netto-Null-Emissionen benötigt werden, aber aufgrund ihrer hohen Innovativität oft nicht Teil von Minderungspfaden sind. Darüber hinaus definiert das EU-Klassifikationssystem für ökologisch nachhaltige Wirtschaftsaktivitäten ("EU-Taxonomie") Schwellenkriterien hinsichtlich der Nachhaltigkeit für eine breite Palette von Technologiefeldern. Einige weitere Instrumente wenden das Konzept des transformativen Wandels an, um die langfristige Perspektive der geförderten Programme zu berücksichtigen. Während das Konzept des transformativen Wandels einige Verbindungen zur Verwendung von Baselines und Positivlisten aufweist, fügt es einige weichere Kriterien über die langfristigen Auswirkungen hinzu, insbesondere über die Vermeidung der Einstellung einer Aktivität aufgrund von Finanzierungs- und/oder Akzeptanzproblemen.

Die ausführliche Diskussion der Ansätze zeigt, dass sie nicht als sich gegenseitig ausschließend, sondern vielmehr als komplementär zu betrachten sind. Darüber hinaus können die Ansätze, obwohl sie zumindest teilweise auch die Zusätzlichkeit berücksichtigen, keinen vollständigen Ersatz für die Überprüfung der Zusätzlichkeit darstellen. Die Arbeit mit Baselines anstelle von Positiv-/Negativlisten hat den Vorteil, dass es nicht notwendig ist, explizit "Technologien auszuwählen". Auf der anderen Seite kann die Entwicklung von Baselines, die mit langfristigen Null-Emissionen in Einklang stehen, mühsam sein, wenn kein wissenschaftlich fundierter Zielansatz verwendet wird. Aus den Analysen in diesem Bericht ergeben sich zwei Handlungsstränge, wie Aspekte der verschiedenen Ansätze in einer vernünftigen Weise kombiniert werden können, um das langfristige Ziel von Netto-Null-Treibhausgasemissionen gemäß Artikel 6.4 zu fördern:

- Wenn es politisch machbar ist, wäre es am einfachsten, im ersten Schritt den dreistufigen Ansatz zu verwenden, der Negativ- und Positivlisten entspricht. Das bedeutet, bestimmte Aktivitätstypen zu Beginn durch die Aufstellung von Positiv- und Negativlisten zu sortieren, während die Zulässigkeit von Aktivitätstypen, die weder auf der Positiv- noch auf der Negativliste stehen, von der Anwendung weiterer Kriterien abhängig gemacht wird. Im nächsten Schritt wür-

den die verbleibenden Aktivitätstypen auf der Grundlage eines Vergleichs mit einer Baseline bewertet, die sowohl die Zusätzlichkeit als auch die Kompatibilität mit einem langfristigen Minderungspfad im Einklang mit dem Netto-Null-Ziel nachweisen sollte. In einem dritten Schritt könnten Käufer mit besonders hohen Standards zusätzlich weitere relevante Kriterien für transformativen Wandel anwenden, um so das Risiko der Einstellung einer Aktivität zu verringern und eine nachhaltige Transformation des Gastgeberlandes zu unterstützen.

- Positiv- und Negativlisten werden jedoch auf hohe politische Barrieren stoßen und laufen zudem Gefahr, einen starken Einfluss von Lobbyorganisationen zu erfahren. Es ist daher wahrscheinlicher, dass solche Listen nur von einzelnen Käufern als Kaufkriterien aufgestellt werden. In diesem Fall würden sie weiterhin die anderen Ansätze ergänzen, aber die Reihenfolge würde sich ändern. Der Ausgangspunkt wäre die Einbeziehung von Baselines, die mit den langfristigen Zielen kompatibel sind, in den Nachweis der Zusätzlichkeit, wodurch Aktivitäten mit nur kurzfristigen Auswirkungen zusätzlich zu den NDCs und/oder Aktivitäten, die längerfristig selbst zum Referenzfall werden, ausgeschlossen würden. Dennoch könnten einige der verbleibenden förderungswürdigen Aktivitäten immer noch als nicht mit dem langfristigen Ziel vereinbar angesehen werden oder den Erfordernissen des transformativen Wandels widersprechen. Dann könnten einzelne Käufer diese auf der Grundlage einer Positiv- und Negativliste klassifizieren, aber auch zusätzliche Kriterien für die politische und finanzielle Nachhaltigkeit anwenden, um einen transformativen Wandel zu fördern.

Mit Blick auf die Zukunft wird es wahrscheinlich schwierig sein, Mechanismen zu etablieren, die das langfristige Ziel von Netto-Null-Treibhausgasemissionen bei der Operationalisierung von Artikel 6.4 fördern, zumindest kurzfristig, da die Verhandlungen über Artikel 6 derzeit auch ohne Berücksichtigung der hier diskutierten langfristigen Aspekte sehr umstritten sind. Dennoch besteht die Notwendigkeit, zumindest einen klaren Fahrplan zu haben, wie die Übereinstimmung des Mechanismus mit dem Netto-Null-Ziel längerfristig erreicht werden kann. Die hier diskutierten Optionen bieten einige mögliche Wege. Angesichts der unklaren politischen Durchführbarkeit der einzelnen Ansätze erscheint es wichtig, sich nicht nur auf einen Ansatz zu beschränken, sondern flexibel bei der Festlegung jedes einzelnen Ansatzes zu sein, wann immer sich eine Gelegenheit ergibt.

Der letzte Textentwurf der Madrider Konferenz verlangt von den gastgebenden Vertragsstaaten, dass sie sicherstellen, dass ihre Teilnahme nicht nur zur Umsetzung ihrer NDC, sondern auch zu ihrer langfristigen Entwicklungsstrategie für niedrige Treibhausgasemissionen beiträgt, sofern sie eine solche verabschiedet haben (UNFCCC 2019b, Abs. 28b). Darüber hinaus muss gemäß dem Textentwurf jede Methodik des Mechanismus, einschließlich der Prinzipien zur Festlegung von Baselines und von Zusätzlichkeit, vom Supervisory Body genehmigt werden (UNFCCC 2019b, Abs. 34) und sollte auch die langfristige Entwicklungsstrategie des Gastgeberlandes für niedrige THG-Emissionen sowie das langfristige Ziel des Pariser Abkommens berücksichtigen (UNFCCC 2019b, Abs. 35). Diese Anforderungen könnten ein Ausgangspunkt für die Stärkung der Verbindung zwischen der kurzfristigen Anwendung von Artikel 6.4 und seinen langfristigen Auswirkungen sein. Selbst wenn ein solcher Ansatz auf internationaler Ebene angenommen würde, könnte er jedoch unzureichend sein, um Artikel 6.4 vollständig mit den langfristigen Anforderungen des Pariser Abkommens in Einklang zu bringen. In diesem Zusammenhang scheint eine Umsetzung im Rahmen eines Club-Ansatzes durch eine Gruppe von Ländern als erster Schritt vorerst eher machbar, wobei zu berücksichtigen ist, dass robuste Regeln zur Gewährleistung der Umweltintegrität für alle Vertragsparteien die Grundlage für alle Teilnehmer an dem Mechanismus bilden müssen.

Summary

Background and Scope of the Project

Article 6 of the Paris Agreement establishes three approaches for Parties to cooperate in achieving their nationally determined contributions (NDCs). One of these approaches is a new mechanism "to contribute to the mitigation of greenhouse gas emissions and support sustainable development" (Art. 6.4(a)). The UNFCCC's Subsidiary Body for Scientific and Technological Advice (SBSTA) has been mandated with developing draft rules, modalities and procedures (RMP) for this mechanism for consideration and adoption by the Conference of the Parties serving as Meeting of the Parties to the Paris Agreement (CMA).

The aim of this project has been to contribute to the development of the RMP for the new mechanism by analysing a range of design questions:

- What are options for achieving an overall mitigation of global emissions, as mandated by Art. 6.4(d) of the Paris Agreement?
- In how far can baselines be established on the basis of best available technology (BAT) values?
- How can the new mechanism be used to raise the ambition of nationally determined contributions (NDCs), as mandated by Art. 6.1 of the Paris Agreement?
- What role can the voluntary carbon market play in raising ambition?
- Which incentives can be created for private companies to participate in the new mechanism?
- What role can Article 6 play on the way towards a (net) zero emission world?

Over the course of the project, these questions and possible solutions were analysed in a series of working papers, one for each question. The research was conducted mainly as a desk study. In addition, for the question on the voluntary market, a number of market stakeholders were interviewed. Furthermore, key findings of the project were discussed in a workshop on 30 October 2018. This report synthesises the findings from the working papers and the workshop and relates them to the status after the negotiations after the climate conference in Madrid in November 2019.

Achieving an Overall Mitigation of Global Emissions

Definition of Overall Mitigation

The objective to "deliver an overall mitigation in global emissions" (Art. 6.4(d)) is one key innovation of the Article 6.4 mechanism. The new mechanism is thereby supposed to not continue the "zero sum game" of the Kyoto mechanisms, where each tonne of emission abatement achieved may be used by the buyer of the respective emission credits for compliance with their Kyoto commitment. The new mechanism is supposed to globally achieve more emission reductions than would have been achieved without use of the mechanism.

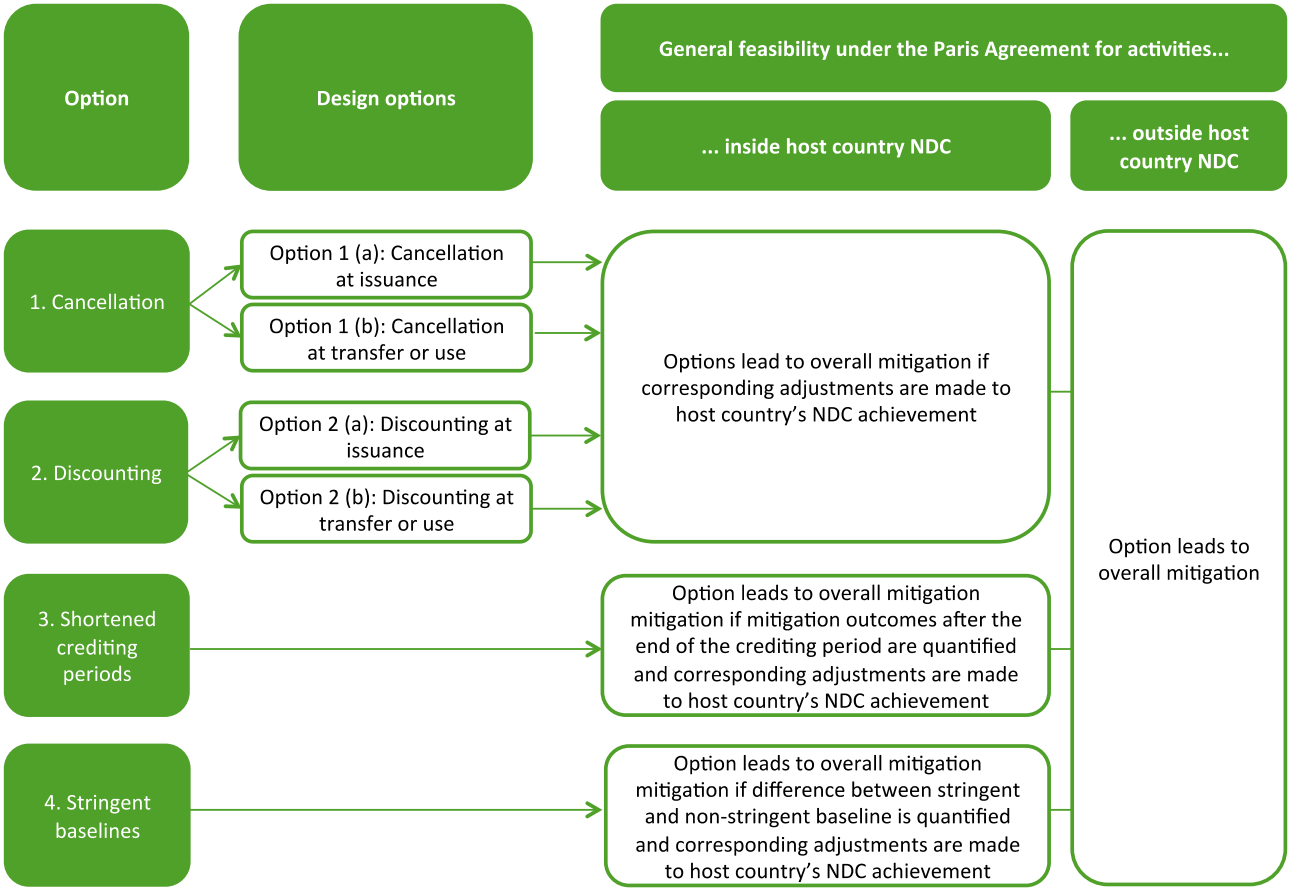
However, the concept of overall mitigation has so far not been clearly defined by Parties. In particular, it must be clearly demarcated from the requirement in Article 6.1 to raise ambition. This report proposes the following demarcation of terms:

- The concept of **raising ambition** encompasses Parties' targets *and* actions which Parties take on their own initiative.
- The concept of **overall mitigation** applies to the net climate benefit of Article 6.4 activities resulting from the mechanism's regulations.

Options for Obtaining an Overall Mitigation in Global Emissions and their Applicability under the Paris Agreement

On this basis, the report surveys which options are available to make the Article 6.4 mechanism contribute to overall mitigation. Figure 1 provides an overview of the options that are considered in the report.

Figure 1: Overview of Design Options and their General Feasibility under the Paris Agreement



Source: Own compilation, Wuppertal Institute.

It bears noting that according to the body of literature that was reviewed for this report there is no strong difference between discounting and cancellation in case they are implemented at transfer or use. In both cases, overall mitigation is achieved by taking units out of the system. The SBSTA negotiating text from Katowice envisaged 'cancellation' as applying at the transfer stage and 'discounting' as applying at the use stage. We nonetheless decided to retain the definitions of the terms as used in the literature. Discounting does not appear in the current text from Madrid.

It also bears noting that there is no agreement yet on how corresponding adjustments will be applied. If they were applied only for international transfers, not directly at issuance, cancellation and discounting at issuance would not lead to overall mitigation; instead, the mitigation benefit would accrue to the host country.

Differentiation: All of these options can either be applied equally to all emission reducing activities or they can be modified to favour specific types of activities or sectors or activities within specific geographical boundaries. While it may be possible to reach political consensus regarding geographical differentiation in international negotiations on Article 6, different treatment of certain types of activi-

ties or sectors may prove to be difficult to agree on politically, in particular with regards to discounting and cancelation.

Finally, the implementing entity may significantly affect overall mitigation in global emissions. It has not been decided yet whether the host country or acquiring country, or an administrator for the crediting mechanism at UN level would implement the option(s) to achieve overall mitigation.

Assessment of Options

The assessment of the options for obtaining overall mitigation in global emissions discussed in this report assumes that modalities and procedures for the Article 6.4 mechanism are able to guarantee that only actual emission reductions are credited. The report assesses the options on the basis of the following criteria:

- The ease of implementation
- The applicability to different activities and sectors
- The transparency of the option
- The potential for overall mitigation
- The option's impact on the internal rate of return
- The confidence that surplus reductions will be achieved

The assessment shows that all of the options discussed have clear advantages and disadvantages.

- All in all, **implementation at UN level** seems to yield the most positive outcomes. It would be most likely to guarantee high levels of transparency and lower the risk of double claiming because it is able to centralise relevant accounting tasks. Implementation at UN level would also ensure easier oversight and mainstreaming of standards and procedures, facilitating technical applicability.
- **Differentiation** of the options according to activities, sectors, or geographical regions may boost the mechanisms effectiveness by providing opportunities for mitigating activities that would otherwise not be implemented, e.g. activities in disadvantaged sectors or geographical regions. However, it reduces the cost-effectiveness of the mechanism and complicates technical application. Furthermore, it may be very difficult to reach political agreement on specific activities or sectors to be favoured. Giving preferential treatment to specific geographical regions such as to LDCs and SIDS, in contrast, is already established practice under the UNFCCC and may be more feasible. Differentiation according to activities may be politically most feasible if done at the level of the methodologies, as in this case discussions could take place on a factual basis regarding the economic viability of the respective activities.
- **Cancellation and discounting** at issuance, transfer or use without differentiation are the most straightforward options to be implemented and applied.
- **Shortened crediting periods** have many advantages, including high transparency, relatively easy implementation and applicability, and a high potential for overall mitigation as well as backloading of reduced revenue which increases the positive impact on an activity's internal rate of returns when crediting periods are shortened at the end of a mitigating activity's life cycle. However, postponing the benefits to the atmosphere is a serious disadvantage of this option. In addition, installation operators have no incentive to continue monitoring and verification after the end of the crediting period. Monitoring and verification costs would therefore probably have to be covered from other sources, such as the revenue of the Supervisory Body. Shortening crediting periods at the start of a project would eliminate these problems but would seriously reduce the internal rate of return and thereby the economic viability of activities.

- **Stringent baselines** may be most useful where innovative technologies can be incentivised as this advantage could trump the high amount of work that would be needed to implement this option.

Ultimately, what option to choose and how to design it depends on the weight given to the different criteria. If ease of implementation and applicability to all types of activities are a priority, cancellation and discounting without differentiation are clearly the most suitable options. By contrast, if transparency and the option to favour particular types, sectors or geographical regions of mitigation activities are considered to be important, the most favourable options are differentiated crediting periods and stringent baselines.

According to the last draft text from Madrid (UNFCCC 2019b), overall mitigation would be operationalised by requesting the mechanism registry administrator to transfer a percentage of the issued A6.4ERs to a cancellation account in the mechanism registry. This approach would be in line with the definitions used in this report, according to which overall mitigation results from the mechanism's design and is of mandatory nature. Cancellation at issuance is also the most straightforward option identified. However, discussions on this item have been highly contentious, it remains to be seen whether Parties will in the end agree on this approach.

Benchmarks to determine baselines for mitigation action under the Article 6.4 mechanism

Background

Baseline setting with globally applicable and stringent benchmarks may be an important instrument for scaling-up market mechanisms under Article 6. Defining baselines based on business-as-usual (BAU) and nationally determined contributions (NDC) targets is challenging as targets are uncertain, sometimes unclear or have only a limited scope. Benchmarks promise to be an efficient and simple solution. This builds on the rationale that stringent benchmarks lead to baselines that are automatically below both BAU and to an emission trajectory that is compliant with the host country's NDC target. The analysis in this report focuses on global benchmarks in the sense of simple reference values for specific products and services that are independent of a specific country and may be applied globally or on the level of groups of countries (e.g. low/middle/high income countries).

Benchmarking is a term widely used and describes a standard or set of standards that can be used as a point of reference for evaluating performance or level of quality against peers. In the context of Article 6.4., we consider benchmarking as a comparison of the performance with respect to either GHG or CO_2 emissions and in some cases also energy.

Different levels can be used to define a benchmark. Examples are the average performance level, the average of the top 20%/10%/ x% best performers (e.g. applied under the EU ETS (10%) and partly in CDM (20%)), the best achieved level or the best available level (see e.g. pmr 2017).

Benchmarks are often used as a management tool to monitor company performance, but they are also used more and more often in energy and climate policy. The best-known example of this is the EU ETS, for which 59 product benchmarks have been developed. These benchmarks are used to determine the free allocation of allowances to industrial installation operators. Fallback benchmarks for emissions from heat and fuel consumption have also been developed. Other countries such as South Korea and Switzerland also use benchmarks in their emissions trading systems.

Using benchmarks for crediting systems

In contrast to emissions trading, where a benchmark is used to determine the number of allowances allocated, in a crediting system the benchmark is used to define the baseline emissions. The amount of credits that can be issued is subsequently determined by the difference between the benchmark and

the installation's performance (which needs to be monitored). The fact that benchmarks are being used to define the baseline (and not the standard that should be achieved), also implies that some of the existing benchmarks are not suitable in this context. For example, a benchmark based on best available technology may not provide sufficient leeway to credit further emission reductions compared to that benchmark.

Paragraph 48c of the Modalities and Procedures for the CDM today explicitly allows for the use of benchmarking. However, it is rarely used in reality. Yet, in contrast to the CDM, where each project provides its own baseline based on the specifications within the methodology, the use of benchmarks for the definition of a baseline could increase transparency, reduce administrative costs and may help to increase environmental integrity of the crediting system by preventing over-crediting.

Several different potential sources for benchmark values may be considered:

- Best Available Techniques reference documents that have been adopted under both the IPPC Directive (2008/1/EC) and later under the Industrial Emissions Directive (IED, 2010/75/EU).
- Data from CDM projects for the relevant sectors.
- Product benchmarks, in the context of the EU ETS.
- Energy efficiency standards for specific jurisdictions.
- Data on carbon intensity as collected by sectoral organizations, such as in the Cement Sustainability Initiative or data on upstream emissions from the oil industry.

For the development of benchmarks under the EU ETS, 11 guiding principles were developed in advance (Ecofys and ISI 2008). They characterise what – from a theoretical point of view – good benchmarks should respect. However, while at first glance the EU ETS benchmarks and hence the underlying guiding principles seem to provide a good starting point for the discussion, in detail one faces difficulties in the application of benchmarks in the context of international crediting (rather than linking of ETS). First, not all installations, but only some, either new or significantly improved installations will apply the benchmark on a voluntary basis (self-selection of installations). Second, applying similar benchmarks in all countries may not necessarily be the best solution. For products competing in the global market, a level playing field seems indeed appropriate. However, in the international context, differences in the countries' national circumstances and the UNFCCC's principle of common but differentiated responsibilities and respective capabilities may call for factoring in the national context in the definition of the benchmark.

Criteria for the selection of benchmarks

Based on DEHSt (2013), the following general criteria are necessary for the development of a benchmarking approach in an international context:

- Clear definition of system boundaries
- Adequate definition of key performance indicator/ benchmark
- Availability of data for determination of benchmark level
- Similar benchmarks for similar products in similar countries
- Benchmark levels should incentivise investment in no- and low-carbon technologies
- Improvement over time
- Availability of data for performance evaluation

In addition to these general criteria, the use of benchmarks under Article 6.4 also necessitates specific requirements. This means that the crediting baseline must not only be below BAU emissions, but also in line with national NDC targets. The benchmark must also be consistent with the Paris Agreement, which means that the benchmark should not incentivize the construction of plants that are not consistent with the emission reduction pathway necessary to meet the Paris agreements. Furthermore, the benchmark should also be applicable to a wide range of countries or different benchmarks will be

developed for different categories of countries (e.g. by income). And finally, there should be a transparent and science-based process for determining benchmarks.

Chapter 3.2 of this report looks at data sources and discusses possible types of benchmarks for the most relevant areas (Industry including energy use, Energy generation, Housing, Transport and Wastewater management). In addition, there are three detailed case studies on Cement, Steel and Wastewater Treatment (chapter 3.4).

The following table evaluates important criteria that define the suitability of benchmarks for selected sectors. The criteria are: the availability of data (for activity levels and benchmark data); the availability of global benchmark (vs. the need to differentiate them for specific countries or regions); and the carbon market contribution to profitability (in order to focus on projects that are additional compared to what would otherwise occur). Adequate levels of data availability are crucial, be it for benchmarks that are determined purely rule based (by use of a formula, e.g. as a certain percentile of the market performance) or by expert judgement (considering ambition and technological leaps). In general, data availability is much more limited in developing countries, in more informal industries and the residential sector. The Paris Agreement requires also the regular updating of benchmark values, for instance in sync with the 5-year NDC cycle to prevent lock-ins into technologies that may not be in line with the long- term goal of the Paris Agreement.

Table 1: Evaluation of criteria that define the suitability of benchmarks for selected sectors

(Sub-) sector	Activity data availability	Benchmark data availability	Availability of global benchmarks	Carbon market contribution to profitability
Industry energy use – product benchmarks	***	**	**	*
Industry energy use – other benchmarks	**	*	*	*
Industry process emissions	***	**	***	***
Energy generation	***	**	**	*
Housing	**	*	*	*
Transport – general	*	*	*	*
Transport – fuel efficiency standards	**	**	**	*
Wastewater	**	*	*	***

Source: Own analysis. Key: * = low, ** = medium, *** = high

Recommendations

The contribution of carbon markets to the profitability of a project differs strongly between different sectors. For wind projects the impact of carbon revenues under the CDM added on average below three percentage points to its profitability (internal rate of return). On the contrary in e.g. landfill gas projects, where the high global warming potential of the avoided methane produces much more revenues from carbon markets, the impact on profitability is on average in the order of 14 to 15 percentage points (Cames et al. 2016). This problem is not benchmarking-specific. However, when identifying

sectors that are most suitable for using benchmarks under Article 6.4, the economic attractiveness is an important factor.

While the analysis indicates an overall limited potential for global benchmarks, there are some *quick wins* in the form of global benchmarks related to industry process emissions. Here, the CDM has established robust and stringent benchmarks for baseline setting e.g. in N2O abatement in nitric acid or adipic acid production, or for abatement of HFC23 emissions in the production of refrigerants. It may also be assumed that with these high GWP gases, the revenues from the transfer of emission reductions may provide a significant contribution to overall profitability of a project and therefore lead to mitigation action beyond BAU with no abatement.

In our case studies we derived that some other industries may be suitable for benchmarking, including cement or iron and steel. However, related emissions depend on local factors (such as quality of raw materials) and are thus difficult to implement on a global level. Here, baseline setting with approaches of intermediary complexity may be possible, building on proposed or approved CDM methodologies and EU-ETS guidance for product benchmarks. In practice, expected carbon prices may not be on a level that would trigger *additional* action in these sectors.

Also, the process that leads to the definition of benchmark values may be challenging to implement under an Article 6.4 mechanism. Providing benchmarks may open the door for loopholes or non-stringent values may result. A stringent and science-based process within the Article 6.4 supervisory body should facilitate the definition of adequate global benchmarks. In settings of weak governmental oversight, using benchmarks may be less adequate than conventional methodologies of baseline setting, where baselines are set on the basis of project specific parameters that are validated by independent third parties.

To summarize: Even though there are sub-sectors with medium to large potential for benchmarking, most emission sources cannot be covered by global benchmarks, because the goods and services are heterogeneous (e.g. “shoes”, “tonne-kilometers”) and emissions tend to depend also on exogenous local factors. Benchmarking is therefore barely the silver bullet to solve the issues with crediting baseline setting under the Paris Agreement.

A way forward is to move from global benchmarks towards standardized approaches of baseline setting, where there is a large body of methodological approaches and reference values from ETS and the CDM (see further chapter 3.6) that can be used to define crediting baselines in a more efficient and robust way. Their use under Article 6 requires their further development including comprehensive data collection exercises that would allow for standardized approaches taking into account at least some regional, local or project specific factors.

The current negotiating text includes no explicit reference to benchmarks. It stipulates only generic requirements, such as that each methodology “shall require the selection of a transparent and conservative approach, assumptions, parameters, data sources and key factors” (UNFCCC 2019b, Annex, section V B, para 35). The text also provides for the development of standardised baselines to be established “at the highest possible level of aggregation in the relevant sector of the host Party” (UNFCCC 2019b, Annex, section V B), para 37). If adopted in its current form, the text would not provide clarity on whether use of benchmarks will be possible or not.

Options for Fostering Increasing Ambition levels under the Paris Article 6.4 Mechanism

Background

The collective ambition level of Parties’ NDCs so far falls short of meeting the objectives of the Paris Agreement to hold “the increase in the global average temperature to well below 2°C above pre-industrial levels” (Article 2) and “to achieve a balance between anthropogenic emissions by sources

and removals by sinks of greenhouse gases in the second half of this century" (Article 4). Therefore, it is particularly important that the Paris Agreement has an in-built mechanism of progressively raising ambition levels individually and collectively.

Ambition raising is also a component of the cooperation approaches established under Article 6 of the Paris Agreement. However, the incentives set by the Article 6.4 mechanism may not necessarily support or may even conflict with the Paris Agreement's need for ambition raising, depending on the outcome of the ongoing negotiation of the detailed modalities and rules. The following examples are key issues discussed in the negotiations: On the one hand, setting ambitious targets may directly reduce the amount of mitigation outcomes that go beyond the NDC target and that a host country can transfer (and sell) abroad. On the other hand, if the Article 6.4. mechanism allows for crediting of activities that are beyond the scope of the NDC without requiring the host country to account for exported mitigation outcomes from such activities, there is no incentive to expand the scope of the NDC, because this would reduce the host country's potential to obtain external funding.

The report presents four options on how the risks outlined above could be addressed allowing Article 6.4 to contribute to ambition raising:

Option 1: Strengthening reporting, transparency and comparability

This weakest option to foster ambition raising builds on the comprehensive requirements of the Paris Agreement for transparency, reporting and review and the related rulebook. Parties may choose for a comprehensive and strong implementation in order to foster comparability between efforts and therefore ambition raising.

Upfront information: Each party is required to provide upfront information through their NDCs, including on the use of Article 6 mechanisms, which may make targets and ambition levels comparable between different countries and over time.

Transparency framework and review: The transparency framework for action and support is the main mechanism to hold states accountable for the implementation of their NDCs. The rulebook is not yet very specific on reporting about Article 6.4 use, so further guidance is important.

Global stocktake: The global stocktake on the implementation of the Paris Agreement assesses the collective progress and is a key element of the ratcheting mechanism to increase ambition over time. While not specified in the rulebook, the stocktake could provide lessons learned and best practices from Parties that have used Article 6.4 mechanism to increase ambition.

Compliance mechanism: The Paris Agreement establishes a mechanism "to facilitate implementation" and "promote compliance" (Article 15). The rulebook contains its modalities and procedures, but it remains to be seen to what extent it may have an impact on Article 6 and ambition raising.

Option 2: Reconciling the design of the Article 6.4 mechanism with ambition raising of host countries

This option focuses on ways to design the rules, modalities and procedures that operationalize the Article 6.4 mechanism in such a way that allows countries to raise their ambition without being negatively affected in their role as host countries.

- Requiring host countries to also account through corresponding adjustments for exported mitigation outcomes that were generated outside the scope of their NDC;
- Restricting crediting periods and adjusting baselines in alignment with the 5-year NDC cycle;
- Requiring conservative baselines;
- Defining eligibility criteria for the Article 6.4 mechanism (relating to NDC targets): Coverage of NDC targets, engaging in long-term strategies, restricting eligibility of technologies or types of action, requiring ambitious and quantified NDC targets;
- Requiring inclusion of emissions targeted by Article 6.4 activity into future NDC;

- Assuring quality of the mitigation outcomes.

Option 3: Supporting the host country to raise ambition through the Article 6.4 mechanism

Parties, bi- and multilateral institutions and initiatives can support host countries in fulfilling the requirements outlined in the previous section.

Support ambitious target-setting and long-term planning activities: Limited and incomplete planning processes can be a reason for unambitious and unclear NDCs as well as incomplete long-term strategies. Therefore, support for countries that need it could help increasing ambition.

Facilitate investments in new low-carbon technologies: The Article 6.4 mechanism should facilitate investments in technologies in a host country that would be unable to make such investments unilaterally. There could be positive lists for (high cost) emerging technologies and negative lists for low-cost, mature technologies.

Option 4: Fostering the acquiring country to raise ambition through the Article 6.4 mechanism

An acquiring country can use the mitigation outcomes purchased to reach their NDC target, but also to cancel (a part of) the mitigation outcomes to increase its ambition.

Using lower compliance costs for ambition raising: The country is lowering its cost of compliance with its NDC target if the implementation of policies that would be necessary to reach the NDC has higher marginal abatement costs than the purchase of the mitigation outcomes from the Article 6.4 mechanism. If the acquiring country invests the savings in domestic reductions or international climate finance, this can lead to increased ambition.

Increasing ambition with long-term strategies: Embedding the purchase of mitigation outcomes in long-term strategies and clear communication of these strategies can help increasing ambition.

Increasing ambition through risk reduction: The country bears a risk of not being able to attain its NDC target due to financial or technical constraints. Mitigation outcomes are acquired to hedge the risk.

"Insetting" or linking use of mitigation outcomes to domestic mitigation activities: Countries wishing to use mitigation outcomes from abroad to achieve their NDC could voluntarily commit to carry out additional domestic reductions.

Recommendations

The first two options may be implemented on different levels, depending on the level of international agreement with regard to the need to prevent perverse incentives from the use of the Article 6.4 mechanism. The following cascade may be considered:

- CMA/ rulebook level (international governance setting required)
- Supervisory Body for Article 6.4
- «Club» of likeminded parties
- Individual acquiring countries defining criteria for mitigation outcomes purchase

The third option is the support of host countries to raise ambition. This is a role that many (potential) acquiring countries and multilateral institutions have historically carried out already in the Kyoto periods and will probably continue to do so under the Paris Agreement.

The fourth option is fostering action to raise ambition on the side of the acquiring country. This is key to achieving the targets of the Paris Agreement and will mainly be achieved individually.

The Madrid negotiating text by the President foresees corresponding adjustments irrespective of whether the mitigation outcomes transferred are from within or outside of the host country's NDC

(UNFCCC 2019b). There might be an opt out period introduced, during which corresponding adjustments do not have to be applied. Nevertheless, such a rule would support Article 6 as an ambition raising mechanism.

The Voluntary Carbon Market: What May Be Its Future Role and Potential Contributions to Ambition Raising?

Background

With the Paris Agreement, the role of the voluntary carbon market and its relation with mandatory carbon regulation schemes is set to change fundamentally. This is due to two major paradigm shifts: First, by requiring all Parties to adopt NDCs, the Paris Agreement will significantly reduce the so called 'uncapped environment', i.e. the emissions not covered by carbon regulation, which have so far been the main source of supply for voluntary carbon market activities. Second, the new agreement requires all Parties to raise their ambition when engaging in cooperation under Article 6, thereby terminating the era of 'pure offsetting'.

Against this backdrop, this report explores the future role of the voluntary market and its potential to contribute to ambition raising. For this purpose, desk research was complemented by interviews with voluntary carbon market representatives. The interviews allowed to further elaborate initial ideas and concepts as well as to gather views from the voluntary market representatives on some of the key issues identified.

Potential Roles of the Voluntary Market

The report looks at the voluntary market as an investor in and as a certifier of ambition raising activities and identifies different roles it could play in the future by putting particular focus on its potential to contribute to ambition raising.

For the future of the **voluntary market as an investor**, three potential roles were identified:

- The market may maintain its current role of buyer of carbon neutrality credits,
- it may become a supporter of NDC implementation,
- or it may become a driver of ambition by purchasing ambition raising units.

The findings indicate that the current role of the voluntary investor as a buyer of carbon neutrality credits (role 1) will be impacted significantly by the changes introduced with the Paris Agreement as the "uncapped environment" will be limited in the future. The potential of the voluntary market to continue performing this role will largely depend on the requirements for host Parties to account for mitigation outcomes exported. Transparent and easily accessible accounting instruments will be key determinants for continuing the carbon neutrality concept in the future, as well as countries' capacities and willingness to make corresponding adjustments. Despite these challenges, the continuation of the carbon neutrality model can be considered the most promising future role for the voluntary market. If carbon neutrality credits are generated within the scope of ambitious NDCs and accounted for by a robust accounting approach that uses the NDC as its point of reference, this model holds significant potential to assist Parties in increasing their ambition. This also holds for carbon neutrality credits generated outside the scope of NDCs, if it is ensured that activities are truly additional. This is particularly salient as no decision has yet been taken on whether mitigation outcomes generated outside the scope of an NDC will have to be accounted for.

The role of the voluntary investor as a facilitator of NDC implementation (role 2) is increasingly being endorsed by carbon market participants. Private certification standards are exploring the possibilities to develop respective products and suppliers are engaging with final customers to evaluate the marketing potential. While there seems to be some potential for this new role in terms of demand it is also

associated with significant challenges: This role does not only require the development of a new product but there are also some environmental risks associated with its use if the underlying NDC lacks ambition. Therefore, this approach should be carefully explored further in order to find solutions in addressing the major concerns.

The role of the voluntary investor as a contributor to ambition raising through investing in ambition raising units (role 3) turned out to be the role with the lowest overall potential. While it could have a direct ambition raising impact, it suffers from the fact that it requires both, the creation of a new commodity and the need to implement corresponding adjustments. Therefore, approaches that allow the voluntary market to contribute to ambition raising through its role as an investor in carbon neutrality offsets or while supporting countries in achieving their NDCs seems the most promising avenue.

With regard to the **future role of private certification standards**, three options were identified:

- Private standards could function as mere providers of methodologies and innovative approaches to be used by the Article 6.4 mechanism,
- they could be used as standards under Article 6.2,
- or they could be applied outside of Article 6.

The analysis found that the integration of private standards into Article 6.2 can be expected to be the most promising option, as it would allow to use the entire architecture of the standards while accounting would accrue under the international accounting framework under Article 6.2.

Recommendations

The findings indicate that the voluntary market has potential to contribute to ambition raising. Whether this potential will actually be unlocked depends on how the concept of ambition raising will be operationalized under the Paris Agreement. Another determinant will be the voluntary market's ability in transitioning from the current carbon neutrality-based model to new approaches that take into account the new framework conditions established with the Paris Agreement. Negotiators under the UNFCCC are currently in the process of translating these framework conditions into provisions in order to make the Paris Agreement and its Article 6 operational. Some of these provisions could be relevant for the future involvement of the voluntary carbon market: paragraph 58 of the draft RMPs, for instance, envisages the voluntary cancellation of emission reductions at the request of activity participants, while paragraph 71 provides the basis for the application of corresponding adjustments if emission reductions are used for "other international mitigation purposes" (UNFCCC 2019b, Annex, para 71). The latter paragraph establishes a link to the modalities, procedures and guidelines of the Transparency Framework adopted in 2018 in Katowice where Parties had agreed that "use of mitigation outcomes for international mitigation purposes" (UNFCCC 2018, para 77 d)) will have to adhere to the same rules as the use of MOs against NDC attainment. While this is primarily understood as referring to the use of mitigation outcomes under CORSIA and other future mandatory mitigation schemes, it could also be seen as an indication that "unilateral adjustments" could be implemented in the context of voluntary carbon market activities. However, it remains to be seen whether these provisions will be adopted and how they will be operationalized. This process will take time and its outcome cannot be expected to answer all questions that are relevant to the current operations of the voluntary market and its future role. When being confronted with such governance gaps, the voluntary market should take a progressive stance by advocating for robust solutions that enhance mitigation ambition and safeguard the environmental integrity of the Paris regime. With this, the voluntary market can live up to its role as an innovator and developer of solutions that could at a later stage be translated into compliance market activities under the Paris Agreement.

Incentives for Private Sector Participation in the Article 6.4 Mechanism

Background

The private sector is not only a large emitter of greenhouse gases, it also provides innovative solutions to address climate change. These multiple functions have been recognized by Parties when adopting the Paris Agreement and its Article 6.4, which explicitly aims to incentivize and facilitate the participation in the mitigation of greenhouse gas emissions by private entities (Art. 6.4 (b)).

Under the CDM, private sector actors had the opportunity to participate in a new and fast-growing market but faced challenging investment barriers as well. Given the more heterogeneous architecture of the Paris Agreement and the stronger role (host) country governments have been granted under the new regime, it appears that private sector actors might have to operate under an even more complex regime and face more challenges, in particular in countries with weaker institutions and authorities (e.g. for obtaining the authorisation).

For the following analysis, we distinguish between demand side factors, rules and standards for market mechanisms, and supply side factors.

Key factors determining private sector participation

Demand for units from the EU-ETS was the key driver of the earlier market under the CDM. However, the rules and standards of CDM and Joint Implementation (JI) were of limited robustness and allowed for the use of units which to a large share carried a high risk of being non-additional. As a result, CER and ERU prices remained far too low and provided no significant revenues compared with other cash-flows in a typical investment analysis of energy related projects. As a result, the private sector was stimulated by domestic subsidies (such as feed-in tariffs), but whether the flexible mechanism provided a source for additional activities is in many cases questionable.

So far, the stated demand for tradeable emission reductions by Parties under the Paris Agreement is minimal. Only very few Parties have indicated their plans to buy ITMOs in their NDCs while many Parties indicated they intend to sell units. Some Parties such as Switzerland and Sweden have indicated their interest to start purchasing mitigation outcomes from Article 6 pilot projects.

A certain level of demand for offsets may also be expected from the UN's International Civil Aviation Organization's (ICAO) Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). However, this demand for new Article 6 activities will depend highly on the rules limiting the transitioning of CDM projects and legacy CERs, as existing legacy CERs may supply the expected CORSIA demand multiple times.

On the other hand, the emerging pilot schemes may lead to a certain demand for high quality ITMOs. This may be somewhat strengthened if such purchase schemes were scaled up, for instance, in the form of clubs of likeminded Parties aiming at higher ambition.

Rules and standards for market mechanisms are another key factor for the participation of the private sector. The dynamic evolution and some persistent ambiguities in rules and standards of the flexible mechanisms (e.g. regarding the concept of additionality and baseline setting) have led to complicated and time-consuming processes and uncertainty for investors under the CDM. These uncertainties led to considerable risks for private sector actors related to project approval, issuance of CERs and unit prices, which counted against an investment in additional projects.

Under the Article 6 mechanisms of the Paris Agreement the situation for private sector actors may become even more challenging. The Article 6 text itself appears not to be free of ambiguities. Key topics generating uncertainty include single-year vs. multi-year accounting, timing and operationalization of corresponding adjustments, and avoidance of double counting in general. It has to be seen to which extend they will be solved by the expected Article 6 rulebook. With the weakening of centralized gov-

ernance for the Article 6 mechanisms compared to a situation with the CDM EB as a centralized governing body in the CDM, it may be expected that the uncertainties for private sectors will tend to increase compared to the situation under Kyoto.

Looking at *supply side factors*, host countries need investment readiness in order to facilitate private sector action. Article 6 activities are not fundamentally different from any other foreign direct investment project. Such investments are fostered, for instance, by sound institutional setting, sound regulatory setting, transparency, and a competitive tax environment.

With the Paris Agreement, these domestically defined supply side challenges do not change in general. However, if for instance host countries define in the context of their Long-term Low Emissions Development Strategies (LT-LEDs) sectors in which they would like to see Article 6 activities, they may as part of their national mitigation planning provide incentives for the private sector to invest in that sector.

Overview of options to mitigate or overcome barriers

On the *demand side* the main option is the stimulation of demand for additional units that foster ambition raising in both acquiring and host countries. Acquiring countries committing to raise their ambition and strengthening demand for ITMOs are crucial for the establishment of a carbon market (see section on ambition raising above).

Possible instruments to foster ITMO demand by companies in acquiring countries are, for example, domestic emission trading systems (ETS) or carbon taxes that allow for the use of ITMOs to fulfil part of the obligations. This may include the so-called "insetting" approach, where companies invest into mitigation actions within their own supply chain.

Regarding the *design of the rules and standards of the Article 6.4 mechanism* to support demand and facilitate private sector participation, rules should provide a clear framework to facilitate the role of national governments and enabling national systems and capacities. Further, the definition of clear and unambiguous rules and standards is crucial for private actors to participate in carbon markets. Private sector participation and demand for ITMOs can be supported by rules that allow for up-scaling of projects. Further, digitization of MRV and distributed ledger technologies have the potential to generate efficiency gains and increase trust in registries and unit tracking.

On the *supply side*, it is important to foster host country investment readiness facilitating private sector action. Many countries already receive support for investment readiness (e.g. through the World Bank, development agencies, etc.). This support has to be continued and expanded under the Paris Agreement. Sound institutional and regulatory settings and transparency are crucial to increase investment readiness in host countries. Regarding the investment sectors, it is favourable to build on domestic strengths of a host country's specific market context. For this reason, host countries could be supported to develop strategy studies regarding Article 6 mechanisms, e.g. in combination with their LT-LEDS development.

Specific options fostering private sector participation

Based on the given overview, the study provides an explorative analysis focussing on three topics: the design and support of national systems and capacities, allowing for up-scaling of projects, and exploring the potential through digitization of MRV.

Any private sector activity depends on well *designed and supported national systems and capacities*. In countries that do not do their "transparency related homework", the implementation of private sector Article 6 activities may sooner or later run into barriers, e.g. if the international transfer to a acquiring country cannot be executed or is delayed, because the tracking and registry information is not available to assure corresponding adjustments, or a host country takes back its authorization of a transfer because the mitigation action is not visible in the national GHG inventory.

Domestic rules for participation in carbon markets as outlined in Article 6 of the Paris Agreement have to be defined by host country governments. Countries with weaker governments will need assistance in defining and establishing these rules. Bilateral processes or partnerships are possible ways to foster this. An efficient and robust national system for authorizing the use and transfer of emission reduction credits to other countries is necessary, allowing for transparency and predictable revenues for private investors.

Allowing for up-scaling of projects is mainly driven by the need for rapid reduction of global GHG emissions and the perceived shortcomings of the Clean Development Mechanism (CDM). Upscaling is assumed to lead to a simplification of the process for registration of individual projects and the issuance of credits and reduce transaction costs. Up-scaled crediting aligns the crediting level with the national or sectoral policy-level. In doing so it may further foster private sector participation, since it is policies established at this level which actually trigger most private sector activities. Up-scaled crediting could also reduce investment risks and regulatory uncertainty for the private sector. Registering domestic policies internationally as Article 6.4 activities may provide some safeguard against sudden changes at the international level.

On the other hand, scaling-up poses new challenges. Transaction costs and risks are shifted from the private sector to the national regulator. At the same time, challenges related to the causality of emission reductions remain as up-scaled approaches will also have to ensure that the actual mitigation activities will actually be incentivised by these policies.

In order to increase the scale of mitigation activities under Article 6.4, one first step is to ensure that the provisions and definitions of the mechanism do not exclude such type of activities. Similarly, the governance functions of the Article 6.4 mechanism should be designed with policy-based mitigation activities in mind. Allowing scaled-up crediting will further require an entire new set of methodologies for additionality demonstration, baseline calculation and MRV. Top-down development of these methodologies and capacity building measures that support host Parties in developing policy-based crediting activities could foster the emergence of up-scaled crediting.

In the current negotiations there does not appear to be much emphasis on up-scaling, the latest draft text from Madrid does not contain any explicit references. At the same time, it does not limit the scope of Article 6.4 to projects and programmes, as it gives the Supervisory Body a mandate to also approve other types of activities (UNFCCC 2019b, para 31a). There are some areas, however, that may not be fully compatible with policy-based or sectoral crediting, such as the governance structure that would allow host Parties to register Art. 6.4 activities (UNFCCC 2019b, Annex, para 27c). This may raise concerns about conflicts of interest if the host Party government is directly involved in the respective activity.

The use of *digital tools and processes for Measuring, Reporting and Verification (MRV)* has the potential to address and significantly reduce many of the related challenges and barriers along the entire project cycle:

Data coverage, accuracy and reliability can be improved drastically by using technology, such as sensors or mobile phones to capture data. Data collection and processing can be automated, e.g. by using Internet of Things (IoT). The combination of remote sensing with new data processing approaches including artificial intelligence potentially allows for the automated monitoring of forest areas and land use patterns. The emerging Blockchain (or "DLT") technology can contribute to secure data logging, by making the recorded data immutable.

Regarding impact quantification and reporting, "smart contracts" (i.e. small programs on a blockchain that securely carry out certain calculations) and online applications linked to automated data capturing and processing have many advantages compared to counting up by hand using complex spread-

sheets. Automated impact calculation, based on collected data and pre-set methodological approaches, would improve reliability, increase efficiency of this process and foster trust in outcomes.

In the process of impact verification, technologies like certified sensors and data transfer, smart contracts on blockchains could speed up and facilitate the process through real-time verification. Such systems allowing for automated quality assurance and quality control can be implemented by checking monitoring data for plausibility, consistency and outliers. Artificial intelligence can help to detect potential irregularities and areas of higher risk.

For the final issuance of units, technologies like registries building on blockchain or other distributed ledger technologies allow for trusted registry systems that are accepted by all stakeholders. The application of blockchain technology makes any changes immutable and allows for full transparency in tracking ITMO transactions. Besides information on carbon assets, such registries may also contain attributes of sustainability impacts of the mitigation actions. This kind of digital systems may also enable to link up with other registry systems and therefore allow for a linking of carbon markets beyond specific registry systems. This may require also the automated conversion of mitigation outcome units.

Digitizing MRV is only emerging and needs further research, development and field trials of approaches. Current issues range from technical aspects in data collection such as speed and lacking connectivity, to cost of monitoring equipment or needed capacities to train staff, interfaces for data reporting, adaptation of methodological approaches to digitization of MRV, to the need for strategies and harmonized implementation frameworks and governance for digital MRV.

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

Background

The objectives of the Paris Agreement in its Article 4 require a global balance of greenhouse gas 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 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.

Approaches to fostering a net-zero GHG emission world

This report 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 in 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 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. 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 objec-

tive 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.

The last draft text from the Madrid conference requires host Parties to ensure that their participation does not only contribute to the implementation of their NDC but also to their long-term low GHG emission development strategy, if they have adopted one (UNFCCC 2019b, para 28b). Moreover, any mechanism methodology, including baseline setting and additionality principles, needs to be approved by the Supervisory Body (UNFCCC 2019b, para 34) and should also take into account the long-term low GHG emission development strategy of the host Party as well as the long-term goal of the Paris Agreement, according to the draft text (UNFCCC 2019b, para 35). These requirements could be a starting point for strengthening the linkage between short-term use of Article 6.4 and its long-term effects. Even if adopted at the international level, such an approach might however be insufficient to fully align Article 6.4 with the long-term requirements of the Paris Agreement. 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.

1 Background and Scope of this Report

After twenty-five years of international climate negotiations, in 2015, the twenty-first Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) in Paris finally adopted a universal agreement requiring climate action from all countries. The Paris Agreement (PA) specifies the UNFCCC's objective to prevent dangerous anthropogenic climate change. With the PA, the international community now aims to stabilise average global temperature increase "well below" 2°C compared to pre-industrial levels, and to make "best efforts" to stay below 1.5°C (Article 2.1(a)). However, the universal coverage of the new agreement came at a price: the PA does not contain legally binding commitments for the individual Parties. Instead, the PA lays down only a procedural obligation for Parties to submit and maintain an NDC (Article 4.2). Nor are there strict international requirements on the format and content of the NDCs. NDCs are supposed to reflect Parties "highest possible ambition" (Article 4.3), but there is no guidance as to what this is supposed to mean. There also is no requirement for Parties to actually achieve their NDCs, only a requirement to pursue domestic measures towards this end (Article 4.2).

As result of this lack of formal requirements, the NDCs Parties have notified vary strongly from each other. Furthermore, the collective ambition of Parties is currently much weaker than what would be necessary to achieve the temperature limits of the Paris Agreement. If not strengthened further, the current NDCs would lead to warming of between 3-4°C (UNEP 2019).

Article 6 of the PA is supposed to support Parties in increasing ambition by providing them with options to cooperate in achieving their contributions. Article 6.1 of the Paris Agreement recognizes "that some Parties choose to pursue voluntary cooperation in the implementation of their nationally determined contributions to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity." Article 6 subsequently establishes three approaches for countries to cooperate with each other.

One of these three approaches is a new mechanism "to contribute to the mitigation of greenhouse gas emissions and support sustainable development" (Art. 6.4(a)). The Parties are to adopt rules, modalities and procedures which must be observed when implementing activities under Article 6.4. The UNFCCC's Subsidiary Body for Scientific and Technological Advice (SBSTA) has been mandated with developing draft rules, modalities and procedures for consideration and adoption by the CMA. These rules, modalities and procedures were to be adopted at the 24th Conference of the Parties serving as Meeting of the Parties to the Paris Agreement (CMA) in 2018. However, Parties were not able to come to an agreement on Article 6 at COP24, nor at COP25 in 2019. Negotiations are still ongoing. Key controversies include, among other, rules for making sure that mitigation outcomes are not double counted, rules for making sure that Article 6 activities go beyond mere offsetting and achieve an overall mitigation of global emissions and the question of how to deal with certificates from the Kyoto Protocol. In Madrid, delegations were again unable to agree on whether Parties will have to fully account for the transfers of emission reductions under Article 6.4, with Brazil continuing to push for Article 6.4 emission reductions being partially exempt from the requirement to implement corresponding adjustments. Most other Parties rejected this approach, highlighting that it would lead to double counting and thereby undermine the environmental integrity of the Paris Agreement. Another issue that could not be solved in Madrid was the CDM transition. Some large CDM host countries pushed for certificates from existing CDM projects to be eligible for being used towards NDCs, which several other Parties opposed. Parties tried to find common ground by introducing temporal limits and eligibility rules for the application of this option. In the end, however, the text proposals tabled by the CMA presidency were not adopted and negotiations will be continued on the basis of the different draft texts produced in Madrid. By postponing a decision on Article 6, Parties prevented potential loopholes being integrated into the Paris rulebook. While this should be seen as the preferential option to be taken at the time in Madrid, the future of the Article 6.4 mechanism remains uncertain.

The aim of this project has been to contribute to the development of the RMP for the new mechanism by analysing a range of design questions:

- What are options for achieving an overall mitigation of global emissions, as mandated by Art. 6.4(d) of the Paris Agreement?
- In how far can baselines be established on the basis of best available technology (BAT) values?
- How can the new mechanism be used to raise the ambition of nationally determined contributions (NDCs), as mandated by Art. 6.1 of the Paris Agreement?
- What role can the voluntary carbon market play in raising ambition?
- Which incentives can be created for private companies to participate in the new mechanism?
- What role can Article 6 play on the way towards a (net) zero emission world?

The project team analysed these questions and possible solutions in a series of working papers, one for each question. The research was conducted mainly as a desk study. Moreover, for the question on the voluntary market, a number of market stakeholders were interviewed. The list of the interviews that were conducted are provided in the Annex of this report. Furthermore, key findings of the project were discussed in a workshop in October 2018.

This report synthesises the findings from the working papers and the workshop. Where relevant, findings were updated in the light of the status after the negotiations after the climate conference in Madrid in November 2019. In addition, the final chapter puts the report's recommendations into the context of the current negotiation text and provides an outlook for the future process.

2 Overall Mitigation of Global Emissions

2.1 Background

One key innovation of the new mechanism for which rules still need to be developed is the objective to "deliver an overall mitigation in global emissions" (Art. 6.4(d)). This objective is reminiscent of the long-standing discussion around achieving a "net reduction" in the Kyoto Protocol's flexible mechanisms. Under the Kyoto mechanisms, each tonne of emission abatement achieved may be used by the buyer of the respective emission credits for compliance with their Kyoto commitment. That is, for each tonne of emissions reduced through the flexible mechanisms, the credit buyer can emit one tonne more, the net effect for the atmosphere is zero. There have been detailed discussions and negotiations on reforming the Kyoto mechanisms to enable achievement of a net atmospheric benefit. The Joint Implementation Supervisory Committee actually adopted recommendations for reforming the mechanism accordingly (UNFCCC 2015), but the Conference of the Parties serving as Meeting of the Parties to the Kyoto Protocol decided to conclude its review of the Joint Implementation guidelines without adopting any revisions (UNFCCC 2017).

This chapter aims to develop recommendations on how to implement the objective of achieving an overall mitigation in global emissions under the Article 6.4 mechanism. A key difficulty lies in the fact that even basics of how the mechanism is supposed to function have so far not been clarified by the Parties. The report will therefore in the first step sketch out what has so far been agreed and discussed on the mechanism's activity cycle as basis for further discussions. Second, as the concept of overall mitigation has so far neither been clearly defined by Parties, the report will derive a working definition from the language that was agreed in the Paris Agreement. In the next step, the report will provide an overview of the options to achieve overall mitigation that have so far been discussed in the relevant literature and in the Article 6 negotiations. Many of these options were developed in the context of the Kyoto mechanisms. The report will therefore discuss to what extent the options are also applicable under the Paris Agreement or whether adjustments need to be made. In the following, the options that are applicable under the Agreement are assessed on the basis of a number of criteria. The report concludes with a summary of the main findings and recommendations.

2.2 Current Status of Agreement on the Article 6.4 Activity Cycle

The Paris Agreement and the decision by the Conference of the Parties adopting the Agreement (Decision 1/CP.21) contain only few elements on how the mechanism is supposed to function:

- The mechanism is established under the authority and guidance of the CMP.
- The mechanism shall be supervised by a body designated by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement.
- Emission reductions resulting from the mechanism shall not be used to demonstrate achievement of the host Party's NDC if used by another Party to demonstrate achievement of its NDC. That is, there is to be no double counting.
- Participation is voluntary and needs to be authorised by each Party involved.
- Emission reductions resulting from mitigation activities need to be verified and certified by designated operational entities.

Key open questions that are relevant for this chapter include:

- Whether or not transferrable units will be issued for emission reductions resulting from mitigation activities under the mechanism.
- If yes, who would be responsible for their issuance. This could either be the international regulator as in the Kyoto Protocol's Clean Development Mechanism or the host country as in Joint Implementation.
- How the prohibition of double counting is to be implemented. Decision 1/CP.21 envisages that transfers of mitigation outcomes under the Paris Agreement's Article 6.2 are to entail a 'corresponding adjustment' by Parties for both anthropogenic emissions by sources and removals by sinks covered by their nationally determined contributions under the Agreement. It has yet to be decided whether, how and to what extent corresponding adjustments will need to be made for issuance and transfers of Article 6.4 emission reductions.

The climate conference in Madrid produced various draft decision texts all of which will serve as a basis for the next round of talks in Bonn in June 2020 (UNFCCC 2019a). The latest text from the third iteration suggest the following regarding the above questions (UNFCCC 2019b):

- There will be units. The document refers to them as "Article 6, paragraph 4, emission reduction(s)" (A6.4ERs).
- There is to be a mechanism registry to operate issuance and transfer of units.
- Units are to be issued by the UNFCCC Secretariat acting as administrator of the mechanism's registry under the authority of the Supervisory Body.

The question of corresponding adjustments is still open. The current negotiating texts suggest that the guidance relating to corresponding adjustments under Article 6.2 will also apply to transfers of emission reductions from Article 6.4 in some form, but there is as yet no agreement on how exactly. Corresponding adjustments could be applied to all emission reductions, or only after the first transfer of reductions from the mechanism registry, or only to emission reductions that are transferred internationally. As will be discussed in the following section, not applying corresponding adjustments to all reductions has some impact on the options to achieve overall mitigation.

In addition, applying corresponding adjustments only after the first transfer from the registry could lead to double counting, as the first transfer may be an international transfer. In this case, the emission reductions from the Article 6 activities would help the host country achieve its NDC – and lead to double counting when the reductions are subsequently used by another Party for its NDC achievement. As this would be inconsistent with the prohibition of double counting in the Paris Agreement, this report will assume that corresponding adjustments will need to be made for all international transfers.

Another question that needs to be clarified regards intermediate buyers: It is still to be decided whether NDCs need to be adjusted for each transaction of units or only for the final use towards NDC achievement. If corresponding adjustments were to apply to each transaction, a follow-up question is whether this should also apply to transactions among non-Party actors, for example among companies covered by emission trading systems. However, the net impact on intermediate buyers' NDCs would be zero. Units would be added to their accounts upon purchase and subtracted upon sale. There is no proposal in the negotiations to implement overall mitigation at the level of first or intermediate buyers.

2.3 Working Definition

The concept of overall mitigation in global emissions is closely related to the concept of ambition raising, the requirement included in Article 6.1 as cited above, whereby Parties' use of Article 6 is "to allow for higher ambition in their mitigation and adaptation actions". Both concepts describe a situation in which there are more emission reductions than there would be without use of Article 6. Nonetheless, in the view of the authors the concepts must be kept separate: While according to Article 6.1 ambition raising is a *requirement for Parties* using Article 6, according to Article 6.4(d) overall mitigation is an *objective of the mechanism* under Article 6.4. Consequently, who the actors are becomes key when deciding whether a particular activity is to be considered ambition raising or a contribution to overall mitigation: In the view of the authors, ambition raising refers to measures taken by Parties, while overall mitigation refers to measures embedded in the rules, modalities and procedures of the Article 6.4 mechanism.

Building on this observation, this report proposes the following demarcation of terms:

- The concept of **raising ambition** encompasses Parties' targets *and* actions: In line with the aim of Article 4.3, which requires NDCs to progress over time and reflect Parties' highest possible ambition, use of Article 6 is to lead to a 'dynamic' improvement of Parties' mid-term mitigation targets (NDCs) and their long-term low greenhouse gas emission development strategies. At the same time, ambition raising may also relate to an immediate climate change mitigation impact, as indicated by the wording of Article 6.1, which refers to Parties' "actions".
- The concept of **overall mitigation** applies to the net climate benefit of Article 6.4 activities resulting from the mechanism's design as such. The contribution to overall mitigation of Article 6.4 activities will therefore be achieved and determined by the decisions on the mechanism's design and irrespective of whether Parties increase their ambition when using the mechanism.

In Katowice, the SBSTA had arrived at the following draft definition of overall mitigation: "'Overall mitigation in global emissions' is achieved when, through the operation of Article 6, a fixed percentage of emission reductions, duly reported, are not used by any Party or entity to implement or achieve its nationally determined contribution (NDC) or used for any other compliance purposes outside Article 6." (UNFCCC 2018a, Para 1(c)) In the view of the authors, this draft definition is compatible with the above demarcation of terms as it specifies that overall mitigation is to be achieved through the operation of Article 6, with a fixed percentage of reductions to be removed from use. By contrast, the text proposed by the COP24 Presidency in Katowice contained no specific definition and envisaged overall mitigation to be achieved through voluntary cancellation of reductions (UNFCCC 2018b, Para 60). The last text from the Madrid negotiations also does not contain a definition of overall mitigation but specifies that overall mitigation is to be achieved through a mandatory "transfer [of] a percentage of the issued A6.4ERs to the cancellation account in the mechanism registry […] at a level to be determined by the CMA that shall not be less than 2 percent" (UNFCCC 2019b, Annex, para 67b). However, as highlighted by the CMA in its decision on Article 6, "these draft texts do not represent a consensus among Parties" (UNFCCC 2019, para 1) and in the next round of negotiations SBSTA is to also take into ac-

count previous versions of the negotiation text (UNFCCC 2019c and d), which do also contain other options, such as the application of conservative baselines.

On this basis, the following discusses options how the mechanism under Article 6.4 could be designed to achieve an overall mitigation in global emissions. It does not discuss proposals in which the net environmental benefit is achieved by the Parties using Article 6 acting on their own initiative instead of as a result of the rules of the mechanism, as Parties acting on their own initiative would according to the above definition fall under 'raising ambition'. So, for example, if the rules of the mechanism require Parties to cancel units, this would fall under the definition of overall mitigation, whereas Parties cancelling units voluntarily on their own initiative would fall under the definition of ambition raising.

2.4 Options for Obtaining an Overall Mitigation in Global Emissions and their Applicability under the Paris Agreement

2.4.1 Overview of Options

A fundamental precondition for achieving an overall mitigation is that that the rules, modalities and procedures for the Article 6.4 mechanism are able to guarantee that the mechanism as such functions in the way it is supposed to function. This includes, in particular, that additionality is assessed correctly, baselines are reasonably aligned with the NDC / do not jeopardize compliance with the NDC, leakage is considered appropriately, and non-permanence of emission reduction is taken into account. If these conditions are not met, activities will be issued more credits than they have actually reduced emissions, leading to higher instead of lower global emissions (Lazarus et al. 2013).

The available literature and negotiation texts (e.g. CCAP (n.d), Lazarus et al. (2013), Obergassel (2017), Schneider (2008, 2009a) Schneider et al. (2018), Strand (2016), UNFCCC (2015, 2018a and b) and Vrjoljik and Philips (2013)) discuss various design options regarding the question how to make mechanisms contribute to overall mitigation in global emissions:

- **Cancellation** of units so that they cannot be used for NDC achievement;
- **Discounting** of emission reductions so that the reductions are not counted fully;
- **Shortened crediting periods** allowing fewer years in which units can be generated;
- **Stringent/conservative baselines** set crediting baselines below the emission levels that would be achieved by the host country's NDC (NDC baseline);
- **Conservative default emission factors** may contribute to conservative baseline setting;
- **Limited project type eligibility** to project types that are deemed to have greater net mitigation impacts, or to policy or sector-based crediting;
- **Additionality** of emission reducing activities, i.e. ensuring that they would otherwise not have occurred;
- **Any other measures** selected by participating Parties voluntarily.

Following our definition of ambition raising and overall mitigation, only obligatory options that are built into the Article 6.4 mechanism would make the mechanism contribute to overall mitigation. Option 5 is to safeguard environmental integrity and could only contribute to overall mitigation in case default emission factors are set more conservatively than would be required to ensure environmental integrity. This option is subsumed in this study under option 4. As for option 6, net mitigation is not a question of types of activities but a question of how mitigation impacts are accounted for, namely whether or not they are used completely for NDC achievement. Additionality (option 7), again, does not contribute to overall mitigation by itself, but rather ensures that only activities that would otherwise not have taken place are accounted for in the mechanism. Thus, the options to be discussed in detail in this study are limited to options 1, 2, 3 and 4.

There are two design options for cancellation and discounting regarding the point of implementation. Thus, units can be cancelled by the host country upon issuance of units (option 1 (a)) or by the acquir-

ing country when units are transferred or used (option 1 (b)). Respectively, discounting can be conducted at issuance (option 2 (a)) or at transfer or use. With discounting at transfer or use, the GHG credit for use by the acquiring country would be lower than for use by the host country (option 2 (b)). For example, the acquiring country could be required to acquire five units to cover four tonnes of emissions.

Furthermore, all of these options can either be applied equally to all emission reducing activities or they can be **differentiated,** for example by project types or geographically. Equal application to all emission reducing activities implies the same percentage of units to be cancelled, the same discount, equal crediting periods, or the reduction of the same percentage of emissions from NDC baselines, respectively, for all emission reducing activities. In contrast, lower discounts and percentages of units to be cancelled, as well as longer crediting periods and less stringent baselines for particularly desired emission reducing activities could boost desired emission reducing activities, or even restrict activities entirely. This could be done, on the one hand, to favour specific types of activities or sectors, e.g. energy efficiency projects or the transport sector, or, on the other hand, to favour emission reducing activities within specific geographical boundaries, e.g. in least developed countries (LDCs) and small island developing states (SIDS). While it may be possible to reach political consensus regarding geographical differentiation in international negotiations on Article 6, different treatment of certain types of activities may prove to be difficult to agree on politically. In the context of the Kyoto mechanisms, a number of Parties have in the past always insisted on maintaining strict technology neutrality.

2.4.2 Overall Mitigation in the Context of the Paris Agreement

While options 1, 2, 3 and 4 have already been discussed at length in relation to the Kyoto mechanisms, the framework conditions under the Paris Agreement differ significantly from those under the Kyoto Protocol. Most importantly, under the Kyoto Protocol there has been a large 'uncapped environment', i.e. the majority of global emissions has not been covered by mitigation commitments. Under the Paris Agreement, all Parties are required to make contributions. While not all NDCs include economy-wide emission targets, the majority of Article 6 activities can be expected to take place within the boundaries of the host countries' NDCs as most NDCs are quite comprehensive and usually include the most attractive mitigation options, which may also be interesting for Article 6 activities.

Options 1-4 outlined above will all directly achieve an overall mitigation if the mitigation activity takes place outside the NDC boundary. By contrast, any mitigation outcome achieved within the boundary of an NDC will accrue to the host country unless the NDC or the emissions levels are adjusted correspondingly. The respective accounting requirements differ for the different options.

When the first two of the above options – cancellation of units or discounting of reductions – are applied, overall mitigation will be achieved if

- first, units are issued for all emission reductions achieved by an activity and the host Party's NDC or total emissions are adjusted correspondingly, and then
- second, a share of the units is cancelled or discounted.

It bears noting that according to the body of literature that was reviewed for this report there is no strong difference between discounting and cancellation in case they are implemented at transfer or use. In both cases, overall mitigation is achieved by taking units out of the system. The two options differ only if applied at issuance. With cancellation, units are first issued and then cancelled, while with discounting at issuance, the amount of units to be issued is reduced before they are issued. In the case of discounting, the corresponding adjustment would need to apply to the full volume of reductions achieved. Otherwise, the discounted volume would contribute to achieving the host country's NDC.

However, the rules on corresponding adjustments can significantly influence the impact of these options. If corresponding adjustments are to be applied only after the first transfer or for international

transfers, discounting or cancellation at issuance would not lead to overall mitigation; instead the mitigation benefit would accrue to the host country. The latest text from Madrid on the Article 6.2 guidance suggests that corresponding adjustments will presumably be required for first transfers of ITMOs as well as for mitigation outcomes that have not been internationally transferred (UNFCCC 2019e).

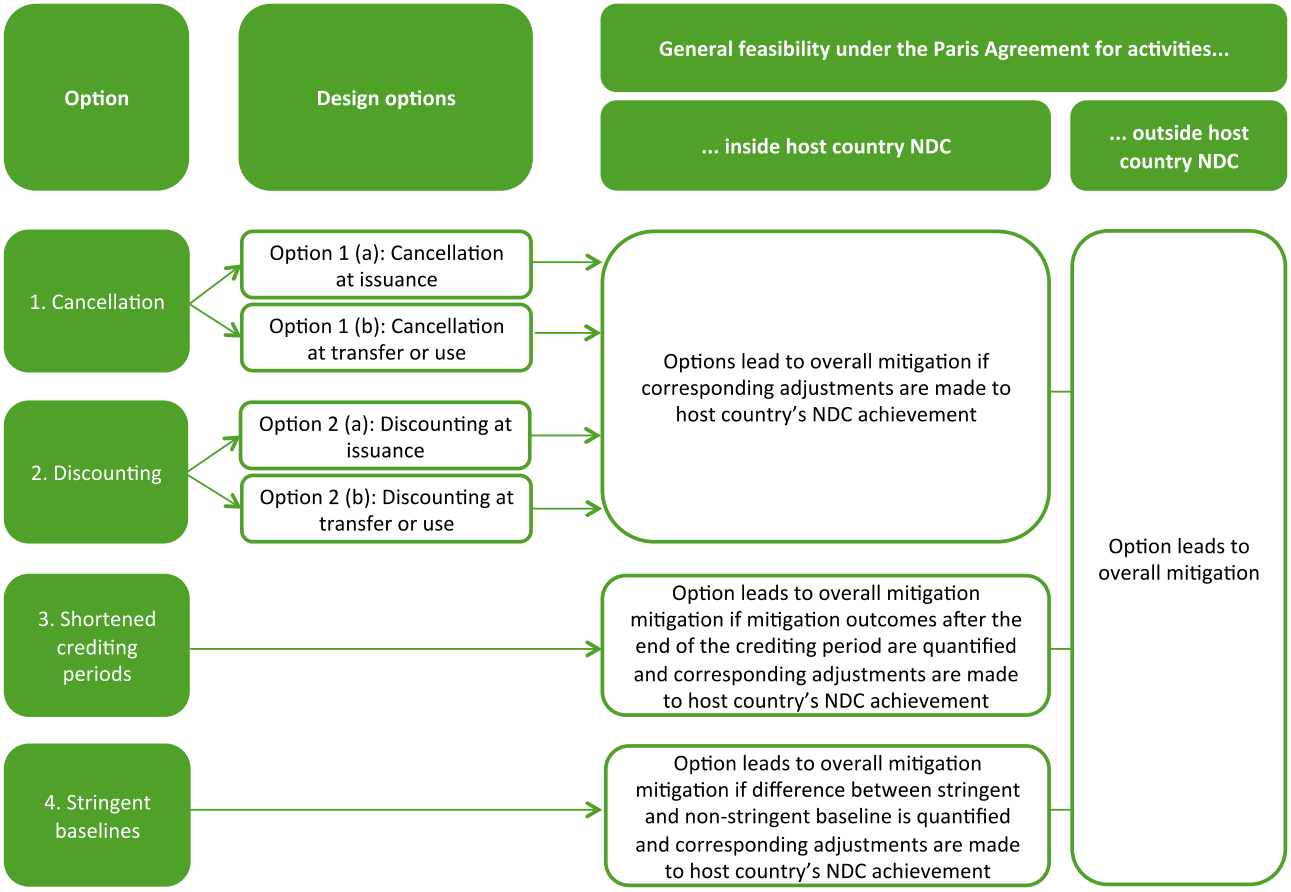
It also bears noting that the SBSTA text from Katowice (UNFCCC 2018a) has a different definition of cancellation and discounting; the document differentiates between the two by the point at which overall mitigation is applied. The document envisages 'cancellation' as applying at the issuance or transfer stage and 'discounting' as applying at the use stage. We nonetheless decided to retain the definitions of the terms as used in the literature.

In the third and fourth option – limitations on crediting period length and stringent baselines – units are not issued for all the emission reductions achieved by the activity. Therefore, if the activity is within the host country's NDC, the difference between the amount of units issued and the amount of emissions that has actually been reduced would automatically accrue to the host country unless further accounting provisions are implemented:

- In the case of shortened crediting periods, the emission reductions accruing after the end of the crediting period would need to be quantified and deducted from the host Party's NDC achievement. In theory, this could be achieved on the basis of continuing monitoring and verification of the mitigation activity. However, as no sellable units would be issued, the operator would not have a financial incentive to do so.
- In the case of stringent baselines, two baselines need to be established, not only the stringent baseline but also the non-stringent baseline. This is necessary in order to be able to quantify the mitigation impact of the stringent baseline and adjust the host countries' NDC correspondingly.

The following figure provides an overview of the different options as well as their general feasibility under the Paris Agreement. The subsequent sections will discuss practical implementation questions in more detail.

Figure 2: Overview of Design Options and their General Feasibility under the Paris Agreement



Source: Own compilation, Wuppertal Institute.

2.5 Assessment of Options

2.5.1 General Considerations

With the requirement to contribute to overall mitigation in global emissions, more emissions have to be reduced per tradable unit of the Article 6.4 mechanism. This has an impact on the profitability of mitigation activities as well as on global emissions:

- Impact on the profitability of mitigation activities: As more emissions have to be reduced per tradable unit, producing units becomes more expensive. As developers of mitigation activities usually pass these additional costs onto unit buyers, units become more expensive. Schneider (2009a) analyses a number of scenarios with different framework conditions and concludes that when introducing the requirement to achieve overall mitigation with the CDM, in many cases the increase in unit prices exceeds the increased costs of producing tradable units. The introduction of overall mitigation would thus actually increase the internal rate of return of mitigation activities. Furthermore, in many scenarios, the volume of the market for units may increase with the implementation of options to achieve overall mitigation due to higher unit prices, in particular when use of the mechanism's units is limited.[1] These findings can be trans-

[1] The authors would like to thank Lambert Schneider for respective comments on this issue.

ferred to the Article 6.4 mechanism which Schneider et al. (2018) do in their latest paper. They conclude that the elasticity of demand determines in how far implementing overall mitigation under Article 6 reduces the transaction of credits. Based on analysis of a number of scenarios, they furthermore explain that under a broad range of circumstances, the abatement in transferring countries is higher with larger rates of overall mitigation. While cost increases of credit supply are outweighed by higher credit prices, offset buyers rather than project developers bear the costs of achieving overall mitigation (Schneider et al. 2018).

- Impact on global emissions: With higher unit prices, on the one hand, potential unit buyers have a stronger incentive to reduce emissions at home. On the other hand, additional mitigation is achieved in host countries where more activities have to be implemented to produce the same amount of tradable units. Where emissions are reduced largely depends on the extent to which overall mitigation is to be achieved with the Article 6.4 mechanism, the extent to which Article 6.4 units may be used, abatement opportunities and costs, and national climate policies and actions.

2.5.2 Assessment Criteria

Starting from these considerations and from assessments of discounting, cancellation, shortened crediting periods, and stringent baselines in CCAP (n.d.), Lazarus et al. (2013), Schneider (2008, 2009a), Schneider et al. (2018), Strand (2016) and Vrjoljik and Philips (2013), the following expands the literature's assessment to the options for obtaining overall mitigation in global emissions regarding the following criteria:

- **The ease of implementation** of the option in general, explaining how easy or difficult it is to implement the option.
- **The applicability to different activities and sectors,** explaining how easy or difficult it is to apply the option to various mitigation activities and sectors.
- **The transparency of the option,** explaining how easy or difficult it is to verify that the option has been applied correctly and yields the emission reductions it claims.
- **The potential for overall mitigation,** i.e. the extent of the net atmospheric benefit that could be achieved with this option.
- **The option's impact on the internal rate of return,** estimating the option's impact on the profitability of mitigation activities.
- **The confidence that surplus reductions will be achieved:** Whether or not surplus reductions envisaged by the developer of an emission reducing activity beforehand will be achieved cannot be assured to the same extent for every option. How likely it is that surplus reductions will be achieved depends on the potential for overall mitigation, but also on the envisaged emission reducing activity itself, i.e. whether the developer of an emission reducing activity is actually able to implement the activity as planned, including related emission reductions that result in a surplus.

2.5.3 Overarching Aspects

Furthermore, additional considerations seriously affect the overall performance of all options discussed. Thus, whether or not the options are **applied equally to all types of activities, sectors, and geographical regions** has a huge impact on both how easy it is to implement the options and how easy it is to apply them to different activities and sectors. In general, implementation of all options is easier when they are applied equally to all types of activities, sectors, and geographical regions and becomes more complicated with differentiation. Favouring some emission reducing activities over others may, however, distort the market for Article 6.4 units, reducing the cost-effectiveness of the Article 6.4 mechanism.

Regarding all of the options discussed, the **implementing entity** may significantly affect overall mitigation in global emissions. It is to be decided yet whether the host country or the acquiring country, or an administrator of the crediting mechanism at UN level would implement the option(s). While appointing a crediting mechanism administrator at UN level as implementing entity for shortened crediting periods and stringent baselines seems most sensible as these options apply at the level of the methodologies, cancellation and discounting could also be done at host country or acquiring country level, respectively.

Generally, administration at UN level is associated with higher levels of transparency and a lower risk of double claiming because the implementing entity is in this case able to centralise relevant accounting tasks. Furthermore, oversight is ensured and mainstreaming of standards and procedures is easier, facilitating technical applicability and easier implementation of the options.

Implementation of the options by host country or acquiring country, in contrast, entails the risk of lower transparency as well as double claiming, as governments may be tempted to claim net mitigation benefits for NDC compliance or as their contribution to ambition raising. Moreover, implementation at host country or acquiring country level would be technically and administratively more challenging for each individual country, as standards and procedures have to be put in place for every participating country.

2.5.4 Assessment

The following provides an assessment of the options for overall mitigation according to the six criteria listed at the beginning of this chapter. One result is that cancellation and discounting have essentially the same implications.

Option 1 (a): Cancellation at issuance:

- The main difficulty with this option lies in achieving policy agreement on the percentage of units to be cancelled. Technically, this option is fairly **easy to apply** if a uniform cancellation rate is agreed on**.** However, if types of activities or sectors are to be treated differently, effort would need to be invested to determine appropriate cancellation rates for each one. It may also prove to be very hard to reach political agreement on such differentiation. Differentiation according to geographical regions, for example, exempting activities in LDCs and SIDS, would not be as methodologically challenging and is established political practice under the UNFCCC.
- With a uniform cancellation rate, this option can easily be applied **to all types of activities**. With differentiation, it is most effective for the types of activities with high confidence in additionality and NDC baseline, and low marginal abatement costs, as in this case, the appropriate cancellation rate can be quantified easily.
- The **transparency** of this option depends on the implementing entity. While administration at UN level would lead to high transparency, host or buyer country as implementing entity would leave transparency to be considered only low to medium.
- The **potential contribution to overall mitigation** depends on the percentage of units to be cancelled and is equivalent to the amount of units cancelled in the end.
- With the positive impact of overall mitigation on unit prices outweighing the higher unit costs, this option has a **positive impact on the internal rate of return** of mitigating activities.
- The **confidence that surplus reductions will be achieved** is medium to high as certified reductions are cancelled.

Option 1 (b): Cancellation at transfer or use: This option's assessment equals the one regarding option 1 (a), except for the confidence that surplus reductions will be achieved. Until units are cancelled at transfer or use, they may be used for NDC compliance in the host country. Each unit cancelled and not used leads to overall mitigation.

Option 2 (a): Discounting at issuance:

- Again, the main difficulty lies with achieving policy agreement on the discount rate. Technically, this option is **easy to apply** if there is a uniform discount rate and more difficult if there is to be differentiation.
- With a uniform cancellation rate, this option can easily be applied **to all types of activities**. With differentiation, it is most effective for the **types of activities** with high confidence in additionality and NDC baseline, and low marginal abatement costs, as in this case, the appropriate discount can be quantified easily.
- Depending on the implementing entity, this option scores low to medium regarding **transparency** when host or buyer countries are administering the discount, but high with administration at UN level.
- The **potential for overall mitigation** depends on the discount rate and equals the discount.
- This option has a **positive impact on the internal rate of return** of mitigating activities because the positive impact of overall mitigation on unit prices outweighs the higher unit costs.
- The **confidence that surplus reductions will be achieved** with this option is medium to high because some verifiable mitigation outcomes are not credited (with discounting at issuance) or certified reductions are cancelled (with discounting at transfer or use).

Option 2 (b): Discounting at transfer or use: Again, this option's assessment equals the one regarding option 2 (a), expect for the confidence that surplus reductions will be achieved. Each unit cancelled and not used leads to overall mitigation.

Option 3: Shortened crediting periods:

- Again, the **ease of implementation** would depend on whether crediting periods are set uniformly or differentiated by activity types or geographies. In relation to the CDM, there have already been discussions on differentiating crediting periods as uniform periods can lead to inefficient overallocation of resources to projects with short payback periods. Differentiation according to project types may therefore be politically easier than in the case of cancellation and discounting. If the desire to limit inefficient allocation of resources leads to crediting periods being differentiated anyway, integrating a factor for achieving overall mitigation would probably create little additional methodological effort. However, as noted above, installation operators would have no incentive to continue monitoring after the end of the crediting period. In theory, the operators could simply be required to continue monitoring. However, this would require proper enforcement, which would probably need to be done by the host countries and thus depend on their respective enforcement capacity and willingness. Alternatively, the costs of monitoring and verification could be covered from other sources, such as the revenue of the Article 6 supervisory body.
- This option is feasible for **all types of activities** that are likely to continue operation after the end of the crediting period, or where shorter periods are sufficient to trigger implementation. This may be the case in projects that are one-off interventions which remain in place in any case, such as building retrofits, or which have sufficient non-credit revenue streams. By contrast, this option would not be applicable to activities that depend on constant carbon market revenue for their operation. However, given the need for ambition raising, indefinite cash flows to projects should conceivably not be envisaged anyhow (Warnecke at al. 2018).
- As an administrator at UN level is likely to be the implementing entity of this option, **transparency** is considered to be relatively high. Buyer or host country as an implementing entity, in contrast, would lower transparency significantly.
- Crediting periods are usually shortened at the end of a mitigation activity's life cycle. In this case, in contrast to all other options discussed in this study, the benefits to the atmosphere of this option are postponed and only occur after the end of the crediting period. Then, the **po-**

tential for overall mitigation is considered to be high for types of activities that do not depend on carbon market revenue for their continued operation. Shortening crediting periods at the beginning of a mitigation activity's life cycle would prevent postponing benefits to the atmosphere.

- However, shortening crediting periods at the beginning of a mitigating activity's life cycle would have serious negative impacts on the internal rate of return of an activity. Backloading of reduced revenue with shortened crediting periods at the end of a mitigating activity's life cycle, again, lowers the negative impact of higher unit costs on the **internal rate of returns,** which is outweighed by increased unit prices.
- Nevertheless, the **confidence that surplus emission reductions will be achieved** is considered to be only medium to low as surplus reductions depend on the continuation of emission reducing activities and them being additional beyond the crediting period.

Option 4: Stringent baselines:

- Developing stringent baselines is time-consuming and requires complicated technical and methodological work as well as frequent updates of the baselines. For their application, changes have to be made in each methodology, or a fixed discount factor has to be applied for all methodologies. This further complicates the political decision-making process regarding this option. Compared to the other options assessed in this study, stringent baselines are **much more difficult to apply,** especially, when they are differentiated for individual activities, sectors, or geographical regions.
- Stringent baselines are most effective for the **types of activities** with high confidence in additionality and NDC baseline, and low marginal abatement costs. Under these conditions, baselines can be set relatively straightforward.
- This option's **transparency** is considered to be medium to high: On the one hand, likely administration at UN level boosts transparency, on the other hand, the calculations needed to prove emission reductions may complicate transparency. Instead of a simple subtraction of emission reductions as in the other options, the amount of overall mitigation would have to be calculated individually for each activity. Acquiring or host country as an implementing entity would lower transparency furthermore.
- A clear advantage of this option is the fact that it may provide stronger incentives to use innovative technologies in some sectors compared to the other options discussed. Stringent baselines would tend to eliminate crediting for small improvement in emissions performance (i.e. activities that fall between NDC baseline and the stringent baseline), whereas the other options would credit all activities that exceed NDC baseline emission performance. Moreover, pre-issuance discounting and cancellation would apply to all emission reductions achieved by an activity, whereas with stringent baselines each further emission reduction would be fully rewarded by one additional credit. This provides an incentive to push reductions as far as possible. This option therefore has a high **potential for overall mitigation.**
- The positive impact of overall mitigation on unit prices can be expected to outweigh the higher unit costs caused by this option in most cases, leading to an increased **internal rate of return.**
- The **confidence that surplus reductions will be achieved** when employing this option is medium to high, as some verifiable mitigation outcomes are not credited.

The following table provides an overview of the assessment of the options for obtaining overall mitigation in global emissions.

Table 2: Assessment of options for obtaining overall mitigation in global emissions

Assessment field	Cancellation at issuance	Cancellation at transfer or use	Discounting at issuance	Discounting at transfer or use	Shortened crediting periods	Stringent baselines
1. Implementation	Easy to apply without differentiation, more difficult with differentiation	Easy to apply without differentiation, more difficult with differentiation	Easy to apply without differentiation, more difficult with differentiation	Easy to apply without differentiation, more difficult with differentiation	Easy to apply without differentiation, difficult with differentiation Installation operators have no incentive to continue monitoring after end of crediting period	Application methodologically challenging even without differentiation
2. Applicability to different activities and sectors	Applicable to all activities, more difficult with differentiation	Applicable to all activities, more difficult with differentiation	Applicable to all activities, more difficult with differentiation	Applicable to all activities, more difficult with differentiation	Feasible for types of activities that are likely to continue operation after the crediting period	Most feasible for activities for which baselines can be set relatively straightforward
3. Transparency	Depends on implementing entity	Depends on implementing entity	Depends on implementing entity	Depends on implementing entity	High as administration most likely at UN level	Medium to high: administration most likely at UN level, but complicated calculations
4. Potential for overall mitigation	Depends on percentage of units to be cancelled	Depends on percentage of units to be cancelled	Depends on discount rate	Depends on discount rate	Postponed benefits to the atmosphere when applied to end of life cycle, but then high potential	Stronger incentives to maximise reductions
5. Impact on internal rate of return	Positive impact of overall mitigation on unit price out-	Positive impact of overall mitigation on unit price out-	Positive impact of overall mitigation on unit price out-	Positive impact of overall mitigation on unit price out-	Positive impact of overall mitigation on unit price out-	Positive impact of overall mitigation on unit price out-

Assessment field	Cancellation at issuance	Cancellation at transfer or use	Discounting at issuance	Discounting at transfer or use	Shortened crediting periods	Stringent baselines
	weighs higher unit costs	weighs higher unit costs	weighs higher unit costs	weighs higher unit costs	weighs higher unit costs. Backloading of reduced revenue further lowers impact of higher unit costs. Frontloading of reduced revenue strongly impairs IRR.	weighs higher unit costs
6. Confidence that surplus reductions will be achieved	Medium to high as certified reductions are removed without counting for compliance	Medium to high as certified reductions are removed without counting for compliance	Medium to high as verifiable reductions are not credited	Medium to high as certified reductions are removed without counting for compliance	Medium to low as surplus reductions depend on continuation and additionality beyond crediting period	Medium to high as verifiable reductions are not credited

Source: Own compilation expanded on synthesis of CCAP (n.d.), Lazarus et al. (2013), Schneider (2008, 2009a), Schneider et al. (2018), Strand (2016) and Vrjoljik and Philips (2013).

2.6 Summary and Conclusions

2.6.1 Definitions and Options to Achieve Overall Mitigation in Global Emissions

In order to develop recommendations on how to implement the objective of achieving an overall mitigation in global emissions under the Paris Agreement's Article 6.4 mechanism, this report proposed the following demarcation of terms:

- The concept of **raising ambition** encompasses Parties' targets *and* actions.
- The concept of **overall mitigation** applies to the net climate benefit of Article 6.4 activities resulting from the mechanism's design as such.

Of the options discussed in available literature, cancellation, discounting, shortened crediting periods, and stringent baselines can contribute to overall mitigation according to this definition. Cancellation and discounting can either take place upon issuance, or at transfer or use. All of these options will directly achieve an overall mitigation if the mitigation activity takes place outside the NDC boundary. By contrast, any mitigation outcome achieved within the boundary of an NDC will accrue to the host country unless the host country's NDC or emissions level are adjusted correspondingly.

It bears noting that if corresponding adjustments are to be applied only after the first transfer or for international transfers, cancellation and discounting at issuance would not lead to overall mitigation; instead, the mitigation benefit would accrue to the host country.

2.6.2 Assessment of Options along Defined Assessment Criteria

The assessment of the options for obtaining overall mitigation in global emissions focused on the following criteria:

- The ease of implementation
- The applicability to different activities and sectors
- The transparency of the option
- The potential for overall mitigation
- The option's impact on the internal rate of return
- The confidence that surplus reductions will be achieved

Furthermore, whether or not the options are **applied equally to all types of activities, sectors, and geographical regions (differentiation)** has a huge impact on both how easy it is to implement the options and how easy it is to apply them to different activities and sectors. Finally, **the implementing entity** may significantly affect overall mitigation in global emissions.

The detailed assessment of the different options brings to light great differences between the options as well as similarities. Thus, the introduction of stringent baselines is by far the most challenging of the options while all of the other options are relatively **easy to apply,** in particular without differentiation. Differentiation reduces the ease of implementation of all options.

Cancellation, discounting and stringent baselines may be **applied to all types of activities.** With differentiation, application becomes more difficult and will in all cases be most feasible for types of activities with high confidence in additionality and NDC baselines, and low marginal abatement costs. Shortened crediting periods are most feasible for activities that are likely to continue operation after the end of the crediting period, or where shorter periods are sufficient to trigger implementation. A further problem is that installation operators would have no incentive to continue monitoring after the end of the crediting period.

Transparency highly depends on the implementing entity. In case of host country or buyer country implementation, transparency is considered to be only low to medium. Shortened crediting periods are considered an option with high transparency due to their likely administration at UN level. Strin-

gent baselines score medium to high regarding this criterion because, on the one hand, necessary calculations complicate transparency, but on the other hand, this option is likely to be administered at UN level.

The **potential for overall mitigation** depends on the percentage of units to be cancelled for options 1 (a) and (b) and on the discount rate for options 2 (a) and (b), respectively. In the usual application of option 3, shortening crediting periods at the end of a mitigating activity's life cycle, the benefits to the atmosphere are postponed to after the end of the crediting period, but then the potential contribution to overall mitigation is considered to be high. An advantage of stringent baselines consists in them having the potential to incentivise the use of innovative technologies in some sectors considerably. In the end, all options' contribution to overall mitigation depends on the ambitiousness of negotiating Parties: The higher the percentages for units cancelled or the discount rates, the shorter the crediting periods and the more stringent baselines are set, the higher the mechanism's potential contribution to overall mitigation will be.

However, making the Article 6.4 mechanism contribute to overall mitigation would also increase the costs per unit. For all options, however, increased unit costs can be expected to be outweighed by higher unit prices in most cases, leading to an overall positive **impact on the internal rate of return** of mitigating activities. Compared to the other options, shortened crediting periods would further increase this impact as the reduced revenues are backloaded until after the end of the crediting period, which would be a clear advantage for investors.

Finally, the **confidence that surplus reductions will be achieved** is medium to high for cancellation, discounting and stringent baselines, as either verifiable mitigation outcomes are not credited or certified reductions are cancelled instead of being used for NDC achievement. By contrast, the confidence that surplus reductions will be achieved is only medium to low for shortened crediting periods because in this option surplus reductions depend on the continuation and additionality of the activity beyond the crediting period, which poses significant challenges.

2.6.3 Key Insights and Recommendations

All of the options discussed have clear advantages and disadvantages.

- All in all, **implementation at UN level** seems to yield the most positive outcomes. It would be most likely to guarantee high levels of transparency and lower the risk of double claiming because it is able to centralise relevant accounting tasks. Implementation at UN level would also ensure easier oversight and mainstreaming of standards and procedures, facilitating technical applicability.
- **Differentiation** of the options according to activities, sectors, or geographical regions may boost the mechanisms effectiveness by providing opportunities for mitigating activities that would otherwise not be implemented, e.g. activities in disadvantaged sectors or geographical regions. However, it reduces the cost-effectiveness of the mechanism and complicates technical application. Furthermore, it may be very difficult to reach political agreement on specific activities or sectors to be favoured. Giving preferential treatment to specific geographical regions such as to LDCs and SIDS, in contrast, is already established practice under the UNFCCC and may be more feasible. Differentiation according to activities may be politically most feasible if done at the level of the methodologies, as in this case discussions could take place on a factual basis regarding the economic viability of the respective activities.
- **Cancellation and discounting** at issuance, transfer or use without differentiation are the most straightforward options to be implemented and applied.
- **Shortened crediting periods** have many advantages, including high transparency, relatively easy implementation and applicability, and a high potential for overall mitigation as well as backloading of reduced revenue which increases the positive impact on an activity's internal rate of returns when crediting periods are shortened at the end of a mitigating activity's life cy-

cle. However, postponing the benefits to the atmosphere is a serious disadvantage of this option. In addition, installation operators have no incentive to continue monitoring and verification after the end of the crediting period. Monitoring and verification costs would therefore probably have to be covered from other sources, such as the revenue of the Supervisory Body. Shortening crediting periods at the start of a project would eliminate these problems but would seriously reduce the internal rate of return and thereby the economic viability of activities.

- **Stringent baselines** may be most useful where innovative technologies can be incentivised as this advantage could trump the high amount of work that would be needed to implement this option.

Ultimately, what option to choose depends on the weight given to the different criteria. If ease of implementation and applicability to all types of activities are a priority, cancellation and discounting without differentiation are clearly the most suitable options (see also Schneider et al. 2018). By contrast, if transparency and the option to favour particular types, sectors or geographical regions of mitigation activities are considered to be important, the most favourable options are differentiated crediting periods and stringent baselines.

3 Benchmarks to determine baselines for mitigation action under the Article 6.4 mechanism

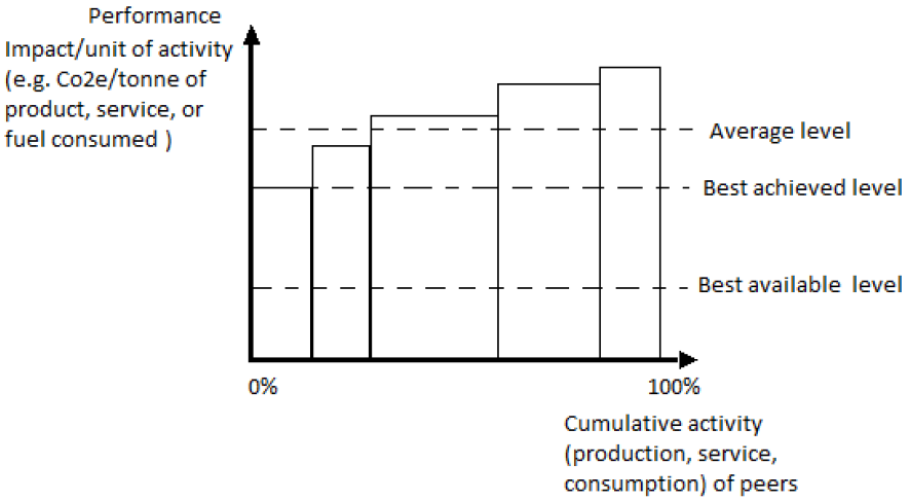
3.1 Background – the role of benchmarks and BAT values

Benchmarking is a term widely used and describing a standard or set of standards that can be used as a point of reference for evaluating performance or level of quality (see www.businessdictionary.com) against peers. The comparison of performance can be applied in many fields such as profitability, safety, energy-use or for climate change-related issues. In our case, a comparison of the performance with respect to either Greenhouse Gas (GHG) or often — more specific — CO_2 emissions and in some cases also energy is most useful and will be applied used in this study. Additional common definitions in the context of benchmarking are (adapted from Ecofys and Fraunhofer ISI, 2009):

- "Activity" refers to the commodity, the service provided or an activity the emission benchmark applies to (e.g. production of a commodity in tonnes, heated square meters, kilometres driven)
- "Activity level" refers to the amount of the activity
- "Impact" refers to the measured impact, here mainly GHG emissions, but partly also energy use
- "Benchmark level" refers to the level of the performance in terms of specific emissions per unit of a certain activity
- "EU ETS benchmark"/"EU ETS benchmark values" refers to the benchmarks and benchmark levels defined under the EU Emissions Trading System for Phase III

Different levels can be used to define a benchmark. Examples are the average performance level, average of the top 20%/10%/ x% best performers (applied under the EU ETS (10%) and partly in CDM (20%) when benchmarking is used), the best achieved level or the best available level (see e.g. pmr 2017). As will be shown later in the text, the setting of the benchmark level has a key role in the use of benchmarks.

Figure 3 Illustrative examples for different performance levels that can be used for benchmark purposes.



Source: pmr (2017)

A different definition of “Best available technology/techniques” (BAT) can be found in the Industrial Emissions Directive (IED) of the European Union. As the documents developed under the IED are important later in the text, we introduce the definition here. The directive defines BAT as: "best available techniques means the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole." Further, IED specifies that the term "techniques includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned" and that "available techniques means those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, ... as long as they are reasonably accessible to the operator." This definition is much broader compared to the above example where "BAT" refers to a technically possible, but not yet in reality achieved performance level. For the context of this report, we will use *BAT in the stricter definition* when referring to best available levels as defined by pmr (2017) and *BAT in the IED definition* when referring to best available techniques as defined under the IED.

While benchmarks are often used as a management tool to optimize a firm’s performance, they are more and more commonly also used in energy and climate policy. The most prominent application of emission benchmarks can be found in the EU ETS. Since 2013, GHG benchmarks are used under the EU ETS for EU-wide harmonized free allocation of allowances to installations in industry. For that, in-depth sector studies have been prepared to define product benchmarks for 59 products regulated under the EU ETS along with benchmarks for heat and fuel (fallback approaches). In advance to the development of benchmarks for industry sectors, some member states had developed national benchmarks for power generation and combined heat and power generation for earlier years of the EU ETS as well as for allocation of allowances to new plants in industry. Also, other countries such as Korea and Switzerland are using benchmarks for free allocation of allowances in their national emissions trading systems.

The use of benchmarks in the context of the market-based mechanism under Art. 6.4 (crediting system) differs from the application of benchmarks under the EU ETS. Under a crediting system, the benchmark is used to define the baseline. The performance of a specific installation then needs to be monitored to determine the amount of credits that can be issued (determined by the difference be-

tween the benchmark and the installation's performance). That is, the measurement of real performance allows for the issuance of credits. If the measured emissions are higher than the baseline, no credits are issued but no further action from the installation is required. In contrast, in the EU ETS benchmarks are used to determine in advance the free allocation of permits to installations. The reporting of emissions is used to determine the amount of allowances that need to be surrendered at the end of the year. If the installation emits more than the benchmark, then it has to compensate for this by buying additional allowances. Also, emissions in ETS may be reported for the installation as a whole, while the benchmarks can be defined on the level of sub-installations, i.e. only a part of the production process within an installation. In case of crediting, the performance must be reported for the same system boundaries as the benchmark.

The fact that benchmarks are being used to define the baseline, not the standard that should be achieved, also implies that some of the existing benchmarks are not suitable in this context. E.g. a benchmark based on best available technology may not provide sufficient leeway to credit further emission reductions compared to that benchmark.

Paragraph 48c of the Modalities and Procedures for the CDM today explicitly allows for the use of benchmarking. However, it is rarely used in reality. In contrast to the CDM, where each project provides its own baseline based on the specifications within the methodology, the use of benchmarks for the definition of a baseline could increase transparency, reduce administrative costs and may help to increase environmental integrity of the crediting system by preventing over-crediting.

Benchmark values are in general more stringent than baseline values that have been used in the CDM, which were often derived from historical performance. Even though Paragraph 48c of the Modalities and Procedures for the CDM foresees the use of benchmarks, they have not been very often used (see also Section 3.2). With the Paris Agreement, all countries have committed themselves to NDCs. In this new situation, baseline setting needs to be informed by the NDCs targets and only mitigation action that goes beyond the NDCs emissions levels may be used for international transfers under Article 6 (see Schneider, Fuessler, et al. 2017). This makes baseline setting for host countries more difficult.

Also, in many developed and developing countries NDC targets are not sufficiently ambitious to meet the Paris Agreement's 1.5/2° target (UNEP Emissions Gap report 2019), or they are not clearly formulated and often do not have economy wide coverage. In this situation, the NDC target cannot be used as a point of reference for determining the crediting baseline.

Under these circumstances, a simple approach may be to use ambitious performance benchmarks for baseline setting. Such benchmarks may be stringent enough that while they allow for the participation in international transfers, they keep a significant part of the mitigation impact in the host country so as not to endanger the meeting of its own NDC because of its engagement in international transfers (and the related corresponding adjustments).

In the following, we provide an overview of potential sources for benchmark values for different key sectors (Section 3.2), provide criteria for good benchmarks (3.3), further analyse the practical feasibility of a benchmark approaches under Article 6.4 in three example sectors (3.4), identify suitable approaches and sectors for benchmarks under Article 6.4 (3.5) and conclude with findings and recommendations (3.6).

3.2 Sources and types of benchmarks

Several different potential sources for benchmark values may be considered:

- BREF documents (Best Available Techniques (BAT) reference documents) that have been adopted under both the IPPC Directive (2008/1/EC) and later under the Industrial Emissions Directive (IED, 2010/75/EU). Each BREF document provides "information on a specific industrial/agricultural sector in the EU, on the techniques and processes used in this sector, current

emission and consumption levels, techniques to consider in the determination of the best available techniques (BAT) and emerging techniques."[2] Sectors such as housing, transport or residential waste are not covered as these do not cause industrial emissions. Large emitting industrial sectors are covered by BREF documents. However, the age of the documents varies significantly (see Appendix 1 for an overview of BREF documents and their publication date).[3]

- Data from CDM projects for the relevant sectors.
    1. Currently the CDM has more than 115 methodologies and several thousand registered projects both of which can be a valuable source of standardized parameters, reported emission intensities or at least the relevant literature.
    2. Approved standardized baselines of the UNFCCC cover grid emission factors, the charcoal sector, rice mills and cultivation, landfill gas capture and flaring, cookstoves and wastewater treatment for specific countries.
- Product benchmarks, in the context of the EU-ETS. Product benchmarks have been developed for 52 products from different industrial sectors, namely mineral oil refining, mineral wool, aluminum, cement, lime, gypsum, glass, ceramics, iron and steel, pulp and paper and chemicals.
- Energy efficiency standards for specific jurisdictions.
- Data on carbon intensity as collected by sectoral organizations, such as in the Cement Sustainability Ini-tiative (CSI) or data on upstream emissions from the oil industry. These have the advantage that the data are available globally, but the quality of such industrial data needs to be scrutinized.

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In the following we discuss the potential of benchmarks from those and other sources for the following sectors:

- Industry including energy use
- Energy generation
- Housing
- Transport
- Wastewater treatment

For each of these sectors, we identify suitable benchmark values and explore their specific sector context. This allows later for the analysis on which sectors and benchmark types are best suited for their potential use in the Article 6.4 mechanism.

3.2.1 Industry incl. energy use

The use of benchmarks in industry has a long tradition as it is often used as a management tool to assess and improve the economic performance of installations. In addition, many (multi-national) enterprises are experienced in comparing their own performance against that of competitors. A number of consultants such as Solomon Associates, Plant Service International or SRI management consulting provide services that allow access to anonymized benchmarks if own data sets are provided.

[2] http://eippcb.jrc.ec.europa.eu/reference/ (09.04.2018)

[3] The OECD's "Best Available Techniques for Preventing and Controlling Industrial Chemical Pollution" is a project that aims to assist governments to implement policies and practices that embody BAT (or similar concepts) to prevent and control industrial emissions. It is separated into three activities (compilation of policies in four member and three partner countries, exchange of experience and finally evaluation of effectiveness). So far there exists only a report concerning the first part. The focus is not on deriving BAT values per se but to help in the process of creating appropriate laws. It has therefore limited value for deriving carbon related benchmarks.

Looking at sources for greenhouse gas emissions in industry, two main sources exist:

- Consumption of fossil fuels, mainly for heat but also for electricity production
- Process emissions (e.g. in cement or steel or glass production).

The most prominent case for GHG benchmark application in industry is the EU ETS. It uses the following cascade of benchmark-types:

- Product benchmarks (output-related) that define emissions related to the production of one unit of the final or intermediate product (in units of tCO_2eq/product); 52 product benchmarks have been developed for the free allocation of allowances under the EU ETS for the main emitting sectors: coking, sintering and iron and steel production (most importantly: hot metal), non-ferrous metals, cement clinker, lime, glass, tiles and bricks, pulp, paper and board, chemicals and refinery products.
- Fall-back benchmarks can be used if a homogeneous output for a product benchmark is not available (e.g. in the chemical industry, which has various outputs). For fall-back benchmarks, there are the following options:
    1. A heat benchmark related to the amount of heat used in the process (in units of tCO_2eq/kWh)
    2. A fuel benchmark related to the amount and type of fuel used (in units of e.g. tCO_2eq/tonne lignite or tCO_2eq/liter of oil).

Product benchmarks are preferred as they allow to harness the mitigation potential due to process efficiency and fuel switches. Heat benchmark allow only for the mitigation potential due to fuel switches. And fuel benchmarks do not incentive any mitigating potential and as such shall only be used for minor cases.

The product benchmarks in the EU-ETS are performance benchmarks and are based on so-called benchmark curves. They have been developed based on data collected from all installations within the EU producing a specific product. Based on information on production and emissions in the – then – most recent historic years, the benchmark level has been set to the average GHG emissions of the 10% best performers in the EU. In contrast, the heat benchmark is a technology benchmark, determined on the use of natural gas.

For being able to provide a limited number of benchmarks that cover a large number of installations throughout the EU so called “sub-installations” were defined, intermediate products that can, but are not necessarily always traded between installations, but can also be produced in an integrated way. While this allowed to limit the number of product benchmarks used under the EU ETS, it also increased the necessary effort to collect the data needed to calculate production of the intermediate product as well as emissions related to the production of the intermediate product.

Besides the EU ETS, national voluntary agreements (Energy Efficiency Benchmarking Covenant) have been in place in the Netherlands and parts of Belgium to increase energy efficiency in industry. Participating companies were required to report their energy use. Benchmarking methodology needed to be developed by the participating companies and was to be verified and approved by an official verifying entity.

Besides the EU ETS benchmarks, also some industry sectors have been engaged in the collection of data for benchmark development. For refineries, Solomon Associates collect information on refineries and steam crackers, among others on GHG intensity of the individual installations. Firms that collect and provide data themselves have access to an anonymised data set on performance of other refineries and steam crackers. While data is not freely accessible to everyone, Solomon Associates was in the past open for cooperation to develop benchmarks in other contexts (e.g. under the EU ETS or for the US EPA).

Another association active in the development of reporting protocols and collection of data is the world cement association. Under the Cement Sustainability Initiative (CSI) data were collected from participating enterprises and a benchmark was developed based on the collected data for cement clinker or cement. The data set "Getting the numbers right" is freely accessible (aggregated information on all reporting enterprises). It contains information on 50% of global cement production outside of China. The CSI also submitted a methodology (NM0302)[4] to the CDM executive board based on the data collected.

Similar to the CSI, a standardised protocol for data collection and reporting was developed by the World Resources Institute and the World Business Council on Sustainable Development for aluminium producers, focusing on PFC emissions. Two CDM methodologies were developed based on the standardised protocol (AM0059 and AM0030)[5].

Other documents providing information on BAT or performance of installations are the BREF documents developed under the IPPC Directive on behalf of the European Commission. They contain information – among others - on energy consumption and GHG emissions. While they are available for the most energy-intensive sectors and provide a detailed view on installations in the EU, they were found not to be suitable for the development of benchmarks under the EU ETS for two reasons: the BREF documents developed in "the first round of the Seville-process (1996-2010)" are very heterogeneous and differ in size, content and age (some state specific energy consumption of technologies, others merely state ranges or do not provide information at all) and background and status of information contained in the documents is not always clear. Despite these shortcomings that prevented use of the information for benchmarks under the EU ETS, they provide a good starting point for information on installations and technology available in the EU. Also, there are updating and improvement processes in place that may make the documents more relevant for benchmarking purposes in the future. If available, BREF documents will be considered in the case studies in section 4.

Under the Asia-Pacific-Partnership, the task force on steel collected information on state-of-the-art clean technologies in the participating countries and published those information in the form of a handbook. Technologies are grouped by production steps and the state of the technology is ranked between mature and emerging. However, technology information in the document are limited and in particular no information is available on energy consumption or GHG emissions.

3.2.2 Energy generation

Energy generation relates to electricity production as well as heat production in centralized heating plants (in contrast to local heat production in industry or housing). In contrast to industry, the final products (electricity, and – although to a lesser extent – heat) are very homogenous. We concentrate on electricity generation.

Electricity generation relevant for GHG benchmarking includes coal- and lignite-fired power plants, gas-fired power plants, in some cases oil-fired power plants and, to a certain extent also biomass- and waste-fired power plants. All other power generation (e.g. from nuclear or renewables) is – broadly speaking – independent of direct CO_2 emissions. In addition, a differentiation needs to be made between electricity generation only or combined heat and power (CHP) plants. While in aggregate, efficiency of CHP plants is higher and hence emissions are lower, emissions for electricity may be higher compared to conventional electricity generation, depending on the method to calculate heat and power's share in emissions.

[4] https://cdm.unfccc.int/methodologies/PAmethodologies/pnm/byref/NM0302

[5] https://cdm.unfccc.int/methodologies/DB/CHNLRVLNEAM438MR5400YQDS3CPC50 and http://cdm.unfccc.int/methodologies/DB/PKA23BNEYGINU7U4FBINDNYP1F1EU8

The definition of electricity-benchmarks is normally output-related to not differentiate for efficiency of the plant. More interesting is the question of whether a technology-differentiated benchmark is applied (e.g. one for coal, one for lignite, one for gas) or not and how existing abatement options are taken into account. Renewable energies, biomass, nuclear but also – with slight restrictions - the combination of fossil-fuels with carbon capture and storage allows for CO_2-free electricity generation. Hence, the level of the benchmark merely reflects the level of ambition of the target that should be met along with the incentive that should be provided by the market-based mechanism to invest into low-carbon technologies.

3.2.3 Housing

Greenhouse gas emissions in the housing sector are primarily related to heating and cooling, the provision of warm water (drinking, shower, etc.) and even the provision of electricity for appliances. In the following, we will concentrate on heating and cooling.

Heating

Benchmarks may be derived from:

- Statistics of energy consumption data of the housing stock for the country or region considered or similar geographical areas (regarding climatic and economic conditions). Such data is available for already existing buildings, mainly through energy bills. A benchmark corresponds to a certain quantile.
- Consumer data from energy providers (especially gas or district heating)
- Building norms[6] for buildings relevant for the country in question or similar countries (regarding climatic and economic conditions). Building norms normally include one or both of the following:
    1. Country-specific requirements of useful energy demand[7] in kWh per energy reference area [kWh/m^2] for new buildings[8]
    2. heat transfer coefficients (u-values) [W/(m*K)] of specific components for new or retrofitted buildings[9]
- A micro-economic investment model (weighing investment costs against energy savings)
- National greenhouse gas NDC target for the building stock that can be broken down to a benchmark value per adequate activity metric such as heated square meter.

The greenhouse gas emissions related to heating can be mitigated at three major control elements:

- The isolating properties of the building **envelope** (roofs, walls, windows, doors, floors, etc),
- The energy efficiency of the **heating system**, and
- The type of the **fuel** used.

There are additional factors that influence greenhouse gas emissions, e.g. the climate, the indoor temperature, the shape of the building, etc. Yet, these factors are not considered in this context.

Related to the three major control elements, different benchmark scopes can be defined:

[6] For example, ISO 52016-1:2017 (internationally), SIA 380/1 (Switzerland), MuKEn (Switzerland), ANSI/ASHRAE/IES Standard 90.1-2016, Directive on Energy Performance of Buildings of the European Union, etc.

[7] Useful energy is the energy needed to increase the building's temperature. Primary energy (also called end energy) is the energy embodied in the energy carrier used for this purpose. The primary energy demand is always higher. The difference stems from the inefficiencies in the transformation and distribution process.

[8] Norms normally do not prescribe a specific energy demand in kWh/m^2 for retrofitted buildings, but only u-values for retrofitted components.

[9] In Switzerland, for example, new building's walls or windows shall have a u-value of 0.17 or 1.0, respectively.

Benchmarks that comprise only **the building envelope** are mainly related to building norms. Projects may thus claim emission reductions if a building's useful energy demand or specific components' u-values are better than these norms.[10] To calculate greenhouse gas reductions, the useful energy savings have to be converted to primary energy savings (through a parameter that reflects the heating system's energy efficiency). Second, the primary energy has to be multiplied with the emission factor of the building's energy carrier. The first step is complex, as a building's useful energy demand cannot be directly measured. One has to take the final energy demand (energy bills) and use assumptions on the energy systems efficiency. Transforming improvements of u-values into final energy demand is even more error-prone, as this depends, among other things, on the condition of the building's other components and most importantly on use patterns.[11]

Benchmarks that comprise **the building envelope and the heating system** typically use the primary energy demand per energy reference area [kWh/m^2] and thus can be directly related to statistics of the housing stock. In addition to the hull, greenhouse gas reductions may also stem from a better heating system (heating boilers, storage and distribution system, ventilation system as well as control system). Calculations of greenhouse gas reductions are more straightforward. They are the difference between benchmarked and measured specific final energy demand multiplied with the emission factor of the building's energy carrier.

Benchmarks that comprise **the building envelope, the heating system and the energy carrier** may directly be related to national greenhouse gas target of the building stock. Beyond the possibilities of the hull and the heating system elements, greenhouse gas savings may also stem from a fuel switch. This may be a switch to a building level heating system that is less greenhouse gas intensive (e.g. from coal or oil to gas, to wood or to a heat pump) or through a connection to a district heating system (with a lower greenhouse gas emission factor).[12]

Benchmarks may differentiate between several characteristics related to heating of a building stock. Typically, the differentiation between newly constructed buildings and retrofits of existing buildings as well as different climatic conditions is made. The latter can roughly be accounted for using heating or cooling degree days. In addition, one may consider construction vintages, types (e.g. single-family houses, multi-family house, schools, administration building, restaurants, hospitals, industry, warehouses, gyms, indoor-pools), etc. The more elaborate such differentiations are, the more accurate the calculated greenhouse gas reductions will be. On the other side, the effort for both benchmark development and MRV increases.

Cooling

For cooling the approach would be quite similar. The energy needed for cooling decreases if the building's envelope and the energy efficiency of the air conditioning unit are being improved. The actual power consumption may then be compared with a benchmark. Using the local grid emission factors allows to calculate the greenhouse gas reductions. An additional difficulty as compared to heating is that the energy consumption also depends on the air's humidity levels.

[10] For example, triple glass windows may have better u-values than norm windows. And they lower the useful energy demand.

[11] U-values would thus rather be useful for a deemed savings approach.

[12] In the draft of the revised CO_2-law, Switzerland plans to introduce an upper limit of the six kilograms of CO_2-emissions per square meter energy reference area for existing residential and service buildings whose energy system is replaced. For existing commercial buildings, the upper limit is 4 kilograms, New buildings may not emit CO_2 at all.

3.2.4 Transport

Greenhouse gas reductions in the transport sector can be achieved by less driving, modal shifts, more efficient vehicles, and the usage of fuels that have a lower GHG intensity (e.g. assumed for biofuels). We will focus on more efficient vehicles.

Benchmarks for vehicle efficiency may be related to:

- Fuel efficiency standards (mileage, specific fuel consumption) which exist in various jurisdiction (e.g. EU regulation on CO_2-Emissions, CAFE and GHG in the US) and may depend on a wide variety of vehicle characteristics, such as engine displacement, fuel type, model year, weight or type of the vehicle,
- Handbooks of emission factors for several vehicle categories and a wide variety of traffic situations (e.g. HBEFA),
- Data of comparable traffic situations.

Using fuel efficiency standards, greenhouse gas reductions can be determined as the difference of the vehicles' specific fuel consumption as compared to the applicable fuel efficiency standard. In addition, the average or a vehicle's specific vehicle-kilometres travelled, and the fuel's emission factor are needed.

It is important to avoid double counting with respect to the jurisdiction's regulations.[13] Also, emissions standards normally have certain features that facilitate manufactures to meet the requirements. In the European Union, for example, the electric cars count more, eco-innovations can be accounted for, etc. Therefore, an Art. 6 system based on emissions standards has to be designed carefully, in order not to infringe environmental integrity.

Handbooks of emission factors allow to design benchmarks related to a clearly containable purpose (e.g. a public transport system, a business car fleet), incorporating the standard emission factor(s) that apply for this purpose. Such benchmarks can then be compared with the actual fuel use.

For clearly containable purposes, one may also use fuel data derived from business-as-usual situations as benchmark. For example, it is possible to collect data of a business-as-usual diesel bus fleet and derive a benchmark. This benchmark can be compared with fuel data from hybrid buses that serve comparable routes and have a comparable size.

3.2.5 Wastewater treatment

There are two major types of wastewater treatment plants (WWTP): anaerobic (where mainly methane emissions occur) and aerobic (where methane and nitrous oxide emissions occur) WWTP. These must be distinguished as emission sources, levels and types differ. There also exist various design types for aerobic and anaerobic systems. Emissions depend in addition on a range of influencing factors, which vary substantially among the WWTP. Those factors are e.g. design and type of the WWTP, loading and type of pollutants (organics, nutrients, solids, toxic material, etc.), pH, dissolved oxygen, retention time, temperature or amount and type of bacteria. Controlling for those factors and comparability between WWTP is complex. As a corollary, deriving a suitable benchmark is very challenging. For further details on WWTP see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**.

[13] For example, emission reductions may be credited for specific vehicles that are more efficient than an emission standard. In the inventory of the jurisdiction's accounting those vehicles must accordingly be considered as if they would exactly meet the emission standard (and shall not be accounted for with their real efficiency).

3.3 Criteria for good benchmarks to be used under Article 6.4 mechanism

For the development of benchmarks under the EU ETS, 11 guiding principles were developed in advance (Ecofys and ISI 2008). They characterise what – from a theoretical point of view – good benchmarks should respect. However, while at first glance the EU ETS benchmarks and hence the underlying guiding principles seem to provide a good starting point for the discussion, in detail one faces difficulties in the application of benchmarks in the context of international crediting (rather than linking of ETS). First, not all installations, but only some, either new or significantly improved installations will apply the benchmark on a voluntary basis (self-selection of installations). Second, applying similar benchmarks in all countries may not necessarily be the best solution in contrast to the harmonization required under the EU ETS where it was a clear prerequisite that the same benchmark value is applied to installations in all countries regulated under the EU ETS. Certainly, for products competing in the global market, a level playing field seems appropriate. However, in the international context, differences in the countries' national circumstances and the UNFCCC's principle of common but differentiated responsibilities and respective capabilities (CBDRC) may call for factoring in the national context in the definition of the benchmark.

3.3.1 General criteria for good benchmarks

Instead of building on the criteria for benchmark development from the EU ETS, the following criteria for good benchmarks are based on the process necessary to apply a benchmarking approach in the international context (DEHSt 2013):

- Clear definition of **system boundaries**: The system boundaries define the activities/ production phases and / or products for which a benchmark value is defined. The definition of a (final) product or the whole production process increases the emission coverage and the emission reduction potential. However, high heterogeneity of the production processes (maximize emission/energy coverage of the process) may reduce the applicability of a large system boundary. In addition, benchmarks for smaller systems may be easier to be applied in different installations and countries, while large systems may be very plant-specific and general definition of a benchmark may be more difficult. Independent of the size of the system it is important to define the system boundaries in a clear and transparent manner that does not allow for shifting emissions from within and outside the system boundaries by installations.
- Adequate **definition** of key performance indicator/ benchmark: The performance that shall be measured is normally calculated as impact (e.g. in terms of GHG emissions, CO_2 emissions or energy use) divided by the activity (e.g. tonnes of product, electricity produced, heating, …). Both, the definition of the impact (inclusion of all GHG emissions or CO_2 only, inclusion of indirect emissions from electricity and heat, definition of benchmark based on energy use) as well as the definition of the activity (e.g. production of tonnes of paper in general, production of tonnes of specific quality types of paper, production of tonnes of specific paper types or even paper types further differentiated by certain parameters such as thickness of paper or colour of paper) determine the benchmark but also the demand for data and the emission reduction options. An adequate definition reflects functionality along with a certain pragmatism for data availability and collection.
- **Availability of data** for determination of benchmark level: Different approaches exist for the definition of the benchmark level. All of them have in common that data is needed. If performance benchmarks shall be defined based on actual existing installations (e.g. best achieved level, top percentile based, average level), a significant level of statistical data on existing plants (either within a country or group of countries or larger region or globally) are required. Definitions based on the best available levels in the stricter definition requires less real-world data, but the calculation of emissions from a virtual best plant by theoretical modelling can also be very arguable. In both cases, theoretical modelling as well as statistical data, it needs to be

ensured that data collected are accurate and robust. If available data was subject to high uncertainties, the definition of a benchmark based on that data is not recommended. That applies to both activity level data as well as impact data.
A clear connection exists between the definition of the system boundaries and the availability of data for quantification of benchmark levels. In some cases, official statistics may exist (such as the national energy balance) that contain – in parts – data that can be used for calculation of the benchmark level while in other cases – such as under the EU ETS – all data needs to be newly collected.

- **Similar benchmarks for similar products** in similar countries: While it can be argued that national circumstances should be factored in in the definition of benchmark values (e.g. heating and cooling demand differs significantly for different countries in different areas of the world), similar benchmarks should be applied to products produced in countries with similar national circumstances. However, if benchmarks of different stringency are implemented in countries that participate in the same market for a specific product (e.g. steel), different benchmarks may lead to carbon leakage.
- Benchmark levels should **incentivise investment in no- and low-carbon technologies:** Another aspect that should be considered when defining the benchmark levels is that the benchmarks have to address two purposes: they need to be sufficiently ambitious to incentivise long term investment in low- and no-carbon technologies; in contrast, investment in technologies that lead to only small emission reductions compared to today's levels and will – in the long-run – lead to a lock-in of not-climate-friendly technologies (e.g. super-efficient coal-fired power plants without CCS) should not be incentivised. In addition, it is likely that the amount of money that can be generated with selling the credits needs to be sufficient for a firm to make the decision in favour of a cleaner production technology – in the absence of national climate policies such as carbon prices that would incentives such an investment. It should be noted that the voluntary nature of a benchmark-based crediting system leads only to positive incentives for low emitting installations but does not provide negative incentives (such as higher compliance costs) for high emitting installations as under ETSs.
- **Improvement over time:** The benchmark level should not keep constant over time. Instead, it should decrease to reflect general technology improvements over time as well as the increasing level of ambition of overall emission reductions. That may require repeated collection of data.
- **Availability of data for performance evaluation:** Data need not only be available to define the benchmark level, but also – and at least as important – the performance needs to be monitored in the installation to check the own performance against the benchmark. While that can be easy if all production phases within the installation are included in the benchmark, it can be complicated if e.g. sub-installations are being defined as is the case under the EU ETS and certain processes needed to be included or excluded from the calculation of the performance value

3.3.2 Specific requirements for using benchmarks under Art. 6.4

With the Paris Agreement, all countries have committed themselves to NDCs and many developing countries have specific mitigation targets in their NDCs. From this, several additional requirements for the use of benchmarks for crediting baseline setting under Article 6.4 may be derived:

- **Consistency with the NDC target:** Crediting baselines for Article 6 mechanism do not only required to be below BAU emission but in addition need to be below an emissions trajectory that is in line with the host country reaching its NDC target (Schneider et al. 2017). This holds also for a benchmark derived baseline. In order to be suitable as benchmarks on a global level,

benchmarks need therefore to be sufficiently stringent to assure with high certainty that it is more stringent than the NDC target.

- **Consistency with long term goal of Paris Agreement:** Article 4 states that the long term goal of reaching the 1.5/2°C target requires "global peaking of greenhouse gas emissions as soon as possible […] and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity […]". This may be interpreted that benchmarks should be so stringent that they do not allow for the lock-in of technologies of medium to high carbon intensity. For instance, there should be no fuel specific benchmarks incentivizing the construction of efficient coal power plants, as they are not in line with the required emission reduction pathway to meet the Paris Agreement goal (even though such a technology wold be in line with the NDC target).
- **Applicability to a wide range of countries:** The use of benchmarks under Article 6.4 would mean that they are applicable to a wide range of countries, not only to developed and emerging economies, but also middle- and low-income countries. Or, a scale of international benchmarks would be defined for each of the main group of countries (e.g. high-, middle- or low-income countries). Such an approach however is strongly dependent on the categorization used and the best performers in each group
- **Agreed process for determining benchmarks:** A suitable institution such as the Article 6.4's supervisory body would need to provide for a transparent and science-based process on how to determine benchmarks for different sectors and mitigation actions.

What if a different benchmark is used for additionality and for the crediting baseline?

One might think of a benchmark-based approach in the Article 6.4 mechanism that uses a benchmark A to determine if the mitigation would not have happened in absence of the mechanism (additionality) and another (less stringent) benchmark B that is used to determine the crediting baseline which defines the amount of mitigation outcomes issued. Such an approach with two benchmarks may increase the profitability and therefore the attractiveness of the mitigation activities in particular if the prices are low. However, in such a situation also the (less stringent) benchmark (B) would need to fulfill consistency with both the NDC target, because of the need for corresponding adjustments. With this, in practice benchmark (B) would need to be quite stringent and there would be not much room for widely differing benchmarks.

3.4 Three examples

In order to further analyse the practical feasibility of a benchmark approach to define crediting baselines, the following three examples in the cement and in the iron and steel industry as well as in wastewater treatment are given.

3.4.1 Case study: Benchmarking for Cement Clinker

3.4.1.1 Cement production process

The standard production process of cement follows three main steps (Ecofys, Fraunhofer ISI, Öko-Institut 2009).

1. Raw material preparation: The preparation of the raw material includes the transport of the raw materials (limestone approx. 90% and other e.g. clay, iron ore), crushing and grinding of raw materials into homogenized powder called "raw meal".
2. Clinker production: Temperatures of > 900°C are required to transform limestone ($CaCO_3$) into lime (CaO), releasing CO_2 in the process. The calcinated raw meal is sintered and formed into clinker. It is the most energy-intensive and CO_2 emitting part of the cement production. The step is necessary, because it lends the cement its binding properties. The process emissions due to calcina-

tion are constant, not avoidable (only by substituting clinker) and determined by the chemical reaction (about 0.507 t CO_2 per tonne of clinker, depending on fraction of lime in clinker (IPCC 2001)).
On average, the following percentages of CO_2 emissions can be assumed in clinker production: 55% calcination, 35% thermal energy (22% energy required for endothermic calcination, 13% heat losses), 5% transportation, 5% electricity. (Ecofys, Fraunhofer ISI, Öko-Institut 2009)

3. Cement grinding: To produce cement, the clinker is finally grinded and mixed with a variety of different ingredients.

3.4.1.2 Mitigation options

The main drivers for reducing the carbon content of cement are the addition of clinker substitutes, the fuel, the efficiency of the kiln or other new clinker types.

Clinker substitutes: Some mineral components such as fly ash from coal combustion, slags from the steel industry or some natural volcanic materials (e.g. Pozzolana) have hydraulic properties. These properties are a prerequisite for the materials to be suitable as clinker substitutes, as these materials harden both in air and under water and are also resistant. For this reason, these components can be used to reduce the clinker content in cement. Such blended cements can be manufactured with up to 65% of slags or 35% of fly ash without quality problems in terms of the strength of the cement. Ordinary Portland Cement typically contains 95% clinker. However, the availability of clinker substitutes that are being produced as by-product of other production or combustion processes is limited and is likely to decrease, because improved facilities, less steel produced with the Basic Oxygen Furnace process and lower coal combustion in the future can restrict the supply (Ecofys, Fraunhofer ISI, Öko-Institut 2009).

Kiln efficiency: More and more alternatives to coal are being used for firing the kiln (e.g. biomass, used tires, waste, solvents or waste oils). These alternatives often have a lower carbon content and are partly of organic origin, which can reduce emissions. Again, availability and usage competition of the alternative fuels can restrict the use of low-carbon fuel alternatives. The available of raw materials limits the choice of kiln type.

Choice of kiln type: One of the biggest problems of the calcination process are the large heat losses. Modern plants try to minimize these heat losses by using the heat for preheating or to dry the raw materials. But the losses are still very high even in modern plants.

New clinker types: In the last few years, some companies also have been trying to develop new types of clinker that use less limestone and require less heat for calcination (e.g. sulfoaluminate clinkers). Although the tests with these new types of clinkers were promising, they are currently not used on a commercial scale due to limited availability or higher costs for raw materials (e.g. alumina) (LCTPI 2015).

3.4.1.3 Benchmarking aspects

System boundaries: Since the three steps mentioned above are the only ones that occur within the cement plant or at least in its immediate neighbourhood, only these are taken into account when defining the system boundaries. Further steps such as transporting the cement would significantly increase complexity and would lead to overlaps with the transport sector. Especially with regard to the feasibility of data collection, emission control and the fact that the plant operators do not carry out steps outside the plant, system limits that go beyond these limits do not seem practicable.

Activity choice: One of the most important questions in developing a benchmark for cement is whether clinker or cement should be the basis for the benchmarks. The arguments put forward in the development of the European Emissions Trading Scheme in relation to clinker or cement benchmarks do not apply in context of an international market-based mechanism. Examples are the scope of the EU ETS

Directive or perverse incentives to switch from internal production to external production. In favor of cement benchmarking is the principle that benchmarks should be defined on products in order to maximise GHG emissions reduction and energy-efficiency savings throughout the complete production process. One argument against a cement benchmark is the trade in clinker between plants. Keeping track of the carbon-content of traded clinker is not as easy as benchmarking clinker directly at its production site. Unlike the EU ETS, in which participation is mandatory, participation in a market-based mechanism is voluntary. For this reason, project developers themselves would have to set up a monitoring system that tracks the clinker trade, which may be a high if not prohibitive burden. Another argument against a cement benchmark is that several benchmarks or correction factors would have to be developed, as clinker substitutes are not fully available in some regions. However, this argument also applies to the production of clinker, where raw materials and the availability of alternative fuels differ between regions as well. Against this background, it must be considered whether the additional emission mitigation potential of a cement benchmark outweighs the additional complexity due to the addition of further production steps. In order to achieve a maximum reduction in greenhouse gases, for the remainder of this section we focus on the cement benchmark.

A common basis for a benchmark is specific emissions, which means the amount of greenhouse gas emissions per cement output in unit of GHG/unit of cement. For cement, CO_2 is the major GHG.

Data: In order to determine the benchmark, a data set with production levels and emissions that is as representative as possible is required. There exists worldwide data on cement plants, for example, in the Global Cement Report. The data include information on the plant, the operator, the location, the type of cement or the capacity of the plants.

The Cement Sustainability Initiative (CSI) described in section 2.1, "Getting the numbers right" (GNR), contains freely available data at country or regional level on production volume, kiln type, clinker type, emissions, energy consumption and fuels used (see Annex). Even if the data availability is not complete, the data provide a good basis for a first indication. A problem is that the data is only available at a regional level, but not at the plant level. A benchmark based on, for example, the average of the 20% most efficient plants cannot be calculated on the basis of this data without further information. Furthermore, detailed data, such as emissions by kiln type or production volume by kiln type, are only shown on a (grey) clinker basis and not for cement. A cement benchmark, as recommended above, cannot be developed on the basis of the data without further information.

Another possible source for benchmark development could be the document "Best Available Techniques (BAT) reference Document for the Production of Cement, Lime and Magnesium Oxide" of the European Commission. The document provides a detailed overview of the processes and techniques used in cement production, of raw material consumption and emissions, as well as an overview of best available techniques and emerging new techniques. In the document an average value of specific emissions is available. Specific emissions of technologies or certain regions are not shown. A benchmark developed on the basis of this technical information will require a lot of effort to verify the compatibility of existing plants and the raw materials available in the regions. Furthermore, the reported average value for specific emissions seems too high to represent an ambitious benchmark. The document estimates average emissions for one ton of cement at around 0.672 tons of CO_2 (p. 44), which seems very high compared to the global average based on GNR data for 2016 of 0.646 tons of CO_2/ton of cement (To the best of our knowledge, both values are based on the same calculation basis). Due to the lack of information on specific emissions in general and the rather high and therefore unambitious value for average specific emissions, the document appears unsuitable for benchmark development based on specific emissions.

More details on cement data can be found in the Appendix.

Monitoring: In the market-based mechanism it is necessary to monitor emissions and the amount of cement produced by the plants. While monitoring cement quantities is relatively simple, a series of

measurements and calculations are required for emissions. The process emissions from calcination for cement clinker are also simple to measure (about 0.507 t CO_2 per tonne of clinker). The emissions caused by the heating process are more complicated to calculate. At least information on the emission factors of the fuel and the amount of fuel used are needed. CSI has published the "CO_2 and Energy Accounting and Reporting Standard for the Cement Industry" for this purpose, which can provide a good starting point.

Benchmark adjustments: In order to establish an efficient benchmark system, it is necessary to continuously adjust the benchmarks. Changes in the availability of alternative fuels or - more importantly - developments in the sector of alternative low-CO_2 clinker types must be observed in particular. Other developments such as the improvement of kilns or research breakthroughs in the field of clinker substitutes may also be relevant. These improvements may cause specific emissions to decrease, making it necessary to adjust the benchmark.

Regional correction factors: One of the main questions in developing a benchmark for the cement industry is whether or which correction factors should be introduced. A distinction could be made between

- the kiln types used
- the size of the plant
- the age of the plant
- the raw materials available
- the fuels available
- availability of clinker substitutes

According to Ecofys, Fraunhofer ISI (2009), no different benchmarks should be set for a homogenous end-product to avoid carbon leakage. This argument is less important in this context due to the voluntary nature of the market-based mechanism. A benchmark that is chosen too ambitiously or that makes it impossible for some plant operators to meet will fail to achieve its goal. It is important to note that in some regions there are only certain types of raw materials for which certain kilns are required in the calcination process. Since the transport of cement has not proven to be economically viable and would in turn cause large quantities of emissions, it could make sense to factor in regional characteristics such as different raw materials when developing benchmarks. Furthermore, the availability of alternative fuels and their compatibility with the required kiln types as well as the availability of clinker substitutes must be investigated and, if necessary, correction factors must be applied for certain regions. It is important that correction factors are only introduced if alternative fuels or substitutes are not available or cannot be used due to political regulations (e.g. mandatory clinker content in cement or waste must only be used in waste combustion plants).

3.4.2 Case Study: Benchmarking for Steel

3.4.2.1 Steel production process

Steel can be produced from iron ores in integrated steel sites (primary steelmaking) or from steel scrap (secondary or recycling steelmaking). The production of primary steel in integrated steel sites, which is globally the dominant steelmaking process, follows three steps using different plants. The first step includes raw material preparation, i.e. is cokemaking from coking coal and sintering of iron ore fines. The second step includes the blast furnace (BF) and the basic oxygen furnace (BOF) where coke and sinter are converted to hot metal and finally crude steel. In a third step, crude steel is processed to finished steel by passing a set process steps including secondary metallurgy, casting, rolling and finishing. The off-gases from primary steelmaking are used throughout the process steps, e.g. in sinter plants, blast furnaces or rolling and parts are also used in power plants for electricity generation.

In secondary steelmaking, the process chain typically consists of the secondary metallurgy. Direct reduction of iron ore, a less widespread process, typically uses natural gas to produce direct reduced iron that is then fed to the electric arc furnace to produce crude steel. The process can also be run with hydrogen.

Globally primary steelmaking is the dominant steel making process. Developing countries, however, seldom possess these capital-intensive facilities (WSA 2018a). Developing countries with a relevant primary steelmaking capacity[14] are China, Brazil, Turkey, Mexico, Argentina, South Africa, Iran, India, and Vietnam (UN 2014). Secondary Steelmaking is vastly spread among developing countries (Turkey, Belorussia, Trinidad and Tobago, Argentina, Brazil, Ecuador, Venezuela, Egypt, Morocco, South Africa, Oman, Iran, Qatar, Saudi Arabia, United Arab Emirates, China, India, Indonesia, Malaysia, Pakistan, Philippines, Thailand, Vietnam exceeding a production 0.5 Mt in 2015) .

According to Ecofys and Fraunhofer ISI (2009), 88 % of the sector's CO_2 emissions originate from the production of coke, sinter, BOF crude steel and EAF crude steel. The remaining 12 % of the CO_2 emissions stem from a large variety of downstream processes, among these foundries, casting machines, hot rolling, cold rolling, surface treatment like tinning and galvanizing.

3.4.2.2 Mitigation options

Energy efficiency: The energy intensity of primary steel production has been more than halved in the past decades in Germany. This was achieved by several measures, including the introduction of secondary steelmaking, the basic oxygen furnace and continuous casting as well as of pulverized coal injection and the recovery of basic oxygen furnace gas (Arens 2017).

Heat recovery is another option to increase energy efficiency. Coke dry quenching, for instance, cools hot coke with nitrogen. The heated nitrogen is then used to generate steam and electricity. Energy can also be recovered from, e.g. sinter coolers, furnaces, blast furnace slag, or hot slabs.

Increase of steel production from recycling: Steel produced via the primary route consumes about three times more energy than steel recycled from steel scrap. Thus, increasing the use of scrap or the production of secondary steel helps to reduce the energy consumption and CO_2 emissions of the total steel industry. However, steel production from scrap is limited by scrap availability and by the quality of steel grades that can (currently) be produced via secondary steelmaking.

Material efficiency: Reducing material losses during steelmaking and steel consumption during steel use improves efficiency. Reducing the number of processing steps also improves efficiency. For instance, directly injecting coal into blast furnaces reduces the need for coke. New reactors are designed to completely omit coke (i.e. COREX-process) and sinter making (i.e. FINEX-process). Belt-casting technologies process coils directly from liquid steel and thus skip reheating processes.

Fossil-free steelmaking: Hydrogen from renewable energies is a promising technology providing a low CO_2 energy to industry. It can be directly used in the steel industry by producing direct reduced iron (DRI) that can be processed to steel. Plants to produce DRI, so-called DR-plants, are commercially available for the use of natural gas. There is also some experience with DR-plants that were run with hydrogen from fossil fuels. The concept of using hydrogen from renewable energy sources to produce DRI is new, but is currently explored by several European steel companies.

The electrolysis of iron ore offers a second option to produce steel directly from electricity. Compared to steelmaking from renewable hydrogen, the electrolysis of iron ore omits the generation of hydrogen. Thus, this concept may be more efficient. However, in contrast to DR-plants, the electrolysis of iron ore is currently under development. For 2030, a demonstration plant is announced.

[14] exceeding 1.0 Mt in 2015

3.4.2.3 Benchmarking aspects

System boundaries: Setting the system boundaries for benchmarking steel making is of key importance, since the system boundaries strongly affect the resulting energy and CO_2 intensity. For instance, Tanaka (2008) found that energy intensity may vary from 16 to 21 GJ per ton of crude steel depending on the chosen boundaries.

An integrated steelmaking site encompasses a set of plants, including cokemaking, sinter plants, blast furnaces, basic oxygen furnaces, secondary metallurgy, rolling and finishing. Next to these plants that are closely related to the steelmaking process, there may also be auxiliary plants located on the steelmaking site like a power plant or oxygen plants. The CO_2-intenstiy of primary steel is affected by all these plants. Additionally, the CO_2-intensity is affected by the processing depth that is achieved in each steelmaking site. Additional cold rolling and finishing, for instance, increases the specific CO_2-intensity.

There are two types of steelmaking benchmarking systems. The estimation of the CO_2-intensity of the entire steelmaking site is discussed in Tanaka (2008) and is also proposed by the ISO 1440415. This approach relies on input to and output from the steelmaking site, thus on values that should be easily available. However, a certain amount of adjustments would have to be made to benchmark different steelmaking sites. Worldsteel claims that a comparison against a reference plant is possible, but no further information on this reference plant could be provided (World Steel Association, 2018b). Second, the EU-ETS as well as the DIN EN 1969416 set benchmarks on the product level. While this approach requires detailed process data on each plant included as well as rules how to deal with by-product gases, it allows a direct comparison of the CO_2-intensity of the same products from different sites.

Activity choice: The chosen activity should be crude steel if the benchmark is set for the entire steel site. If the benchmark is set for a single plant then the product of this plant is the reference (e.g. sinter, hot metal, hot rolled steel).

Ecofys and Fraunhofer ISI (2009) proposed five to six product benchmarks for the iron and steel industry under the EU Emission Trading System. These benchmarks are coke, sintered ore, hot metal, EAF carbon steel and EAF high alloy steel. Furthermore, they argued that an additional benchmark for foundries could be possible. Direct emissions from foundries amount to about 1.4 % of the overall emissions of this sector between 2005 and 2008. Ecofys and Fraunhofer ISI (2009) argued that since there is a large variety of semi-finished products in the iron and steel sector, product benchmarks should be established only for a smaller number of products, but these should cover to a large extent the direct emissions of this sector. Since coke and sintered ore are traded as intermediate products in primary steelmaking, they are proposed to receive own benchmarks to allow allocation to installations selling these intermediate products.

Crude steel from primary steelmaking and crude steel from secondary steelmaking can be regarded as distinctly different products in respect of steel qualities. Therefore, separate benchmarks should be set up for the process routes. First, a benchmark for hot metal is proposed that also includes the basic oxygen furnace and casting machines. Second, two benchmarks for secondary steelmaking are suggested, one for EAF carbon steel and the other for EAF-high alloy steel. For waste gases, e.g. blast furnace gas, that are exported from the production process outside the system boundaries of the relevant product benchmark and combusted for the production of electricity, no additional allowances are allocated beyond the share of the carbon content of the waste gas accounted for in the relevant product benchmark.

[15] Calculation method of carbon dioxide emission intensity from iron and steel production

[16] Emissionen aus stationären Quellen - Bestimmung von Treibhausgasen (THG) aus energieintensiven Industrien

The product benchmarks also take account of the historical emissions from flaring of waste gases related to the production of a given product and fuel used for safety flaring should be considered fuel used for the production of non-measurable heat in order to take account of the compulsory nature of these flares.

Data: Benchmarks for the entire steel site require data on input to and output from the steel site (e.g. coal, natural gas, limestone; crude steel produced, by-product gases sold). Benchmarks on single plants require detailed data on its inputs and outputs (e.g. consumption of by-product gases and onsite produced steam and/or electricity).

IS0 14404 is a standardized method to calculate the energy and CO_2 emission intensity from iron and steelmaking on the company or site level. Its key purpose is to compare energy consumption and CO_2 intensity of single companies over two or more years and the assessment of energy and CO_2 savings from the introduction of new technologies. Companies could also compare their results against a representative reference site. The standard also enables the user to compare their results against better performing sites and identify the areas for improvement. Different companies can be compared if they have comparable production facilities. Three sub-norms are available that refer to steelmaking via the blast furnace (ISO 14404-1), the electric arc furnace (ISO 14404-2), or via electric arc furnaces and coal- or gas-based direct reduction iron (DRI) facilities (ISO-14404-3). ISO14404 refers only to the input and output of the site where steel is produced. Thus, it benchmarks the whole steelmaking site. A benchmark on the process-level is not possible. This norm seems to be appropriate for internal comparison of energy and CO_2 emission intensity. Since it does not take into account different set-ups of sites, it should be analyzed which adjustments would be required.

In contrast to the ISO 14404, the DIN EN 19694-317 refers to the process level rather than to the entire steel site. This allows to benchmark production plants or a combination of these. However, a large amount of plant specific data is required. If DIN EN 19694 is to be applied for benchmarking steel, companies in non-Annex-I countries, effectively this could only be applied to selected plants, e.g. sinter plants, coke ovens, blast furnaces, electric arc furnaces.

Monitoring: Detailed measuring of input data at single plants may be an issue in less developed countries: instruments may not be available or may not be calibrated. Inaccuracy of measurements distorts monitoring. In the EU-ETS there are strict rules regarding the accuracy of measurement instruments. If the calibration is outdated, for instance, as a fine additional consumption is added to the measured one.

Benchmark adjustments: Input factors that the steel company cannot influence, should be normalized. For instance, the CO_2-emission factor of the national electricity production may vary between very low (electricity from hydropower) to very high (electricity from bituminous coal) [18]. It is proposed to use the global average value or the average values of the countries participating in the benchmarking. In addition, the CO_2 emission factor of fossil fuels should be normalized as well.

Steelmaking follows similar production processes notwithstanding global regions. Thus, regional correction factors seem not to be necessary. However, it should be considered that steel companies cannot influence the CO_2 grid emission factor and corrections in this respect may be necessary.

[17] Stationary source emissions -- Greenhouse Gas (GHG) emissions in energy-intensive industries -- Part 2: Iron and steel industry; the respective ISO norm is currently under development.

[18] However, steel companies could assure that electricity comes from renewable sources (e.g. contracting a hydropower plant, purchasing electricity that comes from renewable energies, use low-carbon energy carriers in on-site power plants).

3.4.3 Case Study: Wastewater Treatment

3.4.3.1 Processes and Emission Sources

Biological wastewater treatment plants (WWTP) use living microorganisms to decompose pollution that originates from residential and industrial sources. Pollutants are mainly organics, but also nutrients (nitrogen and phosphorus), pathogens, heavy metals, etc. The main aim of a WWTP is to meet requirements set by the local environmental agencies regulating what is released into the water (as well as the ground and the air). Greenhouse gas emissions are a secondary concern or no concern at all.

The organics are largely converted to carbon dioxide. Yet, those emissions are commonly not considered as additional greenhouse gas emissions as the organics are predominantly of biogenic origin. The biological processes during the wastewater and sewage sludge treatment also result in methane and nitrous oxide emissions.[19] There are two major types of plant designs: anaerobic and aerobic systems. These differ substantially with respect to greenhouse gas emissions processes as well as mitigation options.

Anaerobic WWTP use microbial action to reduce the pollutants in wastewaters in the absence of additional oxygen (there is however oxygen in the wastewater and the pollutants). This process is called anaerobic digestion and is good at treating high input levels of organic matter. Its operation is low cost, as e.g. no energy is needed for aeration. Anaerobic digestion produces biogas (a mixture of methane and carbon dioxide), which — if captured — can be used for energy generation. If methane is not captured, this is a major emission source. The removal of organic matter is not complete and thus anaerobic WWTP are not suitable for direct discharge to surface waters (post aerobic treatment would be needed). They also do not remove other contaminations such as nitrogen and there can be odour issues. The main greenhouse gas emissions source is the methane from the anaerobic digestion if it is not captured and destroyed.

Aerobic WWTP use oxygen (or air) and microbial action to reduce the pollutants in wastewaters. There are many different systems such as aerated lagoons, activated sludge or trickling filters. In general, they achieve a better discharge quality as compared to anaerobic systems (i.e. they remove more types of contaminants and the final level of organics is lower). Yet, their operation is costlier (energy for aeration, operation more complex, sludge treatment, etc.). And they produce considerable amounts of sludge[20] which has to be disposed of. Methane emissions stem from anaerobic processes at several stages of the treatment (e.g. anaerobic digesters, sludge treatment and storage as well as methane leakage of a biogas power plant). There are also nitrous oxide emissions that mainly arise as a side product of the biological removal of nitrogen (nitrification and denitrification processes), if this is part of the wastewater treatment process. Nitrous oxide emissions are much lower in WWTP that do not have such a system. Another source of nitrous oxide is the storage and — if done — incineration of the sludge.

3.4.3.2 Mitigation options

Due to the different emission processes, the mitigation options differ between anaerobic and aerobic WWTP.

For anaerobic WWTP, a rather comprehensive mitigation option is to replacement the plant (existing or planed) with an aerobic WWTP, where emissions are generally considered to be lower (see e.g.

[19] Methane and nitrous oxide are powerful greenhouse gases with a global warming potential at a 100-year time scale of 25 and 298, respectively

[20] Sludge consists of the particulate components of the wastewater from the primary treatment as well as the active bacteria biomass from the biological purification stage.

CDM Method AM0080). With an anaerobic WWTP remaining in place, the most effective mitigation option is to cover the anaerobic digestor and capture biogas, which contains 60% or more methane (the rest is mainly carbon dioxide). End-of-pipe the methane can either be used (generation of heat and electricity or injection into a natural gas distribution grid) or destroyed (flaring in a torch).[21] See e.g. the CDM methods ACM0014 or AMS-III.H. Finally, the separation and treatment of solids in the wastewater also yields less methane emissions (CDM Method AMS-III.Y). Under the CDM there are only methods related to anaerobic WWTP, which have high methane emissions from uncaptured anaerobic digestion in the baseline.

For aerobic WWTP, optimizing the nitrification and denitrification process has the potential to lower nitrous oxide emissions. Yet, emission levels depend on a variety of factors, whose influence is not very well understood.[22] Optimization is thus difficult and plant specific. It is important to note that optimizations with respect to nitrous oxide emissions must not impair the nitrogen removal rates (as well as the rates of other pollutants). There are e.g. following options:

- Solid retention time[23] can be increased to maintain low ammonia and nitrite concentrations.
- Larger systems are better able to buffer the pH value and reduce the risk of transient oxygen depletion, both of which are considered to increase nitrous oxide emissions.
- The methane that forms in aerobic WWTP during the anaerobic sludge treatment can be captured and used.[24]
- The foul water which forms during that treatment contains large amounts of nitrogen and is usually fed back into the WWTP. Stripping that nitrogen before recycling the foul water (and converting it e.g. to fertilizer) can decrease the nitrous oxide emissions of the WWTP.
- The inert remainder of the sludge treatment is often burned, and nitrous oxide forms, if temperatures are not high enough. Another mitigation option is thus to increase incineration temperature or to use catalysts to reduce nitrous oxide emissions.
- Finally, in all current WWTP only parts of the energy contained in the raw wastewater (as organic compounds) is converted into methane during anaerobic digestion and thus available for energy generation. The remaining part is converted to carbon dioxide in the nitrification and denitrification processes to remove nitrogen and organic matter simultaneously. From an energy generation perspective this constitutes a waste. There are ways to remove organic matter and nitrogen compounds in separated processes and increase the methane production. Yet, such technologies are still at an experimental phase.

3.4.3.3 Benchmarking aspects

System boundaries: This chapter concentrates on the benchmarking of methane and nitrous oxide emissions, which arise during the treatment process. It shall be noted however, that apart from those direct emissions, there are also indirect emissions that could be considered as well. These are related to e.g. the electricity supply, transportation of chemicals and sludge or even the construction of the WWTP (concrete, steel, etc.). When defining an appropriate benchmark, these indirect emissions may also be considered using e.g. a specific plant-type as a benchmark.

Activity and Benchmark Choice: Possible activity choices differ for methane and nitrous oxide emissions. For methane emissions possible choices are:

[21] A less common method of methane removal are biofilter systems.

[22] Some identified factors are dissolved oxygen concentration, nitrite concentrations in both low COD/N ratio in the denitrification stage, sudden shifts of pH and timing of the anoxic and aerobic conditions.

[23] The solid retention time is the average time that bacteria (solids) are in the anaerobic digester.

[24] Sludge contains a high proportion on biodegradable high-energy components. In a separate process this sludge is usually treated in an anaerobic reactor (digester) such that only inert components remain. This is called sludge stabilization.

- The Biological Oxygen Demand (BOD), which is a proxy for the organic loading of the wastewater.[25] As the methane emissions depend on the organic loading, BOD is a viable activity choice. Yet, the correlation is rather low. The same levels of BOD can arise from different types of pollutants, some of which are, among other differences, more easily biodegraded (e.g. methanol and sugars) than others (e.g. turpentine and soaps). For related reasons, the same levels of BOD may give rise to varying levels of methane emissions.
- The chemical oxygen demand (COD)[26], which is less time consuming to measure than BOD but the relation to methane emission is probably even weaker.
- The population size (for residential sources) or the population equivalent (for industrial sources) in the catchment area of the WWTP.

For nitrous oxides emissions, the nitrogen load is the crucial factor and therefore the most suitable activity choice. Additionally, the nitrogen-to-COD-relation may be accounted for as well.

Benchmark have to be differentiated between anaerobic (mainly methane emissions) and aerobic (methane and nitrous oxide emissions) WWTP. Yet, there also exist several types of WWTP within these classes and it would have to be decided whether design-specific benchmarks are implemented. In addition, emissions depend on a range of influencing factors which may be different in every single WWTP. Those factors are e.g. loading and type of pollutants (organics, nutrients, solids, toxic material, etc.), pH, dissolved oxygen, retention time, depth of a lagoon, temperature or amount and type of bacteria. Controlling for those factors is complex and comparability between WWTP is low. As a corollary, benchmarking development and application is complex.

Data: Methane Emission and — to a lower extent — nitrous oxide emissions have been measured in several WWTP. Yet, given the above-mentioned differences among WWTP in several dimensions and the fact that the studies use different activities, comparability among the data is low and does not suffice as a basis for benchmarking.

Monitoring: The above proposed activity parameters are usually measured for operational reasons and thus additional monitoring demand is low. Emissions, on the contrary, usually cannot be monitored, as in most cases it is too costly to capture and measure emissions just for the purpose of an Article 6.4 mechanism. Measurements can only be taken in specific studies (measurement campaigns) for a limited amount of time. Expected emission reduction from an intervention may then be based on those results (this is called the deemed-savings approach).

Temporal adjustments: Temporal adjustments are not needed as the chemical processes that determine emissions stay the same. Yet, if influencing factors (see above) change with time, those would have to be considered if possible (mostly via changes in the activity data).

Regional corrections: Different regions have different WWTP-designs. Anaerobic WWTP (which have higher greenhouse gas emission) are e.g. common in the developing world, but not any more in the developed world. Influencing factors have regional variability as well (e.g. temperature). Therefore, regional benchmarks are meaningful.

[25] BOD is the amount of oxygen needed by biological organisms under aerobic conditions to break down the organic matter present in a water sample during 5 days at 20 °C. BOD is thus a surrogate for biodegradable pollution.

[26] COD is the amount of oxygen needed for a complete (chemical) oxidation of all components of the water sample. BOD thus measures biodegradable and non- biodegradable organics as well as oxidizable inorganic material such as chlorine.

3.5 Analysis – which benchmark approaches work for Art. 6.4?

3.5.1 General requirements for benchmarks for the Article 6.4 mechanism

A basic requirement for the use of benchmark is the availability of data: **Data for benchmark values** (as discussed in section 3.2) but also the availability of **activity data** information. Adequate levels of data availability are crucial, be it for benchmarks that are determined purely rule based (by formula like e.g. as average performance certain percentile of the market) or by expert judgement (considering ambition and technological leaps). In general, data availability is much more limited in developing countries, in more informal industries and the residential sector.

Besides the criteria for benchmarks in general (section 3.3.1) the criteria that are specific for the Article 6.4 mechanism (section 3.3.2) seem to leave **little room under Article 6.4 for benchmarks with lower stringency levels**, e.g. for fuel specific benchmarks do not allow to tap into the potential of fuel switching or technology specific benchmarks (e.g. for single cycle vs. combined cycle power plants).

The Paris Agreement requires also **the regular updating of benchmark values**, for instance in sync with the 5-year NDC cycle in order to prevent lock-ins into technologies with high to medium technologies that may not be in line with the long-term goal of the Paris Agreement.

3.5.2 In which (sub-)sectors is there the best potential for the use of benchmarks?

We consider the following four factors when determining the potential use of benchmarks under Article 6.4. The analysis builds on the evaluation of data availability for benchmarks in section 3.2.

Table 2: Evaluation of criteria that define the suitability of benchmarks for selected sectors

(Sub-) sector	Activity data availability	Benchmark data availability	Availability of global benchmarks	Carbon market contribution to profitability
Industry energy use – product benchmarks	***	**	**	*
Industry energy use – other benchmarks	**	*	*	*
Industry process emissions	***	**	***	***
Energy generation	***	**	**	*
Housing	**	*	*	*
Transport – general	*	*	*	*
Transport – fuel efficiency standards	**	**	**	*
Wastewater	**	*	*	***

Source: Own analysis. key: * = low, ** = medium, *** = high

Industry energy use – product benchmark

Where homogeneous products are found, product benchmarks can be defined. Important is in that context to find a clear definition of the product and the related system boundaries. Several examples for product benchmarks are available under the EU ETS.

An advantage of products which are homogenous enough to define product benchmarks is that activity data are more likely to be available (although not normally freely available on the installation level) and comparable between installations and countries. Examples are the cement sustainability initiative or the collection of information on refineries by Solomon. Compared to other industry sectors, availability or collection of activity data is likely to be better.

Similarly, examples exist for the definition and values of product benchmarks from the EU ETS. However, also other ETS systems are interested in benchmarks and in the process of defining product benchmarks (e.g. Korean ETS). These activities may provide a good starting point for defining benchmarks under Article 6.4, although they are not necessarily to be used one-to-one.

In case of similar product definitions and benchmark setting systems among different ETS systems in the future, a comparison of the values can also provide a good indication on the necessity of defining differentiated benchmarks vs. a global benchmark. It needs to be considered, that there may be a bias in the benchmark values as ETS systems are more likely to be implemented in industrialized countries. Whether a definition of a global benchmark is per se an adequate solution in case of product benchmarks, cannot be determined in general. On the one hand, homogenous products such as steel or aluminium or other metals are more likely to be traded between countries and hence competition on a global market is more likely which would be a reason in favour of a global benchmark to prevent distortions. On the other hand, availability of raw materials and the costs of trading certain goods - e.g. in case of cement clinker - may result in the conclusion that the use of a global benchmark value is not adequate.

As the case studies for iron and steel as well as for cement show, the definition of the system boundaries is key. It determines the energy/ emission content of the product, the options for reducing emissions/energy use, but also the resources needed to collect data for monitoring the plant performance which relates directly to the credits that can be generated under Article 6.4. For further investigation into product benchmarks in context of Article 6.4 it is therefore important to understand in detail the advantages and disadvantages of the setting of the system boundaries. As different approaches already exist, iron and steel, but also cement/ cement clinker may provide good starting points for in-depth analyses of product benchmarks.

Industry energy use – other benchmarks

Product benchmarks are only suitable for a small group of industry products that are homogeneous enough. The larger group of industry products is likely to require other benchmark approaches such as fuel- or heat-benchmarks as the products and hence the heat or fuel required in the production process are too heterogeneous to define a product-specific benchmark value.

The heterogeneity of the product also makes collection of activity data more difficulty. Due to the missing standardization — even when available —, production data may not always follow similar definition and are therefore difficult to compare. For similar reasons, the availability of benchmark data is limited. While there are definitions of heat and fuel benchmarks under the EU ETS, they are limited to emission-intensive products regulated under the EU ETS.

The availability of a global benchmark depends heavily on the product/ sector. While for some products it may be possible to define a global benchmark value, it is certainly not possible for all products.

The specific production circumstances need to be evaluated to identify the possibilities for global benchmark values.

Again, the benchmarks defined under the EU ETS may provide a starting point for definition of other benchmarks in industry. It should be checked whether the approach for fuel and heat benchmark definitions from the EU ETS (i.e. definition of a standard fuel input in combination with an emission factor for that fuel; see chapter 3.2.1) can be applied in case of Article 6.4, even if the benchmark values chosen under the EU ETS may not be adequate in many cases.

Industry process emissions

The best starting point for benchmark development in industry present the process emissions. In contrast to energy-related emissions they follow clearly defined chemical processes and can easily be calculated. Examples are CO_2 emissions from calcination of cement clinker or N_2O emissions from adipic or nitric acid production.

The number of products with process-related emissions is limited. At the same time, the products with process-related emissions are often standardized and therefore collection of activity data is easier compared to other product groups. Like the product benchmarks, most process-related emissions are regulated under the EU ETS, hence the methodology applied under the EU ETS can be used in the context of Article 6.4. As the process-related emissions follow clearly defined chemical processes and products are standardized, the use of global benchmark values should in most cases be possible.

What may present a problem in some cases, is the choice of the benchmark value. It depends heavily on the availability of abatement options. In some cases, such as adipic or nitric acid abatement, options are available that allow for an almost complete reduction of process-related emissions (e.g. by a catalyst). In other sectors, e.g. calcination processes for cement and lime production, reduction of emissions is not that easy. It may either require the use of CCS technology, meaning that the emissions are not reduced, but captured and stored, or completely new production processes or product substitutes that are still under development. In these cases, it is unclear whether the definition of a purely process-related benchmark is sufficient to provide incentives to reduce process emissions in a meaningful way or if the definition of process-related benchmarks may in contrast result in a lock-in in old production technologies as the system boundaries do not take into account alternative production processes/product substitutes.

Energy generation

Another good starting point for the development and application of benchmarks is the area of energy generation. In particular the availability of data for power plants is very good for many regions of the world. An example is the global PLATTS database which contains information on capacity and efficiency as well as input fuels for large, but also for many small power plants around the world. This or similar data bases can serve as a starting point for calculating technical possibilities. Due to the relevance of electricity, national statistics normally provide significant information on the production of electricity from different sources which can complement the technical information from databases. Even for countries where emissions from power plants have not been monitored in detail in the past, the technical and production information can be used to calculate proxies for the emission intensity of electricity in a country.

The definition of global benchmarks for Article 6.4 may - at least in the short to medium term - be difficult for energy generation. While in general the same production technologies are available in all countries, national circumstances (availability of fossil fuels and renewable potentials) determine to a large attend the current energy mix. Measuring against a global benchmark would not make use of that benchmark beneficial, in particular in countries with a high share of fossil fuels, where mitigation ac-

tion is particularly required. In contrast, countries with an already low emission intensity of the energy mix would be able to generate a significant amount of mitigation outcomes to be used under Article 6.4, which may neither be required nor provide a real environmental benefit. In the long-run, however, assuming that energy generation will get closer to being decarbonized in all countries, a global benchmark is more likely to being applicable.

Housing

Benchmark data availability depends on the scope of the benchmark (see section 2): benchmarks can be derived from norms related to the overall building's envelope or single components. Such data is available in many countries. To calculate emission reductions from such a benchmark or to directly derive a benchmark related to energy demand, energy consumption of houses clustered by energy categories is needed. Yet, whereas consumption data is quite often available, it is rarely clustered in such a way. In addition, there are many different types of houses (single family, multi family, office buildings, etc.). A further problem is that houses have a long live-time such that data of the existing housing stock do not serve as a benchmark for new houses, yet they may do so for retrofits. Therefore, benchmark data availability is low. It is therefore difficult to define a proper benchmark.

As housings' energy consumption depends heavily on the climate as well as the general standards of the region's building stock, benchmarks have to be defined locally. A global benchmark is not feasible.

The availability of activity data is medium, as for certain types of energy carriers (e.g. gas or district heating) energy consumption data is often readily available. For other fuels with decentralized distribution, data availability tends to be much lower.

Due to the problems in deriving a benchmark, lack of homogeneity in the building stock and the strong local differences, this sector is not suitable for benchmark-based baseline setting under Article 6.4.

Transport – general

General transport relates to measures in the transport sector, such as modal shifts or changes in the usage patterns (e.g. traveling less or car sharing). There are various mitigation options and deriving benchmarks is notoriously difficult. The baseline depends on many influencing factors such as user-behaviour, city-structure, culture, etc. Those also differ regionally, such that there is no comprehensive data-set that might be used for benchmarking and global benchmarks can usually not be applied.

Measuring activity is possible for public transport fleets, but difficult for private fleets, except on a very aggregate level.

Due to these problems, transport is in general not suitable for baseline setting under Article 6.4. An exception might be mitigation options of public-transport fleets. For those, however, input-based finance[27] (instead of article 6.4 result-based finance) is most likely the more efficient mitigation instrument.

Transport – fuel efficiency standards

Data related to fuel efficiency standards of cars and light-duty vehicles are widely available. There are some regional differences as e.g. in the US cars are on average heavier.

Article 6.4 project could in principle set incentive to increase the fuel efficiency. In most countries, however, regulations on the fleet's fuel efficiency standards are already in place. Additional incentives

[27] With input-based finance we refer to instruments that finance mitigation measures up-front and do not measure the outcome (or measure only to evaluate the usefulness of the measure).

using article 6.4 projects are thus not useful. On the contrary, they might cause double counting problems and create perverse incentives for the policy-makers not to strengthen the fuel efficiency standards.

Wastewater

Activity data may relate to pollution loading or population size of the plant's catchment. Yet, deriving a suitable benchmark is challenging if not impossible, as there are various wastewater treatment plant designs, the range of important influencing factors (which vary regionally) is wide and data availability is low (because measurements are costly).

Therefore, the wastewater sector is not suitable for baseline setting under Article 6.4.

Carbon market contribution

The contribution of carbon markets to the profitability of low carbon investments differs strongly between different sectors. While e.g. for wind projects the impact of carbon revenues under the CDM added on average below three percentage points to its profitability (IRR), in landfill gas projects, where the high global warming potential of the avoided methane produces much more revenues from carbon markets, the impact on profitability is on average in the order of 14 to 15 percentage points, a much more significant contribution (Cames et al. 2016). This factor is not specific for the context of benchmarking. However, when identifying sectors that are most suitable for using benchmarks under Article 6.4, the economic attractiveness may be an important factor when it comes to recommending sectors with projects that are additional compared to what would otherwise occur and have the potential to best use benchmarks to scale *additional* mitigation action.

3.6 Findings and recommendations on the use of benchmarks in Article 6.4

Baseline setting with globally applicable and stringent benchmarks may be seen as an important instrument for scaling-up market mechanisms under Article 6. This builds on the rationale that benchmarks that are stringent enough lead to baselines that are automatically below both BAU and an emissions trajectory that is compliant with the host country achieving its NDC target. This promises to be an efficient and simple way to solve the challenging issue of defining crediting baselines on the basis of BAU and NDC targets with its uncertainties, the sometimes unclear and only partial scope of NDC targets etc.

The analysis identifies different sources for benchmark data in the industry, energy generation, housing, transport and wastewater sectors. It defines criteria for good benchmarks and provides in-depth analysis of the feasibility of benchmarks in three case studies for cement clinker production, steel production and wastewater treatment. It then identifies sub-sectors that appear particularly suitable for the use of benchmarks for baseline setting under Article 6.4. In this context, the analysis focusses on *global* benchmarks in the sense of simple reference values for specific products and services that are independent of a specific country and may be applied globally or on the level of groups of countries (e.g. low/middle/high income countries).

The analysis indicates a limited potential for global benchmarks. There are some *quick wins* in the form of global benchmarks related to industry process emissions. Here, the CDM has established robust and stringent benchmarks for baseline setting e.g. in N2O abatement in nitric acid or adipic acid production, or for abatement of HFC23 emissions in the production of refrigerants. it may also be assumed that with these high GWP gases, the revenues from the transfer of emission reductions may provide a significant contribution to overall profitability and therefore lead to mitigation action beyond BAU.

In addition, some other industries may be suitable for benchmarking, including cement or iron and steel. However, related emissions depend stronger on local factors (such as quality of raw materials) and are more difficult to implement on a purely global level. Here, baseline setting with approaches of intermediary complexity may be possible, building on proposed or approved CDM methodologies and EU-ETS guidance for product benchmarks. In practice, expected carbon prices may not be on a level that would trigger additional action in these sectors.

The process leading to the definition of benchmark values may be challenging to implement under an Article 6.4 mechanism. Providing such benchmarks may also open the door for loopholes and non-stringent values. A stringent and science-based process within the Article 6.4 supervisory body should define adequate global benchmarks but may also open loopholes. In settings of weak governmental oversight, using benchmarks may be less adequate than conventional methodologies of baseline setting, where baselines are set on the basis of project specific parameters that are validated by independent third parties.

Even though there are sub-sectors with large or medium potential for benchmarking, the majority of emission sources cannot be covered by global benchmarks, because the goods and services are heterogenous (e.g. “shoes”, “tonne-kilometers”) and emissions tend to depend also on exogenous local factors. Benchmarking is therefore barely the silver bullet to solve the issues with crediting baseline setting under the Paris Agreement.

However, if one moves from global benchmarks towards standardized approaches of baseline setting, there is a large body of methodological approaches and reference values from ETS and the CDM that can be used to define crediting baselines in a more efficient and robust way. Their use under Article 6 requires their further development including comprehensive data collection exercises that would allow for standardized approaches taking into account at least some regional, local or project specific factors.

4 Options for fostering increasing ambition levels under the Paris Article 6.4 Mechanism

4.1 Background

The collective ambition level of Parties’ Nationally Determined Contributions (NDCs) pledges falls short of meeting the objectives of the Paris Agreement “to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century” (Article 4) and to limit global temperature increase to “well below” 2°C. The IPCC Special Report on the impacts of global warming of 1.5 °C states that current NDCs are broadly consistent with pathways that result in a global warming of about 3°C by 2100, with warming continuing afterwards (IPCC 2018). The latest UN Emissions Gap Report (2019, p. xix) reaffirms this finding and states: “If current unconditional NDCs are fully implemented, there is a 66 per cent chance that warming will be limited to 3.2°C by the end of the century. If conditional NDCs are also effectively implemented, warming will likely reduce by about 0.2°C.”

Given this weakness of the current NDC targets, it is particularly important that the Paris Agreement includes an in-built mechanism of progressively raising ambition levels individually and collectively. Several provisions of the Paris Agreement are intended to contribute to ambition raising. However, while this makes ambition raising a key concept of the Paris Agreement, a clear definition is still missing. We will therefore first explore this concept by building on the key provisions contained in the Paris Agreement. Ambition raising is also a component of the cooperation approaches established under Article 6 of the Paris Agreement, and therefore also a guiding principle for the design and operation of the Article 6.4 mechanism, which will be the focus of this chapter.

Having ambition raising as an explicit goal of international cooperation is new and a departure from the market-based instruments of the Kyoto Protocol, which were meant to assist countries in reaching fixed targets through reduced costs, but without any direct relation to their commitment levels (Warnecke et al. 2018). Depending on the outcome of the ongoing negotiation of the detailed modalities and rules for Article 6.4 (as of January 2020), the incentives set by the Article 6.4 mechanism may not necessarily support or may even conflict with the Paris Agreement's need for ambition raising and regular "ratcheting-up" of Parties ambition levels.

The following examples are key issues discussed in the negotiations: On the one hand, setting ambitious targets may directly reduce the amount of mitigation outcomes that go beyond the NDC target and that a host country can transfer (and sell) abroad. On the other hand, if the Article 6.4. mechanism allows for crediting of activities that are beyond the scope of the NDC without requiring the host country to account for exported mitigation outcomes from such activities, there is no incentive to expand the scope of the NDC, because this would reduce the host country's potential to obtain external funding.

This chapter explores the complex interaction between ambition raising and the Article 6.4 mechanism, develops options on how the mechanism may be designed in order to foster ambition raising and evaluates these options regarding their contribution to raising ambition levels, their practicability and feasibility. It finally derives conclusions from these findings and presents recommendations to enhance the ambition raising potential of the Article 6.4 mechanism.

Please note that this chapter focuses on design elements of the Paris Agreement and its Article 6.4 mechanism that allow for "ambition raising" related to Parties' NDC targets in terms of ambition level and scope. Another concept closely related to ambition raising is "overall mitigation", i.e. the net climate benefit of Art. 6.4 activities resulting from the mechanism's design as such, which is discussed in chapter 2.

4.2 The Paris Agreement's aim for ambition raising and incentives from international transfers under Article 6.4

4.2.1 Ambition raising in the Paris Agreement

The Paris Agreement and the decision by the Conference of the Parties adopting the Agreement (Decision 1/CP.21) contain several elements that underline the importance of increasing ambition over time.

Article 3 states that the efforts of 'all Parties' – collectively – will represent a progression over time. Article 4.3 states that "each Party's successive nationally determined contribution will represent a progression beyond the Party's then current nationally determined contribution and reflect its highest possible ambition", while stressing the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

The Paris Agreement establishes a ratcheting mechanism in order to increase ambition over time (Kohli 2015). According to Article 4.9, each Party shall communicate an NDC every five years "with a view to enhancing its level of ambition" (Article 4.9). Parties may also increase the ambition level of their NDC at any time (Article 4.11). Each round of NDC submission is preceded by a global stocktake through which the collective progress towards the Agreement's long-term goals is assessed. Parties are required to take into account the outcomes of the global stocktake when formulating their NDCs (Art. 4.9 and 14.3).

Ambition raising is not only related to **increasing the target levels of an NDC,** but "progression" referred to in Article 4.3 may also relate to **expanding the coverage (or scope) of the NDC**. This is in line with requirements of the Paris Agreement: While developed countries "should" adopt economy-wide absolute emission reduction targets, developing countries "are encouraged to move over time

towards economy-wide emission reduction or limitation targets" (Article 4.4). To this aim, developing countries shall be provided support (Article 4.5).

Ambition raising can however also be understood to include an **increase of climate actions** more generally. This broader concept is used in Article 6.1, which states that the voluntary cooperation among Parties is "to allow for higher ambition in their mitigation and adaptation actions" (Art. 6.1).

At the same time, ambition raising can be discerned from the concept of **overall mitigation in global emissions** (see chapter 2). Delivering such an overall mitigation in global emissions is one of the aims of the Article 6.4 mechanism. The key difference between both concepts is actorness: Overall mitigation is achieved by the design of the mechanism while ambition raising is an outcome of individual Parties taking action to generate a climate benefit. With overall mitigation, the mitigation outcomes are no longer linked to the Parties involved and the Parties' ambition level stays the same.

In sum, ambition raising can be defined as a process in which Parties enhance their NDC targets and/or intensify their mitigation actions. Expanding the concept of ambition raising to include both NDC targets and concrete mitigation actions is not only in line with the provisions contained in the Paris Agreement. It further allows to achieve both, an enhancement of climate change targets in the mid-term (NDCs) and long-term (2050 strategies) as well as an immediate climate impact. The latter aspect is also key, as exclusively relying on the (future) enhancement of purely nationally determined targets of NDCs and long-term low greenhouse gas emission development strategies cannot be considered a viable pathway to address climate change given their lack of legal bindingness. Hence, the use of Article 6.4 would ideally support Parties in achieving both, a short-term increase of their mitigation actions and a long-term enhancement of their mitigation targets.

4.2.2 Challenges and risks of the Article 6.4 mechanism in contributing to ambition raising

Article 6 is explicitly introduced as a means for Parties "to allow for higher ambition in their mitigation and adaptation actions" (Article 6.1). In theory, allowing for the allocation of resources to actions that provide mitigation outcomes at the lowest cost may help to raise ambition in order to achieve the goals of the Paris Agreement. Using mitigation outcomes generated abroad and using them for NDC attainment may decrease mitigation costs for acquiring countries. This may or may not lead the acquiring countries to pledge more ambitious mitigation levels in their NDC, depending on how they make use of the economic rent from international transfers. In addition, the use of Article 6 mechanisms may incentivize investments in advanced mitigation technologies and sustainable development that are only possible with such cooperative approaches.

However, the use of international transfers under Article 6.4 may bring various challenges and perverse incentives to raising the ambition of both, host and acquiring countries. The fundamentally new element comes with the fact that under the Paris Agreement, in contrast to the Kyoto Protocol, all Parties are now expected to contribute to the global effort of mitigation, peak their own emissions as soon as possible, and to rapidly reduce their emissions thereafter (Article 4.1).

Host countries: Ambition raising of host countries could be adversely impacted by the Article 6.4 mechanism in numerous ways. One potential perverse incentive relates to the scope of Parties' NDCs: Although developed countries should and developed countries are encouraged to move to economy-wide NDCs, the use of the Article 6.4 mechanism may provide perverse incentives not to do so. If the mechanism allows crediting of activities that are beyond the scope of the NDC without requiring the host country to account for exported mitigation outcomes from such activities, expanding the scope of the NDC would reduce the host country's potential to obtain external funding.

Article 6.4 may further impact the ambition level of an NDC, as the definition of a country's NDC has an impact on baseline-setting and additionality demonstration of mitigation actions to be credited under the mechanism. Setting ambitious targets may directly reduce the amount of mitigation outcomes that go beyond the NDC target and that a host country can transfer (and sell) abroad (Schneider et al 2017;

CCAP 2017). Host countries that increase their ambition level may lose their (lower cost) mitigation potential, which they might want to monetize under Article 6.4.

In addition, many NDCs in their current initial form are not yet formulated very clearly and in a quantified manner. This includes aspects of NDCs such as the quantification of emission targets, definition of national business as usual (BAU) scenarios, scope of NDC, single-year- vs. multi-year-targets etc. Aiming to participate in market mechanisms may provide incentives to interpret these NDC targets in an unambitious way, e.g. by assuming non-conservative BAU scenarios that allow for more mitigation outcomes to be transferred internationally.

In addition to these potential perverse incentives, the structure of Article 6.4 mechanism may also entail a risk for the host country. Using low-hanging fruits for international transfers may increase the marginal cost of additional mitigation potentials and make it costlier for a host country to reach its NDC and to increase its ambition level in the future.

Acquiring countries: From the perspective of the acquiring country, the availability of more cost-effective mitigation outcomes from Article 6.4 mitigation activities abroad may entail the risk of reducing investments in domestic low carbon technologies and allow for the prolonged use and implementation of high emitting technologies ("lock-in" effect). This may hinder the necessary transformation towards a low-carbon economy domestically.

From this it appears that without adequate incentives, rules and procedures, the Article 6.4 mechanism may fail to achieve its goal of contributing to ambition raising and, on the contrary, may provide numerous perverse incentives for host countries not to increase their ambition levels, possibly leading to a race to the bottom. The following chapter develops different options on how to, at least partially, address these challenges.

4.3 Options for fostering ambition raising in the context of the Article 6.4 mechanism

In the following, we develop four options on how the risks outlined above could be addressed allowing Article 6.4 to exert its ambition raising function:

1. Strengthening reporting, transparency and comparability
2. Reconciling the design of the Art. 6.4 mechanism with ambition raising of host countries
3. Supporting the host country to raise ambition through the Article 6.4 mechanism
4. Fostering the acquiring country to raise ambition through the Article 6.4 mechanism

This chapter will first describe the options in detail. Subsequently, the options will be evaluated in chapter 4.4 with regards to their potential to enhance ambition levels and their practicality in terms of institutional needs, data availability etc.

4.3.1 Strengthening reporting, transparency and comparability

This weakest option to foster ambition raising builds on the comprehensive requirements of the Paris Agreement for transparency, reporting and review. Stringent requirements, including on reporting information about progress in ambition levels as well as on accounting of all international transfers, could contribute to raising ambition. The key is comparability of the targets and ambition levels between different countries and over time. More ambitious countries could demonstrate their high ambition levels. In contrast, countries with low ambition levels may be identified, in particular those who engage in hosting mitigation outcomes for international transfers based on their "hot air". Such information may also be useful for acquiring countries that seek to buy mitigation outcomes from countries with sufficiently ambitious NDC targets, preserving environmental integrity.

The rulebook adopted end of 2018 in Katowice includes guidance on the relevant articles of the Paris Agreement, except Article 6. Some of the current provisions allow to increase comparability of targets and progress. However, in some cases further guidance or clarity may be needed so that the implementation of the rulebook actually allows transparency, reporting and review to contribute to ambition raising through Article 6.4. In the following, relevant provisions from the Paris Agreement and rulebook are presented. While an assessment of the latter needs a further and more in-depth analysis, the text below nevertheless provides some initial proposals on how the provisions could be further developed.

Upfront information

Each Party is required to provide upfront information through their NDCs. The features of the NDCs and the information to be provided by Parties in order to facilitate clarity, transparency, and understanding of NDCs (Article 4.8) may contribute to increasing ambition, namely by allowing better comparability of NDCs between countries and between different NDC cycles. Consequently, the ambition level at a certain time and the increasing ambition over time can be better understood and compared by the different stakeholders.

In their second and subsequent NDCs, Parties need to provide the following information: (i) quantifiable information on the reference point, (ii) time frames and/or periods for implementation, (iii) scope and coverage, (iv) planning processes, (v) assumptions and methodological approaches, (vi) how the Party considers that its NDC is fair and ambitious, in the light of its national circumstances, and (vii) how the NDC contributes towards achieving the objective of the Convention.

Annex I of decision 4/CMA.1 specifies each of the aforementioned element. Parties are required to provide information on the intention to use voluntary cooperation under Article 6 mechanisms, including Article 6.4 mechanism (see 5(g)). Additionally, Parties are required to describe how their NDC contributes towards the objective of the Paris Agreement to holding the increase in the global average temperature to well below 2°C above pre-industrial levels (see 7(b)). There is no further indication on what the information should entail to fulfil these requirements. Information may contain a description not only on how, but also to what extent (quantified amount) Article 6 mechanisms are used. Additionally, information may contain a description on how the use of Article 6 mechanisms allows the Party to have "higher ambition in their mitigation actions" (Article 6.1) and increase ambition in its current and future NDCs.

Quantifiability in terms of CO2-eq is another relevant feature. Annex I of decision 4/CMA.1 requires Parties to provide quantifiable information (1 (a-f)). While there seems to be a certain leeway (see 1(c)), Parties are required to provide information on reference years or other starting points, a target relative to the reference indicator expressed numerically, and quantifiable information on the reference indicators at the starting points and in the target year. Quantifiable targets and baselines for NDCs are particularly important if the mitigation outcomes transferred are from within a host country's NDC. Amongst others, it helps the host country to understand what amount it can transfer without risking to not achieve its own (ambitious) NDC. On the acquiring country's side, such information is relevant to understand what can be achieved through domestic actions and how much international transfers are needed to achieve its own (ambitious) NDC.

Annex I of decision 4/CMA.1 requires information on the planning process that a Party undertook to prepare its NDC (4 (a)). While not explicitly mentioned, such information could also entail a link to a Party's long-term strategy or how it considers the formulated target to fit into its long-term mitigation actions and decarbonization. Together with the information on Article 6 mechanisms this would help to understand if short term gains are favored instead of a long-term decarbonization.

As outlined above, Annex I of decision 4/CMA.1 already contains several requirements for relevant information to assess ambition. However, some of the above mentioned and more detailed information necessary for assessing ambition raising through Article 6.4 mechanism is not explicitly mentioned. It could be decided – for example by the supervisory body of Article 6.4 mechanism or a "club" of acquiring countries – that these requirements are only to be fulfilled by those Parties deciding to make use of Article 6.4 mechanism.

Transparency framework and review

Article 13 establishes an enhanced transparency framework for action and support. This framework is the main mechanism to hold states accountable for the implementation of their NDCs. The modalities, procedures and guidelines have been specified through decision 18/CMA.1. While they are common to all Parties, there is a certain flexibility foreseen for those developing country Parties that need it in the light of their capacities (Article 13.2). Parties making use of the flexibility have to indicate the capacity constraints that make the flexibility necessary and provide time frames for improvements (see para. 6 of annex to decision 18/CMA.1).

Parties are required to provide national inventory reports as well as information necessary to track progress made in implementing and achieving their NDCs (Article 13.7). The annex of decision 18/CMA.1 outlines the information that Parties need to provide. For example, with regard to Article 6, Parties have to provide (para. 76 (d)) a description on how double counting of net GHG emission reductions has been avoided, or (para. 77 (d)) an emission balance reflecting the level of anthropogenic emissions by sources and removals by sinks covered by their NDC adjusted on the basis of corresponding adjustments (assuming that the Article 6.4 mechanism is considered a cooperative approach). For additional information that might be necessary requirements could be included in the guidance for Article 6, which still needs to be developed, additional guidance established by the Article 6.4 supervisory body, or a "club" of acquiring countries. For example, Parties could be asked to provide specific information on how Article 6.4 use has allowed them to increase ambition.

There is a two-step review process common to all Parties (Articles 13.11 and 13.12): First, there is a technical expert review, checking consistency of the information with the modalities, procedures and guidelines of the transparency framework. Second, there is a multilateral consideration of progress. As recognized in the annex to decision 18/CMA.1, technical expert teams have to include members with knowledge on Article 6, if relevant for the information to be reviewed. This is necessary to review the information provided by parties on the Article 6.4 use and how it e.g. helped them to increase ambition.

The purpose of the framework for transparency of action is to provide not only clarity and tracking of progress towards achieving Parties' individual NDCs, but to also include good practices, priorities, needs and gaps to inform the global stocktake under Article 14 (see also Article 13.5). Amongst others, good practices with regard to ambition raising through Article 6.4 could be identified and provided as input to the global stocktake.

As outlined above, Annex I of decision 4/CMA.1 already contains some requirements for relevant information to assess ambition raising through Article 6.4. However, the annex refers in some cases to guidance related to Article 6 that still needs to be developed. Additionally, some of the above mentioned and more detailed information necessary could also be part of reporting requirements established by the Article 6.4 supervisory body or a "club" of acquiring countries.

Global Stocktake

Article 14 establishes a global stocktake on the implementation of the Paris Agreement to assess the collective progress. It is a key element of the ratcheting mechanism to increase ambition over time.

The assessment not only includes progress towards achieving the purpose of the Paris Agreement, but also its long-term goals (Article 14.1). Thus, as noted above, it allows a feedback mechanism connecting the current climate action with the long-term targets of the Paris Agreement (Northrop et al. 2018). The outcome of the global stocktake shall inform Parties in updating and enhancing their NDCs as well as enhance international cooperation for climate action (Article 14.3). While Parties are required to take into account the outcome of the global stocktake in their NDCs (Article 4.9), it remains a nationally determined process on how and to what extent they want to profit from the information. The first stocktake will take place in 2023 and every five years thereafter (Article 14.2).

The mandate of Article 14 is limited, as it only assesses the progress ex-post and on an aggregate level. Nevertheless, such an assessment could include information on the extent of Article 6.4 use. The assessment could include information on how the use of Article 6.4 mechanism has actually helped Parties to achieve their targets and increase ambition. Lessons learned and best practices could be provided in order to improve the use of Article 6.4 mechanism in future NDC cycles so that they allow Parties to increase the ambition levels in their NDCs.

Hermwille and Siemons (2018) propose that the global stocktake could also implicitly or explicitly determine points of references for ambition, possibly for country groupings, based on parameters such as the level of emissions, state of development, or sectoral benchmarks. Such points of references could then be used by national policy makers and civil society organizations to assess the NDCs of the following cycle (Hermwille and Siemons 2018). Such points of references could include Article 6.4 use. Alternatively, points of references could also be developed by civil society or a "club" of acquiring countries, based on the global stocktake.

Compliance Mechanism

Article 15 of the Paris Agreement establishes a mechanism "to facilitate implementation" and "promote compliance". In December 2018 in Katowice, Parties have agreed in the rulebook on the modalities and procedures for the effective operation of this mechanism and its committee. The committee may consider an issue in the following cases (paragraph 20, 22, 32 of decision 20/CMA.1): first, if a party provides a submission on its own implementation or compliance; second, if a party has failed to submit an NDC, a mandatory inventory or report; third, if a party has not participated in the facilitative, multilateral consideration of progress; fourth, in case of persistent and significant inconsistencies with the Article 13 modalities, procedures and guidelines; fifth, in case of systematic issues.

Further analysis is necessary to understand the implications of adopted modalities and procedures of Article 15 for Article 6 and ambition raising. For example, the fourth option seems interesting as it may include issues related to reporting progress by parties using the Article 6 mechanisms. The first option would allow the mechanism to also address challenges of individual Parties in implementing their NDCs and increasing ambition, including through the Article 6.4 mechanism. However, and based on the experience with other compliance mechanisms, it remains to be seen to what extent this option will be used.

4.3.2 Reconciling the design of the Article 6.4 mechanism with ambition raising of host countries

This chapter considers ways to design the rules, modalities and procedures that operationalize the Article 6.4 mechanism in such a way that allows countries to raise their ambition without being negatively affected in their role as Article 6.4 host countries. In addition, this chapter discusses design options that allow the Article 6.4 mechanism to exert its function as ambition raising. The following approaches build on earlier work of Schneider et al. (2017) and Warnecke et al. (2018) Howard (2018), Kreibich (2018). They are key issues in the ongoing negotiations for Article 6.

Table 3: Options to address perverse incentives and make Art. 6.4 an ambition raising mechanism

Option	Suboption	Perverse incentive or risk addressed	Contribution to ambition raising
Requiring host countries to also account for exported mitigation outcomes that were generated outside the scope of their NDC		YES, the perverse incentive to maintain the scope of the NDC narrow is addressed	-
Restricting crediting periods and adjusting baselines in alignment with the 5-year NDC cycle		YES, risk mitigated	-
Requiring conservative baselines		YES, the incentive to adopt unambitious NDC targets is addressed.	
Defining eligibility criteria for Article 6.4 mechanism (relating to NDC targets)	*Coverage of NDC targets*		YES, countries are incentivised to expand the scope of their NDC.
	Engaging in long-term strategies	YES, the incentive to exclusively focus on the short-term cost-savings from offsetting is addressed.	YES, countries would be required to demonstrate how they intend to use Art. 6.4 for ambition raising.
	Restricting eligibility of technologies or types of action within the scope of the NDC	YES, by restricting eligibility to actions within the scope of the NDC the incentive to maintain a narrow scope is addressed.	
	Requiring ambitious and quantified NDC targets	YES	YES
Requiring inclusion of emissions targeted by Art. 6.4 activity into future NDC		YES, by requiring the inclusion of emissions into future NDCs the incentive to maintain a narrow scope is addressed.	YES, requiring the inclusion of emissions into future NDCs expands the scope of NDCs.
Quality of the mitigation outcomes		YES, quality of MO as necessary pre-requisite enabling ambition raising in subsequent NDC cycles	

These options could be implemented on a CMA-level or by the ruling of the considered Supervisory Body under Article 6.4. In absence of such an international ruling, an acquiring or host country or a group of countries ("club") could decide to implement these design options on a regional or national

level, or even on the project level through the inclusion in an emission reductions purchase agreement. The acquiring countries could complement such rulemaking by providing support to host countries (see also chapter 4.3.3).

Requiring host countries to also account for exported mitigation outcomes that were generated outside the scope of their NDC

If host countries are allowed to export mitigation outcomes that were generated outside the scope of their NDC there could be a perverse incentive to maintain the scope of their NDC narrow, in order to be able to export a larger amount of mitigation outcomes without having to implement corresponding adjustments. This perverse incentive could be addressed by requiring host countries to also account for exported mitigation outcomes that were generated outside the scope of their NDC and to carry out corresponding adjustments also for these mitigation outcomes.

Restricting crediting periods and adjusting baselines in alignment with the 5-year NDC cycle

The period over which outcomes from a specific mitigation activity could be internationally transferred might be limited, possibly aligned with the NDC cycle. Restricting crediting periods prevents the lock-in of mitigation potential in the host country. If crediting periods were much longer (e.g. 21 years as is possible in the CDM), then the host country would not be able to use these mitigation potentials over a long time period and the related corresponding adjustments would burden the adjusted national emissions balance for a long period, making it more difficult for host countries to ratchet-up their NDC target. Limiting crediting periods combined with the inclusion of emission reduction into future NDC targets (see below) can further contribute to ambition raising.

Restricting crediting periods is applied already under the CDM. For instance, under the CDM project proponents may choose between one ten-year crediting period or three seven-year periods with a reassessment of the baseline for each new period. These timeframes appear rather long compared with the shorter five-year NDC cycles foreseen in the Paris Agreement.

In addition, shorter crediting periods may increase environmental integrity, because scenarios for crediting baselines can change over the time. They are difficult to estimate over longer time periods. Especially for complex and dynamic areas, the baseline uncertainty may increase and become larger than the considered emission reduction (i.e. the issue of "signal-to-noise-ratio", see Fuessler et al. (NMM Part II)). Restricting crediting periods and aligning them with the 5-year cycle of updating NDCs would remove uncertainties with regard to the mitigation outcomes that are transferred (Schneider et al. 2017).

Requiring conservative baselines

Host countries have an incentive to set unambitious NDC targets or inflate baseline emission projections to which these targets are tied, in order to allow to transfer more mitigation outcomes. One possibility would be to require the baselines in subsequent NDCs to be based on emission levels achieved in previous NDCs (CCAP 2017, Warnecke et al. 2018). Eventually, in one of the following NDCs, any mitigation outcomes transferred should also be included. Another option would be that only activities in countries that agree to an international review of their NDC baseline and where this review determines that the NDC does not contain hot air would be automatically deemed additional.

Defining eligibility criteria for the Article 6.4 mechanism (relating to NDC targets)

Participation by parties in Article 6.4 mechanism could be subject to eligibility criteria contributing to ambition raising.

Explicit and implicit *eligibility criteria* have already been used under the CDM. For example, participating parties need to nominate a designated national authority responsible for authorizing projects, some technologies (e.g. nuclear) where ruled out and only those project types where applicable where a corresponding CDM methodology has been approved (see further examples in Schneider et al. 2017).

Coverage of NDC targets

Participation could be restricted to Parties with *economy-wide targets* in their NDCs (see also Warnecke et al. 2018). According to Article 4.4, developed country Parties should undertake economy-wide absolute emission reduction targets and also developing country Parties are encouraged to move over time towards economy-wide emission reduction or limitation targets. A requirement for economy-wide emission reduction targets would actively encourage Parties to move more quickly towards economy-wide targets than they would have done without Article 6.4 mechanism. Since such a requirement might be challenging to fulfill for some potential host parties, one could also allow for these countries to only provide *a clear plan for the adoption of economy-wide targets* (Warnecke et al. 2018). Such countries could possibly receive support in capacity building in doing so (see chapter 4.3.3 further below).

Engaging in long-term strategies

Engaging in a process to *develop and communicate long-term strategies according to Article 4.19* could also be a prerequisite for both acquiring and host parties to participate in the Article 4.6 mechanism:

Without long-term strategies, *acquiring countries* risk to not achieve the transition towards low-emission development because they do not sufficiently invest in technological advancements on the national level.

Host countries risk that they do not consider the implications of using Article 6.4 mechanism on achieving their own NDC target as well as for ambition raising in the future. In long-term strategies, participating countries could be required to demonstrate how they intend to increase the ambition of their targets in future NDC cycles, by using Article 6.4 mechanism without undermining the achievement of their own NDC target, and on focusing long-term decarbonisation instead of short-term gains only (see also Warnecke et al. 2018, CCAP 2017 and further below).

Restricting eligibility of technologies or types of action

Eligibility of actions could be restricted to sectors, technologies and actions *within the scope of NDCs* (see also Warnecke et al. 2018). This would avoid disincentives to not include actions in NDCs.

Based on *positive and/or negative lists of technologies,* only certain activities would be allowed for transferring emission outcomes under Article 6.4 mechanism. The CDM applied positive lists in small and micro-scale renewable energy and energy efficiency projects/programs. On how these lists could be defined, see elaborations below in chapter 4.3.3.

Requiring ambitious and quantified NDC targets

Parties are required to set *ambitious NDC targets* (Article 4.3), for which certain safeguards can be formulated. This not only contributes to avoiding the transfer of hot air and undermining the overall ambition, but it also contributes to raising the individual ambition of NDCs. Assessing the level of ambition in NDCs is difficult, but it is necessary to get an idea on how Article 6.4 contributes to raising ambition (Howard 2018). As a minimum, participating parties could be required to demonstrate how their NDC targets are more stringent than their BAU emissions. This is a minimum requirement that could be combined with the requirement that the baselines in each NDC cycle need to be based on the actual emissions in the previous cycle (see above). In addition, all parties participating in Article 6.4 mechanism could be required to provide information necessary for clarity, transparency and understanding (Article 4.8) on how they consider their target to be the highest possible ambition, reflecting

its common but differentiated responsibilities and respective capabilities in the light of different national circumstances (Article 4.3) (see also Schneider et al. 2017). What the information should be can be defined based on the guidelines currently developed on paragraph 28 of decision 1/CP.21 on NDCs.

Another eligibility criteria could be that only parties with *quantified NDC targets* are allowed to trade emission outcomes. This would facilitate clarity, transparency and understanding of nationally determined contributions (Article 4.8), what the transferred mitigation outcomes are and how the corresponding adjustments have been applied.

Application of eligibility criteria

The eligibility criteria could be applied strictly, so that only parties fulfilling all criteria can participate in Article 6.4 mechanisms. However, a less strict application could also be required to limit the quantities of emission outcomes that can be transferred from countries that do not fulfil all criteria (see also Schneider et al. 2017).

Eligibility criteria that for example would only allow for international transfers from host countries that have NDCs with a "sufficient level of ambition" and which can demonstrate progress towards more comprehensive and more ambitious NDCs over time would prevent the competition with host countries that have unambitious NDCs and can therefore transfer more mitigation outcomes internationally and at a lower cost. In practice however, it is politically very difficult to agree between parties on what adequate ambition levels are. As such eligibility criteria may not be implemented on a CMA level, some acquiring countries (or clubs of buying countries) may require an objective demonstration from potential host countries that their NDC's ambition level is adequate and that the country has a strategy on how to increase ambition levels over time. For instance, Switzerland takes the NDC of prospective host countries into account when selecting potential suppliers in the carbon market pilot scheme.

Requiring inclusion of emissions targeted by Article 6.4 activity into future NDC

If the scope of Article 6.4 is not limited to activities within the scope of NDCs, host parties could also be required to *include sectors and technologies* that are used in Article 6.4 mechanism during one NDC cycle *to their NDC in future cycles* (see also above on restricting crediting periods). This is a contribution to ambition raising, as the scope of the NDC would be increased. At the same time, this measure would address the incentive for countries to maintain a narrow scope of the NDC is addressed.

Quality of the mitigation outcomes

Units that lack quality increase global greenhouse gas emissions. Under crediting mechanisms, the quality of credits is ensured if the emission reductions are additional, not overestimated, and permanent (or provisions are in place to address non-permanence). Additionally, robust accounting needs to be applied.

Units that lack quality may also be a risk for host countries not to achieve their NDC target. In case a mitigation outcome is transferred from within a party's NDC, quality of unit is important for the host country to assess if it still achieves its own NDC target.[28] This is particularly true if the transfer happens before the target year or period, because the host country may have to compensate for the transfer of units that lack quality (Schneider et al. 2017). International rules may be important to assure unit quality.

[28] Units have quality if the 6.4 mechanism ensures that the issuance or transfer of one unit, defined as 1 t CO2eq, directly leads to an emission reduction of at least 1 t CO2eq in the host country, compared to the situation in the absence of the mechanism (Schneider et al 2017)

In case the host country is required to integrate the activities used for Article 6.4 mechanism in its future NDC, it seems particularly important to assure unit quality. Otherwise the host country risks that it has to compensate in the future for low quality units.

4.3.3 Supporting the host country to raise ambition through the Article 6.4 mechanism

In the following, options are presented how other parties, bi- and multilateral institutions and initiatives could support host countries in fulfilling the requirements outlined in the previous chapter. Some of the requirements outlined in 4.3.2 are challenging to fulfil, especially for certain host countries. This may lead to the exclusion of some countries to participate in Article 6.4 mechanism and, in turn, hinder increasing ambition. Therefore, support for those countries that need it may contribute to raising ambition of NDCs through Article 6.4 mechanism. Such support could also be part of the Article 6.4 mechanism.

Support ambitious target-setting and long-term planning activities

National mitigation planning processes leading to a long-term strategy are important to define and progress in NDC targets. A well-established planning process may help a party to set ambitious targets, achieve ambitious mitigation outcomes in the short as well as long term, and to participate in the Article 6.4 mechanism while managing the risk of non-achievement of the own NDC targets (Schneider et al. 2017). Limited and incomplete planning processes can be a reason for unambitious, unclear and incomplete NDCs, amongst others because reference scenarios are unknown. Planning processes have been implemented in several countries in the context of the regular domestic climate policies and measures including the Low Emission Development Strategies (LEDS) or Mitigation Action Plans and Scenarios (MAPS).

Article 4.19 of the Paris Agreement encourages Parties 'to formulate and communicate long-term low greenhouse gas emission development strategies'. At COP 23 end of 2017, several parties proposed linking potential participation in Article 6 mechanisms to long-term decarbonisation strategies (Warnecke et al. 2018). Requiring long-term strategies that explicitly identify the role of Article 6.4 mechanism would help to analyse the impacts of the Article 6.4 mechanism on the achievement of a Party's own NDC target and how it may help to increase ambition and achieving long-term mitigation goals. By September 2018, nine parties have submitted a long-term low greenhouse gas emission development strategy under Article 4.19 of the Paris Agreement. In addition, many (developed) countries elaborate and communicate long-term strategies in the context of their National Communications under the UNFCCC and in other international or domestic fora (e.g. the Deep Decarbonisation Pathway Project (DDPP)).

Host countries might be required to provide answers to the following challenges and questions related to their long-term strategies (CCAP 2017):

- How will the NDC scope expand over time and how can Article 6.4 participation help, through the inflow of finance, technology and capacity, to incorporate sectors/activities into subsequent NDCs and increase ambition?
- What mitigation pathways are required or possible for achieving domestic NDC targets and how does participation in Article 6.4 allow or help getting on this pathway?
- How can be assured that using the Article 6.4 mechanism does not prioritize short-term gains over long-term decarbonization and how it may even encourage long-term decarbonisation?

Formulating ambitious targets and long-term strategies is not easy. Particularly developing references and mitigation scenarios are a very complex task (Novikova et al. 2016). Many host countries lack relevant information e.g. in their greenhouse gas inventories and know-how for defining future pathways

based on assumptions related to e.g. economic growth, developments in economic sectors, or effects on emission sources. Thus, there is a need of some host countries for support and capacity building.

This support may come through existing international financing mechanisms and bilateral cooperation (see also Warnecke et al. 2018 or Howard 2018). However, there could also be a collaboration between an individual acquiring country or a coalition of acquiring countries with potential host countries. An example for such a complementary approach is the work of the World Bank's Partnership for Market Readiness (PMR) capacity building initiative, supporting host countries in their mitigation planning processes and development of domestic MRV capabilities and mitigation instruments. This capacity building then allows for other World Bank carbon facilities such as the Transformative Carbon Asset Facility (TCAF) to engage with these host countries in using the Article 6.4 mechanism.

Facilitate investments in new low-carbon technologies

The Article 6.4 mechanism should facilitate investments in technologies in a host country that would be unable to make such investments unilaterally (see Warnecke et al. 2018 on the importance of identifying inaccessible technologies). This may accelerate technology diffusion to host countries allowing them to raise ambition in their future NDCs. It is not only in the interest of the international community, but may also be a host countries' priority to identify activities that are particularly suitable for the Article 6.4 mechanism. If a host country sells its cheapest mitigation options that could well be implemented domestically, it is left with only the more expensive abatement options for the achievement of its NDC target.

Host countries may focus or even restrict their use of the Article 6.4 mechanism to sectors/ project types that facilitate investments to technologies where specific local barriers of technology, know-how and finance limit a purely domestic uptake and where international cooperation is necessary for their transformational implementation (Warnecke et al. 2018). See also chapter 4.3.2.

In order to assess whether an activity involves an "inaccessible" technology for a country, the maturity of the technology for a specific country or region, if not globally, and the costs need to be considered (Warnecke et al. 2018). There could be an international negative list for low-cost, mature technologies and an international positive list for (higher cost) emerging technologies. In addition, there is a "grey zone" of high-cost, mature technologies and low-cost, emerging technologies, which needs careful investigation, taking into account the domestic context of the host country (Warnecke et al. 2018). There are major differences between regions and countries with regard to technologies, so that the inaccessibility of technologies in the "grey zone" needs to be analysed for each country or a group of countries individually. This could be done through internationally developed decision trees or eligibility criteria (Schneider et al 2017). Through a national self-assessment, the decision tree or eligibility criteria could be applied to develop the national lists, which would then be internationally reviewed, e.g. through a peer review process (Warnecke et al. 2018).

As mentioned above, it is also in the host country's interest to identify the inaccessibility of technologies. However, the task of establishing national positive and negative lists is very challenging. In addition, national actors overseeing Article 6.4 participation in their countries need to be able to assess activities proposed by the private sector. Therefore, support for host country's readiness to participate in Article 6.4 mechanism should be available – either through international mechanisms or bilateral agreements for capacity building and financial support.

The positive and negative lists need to be regularly updated, ideally in alignment with the 5-year cycle of the NDCs. An update every five (or ten) years would allow to take into account new developments such as the diffusion and costs of technologies, changes to GDP or know how of a country.

4.3.4 Fostering the acquiring country to raise ambition through the Article 6.4 mechanism

The mitigation outcomes purchased by acquiring countries can be used by the acquiring countries to reach their NDC target. An acquiring country may, however, also decide to cancel (a part of) the mitigation outcomes it has acquired and thus increase its ambition. While such a voluntary cancellation implies units to be issued, the acquiring country may also implement a corresponding adjustment by unilaterally adjusting its NDC target or its emissions level according to the amount of mitigation outcomes acquired. In addition to this short-term ambition raising impact, countries could also use the purchase of Article 6.4 mitigation outcomes to increase its ambition level in the long run.

Four cases can be identified in which countries buy mitigation outcomes from abroad, leading to increased ambitions under certain conditions:

1. **Using lower compliance costs for ambition raising:** The country is lowering its cost of compliance with its NDC target if the implementation of policies that would be necessary to reach the NDC has higher marginal abatement costs than the purchase of the mitigation outcomes from the Article 6.4 mechanism. If the acquiring country invests the savings in domestic reductions or international climate finance, this can lead to increased ambition.
2. **Increasing ambition with long-term strategies:** Embedding purchase of mitigation outcomes in long-term strategies and clear communication of these strategies.
3. **Increasing ambition through risk reduction:** The country bears a risk of not being able to attain its NDC target due to financial or technical constraints. Mitigation outcomes are acquired to hedge the risk.
4. **"Insetting": Linking use of mitigation outcomes to domestic mitigation activities:** Countries wishing to use mitigation outcomes from abroad to achieve their NDC could voluntarily commit to carry out additional domestic reductions.

Using lower compliance costs for ambition raising

Countries with very high mitigation costs have incentives to buy mitigation outcomes up to the point where their own marginal abatement costs are equal to the price of mitigation outcomes from abroad. If this trade is conducted with environmental integrity and the mitigation outcomes are not discounted, the trade has no impact on global emissions. However, emissions are reduced by trading with mitigation outcomes exactly where this is financially most favourable. This not only benefits the acquiring country through lower costs, but also the host country through income from the sale of mitigation outcomes.

Spalding-Fecher et al. (2012) consider the EU ETS region as acquiring countries, they show that the savings in the second trading period of the EU ETS for private companies were estimated at least 2.3 billion dollars (rather higher, since the price decline of the EUA that was caused by the availability of CERs was not included in this calculation). Government savings over this period are estimated at around $1.3 billion.

The cost reduction achieved by trading mitigation outcomes can have two consequences. On the one hand, necessary investments in low carbon technologies in the acquiring country are not being made, which leads to higher emissions in the acquiring country than would be the case without trading of mitigation outcomes (CCAP 2017). This effect becomes apparent in the medium to long term when mitigation outcomes from abroad become scarcer. Meeting the NDC of the acquiring country becomes more expensive due to higher prices for mitigation outcomes and cannot be reached domestically due to a lack of necessary long-term investments in low carbon technologies.

On the other hand, the benefits achieved by trading with mitigation outcomes could encourage policymakers to raise ambitions. This can be achieved by three different options.

Fixed investment volume in low carbon technologies:

The benefits achieved could be invested in low carbon technologies at the national level. However, these investments alone are not enough to increase ambition, as they ultimately only lead to lower domestic abatement costs in reaching the NDC. But, the acquiring country could set itself a fixed investment volume that corresponds, for example, to the investment volume required to achieve the NDC without the possibility of acquiring mitigation outcomes. This case would lead to an increase in ambition, provided that the country invests the money into mitigation activities. However, this would not happen without incentives, as actors tend to take short-term secure profits rather than invest them in an uncertain future.

Strengthen targets:

Policy makers could be encouraged by the lower expected mitigation costs due to trading of mitigation outcomes to make more ambitious commitments than would be possible without trading. Spalding-Fecher et al. (2012) investigate whether the establishment of the CDM under the Kyoto Protocol has increased the ambition of Annex I countries. Interviews with negotiators from Annex I countries, carried out as part of the report's research, confirmed that the inclusion of the CDM in the Kyoto Protocol had no quantitative impact on the Annex I commitments. However, negotiations on the Kyoto Protocol took place more than 20 years ago and since then a lot has been learned about carbon pricing and emissions trading and climate change has also become more prominent in public opinion. These changing conditions may lead to negotiators today being more willing to pursue more ambitious NDCs due to the financial benefits of trading mitigation outcomes. However, it is not confirmed that acquiring countries actually set more ambitious targets because of the possibility to use international carbon markets.

Strengthen domestic instruments:

Howard (2018) describes another instrument that enables increased ambitions through lower compliance costs. According to Howard, an effective instrument is the strengthening of domestic compliance obligations for emitters under an ETS or CO_2 tax. These stronger obligations could be set for example, by lowering targets, tightening allocation rules, increasing coverage to include new emission sources or in the case of a tax by higher tax rates. The ability for emitters to use mitigation outcomes generated under Article 6.4 from international sources under their ETS or tax obligations can raise lower costs and support strong emission targets for emitters. According to Howard it would be important that the strengthened ETS or tax obligations are not offset by relaxing other contributions - either by relaxing other components of the country's NDC or by reselling acquired reductions to other countries as compensation for their NDCs. The impact of the increase in ambition would have to be safeguarded by reserving the increased mitigation efforts and reporting them to the UNFCCC as an achievement of an enhanced NDC or as an over-achievement of an NDC. In contrast to 2., where only the possibility of trading mitigation outcomes could strengthen the negotiated NDCs, in this case it becomes clear how the linking of national instruments such as an ETS or a CO_2 tax with mitigation outcomes can achieve increases in ambition.

Increasing ambition with long-term strategies

The CCAP report (2017) identifies long-term strategies as a suitable instrument not only to eliminate the above-mentioned perverse incentives, but also to achieve increases in ambition. Long-term strategies are used as a basis to demonstrate the complementarity between the acquisition of mitigation outcomes and domestic action. It should be clearly communicated which sectors have problems to achieve short-term reduction targets, what makes the acquisition of mitigation outcomes necessary and which measures the policy plans to support the transformation. A clear communication about the time period for the planned acquisition of mitigation outcomes and the volume is important. Furthermore emissions and compliance projections without the acquisition of mitigation outcomes and projected emissions/compliance with use of mitigation outcomes (CCAP 2017) should also be well communicated, which illustrates how trading mitigation outcomes can have a positive impact on the development of decarbonization. Such communicated long-term strategies clearly show which goals are to be pursued and when these must be met. In this way, they give the acting parties certainty with regard to the planning of necessary investments. Long-term strategies thus prevent the lack of necessary investments. The elimination of the perverse incentive by the long-term strategy leads to higher investments than without a long-term strategy and thus to increased ambition. Long-term strategies, which include, for example, the contribution of a country to the achievement of the 2°C target, sometimes represent a more ambitious plan than to pursue only a five-year NDC. An orientation towards such a long-term strategy would thus increase ambition in the present compared to the goal of NDC achievement. Under these circumstances, a long-term strategy contributes to increasing ambition not only by eliminating the perverse incentive, but also directly through higher long-term reduction targets.

Risk reduction

When countries set their NDCs based on available budgets and technologies, they have an incentive to design them in a way that they are likely to be met (Höhne et al. 2016). This applies to countries with limited political will to fight climate change but also to those that have made climate change mitigation a political priority. This leads to the NDC targets being weaker than they would be in an optimal case. An optimal NDC, in simplified terms, would have to be set to an average of all projections for a given budget and technology level. An optimal NDC would however, mean that the probability of reaching the NDC would not be well above 50%. In a world where there is no transfer of mitigation outcomes, such NDCs would not be adopted because the risk of not reaching them would be too high. In a world that allows the international exchange of mitigation outcomes, countries are able to set such NDCs without significant risk, as they can acquire mitigation outcomes if the NDC is not reached through domestic measures. Transferring mitigation outcomes can thus help countries to set their NDCs at an optimal and thus higher level than without trade.

It should be noted, however, that if decision-makers continue to set their NDC conservatively, there would be an oversupply of mitigation outcomes leading to globally lower investments into low carbon technologies than optimal. In order to counteract this effect, acquiring countries could be encouraged to buy-up and cancel mitigation outcomes in order to increase their ambition. According to Kreibich (2018), an efficient measure to prevent conservatively set NDC targets could be that countries that are willing to enter into cooperation under Article 6 are required by the UNFCCC to adopt a NDC with specific characteristics in order to prevent the generation of an oversupply of mitigation outcomes at its core.

"Insetting": Linking use of mitigation outcomes to domestic mitigation activities

Kreibich (2018) describes a fourth way of increasing the ambition of acquiring countries by using mitigation outcomes. In this case, countries wanting to import mitigation outcomes from abroad and use them for NDC attainment could decide to carry out additional domestic reductions that are linked to the mitigation outcomes acquired. The link could be via technology, incentive structure or the quantity of greenhouse gas reductions. If, for example, the mitigation outcomes imported and the domestic measures are linked via technology, the acquiring country could decide that with the purchase of mitigation outcomes from a certain project type, say solar PV, an additional investment will be made to foster solar PV domestically. The scale of the domestic investment could be equivalent to the amount spent for the mitigation outcomes imported.

In order to have a real ambition raising impact, the acquiring country would have to ensure that the domestic measures are additional and do not contribute to the achievement of the NDC. While this option seems to be fully compatible with well-known principles, such as supplementarity, it can be expected to be associated with significant challenges when being implemented. Linking the transfer of mitigation outcomes to the implementation of or support for a domestic policy could raise significant opposition, including from the transferring Party.

In summary, it can be said that all four possibilities described do not automatically lead to increased ambitions. Incentives and obligations are also necessary so that the use of mitigation outcomes leads to the desired increase in ambition. In all cases it also depends on how motivated political decision makers are in designing efficient mechanisms or to set ambitious climate protection targets, whether the trade of mitigation outcomes leads to increased ambition in the acquiring country.

4.4 Evaluation of options and recommendations

4.4.1 Overview and assessment of options

The following table summarizes the options presented in the previous chapter. It provides an overview of their impact on ambition raising as well as the possibilities for their implementation are presented. In addition, it provides an assessment of the different options' political feasibility.

Table 4: Assessment of the options

Option	Assessment		
	Impact on ambition raising	Practicability (institutional circumstances, data availability etc.)	Political feasibility
1) Strengthening reporting, transparency and comparability			
Upfront information	Indirect impact through transparency and comparability of ambition and intended Article 6.4 use.	General guidelines on clarity, transparency, and understanding of NDCs are included in the rulebook. More detailed guidelines could be added through guidelines by the 6.4 supervisory body or a "club". Some countries might need support to provide necessary data.	In the rulebook. Further requirements through the 6.4 supervisory body or a "club": politically feasible.
Transparency framework and review	Indirect impact through transparency and comparability of Article 6.4 use, achievement of NDC target and ambition.	General guidelines on reporting and modalities and procedures of the transparency framework are included in the rulebook. More detailed guidelines could be added through separate reporting requirements established by the 6.4 supervisory body or a "club". Some countries might need support to provide necessary data.	In the rulebook, but further guidance to be developed for Article 6 and these negotiations seem difficult. Other possibilities such as the 6.4 supervisory body or a "club": politically feasible.
Global Stocktake	Indirect impact through transparency on progress, including the effect of Article 6.4 use, and possibly through comparability of ambition with points of references.	The modalities for the global stocktake are included in the rulebook. Additionally or alternatively, "clubs" or stakeholders from civil society could make independent assessments.	Demonstrating the added value of Article 6.4 mechanism in the collective progress is not explicitly mentioned in the rulebook but seems feasible. Points of references for ambition are not men-

Option	Assessment		
	Impact on ambition raising	Practicability (institutional circumstances, data availability etc.)	Political feasibility
			tioned in the rulebook and seem difficult, because it could be perceived as a tool for ex-ante assessments. Other possibilities such as "clubs" or stakeholders seems possible.
Compliance Mechanism	Indirect impact by addressing challenges of individual Parties in implementing their NDCs and increasing ambition.	The modalities and procedures are included in the rulebook.	In the rulebook, but impact depends also on operationalisation through the Committee.
2) Reconciling the design of the Art. 6.4 mechanism with ambition raising of host countries			
Requiring host countries to also account for exported mitigation outcomes that were generated outside the scope of their NDC	Addresses the perverse incentive to maintain the scope of the NDC narrow.	Integrate in the rules, modalities and procedures for Article 6.4 mechanism. Other possibilities would be decisions by the supervisory body or "club".	Part of Article 6.4 negotiations. Possible
Restricting crediting periods and adjusting baselines in alignment with the 5-year NDC cycle	Mitigates the risk to lock-in mitigation potential over long crediting periods	Integrate in the rules, modalities and procedures for Article 6.4 mechanism. Other possibilities would be decisions by the supervisory body or "club".	Part of Article 6.4 negotiations. Possible. Similar rule exists under CDM.
Requiring conservative baselines	Addresses the incentive to adopt unambitious NDC targets.	Integrate in the rules, modalities and procedures for Article 6.4 mechanism. Other possibilities would be decisions by the supervisory body or "club".	Part of Article 6.4 negotiations. Discussed controversially.
Defining eligibility criteria for the Article 6.4 mechanism (relating to NDC targets)	The different criteria address perverse incentives and/or contribute to ambition raising.	Integrate in the rules, modalities and procedures for Article 6.4 mechanism. Other possibilities would be decisions by the supervisory	Part of Article 6.4 negotiations. Possible if "soft". Similar rule exists under CDM.

Option	Assessment		
	Impact on ambition raising	Practicability (institutional circumstances, data availability etc.)	Political feasibility
		body or "club".	
Requiring inclusion of emissions targeted by Article 6.4 activity into future NDC	Addresses the incentive to maintain a narrow scope in a NDC. Contributes to ambition raising.	Integrate in the rules, modalities and procedures for Article 6.4 mechanism. Other possibilities would be decisions by the supervisory body or "club".	Part of Article 6.4 negotiations, but rather unlikely
Quality of the mitigation outcomes (additionality, no overestimation, permanence, robust accounting)	Addresses the quality of mitigation outcomes as necessary pre-requisite for ambition raising.	Integrate in the modalities, procedures, and guidelines for the transparency framework for action and support in the context of the accounting rules. Integrate in the rules, modalities and procedures for Article 6.4 mechanism.	Part of Article 6.4 negotiations, but rather unlikely
3) Supporting the host country to raise ambition through the Article 6.4 mechanism			
Support ambitious target-setting and long-term planning activities	Indirect impact through support for good planning processes in host countries	Integrate suggestions for long-term low greenhouse gas emission development strategies and other planning activities. Support for some host countries that need it.	Yes, requires international (acquiring country) resources
Facilitate investments in new low-carbon technologies	Indirect impact through investments in low-carbon technologies	Support for some host countries that need it.	Yes, requires international (acquiring country) resources
4) Fostering the acquiring country to raise ambition through the Article 6.4 mechanism			
Using lower compliance costs of Article 6.4 for ambition raising	Limited; Historically, experience was mixed.	Acquiring country's own decision.	Possible
Increasing ambition with long-term strategies	Limited; Strategy needs to demonstrate complementarity of transfer of mitigation outcomes and domestic action.	Integrate in the suggestions for the long-term low greenhouse gas emission development strategies Other possibilities would be decisions by the supervisory body or "club".	Possible

Option	Assessment		
	Impact on ambition raising	Practicability (institutional circumstances, data availability etc.)	Political feasibility
Risk reduction	Relevant	Acquiring country's own decision.	Possible
"Insetting": Combining use of international mitigation outcomes to domestic mitigation activities	Relevant	Countries wanting to import mitigation outcomes from abroad and use them for NDC attainment could decide to carry out additional domestic reductions that are linked to the mitigation outcomes acquired.	First option unlikely, but "club" option seems possible

4.4.2 Recommendations

Without adequate incentives, rules and procedures, the Article 6.4 mechanism may fail to achieve its goal of contributing to ambition raising and, on the contrary, may provide numerous perverse incentives for host countries not to increase their ambition levels, possibly leading to a race to the bottom.

In the current negotiations, a key issue of concern is that a host country engaging in Article 6 has no incentive to set ambitious targets, because this may directly reduce the amount of mitigation outcomes that go beyond the NDC target and that can be transferred internationally. Another key issue is that if the mechanism allows crediting of activities that are beyond the scope of the NDC without requiring the host country to account for exported mitigation outcomes from such activities, there is no incentive for the host country to expand the scope of the NDC, because it would reduce the potential to obtain external funding.

Based on earlier work (Schneider et al. 2017, Warneke et al. 2018, Howard 2018, Kreibich 2018) four lines of action are identified to mitigate perverse incentives and foster NDC target ambition raising in host and acquiring countries in the context of article 6.4:

a) Strengthening reporting, transparency and comparability
b) Reconciling the design of the Art. 6.4 mechanism with ambition raising of host countriesSupporting the host country to raise ambition through the Article 6.4 mechanism
c) Fostering the acquiring country to raise ambition through the Article 6.4 mechanism

The first two lines of action may be implemented on different levels, depending on the level of international agreement with regard to the need to prevent perverse incentives from the use of the Article 6.4 mechanism. The following cascade may be considered:

- CMA/ rulebook level (international governance setting required)
- Supervisory Body for Article 6.4
- «Club» of likeminded parties
- Individual acquiring countries defining criteria for mitigation outcomes purchase

In order for the Article 6.4 mechanism to actually contribute to ambition raising, it would be important to have clear rules on the rulebook level or on the level of the supervisory body. Ideally, Article 6.4 could only be used by countries that have ambitious NDCs and that cannot only demonstrate this ambition but also report transparently about progress.

In December 2018 in Katowice, the rulebook has been adopted. However, Parties could not find an agreement on Article 6 and neither could they one year later at the COP in Madrid. This means that

many issues on the first line of action (a) have been clarified. Nevertheless, the outcome needs further analysis and some issues remain unclear, including issues on e.g. reporting related to Article 6. The second line of action (b) will be further negotiated on the CMA level, but these negotiations may turn out to be challenging. The task of reconciling the use of Article 6.4 with the need for progress in NDC target levels and scope may be handed down to the Article 6.4 supervisory body who may put in place rules under Article 6 such as the limitation of crediting periods as well as the definition of criteria for the participation of host countries in Article 6.4 activities (b).

In absence of the CMA or the Article 6.4 supervisory body providing rules to prevent the perverse incentives, "clubs" of like-minded (host and acquiring) countries can agree among themselves on additional rules regarding information (a) and Article 6.4 (b) that govern all transactions between the countries (i.e. the acquiring country would only allow mitigation outcomes for compliance with their NDC target that fulfil additional criteria regarding (a) and (b)).

Initially, individual acquiring countries may decide to define criteria for purchasing mitigation outcomes that follow the approaches listed in lines of action (a) and (b) and implement them together with interested host countries.

The support of host countries to raise ambition (c) is a role that many (potential) acquiring countries and multilateral institutions have historically carried out already in the Kyoto periods and will probably continue to do so under the Paris Agreement. The need for support is strengthened by the additional requirements for host countries in terms of planning their mitigation actions on a national level and demonstrate how to reconcile ambition raising in NDC target with the use of Article 6.4 over time.

Finally, fostering action to raise ambition on the side of the acquiring country (d) is key to achieve the targets of the Paris Agreement and will mainly be achieved by acquiring countries implementing it individually or as part of a "club".

5 The Voluntary Carbon Market: What May Be Its Future Role and Potential Contributions to Ambition Raising?

5.1 Background

Voluntary carbon markets have in the past often played a role in complementing mandatory regulation of GHG emissions. They have allowed companies and individuals to reduce their carbon footprint by offsetting a part of their emissions that were not subject to carbon regulation. The rising demand from voluntary buyers has led to a proliferation of privately governed certification standards, which in turn served as a testing ground for the development of innovative approaches, some of which were adopted by the compliance market later on.

With the Paris Agreement, the role of the voluntary carbon market and its relation with mandatory carbon regulation schemes is set to change fundamentally. This is due to two major paradigm shifts: First, by requiring all Parties to adopt nationally determined contributions (NDCs), the Paris Agreement will significantly reduce the so called 'uncapped environment', i.e. the emissions not covered by carbon regulation, which have so far been the main source of supply for voluntary carbon market activities. Second, the new agreement requires all Parties to raise their ambition when engaging in cooperation under Article 6, thereby terminating the era of 'pure offsetting'.

Against the backdrop of these major changes in global climate governance and in light of the urgent need to raise the global mitigation ambition, this chapter explores the potential for the voluntary carbon market to contribute to ambition raising. For this purpose, desk research was complemented by interviews with voluntary carbon market representatives. The ideas and concepts on the future of the voluntary market and its potential role in ambition raising were discussed with interviewees. The interviews allowed to further elaborate the initial ideas and concepts as well as to gather views from the

voluntary market representatives on some of the key issues identified. This chapter compiles these findings, presenting different concepts and ideas that are to inform the debate about the future of the voluntary carbon market and its contribution to ambition raising.

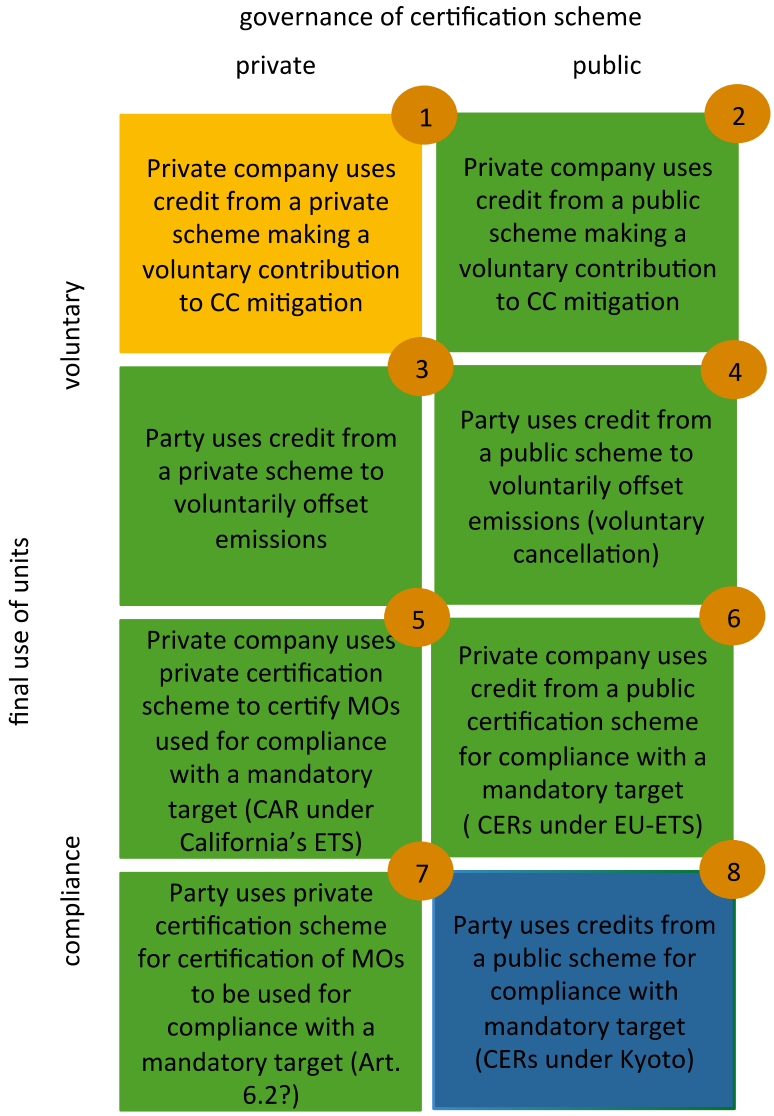
For this purpose, the different segments of the voluntary carbon market will first be identified and delimited from compliance market activities (section 5.2). In a second step, the two paradigm shifts introduced with the Paris Agreement and their potential implications for carbon market activities will be discussed in greater detail (section 5.3). Building on these observations, section 5.4 explores how the future of the voluntary carbon markets could look like post-2020 and how different elements of this market may contribute to ambition raising. The paper looks at the voluntary market as an investor and as a certifier of ambition raising activities and identifies different roles it could play in the future. The roles are explored by taking into account the modified circumstances introduced with the Paris Agreement and their potential to contribute to ambition raising.

5.2 Segments of the voluntary market

In principle, the global carbon market can be divided into two segments: On the one hand, there is the compliance market, the market whose demand is fed by the binding emission reduction targets of countries. At the moment, demand comes primarily from industrialised Parties that have adopted binding mitigation targets under the Kyoto Protocol. On the other hand, there is the voluntary market, which has evolved dynamically over the recent years. This newer market enables private organisations such as businesses, non-governmental organisations or churches as well as public organisations and individuals to reduce their carbon footprint voluntarily. Firms inter alia use this market to claim "carbon neutrality" by buying and cancelling carbon credits to "neutralise" the emissions from their products and services.

However, the lines between the compliance market and the voluntary carbon market become increasingly blurred, an observation also made by one of the interviewees (Interview 5). The current efforts of private certification standards towards being recognized under future compliance schemes, such as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), are also a manifestation of this development. The term "voluntary market" is not clear cut and can relate to activities with different characteristics. In its most common usage it refers to the situation described above, in which individuals or organisations buy carbon credits issued by private sector certification schemes to voluntarily reduce their carbon footprint. A clear delimitation of such activities and compliance market activities is, however, increasingly difficult, as private certification standards are also being used in compliance markets and voluntary buyers do also use internationally governed market standards for voluntary offsetting.

Figure 4: Segments of the global carbon market



Source: Own illustration, Wuppertal Institute

Figure 4 shows different types of transfers taking place on the global carbon market. The prototype voluntary carbon market activity described in the preceding paragraph is case 1 (yellow). Case 8 (blue) is exactly opposite to this case and describes the compliance market transfer known from the Kyoto Protocol, where a national government uses credits from a public certification scheme (e.g. the Clean Development Mechanism (CDM)) to comply with a mandatory mitigation target. In between these two prototypes there are different subtypes which involve different degrees of private and public participation and different usages of the mitigation outcome (green). provides an overview of the key characteristics of these different cases.

Table 5: Key characteristics of different cases of carbon market activities

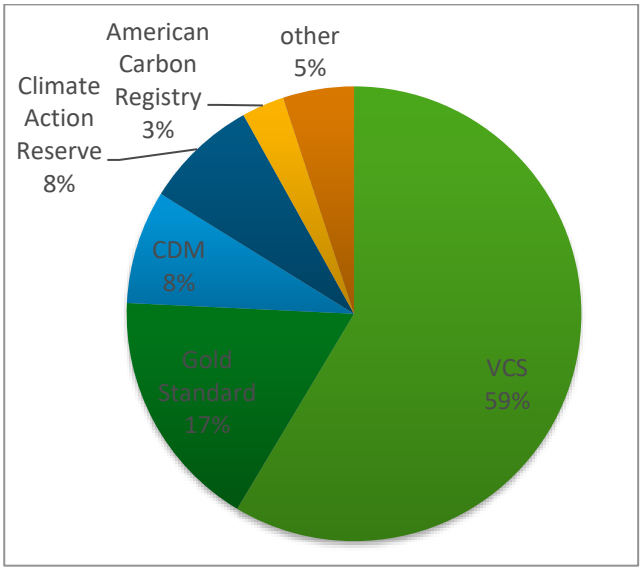
	Is the user of the mitigation out-come private or	Is the governance of the certification scheme private or	Will the unit be used for compli-ance or on a vol-

	public?	public?	untary basis?
Case 1	Private	Private	Voluntary
Case 2	Private	Public	Voluntary
Case 3	Public	Private	Voluntary
Case 4	Public	Public	Voluntary
Case 5	Private	Private	Mandatory
Case 6	Private	Public	Mandatory
Case 7	Public	Private	Mandatory
Case 8	Public	Public	Mandatory

Source: Own compilation, Wuppertal Institute

UN-governed instruments, such as the CDM, have in the past only had limited relevance on the voluntary market. Voluntary credit buyers have until now largely relied on the growing number of certification mechanisms developed from private initiatives, such as the Verified Carbon Standard (VCS) and the Gold Standard. These standards each have their own requirements regarding the design and implementation of emission reduction activities. Some focus purely on the climate impact of the certified projects, while others take a broader approach which includes their social and environmental impacts. Combinations of different standards are also possible and are frequently used. Certificates generated by projects with high social and environmental additionality are particularly attractive to voluntary market buyers. Figure 5 below illustrates the share of the different certification standards used in the voluntary transactions that took place in 2016. The most common standard used is VERRA's Verified Carbon Standard, accounting for almost 60% of all transactions.[29] Other common standards are the Gold Standard (17%), the CDM (8%), Climate Action Reserve (8%) and the American Carbon Registry (3%). The role of public standards is rather limited, as the small share of the use of the CDM indicates.

Figure 5: Market share of certification standards in the voluntary carbon market in 2016



Source: Own illustration based on Hamrick / Gallant (2017), Wuppertal Institute

[29] A significant share of these emission reductions (around 23%) where also certified by the Climate, Community and Biodiversity (CCB) Standards. The CCB Standards focus on social and environmental benefits of land-based project, but do not issue emission reduction credits.

5.3 New challenges for carbon market activities under the Paris regime

All the segments of the global carbon market identified above are directly or indirectly affected by the paradigm shifts of global climate governance introduced with the Paris Agreement. We will in the following outline two of these major changes to then describe how these can be expected to impact carbon market activities under the Paris Agreement.

5.3.1 Paris' first paradigm shift: from partial to global participation

5.3.1.1 Overview

Under the Paris Agreement, *all* Parties have to adopt Nationally Determined Contributions (NDCs). Hence, Parties will put some sort of (absolute, dynamic or relative) cap on the emissions of their economy or at least on some sectors thereof. This situation is very different from the Kyoto Protocol, where only Parties listed in Annex B of the protocol – mainly industrialised countries – have adopted mitigation targets, leaving a large part of the world unregulated, the so called 'uncapped environment'. Mitigation activities implemented in this uncapped environment could be used for (voluntary as well as mandatory) offsetting emissions anywhere else without host countries having to account for these exported mitigation outcomes.

With the Paris Agreement requiring all Parties to adopt NDCs, the uncapped environment will be much smaller in size, and is set to become even smaller in the future as all Parties are supposed to move towards economy-wide NDCs, as envisaged by Art. 4.4 of the PA. Consequently, the majority of mitigation outcomes (MOs) will be generated by activities implemented within the scope of an NDC.

5.3.1.2 Increased risk of double claiming

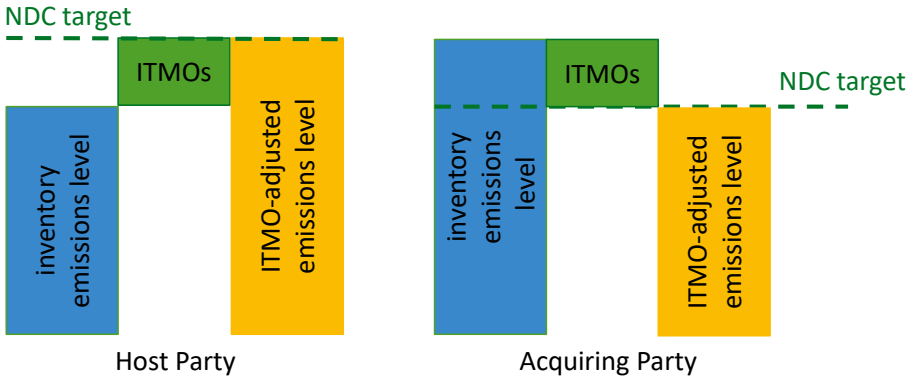
Without further action, these mitigation activities would contribute towards the achievement of the NDC of the host country. If the acquiring Party uses these MOs for NDC attainment, emission reductions would be counted twice (on double counting see inter alia: Schneider et al. 2014; Hood et al. 2014; Kreibich / Obergassel 2016). This situation is commonly referred to as double claiming as both Parties claim one mitigation outcome for achieving their individual climate change mitigation targets. As the Paris Agreement has a global reach and the coverage of NDCs will presumably increase, the risk of double claiming is also set to rise.

5.3.1.3 Corresponding adjustments as a means to address double claiming

To address the risk of double claiming, Article 6.2 of the agreement requires Parties to avoid double counting of emission reductions through robust accounting. Decision 1/CP.21 envisages that transfers of mitigation outcomes under the Paris Agreement's Article 6.2 are to entail a 'corresponding adjustment' by Parties for both anthropogenic emissions by sources and removals by sinks covered by their NDCs under the Agreement. The details of how to implement these adjustments still have to be agreed and must be translated into concrete provisions that will form part of the Paris rule book. In principle, however, two mathematically equivalent approaches can be distinguished: Adjustments of emissions levels (emissions-based accounting) and adjustment of target levels (target-based accounting) (OECD / IEA 2017).

Emissions-based accounting (Figure 6) starts from the Party's inventory emissions (blue) which are then adjusted by adding or subtracting Internationally Transferred Mitigation Outcomes (ITMOs) (green) to reach an ITMO-adjusted emissions level (yellow). This ITMO-adjusted emissions level can then be compared to the NDC target level in order to account for the Party's progress in achieving its NDC.

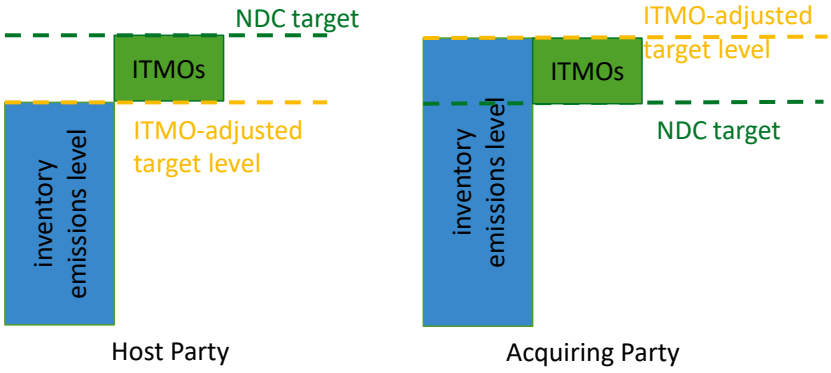
Figure 6: Emissions-based accounting



Source: Own illustration based on OECD / IEA (2017), Wuppertal Institute

Target-based accounting (Figure 7) starts from the NDC target level and adjusts it according to the ITMOs transferred. The adjusted target-level can then be compared to the actual inventory emissions to account for the progress of the Party. This approach is applied under the Kyoto Protocol using emission budgets. Countries' individual targets are translated into assigned amounts which can then be modified by adding acquisitions made and subtracting units transferred. Compliance with the targets is then assessed by comparing the budgets with the countries' inventories (see: Kreibich & Obergassel 2016).

Figure 7: Target-based accounting



Source: Own illustration based on OECD / IEA (2017), Wuppertal Institute

It must be noted that it is still unclear whether accounting for transfers will be required and even be possible if ITMOs are generated outside the scope of an NDC. The concept of corresponding adjustments is commonly understood to apply to transferred mitigation outcomes that were generated in sectors covered by the NDC. However, in a submission to the UNFCCC, Japan suggests that the concept should also be applied to MOs generated outside the scope of an NDC by adding "the amount of credits/units transferred to its own emissions or deduct it from its own removals" (Japan 2017). This approach is also included in the last draft text from the Madrid negotiations, which envisages corresponding adjustments to be applied also if ITMOs are generated from sectors and GHGs that are not covered by an NDC (UNFCCC 2019e, Annex, para 15). It remains to be seen whether this approach would also be applied under the Article 6.4 mechanism and how it could work in practice. In principle, the amount of ITMOs generated outside of the NDC could be added or subtracted to the exporting country's target level or emissions level. Applying these deductions or additions to the inventory of

Parties, in contrast, can be associated to additional challenges, as the granularity of inventories will in most cases not be sufficiently high to reflect impacts of individual mitigation outcome. Prag et al. (2013) describe this phenomenon as "partial lack of visibility of reductions in emissions inventories" and underscore that reporting of unit transfers should be kept separate from inventory reporting.

There will also be cases in which corresponding adjustments will not be required, for instance if the acquiring country uses Article 6 in the context of (results-based) climate finance in order to assist NDC implementation. These transfers should, however, be subject to reporting for the sake of transparency.

It is still unclear how corresponding adjustments will be embedded in the overall structure of the Paris Agreement and the different approaches it offers to Parties for cooperation. With the adoption of the modalities, procedures and guidelines for the transparency framework at COP 24 Katowice, an accounting approach was introduced which requires countries to adjust their emissions balance (emissions-based accounting) (UNFCCC 2018c, para 77d). It remains to be seen how this approach will be operationalized once Parties agree on a guidance for Article 6.2.

5.3.2 Paris' second paradigm shift: making ambition raising a key component of market-based cooperation

A second paradigm shift relates to the role of carbon markets as a means to achieve national mitigation targets. While offsetting of emissions will still be possible in the future as Article 6 of the Paris Agreement explicitly allows Parties to cooperate in implementing their NDCs, such a cooperation is "to allow for higher ambition of their mitigation and adaptation actions" (Art. 6.1). Hence, 'pure offsetting' with no net impact on the global environment (zero-sum game) will no longer be possible under the Paris Agreement. Building on a conceptual foundation developed in chapter 2.3, ambition raising will in the following be understood as being related to Parties targets and actions.

With this conceptual foundation, ambition raising can be discerned from the concept of overall mitigation: Despite both concepts being associated with a positive contribution to the global climate, they must be kept separate. In the context of cooperative approaches, ambition raising is a requirement for all *Parties using Art. 6*, while overall mitigation is exclusively devoted to *activities implemented under the Article 6.4. mechanism*: Article 6.4 lists four objectives the new mechanism "shall aim" at. "To deliver an overall mitigation in global emissions" (Art 6.4 (d)) is one of them. Following this distinction, ambition raising of Parties cannot at the same time contribute to overall mitigation, as otherwise establishing this additional objective for the Article 6.4 mechanism would be pointless.

Following this reading of the Paris Agreement, the concept of ambition raising encompasses both, strengthening of Parties' **mitigation targets** and an increase of their **mitigation actions.** In principle, a cooperation under Article 6 can contribute to both, as will be shown in the following.

5.3.3 Impacts of the paradigm shifts on carbon market activities

We will in the following explore how these two paradigm shifts impact carbon market activities by focusing on the potential contribution of Article 6 activities to ambition raising. For this purpose we will start from the assumption that the Article 6 cooperation is undertaken with the sole purpose of contributing to ambition raising, while other objectives will only be taken into account at a later stage. For the sake of simplicity we will further assume that the cooperation activity will only generate one single mitigation outcome that is indivisible.

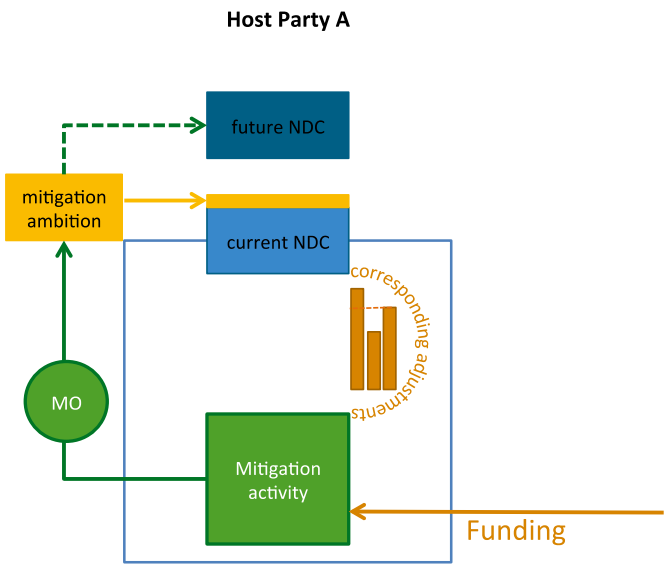
From a **static perspective**, the participation in an Article 6 cooperation may allow the host Party to target emissions that could not be tapped unilaterally. Provided that the mitigation outcome is not transferred and used by the acquiring Party but cancelled, it could be considered a contribution to ambition raising of the host Party. It should further be noted that the host Party would have to implement an adjustment if this MO is generated within the scope of its NDC, as it would otherwise automatically contribute to the achievement of its NDC. This adjustment would be "unilateral", as there is no

use of ITMOs by an acquiring Party to which the adjustment could correspond. If not used by the host Party, the cooperation could also be used to raise the ambition of the acquiring Party. The acquiring Party could raise its ambition by voluntarily cancelling the mitigation outcome acquired, instead of counting it against its NDC. With this measure, the acquiring Party could overachieve its NDC, which is then achieved by other means (domestic measures and/or use of other ITMOs).

From a **dynamic perspective**, the Article 6 cooperation may further put the host Party in a better position to strengthen its mitigation targets in the future. Once the crediting period of the mitigation activity is terminated, the host Party could decide to unilaterally target the emissions that were previously addressed by the Article 6 cooperation and integrate these into its NDC. Article 6 host Parties may therefore be able to adopt a stronger future NDC. Article 6 may also allow the acquiring Party to dynamically enhance its mitigation ambition: An Article 6 cooperation will usually take place because emissions can be reduced at lower cost in the host Party than in the acquiring Party. These cost savings could in principle facilitate the adoption of more ambitious mitigation targets by the acquiring Party in the future, by lowering political resistance and unlocking additional resources that can be devoted to climate action. It should be noted, however, that lower costs do not automatically translate into an increase of mitigation ambition.

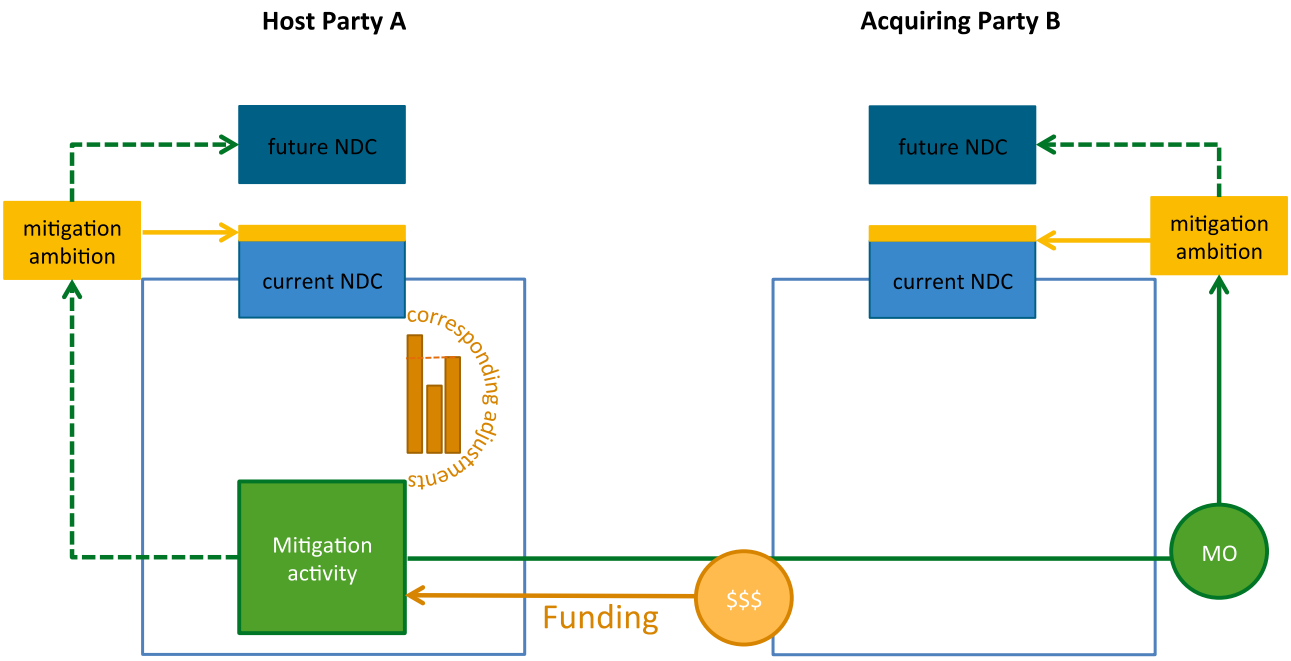
Ideally, a market-based cooperation under Article 6 will lead to an immediate climate mitigation impact as well as strengthened mid- or long-term mitigation targets. Figure 8 and Figure 9 illustrate two such pure cases that are exclusively aimed at raising the mitigation ambition. Figure 8 shows how an immediate as well as a long-term ambition raising impact could be achieved in the host Party participating in an Article 6 cooperation. The illustration focuses on the host Party since there is no transfer of ITMOs and the investor will not receive anything in return for its investment. This clearly makes this form of cooperation a rather theoretical example. Figure 9, in contrast, shows a cooperation in which the mitigation outcome generated is transferred to the acquiring Party, who uses this MO to raise its ambition, while the host country raises its ambition by increasing its future NDC. The cost savings associated to the import of the MOs could allow the acquiring Party to dynamically increase its ambition.

Figure 8: Raising mitigation ambition of the host Party



Source: Own illustration, Wuppertal Institute. Explanation: Host Party A implements a mitigation activity (green box) and uses the mitigation outcome (green circle) for ambition raising by overachieving its current NDC (blue box). Since the mitigation activity is within the scope of the NDC, the host Party must implement a unilateral adjustments and cancel the MO to avoid that the mitigation outcome contributes to NDC attainment. Funding is provided from outside, however, the mitigation outcome remains within the host Party. The mitigation activity further contributes to the strengthening of the future NDC (dark blue box).

Figure 9: Achieving an immediate ambition raising impact in the acquiring Party and a long-term impact in both Parties



Source: Own illustration, Wuppertal Institute. Explanation: Host Party A implements a mitigation activity (green box) and exports the mitigation outcome (green circle) generated in exchange of funding to the acquiring Party B, who uses this MO to overachieve its current NDC by voluntarily cancelling the MO acquired, instead of counting it against its NDC. Hence, no corresponding adjustment will be implemented by the acquiring Party but the MO will be cancelled. Since the mitigation activity is within the scope of the host Party's NDC, this Party must implement corresponding adjustments to avoid that the mitigation outcomes contribute to NDC attainment. The mitigation activity could assist both Parties to raise their future ambition.

Building on these two "pure cases", in which ambition raising is the sole purpose of the cooperation, we will now look at "mixed cases", taking account of the fact that a contribution to ambition raising may not be the only objective of a market-based cooperation. In most cases, the cooperation may also involve a (limited) offsetting element or a climate finance component. A single cooperation activity may therefore contribute to up to three different climate change related objectives[30]:

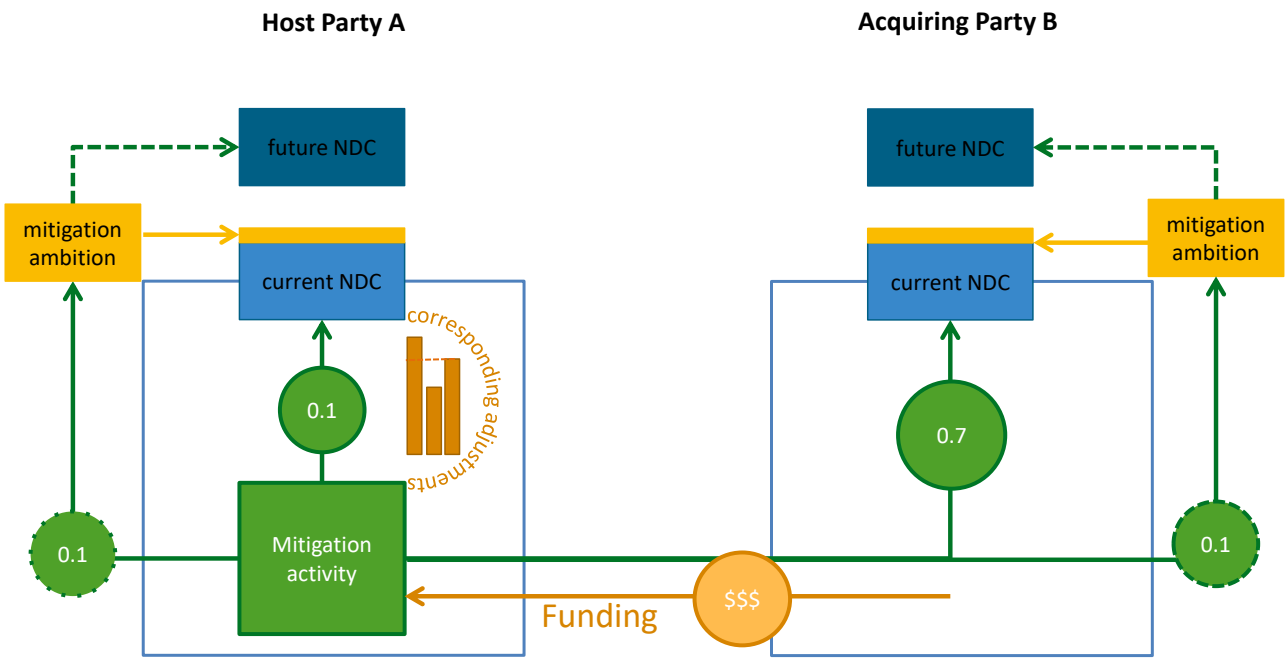
- Contribution to climate change mitigation ambition by strengthening targets and actions;
- Contribution to achievement of Parties' NDCs;
- Contribution to climate finance.

In order to illustrate how a single cooperation could serve the three objectives, we will in the following explore cases in which the mitigation activity generates a mitigation outcome that is divisible and could be shared among the different participants according to their individual objectives and priorities. Figure 10 below illustrates how such a cooperation could work in principle. As can be seen, the mitigation outcome is divided into four parts (green circles). Table 6 outlines how the mitigation outcomes are used and shared among the participants. It further indicates what consequences this use

[30] Please note that cooperation under Article 6 may further contribute to other sustainable development goals, by fostering biodiversity conservation or improving access to renewable energy. These contributions, however, will not be looked at in more detail.

has in terms of the corresponding adjustments to be implemented and whether accounting for climate finance is possible.

Figure 10: Example of an ambition raising cooperation with mitigation outcomes generated within an NDC



Source: Own illustration, Wuppertal Institute.

Table 6: Sharing of mitigation outcomes in a cooperation scenario with multiple objectives

	Use	Amount of MOs transferred	Corresponding adjustments by host Party required?	Climate finance accounting possible?
Mitigation activity	The mitigation activity generates mitigation outcomes of 1 $MtCO_2e$.		-	-
0.7	**NDC attainment:** The acquiring Party uses the largest share of mitigation outcomes (0.7 $MtCO_2e$) for the achievement of its NDC. The acquiring Party has provided funding for these MOs.	0.7 $MtCO_2e$	Yes	No

	**NDC attainment:** The host Party uses a small part of the MOs (0.1 $MtCO_2e$) for the achievement of its NDC. The acquiring Party has provided funding for these MOs.	-	No	Yes
	**Ambition raising**: The acquiring Party uses a small part of the MOs (0.1 $MtCO_2e$) for overachieving its current NDC. The acquiring Party has provided funding for these MOs.	0.1 $MtCO_2e$	Yes	No
	**Ambition raising**: The host Party uses a small part of the MOs (0.1 $MtCO_2e$) for overachieving its current NDC. The acquiring Party has not provided funding for these MOs.	-	Yes	In the authors' view, the acquiring Party cannot claim to have financed these MOs as they were achieved by the host Party and are accounted for through adjustments and cancellation.
Total		The total amount of MOs transferred is 0.8 $MtCO_2e$	The host Party would have to implement adjustments corresponding to 0.9 $MtCO_2e$: 0.8 to account for the MOs transferred plus 0.1 $MtCO_2e$ to overachieve its current target.	The acquiring Party could claim to have provided climate finance corresponding to 0.1 $MtCO_2e$, the MOs used for attainment of the host Party's NDC.

As the mitigation activity is implemented within the scope of the NDC, the host Party will have to implement corresponding adjustments for all mitigation outcomes that will not be used for NDC attainment, this relates to mitigation outcomes exported and those used for ambition raising. In our example, the host Party A will have to make corresponding adjustments in the amount of 0.9 $MtCO_2e$. An adjustment of 0.8 $MtCO_2e$ is needed to account for the ITMOs exported to Party B. An additional adjustment of 0.1 $MtCO_2e$ would have to be made by the host Party to show that its participation in the Article 6 cooperation has contributed to ambition raising.

Ambition raising could also be possible if the **mitigation activity is located outside the scope of the host Party's NDC.** The activity will by design not contribute to NDC attainment. It remains to be seen whether Parties will adopt an accounting approach that also requires corresponding adjustments to be

made for mitigation outcomes generated outside of the scope of an NDC, as envisaged in Japan's submission to the UNFCCC (Japan 2017). If, in contrast, these MOs can be used without requiring corresponding adjustments to be made, the host country can directly use them for ambition raising. The host country would, however, have to report on these transfers to the UNFCCC when describing how the increase of ambition was achieved.

The mitigation activity would have an **immediate ambition raising impact**, as the mitigation activity would lead to a reduction of emissions in a sector not covered by the NDC and potentially not yet targeted by a policy. In order to achieve this impact, the project would have to be truly additional and the mitigation outcomes would have to be robustly calculated using an ambitious baseline.

A **long-term mitigation impact** will be achieved if the host Party commits to include the targeted emissions in its NDC after the end of the mitigation activity's crediting period. When including the sector into the future NDC, the mitigation impact of the activity should be taken into consideration when establishing the baseline. This would avoid double counting of ambition raising efforts.

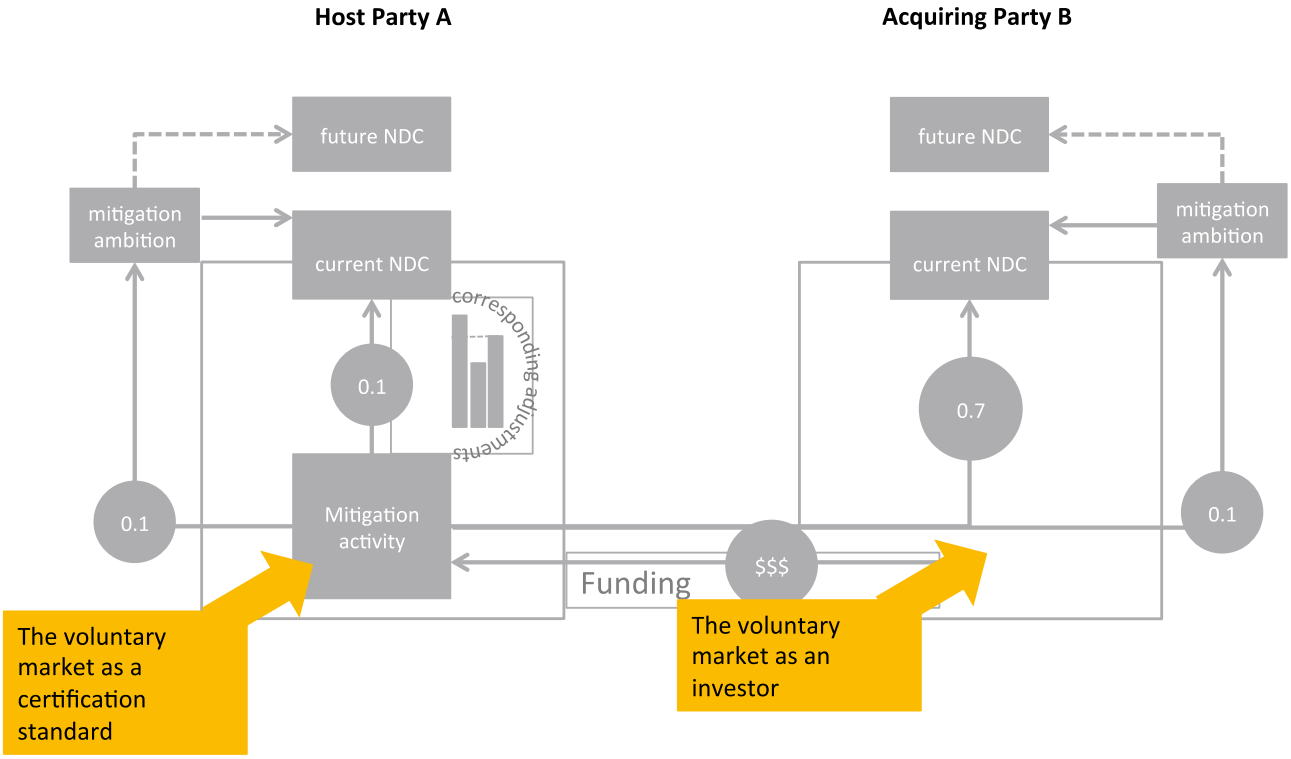
There are some risks associated to this model deriving from the fact that the mitigation activity is not covered by an NDC. First, it is still unclear whether mitigation outcomes generated outside the scope of an NDC could be used for NDC attainment by the acquiring Party. Closely associated to this is the still unanswered question of whether these emissions will be included in the accounting framework of Article 6.2. If Parties decide not to include these MOs in the accounting framework, there will be no requirement to make corresponding adjustments. This could incentivize the host Party to use inflated baselines, to overestimate the mitigation outcomes of the activity and to allow non-additional projects to be credited. In addition, crediting activities implemented outside the scope of the NDC may reduce the incentive to expand the scope of the NDC and therefore conflict with the requirement of Article 4.4 to move towards economy-wide NDCs.

5.4 The future of the voluntary carbon market and entry points for contributing to ambition raising

The preceding chapter has outlined the fundamental changes introduced with the Paris Agreement and discussed how these could impact carbon market activities in generic terms. This section focuses on what these changes could mean for the voluntary carbon market.

The examples above illustrate how ambition raising could be achieved in the context of bilateral cooperation without specifying potential private sector involvement. The private sector, however, can be expected to play a crucial role in such a cooperation. From the perspective of the host Party, the private sector could be involved in the implementation of the mitigation activity, its certification or verification. From the acquiring Party's perspective, the private sector could engage as a buyer or financier of the mitigation activity. There might therefore be significant room for the voluntary carbon market to contribute to this process. Figure 11 below illustrates the entry points for the voluntary carbon market on which we will focus in the following: the private sector acting as a buyer or investor of mitigation activities and the use of private certification standards. The involvement of the voluntary market actors as project proponent, in contrast, will not be analysed in greater detail, as this function will presumably be similar to that of compliance market actors.

Figure 11: Entry points of the voluntary market in the context of ambition raising



Source: Own illustration, Wuppertal Institute

5.4.1 The future of the voluntary market as an investor

For the voluntary market as an investor, we have identified three roles it could play in the future: The market may maintain its current role of buyer of carbon neutrality credits, it may become a supporter of NDC implementation, or it may become a driver of ambition. The following section discusses these future roles in the context of the new framework conditions established by the Paris Agreement.

5.4.1.1 The voluntary investor as a buyer of carbon neutrality credits

The changes introduced with the Paris Agreement can be expected to significantly impact the role of the voluntary market as a buyer of carbon neutrality credits. This role is the continuation of the current mode, where mitigation outcomes are used by investors to offset their emissions. The investor can use these MOs to reduce its carbon footprint and claim carbon neutrality. With the Paris Agreement, this role is at risk: As outlined above, the new climate regime will significantly reduce the "uncapped environment" and host Parties will presumably be required to account for emission reductions transferred to the voluntary market.

The potential of the voluntary market to continue performing this role in the future will depend on the requirements for host Parties to account for MOs exported by implementing corresponding adjustments. Looking at the Paris Agreement, one could assume that Parties will be required to account for all MOs exported. For a long time, there was no indication whether accounting will be required if MOs are not used for NDC attainment. However, Parties in Katowice agreed that "use of mitigation outcomes for international mitigation purposes" (UNFCCC 2018c, para 77 d)) will have to adhere to the same rules as the use of MOs against NDC attainment. While this is primarily understood as referring to the use of mitigation outcomes under CORSIA and other future mandatory mitigation schemes, it could also be seen as an indication that adjustments can be made for carbon neutrality or for other purposes. However, there is no certainty regarding accounting for the use of mitigation outcomes for such purposes. Private certification standards, which are currently dominating the voluntary market,

have in the past partially addressed similar governance gaps by developing their own accounting provisions. They required host Parties to account for offsetting credits if the host countries had adopted a commitment under the Kyoto Protocol (see for instance VCS 2012), while there was no accounting against pledges adopted by Parties under the Cancún Agreements.

According to one interviewee, the future under the Paris Agreement will not differ significantly from the current situation under the Cancún Agreements: Due to their non-binding nature, NDCs will be largely similar to the pledges adopted under the Cancún Agreements. Private certification standards could hence decide not to use NDCs as a reference point for accounting but to instead rely on other parameters, such as domestic policies (Interview 3). Interviewees have indicated that alternatives to an accounting framework based on NDCs are currently being explored (Interview 1). These efforts must be seen against the backdrop of an NDC-based accounting approach putting the future of the voluntary market at risk.

What follows from this is a wide spectrum of possible accounting approaches:

- On the one side of the spectrum there is a rigorous accounting approach requiring the implementation of corresponding adjustments for each mitigation outcome that is exported from an NDC (approach A).
- Another approach would be to require a corresponding adjustment to be made for all MOs that are exported from sectors for which a sectoral, quantified mitigation target was adopted and which is legally enshrined (approach B).
- A third approach would require a corresponding adjustment to me made only if the mitigation outcome is transferred from a sector covered by a policy instrument that puts a cap on emissions, such as an emissions trading system (ETS) (approach C).

In principle, the potential for the voluntary market to continue its current offsetting role will be higher if a less rigorous approach is chosen (approach C) as there would only be limited need to implement corresponding adjustments. With one of the more rigorous approaches the need to implement corresponding adjustments rises. This process can be expected to be associated with significant challenges. Views among voluntary carbon market representatives are diverse: While some interviewees advocate for the rigorous accounting approach A that is linked to Parties' NDCs (e.g. Interview 5, Interview 6), others speak in favour of making corresponding adjustments contingent on the targeted emissions being covered by a specific policy or quantitative goal, as envisaged by approaches B and C (Interview 1, Interview 3).

From a **political perspective**, countries' willingness to implement corresponding adjustments could be one major concern, in particular during the transition period which can be expected to last five to ten years and in which the consequences of the new framework conditions under the Paris Agreement are highly uncertain (Interview 1). Being confronted with these uncertainties, Parties could decide to adopt a very conservative approach, not exporting any MOs. This could put the future of the voluntary market at existential risk (Interview 1). With regard to concerns regarding the limited willingness of Parties to implement corresponding adjustments for exporting MOs, a voluntary market representative referred to the experiences made under the EU, where no AAUs have been cancelled to account for voluntary market units (Interview 6).

Another concern are the **administrative and institutional capacities needed to implement corresponding adjustments.** As highlighted by interviewees, obtaining a Letter of Approval from CDM host Parties has already been quite cumbersome in the past, despite this document being a clear requirement under the Kyoto Protocol's CDM and the fact that their issuance does not involve any costs for the host Party in terms of giving away part of its (potentially low cost) mitigation potential (Interview 4, Interview 6). Against this backdrop it could be challenging for voluntary market participants to ensure that host Parties implement the corresponding adjustments needed for exporting the MOs.

Another aspect closely associated to this is the fact that implementing corresponding adjustments will require strong **technical capacities**. Host Parties will have to assess whether the mitigation outcomes at stake should be sold or if they should be kept for the achievement of Parties' NDCs. This assessment will be particularly difficult for small countries with limited capacities and where data is insufficient (Interview 2).

More generally, the **design of the corresponding adjustment framework** will be a key parameter influencing the potential of Parties to account for MOs exported. As highlighted by one interviewee, the accounting framework should meet several requirements: The framework should be transparent and provide a level playing field for all players involved. What should be avoided is a situation in which the degree of implementing corresponding adjustments is subject to negotiations, with some actors being able to negotiate an agreement with a host Party that another actor could not be able to negotiate. Otherwise, there is a risk of the corresponding adjustments becoming a "corruption blackbox". Timing will be another key aspect: Will corresponding adjustment be made before MOs are exported or on a regular (annual) basis? These and other issues must be addressed to ensure that corresponding adjustments will be available for voluntary market activities (Interview 5).

Table 7 below summarizes the potentials and challenges of continuing the current mode based on carbon neutrality credits.

Table 7: Potentials and challenges of the voluntary investor as a buyer of carbon neutrality credits

Potentials	Challenges
	Accounting: If MOs are generated within the host Party's NDC, implementation of corresponding adjustment will be required, which is associated with significant challenges.
	Regulatory uncertainty: Large uncertainty regarding the requirement to implement corresponding adjustments and the administrative/institutional and technical capacities to make these adjustments.
	Supply: Paris regime will significantly reduce the "uncapped environment" and host Parties will presumably have to account for emission reductions transferred to the voluntary market
Marketability: Carbon neutrality credits are well established products	
Demand: Potentially large interest from buyers to continue offsetting their emissions	

One of the benefits of this role of the voluntary investor is that the carbon neutrality credits are already well established products on the market that align with business models of many investors. On the other hand, this role is challenged by the changes introduced with the Paris Agreement, namely the limitation of the "uncapped environment". Furthermore, there is large uncertainty regarding the conditions under which MOs will have to be accounted through corresponding adjustments, adding an additional layer of complexity to this role. In this regard it should be noted that corresponding adjustments will only have an impact if the host Party's NDC is sufficiently ambitious. This has direct impacts on the carbon neutrality model, since implementing corresponding adjustments on the basis of above-business as usual NDCs would undermine the integrity of the MOs exported and even put at risk the

credibility of the entire voluntary carbon market. Hence, voluntary market activities should either address mitigation sources that are not covered by an NDC at all, not requiring corresponding adjustments to be implemented, or focus on emissions that are covered by an ambitious NDC. Alternative approaches that suggest moving away from the NDCs as the accounting reference point and using national policies or sectoral targets instead should not be pursued further, as this would result in the accounting approach being undermined.

5.4.1.2 The voluntary investor as a facilitator of NDC implementation

With the Paris Agreement putting at risk the previous operational mode of the voluntary carbon market, voluntary investors could adopt the role of a facilitator of NDC implementation. In this model, the mitigation outcomes would remain with the host Party while investors of mitigation activities would only be allowed to claim having assisted the host country in achieving their NDC, instead of claiming carbon neutrality.

This role would require private certification standards to develop a new type of product which certifies the support provided to the host Party. Private certification standards are already exploring products that could complement existing carbon credits: The Gold Standard is currently exploring the concept of "certified statements of emission reductions", which could be used by investors to claim a contribution to climate finance (Verles 2017). Similarly, VERRA is currently considering the creation of a new unit called "domestic climate contribution - DCC". These DCCs could work as a complement to the organisation's offset units, the verified carbon units (VCU), without having to address the issue of double counting (VERRA 2018).

While such an approach would avoid the double claiming risk, it could at the same time significantly reduce the attractiveness for voluntary buyers to engage in such transfers, as carbon neutrality is one of the main reasons to invest in mitigation activities. As highlighted by interviewees, it took more than a decade to establish the concept of carbon neutrality and corporate investors have made considerable efforts to promote and communicate this concept both within and outside their companies (Interview 3, Interview 5, Interview 6). Establishing a new concept would require a broad consensus among key players from the voluntary market and civil society organisations and a branding campaign (Interview 6). Support from governments would also be key (Interview 5).

Voluntary credit suppliers are generally open to explore alternatives to the carbon neutrality offsets, and they engage with their customers asking whether they would be interested in buying such a new product in the future (Interview 3). The picture regarding the interest to invest in such project in the future is mixed: Large companies, in particular those operating at a global level, could be interested in supporting a specific country in the implementation of its NDC, as this could align with their global approach (Interview 1). For some companies that have in the past refrained from investing in carbon offsets due to the environmental justice debates that surrounded the offsetting approach, the new model of assisting countries in NDC attainment could be even more interesting than the previous model (Interview 6). And also buyers from the public domain have shown interest in exploring alternatives to carbon offsetting (Interview 3). One interviewee highlighted that there could even be some potential among the group of private end customers: some of these voluntary buyers are very interested in the performance of the individual projects supported and do not use credits for claiming carbon neutrality but to make a positive contribution to the climate cause. This specific type of buyer could be interested in supporting NDC implementation abroad (Interview 2). Some buyers, however, are more reluctant to explore such alternatives, as their business model builds on the provision of carbon neutral products (Interview 6) . Furthermore, for some small and medium enterprises, communicating their engagement as NDC supporters could be challenging. These entities might further encounter difficulties in assessing the quality of individual products. These entities could however be assisted through the establishment of a new product that is endorsed by many actors (Interview 1).

Moving from the concept of carbon neutrality to a "support approach" that is delinked from own emissions could however also be associated to environmental risks: some companies could buy small amounts of units and use them for window dressing, while own emissions continue to rise. More generally, this approach does not align with the idea of internalising the environmental externalities of products and services. Transitioning away from the carbon neutrality approach could also undermine the quality of monitoring, reporting and verification (MRV) standards: The fact that these units will not be used to offset emissions could be seen as an argument against rigorous MRV standards (Interview 1). Moreover, if the NDC that is being supported is weak, environmental integrity and the reputation of the voluntary market actors are at risk.

Table 8 summarizes the potentials and challenges of the voluntary investors role as a facilitator of NDC implementation. On the one hand, moving away from the carbon neutrality approach would address the double claiming risk and avoid the challenges associated to implementing corresponding adjustments. There could even be considerable interest from some companies to invest in such activities for CSR reasons. At the same time, however, this model is associated to numerous challenges, including the difficulties in communicating the new product, environmental and reputational risks linked to the difficulties in assessing the ambition level of the NDCs supported as well as a potential undermining of MRV standards. In light of these numerous challenges, the future potential of this model seems limited.

Table 8 Potentials and challenges of the voluntary investor as a facilitator of NDC implementation

Potentials	Challenges
Environmental Integrity: Double claiming risk is avoided	
Demand: Claiming NDC support could align with global strategy of some companies.	**Demand:** Reduced attractiveness for voluntary buyers to engage, as product cannot be used to claim carbon neutrality. Communicating their engagement as NDC supporters could be challenging for some small and medium enterprises.
	Marketability: Requires development of new product (NDC support unit)
	Reputational risk/Environmental impact: Difficulties in assessing the ambition level of NDCs could expose investors to a reputational risk and undermine environmental impact.
	Environmental impact: Companies could buy small amounts of units and use them for window dressing, while own emissions continue to rise.
	MRV Standards: Transitioning away from the carbon neutrality approach could result in MRV standards being undermined if strong MRV is only being considered relevant in the context of offsetting.

5.4.1.3 The voluntary investor as a driver of ambition

The role of the private investor as a contributor to ambition raising is particularly salient. Voluntary buyers are already making large investments on the carbon markets and it is not clear if these and

future investments should be considered a contribution to ambition raising. In the following, some of the key questions related to this role of the voluntary market will be explored.

Should voluntary buyers be allowed to claim ambition raising or should the concept only be applied to Parties?

One question is related to the definition of ambition raising as such: Should the concept be exclusively devoted to Parties, as Article 6.1 suggests, or should non-Party actors also be allowed to make contributions to ambition raising and claim them for themselves?

We will first look at the consequences of applying a broader concept of ambition raising, which would also allow non-Party actors to claim contributions to ambition raising for themselves. Hence, for instance, a company based in Germany that has bought and cancelled carbon credits from abroad for Corporate Social Responsibility (CSR) reasons could not only claim carbon neutrality but could also claim to have made a contribution to ambition raising. The merits of broadening the concept in such a way, however, seem rather limited. First, delinking the concept of ambition raising from Parties would not be in line with its application in the Paris Agreement: Not only Art. 6.1 relates the concept to Parties' but also other paragraphs of the Paris Agreement and its accompanying decision link it to Parties, be it their "actions" (Art. 4.5), their "nationally determined contributions" (Art. 4.3), their "pre-2020 action" (Decision 1CP21: para 121) or their mitigation efforts (Decision 1CP21: para 122). Second, delinking the concept of ambition raising from Parties could further lead to a situation where responsibility for the urgently needed step to raise ambition cannot be clearly assigned to a particular entity. This could undermine the entire concept. Third and closely related to the second point, the Paris Agreement is related to Parties: While it is clear that 'everybody' should contribute to mitigate climate change, the Paris Agreement can only put a binding obligation on its Parties, which are, for the time being, national states. Therefore, in the view of the authors, the concept of ambition raising should only be applied to Parties. This view was generally shared by interviewees, who also questioned the merit of expanding the concept of ambition raising to voluntary buyers (e.g. Interview 1, Interview 5, Interview 6). As highlighted by one interviewee, companies could, however, be interested in claiming to have *contributed* to an increase of ambition (Interview 4).

A further question is whether decoupling ambition raising from Parties would ever be done in practice. As Parties using Article 6 are required to raise their ambition, there is the question of whether any Party would give up a potential claim to having raised ambition to a non-Party actor.

Should a voluntary cancellation by a private investor be considered an enhancement of a Party's ambition?

The application of the more narrow conceptualisation of ambition, according to which ambition will always be related to the targets and actions of a Party, seems reasonable. This, however, raises the question of whether a voluntary cancellation of mitigation outcomes in a public registry by private entities should be counted as having raised the ambition of the countries involved in the transfer. For the sake of simplicity, we will here focus on the host and the acquiring Party and not consider the role of intermediaries or broker countries.

We will first look at the possible **contribution to the ambition of the investor Party**, hence the country in which the private investor is based. Consider, for instance, a German company that buys and cancels carbon certificates from abroad to claim carbon neutrality for CSR reasons. Should these voluntary cancelations be considered an enhancement of Germany's mitigation ambition? This seems highly questionable, as the Party, in this case Germany, has neither increased its own mitigation targets nor its mitigation actions and the voluntary cancellation by the company is fully detached from the country's climate policy. You could even argue that counting such voluntary actions towards Par-

ties' ambition leads to a perverse incentive, as voluntary actions are only relevant for emissions not targeted by a climate policy. Hence, allowing Parties to claim subnational non-Party actors' voluntary activities as a contributions of the home Parties' ambition should not be allowed. This perception was generally shared by voluntary market representatives (e.g. Interview 1, Interview 2). One interviewee however outlined the idea that the investments made could be considered a contribution to the "private sector climate finance" of the investor country (Interview 5).

A second possibility would be to consider a voluntary cancellation by the voluntary investor as a **contribution to ambition raising of the host Party**, hence the country in which the mitigation activity is based. This question is closely related to whether the mitigation outcomes used by the private entity to claim carbon neutrality could also be used by the host Party to claim ambition raising, or whether this should already be considered a case of double claiming that must be avoided.

There are two arguments against considering this a case of double claiming that must be avoided. First, it should be noted that this situation would not adversely impact environmental integrity, at least from a static point of view. This is due to the fact that the private buyer will not use the mitigation outcomes for attaining to a (legally-binding) mitigation target. Claiming carbon neutrality will therefore not result in additional emissions. A second argument in favour of allowing these mitigation outcomes to be used for carbon neutrality is that ambition raising cannot be considered a "claim", as pointed out by one voluntary market representative (Interview 5).

This perception clearly contrasts with the view that units voluntary cancelled by a private entity should not at the same time be counted towards both, carbon neutrality of the private entity and ambition raising of the host country. The main argument against allowing MOs to be used for carbon neutrality and ambition raising is that the concept of carbon neutrality implies that emissions are neutralized through mitigation activities that are implemented elsewhere and not used for another purpose. Using this concept in cases where the mitigation outcomes are used by the host country for ambition raising could therefore be considered misleading.

Could the issuance of "ambition raising units" be a solution to the double claiming challenge?

If the use of MOs for carbon neutrality and their simultaneous use for ambition raising is being considered double claiming, the issuance of so called "ambition raising units" could be a solution to this problem. These units could be used by the investor to show its contribution to increasing the host country's ambition instead of using the investments to claim carbon neutrality (or NDC support). This approach would allow the host Party to voluntarily cancel the mitigation outcomes and thereby increase its ambition. Such a cancellation of mitigation outcomes is equivalent to a unilateral "corresponding adjustment" implemented by the host country, hence, an increase of the Parties' emissions (emissions-based accounting) or the adoption of a more strict NDC target (target-based accounting).

Voluntary market representatives raised several concerns with the introduction of such ambition raising units. Even if it is ensured that the specific mitigation activity will lead to an increase of ambition in the host country through the accounting system, host Parties could lack the incentive to implement corresponding adjustments (cancel the MOs) without getting anything in return. In addition, the volumes and the negotiating power of the voluntary market will presumably be too limited to allow for an active engagement with host Parties (Interview 3).

While this approach would address the double claiming risk outlined above, it could at the same time significantly reduce the attractiveness for voluntary buyers to engage in such transfers. This was confirmed by voluntary market representatives, who have indicated that they consider "ambition raising units" to be very challenging to commercialize. Understanding the concept underlying this new product is difficult and hard to differentiate from voluntary investors' role as supporters of NDC implementation (Interview 3). As highlighted by one interviewee, the use of ambition raising units combines the

difficulties of both previous roles: It requires the host Party to account for the mitigation outcomes generated while at the same time preventing the units to be used for carbon neutrality by the investor (Interview 2).

Interviewees highlighted that if such a product is to be developed, it will be of key relevance to ensure that such a new claim is endorsed by key stakeholders, including international NGOs as well as existing initiatives such as the Carbon Disclosure Project (CDP). To avoid a mushrooming of individual claims this process could establish in one universal claim or label, be it "carbon positive", "Paris Supporter" or the like (Interview 1) The development of a public registry with accounts clearly showing how voluntary action contributed to ambition raising of Parties was further mentioned as an idea to ensure public recognition of this role (Interview 4).

Table 9 below summarizes the potentials and challenges of this concept.

Table 9 Potentials and limitations of the voluntary investor as a driver of ambition

Potentials	Challenges
Environmental integrity: Double claiming risk is avoided	
	Accounting: If MOs are generated within the host Party's NDC, implementation of corresponding adjustment will be required, which is associated with significant challenges.
	Regulatory uncertainty: Large uncertainty regarding the requirement to implement corresponding adjustments and the administrative/institutional and technical capacities to make these adjustments.
Environmental impact: Voluntary market activities achieve a climate impact that goes beyond what Parties have adopted (ambition raising)	**Environmental impact:** Companies could buy small amounts of units and use them for window dressing, while own emissions continue to rise. Climate investment activities are delinked from own emissions and do not allow for internalising the externalities of products and services.
	Reputational risk/Environmental impact: Difficulties in assessing the ambition level of NDCs could expose investors to a reputational risk and undermine environmental impact.
	Marketability: Requires development of new product (ambition raising unit)
	Demand: Interest from voluntary buyers to invest in ambition raising could be limited, as product cannot be used to claim carbon neutrality and benefits could be difficult to communicate.
	MRV Standards: Transitioning away from the carbon neutrality approach could result in MRV standards being undermined if strong MRV is only being considered relevant in the context of offsetting.

As indicated previously, the potential of this role is limited by the fact that it combines the challenges of the other two roles: the voluntary market would have to ensure that MOs exported are accounted for, while at the same time having to develop a new virtual product that could be used in lieu of carbon neutrality offsets. While these are considerable challenges the merits of this model are limited, in particular given the lack of clarity in terms of whether the use of MOs for carbon neutrality and ambition raising should be considered a case of double claiming that must be avoided. In general terms, finding ways that allow the voluntary market to make a contribution to ambition raising while building on the other two roles seems much more promising.

5.4.1.4 Combining the different roles to address challenges and account for diverse interests?

In light of the challenges identified with the individual roles of the private market, an alternative approach would be to combine these different roles within one mitigation activity. For this purpose, the host country and the private investor would have to agree on dividing up the shares of the activities' mitigation outcome. The host country could then count the share of MOs that is not used by the investor for carbon neutrality purposes as ambition raising, while the investor could use another share to claim carbon neutrality and make a statement that it has assisted the host country increase its ambition for the amount of MOs that remained with the host Party. However, having the host country deduct a share of the mitigation outcome for its purpose would effectively impose a tax on the project and reduce its economic attractiveness for the private investor. This is particularly problematic during phases in which the carbon market is characterized by low profit margins (Interview 6). In order to deal with this situation, a carbon market representative suggested that the obligation to cancel a certain amount should be binding and be applicable to all mitigation activities globally (Interview 1).

In general terms, interviewees maintain that a combination of role 1 and 2 can be expected to be commonly applied in the future, indicating that Peru is pioneering the sharing of mitigation outcomes in a REDD+[31] project (Interview 3, Interview 4)(see: Ecosphere+ 2018). Using a certain share of MOs for ambition raising by implementing unilateral corresponding adjustments, in contrast, is generally seen with scepticism in light of the difficulties this concept entails (see discussion on "ambition raising units" in section 5.4.1.3 above).

While the static contribution to ambition raising will be challenged by these accounting and double claiming aspects, voluntary carbon market actors may be able to contribute to raising the ambition of a host country by facilitating the inclusion of previously uncapped emissions under future NDCs. One example is a mitigation activity based outside the scope of the NDC. The private investor could invest in this mitigation activity and obtain voluntary certificates that could be used for claiming carbon neutrality, while the host country could commit to include the targeted emissions in future NDCs. Hence, voluntary cancellation could contribute to the enhancement of the host country's ambition if it dynamically assists the host country to include the underlying emission sources in future NDC periods. It should be noted, however that this not different to the potential contribution of compliance market activities.

Several voluntary market representatives have made reference to this role, indicating that it could be relevant in the future (e.g. Interview 2, Interview 4, Interview 5). In order to exploit the full potential, a level playing field for the different actors on the voluntary market will be important, for instance by developing common rules for how these emissions can be tapped (Interview 5). One carbon market representative however raised concerns with regard to ensuring the causality of ambition raising in this context: How can it be ensured that the voluntary market mitigation activity has actually led to an

[31] REDD+ stands for: Reducing Emissions from Deforestation and Forest Degradation, and the Role of Conservation of Forest Carbon Stocks, Sustainable Management of Forests and Enhancement of Forest Carbon Stocks

increase of the host Party's ambition? Another problem is political uncertainty: How can the system ensure that future governments commit to the policy decisions made by their predecessors (Interview 3). In light of these uncertainties, engaging the voluntary market in such activities can be considered challenging.

5.4.2 The future of the voluntary market as a provider of certification standards

Another interesting function of the voluntary market is that of a provider of private certification standards. Under the Paris regime, three different options can be distinguished.

5.4.2.1 Option 1: Supporting the design and implementation of the Article 6.4 Mechanism

With Article 6.4, an internationally governed market mechanism is installed. Activities under this mechanism will have to be implemented according to internationally agreed rules, modalities and procedures and be supervised by a designated body. There will presumably be binding rules on how to ensure additionality of activities and how to account for mitigation outcomes exported in case they are covered by an NDC.

The voluntary carbon market could contribute to the development of methodologies and procedures to be applied under Article 6.4 and showcase successful project implementation in areas not yet covered by the mechanism. This would be a continuation of a role the voluntary carbon market already played in the past, having served as a testing ground for concepts that were later introduced in the compliance market.

5.4.2.2 Option 2: Application of private certification standards under Art. 6.2

An area under the Paris regime where private certification standards could play a more prominent role is Article 6.2. This Article will presumably establish a framework for international transfers of mitigation outcomes. While this framework can be expected to provide accounting provisions for ITMO transfers, it will presumably not establish internationally binding rules for determining and certifying mitigation outcomes. There will hence not be a single Article 6.2 mechanism but possibly only a generic guidance to which the different mechanisms and certification standards applied must adhere. Parties have not yet agreed on the level of rigour to be applied. Private certification standards could presumably be used under Article 6.2. While building on such standards could be a pragmatic way to use existing frameworks, the potential role of private standards in certifying mitigation action of Parties under the UNFCCC might be highly disputed, as countries could fear a breach of sovereignty (Interview 5).

According to information gathered in interviews, private certification standards are already working towards being recognized for the certification of compliance activities in the future and they are also in contact with individual countries (Interview 1; Interview 4). Some countries, such as Colombia and South Africa, have already decided to include private certification standards in the design of their domestic offsetting schemes, which is seen as an indication of Parties' general interest to use such standards in the future (Interview 1, Interview 5, Interview 6).

More generally, using a large number of certification standards each with its own governance structure, procedures and methodologies may significantly reduce transparency. At the same time, a fragmented carbon market in which voluntary certification standards are being used along with international and bilateral standards must not necessarily be less robust than a market with a single UNFCCC-governed mechanism. However, in order to safeguard environmental integrity, each of the certification standards must be as robust as the standard used by the single UNFCCC mechanism. A robust guidance for Article 6.2 could ensure a high quality in this regard. Voluntary standards would have to ensure that they meet these (high) requirements. One particular challenge for all certification standards will be the assessment of additionality of mitigation activities. While this was by no means trivial in the

past, the new Paris architecture in which NDCs are the cornerstone adds another layer of complexity to this issue.

5.4.2.3 Option 3: Use of private certification standards outside Article 6

A third possible role for private certification standards is their application outside of Article 6. In this scenario, private standards determine and certify mitigation outcomes by themselves, according to their own rules and procedures. This is the current modus operandi of most voluntary market transactions. However, under the Paris Agreement, private standards would not only have to apply robust procedures for additionality assessment and MRV of emission reductions but will also have to ensure that they are robustly accounted for (see discussion on double claiming in section 5.3.1.2).

Robust accounting is also relevant in the context of ambition raising as mitigation outcomes that are used for NDC achievement cannot at the same time be used for ambition raising. One possibility in dealing with these challenges is to focus on emission reductions that are achieved in sectors not covered by NDCs. As these MOs will by definition not contribute to the host country's NDC they could be used for raising the host country's ambition with no risk of double claiming. Some interviewees consider these type of activities as providing some potential for voluntary market activities. Interviewees, however, also pointed at the risk of such activities being of only limited relevance in the mid to long-term as all anthropogenic GHG emissions should be covered by an NDC (e.g. Interviewee 2).

If mitigation outcomes generated within the scope of an NDC are meant to contribute to ambition raising, corresponding adjustments must be made to ensure that these MOs do not contribute to NDC attainment. Hence, the host country would have to adjust its emissions or its NDC to account for the amount of mitigation outcomes used for ambition raising. As we assume that in this option private certification standards will be used outside Article 6, this process would not be linked to any transfers of ITMOs. Hence, the corresponding adjustment would have to be carried out unilaterally by the host country and would have to "correspond" to the amount of mitigation outcomes certified by the voluntary standard. The accounting framework of Article 6 would hence have to allow Parties to implement corresponding adjustments (by adjusting their emissions or their NDC) also if no ITMO transfers have taken place. In this regard, the private certification standards could build on the accounting provisions introduced with Paragraph 77 d) of the modalities, procedures and guidelines of the Transparency Framework. These provisions require the implementation of corresponding adjustments not only when ITMOs are transferred and used towards an NDC but also when mitigation outcomes are used for "international mitigation purposes" (UNFCCC 2018c, para 77d). This could be considered an indication of two things: First, that the future accounting framework will not be limited to ITMO transfers. And second, that it will also be open to account for other purposes. If this was the case, private standards could use this framework for implementing "unilateral adjustments", allowing for the development of domestic voluntary markets, where MOs are not internationally transferred. Voluntary certification standards have in the past already established provisions to avoid double counting under the Kyoto protocol (see for instance: Gold Standard 2015). These, however, relied on the accounting framework of the Kyoto Protocol. A similar approach would be to require project developers to present evidence that the host country will account for these MOs. For the buyer, however, this raises the question of who can be held liable if the host country does in the end not account for these transfers.

Another approach would be to establish an accounting framework for voluntary market activities outside of the Paris Agreement (see also: ICROA 2017). This however, would not only entail considerable efforts but the accounting framework will at some stage need to be linked to the Paris Agreement, in particular if it is to be used as a means for ambition raising. In general, the benefits of using voluntary certification standards outside of Article 6 can be expected to be minimal. Using voluntary certification outside of Article 6 might only be appealing if Article 6.2 does not allow for the participation of voluntary standards or if the barriers for using article 6.2 are too high. One such barrier could be difficulties in meeting the requirements of Article 6.2. However, it can be expected that the benefits of using the

accounting framework under Article 6.2 will ultimately outweigh the costs associated to overcoming these barriers. More generally, from the perspective of a host country willing to raise its ambition, using certification schemes outside of the accounting system of the Paris Agreement seems odd, as the concept of ambition raising itself is part of the Paris Agreement.

5.5 Conclusions

This chapter explored the future role of the voluntary carbon market and its potential contribution to ambition raising. For this purpose, the authors first identified the individual segments of the voluntary market and highlighted the specific challenges the market will be confronted with in the post-2020 era, namely the expansion of GHG emission regulation across the world and the requirements for market-based cooperation under the Paris Agreement to contribute to ambition raising. These two fundamental changes were explored by first looking at their implications on carbon market activities in general before analysing their potential impacts on the voluntary market. In particular, two functions of the voluntary carbon market were explored in greater detail: the voluntary market as an investor and the role of certification standards of mitigation activities. The voluntary market's contributions to ambition raising was assessed by taking into consideration the two paradigm shifts of the Paris Agreement may impact its future role as an investor and as an provider of private certification standards.

For the future of the voluntary market as an investor, three roles were identified: The market may maintain its current role of buyer of carbon neutrality credits, it may become a supporter of NDC implementation, or it may become a driver of ambition. The findings indicate that the current role of the **voluntary investor as a buyer of carbon neutrality credits** will be impacted significantly by the changes introduced with the Paris Agreement as the "uncapped environment" will be limited in the future. The potential of the voluntary market to continue performing this role will largely depend on the requirements for host Parties to account for MOs exported. At the moment, there is still uncertainty regarding the rigour of the future accounting provisions and different approaches are being discussed. Voluntary market representatives highlighted the need to have such accounting instruments readily available and pointed to the administrative and institutional capacities needed for their use by host Parties. Countries' readiness and the ultimate design and access to the corresponding adjustment framework will be key parameters influencing the future role of the voluntary carbon neutrality offset market. Despite these challenges, the continuation of the carbon neutrality model can be considered the most promising future role for the voluntary market: It can build on a well-established market with clear demand from voluntary investors. If carbon neutrality credits are generated within the scope of ambitious NDCs and accounted for by a robust accounting approach that uses the NDC as its point of reference, this model holds significant potential to assist Parties in increasing their ambition. This also holds for carbon neutrality credits generated outside the scope of NDCs, if it is ensured that activities are truly additional.

The role of the **voluntary investor as a facilitator of NDC implementation** is increasingly being endorsed by carbon market participants as a complement of the current offset-based model. Private certification standards are exploring the possibilities to develop respective products and suppliers are engaging with final customers to evaluate the marketing potential. While there seems to be some potential for this new role in terms of demand it is also associated to significant challenges: This role does not only require the development of a new product but there are also some environmental risks associated to its use if the underlying NDC lacks ambition. In case of a considerable demand for such products and a respective market volume, host countries may even be incentivised to reduce their own efforts in NDC implementation. In our view, this approach should be carefully explored further in order to find solutions in addressing the major concerns.

The role of the **voluntary investor as a contributor to ambition raising** through investing in ambition raising units turned out to be the role with the lowest overall potential. While this role could lead to a direct ambition raising impact it suffers from the fact that it requires both, the creation of a new

commodity and the need to implement corresponding adjustments. Therefore, approaches that allow the voluntary market to contribute to ambition raising through its role as an investor in carbon neutrality offsets or while supporting countries in achieving their NDCs seems the most promising avenue.

With regard to the future of private certification standards, three options were identified: Private standards could function as mere providers of methodologies and innovative approaches to be used by the Article 6.4 mechanism, they could be used as standards under Article 6.2, or they could be applied outside of Article 6. Each of these options is associated with specific challenges, of which the assessment of additionality and dealing with double claiming are particularly relevant. The analysis found that the integration of voluntary standards into Article 6.2 can be expected to be the most promising option. Here, the entire architecture of the voluntary standards could be used together with the experiences and knowledge in terms of MRV and additionality demonstration while accounting would accrue to the international accounting framework under Article 6.2. Implementation of activities outside of Article 6 (and therefore outside of the Paris Agreement), in contrast, seems to provide no added value in comparison with their application under Article 6.2 while raising additional questions regarding issues such as the implementation of accounting measures.

The findings indicate that the voluntary market has potential to contribute to ambition raising. Whether this potential will actually be unlocked, however, will depend on how the concept of ambition raising will be operationalized under the Paris Agreement. Another determinant will be the voluntary market's ability in transitioning from the current carbon neutrality-based model to new approaches that take into account the new framework conditions established with the Paris Agreement. Negotiators under the UNFCCC are currently in the process of translating these framework conditions into provisions in order to make the Paris Agreement and its Article 6 operational. This process will take time and its outcome cannot be expected to answer all questions that are relevant to the current operations of the voluntary market and its future role. When being confronted with such governance gaps, the voluntary market should take a progressive stance by advocating for robust solutions that enhance mitigation ambition and safeguard the environmental integrity of the Paris regime. With this, the voluntary market can live up to its role as an innovator and developer of solutions that could at a later stage be translated into compliance market activities under Paris.

6 Incentives for Private Sector Participation in the Article 6.4 Mechanism

6.1 Background

Private actors are key for the implementation of GHG emission reductions of the scale required by the Paris Agreements long-term temperature goal. The private sector is both a large emitter of greenhouse gases while also providing for innovative solutions to address climate change. Furthermore, private sector investments can make an important contribution to mitigate climate change. These multiple functions have been recognized by Parties when adopting the Paris Agreement and its Article 6.4, which explicitly aims to incentivize and facilitate the participation in the mitigation of greenhouse gas emissions by private entities (Art. 6.4 (b)).

Under the Clean Development Mechanism (CDM), private sector actors had the opportunity to participate in a new and fast-growing market, but also faced numerous barriers challenging investments. Given the more heterogeneous architecture of the Paris Agreement and the stronger role (host) country governments have been granted under the new regime, it appears that private sector actors might even be confronted with more challenges, in particular in countries with weaker institutions and authorities (e.g. for obtaining the authorisation). At the same time, the Article 6.4 mechanism constitutes a fresh start. The need to develop a new mechanism from zero provides an opportunity to take on board positive lessons from the Kyoto mechanisms and to avoid the problems they were associated with.

With regard to the role of the private sector in Article 6 activities, two types of actors can be distinguished:

a) Infrastructure: Investors and developers of infrastructure for mitigation activities such as new wind farms, equipment for the utilization of landfill gas or electric busses. These actors are responsible for the main infrastructure investment.
b) Transaction: Carbon developers, aggregators, consultants, validators, verifiers, private carbon standards etc. who enable the monetization of the mitigation outcomes generated. These actors are responsible for enabling the transaction under Article 6.

In the following, we focus on incentives for private sector actors related to infrastructure (a).

6.2 Key factors determining private sector participation in Article 6 mechanisms

Three types of main barriers for increased private sector participation may be distinguished, based on history with the CDM and outlook on Article 6 mechanisms: demand side factors, factors related to rules and standards for market mechanisms and supply side factors.

A. Demand side factors

The history of the CDM is characterized by a learning-by-doing approach. With the introduction of CERs as a global currency for emission reductions, mitigation measures were increasingly seen as attractive investment opportunities. Entrepreneurs, governments and NGOs were engaging in tapping existing mitigation potential and develop strategies for realizing this potential under the CDM. These commercial activities were made in expectation of financial returns which in turn were linked to the demand for CERs and respective prices. Measured by the number of projects, the mechanism has been highly successful. The CDM registry currently records nearly 8,000 projects. The CDM Policy Dialogue in 2012 concluded that the mechanism had mobilised USD 215 billion in investments (CDM Policy Dialogue 2012).

However, there is a question mark on the extent to which these projects actually constituted additional private sector activity that would not have happened in absence of the CDM. With the exception of the "golden era" of high demand and attractive prices of the CDM 2007 – 2008, lack in demand and low prices for units has defined most of the period of the flexible mechanisms under the Kyoto protocol as the EU was the only larger scale buyer and other players with potential large-scale demand such as the US pulled out early. When demand took up from EU-ETS installations in 2007, the price difference between the EU-ETS allowance price and units from the Flexible Mechanisms lead to significant influx of CERs and ERUs in the EU-ETS. However, the rules and standards of CDM and JI were of limited robustness and allowed for the use of units which to a large share carried a high risk of being non-additional (e.g. from the massive expansion of power generation from wind and hydro as prescribed in the Chinese 5-year-plans) (cf. Cames et al. 2016, pp. 105 ff.). As a result, CER and ERU prices remained far too low and provided no significant revenues compared with other cash-flows in a typical investment analysis of energy related projects. For instance, the impact of the revenues from CERs on the project IRR is the lowest for renewables including hydro and wind (increase of IRR by 2-3 percentage-points), fuel switch (4 percentage-points), and energy efficiency in power generation (5 percentage-points) (see section 2.4 in Cames et al. 2016). As a result, the private sector was stimulated by domestic subsidies (such as feed-in tariffs), but whether the flexible mechanism provided a source for additional activities is in many cases questionable.

In order to be sure to trigger private sector investments that would not happen anyhow, market mechanisms would need to provide much higher cash flow contributions that are more in the order of related fuel savings or fuel price uncertainties, i.e. be more in the order of 20 – 300EUR/tCO_2 (see section 2.4 in Cames et al. 2016). Even at the height of the CDM market in 2008, secondary CERs fetched

only a maximum at around 20 EUR/tCO_2, while the offtake of primary CERs from projects barely reached the 14 EUR threshold (World Bank, State and Trends of the Carbon Market 2009, section 2.1.1).

With the Paris Agreement, stated demand from Parties so far is minimal. Only very few Parties have indicated their plans to buy ITMOs in their NDCs while many Parties indicated they intend to sell units (Obergassel and Gornik 2015). Some Parties such as Switzerland and Sweden have indicated their interest to start purchasing mitigation outcomes from Article 6 pilot projects.

The UN's International Civil Aviation Organization (ICAO) is launching its Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). This may lead to a certain level of demand. However, if no steps are taken to severely limit the transitioning of CDM projects and legacy CERs, this demand would be annihilated, as forecast CORSIA demand until 2035 could be served multiple times with existing or dormant legacy CERs from the period until 2020 (Warnecke et al. 2019).

On the other hand, the emerging pilot schemes may lead to a certain demand for high quality ITMOs. This may be somewhat strengthened if such purchase schemes were scaled up e.g. in the form clubs of likeminded Parties aiming at higher ambition.

B. Rules and standards for market mechanisms

The dynamic evolution and some persistent ambiguities in rules and standards of the flexible mechanisms have led to complicated and time-consuming processes and uncertainty for investors under the CDM. These uncertainties led to considerable risks for private sector actors related to project approval, issuance of CERs and unit prices which are all barriers to investments in additional projects.

An example are the rules on how to deal with climate related policies in the host country and to which extend they need to be taken into account ("E+/E- inconsistency", see Fuessler 2012). The application of these conflicting rules in the concrete country context of CDM interventions brought lots of uncertainty. On a governance level, the CDM Executive Board was for a long time not able to solve such fundamental questions in particular around the interpretation of additionality and baseline rules, and many of the more political questions remained unsolved.

On a more technical level, there was a better progress of reforms. The CDM methodologies and MRV provisions were improved, revised and consolidated over time, and the CDM EB streamlined its processes and the project cycle, which brought more clarity for project developers. However, for some project types, in particular for smaller dispersed emission sources such as cookstoves and vehicles, or less standardized project situations, the transaction costs for MRVing were still rather high (in particular compared to the very low CER revenues in the later years of the CDM), which limited the use of carbon market revenues to scale up these project types. MRV costs can, for instance, rise to 1.20 EUR/tCO_2 and above for diffused small-scale projects (see Shishlov & Bellassen 2016, pp. 706ff.).

Given the limited level of clarity of some of the CDM rules, in particular regarding additionality or in the determination of baseline emissions, the role of designated national authorities (DNAs) and designated operational entities (DOEs) led to uncertainties and cost increases, as the project approval and the cost for its validation and verification were not clearly predictable for all project types. This was particularly the case for projects which are less standardized in baseline setting, such as wind turbines but where each project was different, e.g. as in individual industrial energy efficiency measures, where e.g. the determination of baseline emissions was less straightforward and required specific technical knowledge.

Due to these uncertainties, the additional CER income was subject to high risks. The project developers could not be certain ex ante whether their project would be registered, whether it would actually gain the expected amount of emission reductions and what price they would fetch for the CERs. Another

challenge was that projects often require financing before they can start. However, CERs are not generated until the project is already in operation. While there were some purchase programs where part of the CER revenue could be received in advance, the prevailing market model was "payment on delivery" (Sterk 2010). This increased the vulnerability to uncertainties related to rules and standards.

Under the Article 6 mechanisms of the Paris Agreement the situation for private sector actors may become even more challenging. The Article 6 text itself appears not to be free of ambiguities. For example, there is no formal definition of environmental integrity, and its not clear how it should be operationalized, and what governance is needed to be put in place (ADB 2018). Also, the current draft of the related rulebook seems to again push the ambiguities from the negotiations down to the operational level. Key topics generating uncertainty include single-year vs. multi-year accounting, timing and operationalization of corresponding adjustments, and avoidance of double counting in general. It has to be seen to which extend they will be solved by the expected Article 6 rulebook. With the weakening of centralized governance for the Article 6 mechanisms compared to a situation with the CDM EB as a centralized governing body in the CDM, it may be expected that the uncertainties for private sectors tend to increase compared to the situation under Kyoto.

C. Supply side factors

Host countries need investment readiness in order to facilitate private sector action. Article 6 activities are not fundamentally different from any other foreign direct investment project. Such investments are fostered by sound institutional setting, sound regulatory setting, transparency, competitive tax environment etc.

This is probably the most important barrier preventing the wider private sector action based on direct foreign investment (and carbon markets) and may be the main factor in preventing a geographically equal distribution of carbon market projects.

A strong development of robust climate policies and rules on a national and international level is a necessary pre-condition to foster Article 6 activities. However, an underlying lack of general investment readiness in potential host countries can barely be influenced by the design and rules of carbon market projects, although there have been attempts to do so, e.g. by allowing for simplified MRV procedures for LDC/ SIDS countries. Similarly, the introduction of Programmes of Activities, which allowed targeting smaller and geographically dispersed emission sources which are found in many countries previously neglected by the CDM, was also intended to reduce the geographic unequal distribution of the CDM (Kreibich et al 2017).

With the Paris Agreement, these domestically defined supply side challenges do not change in general. However, if for instance host countries define in the context of their Long-term Low Emissions Development Strategies (LT-LEDs) sectors in which they would like to see Article 6 activities, they may as part of their national mitigation planning provide incentives for the private sector to invest in that sector.

6.3 Overview of options to mitigate or overcome barriers

This section provides an overview of options to improve key factors for Article 6 participation and to mitigate the above-mentioned barriers to private sector participation. The mitigation options are grouped in the same manner as the factors and barriers: (A.) demand side, (B.) rules and standards for market mechanisms and (C.) supply side. A selection from these options will be explored in further detail in the subsequent chapter 6.4.

A. Demand side: Stimulation of demand for additional units that foster ambition raising in both acquiring and host countries

Acquiring countries committing to raise their ambition and strengthening demand for ITMOs is crucial for the establishment of a carbon market. This can be achieved by a number of approaches, as discussed in chapter 4 (see also CCAP 2017, Warnecke et al. 2018, Fuessler et al. 2019a, Fuessler et al. 2019b, Michaelowa et al. 2019):

Demand for additional units can be stimulated by increasing NDC goals and purchasing additional ITMOs. As overall compliance costs can be reduced with trade of emission reductions, acquiring countries could revise their NDC targets for emission reductions and cover a part of it with additional ITMOs. In this way, more emission reductions could be achieved, while the cost of compliance for the acquiring country might be the same. Revised NDCs would further send a signal to the market about increased ITMO demand.

Possible instruments to foster ITMO demand by *companies* in acquiring countries are, for example, domestic emission trading systems (ETS) or carbon taxes. In the case of ETS, participating installations may acquire and use ITMOs towards meeting their emissions cap. In carbon tax systems, taxed entities may purchase (domestic) mitigation outcomes to lower their net emissions that are subject to the tax and therefore reduce their tax burden. The policy design has to make sure that at least part of the gains from trade are captured and translated into increased ambition at the national level. Therefore, if entities under the domestic carbon pricing instruments are allowed to use lower cost international offsets, stringency of the national systems has to be increased, e.g. by setting more ambitious overall caps in domestic ETS or higher carbon taxes. A big advantage of creating demand by increased stringency of domestic carbon pricing instruments is that these instruments are reliable and tested policies with more certainty of an adjustments' outcome.

Savings from reduced compliance costs by using imported ITMOs can also be invested directly in low-carbon technologies as a form of climate finance. Results-based financing, for instance, helps to overcome market failures constraining private sector activities in this field by payment upon delivery of prespecified results. Further, private compliance entities under domestic carbon pricing instruments could be obligated to reinvest savings generated from ITMO use.

In the so-called "insetting" approach, companies invest into mitigation actions within their own supply chain. E.g. a coffee company invests into low carbon drying technologies for coffee beans in the country of origin in order to generate ITMOs to offset production emissions in Europe.

Concerning Article 6 mechanisms and their potential of ambition raising, a combination of three approaches is favourable (Fuessler et al. 2019):

- Direct ambition raising by adopting policies or mechanisms that result in more global emission reductions than targeted in countries' NDCs.
- Implementing measures that encourage or foster raising ambitions through more stringent NDCs.
- Ensuring environmental integrity and favourably defining policies that ensure an overall emission reduction by participating in Article 6 mechanisms.

For more details on these approaches see chapter 6.4.

Purchase programs may also be operationalized through the design of a bilateral or multilateral facility to purchase emission reductions generated under Article 6 mechanisms, including price guarantees for higher cost project activities, general guarantees, up-front financing, and de-risking approaches.

Other instruments for ambition raising are government credit acquisition funds (Michaelowa et al. 2019). The Australian Emissions Reduction Fund, for example, supports activities that generate envi-

ronmental, economic, social and cultural benefits for farmers, businesses, landowners, Aboriginal people and others. It provides incentives and opportunities for these actors by enabling them to generate Australian carbon credits (ACCUs) that can be sold to the Australian government or other companies that want to offset their emissions.[32]

Besides the above-mentioned options to raise ambition levels and increase demand, a major source of additional demand for tradeable emission reductions is expected from the emission reduction targets by the International Civil Aviation Organization (ICAO[33]) and potentially by the International Maritime Organization (IMO)[34]. However, the effectiveness of schemes like CORSIA depends on the ruleset concerning the accountability of emission reductions (as described in section 6.2A).

B. Design of Article 6.4 mechanism to support demand side factors (A.) and to facilitate private sector participation

National systems and capacities should be designed and supported in order to help host countries fulfil the higher requirements of the Paris Agreement. The burden for developing host countries under Article 6.4 can be reduced by delegating the issuance of emission reductions to the Article 6.4 supervisory body (similar to the Executive Board under the CDM). In addition to relieving host countries of administrative burdens, international issuance would also help to reduce the risk of non-issuance for private sector actors.

The definition of clear and unambiguous rules and standards is crucial for private actors to participate in carbon markets. Ambiguities of negotiations shouldn't be pushed down to project level rules and standards but should be defined on a market level. Further, risks related to uncertainties in baseline setting (e.g. by definition of methodologies or benchmarking), as well as length and renewal of crediting periods should be reduced wherever possible.

Private sector participation and demand for ITMOs can be supported by rules that allow for up-scaling of projects, (sub-)sector level crediting (such as sector wide or inter-branch agreements), and policy crediting (where useful). Further, digitization of MRV and distributed ledger technologies have the potential to generate efficiency gains and increase trust in registries and unit tracking (e.g. CLI 2018a).

C. Supply side: Host country investment readiness facilitating private sector action

Many countries already receive support for investment readiness (e.g. through the World Bank, development agencies, etc.). This support has to be continued and expanded under the Paris Agreement. Sound institutional and regulatory settings and transparency are crucial to increase investment readiness in host countries. Regarding the investment sectors, it is favourable to build on domestic strengths of a host country's specific market context. For this reason, host countries could be supported to develop strategy studies regarding Article 6 mechanisms, e.g. in combination with their LT-LEDS development (cf. Fuessler et al. 2019, pp. 47 ff).

6.4 Explorative analysis of selected options

The explorative analysis in this section concentrates on options related to the "Design of Article 6.4 mechanism" (B.) with a focus on three options:

- Design and support of national systems and capacities

[33] https://www.icao.int/environmental-protection/CORSIA/Pages/default.aspx
[34] https://carbonmarketwatch.org/our-work/aviation-emissions/shipping

- Reduce risks related to uncertainties through rules that allow for up-scaling of projects, (sub-) sector level crediting, and policy crediting
- Explore potential through digitization of MRV

The rationale for focusing on cluster B is that these are issues that are specific to the design of the Article 6.4 mechanism. By contrast, demand side issues are the same for all kinds of mechanisms and supply side issues are also mostly the same for all kinds of foreign direct investments.

6.4.1 Design and support of national systems and capacities

Private investors, generally, weigh risks and the expected yields of an investment in their investment decision. If they do not fit together, no investments are made. Specifically, international investments depend strongly on often complex and unpredictable national regulatory frameworks. This makes it difficult for investors to assess potentials and risks of an investment from an economic perspective. A major risk arises from potential ambiguities or changes of the regulatory framework. Governance mechanisms are therefore crucial to attract private investors (adapted from Ammermann 2015).

Under Article 6, host countries need a national institutional setting that allows them to decide whether they want to authorize international transfers of emission reductions or not. In order to take that decision, host countries need basic information on their emissions, their mitigation potential and on how they intend to meet their NDCs. Based on this, they have to define in which sectors and what kind of project types international transfers should be possible, and how many units could be transferred in order not to endanger meeting their own NDC target. National systems and capacities are also key to enable the private sector to be actively involved in carbon markets. The systems and capacities have to set a transparent and stable framework for the private sector to plan emission reduction projects, trade emission reductions, and calculate potential revenues. If host countries fail to properly define national systems, this uncertainty could lead to disinvolvement of the private sector. The following key aspects of national systems and capacities should be met by host countries to provide a stable and transparent environment for private sector participation under the Paris Agreement:

6.4.1.1 Host country transparency framework

The Paris Agreement lays down specific provisions for Parties about how to define and monitor the achievement of their national emission reduction targets. Parties shall develop NDCs (Art. 3 and Art. 4.2), communicate them (Art. 4.8), and Parties shall account for their NDCs (Art. 4.13). Further, Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies (LT-LEDS) (Art. 4.19). Information on implementation has to be made available as demanded under the enhanced transparency framework with the requirement for biennial reports (Art. 13). The corresponding national inventory reports (NIR) shall contain detailed information about all greenhouse gas emissions and removals (Art. 13.7(a)). Countries shall also provide information to track progress regarding the NDC targets (Art. 13.7(b)). The Capacity-building Initiative for Transparency (CBIT)[35] and other partnerships[36] support developing countries, for instance, to meet the enhanced transparency requirements of Article 13. While this framework helps host countries to fulfil their reporting duties under the Paris Agreement, they are also instrumental in enabling the host country to decide in a timely manner on the authorization of Article 6 activities of private sector participants.

The national emission reduction targets (e.g. NDC targets) should be laid down in national transparency frameworks. This is particularly important if host countries are participating in Article 6 mecha-

[35] https://www.cbitplatform.org/

[36] For example: Low Emission Development Strategies Global Partnership (LEDS GP): http://ledsgp.org/
Partnership on Transparency in the Paris Agreement: https://www.transparency-partnership.net/

nisms under the Paris Agreement. Robust accounting shall be applied, inter alia, to avoid double counting (Art. 6.2) and emission reductions resulting from article 6.4 mechanism shall not be used for the host country's NDCs if the emission reductions are used by another country to demonstrate NDC achievements (Art. 6.5). Countries need to determine and keep track of the share of emission reductions that are not needed to fulfil the NDC targets. Monitoring of their domestic development of emissions in total and in defined sectors is essential to ensure that the internationally tradeable crediting permits are not endangering the meeting of NDC targets. National transparency frameworks could, for instance, built up on a national GHG inventory and its monitoring system. This has to be matched with the NDC target path. Realized or expected overachievements of specific sectors could then be entitled to be internationally traded. While these activities primarily help the host country government in the fulfilment of their reporting duties under the Paris Agreement, they also form the basis for the design and definition of domestic rules for carbon markets and provide the transparency related basis for enabling the secure international transfer of mitigation outcomes. In countries that do not do their "transparency related homework", the implementation of private sector Article 6 activities may sooner or later run into barriers, e.g. if the international transfer to a acquiring country cannot be executed or is delayed, because the tracking and registry information is not available to assure corresponding adjustments, or a host country takes back its authorization of a transfer because the mitigation action is not visible in the national GHG inventory. The latter may be the case, if the host country's GHG inventory does not follow the level of detail ("tier") in the reporting methodology, as on which the actual mitigation action took place. For instance, if the national inventory calculates methane emissions from wastewater treatment based on population and default factors and does not take into account any methane recovery and utilization or destruction that may have been implemented on the ground (See Schneider et al. 2019).

6.4.1.2 Domestic rules for carbon markets

Building on the information from the transparency framework, domestic rules for participation in carbon markets as outlined in Article 6 of the Paris Agreement have to be defined by host country governments. This should include clear rules on which sectors and technologies, and under what circumstances mitigation actions are eligible to participate in carbon markets. For instance, such rules may define that a particular sector or technology is entitled to generate a certain amount of internationally tradeable emission reductions over the next x years. Host countries could define these "crediting windows" and auction a limited amount of total capacity of projects that can be entitled with internationally tradeable crediting permits (Schneider et al. 2017, p. 43). Applying an auctioning mechanism would also create benefits for the private sector. The transparent allocation of allowed tradeable emission reductions to specific sectors reduces uncertainties for private investors. It is important to private investors to know upfront how many units they are allowed to trade internationally in order to assure predictability of future revenue streams.

Countries with weaker governments will need assistance in defining and establishing these rules. Bilateral processes or partnerships are possible ways to foster this. The NDC Support Cluster[37], for instance, helps developing countries to implement their NDCs by providing guidance and advisory services on cross-cutting capacity building and knowledge management in the fields of political and institutional frameworks, sector approaches, financing, as well as data and transparency. Also, the World Bank's Partnership for Market Readiness (PMR[38]) supports potential host countries in designing and building domestic regulatory structures enabling its private sector in the participation in national and eventually international carbon markets.

[37] https://www.ndc-cluster.net/

[38] https://www.thepmr.org/

6.4.1.3 Authorizing body at national level

Market mechanisms under the Paris Agreement are voluntary (Art. 6.1). Countries have to authorize the use and transfer of emission reduction credits to other countries (Art. 6.3). Compared to the situation under the Kyoto Protocol, host countries have more responsibilities under the Paris Agreement, specifically under the voluntary cooperative approach under article 6.2. The use of internationally transferred mitigation outcomes (ITMOs) has to be authorized by participating countries (Art. 6.3). This implies the need for an authorizing body that defines allowances for ITMOs and keeps track of the NDC targets and the country's emissions development. Therefore, a country's authorizing body should regularly review the national and sectoral emission levels (Schneider et al. 2017, p. 43). The levels should be in line with the domestic emission reduction targets.

In the view of the private sector, authorization should happen through fast and transparent processes, based on clear and public criteria. Depending on the design of the domestic system for participation in Article 6 activities, the national authorizing body could in a first step authorize a specific Article 6 activity, checking the eligibility of the sector or technology and the status of the remaining contingents within a targeted crediting window. In a second step after implementation of the activity, the private sector entity reports the verified mitigation outcomes to the national authorization body. If all criteria are met, the mitigation outcomes will be authorized for international transfer and can be issued in a designated registry. Delays in and uncertainties about ITMO authorization should be avoided, as this has negative effects on the private sector participation.

6.4.1.4 Transparency and predictable revenues for private investors

The above-mentioned need for national systems, domestic carbon markets rules, and authorizing bodies are key elements of a transparent framework enabling private sector involvement. This is one of the most relevant factors to scale up private sector participation, as transparency and planning security are key elements for private investors (cf. Ammermann 2015). Thus, it is of particular importance in countries with weaker institutions and authorities to have predictable and transparent processes for authorization of Article 6 activities.

Efficient, transparent and predictable governmental authorities are even more important in aggregated level mitigation actions for international transfers, such as sectorial approaches or policy crediting. Here, revenues from international transfers would tend to go primarily to the government level or to overarching implementing bodies such as industry associations. In order to compensate the actors who are actually implementing the mitigation action on a lower level – the private sector – the government needs to find ways to trickle down the Article 6 revenues to the private sector players in a transparent way. In particular in countries with weaker governments and less trust in their ability to distribute revenues, this may be a major barrier to implement action on the ground.

The following section will discuss the potential of upscaling for private sector engagement in more detail.

6.4.2 Reducing private sector risks through up-scaling

6.4.2.1 Background

The debate on increasing the scale of crediting activities has a long track record and was mainly driven by the need for rapid reduction of global GHG emissions and the perceived shortcomings of the Clean Development Mechanism (CDM). Some of the expectations associated to up-scaled crediting approaches also relate to the goal to support private sector participation as critics have claimed that the process leading to the registration of individual projects and the issuance of credits is too cumbersome and costly. One important step in addressing these concerns was made with the introduction of the programmatic CDM. Building on a decision taken at the CMP 2005 in Bonn, where Parties had decided "that project activities under a programme of activities can be registered as a single clean development

mechanism project activity" (Decision 7/CMP.1 para 20), the CDM Executive Board approved the official templates for the design and implementation of PoAs at its thirty-six meeting in November 2007 (UNFCCC 2007). These allowed an unlimited number of component project activities (CPAs) to be registered under one single Programme of Activities (PoA) with a streamlined procedure for the inclusion of additional activities. While initial uptake of the programmatic CDM was slow (Kreibich, Arens, & Fechtner, 2011), the number of programs has increased steadily, also in Africa, a largely underrepresented region under the CDM (Kreibich, Hermwille, Warnecke, & Arens, 2017). Despite these achievements of the programmatic CDM, the debate on up-scaling continued, with the CDM Policy Dialogue also recommending to further increase the scale of the CDM (CDM Policy Dialogue, 2012). The debates on reforming the CDM finally fed into discussion on the design of future market mechanisms which are to become operational by 2020 under the Paris regime.

6.4.2.2 What are up-scaled crediting approaches?

Up-scaled crediting can be distinguished from project and programme based approaches through the following features (Broekhoff, Füssler, Klein, & Schneider, 2017):

- Baseline emissions are established collectively for a predefined group of greenhouse gas emission sources;
- Credits are issued based on aggregate reductions achieved across all GHG sources within this predefined group;
- GHG mitigation actions can be diverse and may be undertaken by multiple entities responding to incentives;
- Credits may be issued to a single entity responsible for establishing and implementing policies that foster emission reductions across all GHG sources targeted.

Up-scaled crediting can further be differentiated into sectoral crediting and policy-based crediting.

Under **policy-based crediting**, a host country is supported in its efforts to introduce and implement a national climate policy instrument by being provided financial assistance. In exchange of the support received the country exports (a portion of) the emission reductions achieved by the national climate policy. These emission reductions could then be used by another country for NDC attainment (offsetting), ambition raising or for complying with climate finance commitments. The mitigation outcomes transferred are contingent on the results of the specific policy. Policy crediting is also possible if the policy has already been introduced: In this case, the host country is assisted in its efforts to increase the ambition level of the policy concerned (Kreibich & Obergassel, 2018).

One key question for policy crediting is whether the supervisory body would be politically and technically able to judge the robustness of national policies. Policy crediting may therefore in many cases be most suitable for Article 6.2 rather than 6.4. Under Article 6.2, host Party government and investors may negotiate volumes of mitigation outcomes to be transferred. However, it may be possible for some policies to establish robust methodologies on how to demonstrate their additionality and determine mitigation outcomes. Crediting of such policies could be suitable for the Article 6.4 mechanism.

Sectoral crediting, by contrast, would be based on an agreed emissions threshold or a "no-lose target" at sectoral level. This threshold or target could be defined either in terms of absolute emissions or it could be intensity-based, for example in terms of emissions per unit of gross domestic product (GDP), emissions per unit of electricity generated, etc. The host country government could then undertake actions (i.e. implement policies) to reduce the emissions in the sector to (or below) the agreed level. If emissions are reduced below the target level, the host would receive credits (Sterk, 2010). Another possibility would be to allow private entities, such as industry associations, to assume this role. As outlined by Sterk et al. (2015), the main question here is whether private entities would be able to prevent a situation where some individual installations successfully reduce emissions but others do not and thus the sector as a whole does not. If installations that reduce emissions are at risk of not

being rewarded for their success because of the failures of others, the system would hardly provide an incentive to reduce emissions. Governments generally have more means at their disposal to enforce participation by all installations than private entities. Nonetheless, sectors that feature only few installations and/or are dominated by a publicly owned company may be able to arrange sufficient means to ensure compliance. Switzerland provides one example of a working private-led sector initiative. In 2008-2012, the Swiss cement industry successfully implemented a sectoral emission target. The distribution of the overall effort and the rules for the distribution of the related revenues depending on the installations performance had been agreed within the Swiss cement industry association beforehand.

Table 10 shows key features of market-based approaches and highlights the focus of this analysis.

Table 10 Key features of crediting approaches and focus of the analysis

►	Project-based credting	Programmatic crediting	Sectoral crediting	Policy crediting
Recipient of the credits	Project	Program	National government or other sectoral coordinator	National government
Role of host Party government	Approval	Approval	If scheme is coordinated by government: Baseline setting, Target setting, policy implementation and MRV ► If scheme is coordinated by private entity: Approval	Additionality demonstration, baseline setting, policy implementation and MRV

6.4.2.3 (How) can up-scaled crediting foster private sector participation?

Given the central role governments would have in policy crediting and sectoral crediting, one may ask what role private companies would play. In line with the other sections of this report, we will in the following focus on the role of the private sector as an investor and developer of the infrastructure needed for the implementation of mitigation activities by asking how can its participation be fostered through up-scaled crediting.

Aligning the crediting level with the actual incentive level

Experience under the CDM showed that ensuring the additionality of individual mitigation activities is challenging. An entire set of methodologies has been developed to assist project proponents in demonstrating that their project would not have been implemented without the existence of the CDM. And numerous processes were installed to ensure that the information provided by project developers is sound and allows for a final assessment of project additionality. Despite these measures, additionality is at least questionable for a comparatively high number of CDM projects. This means that there is a high probability that these projects would have been implemented also in the absence of the crediting mechanism. Non-additional projects are hence triggered by other framework conditions, including the following:

- Economic/financial: e.g. project implementation provides economic gains

- Legal: e.g. legal requirement to take action (e.g. increase energy efficiency) that (indirectly) leads to reduced emissions
- Cultural/social: e.g. intrinsic motivation to act on climate change

In this regard, domestic policy plays an important role, as it can influence framework conditions, in particular the economic and legal conditions which are key for implementing mitigation activities. Therefore, as discussed in section 6.2, many CDM projects have (at least partially and indirectly) been triggered by domestic policies, while the incentive provided by the international mechanism might have played a subordinate role. Policy crediting recognizes the key role policies can play by aligning crediting with the actual incentive level of many subnational mitigation activities. To safeguard environmental integrity and ensure that crediting contributes to ambition raising, these policies would have to be additional, for instance by going beyond what is required for NDC attainment. Under a policy crediting scenario, credits are issued when domestic policies are successful and incentivise the desired activities to be implemented. Under project-based crediting, by contrast, credits have been issued to projects that were implemented because policies where shown not to be in place or not to be successful.

Reducing the transaction costs of the private sector

The challenge with ensuring the additionality, or rather the causality of individual project activities is that the actual, real and known project development scenario is compared to a large number of unknown and hypothetical scenarios. The problem is further exacerbated by information asymmetry that gives advantages to the project proponent. The project proponents know their project, why it has been implemented and through which incentives it was triggered. The regulator, by contrast, does only have limited access to this information. This allows the project proponent to portray the project in a way that is in line with the regulatory provisions. This problem is inherent to crediting mechanisms and cannot be fully resolved. It can, however, be shifted to another level through up-scaling: Under a policy crediting scenario, it is the government of the jurisdiction that has to demonstrate that the policy is additional and would not have been implemented in the absence of Article 6. Similarly, the task of defining the baseline accrues to the government level.

The private sector benefits from these changes: It must no longer demonstrate the additionality of its project using complex methodologies and engaging auditors for the validation and verification of the project and its emission reductions but can focus on how to enrol its business taking into account relevant framework conditions, which are mainly driven by policies. This can be expected to lead to a reduction of transaction costs for the private sector.

Reduction of investment risks and regulatory uncertainty

Private sector benefits of policy-based crediting are not limited to a reduction of transaction costs. As discussed in chapter 6.2, under the CDM, regulatory uncertainties regarding how to effectively demonstrate additionality of projects or how to calculate emission reductions have led to considerable investment risks for the private sector. Furthermore, revenues from the sale of CERs have shown to be highly volatile. Under policy-based crediting approaches, these risks are transferred to the domestic policy level. Domestic policies may also change, but having them registered internationally as Article 6.4 activities may provide some safeguard against sudden changes. One key challenge of up-scaled approaches, however, is to ensure that the entities implementing the actual mitigation activities will actually be incentivised by these policies.

6.4.2.4 How must the Article 6.4 mechanism be designed in order to allow for and foster up-scaled crediting?

In order to increase the scale of mitigation activities under Article 6.4, one first step is to ensure that the provisions of the mechanism do not exclude such type of activities. In addition, up-scaled activities could further be fostered by adapting the provisions to specific requirements these activities have. This section therefore analyses different aspects of the Article 6.4 mechanism asking what is needed to allow for policy crediting and how such activities could be fostered.

Definitions

In order to allow for policy crediting under Article 6.4, the definitions of the rules, modalities and procedures must be sufficiently generic. Terms such as "project cycle" or "project proponent" would restrict the scope of possible mitigation activities and not allow for policy-crediting activities to take place. They should therefore be avoided and replaced by terms that are also applicable to up-scaled crediting such as "activity cycle" and "mitigation activity proponent". Further differentiation among the different types of activities (policy crediting, programmatic, project-based) would take place at the implementation level, for instance by establishing methodologies applicable to the specific types of activities.

Governance

The operation of the Article 6.4 mechanism entails numerous and diverse governance functions including the authorization and registration of activities, issuance of credits and the strategic review of the mechanism (Obergassel, 2018). All these governance functions of the Article 6.4 mechanism should be designed with policy-based mitigation activities in mind and by ensuring legitimacy of the actors involved. With the supervisory body of Article 6.4 being responsible for the registration (and rejection) of proposed mitigation activities and policies, this body must have high legitimacy. Legitimacy could be achieved through a composition of the Supervisory Body that ensures a sound representation of (different groups of) countries. Similar rationale should apply to the entities responsible for the validation and verification of policies: In order to allow private sector auditors to assess the success of a public policy as part of the verification process, their legitimacy must be ensured. This legitimacy could be ensured by adapting the accreditation process of auditors. Accreditation could therefore not only be based on technical requirements but also require acceptance from individual Parties and other stakeholders. To increase legitimacy, the acceptance of DOEs could be required for each policy individually with countries providing justification in case specific DOEs are excluded from the policy evaluation. Such an expanded accreditation process could be cumbersome and increase related transaction costs. However, if legitimacy of DOEs is not ensured, the risk of individual countries appealing against the validation and verification outcomes of DOEs increases, potentially resulting in even higher costs. Therefore, such an expanded accreditation process could increase the likelihood of individual Parties and other stakeholders accepting the outcome of evaluation processes.

Methodologies and procedures

Methodologies for additionality demonstration, baseline calculation and MRV must be made available also for policy-based approaches. To demonstrate additionality, for instance, Parties would have to show that the policy has clearly been triggered by the existence of the Article 6.4 mechanism and that no other framework conditions at the global or national level would have incentivised the adoption and implementation of this policy. While there are different approaches of how additionality of a policy could be demonstrated, ensuring additionality of policies can be considered to be very challenging. The introduction and implementation of climate policies is usually motivated by several policy objectives including a government's policy preferences and the country's political economy, making it ex-

tremely difficult to prove the additionality of a policy. One potential solution to this problem might be to explore input-based transfers where credits are issued on the basis of the funding provided. As long as the NDCs of the Parties involved are robust enough and their ambition levels sufficiently high, this could be a pragmatic approach in dealing with this problem (Kreibich & Obergassel, 2018).

Measures to support policy crediting

In addition to ensuring that policy-based crediting is not excluded from Article 6.4, the mechanism could actively support the role of up-scaled mitigation activities. Possible measures include top-down development of methodologies applicable to policy crediting and capacity building measures that support host Parties in developing policy-based crediting activities.

With up-scaled crediting assigning a key role to host countries, strong domestic capacities become a key prerequisite for the implementation of such activities. Limited technical capacities and political awareness could be a barrier to up-scaled crediting, in particular in developing countries. Capacities could be fostered by international level initiatives similar to the Regional Collaboration Centres (RCCs) under the UNFCCC, through multilateral organisations and initiatives such as World Bank's Partnership for Market Readiness or bilaterally. These activities could enhance the host country readiness to identify mitigation potential and develop measures to tap this potential in the context of Article 6.

6.4.3 Explore potential through digitization of MRV

An important barrier to private sector participation lies in the potentially high transaction costs for Measuring, Reporting and Verifying mitigation outcomes. Practicality, efficiency, and the high costs of today's MRV systems are major barriers for the private sector (see section 6.2B). Since the onset of Kyoto Flexible Mechanisms, about two decades ago, the potential of digital technology has evolved while the project cycle processes in crediting standards has largely remained "PDF-driven", with a lot of manual labour related to Project Design Documents (PDDs), validation, registration, monitoring reports, emission reduction calculations, issuance etc.

Many challenges and barriers related to MRV can be addressed and significantly reduced by the use of digital tools and processes. Digitization can particularly facilitate processes on the operational level. It can help to increase data quality, as well as the value of impact data (e.g. thanks to faster data processing, availability, and transparency, as well as the inclusion of information about other sustainable development impacts of a project). With a view to the three MRV elements and the subsequent issuance of units, digitization can have a vast range of positive effects (CLI 2018a, pp. 30 ff.).

As an example: data from an improved cookstoves project can be collected directly, using digital Stove Usage Monitors (SUMs). The automatically collected data, by the temperature loggers, is uploaded directly to a server. Typically, data about "heating events" had to be collected in user surveys which are much more time consuming and prone to errors. Impact quantification is based on the number and duration of heating events and thus can be calculated automatically, based on the project specific methodology. The following data verification can be automated to a large extent as well, since mainly the calibration of the monitoring devices needs to be checked, e.g., by using specific control algorithms and comparable datasets from similar projects.

The following areas along the project cycle may be considered for the use of increased levels of digitization to improve efficiency and automation of processes and reduce transaction costs for the private sector (CLI 2018a, pp. 32 ff.). For each area, we identify particular private sector needs and the potential for new digital technologies:

6.4.3.1 Data collection

Safe, secure, and reliable data capture and transfer are key elements of data collection associated with MRV of mitigation actions. Data collection tends to be particularly complex and costly for individual and dispersed mitigation action e.g. in sectors such as cook stoves, efficient appliances, transportation, but also in LULUCF. A particular issue poses the access to project data in remote areas.

Private sector needs: The private sector needs to trust in emission reduction projects and generated impacts. Improved data integrity is a benefit to monetize carbon reduction (and sustainable development) impacts in a trustworthy manner. Further, private project developers can specifically profit from efficiency gains, when data capturing, transfer and processing is automated. Reliable, fast, and simple data collection reduces barriers for private sector participation, as this is the first step to facilitate the process of monetizing emission reductions. Cost savings, however, depend vastly on the project type (e.g. regarding the scope and complexity of required data sampling) and on the available monitoring technologies (e.g. cost of required sensors).

Digitizing MRV potentials: Data coverage, accuracy and reliability can be improved drastically by using technology, such as sensors or mobile phones to capture data. Data collection and processing can be automated e.g. by using Internet of Things (IoT). The combination of remote sensing with new data processing approaches including artificial intelligence potentially allows for the automated monitoring of forest areas and land use patterns.

The new Blockchain[39] technology can contribute to secure data logging, by making the recorded data immutable. The Blockchain concept builds on two fundamental technological pillars: decentralization and cryptography. They set the basis that blockchains can claim to be immutable. Data is stored on all servers of a network using a blockchain (e.g. all participants in a carbon market) and is constantly monitored and validated. Cryptography creates "hashes" that can be seen as unique digital fingerprint of any imaginable set of data that is stored in "blocks". The last block (of a blockchain) always contains the whole transaction history of a network. Altering any of the information stored earlier (e.g. changing information about a completed transaction) would result in the distortion of the chain of blocks and consequently lead to the exclusion of the participant whose record is not matching the records of the rest of the network's participants. The unique information, containing the complete fingerprint of all transactions, in combination with the decentralized stored and constantly validated datasets ensures immutability and security of the technology (CLI 2018b).

However, depending on its design and consensus algorithm, the operation of Blockchains may lead to a very high power consumption. A well know example is the crypto-currency Bitcoin, which builds on a so called "prove of work" consensus algorithm, where participating nodes enter into a useless number-crunching competition each time a new block is to be generated in order to determine, which note will "mine" the block and get paid. However, there are other designs for Blockchains building on much less power consuming consensus mechanisms, such as the "proof of stake" (CLI 2018a, pp 83f).

On a practical level, automation and use of digital technologies reduces the need for manual interventions and with that the potential for human errors and forgery. This result in increased confidence in data, improved transparency of MRV, as well as in higher trust and integrity (CLI 2018a, pp. 32 ff.).

6.4.3.2 Impact quantification and reporting

Today, the calculation of emission reductions is often carried out manually, on the basis of simple spreadsheets. These processes are slow, costly and prone to introduce errors in the calculations and data sets.

[39] For the sake of simplicity, the common term „blockchain" is used as a placeholder for the much broader concept of distributed ledger technologies (DLT).

Private sector needs: Efforts to impact quantification and reporting should be as efficient as possible for project developers/owners. The more automated this process is and the quicker the impacts are quantified, the easier it is for project owners to set their projects into value. Required time and costs are potential barriers to private investors, as it reduces the revenues on generated emission reductions.

Digitizing MRV potentials: Instead of using complex spreadsheets, technology could enhance impact quantification and the reporting process, for instance, by using smart contracts (i.e. small programs on a blockchain that securely carry out certain calculations) and online applications linked to automated data capturing and processing. Automated impact calculation, based on collected data and pre-set methodological approaches, would improve reliability, increase efficiency of this process and foster trust in outcomes (CLI 2018a, pp. 32 ff.).

6.4.3.3 Verification

The verification process involves the review and checking of all data collected. Data is checked for integrity, accuracy, and methodology conformity.

Private sector needs: Project owners have to hire independent third-party verifiers to verify emission reductions (and potential sustainable development benefits) of their mitigation projects or programmes. This verification process is rather expensive and time consuming for the private sector.

Digitizing MRV potentials: Technologies like certified sensors and data transfer, smart contracts on blockchains could speed up and facilitate verification through real-time verification. Such systems allowing for automated quality assurance and quality control can be implemented by checking monitoring data for plausibility, consistency and outliers. Artificial intelligence can help to detect potential irregularities and areas of higher risk. Therewith, it becomes easier to spot where checks are needed, thus reducing the need for comprehensive and costly site visits. This could increase the efficiency of the verification process significantly (CLI 2018a, pp. 32 ff.).

6.4.3.4 Issuance of units to a registry

Under the Kyoto Protocol, while registries are operated by Annex-I-countries, one centralized platform, the International Transaction Log (ITL), serves as hub for emissions trading mechanisms[40]. The centralized ITL – operated by the UNFCCC Secretariat – is considered trustworthy and is seen as a generally successful system. The availability of an internationally operated CDM-registry that is independent from national institutions has been an important success factor for the CDM, as private sector could rely on issuance once emission reductions were verified.

Under the Paris Agreement, although a centralized Article 6.4 registry may be developed and a Central Accounting Database for corresponding adjustments is foreseen, the general reporting and transparency framework as well as the architecture of Article 6 mechanisms is more party-driven and decentralized than under the Kyoto protocol.

Private sector needs: In countries where there is a lack of trusted (international) registry for ITMOs, it is key for private sector that any bi- or multilateral registries are reliable, secure and trustworthy, so that project developers can count on the ability to transfer their mitigation assets and benefit from their monetization.

Digitizing MRV potentials: In this situation, technologies like registries building on blockchain or other distributed ledger technologies allow for trusted registry systems that are accepted by all stakeholders (CLI 2018a). The application of blockchain technology makes any changes immutable and allows for full transparency in tracking ITMO transactions. Two general options may be considered: Either the

[40] https://unfccc.int/process/the-kyoto-protocol/registry-systems/international-transaction-log

full registry would be stored in a blockchain (which currently faces challenges in terms of capacity and speed of blockchain systems), or the registry is implemented in a conventional database of which regularly a hash is generated (i.e. a kind of digital fingerprint of the entire status of the database) that is stored in an underlying blockchain.

Besides information on carbon assets, such registries may also contain attributes of sustainability impacts of the mitigation action, e.g. the quantification of indoor air quality benefits for efficient cook stoves. With the secure demonstration of sustainability impacts, private sector may gain higher revenues for their ITMOs from some market segments.

This kind of digital systems may also enable to link up with other registry systems and therefore allow for a linking of carbon markets beyond specific registry systems. This may require also the automated conversion of mitigation outcome units.

6.4.3.5 Overcoming barriers to scale – reducing transaction costs

Applying technology along the activity cycle steps of MRV and issuance helps to address current challenges in MRV and barriers to scale. Particularly, high transaction costs are hindering the private sector to be more involved. This can be addressed by digitization of MRV (as described above) and access to carbon markets (or other finance schemes) for the private sector can be facilitated (CLI 2018a, p. 13).

Another major hindering factor for the private sector is the uncertainty about returns on investments. Facilitated trade of emission reductions, e.g. also through tokenization[41] and new distribution channels for mitigation outcomes, can contribute to overcome this barrier. However, it is important to note that digital MRV and blockchain, while being important tools, are no silver bullet to solve all the existing issues regarding private sector involvement. Demand side factors, domestic rules, and design of carbon markets on an international level will be more relevant to foster private sector participation.

Digitizing MRV is only emerging and needs further research, development and field trials of approaches. Current issues range from technical aspects in data collection such as speed and lacking connectivity, to cost of monitoring equipment or needed capacities to train staff, interfaces for data reporting, adaptation of methodological approaches to digitization of MRV, to the need for strategies and harmonized implementation frameworks and governance for digital MRV (CLI 2018a, pp.37).

6.5 Summary and Conclusions

Private actors are key for the implementation of GHG emission reductions of the scale required by the Paris Agreements long-term temperature goal. The private sector is both, a large emitter of greenhouse gases and a provider of innovative solutions to address climate change. Furthermore, private sector investments can make an important contribution to mitigate climate change. These multiple functions have been recognized by Parties when adopting the Paris Agreement and its Article 6.4, which explicitly aims to incentivize and facilitate the participation in the mitigation of greenhouse gas emissions by private entities (Art. 6.4 (b)).

Under the Clean Development Mechanism (CDM), private sector actors had the opportunity to participate in a new and fast-growing market but faced numerous challenging investment barriers. Given the more heterogeneous architecture of the Paris Agreement and the stronger role (host) country governments have been granted under the new regime, it appears that private sector actors might even be confronted with more barriers, in particular in countries with weaker institutions and authorities (e.g. for obtaining the authorisation).

[41] Tokenization refers to a process of securitization. A blockchain token (or security token) represents a real tradable asset (Deloitte 2018).

Although this analysis focuses on factors and barriers related to the design of the emerging carbon markets under Article 6, it has to be acknowledged that host countries need general investment readiness in order to facilitate private sector action. Article 6 activities are not fundamentally different from any other foreign direct investment project. Therefore, they need, for instance, a sound institutional and regulatory setting, government transparency, and competitive tax environments. As long as the country's general investment readiness is not conducive, Article 6 rules may only improve private sector investments to a limited extent.

The present chapter highlights the importance of two key factors for private sector participation: the need for demand and the need for host country readiness:

Without higher ambition of acquiring countries and their willingness to purchase ITMOs, there will be only little trading on international carbon markets. The renewed interest in accelerated climate change mitigation action in some countries with the IPCC 1.5 degrees report and the emerging "Fridays for Future" initiatives may lead some acquiring countries (at least in the short term) to raise their ambition levels and consider the purchase of ITMOs at scale.

On the other hand, Parties to the Paris Agreement granted themselves a lot of sovereignty and bottom-up rulemaking compared to the earlier Kyoto scheme. This leads to a considerable amount of work for a potential host country, to be able to participate in Article 6 mechanisms, related to its transparency framework, the setting of domestic rules for carbon markets, and for the creation and operation of an authorizing body at national level. If host countries are not ready, there is a limited role for the private sector, because the lack of a national system leads to too many barriers and bottlenecks along the project cycle.

Scaling up market mechanisms may help to overcome some of the barriers and streamline the processes for private sector entities. However, this would require a stronger role of the regulator, which would need to be underpinned by adequate resources and institutions.

On a technical level, the digitization of Measuring, Reporting and Verification (MRV) has a high potential to make project cycle processes more efficient and reliable, thus reducing transaction costs and allowing private sector players to define profitable business models. New approaches to data acquisition and monitoring, including the use of sensors and internet of things, may enable the tracking of emission reductions of smaller and distributed sources. Further, the applications of artificial intelligence may allow for new monitoring approaches, e.g. in combination with remote sensing in LULUCF. The largest benefit from new digital technologies may lay in the applications of blockchain technology for trusted and immutable registry and unit tracking systems, in particular in the context of weaker governmental settings where trust in governmental databases may be limited.

In summary, upscaling and digitization may help to reduce barriers, but will not be the silver bullet to solve all issues related to the design and implementation of Article 6 market mechanisms. The key factors to successfully foster private sector involvement are increased international demand for high quality units by acquiring countries (units that require additional activities than what otherwise would have happened) and established domestic frameworks by host countries.

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

7.1 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 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 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-fuelled 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 side[42]. 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.

Another challenge was the question of additionality. Additionality of emission reductions is a key precondition 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 2009b, 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 N_2O, CH_4 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

[42] CDM and PoA Pipeline overview, http://www.cdmpipeline.org/cdm-projects-type.htm

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 favour 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 removed. 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.

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

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

7.2.1.1 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 7.2.1.3.)

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 7.2.1.4).

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 acquiring 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 7.2.1.5).

7.2.1.2 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 discus-

sions on banning certain technologies were triggered by the early dominance of HFC and adipic-acid N_2O 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.

7.2.1.3 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.

7.2.1.4 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"[43]. 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 industry[44]. 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.

7.2.1.5 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). A 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.

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

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

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.

7.2.1.6 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.

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

7.2.2.1 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)?

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

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.

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 7.2.2.3). 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 11 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 fuelling infrastructure (electricity, hydrogen, alternative fuels)	Road infrastructure including tunnels and bridges	New road, rail, waterway and port infrastructure for fossil fuel transport
	Non-motorised transport infrastructure (sidewalks and bike lanes, 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	

	Paris-Aligned	Conditional	Misaligned
	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

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 CO_2 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.

7.2.2.3 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:

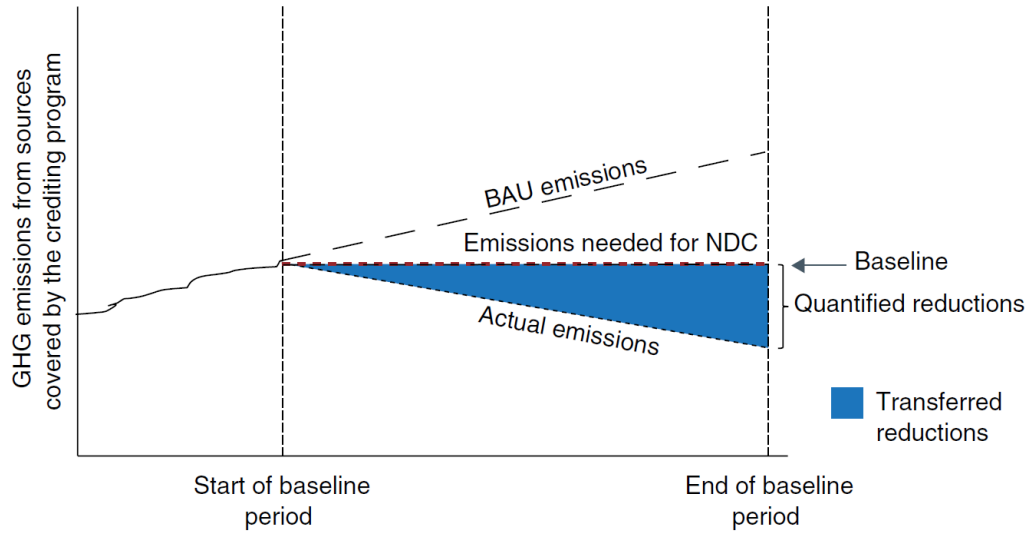
- Baselines in line with (ambitious) NDC targets
- Baselines defining a new long-term view
- Baselines with science-based targets

These three options are discussed in detail in the following.

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 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).

Figure 12 Example of a baseline derived from NDC targets



Source: Broekhoff et al. 2017

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 2019) this leads to lock-in (as described in section 7).

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 (CAT[45]) that provides independent research on countries ambition levels. In terms of market dynamics, as discussed in chapter 4 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.

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 0). However, there are several cases where the baseline cannot be set in line with NDC targets. The NDC target may not to 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

[45] https://climateactiontracker.org/

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 in[46]. 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.

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.

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.

7.2.2.4 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.

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

[46] E.g.: sciencebasedtargets.org

waste management, and low carbon cities[47]. 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 pathway 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 an 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 7.2.2.3. 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 CO_2e 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.

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,

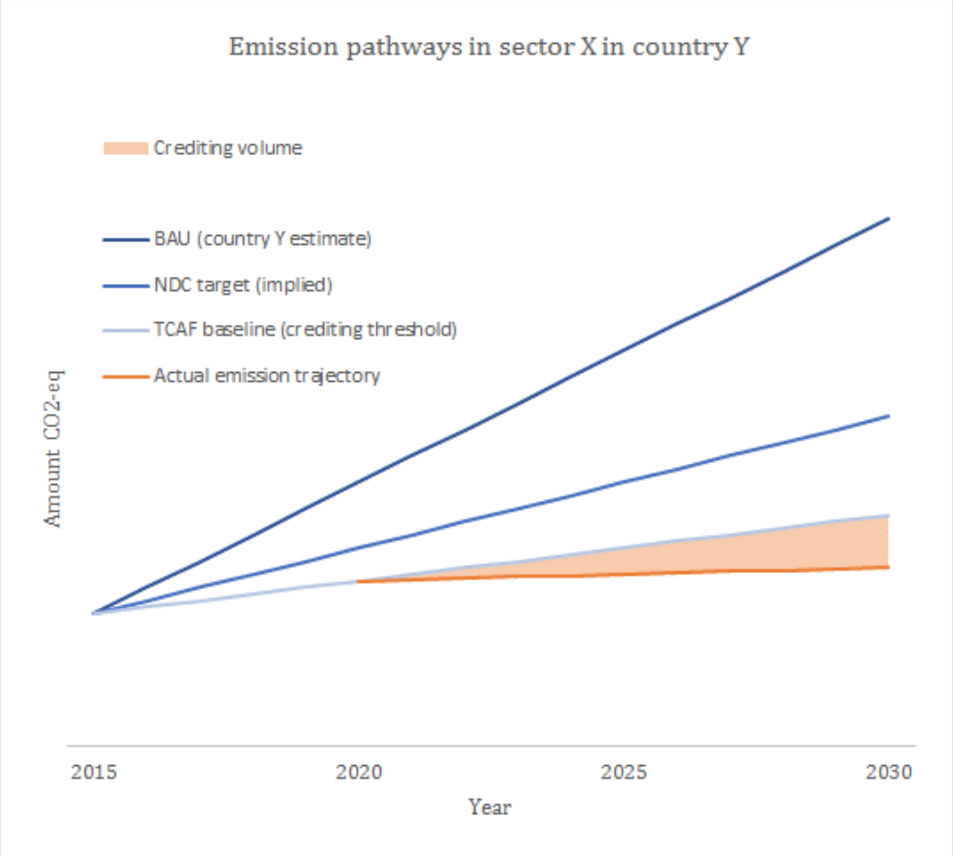
[47] https://www.worldbank.org/en/news/press-release/2015/11/30/new-500-million-initiative-to-boost-large-scale-climate-action-in-developing-countries

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.

Figure 13 TCAF baseline and crediting threshold



Source: own diagram based on World Bank (2018)

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 heterogeneous on the sub-level. 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 outcomes 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.

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 de-risk 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 2020[48].

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

[48] https://ec.europa.eu/clima/policies/innovation-fund_en

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.

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 7.2.2.2, 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 12.

Table 12 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	- Floating off-shore wind power plants - Next generation turbines
	Solar energy	- Concentrated solar power plants - Flexible organic cells - Floating photovoltaics installations - Hybrid photovoltaic, concentrating solar power and storage technologies
	Geothermal energy	- Enhanced geothermal systems
	Bioenergy	- Advanced biofuels
	Ocean energy	- Tidal and wave energy technologies
Energy storage	Energy storage	- 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)	- Full chain CCS projects - Part chain CCS projects, with secured storage contracts
Carbon capture and utilisation (CCU)	Carbon Capture and Utilisation	Capturing CO2 and other carbon containing gaseous effluents and converting them to useable fuels or products

Industry	Manufacture of coke and refined petroleum products	- Switching to low carbon hydrogen - Use of alternative sustainable feedstocks
	Manufacture of basic ferrous metals	- 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	- Low emission electrolysis - Inert anodes/wetted drained cathodes - Magnetic billet heating - Waste heat recovery
	Cement and concrete product manufacturing	- Less carbon cement - Low carbon cement - Changes in concrete composition
	Lime and gypsum product	- Increase of CO2 concentration e.g. by looping - Combination with oxygen-fuel process
	Glass and glass product manufacturing	- 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	- Electric furnaces and dryers - Design of non-fired or low-fired products - Other product innovations
	Manufacture of paper and paper products	- 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	- 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	- Production of low carbon hydrogen with renewable electricity or with CCS - Innovative low-carbon tyre production
Cross-cutting	Cross-cutting projects and industrial symbi-	- Any combination of the above - Carbon capture from several industrial plants, transport of CO2, utilisation and

	osis	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)

EU classification system for environmentally sustainable economic activities

To enhance sustainable finance, the EU Commission's Technical Expert Group (TEG) on sustainable finance published the first report on the EU classification system for environmentally sustainable economic activities ("EU Taxonomy") in June 2019 (EU TEG, 2019). This report came in course of the proposal COM(2018)353 that addresses the need for a unified EU classification system of sustainable economic activities. The political agreement on the EU Taxonomy between the European Parliament and the Council was endorsed on 18th December 2019. The resulting Directive will be implemented in future national-level regulations. 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 progressively complemented by December 2021 (transition to a circular economy, waste prevention and recycling, and pollution prevention and control) and by December 2022 (sustainable use and protection of water and marine resources and protection of healthy ecosystems). The first part of EU Taxonomy on climate mitigation and adaptation includes eight macro-sectors with corresponding economic activities that are considered to substantially contribute to the mitigation objective. Table 13 shows the macro-sectors and activities that are currently included in the EU Taxonomy.

Table 13 Macro-sectors and economic activities that contribute to the climate change mitigation objective, as selected by the TEG and outlined in the EU Taxonomy

► Macro-sector	Activities
Agriculture, forestry and fishing	Growing of perennial crops Growing of non-perennial crops Livestock production Afforestation Rehabilitation, Restoration Reforestation Existing forest management
Manufacturing	Manufacture of Low carbon technologies[49] Manufacture of Cement Manufacture of Aluminium

[49] The EU Taxonomy aims at supporting low-carbon technologies as well as energy-intensive and hard-to-abate sectors.

	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
Electricity, gas, steam and air conditioning supply	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	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 CO_2 Capture of Anthropogenic Emissions Transport of CO_2 Permanent Sequestration of captured CO_2
Transportation and storage	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	Data processing, hosting and related activities Data-driven solutions for GHG emissions reductions
Construction and real estate activities	Construction of new buildings Renovation of existing buildings Individual renovation measures, installation of renewables on-site 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 (underlying 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 CO_2/km thereafter. Production of electricity from gas combustion is included but only facilities operating at life cycle missions lower than 100g CO_2e/kWh while declining to 0g CO_2e/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.

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 channelled to have the most impact on sustainable development. The EU 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 EU 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 EU 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 EU Taxonomy to be successful it is necessary to ensure that it is dynamic and integrates all new advancements in green technologies.

7.3 Summary and 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 concepts 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 condi-

tional 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 7.2.2.2, 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.

8 Conclusions and Outlook

Article 6.4 of the Paris Agreement establishes a new mechanism “to contribute to the mitigation of greenhouse gas emissions and support sustainable development” (Art. 6.4(a)). However, the detailed rules, modalities and procedures for its implementation are yet to be decided. This report has analysed a number of key items that will need to be decided by Parties to operationalize the new mechanism.

8.1 Achieving Overall Mitigation of Global Emissions

Key innovations of the new mechanism are the objectives to promote ambition raising of Parties’ climate actions and to achieve an overall mitigation in global emissions. Thereby, the new mechanism is supposed to go beyond pure offsetting and promote the achievement of more mitigation than would be achieved in the absence of the mechanism. Such promotion is highly necessary as the current NDCs fall far short of the level of mitigation that is needed to achieve the objectives of the Paris Agreement.

However, Parties have so far neither agreed on definitions of the key terms overall mitigation and ambition raising, nor on how these objectives shall be implemented. Based on a discussion of relevant passages of the PA, this report proposed the following demarcation of terms:

- The concept of **raising ambition** encompasses Parties' targets *and* actions.
- The concept of **overall mitigation** applies to the net climate benefit of Article 6.4 activities resulting from the mechanism's design as such.

On this basis, the report surveyed which options for achieving overall mitigation have been discussed in the literature and in the negotiations. Of these options, cancellation, discounting, shortened crediting periods, and stringent baselines can contribute to overall mitigation according to this definition. All of these options will directly achieve an overall mitigation if the mitigation activity takes place outside the NDC boundary. By contrast, any mitigation outcome achieved within the boundary of an NDC will accrue to the host country unless the host country's NDC or emissions level are adjusted correspondingly.

The subsequent analysis of the options revealed that a key question is whether or not the options are applied equally to all types of activities, sectors, and geographical regions (differentiation). In principle, all of the options allow for differentiation, not only stringent baselines and shortened crediting periods but also cancellation and discounting. Such differentiation may boost the mechanisms effectiveness by providing opportunities for mitigating activities that would otherwise not be implemented, e.g. activities in disadvantaged sectors or geographical regions. However, it reduces the cost-effectiveness of the mechanism and complicates technical application. Furthermore, it may be very difficult to reach political agreement on specific activities or sectors to be favoured.

All of the four options discussed have clear advantages and disadvantages.

- **Cancellation and discounting** at issuance, transfer or use without differentiation are the most straightforward options to be implemented and applied.
- **Shortened crediting periods** have many advantages, including high transparency, relatively easy implementation and applicability, and a high potential for overall mitigation as well as backloading of reduced revenue which increases the positive impact on an activity's internal rate of returns when crediting periods are shortened at the end of a mitigating activity's life cycle. However, postponing the benefits to the atmosphere is a serious disadvantage of this option. In addition, installation operators have no incentive to continue monitoring and verification after the end of the crediting period. Monitoring and verification costs would therefore probably have to be covered from other sources, such as the revenue of the Supervisory Body. Shortening crediting periods at the start of a project would eliminate these problems but would seriously reduce the internal rate of return and thereby the economic viability of activities.
- **Stringent baselines** may be most useful where innovative technologies can be incentivised as this advantage could trump the high amount of work that would be needed to implement this option.

Ultimately, what option to choose depends on the weight given to the different criteria. If ease of implementation and applicability to all types of activities are a priority, cancellation and discounting without differentiation are clearly the most suitable options (see also Schneider et al. 2018). By contrast, if transparency and the option to favour particular types, sectors or geographical regions of mitigation activities are considered to be important, the most favourable options are differentiated crediting periods and stringent baselines.

In the current negotiations, there seems to be no full agreement yet on how a contribution to overall mitigation would be achieved. According to the last draft text from Madrid (UNFCCC 2019b) overall

mitigation would be achieved with the mechanism registry administrator transferring a percentage of the issued A6.4ERs to a cancellation account in the mechanism registry. If adopted, this provision would be in line with the definitions used in this report, according to which overall mitigation results from the mechanism's design and is of mandatory nature. Cancellation at issuance is also the most straightforward option identified. However, it remains to be seen whether Parties will in the end agree on this approach, since this option continued to be disputed among Parties and the SBSTA negotiations will also take into consideration the two previous draft text versions which were less clear on how overall mitigation is to be achieved. These versions also included alternative options such as the application of conservative baselines and voluntary cancellation of A6.4ERs (UNFCCC 2019c).

8.2 The Potential for the Use of Benchmarks in Article 6.4

The report subsequently explored to what extent benchmarks may be used for the establishment of baselines for Article 6.4 activities. Robust baselines are a key precondition for achieving the objectives of the Article 6.4 mechanism. The establishment of globally applicable and stringent benchmarks may be seen as an important instrument for scaling-up market mechanisms as benchmarks that are stringent enough lead to baselines that are automatically below both BAU and an emissions trajectory that is compliant with the host country achieving its NDC target.

The report identified different sources for benchmark data in the industry, energy generation, housing, transport and wastewater sectors. It defined criteria for good benchmarks and provided in-depth analysis of the feasibility of benchmarks in three case studies for cement clinker production, steel production and wastewater treatment. However, the analysis indicated only a limited potential for global benchmarks. There are some *quick wins* in the form of global benchmarks related to industry process emissions. Here, the CDM has established after long lasting discussion and strong criticism by NGO robust and stringent benchmarks for baseline setting e.g . in N_2O abatement in nitric acid or adipic acid production, or for abatement of HFC23 emissions in the production of refrigerants. It may also be assumed that with these high GWP gases, the revenues from the transfer of emission reductions may provide a significant contribution to overall profitability.

In addition, some other industries may be suitable for benchmarking, including cement or iron and steel. However, related emissions depend more strongly on local factors (such as quality of raw materials) and are more difficult to implement on a purely global level. Here, baseline setting with approaches of intermediary complexity may be possible, building on proposed or approved CDM methodologies and EU-ETS guidance for product benchmarks. In practice, however, expected carbon prices may not be on a level that would trigger additional action in these sectors.

A key concern is that the development of such benchmarks may open the door for loopholes and non-stringent values. In settings of weak governmental oversight, using benchmarks may be less adequate than conventional methodologies of baseline setting, where baselines are set based on project specific parameters that are validated by independent third parties.

Even though there are sub-sectors with large or medium potential for benchmarking, most emission sources cannot be covered by global benchmarks, because the goods and services are heterogenous (e.g. "shoes", "tonne-kilometers") and emissions tend to depend also on exogenous local factors. Benchmarking is therefore barely the silver bullet to solve the issues with crediting baseline setting under the Paris Agreement.

A way forward is to move from global benchmarks towards standardized approaches of baseline setting, where there is a large body of methodological approaches and reference values from ETS and the CDM (see further chapter 3.6) that can be used to define crediting baselines in a more efficient and robust way. Their use under Article 6 requires their further development including comprehensive data collection exercises that would allow for standardized approaches taking into account at least some regional, local or project specific factors.

The current negotiating text has no explicit reference to benchmarks. It includes generic requirements, such as that each methodology "shall require the selection of a transparent and conservative approach, assumptions, parameters, data sources and key factors" (UNFCCC 2019b, Annex, section V B, para 35). The text also provides for the development of standardised baselines to be established "at the highest possible level of aggregation in the relevant sector of the host Party" (UNFCCC 2019b, Annex, section V B), para 37). Benchmarks could meet these requirements, but the negotiation text makes no explicit reference to benchmarks. If adopted in its current form, the text would not provide clarity on whether use of benchmarks will be possible or not.

8.3 Ambition Raising

In the following section, the report explored options for promoting ambition raising under the new mechanism. In the current situation, a host country has no incentive to set ambitious targets because this may directly reduce the amount of mitigation outcomes that can be transferred internationally. In addition, if the mechanism allows crediting of activities that are beyond the scope of the NDC without requiring the host country to account for exported mitigation outcomes from such activities, there is no incentive for the host country to expand the scope of the NDC, because it would reduce the potential to obtain external funding. At the last COP in Madrid there was no agreement on Article 6 negotiations, but the Proposal by the President foresees corresponding adjustments also for transfers of mitigation outcomes beyond the scope of an NDC.

The report identified four lines of action to mitigate perverse incentives and foster NDC target ambition raising in host and acquiring countries in the context of article 6.4:

a) Strengthening reporting, transparency and comparability
b) Reconciling the design of the Art. 6.4 mechanism with ambition raising of host countries
c) Supporting the host country to raise ambition through the Article 6.4 mechanism
d) Fostering the acquiring country to raise ambition through the Article 6.4 mechanism

The first two lines of action may be implemented on different levels, depending on the level of international agreement with regard to the need to prevent perverse incentives from the use of the Article 6.4 mechanism. The following cascade may be considered:

- CMA/ rulebook level (international governance setting required)
- Supervisory Body for Article 6.4
- «Club» of likeminded parties
- Individual acquiring countries defining criteria for mitigation outcomes purchase

In order for the Article 6.4 mechanism to actually contribute to ambition raising, it would be important to have clear rules on the rulebook level or on the level of the supervisory body. Ideally, Article 6.4 could only be used by countries that have ambitious NDCs and that cannot only demonstrate this ambition but also report transparently about progress.

In December 2018 in Katowice, most of the rules necessary to operationalize the Paris Agreement were adopted, but without Article 6. Parties could not find an agreement and neither could they one year later at the COP in Madrid. This means that many issues on the first line of action (a) have been clarified. Nevertheless, the outcome needs further analysis and some issues remain unclear, including issues on e.g. reporting related to Article 6. The second line of action (b) will be further negotiated on the CMA level, but these negotiations may turn out to be challenging. The task of reconciling the use of Article 6.4 with the need for progress in NDC target levels and scope may be handed down to the Article 6.4 supervisory body who may put in place rules under Article 6 such as the limitation of crediting periods as well as the definition of criteria for the participation of host countries in Article 6.4 activities (b).

Supporting host countries in raising ambition (c) is a role that many (potential) acquiring countries and multilateral institutions have historically carried out already in the Kyoto periods and will probably continue to do so under the Paris Agreement. The need for support is strengthened by the additional requirements for host countries in terms of planning their mitigation actions on a national level and demonstrating how to reconcile ambition raising in NDC target with the use of Article 6.4 over time.

Finally, ambition raising on the side of the acquiring country (d) is key to achieve the targets of the Paris Agreement and will mainly be achieved by acquiring countries implementing it individually or as part of a "club".

8.4 The Potential Role of the Voluntary Market in Ambition Raising

The report subsequently explored the future role of the voluntary carbon market and its potential contribution to ambition raising. The expansion of GHG emission regulation across the world and the requirements for market-based cooperation under the Paris Agreement to contribute to ambition raising constitute strong challenges for the future operation of the voluntary market. In light of these challenges, the market may maintain its current role of buyer of carbon neutrality credits, it may become a supporter of NDC implementation, or it may become a driver of ambition.

The findings indicate that the current role of the voluntary investor as a buyer of carbon neutrality credits will be impacted significantly by the changes introduced with the Paris Agreement as the "uncapped environment" will be limited in the future. The potential of the voluntary market to continue performing this role will largely depend on the requirements for host Parties to account for exported mitigation outcomes. Despite these challenges, the continuation of the carbon neutrality model can be considered the most promising future role for the voluntary market: It can build on a well-established market with clear demand from voluntary investors. If carbon neutrality credits are generated within the scope of ambitious NDCs and accounted for by a robust accounting approach that uses the NDC as its point of reference, this model holds significant potential to assist Parties in increasing their ambition. This also holds for carbon neutrality credits generated outside the scope of NDCs, if it is ensured that activities are truly additional.

The role of the voluntary investor as a facilitator of NDC implementation is increasingly being endorsed by carbon market participants as a complement of the current offset-based model. However, this role does not only require the development of a new product but there are also some environmental risks associated to its use if the underlying NDC lacks ambition. In case of a considerable demand for such products and a respective market volume, host countries may even be incentivised to reduce their own efforts in NDC implementation. This approach should therefore be carefully explored further in order to find solutions in addressing the major concerns.

The role of the voluntary investor as a contributor to ambition raising through investing in ambition raising units turned out to be the role with the lowest overall potential. While this role could lead to a direct ambition raising impact it suffers from the fact that it requires both, the creation of a new commodity and the need to implement corresponding adjustments.

With regard to the future of private certification standards, three options were identified: Private standards could function as mere providers of methodologies and innovative approaches to be used by the Article 6.4 mechanism, they could be used as standards under Article 6.2, or they could be applied outside of Article 6. Each of these options is associated with specific challenges, of which the assessment of additionality and dealing with double claiming are particularly relevant. The analysis found that the integration of voluntary standards into Article 6.2 can be expected to be the most promising option. Here, the entire architecture of the voluntary standards could be used together with the experiences and knowledge in terms of MRV and additionality demonstration while accounting would accrue to the international accounting framework under Article 6.2. Implementation of activities outside

of Article 6 (and therefore outside of the Paris Agreement), in contrast, seems to provide no added value in comparison with their application under Article 6.2 while raising additional questions regarding issues such as the implementation of accounting measures.

The findings indicate that the voluntary market has potential to contribute to ambition raising. Whether this potential will actually be unlocked, however, will depend on how the concept of ambition raising will be operationalized under the Paris Agreement. Currently, however, the definition of ambition raising, let alone its operationalization, is not one of the key topics of the negotiations under the UNFCCC. Another determinant will be the voluntary market's ability in transitioning from the current carbon neutrality-based model to new approaches that take into account the new framework conditions established with the Paris Agreement. Negotiators under the UNFCCC are currently in the process of translating these framework conditions into provisions in order to make the Paris Agreement and its Article 6 operational. Some of these provisions could be relevant for the future involvement of the voluntary carbon market: paragraph 58 of the draft RMPs, for instance, envisages the voluntary cancellation of emission reductions at the request of activity participants, while para 71 provides the basis for the application of corresponding adjustments if emission reductions are used for "other international mitigation purposes" (UNFCCC 2019b, Annex, para 71). The latter paragraph establishes a link to the modalities, procedures and guidelines of the Transparency Framework adopted in 2018 in Katowice where Parties had agreed that "use of mitigation outcomes for international mitigation purposes" (UNFCCC 2018, para 77 d)) will have to adhere to the same rules as the use of MOs against NDC attainment. While this is primarily understood as referring to the use of mitigation outcomes under CORSIA and other future mandatory mitigation schemes, it could also be seen as an indication that "unilateral adjustments" could be implemented in the context of voluntary carbon market activities. However, it remains to be seen whether these provisions will be adopted and how they will be operationalized. This process will take time and its outcome cannot be expected to answer all questions that are relevant to the current operations of the voluntary market and its future role. When being confronted with such governance gaps, the voluntary market should take a progressive stance by advocating for robust solutions that enhance mitigation ambition and safeguard the environmental integrity of the Paris regime. With this, the voluntary market can live up to its role as an innovator and developer of solutions that could at a later stage be translated into compliance market activities under Paris.

8.5 Participation Incentives for Private Actors

The new mechanism explicitly aims to incentivize and facilitate the participation in the mitigation of greenhouse gas emissions by private entities (Art. 6.4 (b)). However, private actors faced numerous investment barriers under the CDM and challenges may be even larger under Article 6 given the more heterogeneous architecture of the Paris Agreement and the stronger role (host) country governments have been granted under the new regime.

The report highlighted the importance of two key factors for private sector participation: the need for demand and the need for host country readiness. Without higher ambition of acquiring countries and their willingness to purchase ITMOs, there will be only little trading on international carbon markets. At the same time, host countries need general investment readiness in order to facilitate private sector action. As long as the country's general investment readiness is not conducive, Article 6 rules may only improve private sector investments to a limited extent.

Depending on the final outcome, they may even create more challenges. Parties to the Paris Agreement granted themselves a lot of sovereignty and bottom-up rulemaking compared to the earlier Kyoto scheme. This leads to a considerable amount of work for a potential host country, to be able to participate in Article 6 mechanisms, related to its transparency framework, the setting of domestic rules for carbon markets, and for the creation and operation of an authorizing body at national level.

Scaling up market mechanisms may help to overcome some of the barriers and streamline the processes for private sector entities as much of the planning work and accounting would be done by the activity co-ordinator. However, this would require a stronger role of the regulator, which would need to be underpinned by adequate resources and institutions. In the current negotiations, however, up-scaling seems to play a limited role. The last draft text from Madrid does not contain an explicit reference to up-scaled activities. At the same time, it does not limit the scope of Article 6.4 to projects and programmes by giving the Supervisory Body a mandate to also approve other types of activities (UNFCCC 2019b, para 31b). There are some areas, however, that are not fully compatible with policy-based or sectoral crediting, such as the governance structure that would allow host Parties to register Art. 6.4 activities (UNFCCC 2019b, Annex, para 27c). This may raise concerns about conflicts of interest if the host Party government is directly involved in the respective activity. When further elaborating the Article 6.4 rulebook, policy makers should address these and other areas that lack compatibility with policy-based or sectoral crediting and take the specific needs of up-scaled crediting activities into account.

On a technical level, the digitization of MRV has a high potential to make project cycle processes more efficient and reliable, thus reducing transaction costs and allowing private sector players to define profitable business models.

8.6 Towards Net-Zero Emissions

In the final step, the report explored how the new mechanism may contribute to achieving the objective of the PA to reach global net-zero GHG emissions in the second half of the 21st century. Building this objective into the mechanism requires to shift the focus from short- and mid-term considerations to the long-term perspective in one way or another. The report 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, establishment of baselines that are consistent with both, NDCs and long-term targets, and the establishment of additional funding criteria.

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. 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. 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, positive and negative lists will face high political barriers and are therefore more likely to be established as buying criteria by individual buyers. 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, as 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 the ongoing negotiations, for instance, there seems to be little appetite among Parties for the introduction of negative or positive lists for Article 6.4 activities, as this is not one of the major topics of the Article 6.4 negotiations. While this clearly limits the potential for this option to be operationalized, other approaches seem more promising: The last draft text from the Madrid conference requires host Parties to ensure that their participation does not only contribute to the implementation of their NDC but also to their long-term low GHG emission development strategy, if they have adopted one (UNFCCC 2019b, para 28b). Moreover, any mechanism methodology, including baseline setting and additionality principles, needs to be approved by the Supervisory Body (UNFCCC 2019b, para 34) and should also take into account the long-term low GHG emission development strategy of the host Party as well as the long-term goal of the Paris Agreement, according to the draft text (UNFCCC 2019b, para 35). These requirements could be a starting point for strengthening the linkage between short-term use of Article 6.4 and its long-term effects. Even if adopted at the international level, such an approach might however be insufficient to fully align Article 6.4 with the long-term requirements of the Paris Agreement. In this context, 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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10 Annex

Table 14 List of interviews conducted

Interview	Date	Category
Interview 1	26 September 2018	**Voluntary Carbon Credit Suppliers** - Organisation involved in the development and implementation of voluntary projects as well as those acting as intermediaries between project developers and credit consumers.
Interview 2	04 October 2018	**Voluntary Carbon Credit Suppliers -** Organisation involved in the development and implementation of voluntary projects as well as those acting as intermediaries between project developers and credit consumers.
Interview 3	09 October 2018	**Voluntary Carbon Credit Suppliers** -Organisation involved in the development and implementation of voluntary projects as well as those acting as intermediaries between project developers and credit consumers.
Interview 4	10 October 2018	**Lobby Organisation** - Organisation representing the views from voluntary market participants.
Interview 5	15 October 2018	**Private Certification Standard** - Organisation providing a private standard used for voluntary mitigation activities.
Interview 6	08 November 2018	**Private Certification Standard** - Organisation providing a private standard used for voluntary mitigation activities.