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Reaching Net-Zero through International Carbon Markets

A Qualitative Analysis of the Potential Impact of Article 6 in the Paris Agreement

BY
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A thesis submitted for the Joint Master's degree in Global Economic Governance & Public Affairs (GEGPA)

Academic year
2021 – 2022

July 2022

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Abstract

International carbon markets have been the subject of substantial criticism in the last decade. At the same time, they have been presented by some as a key instrument to cost-effectively reduce GHG emissions and increase climate ambition. At COP26 in November 2021, countries agreed on a rulebook for a new regime of international carbon markets under Article 6 of the Paris Agreement. With these new rules in place, this study provides an initial qualitative assessment of how Article 6 might contribute to reaching net-zero.

Utilizing the EIMSA framework, data from semi-structured interviews with carbon market experts is analyzed through the perspectives of environmental integrity, market size and ambition. Results indicate that Article 6 will have a marginal positive effect on global emissions if environmental integrity is safeguarded, cost-savings are reinvested into mitigation, and removals are adequately accounted for. However, with the transition of CDM credits, low institutional readiness among host countries and limited projected demand, the market may see a slow start. Over time, Article 6 is expected to play a more prominent role as the world converge towards net-zero. Finally, key recommendations and suggested areas for further research is provided.

Keywords: carbon markets, carbon trading, Article 6, ITMOs, environmental integrity, climate ambition, cooperative approaches, net-zero, Paris Agreement, NDCs

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List of Acronyms

A6	Article 6
A6.2	Article 6.2
A6.4ERs	Article 6.4 Emission Reductions
A6.4M	Article 6.4 Mechanism
ADB	Asian Development Bank
BAU	Business as Usual
BECCS	Bioenergy with Carbon Capture and Storage
CA	Corresponding Adjustments
CBDR	Common But Differentiated Responsibilities
CCS	Carbon Capture and Storage
CDR	Carbon Dioxide Removal
CER	Certified Emissions Reductions
COP	Conference of the Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CDM	Clean Development Mechanism
DAC	Direct Air Capture
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
ECRST	European Roundtable on Climate Change & Sustainable Transition
EIMSA	Environmental Integrity, Market Size and Ambition
ERU	Emission Reduction Unit
ET	Emissions Trading
ETS	Emissions Trading System
EU	European Union
FDI	Foreign Direct Investment
GGGI	Global Green Growth Institute
GHG	Greenhouse Gas
IEA	International Energy Agency
IETA	International Emissions Trading Association
IPCC	Intergovernmental Panel on Climate Change
ITMO	Internationally Transferred Mitigation Outcome
JCM	Joint Crediting Mechanism

JI	Joint Implementation
lCER	Long-term Certified Emissions Reductions
LDC	Least Developed Countries
LT-LEDS	Long-term Low Emissions and Development Strategy
MAC	Marginal Abatement Cost
MRV	Monitoring, Reporting and Verification
NbS	Nature-based Solutions
NETs	Negative Emissions Technologies
NDC	Nationally Determined Contribution
NGO	Non-Governmental Organization
OECD	Organization for Economic Co-operation and Development
OMGE	Overall Mitigation in Global Emissions
PDD	Project Design Document
SB	Supervisory Body (of the A6.4M)
SBSTA	Subsidiary Body for Scientific and Technological Advice
SoP	Share of Proceeds
tCER	Temporary Certified Emissions Reductions
tCO2e	Tonnes of Carbon Dioxide Equivalent
TERI	The Energy and Resources Institute
RBCF	Results-based Climate Finance
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
VCM	Voluntary Carbon Market
VCS	Verified Carbon Standard
WB	World Bank
$	United States dollar

Introduction

Climate change is one of the greatest threats facing our time. Due to the burning of fossil fuels and land-use change, the concentration of greenhouse gases (GHG) in the atmosphere has increased dramatically since the Industrial Revolution. Only in the last few decades since 1990, net GHG emissions have increased by more than 50%, amounting to 59 GtCO2e in 2019.[1]

As a consequence, the global average temperature has soared by approximately 1.1 degrees Celsius compared to pre-industrial levels, with ramifications to the entire planet's climate system. Impacts are already felt across the world, with an increasing frequency of extreme weather events, natural disasters, droughts, and floodings, exacerbating conflicts, poverty, food insecurity, leading to climate-induced migration and hindering human development.[2]

The Paris Agreement adopted in 2015 aims to limit global warming well below 2°C and pursue efforts to limit temperature increase below 1.5°C, to avoid the worst consequences of climate change. To reach the 1.5°C target, emissions would need to decline by half from 2010 until 2030 and reach net-zero by 2050. Yet, countries' self-determined climate targets (NDCs) are still highly insufficient to achieve this goal. In the latest assessment by the United Nations Framework Convention on Climate Change (UNFCCC), net GHG emissions will be 16.3% higher in 2030 compared to 2010 levels if all parties (to the Paris Agreement) achieve their latest NDCs.[3]

This highlights an obvious emissions gap and an urgent need to increase ambition in global mitigation efforts. One proposed mechanism to facilitate this is cooperative implementation through international carbon markets. Since it does not matter where GHG emissions are reduced, trading emission reduction certificates between parties can ideally help deliver mitigation where it is least costly.

After emerging as a concept in the 1980s, the Kyoto Protocol later introduced three such market-based *flexible mechanisms* to help parties cost-effectively reach their targets, encourage private sector investments, and contribute to technology transfer, capacity building and

[1] IPCC AR6 WGIII, "Climate Change 2022: Mitigation of Climate Change" (Working Group III contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, n.d.), https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_FullReport.pdf.
[2] IPCC AR6 WGIII.
[3] United Nations Framework Convention on Climate Change (UNFCCC), "Nationally Determined Contributions under the Paris Agreement: Synthesis Report by the Secretariat" (The United Nations Framework Convention on Climate Change, September 17, 2021).

sustainable development in developing country parties.[4] Together, the Clean Development Mechanism (CDM), Joint Implementation (JI) and Emissions Trading (ET) schemes have seen significant activity, with the CDM registering more than 7,800 project activities, issuing over two billion tonnes of Certified Emissions Reductions (CERs) and mobilizing over $400 billion in private and public investments.[5]

At the same time, criticism has been raised that the CDM provided perverse incentives for less ambitious climate mitigation efforts, shifted responsibilities between countries, undermined environmental integrity, disregarded human rights concerns, and ultimately led to an overall increase in global emissions.[6,7] Still, the theoretical underpinnings for international carbon markets remained strong, and when parties adopted the Paris Agreement in 2015, they did so with several new pathways for cooperative implementation under Article 6. These include a framework for bilateral cooperation under Article 6.2, a new centralized carbon market mechanism under Article 6.4 and various non-market approaches under Article 6.8. Although the general provisions for these new mechanisms were included in the Paris Agreement, it took parties almost six years of negotiations to reach an agreement on the complete rules and modalities for Article 6 at the 26th Conference of the Parties (COP26) in Glasgow, November 2021.[8]

With the rulebook finally in place, there is now a growing interest from countries, corporations, academia, and other non-party stakeholders in how Article 6 will impact global mitigation efforts. While several preliminary studies were published on the options for potential rules and modalities before COP26 (e.g. Figueres & Streck, 2009; Michaelowa et. al., 2019; Blum, 2020; Re & Ellis, 2021), hardly any research has been published after the final agreement in Glasgow last year. In addition, most studies have been narrowly focused either on the environmental integrity (Schneider et al., 2017; Spalding-Fecher et al., 2021; the World Bank, 2021), the

[4] Richard G Newell, William A Pizer, and Daniel Raimi, "Carbon Markets: Past, Present, and Future" (RFF DP 12-51, 2012), https://media.rff.org/archive/files/sharepoint/WorkImages/Download/RFF-DP-12-51.pdf.
[5] "Meeting Report: CDM Executive Board 113th Meeting (Version 01.0)" (United Nations Framework Convention on Climate Change (UNFCCC), March 2022), https://cdm.unfccc.int/filestorage/Y/B/D/YBDUM5V13J4ILKEF2N7PHR9W08XTZ6/eb113_meeting_report.pdf?t=ZEp8cmNjMHRwfDAvXjBfyJgXkh9oC4iICZBg.
[6] Dr Martin Cames et al., "How Additional Is the Clean Development Mechanism? Analysis of the Application of Current Tools and Proposed Alternatives," *Berlin*, March 2016, https://ec.europa.eu/clima/system/files/2017-04/clean_dev_mechanism_en.pdf.
[7] Theuer et. al., "International Transfers under Article 6 in the Context of Diverse Ambition of NDCs Environmental Integrity Risks and Options to Address Them," SEI: Stockholm Environment Institute, Working Paper No. 2017-10 (2017), https://www.sei.org/wp-content/uploads/2017/11/sei-2017-wp-international-transfers.pdf.
[8] United Nations Framework Convention on Climate Change (UNFCCC), "Report of the Conference of the Parties Serving as the Meeting of the Parties to the Paris Agreement on Its Third Session, Held in Glasgow from 31 October to 13 November 2021," 2022, https://unfccc.int/sites/default/files/resource/cma2021_10_add1_adv.pdf#page=11.

economic opportunities (Edmonds et al., 2019; Yu et al., 2021) or the potential of raising ambition through Article 6 (Fuessler et al., 2019; Warnecke et al., 2018; Mikolajczyk & t'Gilde, 2020), with few papers undertaking more holistic assessments. Similarly, most economic modelling studies have employed idealized scenarios, without taking parties' political considerations and their willingness to engage with market mechanisms into consideration.

Research Question

Based on the research gaps identified in literature, the aim of this thesis is to provide a holistic analysis of the possible impact of Article 6 on global mitigation efforts. Consequently, it aims to answer the following research question:

> **What is the potential impact of Article 6 of the Paris Agreement on global mitigation efforts to reach net-zero GHG emissions by mid-century?**

To analyze this impact in more depth, a theoretical framework has been developed based on the extensive literature review and data gathered from experts, assessing the environmental integrity, size, and potential of Article 6 to increase ambition. Accordingly, the following sub-questions have been raised:

1. How will cooperative implementation under Article 6 ensure environmental integrity?
2. What is the expected potential market size of Article 6 mechanisms?
3. How can Article 6 facilitate increased ambition in global mitigation efforts?

To respond to these questions, a qualitative, semi-structured interview study have been undertaken with a diverse sample of carbon market experts working on Article 6. In the following chapters, their perspectives are analyzed through a theoretical framework and contrasted by findings from the literature, to provide a holistic assessment of the potential of Article 6 on reaching global net-zero targets.

As the framework established under Article 6.8 of the Paris Agreement explicitly deals with various non-market approaches, this is not explored further in the limited scope of this thesis. When referring to Article 6 in the following chapters of this paper, it is therefore with regards to the market-based mechanisms established under Article 6.2 and Article 6.4, unless otherwise stated.

Methodology

The following chapter will present the qualitative research design, literature review and semi-structured interviews conducted to provide an answer to the stated research question.

Research Design

Given that the Article 6 rulebook was recently adopted, with several concepts still under deliberation, this thesis has embarked on a path of exploratory research to provide initial insights into the new carbon market mechanisms under the Paris Agreement.

Rather than testing existing hypotheses, this formulative study aims to bring forward new hypotheses and scenarios for the future of the Article 6 market, that can later be tested using formalized empirical studies.[9] Whereas a quantitative study could have been used to provide more compelling numerical evidence to confirm or disprove existing theory, this study aims to explore new concepts with little quantitative data available, which is why a qualitative approach was considered the better choice.[10]

Being a formulative study, flexibility was built into the research design from the outset as to let concepts, theories and methods be informed by the gathering of data.[11] As new relevant patterns and insights emerged, the research design was appropriately revised as to include the wide range of perspectives collected. Following an inductive, analytical research approach, the empirical data gathered through interviews and observations have been integral in shaping the theoretical framework. The following steps were followed:

1. The review of existing literature
2. Development of the theoretical framework
3. Interviews and data gathering
4. Adjustments and updates to the theoretical framework
5. Data analysis

[9] C.R. Kothari, *Research Methodology: Methods and Techniques* (New Delhi, India: New Age International Limited Publishers, 2004).
[10] Alan Bryman, *Social Research Methods*, 4th Edition (Oxford University Press, 2012), https://www.academia.edu/38228560/Alan_Bryman_Social_Research_Methods_4th_Edition_Oxford_University_Press_2012_pdf.
[11] Kothari, *Research Methodology: Methods and Techniques*.

Firstly, a comprehensive review of existing literature on global carbon markets, particularly regarding evidence from the CDM under the Kyoto Protocol, was undertaken. This comprehensive review of books, quantitative and qualitative research studies on historical and theoretical aspects of carbon markets helped formulate the research question of the study, inform the data gathering process and shape the theoretical framework. Following this, several semi-structured interviews with experts and practitioners was conducted, which is explained in more depth in the section below. As many qualitative studies, the theoretical framework as point of departure was then readjusted as data was collected.[12] Based on the information gathered, concepts were sorted and analyzed through the theoretical framework, as to provide answers to the stated research questions. By letting theoretical ideas derive from interesting discoveries parallel to the data collection, former theories were questioned, explored and new hypotheses could evolve.[13] This research design was desirable since it allowed the study to focus, elaborate and analyze the empirical data collected, without actively looking for information to fit it into any preconceived theoretical frameworks.

Literature Review

At the outset of the research, a comprehensive literature review was conducted of previous studies and literature in the field, including both printed and digital sources. By using search terms such as '*carbon markets*', '*Clean Development Mechanism*', '*CDM*' and '*Article 6*' in various online databases, such as Google Scholar, Elsevier and JSTOR, a large volume of literature was found. To further deepen the review, a backward snowballing technique was utilized, looking at the reference list of academic papers to identify additional relevant sources.[14]

Whilst these sources provided an in-depth review of carbon market principles and historic examples, mainly relating to the CDM under the Kyoto Protocol, few academic publications were discovered regarding Article 6 of the Paris Agreement. This was an expected result, considering that the rulebook was agreed to less than a year ago, leaving little time for scholars to elaborate. For this reason, different thought-leaders in the field of global carbon markets, who

[12] Bryman, *Social Research Methods*.
[13] Bryman.
[14] Claes Wohlin, "Guidelines for Snowballing in Systematic Literature Studies and a Replication in Software Engineering," in *Proceedings of the 18th International Conference on Evaluation and Assessment in Software Engineering - EASE '14* (the 18th International Conference, London, England, United Kingdom: ACM Press, 2014), 1–10, https://doi.org/10.1145/2601248.2601268.

are the first ones that have published initial assessments and white papers, so called *gray literature*, on Article 6, were also consulted.[15] This includes studies from multilateral organizations such as the International Emissions Trading Association (IETA), the World Bank, and the Organization for Economic Co-operation and Development (OECD), private consultancies such as Climate Perspectives and Climate Focus, as well as independent think-tanks and Non-Governmental Organizations (NGOs) such as the European Roundtable on Climate Change and Sustainable Transition (ECRST). This gray literature has formed an important basis for the literature review and helped provide a more diverse, holistic, and updated view of recent developments of carbon market mechanisms under Article 6. All literature has been systematically and critically reviewed in order to reveal important understandings and discourses within the field of research.

Semi-Structured Interviews

To investigate the emerging trends and provide a full understanding on the potential impact of carbon markets under Article 6, a semi-structured qualitative interview study was seen as the preferred methodology. Rather than following a static approach, the semi-structured interviews allowed for flexibility and for collection of rich insights from diverse groups of stakeholders.[16]

[15] Arsenio Paez, "Gray Literature: An Important Resource in Systematic Reviews," *Journal of Evidence-Based Medicine* 10, no. 3 (2017): 233–40, https://doi.org/10.1111/jebm.12266.
[16] Bryman, *Social Research Methods*.

Interviews were based on a set of seven guiding questions regarding Article 6 and followed up organically based on the response of the interviewee. See **Annex 1. Interview Guide.** The question design was based to first capture their overall experience and perspectives on carbon markets under Article 6, to then funnel down more in-depth as the interview progressed, which allowed for deeper deliberations as trust was established with the interviewee.[17] With the knowledge that few countries have adopted official positions on Article 6, and there is limited literature available on the topic, an interview study with experts from various backgrounds was considered as the best approach to respond to the research questions addressed. The respondents were selected using deliberate judgment sampling to give a holistic picture of the future of carbon markets under Article 6, based upon an initial analysis of the Article 6 stakeholder landscape. Such judgmental sampling is often used in qualitative, explorative studies where the aim is to develop new scenarios and hypotheses, rather than generalizing findings across larger populations.[18] The Article 6 stakeholder analysis presented in Figure 1 was developed based on the initial mapping of carbon market stakeholders from Blum (2020)[19] and adapted by the author.

Figure 1. Article 6 Stakeholder Landscape. Source: Author, based on Blum (2020).

Interviews captured a wide range of sources, including experts from inside the UNFCCC Secretariat who are leading work with countries' engagement, capacity building and methodology development for Article 6, stakeholders from international financial institutions, national government agencies, independent carbon market consultants, and research institutions. All interviewees had vast experience of working on carbon markets, either from a methodological perspective, a policy background, negotiations capacity, or on-the-ground

[17] Bryman.
[18] Kothari, *Research Methodology: Methods and Techniques*.
[19] Mareike Blum, "The Legitimation of Contested Carbon Markets after Paris – Empirical Insights from Market Stakeholders," *Journal of Environmental Policy & Planning* 22, no. 2 (March 3, 2020): 226–38, https://doi.org/10.1080/1523908X.2019.1697658.

implementation of Article 6 pilots. This provided for rich and occasionally contradicting perspectives, which enabled a more holistic analysis of Article 6 markets.

Interviewees are presented in Table I below, sorted by the date of interview.

Table I. List of Interviewees.

Interview №.	Country/Organization	Type of Organization	Title	Date
#1	UNFCCC Secretariat	Intergovernmental organization	Regional Manager	2022-02-10
#2	Independent Expert	Private Consultant	Carbon Markets Advisor	2022-02-15
#3	[redacted]	International Financial Institution	Carbon Markets Specialist	2022-02-16
#4	National Planning Authority of Uganda	Government Agency	Senior Planner, Environment and Natural Resources	2022-02-18
#5	The Swedish Energy Agency	Government Agency	Program Manager, International Climate Initiatives	2022-02-23
#6	Independent Expert, United States	Private Consultant	Article 6 Analyst	2022-02-25
#7	UNFCCC Secretariat	Intergovernmental organization	Program Officer	2022-03-10
#8	Independent Expert, Ethiopia	Private Consultant	Carbon Markets Advisor	2022-03-16
#9	The People's Republic of Bangladesh	Government Agency	[redacted]	2022-03-25
#10	UNFCCC Secretariat	Intergovernmental organization	[redacted]	2022-04-11
#11	The International Energy Agency (IEA)	Intergovernmental organization	Climate Policy Analyst	2022-04-27
#12	The Swedish Ministry of Environment	Government Agency	Head of Delegation to the UNFCCC	2022-04-29
#13	The Energy and Resources Institute (TERI), India	Research Institute	Program Director, Earth Science and Climate Change,	2022-05-10
#14	The World Bank (WB)	International Financial Institution	Climate Change Analyst	2022-05-16
#15	The Green Growth Institute (GGGI)	Intergovernmental organization	Program Manager	2022-05-23

Whilst it would have been preferred to conduct interviews face-to-face, it was not practically possible for the purpose of this study as interviewees were spread out in various locations of the world, including Thailand, Korea, Uganda, Washington, India and Sweden. Instead, all

interviews took place either over telephone or virtual video calls through Zoom or Microsoft Teams, except for the one with interviewee #10, which took place in-person at the UNFCCC Headquarters in Bonn, Germany. Interviews lasted between 45 to 105 minutes. Instead of a live interview, the Climate Policy Advisor of The Federal Office for the Environment in Switzerland provided a written email response to the questions outlined. All interviews, except for the ones with interviewee 3 and interviewee 10, were recorded and transcribed, in order to ensure accurate citations, capture important nuances and facilitate the interpretation of results.[20]

Coding

After data was collected, the empirical results were coded using an inductive thematic analysis. First, interviews were transcribed, and ideas noted down, as suggested by Braun and Clarke's approach to reflexive thematic analysis.[21] Having identified the key points from each interview, the thematic framework was updated and informed, ensuring that the rich data collected was not discarded but rather analyzed and reflected in the results of the study. The open-ended nature of the semi-structured interviews sometimes made it difficult to code responses into overarching thematic areas. On the other hand, the rich interviews provided for a deeper analysis of the opportunities, challenges and personal perspectives on the questions discussed compared to a quantitative or structured research design.[22] In the initial phase, interviews were coded openly according to the overall themes arising from the literature review, relating to the history of carbon markets, CDM, environmental integrity and the future potential of Article 6. With the themes generated, the coding was checked for its validity and reliability. Following this labelling, more detailed coding and analysis was conducted, breaking down the empirical data under the sub-themes and topics of the theoretical framework. In this focused coding process, certain key outcomes and reflections emerged, including similarities and disagreements between interviewees. Finally, the results were critically assessed and analyzed through the lens of the theoretical framework and presented in the presented in the main chapters below. Throughout the coding process, a reflexive approach has been adopted to avoid narrowing down too early on certain empirical data that would match preconceived ideas or expectations, which is a common challenge in qualitative research studies.[23]

[20] Bryman, *Social Research Methods*.
[21] Virginia Braun and Victoria Clarke, "Using Thematic Analysis in Psychology," *Qualitative Research in Psychology* 3, no. 2 (January 1, 2006): 77–101, https://doi.org/10.1191/1478088706qp063oa.
[22] Daniel Turner, "Qualitative Interview Design: A Practical Guide for Novice Investigators," *The Qualitative Report* 15, no. 3 (May 1, 2010): 754–60, https://doi.org/10.46743/2160-3715/2010.1178.
[23] Turner.

Ethical Considerations

Whilst no formal requirements were placed regarding ethical considerations for the purpose of this master thesis, it is always important to ensure a high ethical integrity in any research study. Most importantly, people's involvement in studies should be considered according to the principles of voluntariness, integrity, confidentiality and anonymity.[24] To respect these standards, all interviewees received a guide before the interview, outlining the request to record the interview and the possibility to quote them using their organization and title. Names of all interviewees were redacted to ensure confidentiality and allow them to speak more freely, sharing their personal perspectives on the topic, rather than just their organizations' official positions. At the start of each interview, interviewees were asked verbally for their consent to be recorded and quoted for the study. Where most interviewees expressed their consent, two interviewees (#3 and #10) requested to not be recorded and to stay anonymous, only quoting their organization and not their official positions or titles. In addition, two interviewees expressed after specific quotes during the interviews that they did not wish to be cited on those particular sentences. Finally, all interviewees were provided an opportunity to correct their statements following the inclusion of any quotes in the initial draft of the thesis. All considerations from interviewees regarding their voluntariness, integrity, confidentiality, and anonymity have been acknowledged to uphold the highest possible ethical integrity of the study.

Quality & Limitations

Overall, the main limitation of this thesis has been the restricted time and availability of respondents, particularly representing country governments. Whilst several experts were interviewed in depth, a larger sample of government officials would have been preferred to provide additional validity of the study. Still, many countries have not yet adopted their official positions on A6 and would probably not be able to provide much additional information at this stage. The diverse sample of experts interviewed has instead brought a wide range of differing perspectives and updated insights into the topic, often with conflicting views, which has provided a richness of data and validity to the conclusions drawn.

Another challenging factor has been to consider the rapid expansion of new articles and analyses on the topic. Since the A6 rulebook was adopted less than a year ago, a large number

[24] Bryman, *Social Research Methods*.

of blog posts, policy briefs, methodologies and country statements have emerged during the period of research. Whilst trying to take the most recent analyses into account, any documents or official statements published after the 10th of May 2022 have not been considered for the purpose of this thesis, as to comprehensively and critically be able to review the information in a timely manner.

Due to this emerging landscape of differing views and analyses on A6, the ability of generalizing the results of this thesis may be seen as limited. Whilst the theoretical framework developed for the basis of this study is encouraged to be adopted and employed for further research on international carbon markets, the study results should be seen as highly indicative and not as a generally applicable truth for the future impact of A6.

Theoretical Framework

Based on the literature review and expert interviews conducted, a theoretical framework was developed to analyze the impact of carbon markets on global mitigation efforts. The theoretical framework is comprised of three key elements and several sub-factors, which together aims to provide a holistic view of the impact of carbon markets in facilitating emission reductions and driving ambition towards net-zero:

1. Environmental Integrity is the foundation for any carbon market, meaning that trade and transfers of credits should not result in a net-increase in emissions. This is comprised by the *Quality of Credits, Robust Accounting* and *Parties' Mitigation Commitments*.

2. Market Size describes the volume of emissions reductions and financial capital transferred under the market, depending on the supply and demand of credits resulting from *Marginal Abatement Costs, Political Considerations, Institutional Readiness, External Demand* and *Transaction Costs.* With environmental integrity ensured, a larger market size would generate larger benefits for all parties involved.

3. Ambition refers to how the cost-savings and benefits gained from the utilization of carbon markets can lead to further emission reductions globally and among the participating parties. This, in turn, depends on the level of *Reinvestments, Credit Cancellation* and *Technological Transformation*.

Together, these key components of Environmental Integrity, Market Size and Ambition (EIMSA) can determine the potential impact of carbon markets on reducing GHG emissions and driving investments in global mitigation efforts. As compared to previous research that largely focused on one of the three components separately, the theoretical model developed for the purpose of this thesis aims to provide a holistic framework that can be used to assess the full impact of national, regional, or international carbon markets on global emissions reductions.

A conceptual representation of the EIMSA impact framework, with environmental integrity as the foundation, market size as the enabler, and ambition as the higher purpose, is presented in Figure 2.

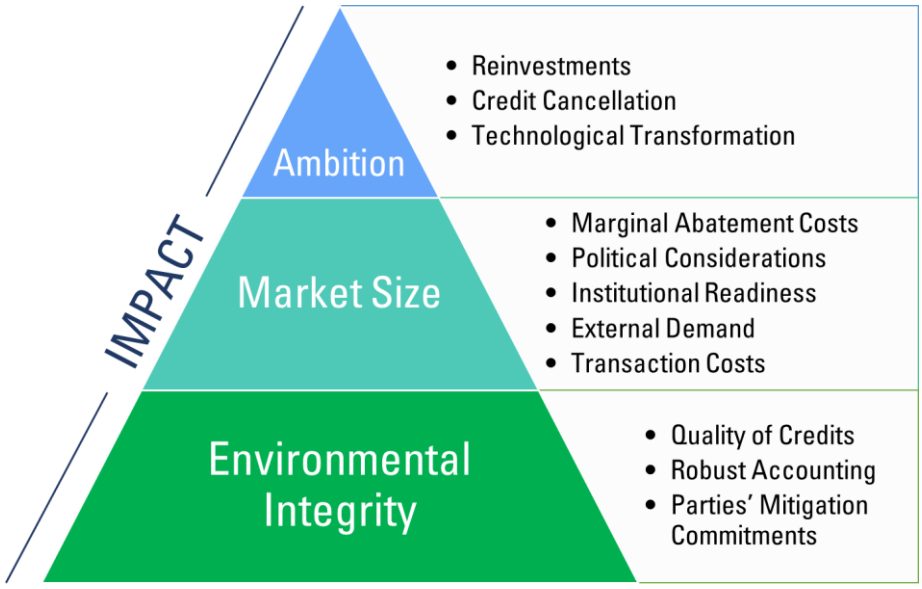


Figure 2. The EIMSA theoretical framework to assess the impact of carbon markets on global GHG emissions. Source: Author.

Each of the three components of the EIMSA framework is described in more detail in the chapters below.

1. Environmental Integrity

Environmental integrity is a key principle of carbon markets, commonly referring to the need to ensure that the use of cooperative mechanisms should not result in a net-increase in emissions.[25] While no internationally agreed definition of environmental integrity exists, the Intergovernmental Panel on Climate Change (IPCC)'s assessment of the flexible mechanisms under the Kyoto Protocol indicates that environmental integrity is safeguarded if the international transfer of emission reduction units leads to the same or lower aggregated global GHG emissions as compared to a scenario where international cooperation would not have taken place.[26] Another, more stringent approach suggested by Theuer et al., would be to assess environmental integrity on if the transfer of emission reduction units contributes to the achievement of certain emissions pathways or long-term temperature goals, such as the one under the Paris Agreement.[27] In this thesis, the first definition of environmental integrity is applied as the foundation of the theoretical framework, simply stating that carbon markets should **not result in a net-increase in emissions**.

To safeguard environmental integrity in international carbon markets, three determining factors have been identified in the literature, and are explained in more detailed in the sections below.

1. The Quality of Credits
2. Robust Accounting of Transfers
3. Parties' Mitigation Commitments

Quality of Credits

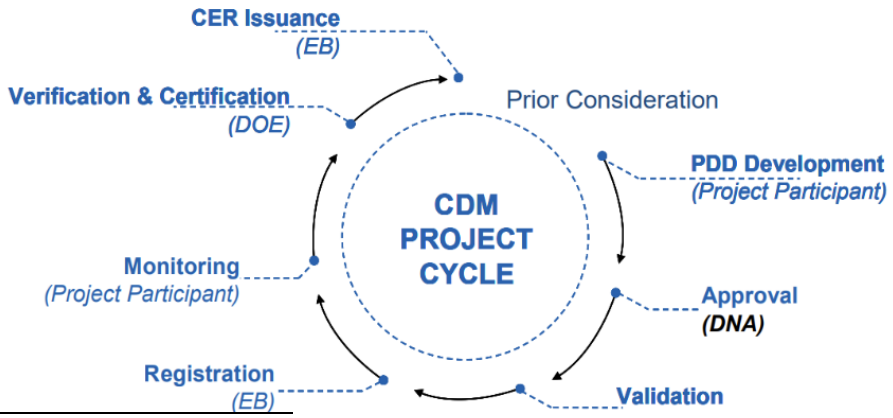
In the context of environmental integrity, the quality of credits refers to ensuring that units transferred under international carbon markets are additional, not over-estimated and permanent (or with provisions in place to address non-permanence).[28] In essence, meaning that one emission reduction unit transferred represent the actual quantity of emissions reductions generated in the host country. Under the CDM, it was said that CERs should be real, measurable and additional.[29] Since the buyer (Annex B) parties could use CERs to achieve their binding

[25] The World Bank, *Ensuring Environmental Integrity under Article 6 Mechanisms*, Article 6 Approach Paper Series, No. 1 (World Bank, Washington, DC., 2021), https://doi.org/10.1596/35393.
[26] Theuer et. al., "International Transfers under Article 6 in the Context of Diverse Ambition of NDCs Environmental Integrity Risks and Options to Address Them."
[27] Theuer et. al.
[28] Lambert Schneider and Stephanie La Hoz Theuer, "Environmental Integrity of International Carbon Market Mechanisms under the Paris Agreement," *Climate Policy* 19, no. 3 (March 16, 2019): 386–400, https://doi.org/10.1080/14693062.2018.1521332.
[29] Cames et al., "CLlMA.B.3/SERl2013/0026r."

emission reduction targets, it was vital to make certain that CERs represented the correct amount of CO2e being avoided or reduced in the host party (who themselves did not have any binding reduction targets). Otherwise, the result would in the end represent an overall *increase* in global emissions.[30]

To ensure a high quality of credits under the CDM, a well-defined project cycle (see Figure 3) was followed. Firstly, project participants were requested to prepare a Project Design Document (PDD), making use of approved emissions baselines and monitoring methodologies. To quantify the emissions avoided or reduced, most activities were employing project-based baselines to compare results with estimated business as usual (BAU) emissions trajectories, had the project under assessment not been implemented.[31] These PDDs were then submitted to the Designated National Authority (DNA) for approval of the host country and later validated by a third-party Designated Operational Entity (DOE) who evaluated the project based on the CDM requirements. Following this, the valid project was submitted to the UNFCCC Secretariat and CDM Executive Board (EB) for approval and registration. After being registered, the project participant would monitor the emissions reductions generated from the project based on the approved methodology, receive verification and certification from the DOE and then finally submit the request to start issuing CERs to the CDM EB. These steps of Measurement, Reporting and Verification (MRV) under the CDM were put in place to assure that CERs generated would be additional and of high quality.[32] Credits from land-use and reforestation projects which have a high risk of reversal, for example due to forest fires, was only able to issue temporary credits (tCERs) or long-term credits (lCERs) under the CDM, to address the

Figure 3. The CDM Project Cycle. (UNFCCC, 2016)



[30] Cames et al.
[31] Axel Michaelowa et al., "Overview and Comparison of Existing Carbon Crediting Schemes," *Perspectives Climate Group GmbH*, February 2019, https://www.nefco.int/wp-content/uploads/2019/05/NICA-Crediting-Mechanisms-Final-February-2019.pdf.
[32] Simon Bisore and Walter Hecq, "Regulated (CDM) and Voluntary Carbon Offset Schemes as Carbon Offset Markets: Competition or Complementarity?," January 1, 2012.

threat to environmental integrity if emissions are not permanently mitigated.[33]

Despite this, several publications suggest that the CDM did not manage to keep the principles of high-quality credits intact. A quantitative analysis of the CDM found that only 2% of projects and 7% of the potential CER supply was considered to have a high likelihood of ensuring environmental integrity, in the sense that emissions reductions are additional and not over-estimated.[34] In the study, they highlight that many projects, for example in renewable energy, would have been implemented even without the revenues coming from the CDM. According to another assessment of power sector projects, 34% of all CERs issued from wind power, hydro power, natural gas and waste heat recovery projects under the CDM were considered not additional.[35] Based on their analysis, they conclude that only 15% of CERs have been both additional and contributed to sustainable development benefits.[36]

Robust Accounting

The robust accounting of transfers in international carbon markets refers to the need to ensure that mitigation outcomes are appropriately quantified, vintage of mitigation outcomes are considered, and double counting of emissions reductions is avoided. If robust accounting of emissions reductions transfers is not in place, there is a risk that aggregated GHG emissions go beyond the levels reported by countries, leading to an increase in global emission levels.[37] Under the CDM, the risk of double counting was mainly addressed by having a dedicated registry under which all CERs were given unique serial numbers, to be held in individual accounts with dedicated purposes.[38] However, since only some countries had binding climate targets, all CERs used by Annex B parties towards the achievement of their Kyoto Protocol targets were effectively counted twice, both for the achievement of their climate targets, and in the emissions balance of the transferring country (in the cases where this was provided).[39]

With this background, several ideas have been proposed to avoid double counting and ensure robust accounting in international carbon markets. One of the key proposals discussed have

[33] Michaelowa et al., "Overview and Comparison of Existing Carbon Crediting Schemes."
[34] Cames et al., "CLlMA.B.3/SERl2013/0026r."
[35] A. Kuriyama and K. Koakutsu, "Quantitative Assessment of Certified Emission Reductions from Non-Additional CDM Projects," 2016, https://www.semanticscholar.org/paper/Quantitative-Assessment-of-Certified-Emission-from-Kuriyama-Koakutsu/e99f3548ee75d30805998d6603264df622f98bdf.
[36] Kuriyama and Koakutsu.
[37] Lambert Schneider et al., "Robust Accounting of International Transfers under Article 6 of the Paris Agreement Discussion Paper," September 1, 2017.
[38] Michaelowa et al., "Overview and Comparison of Existing Carbon Crediting Schemes."
[39] Schneider et al., "Robust Accounting of International Transfers under Article 6 of the Paris Agreement Discussion Paper."

been the application of corresponding adjustments (CA) to the transfer of emission reductions. This would imply that when a host party generates emissions reductions and sell those credits to someone else, the host party would have to correspondingly increase their emissions balance with the same amount.[40] As shown in Figure 4 below, if transferring Country A reduce its emissions with 30tCO2e from cooperative implementation, decreasing the national emissions balance from 100tCO2e to 70tCO2e, and then sell these credits to Country B, Country A cannot claim these reductions as its own. Instead, Country A would have to correspondingly adjust their emissions balance up to 100tCO2e again. This application of CA in emissions trading could theoretically have a significant impact both on the environmental integrity, supply, and demand on international carbon markets.[41]

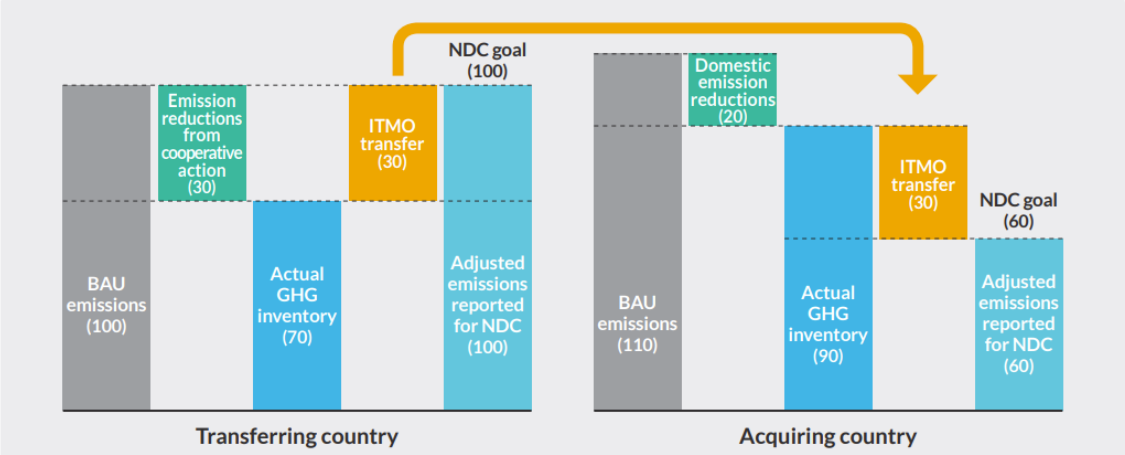


Figure 4. Illustration of corresponding adjustments.[42]

Parties' Mitigation Commitments

Finally, the mitigation commitments of the parties involved in international carbon markets also have a pivotal impact on the environmental integrity of the mechanism. If some parties set inadequate reduction targets that they can meet without effort, they could flood the market with low-quality credits, so called "hot air", which could reduce the incentive for other parties to cut their emissions at home and lead to an overall increase in global emissions.[43]

[40] Schneider et al.
[41] Schneider and La Hoz Theuer, "Environmental Integrity of International Carbon Market Mechanisms under the Paris Agreement."
[42] Randall Spalding-Fecher et al., "Summary Report: Designing Governance Structures and Transactional Documentation for Mitigation Outcome Transactions under Article 6 of the Paris Agreement," January 2021, https://gggi.org/report/summary-report-designing-governance-structures-and-transactional-documentation-for-mitigation-outcome-transactions-under-article-6-of-the-paris-agreement/.
[43] Theuer et. al., "International Transfers under Article 6 in the Context of Diverse Ambition of NDCs Environmental Integrity Risks and Options to Address Them."

Under the Kyoto Protocol, only a few industrialized (Annex B) countries had binding emissions reductions targets, and levels were set relatively low. Developing (non-Annex B) parties had no binding mitigation targets. This meant that there were incentives for host countries, especially for those engaging in bilateral cooperation through JI, to inflate their emission baselines and keep low ambition in their mitigation targets.[44] In particular, the case of Ukraine and Russia exemplifies that, in the absence of stringent national mitigation targets, there may be perverse incentives for countries to inflate project crediting baselines. Both had already drastically cut their emissions in 1998 compared to 1990, due to the economic crisis following the dissolution of the Soviet Union. This meant that their Kyoto targets fundamentally implied an increase in emissions, and they had a surplus of "hot air" which they could sell to other parties through the JI scheme.[45] A quantitative assessment found that 50% of the Emissions Reductions Units (ERUs) issued by the 642 largest projects under JI had a low environmental integrity, with a considerable amount coming from Russia and Ukraine.[46]

Under the Paris Agreement, all parties are requested to submit their own Nationally Determined Contributions (NDCs) to the UNFCCC in a bottom-up, self-determined approach, outlining their emission reduction targets. This flexible nature has led to a large diversity of NDCs in terms of sectoral scope, ambition, emissions coverage, and conditionality. With the consideration of common but differentiated responsibilities (CBDR) as a key principle, many developing countries have expressed their NDC targets compared to BAU scenarios.[47] Similarly to the JI case described above, it is therefore a possibility that some parties have inflated BAU scenarios, resulting in "hot air" in their NDC commitments. If this is the case, it might threaten the environmental integrity of carbon markets.[48]

[44] Michaelowa et al., "Overview and Comparison of Existing Carbon Crediting Schemes."
[45] David Victor, Nebojša Nakićenović, and Nadejda Victor, "The Kyoto Protocol Emission Allocations: Windfall Surpluses for Russia and Ukraine," *Climatic Change* 49 (May 1, 2001): 263–77, https://doi.org/10.1023/A:1010768306975.
[46] Anja Kollmuss, Lambert Schneider, and Vladyslav Zhezherin, "Has Joint Implementation Reduced GHG Emissions? Lessons Learned for the Design of Carbon Market Mechanisms," *Stockholm Environment Institute* Working Paper No. 2015-07 (August 2015): 128, https://www.researchgate.net/publication/281228040_Has_Joint_Implementation_reduced_GHG_emissions_Lessons_learned_for_the_design_of_carbon_market_mechanisms.
[47] Theuer et. al., "International Transfers under Article 6 in the Context of Diverse Ambition of NDCs Environmental Integrity Risks and Options to Address Them."
[48] Theuer et. al.

2. Market Size

The size of carbon markets can be defined either by:

1. The volume of emissions reductions credits transferred (e.g. in tCO2e); or
2. The financial value of market transactions (e.g. in USD terms)

Whichever perspective is taken, the size of carbon markets, just like any other market, is fundamentally defined by the supply and demand of carbon credits, as conceptualized in Figure 5.[49] This, in turn, depends on a vast array of interrelated factors including, but not limited to, the difference of marginal abatement costs between parties, the political willingness to engage in carbon trading, the institutional readiness, the linking to external markets and transaction costs.[50,51]

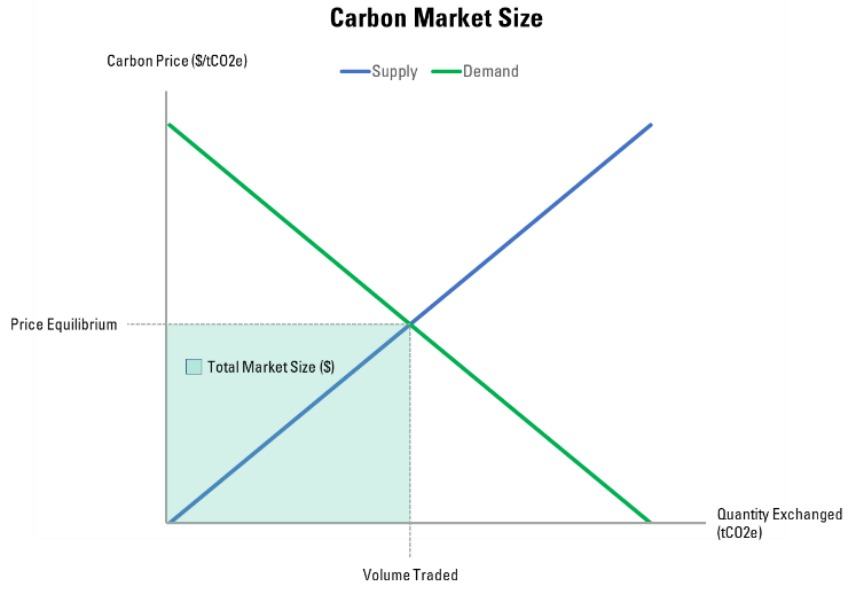


Figure 5. Theoretical representation of the size of carbon markets. Source: author, adapted from Jotzo & Michaelowa, 2002.

One of the key factors determining the size of carbon markets is the difference in costs to reduce 1tCO2e between the parties involved, known as the *marginal abatement cost* (MAC). Generally, a wider spread of MAC means larger opportunities for both buyer and seller countries to benefit from trading with carbon credits, and a larger carbon market.[52] This can easily be understood, as if the cost to reduce one tonne of carbon dioxide in the United States costs $100 and the cost to reduce the same amount of CO2e only costs $10 in India, there are

[49] Frank Jotzo and Axel Michaelowa, "Estimating the CDM Market under the Marrakech Accords," *Climate Policy* 82 (September 30, 2002): 1–23, https://doi.org/10.3763/cpol.2002.0219.
[50] ICAP, "Emissions Trading Worldwide: Status Report 2022" (Berlin: International Carbon Action Partnership, 2022), https://icapcarbonaction.com/system/files/document/220408_icap_report_rz_web.pdf.
[51] Jutta Kill, Edward Fenton, and Forest Ecosystem Research Network FERN, *Trading Carbon: How It Works and Why It Is Controversial* (Moreton in Marsh: FERN, 2010).
[52] Kill, Fenton, and Forest Ecosystem Research Network FERN.

significant gains to realize for both parties should they embark on cooperative implementation. In an ideal situation, the benefits arising from trade in carbon markets can be described according to the classic gains from trade theory, in terms of consumer and producer surplus. In that scenario, trade takes place until there is no longer anything to gain from continued trade and MACs has equalized between the parties, basically implying that the size of the market would be fully determined by all parties' aggregated mitigation targets.[53] In theory, if marginal abatement costs become the same as the marginal damage cost of climate change, mitigation measures would be economically optimal. [54] However, this is based on ideal scenarios where all parties have perfect information about MACs, environmental integrity is fully ensured, climate damages are certain, there are zero transaction costs and all parties are willing to fully participate in trading.

In reality, the size of carbon markets fundamentally depends on a range of other external factors than the spread of MACs, including political cycles, economic cycles, market trust and parties' capacity to participate.[55] As seen in the case of the CDM, is initial growth mainly arose from the political linking decision by the European Union in 2004, which allowed the use of CERs for private companies' compliance under the EU Emissions Trading System (ETS). Following a period of active trading, the market then experienced a rapid collapse in 2011-2012 when the decision was reversed and the EU delinked most of the market from the CDM following environmental integrity concerns.[56] Combined with the economic downturn after the financial crisis, and uncertainty regarding the future of international climate agreements after the first commitment period of the Kyoto Protocol ended in 2012, the market fell into a slump with an oversupply of credits, inadequately low price levels and severely reduced market activity. See Figure 6. [57] This example clearly highlights how

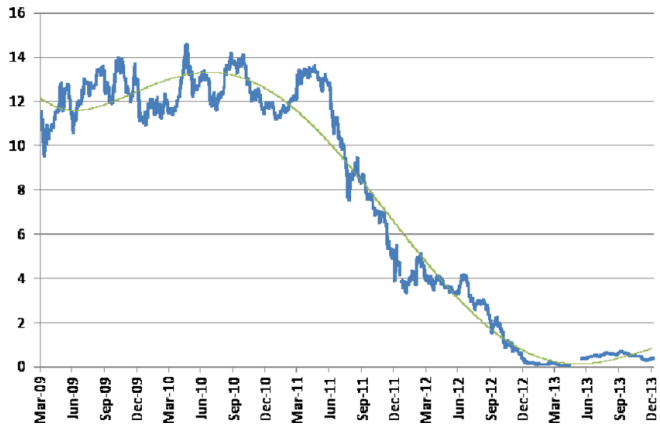


Figure 6. Certified Emission Reductions (CER) price development between 2009-2013 (prices in €). (Willemijn van Rooijen, 2014)

[53] James Edmonds et al., "How Much Could Article 6 Enhance Nationally Determined Contribution Ambition Toward Paris Agreement Goals Through Economic Efficiency?," *Climate Change Economics* 12, no. 02 (May 2021): 2150007, https://doi.org/10.1142/S201000782150007X.
[54] IPCC AR6 WGIII, "Climate Change 2022: Mitigation of Climate Change."
[55] Michaelowa et al., "Overview and Comparison of Existing Carbon Crediting Schemes."
[56] Michaelowa et al.
[57] Loes Willemijn van Rooijen, "Pioneering in Marginal Fields: Jatropha for Carbon Credits and Restoring Degraded Land in Eastern Indonesia," *Sustainability (Switzerland)* 6 (April 16, 2014): 2223–47, https://doi.org/10.3390/su6042223.

external demand, political considerations regarding environmental integrity, the trust in market and external macro shocks can severely impact the size of international carbon markets.

Alongside this, the institutional readiness and transaction costs are other factors influencing the size of carbon markets. As seen in the case of CDM, a vast majority of projects, almost 80%, was implemented in Asia, mainly in China, India, and Indonesia, and exceptionally few were located in Least Developed Countries (LDCs).[58] This can partly be explained by their lack of institutional capacity in monitoring, review, verification, authorization and implementation of emissions reductions projects, the absence of well-functioning financial markets, and the high barriers of entry for LDCs. As outlined by the Designated National Authority (DNA) of Rwanda, the cost to start issuing CERs from a mitigation project could range from $65,000 - $150,000.[59] To guarantee equal opportunities, liquidity and expansion of carbon markets, participants need to be provided with the right institutional support and capacity building programs, including special circumstances for LDCs.[60]

[58] "Meeting Report: CDM Executive Board 113th Meeting (Version 01.0)."
[59] Designated National Authority, Republic of Rwanda, "CDM Cost," accessed June 8, 2022, https://rema.gov.rw/dna/index.php?id=192.
[60] Wilton Park, "Final Recommendations on Capacity Building for Participation in Carbon Markets," *COP26 Catalyst for Climate Action*, 2022, https://www.wiltonpark.org.uk/wp-content/uploads/2022/03/Carbon-Markets-LFR.pdf.

3. Ambition

Ambition in carbon markets is a broad concept, referring to how carbon markets can help facilitating additional emissions reductions and increase climate targets, beyond what would have otherwise taken place.[61] Historically, the main objective of carbon markets has been to implement emissions reductions projects where they are most cost-effective to reduce overall mitigation costs.[62] In an ideal scenario, the selling party will generate financial revenues, and the acquiring party will achieve cost-savings by trading in the carbon market, because of the spread in MACs. Yet, this does not necessarily lead to an increased ambition in emissions reductions.

Instead, the impact of carbon markets in raising ambition will largely depend on how this money is spent. If the revenues generated, or cost-savings realized, are reinvested into additional mitigation projects, parties should be able to drive further emissions reductions and increase ambition in climate targets, compared to a scenario without carbon markets.[63] On the contrary, if cost-savings are recycled back into general public budgets or invested in high-carbon sectors, this could result in the carbon market having a net-zero, or possibly even net-negative effect on emissions.[64]

Another way to increase ambition through carbon markets may be through the mandatory or voluntary cancellation of credits.[65] As seen under the CDM, countries, private corporations and other stakeholders, voluntarily cancelled more than 100 million CERs.[66] By the cancellation of credits, carbon markets basically become a results-based climate finance (RBCF) mechanism, where buyers can quantify the amount of emission reductions their capital generates, but does not make any offsetting claims based on the finance provided. Through either voluntary or

[61] Szymon Mikolajczyk and Lieke t' Gilde, "Leveraging Ambition Through Carbon Markets" (One Exchange Square, London, United Kingdom: European Bank for Reconstruction and Development, December 2020), https://www.ebrd.com/what-we-do/get/knowledge-hub/carbon-markets.html.
[62] Jonathan Schwieger, Urs Brodmann, and Axel Michaelowa, "Pricing of Verified Emission Reduction Units under Art. 6" (Zurich, Switzerland: First Climate (Switzerland) AG, November 19, 2019), https://www.energimyndigheten.se/globalassets/klimat--miljo/internationella-klimatinsatser/sea-pricing-study_final.pdf.
[63] Mikolajczyk and t' Gilde, "Leveraging Ambition Through Carbon Markets."
[64] Juerg Fuessler et al., "Article 6 in the Paris Agreement as an Ambition Mechanism: Options and Recommendations" (Swedish Energy Agency, June 2019).
[65] Hanna Wang-Helmreich, Wolfgang Obergassel, and Nicolas Kreibich, "Achieving Overall Mitigation of Global Emissions under the Paris Article 6.4 Mechanism" (Berlin, Germany: German Emissions Trading Authority (DEHSt), June 7, 2019), https://epub.wupperinst.org/frontdoor/deliver/index/docId/7394/file/7394_Overall_Mitigation.pdf.
[66] "Meeting Report: CDM Executive Board 113th Meeting (Version 01.0)."

mandatory cancellation of credits, environmental integrity can be strengthened, and ambition levels increased through carbon markets.[67]

Finally, many have highlighted the role of carbon markets in facilitating technology transfer to raise ambition in global mitigation efforts, mainly from high-income countries to lower-income countries. Although LDCs are home to more than 1 billion people, they are still only responsible for about 1% of global CO2 emissions. [68] In the coming years, their carbon footprints are expected to grow significantly, as their economies and energy needs expand. To achieve the goals of the Paris Agreement and avoid climate breakdown, it is therefore critical for them to follow another development path than industrialized countries did historically. Here, carbon markets can support the leapfrogging of technologies, for example by avoiding the deployment of large-scale coal power plants to instead adopt clean and decentralized solar energy.[69] If developed at scale with sufficient prices, carbon markets may also help taking emerging clean technologies from being expensive niche

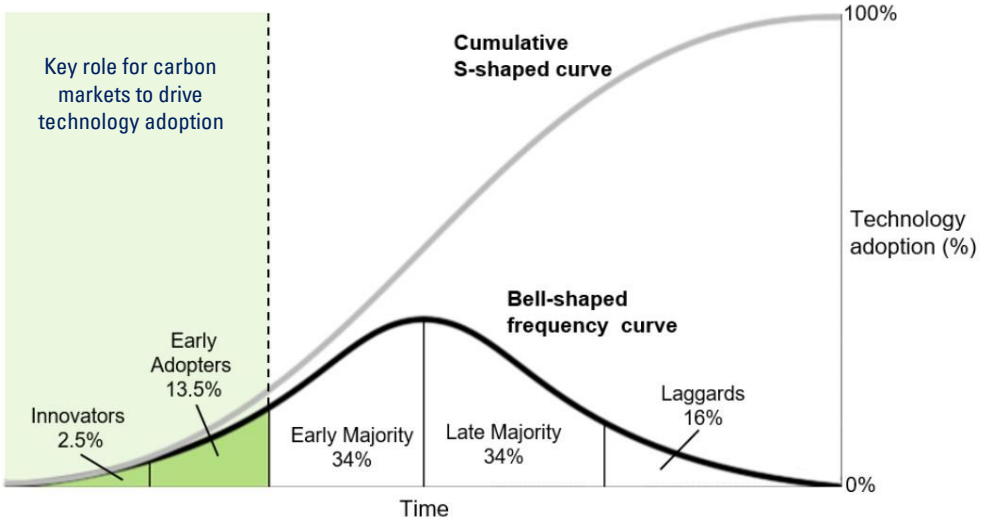


Figure 7. Potential role of carbon markets in technology adoption (adapted from Warnecke et al., 2018, based on Rogers, 1971)

[67] Aki Kachi and Thomas Day, "Results-Based Finance in the Paris Era: Considerations to Maximise Impact" (NewClimate Institute, 2020), https://carbonmarketwatch.org/wp-content/uploads/2020/12/NewClimate_Results_-based_finance_in_the-Paris_era_Dec20-1.pdf.
[68] United Nations Conference on Trade and Development (UNCTAD), "Smallest Footprints, Largest Impacts: Least Developed Countries Need a Just Sustainable Transition," accessed May 12, 2022, https://unctad.org/topic/least-developed-countries/chart-october-2021.
[69] United Nations Conference on Trade and Development (UNCTAD).

solutions to reaching wide-scale commercial adoption, outlined in Figure 7.[70]

During the CDM, specific "positive lists" were applied for certain mitigation technologies such as solar photovoltaics, off-shore wind or tidal power, based on a number of measures, including the maturity of the technology, location and regulatory support.[71] Almost 40% of all CDM projects reported that the project included a component of technology transfer.[72]

Nevertheless, there is also a risk that carbon markets may divert investments from long-term innovation, research and development of new, emerging and potentially transformative technologies, since these often come at a high price compared to the cheaper mitigation options available.[73] If all parties fully utilize carbon markets to pursue the cheapest mitigation options currently available, this could lead to delays in making critical technologies to reach net-zero commercially viable and mature for large-scale adoption, hindering the achievement of the Paris Agreement goals.[74]

[70] Warnecke et. al., "Opportunities and Safeguards for Ambition Raising through Article 6," *NewClimate Institute*, 2018, https://newclimate.org/wp-content/uploads/2018/05/180508_AmbitionRaising-Article6Paper.pdf.
[71] Cames et al., "CLlMA.B.3/SERl2013/0026r."
[72] Niklas Höhne et al., "Carbon Market Mechanisms in Future International Cooperation on Climate Change," *NewClimate Institute*, 2015, 31.
[73] Newell, Pizer, and Raimi, "Carbon Markets: Past, Present, and Future."
[74] Fuessler et al., "Article 6 in the Paris Agreement as an Ambition Mechanism: Options and Recommendations."

Chapter 1: Environmental Integrity in Article 6

In the context of carbon markets under the Paris Agreement, environmental integrity is seen as a key principle. In Article 6.1, parties are requested to promote sustainable development and environmental integrity when pursuing voluntary cooperation in the implementation of their NDCs. In Article 6.2, the agreement reads that parties shall ensure environmental integrity and transparency, apply robust accounting, and avoid double counting in the trade of ITMOs. Article 6.4 does not explicitly refer to environmental integrity in the Paris Agreement text, but instead highlights that the A6.4M shall *"deliver an overall mitigation in global emissions"* (OMGE).[75]

With the vast criticism raised towards the CDM, ensuring a high quality of credits, preventing double counting and avoiding transfers of "hot air" was key negotiation items for the A6 rulebook. Therefore, when parties reached an agreement at COP26 in Glasgow, they did so with several key provisions to ensure environmental integrity. The main principle includes the application of **corresponding adjustments** to avoid double counting, which *"effectively changes the entire market"*[76] and is described in more detail under 1.2 Robust Accounting, but several other provisions were also put in place regarding the Quality of Credits (1.1) and Parties' Mitigation Commitments (1.3).

[75] United Nations Framework Convention on Climate Change (UNFCCC), "The Paris Agreement," in *21st Conference of the Parties* (Paris, United Nations, 2015), https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf#page=9.
[76] Interviewee #11, Climate Policy Analyst, The International Energy Agency (IEA), 2022-04-27

1.1 Quality of Credits

As described in the theoretical framework, the quality of credits in international carbon markets refer to the need for them to be additional, not over-estimated and permanent.[77] Under the A6 decisions, the quality and additionality of credits is outlined as key provisions.

Under the new centralized A6.4M, the quality of credits is determined following a similar process as under the CDM with regards to monitoring, reporting and verification. Still, methodologies, baselines and project approaches will have to be updated to reflect the new rules and provisions of A6. In January 2022, an international expert-led process was initiated to enable the alignment of approved CDM methodologies to A6 under the International Initiative for Development of Article 6 Methodology Tools (II-AMT). The initiative aims to build on the experiences and adapt methodologies used under the CDM for A6 with the new provisions for host country authorization, reporting, and additionality. Rather than discarding old CDM methodologies, it is seen that they should be modified to fit the new rules in order to save financial and human resources and enable a rapid operationalization of A6.[78] Nonetheless, significant work still remains for the UNFCCC Secretariat, the Supervisory Body (SB) acting as the central oversight mechanism of the A6.4M, and the Subsidiary Body for Scientific and Technological Advice (SBSTA), to recommend methodologies and approaches for adoption by parties at COP27 in Egypt. According to some interviewees, this implies that it might take several years before the A6.4M is fully operational and it is therefore difficult to assess the potential quality of credits at this early stage.[79]

When it comes to cooperative approaches under A6.2, it is up to the bilateral agreement between the participating parties to define methodologies, additionality baselines and measures to ensure high quality of ITMOs. Yet, several interviewees argued that based on previous experience, parties are likely to use similar methodologies as under the A6.4M, possibly in conjunction with older CDM methodologies or voluntary carbon market (VCM) standards such as the Verified Carbon Standard (VCS) by Verra or Gold Standard, in bilateral trading under A6.2.

[77] Schneider et al., "Robust Accounting of International Transfers under Article 6 of the Paris Agreement Discussion Paper."
[78] "International Initiative for Development of Article 6 Methodology Tools (II-AMT)," accessed May 11, 2022, https://www.perspectives.cc/public/initiatives/international-initiative-for-development-of-article-6-methodology-tools-ii-amt/.
[79] Interviewee #7, Programme Officer, The UNFCCC Secretariat, 2022-03-10

Neither the A6.2 or A6.4M guidance have taken a clear stance when it comes to accounting and crediting for carbon dioxide removals (CDR) such as nature-based solutions (NbS), carbon capture and storage (CCS) or direct air capture (DAC) projects. Instead, the SB of the A6.4M has been tasked to make recommendations on appropriate measures for monitoring, reporting, crediting periods, avoidance of leakage, and how to address the risk of reversals, for consideration by parties at COP27 later this year. In the A6 rulebook, parties are required to report on how they have minimized the risk of non-permanence of mitigation across NDC periods and how potential reversals of emissions removals have been addressed.[80] While some parties, notably Brazil, have stressed the importance of including forestry and NbS under A6, several NGOs and think-tanks have raised concerns that this might undermine the quality of credits and environmental integrity of the mechanism.[81] One interviewee emphasized that while NbS cannot be excluded from A6, clear definitions and standards should be put in place to address potential risks.[82]

As suggested by the Carbon Market Watch, the definition of removals must refer to physical GHGs removed from the atmosphere that are "permanently" stored for at least 200 years, with the total upstream and downstream emissions generated from the process being smaller than the total quantity removed and stored.[83] They also argue that NbS projects should not be able to generate ITMOs for use towards NDC achievement or corporate offsetting claims under A6, due to their high risk of reversal and non-permanence. Instead, such projects should generate *results-based payment units*, which could facilitate climate finance to NbS but only be used for contribution claims, and not to offset existing emissions balances.[84] Any decisions taken regarding this at COP27 will be crucial for the environmental integrity, size, and development of the A6 mechanisms.[85]

Finally, the COP26 decision also included a definitive agreement on the **transition of CDM projects and credits** to the new A6.4M. This agreement allows for certain CDM projects to transition into the A6.4M if they meet the new A6 rules and are authorized by the host country. In this case, they can continue using the same CDM methodologies until the end of their current crediting period, or at longest until the end of 2025. Old credits from the CDM can be used

[80] United Nations Framework Convention on Climate Change (UNFCCC), "FCCC/PA/CMA/2021/10/Add.1."
[81] Jonathan Crook and Gilles Dufrasne, "Carbon Market Watch Recommendations to Article 6 Negotiators on Removals," *Carbon Market Watch*, May 2022, 7, https://carbonmarketwatch.org/wp-content/uploads/2022/05/CMW-Art-6-recommendations-on-removals-and-permanence-1.pdf.
[82] Interviewee #7, Programme Officer, The UNFCCC Secretariat, 2022-03-10
[83] Crook and Dufrasne, "Carbon Market Watch Recommendations to Article 6 Negotiators on Removals."
[84] Crook and Dufrasne.
[85] Interviewee #13, Distinguished Fellow and Programme Director, Earth Science and Climate Change, The Energy and Resources Institute (TERI), India, 2022-05-10

towards countries' first NDCs from projects registered after 1 January 2013, with the provision that these CERs will be identified as pre-2021 emission reductions. For these transition credits, corresponding adjustments does not have to be applied for the host party, and they are also excluded from the A6 Share of Proceeds towards adaptation and administration. Temporary CERs and long-term CERs from NbS cannot be used towards parties' NDC achievement.[86] In total, the amount of old CERs that can transition into the A6.4M is estimated to be 100-300 MtCO2e, in addition to the maximum of 2.8 GtCO2e credits that could be issued by old CDM projects transitioning into the new mechanism.[87] Whilst representing a significant volume of credits, it is much less than the estimated 15.6 GtCO2e which could have resulted from a full transition of all registered CDM projects into the new A6.4M.[88]

The interviews showcased differing views on this issue, similar to the conflicting views among parties on the transition of CDM credits and activities. Whilst several indicated that they were against the decision and not planning to engage with old CDM activities, it was seen as a necessary arrangement to move forward with the A6 rulebook.[89] Compared to conceding any fundamental principles of the new mechanism, this relatively quantifiable decision was seen as a practical compromise.[90] Others, such as interviewee #13, claimed that the trust of investors, and the progress towards climate goals would have suffered if this decision did not come through. *"Thankfully, the resistance to allowing legacy credits from the CDM into the new market went away, but even more could have been done. All negotiations are a give and take, so it is a matter of satisfaction that we could finally agree to these new arrangements."*[91] Similarly, interviewee #14 was of the opinion that the transition of CDM activities was good, as they could kickstart the A6.4M in coming years and instill trust in the market, noting that it will likely take several years for completely new projects to start issuing credits under the new A6.4M.[92]

Depending on how many project developers will wish to transition their CDM projects and credits over to the A6.4M, if host countries will provide authorization, and if buyer countries will choose to acquire these credits or not, the impact of the CDM transition might range from very considerable to not significant. Should all credits and projects transition, and acquiring parties are willing to purchase these without limitations, it might risk overflowing the market

[86] United Nations Framework Convention on Climate Change (UNFCCC), "FCCC/PA/CMA/2021/10/Add.1."
[87] Harry Fearnehough, "The Potential Impact of Transitioning CDM Units and Activities to the Paris Agreement," October 2021, 38.
[88] Schwieger, Brodmann, and Michaelowa, "Pricing of Verified Emission Reduction Units under Art. 6."
[89] Interviewee #12, Head of Delegation to the UNFCCC, The Swedish Ministry of Environment, 2022-04-29
[90] Interviewee #15, Program Manager, The Green Growth Institute (GGGI), Korea, 2022-05-23
[91] Interviewee #13, Distinguished Fellow and Programme Director, Earth Science and Climate Change, The Energy and Resources Institute (TERI), India, 2022-05-10
[92] Interviewee #14, Climate Change Analyst, The World Bank (WB), 2022-05-16

with cheap, low-quality credits.[93] Another interviewee argued that with the transition of CDM credits and activities, there is going to be much more supply than demand in the authorized market during the early 2020s. If buyers do not explicitly state their preferences to not acquire these old CERs, the development of new projects under A6 might be hampered significantly in the initial phase.[94]

[93] Interviewee #8, Article 6 Advisor, Independent Expert, 2022-03-16
[94] Interviewee #10, [anonymous], The UNFCCC Secretariat, 2022-04-11

1.2 Robust Accounting

To ensure robust accounting and avoid double-counting under A6, several new provisions were agreed to at COP26. Most notably, the obligation for all parties to apply corresponding adjustments (CA) when transferring ITMOs was finally settled. In the A6 decision text from Glasgow, it says that *"Each participating Party shall apply corresponding adjustments in a manner that ensures transparency, accuracy, completeness, comparability and consistency"*.[95]

As described in the theoretical framework, this implies that when a host country authorizes ITMOs for the NDC achievement of another party or other international mitigation purposes, it needs to apply corresponding adjustments to their own NDC targets. Several interviewees emphasized that *"this essentially changes the entire market"*.[96] As compared to the Kyoto Protocol, when host countries normally had nothing to lose by transferring CERs, there is now a risk of "overselling" credits which would leave the host country unable to achieve their domestic climate targets outlined in their NDC. As such, the host country needs to be more careful in what emission reduction outcomes they are willing to transfer, and which mitigation options they prefer to keep for the achievement of their own NDC.[97] While some parties were strongly opposed to CA as they indicated it would limit private sector investments,[98] a majority in the end agreed for the full application of CA under both 6.2 and 6.4. As pointed out by one interviewee, *"CA is something we have to live with, even though it may not be in the best interest of developing economies."*[99] Several interviewees mentioned that the application of corresponding adjustments had been a very complex and sticky issue in negotiations. Even though parties agreed to the new rulebook at COP26, many countries might still not fully understand the impacts of this decision, and there remains numerous disagreements on how it might impact the future of the market.[100]

> *"The uncertainty and ambiguity of the decision was what allowed the agreement to be reached".*[101]

[95] United Nations Framework Convention on Climate Change (UNFCCC), "FCCC/PA/CMA/2021/10/Add.1."
[96] Interviewee #11, Climate Policy Analyst, The International Energy Agency (IEA), 2022-04-27
[97] Edmonds et al., "How Much Could Article 6 Enhance Nationally Determined Contribution Ambition Toward Paris Agreement Goals Through Economic Efficiency?"
[98] Michaelowa et al., "Overview and Comparison of Existing Carbon Crediting Schemes."
[99] Interviewee #13, Distinguished Fellow and Programme Director, Earth Science and Climate Change, The Energy and Resources Institute (TERI), India, 2022-05-10
[100] Interviewee #13, Distinguished Fellow and Programme Director, Earth Science and Climate Change, The Energy and Resources Institute (TERI), India, 2022-05-10
[101] Interviewee #12, Head of Delegation to the UNFCCC, The Swedish Ministry of Environment, 2022-04-29

Under the new rules, all mitigation outcomes from either A6.2 or A6.4M that are authorized and internationally transferred for use towards the achievement of NDCs or for *"other international mitigation purposes"* such as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) or the VCM are referred to as ITMOs and need to apply corresponding adjustments.[102] However, under the A6.4M, host parties might also decide to not authorize the mitigation outcomes generated, in which case the credits are simply referred to as Article 6.4 Emission Reductions (A6.4ERs). These A6.4ERs cannot be used towards another party's NDC achievement but may for example, be used in the VCM, in domestic carbon markets and offsetting schemes, or as RBCF.[103] This distinction between authorized and non-authorized credits, and its implications for the application of CA is presented in Figure 8 below.

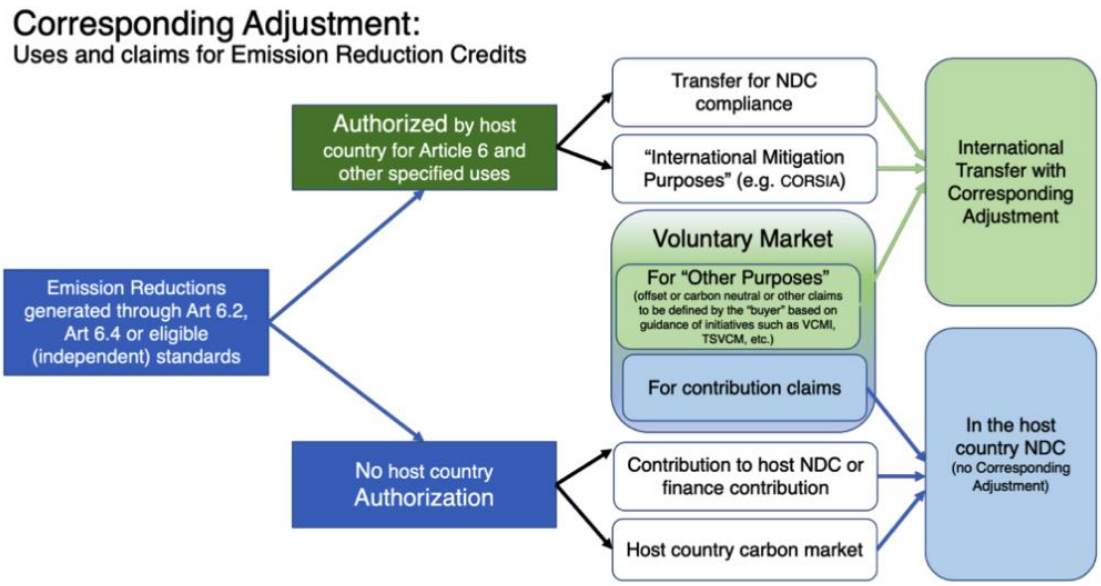


Figure 8. The application of corresponding adjustments, depending on host country authorization and use cases. (The World Bank, 2021)

Notably, the A6 decision went further than some expected, outlining that CA should be applied to all transfers of ITMOs, also from sectors outside of NDCs, and for transfers in non-GHG metrics under A6.2.[104] For host countries, this implies that ITMO transfers from sectors not covered by the NDC essentially increases the opportunity cost of meeting their targets for the sectors that are covered under the NDC.

[102] United Nations Framework Convention on Climate Change (UNFCCC), "FCCC/PA/CMA/2021/10/Add.1."
[103] Interviewee #2, Carbon Markets Advisor, Independent Expert, 2022-02-15
[104] United Nations Framework Convention on Climate Change (UNFCCC), "FCCC/PA/CMA/2021/10/Add.1."

> *"Even if you transfer mitigation outcomes from outside of your NDC, it still will have to be reflected inside the NDC as corresponding adjustments apply, which really doesn't make sense"*.[105]

As parties understand the full implications of this and move towards implementation of the agreed text, one interviewee mentioned that countries will decide what should be authorized for CA.[106] As described by one interviewee, some Article 6 piloting activities that have been initiated have now essentially "frozen" their participation in the carbon markets until the host country has fully grasped the implications of CA on their own NDC achievement.[107]

Still, there is a lot of uncertainty and significant work remains for parties to understand how reporting, crediting periods, NDC timeframes and CA will apply to ensure robust accounting of transfers.

[105] Interviewee #14, Climate Change Analyst, The World Bank (WB), 2022-05-16
[106] Ibid.
[107] Interviewee #11, Climate Policy Analyst, The International Energy Agency (IEA), 2022-04-27

1.3 Parties' Mitigation Commitments

With the self-determined NDCs under the Paris Agreement, parties have vastly differing scopes, baselines, and ambition levels in their mitigation commitments. This means that parties' mitigation commitments must be assessed to avoid the risk of hot air being transferred under the new mechanism, which could undermine the environmental integrity of A6 markets.

Based on one analysis, there is a considerable risk that such hot air will be traded under the new mechanism, leading to an overall increase in global emissions, if NDC targets are not substantially strengthened.[108] Figure 9 outlines the amount of hot air in 2030, as NDC targets are set above projected BAU emissions. Since that study was conducted, several countries have submitted new NDCs with higher ambition. Still, one interviewee pointed out that there remains a considerable ambition gap in parties' NDCs, which might undermine the environmental integrity of A6.[109] Other respondents discussed that the application of CA for all authorized transfers also establishes perverse incentives for host parties to keep their NDC ambition low, as it would allow them to generate FDI and revenues from selling ITMOs without compromising the ability to reach their domestic targets. If these perverse incentives outweigh the cost savings and increased ambition in acquiring parties, global emissions risk increasing due to A6.[110]

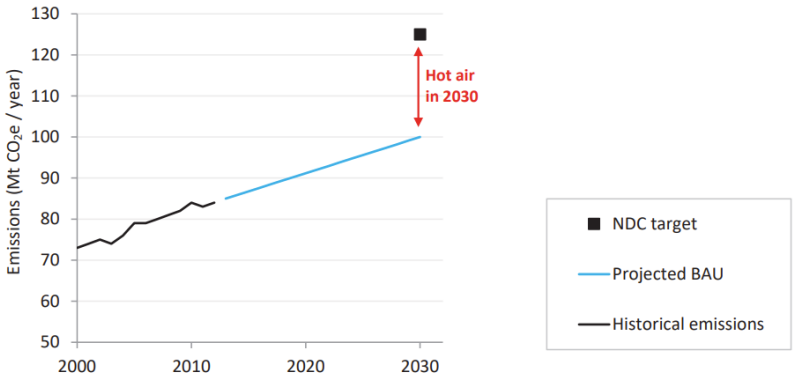


Figure 9. The definition of "hot air" as NDC targets are set above projected BAU emissions. (Theuer et al., 2017)

To address this risk, an independent assessment of NDCs was suggested, to evaluate if NDC targets really go beyond BAU or if baselines are inflated for the purpose of additional crediting.[111] This would likely be both technically and politically very difficult though, considering the self-determined nature and differing circumstances of parties' NDCs.[112] Others

[108] Theuer et. al., "International Transfers under Article 6 in the Context of Diverse Ambition of NDCs Environmental Integrity Risks and Options to Address Them."
[109] Interviewee #14, Climate Change Analyst, The World Bank (WB), 2022-05-16
[110] Interviewee #6, Carbon Markets Expert, Independent Consultant, 2022-02-25
[111] Interviewee #14, Climate Change Analyst, The World Bank (WB), 2022-05-16
[112] Theuer et. al., "International Transfers under Article 6 in the Context of Diverse Ambition of NDCs Environmental Integrity Risks and Options to Address Them."

have suggested setting volume limits on A6 transfers, either relative or absolute, to limit the risk of trading in hot air.[113] Finally, some countries, such as Sweden, have indicated that they will only purchase ITMOs from host parties with ambitious mitigation targets in place, aiming to ensure environmental integrity from the buyer side.[114] This approach would be completely dependent on the acquiring party's high standards in assessing NDC ambition and its priority to safeguard environmental integrity, which historically have shown to be highly dubious.[115] Considering that clear provisions have been put in place regarding both robust accounting and the quality of credits, the assessment of parties' mitigation commitments will likely be the primary factor impacting the environmental integrity of A6.

[113] Theuer et. al.
[114] Interviewee #5, Programme Manager, International Climate Initiatives, The Swedish Energy Agency, 2022-02-23
[115] Interviewee #7, Programme Officer, The UNFCCC Secretariat, 2022-03-10

Chapter 2: Size of Carbon Markets under Article 6

If environmental integrity is safeguarded, the size of carbon markets under A6 is what will determine its potential in driving emissions reductions and facilitating low-carbon development. As presented in the theoretical framework, the size and volume of A6 will depend on a large variety of factors, including:

1. Differences in Marginal Abatement Costs (MACs)
2. Political Considerations
3. Institutional Readiness
4. External Demand
5. Transaction Costs

Interviewees have underlined that because the A6 rulebook have just been agreed to and modalities are still being developed, it is extremely difficult to assess the potential size of A6 markets at this early stage. Whilst some see that A6 will grow larger than the CDM market, others think A6 will play a marginal role in facilitating emission reductions under the Paris Agreement.[116, 117] One interviewee pointed out that most experts thought that the JI would be the largest mechanism under the Kyoto Protocol, but in the end, the CDM garnered much more interest. As such, all predictions should be taken with a grain of salt.[118]

Most interviewees agreed that the bilateral trading under A6.2 is likely to become the main pathway for countries to acquire ITMOs for the achievement of their NDCs, since rules are less stringent and transaction costs potentially lower than under the A6.4M. On the other hand, if the final provisions are less burdensome and makes it easy for the private sector to participate as project developers, then the A6.4M could be the largest mechanism, both for state purposes and the VCM.[119] Interviewee #13 underlined the preference for the A6.4M to become the primary pathway, with the view that bilateral arrangements under A6.2 only transfers obligations from one country to another, thus not serving the purpose of reducing overall emissions and contributing to the Paris Agreement goals.[120] Others pointed out that it will mainly depend on the institutional readiness of the country. High-income and large emerging economies with

[116] Interviewee #12, Head of Delegation to the UNFCCC, The Swedish Ministry of Environment, 2022-04-29
[117] Interviewee #7, Programme Officer, The UNFCCC Secretariat, 2022-03-10
[118] Interviewee #11, Climate Policy Analyst, The International Energy Agency (IEA), 2022-04-27
[119] Interviewee #11, Climate Policy Analyst, The International Energy Agency (IEA), 2022-04-27
[120] Interviewee #13, Distinguished Fellow and Programme Director, Earth Science and Climate Change, The Energy and Resources Institute (TERI), India, 2022-05-10

experience from the CDM, domestic registry systems in place and greater institutional capacity is more likely to form bilateral agreements under A6.2, whereas LDCs with less experience from the CDM and more limited capacities are more likely to engage in the A6.4M where they can employ the centralized registries and UNFCCC oversight.[121]

[121] Interviewee #7, Programme Officer, The UNFCCC Secretariat, 2022-03-10, Interviewee #9, Lead Climate Negotiator, The People's Republic of Bangladesh, 2022-03-25

2.1 Differences in Marginal Abatement Costs

The difference of MAC between countries and regions is a key factor determining the potential size and volume of trade under A6. In the most recent IPCC report, it was concluded that 25% of global emissions could be reduced from 2019 to 2030 with emissions reduction activities costing less than $20/tCO2e and 50% of global emissions with options costing less than $100/tCO2e, with a significant spread between countries and regions.[122] By the utilization of cooperative approaches under A6, these costs can be balanced and the most cost-effective emission reductions pursued first, generating benefits for both buyer and seller parties.[123]

In a modelled net-zero scenario, where global emissions are reduced by 90% until 2050 and countries commit to net-zero from 2045 to 2125 based on their economic development, there is a large spread of MACs and rapidly increasing carbon prices across all regions. In this case, international cooperation under A6 could facilitate up to 3.5 GtCO2e ITMO transfers annually in 2030 with a market value of $300 billion, shifting to 2.4 GtCO2e in 2050 with a market value of $1 trillion.[124] Compared to an independent implementation scenario without A6, more mitigation efforts would take place in non-OECD regions with lower mitigation costs, relocating investments from high MAC projects in OECD countries towards low-cost regions. As nature-based solutions and land use projects generally have low marginal costs, low capital requirements and is easy to implement, those countries with larger land resources are seen as more likely to become sellers in the first years of A6, depending on the methodology and eligibility of these credits, which is currently under deliberation by the Supervisory Body.[125,126] Through the first NDC contribution period until 2030, land-use change projects could contribute more than 50% of total emissions mitigation, then falling to below 20% in 2050 and 5% by 2100. Whilst driving increased volumes of trade, the low cost of such land-use projects could mean a significantly smaller size of the market, reaching $43 billion in 2030, according to some estimates.[127] As such, the eligibility and interest to purchase ITMOs from these activities under the A6 mechanisms will have a significant impact on the market size and development.[128]

[122] IPCC AR6 WGIII, "Climate Change 2022: Mitigation of Climate Change."
[123] Jae Edmonds et al., "The Economic Potential of Article 6 of the Paris Agreement and Implementation Challenges," Technical Paper (Washington, DC: World Bank, September 2019), https://doi.org/10.1596/33523.
[124] Edmonds et al., "How Much Could Article 6 Enhance Nationally Determined Contribution Ambition Toward Paris Agreement Goals Through Economic Efficiency?"
[125] Edmonds et al.
[126] Interviewee #2, Carbon Markets Advisor, Independent Expert, 2022-02-15
[127] Edmonds et al., "The Economic Potential of Article 6 of the Paris Agreement and Implementation Challenges."
[128] Interviewee #2, Carbon Markets Advisor, Independent Expert, 2022-02-15

Developed countries and regions such as Europe, the US, Japan, the Middle East and South Korea are outlined as likely buyers in the new markets, whereas most developing countries and regions, including China, India and most of Africa and Latin America with lower MACs are expected to become sellers.[129] The higher the abatement costs in buyer countries, and the lower the abatement costs are in seller countries, the more they can gain from engaging in cooperative approaches. For those countries with MACs close to the average carbon prices modelled, there is little to gain from participation in the A6 carbon market, unless other factors are prioritized. Whilst the volume of ITMO transfers is expected to decrease over time as countries' NDCs become more stringent and GHG emissions converge towards zero, an increase in levelized MACs is foreseen from $85/tCO2 in 2030 to $420/tCO2 in 2050, generating a market value exceeding $1 trillion annually by 2050.[130] Figure 10 below models the trade volumes (left) and financial transfers (right) per year between parties in the net-zero scenario, whereas Figure 11 showcases the geographic distribution of where trade might take place.[131]

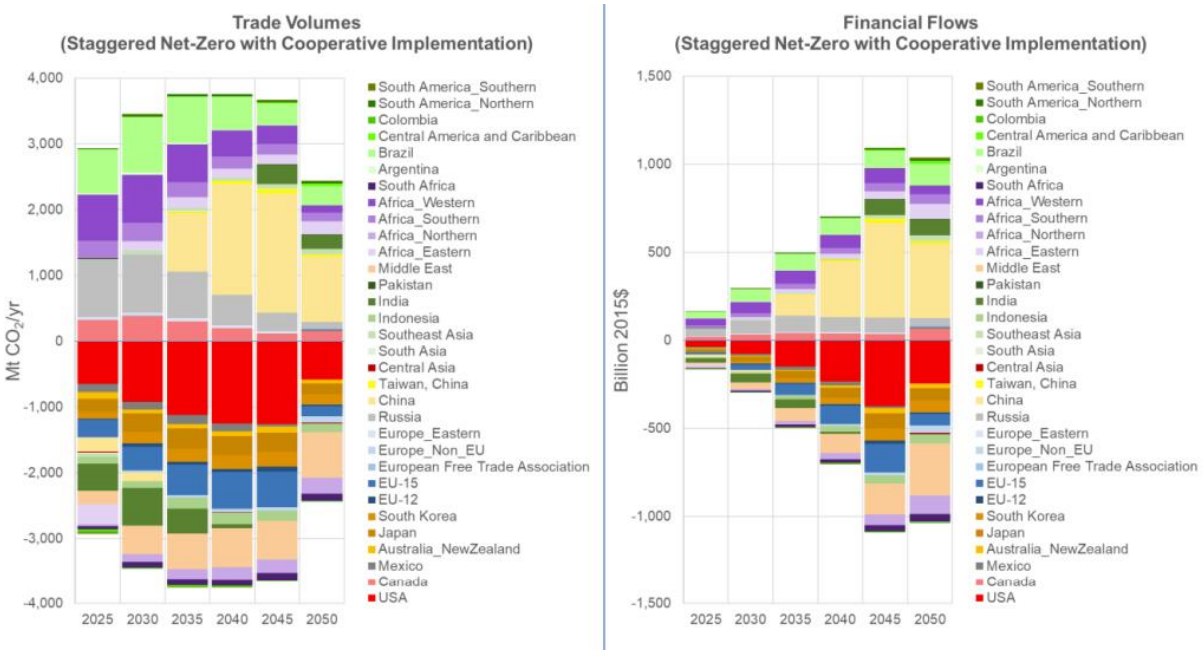


Figure 10. Trade volumes and financial flows of Article 6. Values < 0 = buyers, values > 0 = sellers. (Yu et al., 2021)

[129] Yu et al., "The Potential Role of Article 6 Compatible Carbon Markets in Reaching Net-Zero," *The International Emissions Trading Association (IETA)*, October 2021.
[130] Yu et al.
[131] Yu et al.

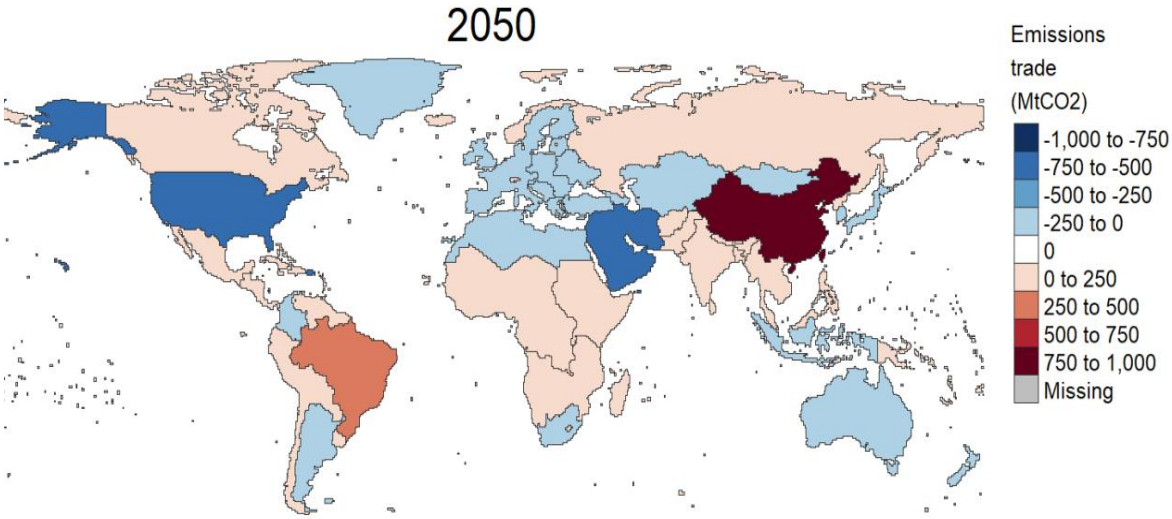


Figure 11. Map of potential A6 buyer (negative values) and seller (positive values) parties in 2050. (Yu et al., 2021)

Another study estimates that international carbon markets could mobilize annual resource flows of $220 billion in 2030, which would reduce annual mitigation costs by 30%. By 2050, the carbon market could mobilize $2.2 trillion in resource flows, reducing annual mitigation costs with 50%.[132] Even though these models showcase different volumes of trade, most estimates range way above the size of the flexible mechanisms established under the Kyoto Protocol, similarly to interviewees projections. Nevertheless, these studies are generally looking at the size of the market from idealized scenarios where all parties are willing to fully utilize international carbon markets for the implementation of their NDCs. In reality, it is not just the spread in MACs but also political considerations, institutional readiness and transaction costs that determines the size of the future A6 market. As highlighted by interviewee #5, Sweden has a legal obligation to reduce 85% of GHG emissions through domestic efforts. Only 15% of their climate neutrality target may be achieved by complementing efforts such as purchasing ITMOs through A6. For those possible ITMOs, they plan to place significant considerations to gender equality, climate ambition and poverty reduction, rather than just pursuing the cheapest possible emission reductions.[133] If other parties have similar political considerations, this could infer a significantly smaller market size.

[132] Emily Davies, "Recommendations for an International Carbon Currency Market under Article 6 of the Paris Agreement," *Carbon & Climate Law Review* 12, no. 2 (2018): 132–39, https://www.jstor.org/stable/10.2307/26489006.
[133] Interviewee #5, Programme Manager, International Climate Initiatives, The Swedish Energy Agency, 2022-02-23

2.2 Political Considerations

Having been emphasized by several interviewees, the size and volume of A6 will primarily depend on parties' political willingness to engage in cooperative approaches and the perceived benefits of doing so.[134]

Based on an analysis of parties' updated NDCs by 30 July 2021, the share of countries indicating that they plan or might engage in cooperation through A6 nearly doubled from 44% to 87%, since their previous NDC submissions.[135] Similarly, the share of parties that have set qualitative limits on their engagement has doubled from 19% to 39% since their previous NDCs.[136] Only 6 parties exclude participation, 42 parties "consider" using cooperative approaches and 45 parties "intend" to use them, out of the 124 second or updated NDCs submitted by parties until October 2021.[137] Figure 12 maps out parties' mention of cooperative approaches in their updated NDCs.

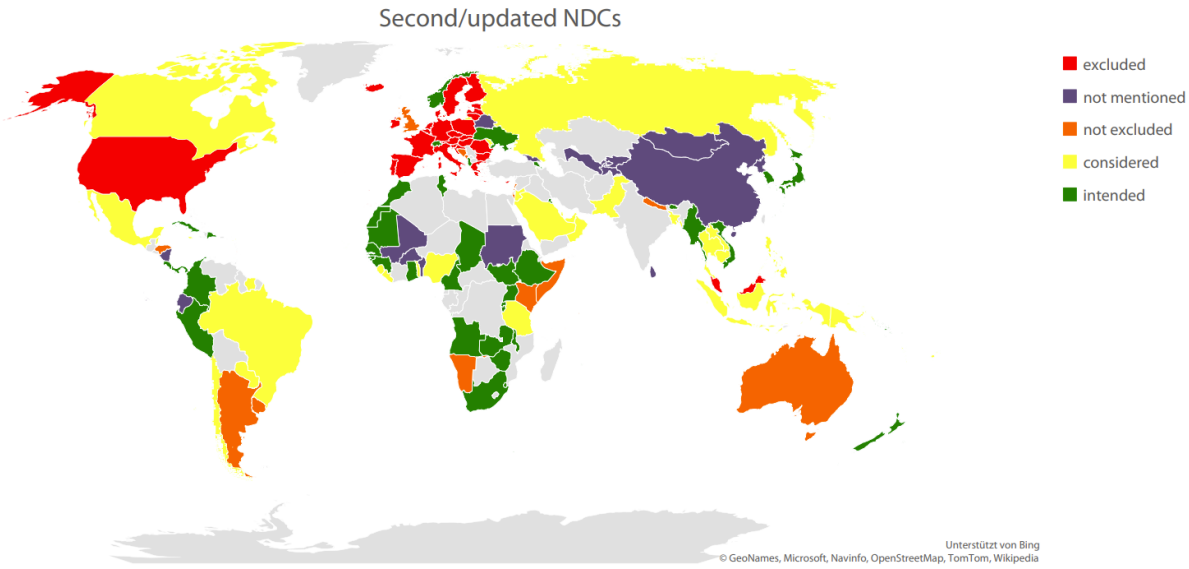


Figure 12. Parties' mention of cooperative approaches in second/updated NDCs (Obergassel et al., 2021)

[134] Interviewee #2, Interviewee #3, Interviewee #7, Interviewee #15
[135] United Nations Framework Convention on Climate Change (UNFCCC), "FCCC/PA/CMA/2021/8."
[136] United Nations Framework Convention on Climate Change (UNFCCC).
[137] Wolfgang Obergassel, Nicolas Kreibich, and Victoria Brandemann, "Implementing Paris Cooperatively: Update on Market Mechanisms in the Latest NDC Submissions," *Carbon Mechanisms Research, Wuppertal Institute* Policy Paper No. 5 / 2021 (November 2021), https://www.carbon-mechanisms.de/fileadmin/media/dokumente/Publikationen/Policy_Paper/Markets_in_NDCs_fin_fin.pdf.

However, most references to cooperative implementation in parties' NDCs are very vague and it is not always clear if they intend to utilize A6.2, the centralized A6.4M, or other cooperative approaches and non-market approaches such as those outlined under Article 6.8. [138] Only six Parties explicitly mention the Article 6.4 mechanism. Likewise, there is little information to the volumes of ITMOs that countries expect to purchase or sell and their strategies to engage with the mechanism. Still, one result that stands clear is that a much larger share of parties envisions to be sellers on the market (53) than those looking to acquire ITMOs (9), presented in Figure 13.

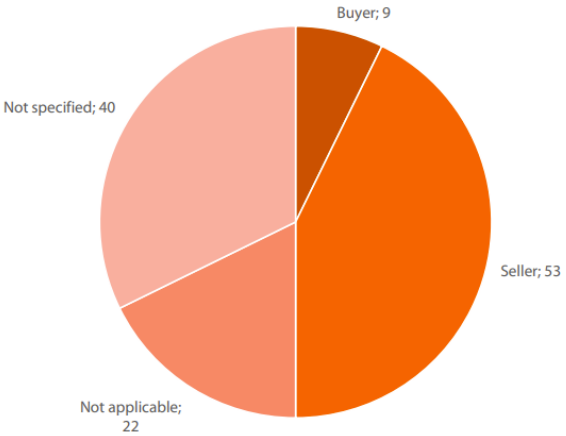


Figure 13. Parties' role in cooperative approaches as outlined in their NDCs (Obergassel et al., 2021)

This imbalance between supply and demand was also confirmed in interviews, with several respondents highlighting that some of the largest potential buyer parties, such as the EU and the US, have so far stated that they are not intending to acquire any ITMOs for achieving their NDCs.[139] In a recent webinar, a representative from the European Commission underlined that the EU target is to reach net-zero by mitigation and removals within Europe, and that the *"glory days"* of the CDM were over. On the same note, he pointed out that the impact of A6 on the planned Carbon Border Adjustment Mechanism (CBAM) of the EU would likely be negligible.[140] If this stance is maintained by the EU and the US, the size of A6 could be substantially reduced compared to earlier estimations.

Instead, other countries such as Japan, Canada, South Korea, Australia, the UK, Sweden, Norway, and Switzerland might constitute the initial demand for ITMOs, with several of them engaged in voluntary pilots.[141] Switzerland have already signed bilateral climate agreements under A6.2 with Peru, Ghana, Senegal, Georgia, Vanuatu, Dominica, Thailand, Morocco and Chile.[142] Under the new CO2 Act, the KliK foundation is planning to procure 35MtCO2e of

[138] Obergassel, Kreibich, and Brandemann.
[139] Interviewee #6, Interviewee #7, Interviewee #11
[140] Martin Hession, "What Does Article 6 Mean For Europe," https://register.gotowebinar.com/recording/8546066696649853446.
[141] Interviewee #11, Climate Policy Analyst, The International Energy Agency (IEA), 2022-04-27
[142] Federal Office for the Environment in Switzerland (FOEN), "Bilateral Climate Agreements," accessed June 12, 2022, https://www.bafu.admin.ch/bafu/en/home/themen/thema-klima/klimawandel-stoppen-und-folgen-meistern/klima--internationales/staatsvertraege-umsetzung-klimauebereinkommen-von-paris-artikel6.html.

international emissions reductions until 2030 to offset emissions from the use of motor fuels in Switzerland.[143] Similarly, Sweden have been recommended to purchase approximately 20MtCO2e until 2030 through A6 by an expert commission, some of which may be used towards the achievement of Sweden's domestic climate targets, and some which may be cancelled to be seen as RBCF.[144] In addition, there are indications of South Korea allowing A6.4ERs for offsets under their domestic ETS, which might constitute a demand of ~10MtCO2e/year,[145] Japan linking their Joint Crediting Mechanism (JCM) with A6.2, aiming for cumulative emissions reductions of ~100MtCO2e until 2030,[146] and Australia investing AUD $104 million into an Indo-Pacific Carbon Offsets Scheme which might fall under A6.[147] Based on an estimation from the Swedish Government, they see a total aggregated demand under A6 of 900MtCO2e during 2021-2030.[148] With this limited demand expected from countries, some experts assess that external demand from the VCM and CORSIA might be larger than the compliance market in the initial phase.[149] This is discussed further under chapter 2.4.

As compared to the CDM, anyone can be a buyer and anyone can be a seller under A6, with the dynamic potentially changing over time. Certain countries like Canada might be a buyer in the early stages but become a seller in the future because of their large land resources. Conversely, India might be a seller to start and become a buyer in the future as their emissions outpace their uptake.[150] One respondent mentioned that ***"It's a little bit of a chicken and egg situation"***, outlining that acquiring parties are waiting to see the supply and quality of credits, while the potential host parties are awaiting to see the demand and price levels of ITMOs before initiating project development.[151]

[143] Simon Fellermeyer, Article 6 Negotiator for Switzerland, email to author, 2022-04-04
[144] Åsa-Britt Karlsson, "Vägen till en klimatpositiv framtid [The Road to a Climate Positive Future]," SOU 2020:4 (Stockholm, Sweden, 2020).
[145] Vandana Sebastian, "South Korean Carbon Credit Provider Looks at Voluntary Carbon Markets," July 21, 2021, https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/metals/072121-interview-south-korean-carbon-credit-provider-looks-at-voluntary-carbon-markets.
[146] Ministry of the Environment, Japan, "JCM (Joint Crediting Mechanism): Introduction of Decarbonizing Technologies," https://baketrans.dephub.go.id/file/599.
[147] Department of Industry, Science, Energy and Resources of Australia, "Supporting climate action in the Indo-Pacific region," Text (Department of Industry, Science, Energy and Resources, November 1, 2021), https://www.industry.gov.au/policies-and-initiatives/international-climate-change-commitments/supporting-climate-action-in-the-indo-pacific-region.
[148] Karlsson, "Vägen till en klimatpositiv framtid [The Road to a Climate Positive Future]."
[149] Interviewee #2, Carbon Markets Advisor, Independent Expert, 2022-02-15, Interviewee #12, Head of Delegation to the UNFCCC, The Swedish Ministry of Environment, 2022-04-29
[150] Interviewee #11, Climate Policy Analyst, The International Energy Agency (IEA), 2022-04-27
[151] Interviewee #1, Regional Manager, The UNFCCC Secretariat, 2022-02-10

Interviewees also discussed that the application of CA might imply that host parties will prioritize the cheaper mitigation options available for domestic efforts towards achieving their NDCs, and only offer the more expensive mitigation options, *"the high-hanging fruit"*, to be sold as ITMOs under A6. This might limit the supply of credits on the market.[152] On the other hand, what mitigation options host parties decide to sell will probably depend mainly on the price levels for ITMOs,[153] and limiting certain sectors or projects from A6 can be seen as going *"against the true market spirit"* according to the respondent from the WB.[154] Instead, a more *"market-friendly"* approach would be for developing countries to not limit which mitigation outcomes to sell under A6, but instead develop clear pricing strategies. If the host country adopts a strategy where they sell any ITMOs at the price of their highest MAC options, they can then reinvest the revenues in additional mitigation projects without risk of compromising their own NDC achievement.[155]

Following the COP26 decision, interest from developing countries to participate in A6 has been growing quickly, as seen by the organizations providing capacity building and piloting activities.[156] However, the institutional capacity, especially among LDCs, is still low, which might hamper the development of A6 strategies and projects, if not addressed effectively.[157]

[152] Interviewee #14, Interviewee #13, Interviewee #11
[153] Interviewee #13, Distinguished Fellow and Programme Director, Earth Science and Climate Change, The Energy and Resources Institute (TERI), India, 2022-05-10
[154] Interviewee #14, Climate Change Analyst, The World Bank (WB), 2022-05-16
[155] Ibid.
[156] Interviewee #15, Program Manager, The Green Growth Institute (GGGI), Korea, 2022-05-23
[157] Interviewee #14, Climate Change Analyst, The World Bank (WB), 2022-05-16

2.3 Institutional Readiness

A key explanation as to why demand and supply may seem limited is depending on parties' lack of understanding and capacity to engage with A6. Whilst many parties have experience from the flexible mechanisms under the Kyoto Protocol, the application of corresponding adjustments fundamentally changes the dynamic of the market, as described in previous chapters. Compared to the CDM, when selling CERs was effectively a win-win situation for developing countries, there is now a need for them to consider their domestic climate targets before engaging in emissions trading, as they otherwise may risk overselling credits and jeopardizing the achievement of their NDC.[158]

This implies that parties need to develop strategies for how they plan to interact with A6, including if they wish to be a buyer of ITMOs, seller of ITMOs or *both* – where they try to sell domestic ITMOs at high prices and then purchase ITMOs from other parties at a lower cost. For host parties, the application of corresponding adjustments means that they must distinguish which mitigation options they are willing to sell, and which mitigation activities they want to pursue for the achievement of their own NDC, to avoid overselling.[159] This can, for instance, be done by the development of domestic MAC curves, where the cheapest abatement options are kept for the achievement of the NDC, and more costly emission reductions are offered as potential projects to be delivered and transferred as ITMOs under A6.[160] Still, as highlighted in the interview with Uganda, the process to decide which potential projects could be developed under A6 is still in its nascent stages due to institutional and structural capacity gaps. This is because the lead climate change responsible agencies such as Ministry of Water and Environment, and the National Planning Authority have commenced conversations on A6, but it has not yet rolled out to other line ministries and local governments. In addition, for LDCs like Uganda, the interviewee emphasized that whilst the NDC captures both mitigation and adaptation measures, more emphasis is rallied towards adaptation to deal with the prevailing effects of climate change. As such, emission mitigation measures and A6 projects should be designed with sustainable development co-benefits such as resilient communities, green jobs, and affordable energy access at the forefront.[161]

[158] Interviewee #11, Climate Policy Analyst, The International Energy Agency (IEA), 2022-04-
[159] Axel Michaelowa et al., "Promoting Article 6 Readiness in NDCs and NDC Im-plementation Plans," *Perspectives Climate Group GmbH*, June 30, 2021, 65, https://www.climatefocus.com/sites/default/files/PCG-CF_Article%206%20in%20NDCs_30.06.21_final%20version.pdf.
[160] Interviewee #7, Programme Officer, The UNFCCC Secretariat, 2022-03-10
[161] Interviewee #4, Senior Planner - Environment and Natural Resources, National Planning Authority of Uganda, 2022-02-18

> ***"The interest is there for everyone, but developing countries generally need a lot of capacity before they can engage in carbon market mechanisms".*** [162]

Countries with prior experience from other market-based instruments, such as the CDM or domestic offsetting schemes, have shown a larger institutional readiness to engage in A6. Despite this, some countries have largely been concentrated on one type of projects during the CDM, e.g., Vietnam on hydropower, which does not necessarily provide the right MRV framework for projects in other sectors or policy-based approaches.[163] In addition, one interviewee pointed out that many governments are still trying to figure out what ministries should be responsible for the authorization and development of A6 strategies. Compared to the CDM when there were few downsides to sell credits, countries now need to coordinate between several ministries such as finance, planning and environment, to consider A6 in the development of domestic climate targets, NDCs and LT-LEDS.[164]

> ***"You have to explain it simply, like to a 10-year-old, so that also the economists and other decisionmakers understand it".*** [165]

Other considerations of institutional readiness for A6 include domestic capacities for MRV, national accounting frameworks, operational registries, GHG inventories, reporting methodologies and authorization processes. In addition, parties with single year NDC targets need to define if they either average ITMO transfers during the entire NDC implementation period and use the average annual volume towards the achievement of their NDC, or if they develop a multi-year emissions trajectory or emission budgets to which CA is applied. A more exhaustive list of A6 readiness dimensions is outlined below in Figure 14.[166]

[162] Interviewee #7, Programme Officer, The UNFCCC Secretariat, 2022-03-10
[163] Mraz Marian, "Identifying Potential Policy Approaches under Article 6 of the Paris Agreement: Initial Lessons Learned," *The Global Green Growth Institute*, January 2021, https://gggi.org/site/assets/uploads/2021/01/Policy-Approaches-under-PA-Article-6210121.pdf.
[164] Interviewee #14, Climate Change Analyst, The World Bank (WB), 2022-05-16
[165] Interviewee #4, Senior Planner - Environment and Natural Resources, National Planning Authority of Uganda, 2022-02-18
[166] Michaelowa et al., "Promoting Article 6 Readiness in NDCs and NDC Im-plementation Plans."

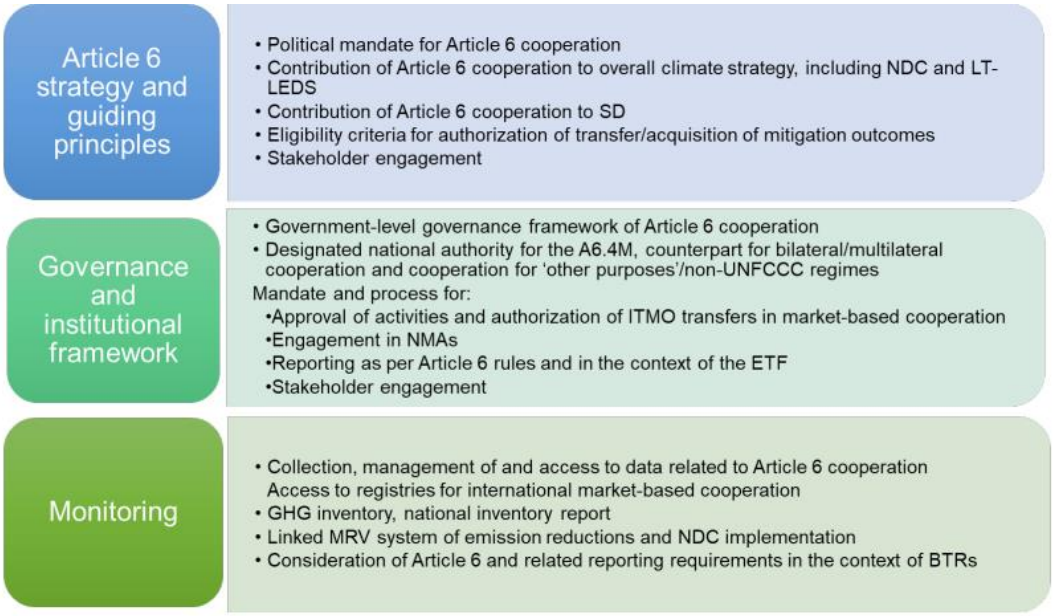


Figure 14. Institutional readiness for Article 6 engagement. (Michaelowa et al., 2021)

Still, there are significant gaps in the understanding of A6 and there is a need for international partners to strengthen capacity building, to ensure that all countries can engage. In the short term, the UNFCCC have tasked its six Regional Collaboration Centers (RCCs) to design and implement capacity building programs for interested parties, especially with regards to the institutional arrangements necessary and technical capacities to set baselines for application in host parties.[167] Other multilateral organizations such as the World Bank (WB), the Global Green Growth Institute (GGGI), and the Asian Development Bank (ADB) have also initiated several different capacity building programs on the ground to support parties in getting ready for A6. How quickly parties can build institutional readiness to start engaging with A6 will likely have a significant impact on both supply and demand in the coming years.[168]

[167] United Nations Framework Convention on Climate Change (UNFCCC), "FCCC/PA/CMA/2021/10/Add.1."
[168] Interviewee #2, Carbon Markets Advisor, Independent Expert, 2022-02-15

2.4 External Demand: Voluntary Carbon Markets & CORSIA

With the limited demand seen from countries so far, many experts believes that external demand from the VCM and CORSIA might represent the largest buyers of A6 credits in the coming years.[169] Following a period of significant expansion, the VCM now represent an annualized trade volume of almost 360MtCO2e, with a market cap of more than $1 billion. Projections expect the market to continue growing, with estimates ranging from 0.5 to 2GtCO2e traded in 2030 and a market size of up to $100 billion.[170] Should some of this demand be directed through A6, it might have a significant impact on the size and development of the A6 market.

Whilst A6 does not regulate the VCM, many have underlined that with the adoption of the A6 rulebook, it can be expected that VCM standards such as Gold Standard and Verra will also consider implementing changes such as the application of CA to strengthen environmental integrity. Since the low credibility of carbon offsets has been an area of growing critique, these changes could then lead to a further expansion of the VCM, if properly adjusted and applied.[171]

> ***"There will inevitably be a convergence between compliance and voluntary markets."***[172]

Some voluntary standards have already indicated that they will look to host both authorized ITMOs with CA applied, and A6.4ERs without application of CA.[173] Whilst some see that the VCM and compliance markets under A6 will converge, others argue that the complex authorization, monitoring and oversight process in A6 will probably limit demand from the VCM of A6 credits and instead see the markets operating side-by-side, at least for the coming years. [174] Interviewee #10 highlighted that the traditional division between voluntary and compliance markets will soon become outdated. Instead, we should start talking about the "authorized" and "non-authorized" market, where the authorized credits apply CA, follows higher quality standards and can be used for carbon neutrality and net-zero claims for parties, corporations and other stakeholders, whereas the non-authorized market represents the cheaper

[169] Interviewee #6, Carbon Markets Expert, Independent Consultant, 2022-02-25
[170] Jiang et al., "Treeprint: Carbon Markets The Beginning of the Big Carbon Age," *Credit Suisse A.G.*, 2022, https://www.credit-suisse.com/about-us-news/en/articles/news-and-expertise/carbon-markets-invest-in-greenhouse-gas-emissions-202204.html.
[171] Jiang et al.
[172] Interviewee #14, Climate Change Analyst, The World Bank (WB), 2022-05-16
[173] Interviewee #6, Carbon Markets Expert, Independent Consultant, 2022-02-25
[174] Interviewee #6, Carbon Markets Expert, Independent Consultant, 2022-02-25, Interviewee #15, Program Manager, The Green Growth Institute (GGGI), Korea, 2022-05-23

offsetting market of the past.[175] These non-authorized "support units" or "results-based payment units", such as those described for NbS projects, could be used for contribution claims and RBCF, but not towards the achievement of climate neutrality goals. As ambition is increased and parties' move towards net-zero, these support units might slowly be phased out, and the market will largely consist of authorized permanent removals.[176]

> ***"Demand from the voluntary carbon market for authorized credits is growing, the problem is still that no countries really know how to do it in practice."***[177]

As the demand for ITMOs from the VCM increase, the institutional strengthening and capacities of host countries will become increasingly important. The opportunity cost arising from host country authorization of ITMOs needs to be carefully assessed in the light of domestic NDC targets, and well-defined strategies should be adopted, as discussed in previous chapters.[178] In the end, we may see a very fragmented voluntary market in the coming years. If corporate demand outweighs the supply of authorized ITMOs, some might choose to purchase A6.4ERs due to the centralized UNFCCC oversight, share of proceeds and perceived quality of credits, some might procure credits from other high-quality voluntary standards, and many non-party stakeholders might instead continue purchasing the cheapest possible, low-quality offsets.[179]

Finally, some interviewees pointed out that CORSIA could raise demand for A6 credits, with earlier studies estimating the potential demand from 1.6 to 3.7 Gt in the period 2021 to 2035. [180,181] However, due to the sharp fall in aviation during the COVID-pandemic, and the voluntary nature of offsetting in the first phases, demand for A6 ITMOs from CORSIA will probably be marginal in the coming years. Still, some experts argue that when it enters the next phase in 2027, it has the potential to become a significant demand center for A6 credits.[182,183]

[175] Interviewee #10, [anonymous], The UNFCCC Secretariat, 2022-04-11
[176] Ibid.
[177] Interviewee #2, Carbon Markets Advisor, Independent Expert, 2022-02-15
[178] Hession, "What Does Article 6 Mean For Europe."
[179] Interviewee #2, Carbon Markets Advisor, Independent Expert, 2022-02-15
[180] Interviewee #13, Distinguished Fellow and Programme Director, Earth Science and Climate Change, The Energy and Resources Institute (TERI), India, 2022-05-10
[181] Sean Healy, "CORSIA: Quantification of the Offset Demand" (Institute for Applied Ecology, June 2017).
[182] Aki Kachi et al., "Considerations for Article 6 Engagement: The Host Country Perspective" (NewClimate Institute, 2020), https://newclimate.org/wp-content/uploads/2020/11/NewClimate_Article6_Engagement_HostCountryPerspective_Nov2020.pdf.
[183] Interviewee #2, Carbon Markets Advisor, Independent Expert, 2022-02-15

2.5 Transaction Costs

After extended negotiations, the COP26 decision eventually also agreed on the levy of Share of Proceeds (SoP) for adaptation, administrative expenses, and other transaction costs under the new A6 mechanisms. For the bilateral trading under A6.2, transaction costs are defined and constituted by the administration and transfer costs of the participating parties with no compulsory fees to the UNFCCC. Under the centralized A6.4M on the other hand, clear rules were put in place for:

- A set 5% levy of SoP of the issued A6.4ERs to the Adaptation Fund, to assist vulnerable developing countries in meeting the costs of adaptation
- A monetary contribution related to the volume of A6.4ERs towards adaptation, to be set by the Supervisory Body
- A periodic contribution based on any remaining budget from the administrative expenses towards adaptation, to be determined by the CMA
- A 2% mandatory cancellation of the issued A6.4ERs towards delivering an overall mitigation in global emissions (OMGE)
- Administrative fees, to be determined by the CMA[184]

In total, this implies a minimum 7% transaction costs under the A6.4M, excluding the administrative fees and monetary contributions to adaptation that are still to be decided. Likely, transaction costs of the centralized A6.4M will be more than 10%, without taking any institutional or administrative costs for the participating parties into account.[185]

Whilst many developing countries were fighting hard to get the SoP towards adaptation included, and developed parties mainly focused on getting the 2% towards OMGE in place, several interviewees mentioned that the high transaction costs might limit the size of the A6.4M.[186] If environmental integrity is ensured, all parties gain from increased trade, and as such would benefit from as low transaction costs as possible. Whilst important, interviewee #8 argued that other means of financing adaptation would be more suitable to not hamper the development of the A6.4M.[187]

Similarly, interviewee #7 pointed out that the high transaction fees under A6.4M might lead to more parties developing bilateral agreements under A6.2, where they are free to use their own

[184] United Nations Framework Convention on Climate Change (UNFCCC), "FCCC/PA/CMA/2021/10/Add.1."
[185] Interviewee #8, Article 6 Advisor, Independent Expert, 2022-03-16
[186] Interviewee #15, Program Manager, The Green Growth Institute (GGGI), Korea, 2022-05-23
[187] Interviewee #8, Article 6 Advisor, Independent Expert, 2022-03-16

systems and methodologies. If parties are to utilize the A6.4M, the SoP towards adaptation, OMGE, and central oversight by the UNFCCC needs to be reflected in a greater trust and willingness from buyers to procure A6.4 credits for a higher price on the market, compared to A6.2 ITMOs and credits from voluntary standards.[188]

> ***"But the question is if the market will be honest to itself and behave this way? Because historically, the market has always been a race-to-the-bottom for the cheapest credits."***[189]

With transitioned CDM activities potentially starting to generate A6.4ERs in 2023, and the first new 6.4 projects possibly starting to issue credits in 2024 or 2025, it will still take some time before the impact of these transaction costs can be evaluated.[190]

[188] Interviewee #7, Programme Officer, The UNFCCC Secretariat, 2022-03-10
[189] Ibid.
[190] Ibid.

Chapter 3: Raising Ambition through Article 6

Raising ambition in global mitigation efforts is critical to achieve the long-term temperature goals of the Paris Agreement and is outlined as a key objective for voluntary cooperation in the first paragraph of A6.[191]

As compared to the CDM, which was clearly designed as a pure offsetting mechanism, the A6 decision underlines that cooperative implementation should allow for higher ambition in parties' mitigation and adaptation actions.[192] Whilst there are many diverging views on the impact of CDM on global emissions, most interviewees have agreed that A6 is likely to have a net-positive impact on global emissions, indicating an increase in ambition.[193]

Similarly, a majority of respondents underlined that A6 will be crucial for parties to achieve their net-zero commitments and balance their GHG emissions with uptakes.

> *"High-income countries with the largest historical responsibility for emissions should not just reach net-zero before mid-century but must become net-negative emitters in gigatonne-scales. This includes expanding CDR in international carbon markets. However, while Article 6 is absolutely necessary to make this transition possible, the ambition raising needs to come from the political level."*[194]

Others emphasized that carbon markets are just one of many instruments needed to support implementation, stating that, *"Markets does not provide a silver bullet for increasing ambition".*[195] That A6 was one of the last things to be agreed to under the Paris Agreement, indicates that it has been seen by parties as relatively marginal pathway to help increase ambition towards the PA goal, according to one interviewee. [196] It may help, but it alone will not close the emissions gap. Rather, it should mainly be seen as an instrument intended for countries to save costs, whilst also helping them increase their ambition.[197] This will ultimately depend on potential technology transformations and how financial gains are reinvested.

[191] United Nations Framework Convention on Climate Change (UNFCCC), "The Paris Agreement."
[192] Edmonds et al., "How Much Could Article 6 Enhance Nationally Determined Contribution Ambition Toward Paris Agreement Goals Through Economic Efficiency?"
[193] Interviewees # 1, 2, 5, 6, 7, 9, 11, 14, 15
[194] Interviewee #10, [anonymous], The UNFCCC Secretariat, 2022-04-11
[195] Interviewee #7, Programme Officer, The UNFCCC Secretariat, 2022-03-10
[196] Interviewee #11, Climate Policy Analyst, The International Energy Agency (IEA), 2022-04-27
[197] Interviewee #11, Climate Policy Analyst, The International Energy Agency (IEA), 2022-04-27

Some were also still of the view that A6 should be seen mainly as a financing mechanism, similar to how the Kyoto mechanisms were designed. Stating that, *"it would not be proper to expect that it will raise ambition".*[198] Similarly, interviewee #4 underlined that LDCs like Uganda will not increase their mitigation ambition unless the earlier promised climate finance support is provided, emphasizing that A6 needs to show how it can facilitate this capital to developing countries.[199]

[198] Interviewee #13, Distinguished Fellow and Programme Director, Earth Science and Climate Change, The Energy and Resources Institute (TERI), India, 2022-05-10
[199] Interviewee #4, Senior Planner - Environment and Natural Resources, National Planning Authority of Uganda, 2022-02-18

3.1 Reinvestments

If the A6 market is fully operationalized, it could potentially reduce the total cost of mitigation with 30% in 2030 and up to 50% by 2050, representing a total of $21 trillion saved between 2020 and 2050.[200] Other studies have highlighted that A6 could reduce the cost of achieving parties' NDCs by 2030 with $300 billion, [201] or up to 79%, if all parties pursue voluntary cooperation.[202] This would free up significant volumes of capital that could be used for enhanced mitigation ambition. If reinvested into additional emission reductions, parties could theoretically double their NDC ambition by 2030, with no extra cost.[203] To decarbonize the world economy, annual investments of up to $1.6 trillion will be needed, of which 30% is likely to come from public funds and the remaining 70% from private sources.[204] Just to achieve the goals of the Paris Agreement, the world would need to see annual investments of around $700 billion by 2030.[205] Consequently, the key impact of A6 on reaching net-zero will depend on how financial gains generated and mobilized will be utilized for further mitigation efforts.[206]

So far, there has been no guidance from the UNFCCC on the reinvestment of revenues or cost-savings from A6, which means that an increase in ambition will depend on every country's individual strategy. According to interviewee #11, it is possible that not all host countries will use revenues or cost-savings to reinvest exclusively in mitigation or adaptation activities. This can partly be explained because of limitations in fiscal codes or national legislation in some countries that prohibits the earmarking of revenues for a certain type of activities, or because of divergent economic interests.[207]

> *"Especially now in the current geopolitical regime, with years of covid-spending and the new Russia-Ukraine crisis, governments' debts have been brought to record highs, and a lot of them will have other priorities than reinvesting in mitigation actions."*[208]

For example, as a response to the global COVID-19 pandemic, governments have issued trillions of USD in recovery stimulus packages. Unfortunately, as highlighted by recent

[200] Edmonds et al., "The Economic Potential of Article 6 of the Paris Agreement and Implementation Challenges."
[201] Edmonds et al., "How Much Could Article 6 Enhance Nationally Determined Contribution Ambition Toward Paris Agreement Goals Through Economic Efficiency?"
[202] Marian, "Identifying Potential Policy Approaches under Article 6 of the Paris Agreement: Initial Lessons Learned."
[203] Yu et al., "The Potential Role of Article 6 Compatible Carbon Markets in Reaching Net-Zero."
[204] IEA, "Net Zero by 2050 - A Roadmap for the Global Energy Sector" (Paris: International Energy Agency, October 2021).
[205] Yu et al., "The Potential Role of Article 6 Compatible Carbon Markets in Reaching Net-Zero."
[206] Interviewee #14, Climate Change Analyst, The World Bank (WB), 2022-05-16
[207] Interviewee #11, Climate Policy Analyst, The International Energy Agency (IEA), 2022-04-27
[208] Interviewee #11, Climate Policy Analyst, The International Energy Agency (IEA), 2022-04-27

analysis, only 6% of the $15 trillion spent by the G20 countries in recovery funding in 2020 and 2021, was spent on clean energy development.[209] According to the OECD tracking, only 17% of recovery spending was allocated to green measures,[210] and according to the Oxford Global Recovery Observatory, who has assessed $3.1 trillion in recovery spending, only 31.2% is classified as green.[211] Since the beginning of the pandemic, the G20 countries alone has instead committed at least $354.11 billion in public finances to support fossil fuel energy production, including oil, gas and coal.[212] If this pattern is followed also with the revenues and cost-savings gained from cooperative implementation under A6, governments may risk additional carbon-lock in effects and stranded assets. Nevertheless, apart from reinvesting directly into additional mitigation efforts, financial gains generated from A6 could also be used for other projects and policies that might contribute to increased public acceptance for climate action, which could be just as important for raising ambition, according to some interviewees.[213]

[209] IEA, "Net Zero by 2050 - A Roadmap for the Global Energy Sector."
[210] OECD, "The OECD Green Recovery Database" (Paris, France: Organisation for Economic Co-operation and Development, 2021), https://read.oecd-ilibrary.org/view/?ref=1092_1092145-fqx3tx0r1q&title=The-OECD-Green-Recovery-Database.
[211] H. Flodell et al., "Global Recovery Observatory" (Oxford, United Kingdom: Oxford University Economic Recovery Project., 2021), https://recovery.smithschool.ox.ac.uk/tracking/.
[212] "G20 Countries," *Energy Policy Tracker* (blog), accessed May 14, 2022, https://www.energypolicytracker.org/region/g20/.
[213] Interviewee #3, Carbon Markets Specialist, [redacted], 2022-02-16

3.2 Credit Cancellations

One of the key concerns leading up to the COP26 decision was regarding how the A6.4M could ensure an overall mitigation in global emissions (OMGE). Whilst several options were discussed, including the shortening of crediting periods, stringent/conservative baseline setting, limited project type eligibility and discounting of emission reductions,[214] the final agreement landed in a 2% mandatory cancellation of A6.4ERs at issuance.[215] Under A6.2, parties and other stakeholders are not mandated but *"strongly encouraged"* to cancel ITMOs for the delivery of an overall mitigation in global emissions. In addition, parties, the private sector and other stakeholders may also request the voluntary cancellation of A6.4ERs, ITMOs or non-authorized credits, to deliver an overall mitigation in global emissions and raise ambition.[216]

In practice, the mandatory and voluntary cancellation of credits under A6 will probably have a modest impact on the increased ambition of parties. Whilst more than 100 million CERs were cancelled under the CDM, this was largely done because of the oversupply of credits, low environmental integrity, and minimal price levels on the market.[217] If the A6.4M would reach the modelled volume of 3.5 GtCO2e in 2030, which is again highly unlikely – considering parties' political considerations and institutional readiness – the 2% cancellation towards OMGE would result in a yearly cancellation of 70MtCO2e. Though representing a significant amount, it does not come close to the 45% reduction in global GHG emissions needed by 2030, to achieve the 1.5°C target.[218] Even with the possible voluntary cancellations from parties and non-party stakeholders, credit cancellations will probably not be a key factor to increase ambition towards reaching net-zero.[219]

[214] Wang-Helmreich, Obergassel, and Kreibich, "Achieving Overall Mitigation of Global Emissions under the Paris Article 6.4 Mechanism."
[215] United Nations Framework Convention on Climate Change (UNFCCC), "FCCC/PA/CMA/2021/10/Add.1."
[216] United Nations Framework Convention on Climate Change (UNFCCC).
[217] Michaelowa et al., "Overview and Comparison of Existing Carbon Crediting Schemes."
[218] IPCC AR6 WGIII, "Climate Change 2022: Mitigation of Climate Change."
[219] Interviewee #8, Article 6 Advisor, Independent Expert, 2022-03-16

3.3 Technological Transformation

Another key consideration for raising ambition through A6 is its potential to facilitate technological transformation in host countries. By lowering the cost of capital and facilitating private sector investments, A6 could help emerging technologies to reach market tipping points where they become commercially viable and can be scaled up in developing countries, enabling higher ambition in mitigation targets.[220] As discussed in a report to the Swedish Government, this could include technologies such as energy storage and transmission, smart electricity grids, low-carbon steel production, transport electrification, direct air capture (DAC), bioenergy carbon capture and storage (BECCS), and other negative emission technologies (NETs).[221]

The commercialization of NETs has particularly been emphasized by several interviewees as an area where A6 could play a significant role towards reaching net-zero. So far, NETs have largely not been considered in international carbon markets and crediting schemes.[222] However, they play a critical role in achieving the goals of the Paris Agreement, both for counterbalancing residual emissions in hard-to-abate sectors, as well as for compensating potential overshoot if emissions are not reduced fast enough.[223]

Whilst estimates vary, the IEA outlines a rapid expansion of BECCS and DAC to 1.9GtCO2 annually by 2050 in their Net Zero Roadmap.[224] Currently, the total capacity of BECCS & DAC in the world is about 2.5MtCO2e, with the largest operating DAC installation capable of capturing about 4000 tonnes per year.[225] Financing early projects like these in the early 2020s, for example through carbon markets, is therefore critical to ensure the rapid development and expansion needed beyond 2030.[226] Since countries will have different capacities for carbon removals and different amounts of residual emissions, A6 will be necessary to incentivize those parties that have the possibility to go net-negative.[227]

Whilst rules and modalities for CDR under A6 are still not finalized, several interviewees agreed that it is very likely that the market will move in that direction. *"We will definitely see*

[220] Systemiq, "The Paris Effect - COP26 Edition: Tipping Points for the Net-Zero Economy," November 2021, https://www.systemiq.earth/the-paris-effect-cop26-edition/.
[221] Karlsson, "Vägen till en klimatpositiv framtid [The Road to a Climate Positive Future]."
[222] Michaelowa et al., "Overview and Comparison of Existing Carbon Crediting Schemes."
[223] IPCC AR6 WGIII, "Climate Change 2022: Mitigation of Climate Change."
[224] IEA, "Net Zero by 2050 - A Roadmap for the Global Energy Sector."
[225] Akshat Rathi, "Climeworks Raises $650 Million in Largest Round for Carbon Removal Startup," *Bloomberg.Com,* April 5, 2022, https://www.bloomberg.com/news/articles/2022-04-05/climeworks-raises-650-million-in-largest-round-for-carbon-removal-startup.
[226] Systemiq, "The Paris Effect - COP26 Edition: Tipping Points for the Net-Zero Economy."
[227] Edmonds et al., "The Economic Potential of Article 6 of the Paris Agreement and Implementation Challenges."

the market moving towards removals, if OECD countries are serious with their net-zero commitments. Credits from avoided emissions will likely be phased out for compliance uses within the next decade, and then remain only for RBCF purposes."[228] A conceptual trajectory of how this might look like was published recently by The Oxford Principles for Net Zero Aligned Carbon Offsetting, highlighting how carbon removal with long-lived storage will have to grow in the coming decades. See Figure 15.[229]

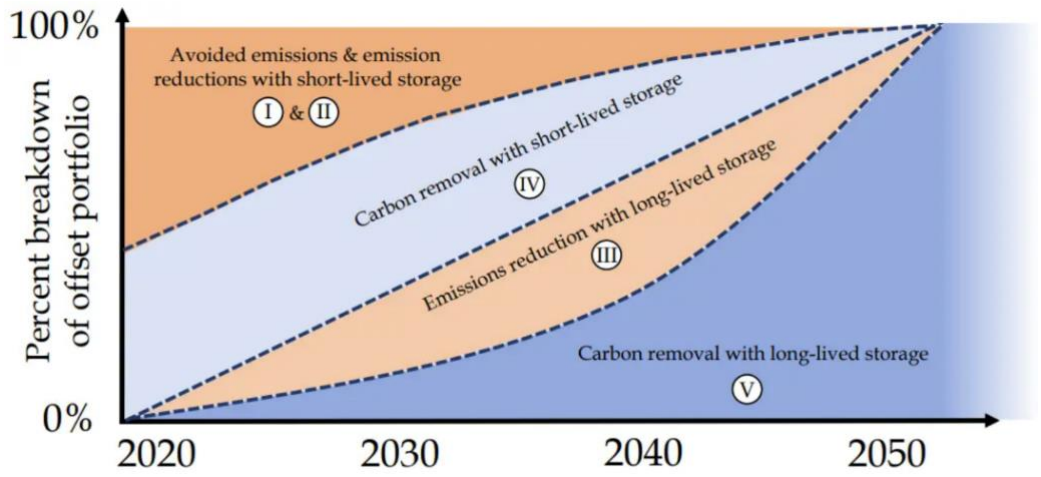


Figure 15. Trajectory for carbon removals, according to The Oxford Principles for Net Zero Aligned Carbon Offsetting. (Allen et al., 2020)

On the other hand, interviewee #13 stressed that as long as emissions are there, the carbon market need to concentrate on investing in new technology for deeper reductions in the hard-to-abate industry sectors, rather than focusing efforts on removals.[230] Others have also underscored that for nascent technologies which are still under development, the uncertainty in the amount of emissions reductions that might be generated make them unsuitable for carbon markets and results-based financing. Instead, these technologies are better supported through grants and concessional loans. It is first when the technology has been proven but not gained significant market penetration that they can be supported through RBCF or carbon market mechanisms.[231]

[228] Interviewee #10, [anonymous], The UNFCCC Secretariat, 2022-04-11
[229] Myles Allen et al., "The Oxford Principles for Net Zero Aligned Carbon Offsetting," 2020, 15, https://www.smithschool.ox.ac.uk/sites/default/files/2022-01/Oxford-Offsetting-Principles-2020.pdf.
[230] Interviewee #13, Distinguished Fellow and Programme Director, Earth Science and Climate Change, The Energy and Resources Institute (TERI), India, 2022-05-10
[231] Gilles Dufrasne, "The Clean Development Mechanism: Local Impacts Of A Global System" (Carbon Market Watch, October 2018), https://carbonmarketwatch.org/wp-content/uploads/2018/10/CMW-THE-CLEAN-DEVELOPMENT-MECHANISM-local-impacts-of-a-global-system-final-spread-web.pdf.

To ensure that carbon markets contribute to technological transformation, policy makers should consider utilizing technology needs assessments, positive/negative lists and techno-economic MAC curves when developing A6 projects.[232]

Ultimately, the final impact of A6 on increasing ambition through technological transformation will depend on the rules and methodologies adopted, the ability to crowd private sector investments and the political considerations by host and buyer parties.[233]

[232] Kachi et al., "Considerations for Article 6 Engagement: The Host Country Perspective."
[233] Interviewee #11, Climate Policy Analyst, The International Energy Agency (IEA), 2022-04-27, Interviewee #15, Program Manager, The Green Growth Institute (GGGI), Korea, 2022-05-23

Discussion & Recommendations

With the new rules and methodologies under A6, environmental integrity has arguably been strengthened substantially compared to the flexible mechanisms under the Kyoto Protocol. Most notably, the application of CA for all ITMOs is likely to completely change the way parties consider environmental integrity when engaging in cooperative approaches under A6. In comparison to the flexible mechanisms established under the Kyoto Protocol, where both parties had incentives to trade low-quality units and inflate crediting baselines, CA now makes it so that parties have an interest in transferring higher quality ITMOs in the authorized market. Still, there are environmental integrity concerns with regards to the crediting from nature-based projects and the transition of old CDM credits to the new A6.4M. Depending on buyer and host party preferences, the transition of CERs might have a significant impact on A6 in the short- to medium-term, as it risks flooding the market with low-quality credits and potentially slowing down development of new projects. Similarly, NbS credits that face a high risk of reversals and leakage could also threaten the environmental integrity of A6. To address these risks, those credits should be clearly distinguished from ITMOs and not be used for offsetting purposes or net-zero claims. The upcoming recommendations from the SB and SBSTA to COP27 on accounting for removals under A6 will play a crucial role in this regard.

Even more critical for the environmental integrity of A6 will be the assessment of participating parties' mitigation commitments. If NDC ambition remain at current low levels with inflated BAU projections, there is a significant risk of hot air being traded under the new mechanism. Thus, it must be an explicit priority for host parties to increase their NDC ambition, and for acquiring parties to only purchase ITMOs from parties who are assessed to have ambitious NDC targets. If perverse incentives are effectively addressed and the ambition in parties' NDCs is strengthened to avoid the transfer of hot air, Article 6 is likely to safeguard environmental integrity concerns and avoid a net increase in emissions from international transfers. Yet, the fulfillment of these basic principles will have to be continually evaluated as the market develops.

In terms of market size, the political considerations and constrained demand for ITMOs from large countries such as the EU and US are likely to be the main factors limiting A6 transfers in its initial stage. Whilst some demand is anticipated from smaller countries, the VCM and CORSIA, this will probably not be able to substitute the large volumes of demand that came from the EU ETS in the early years of the CDM. Moreover, due to the low degree of

institutional readiness, and lack of capacity regarding the application of CA in many developing countries, there might also be a marginal supply of authorized ITMOs in the coming years. In addition, the outstanding completion of the modalities, centralized registry, and transition of CDM credits to the A6.4M indicates that the A6 market could face a slow start. However, as successful activities and examples appear, the interest to participate in trade might increase. Though some might see this potentially slow start of A6 as a weakness, it could also be viewed as an advantage, since a steady and gradual expansion of A6 markets may allow for a higher quality and a more sustainable long-term growth compared to what happened with the CDM.

Beyond 2030, the market size is likely to increase, as parties move closer to their net-zero targets. Although the volume of transfers may still be limited, depending on the political considerations of major emitters, a growing demand for CDR and higher MACs across the world might still generate a substantial A6 market value. To allow for an efficient market and ensure that benefits are distributed among all parties, special considerations and capacity building activities to strengthen the institutional readiness among LDCs will be critical. As even the expert respondents to this study exhibited conflicting interpretations of certain rules for CA and authorization under A6, there is a crucial need for international organizations and academia to shed light on the complex modalities and intricacies of A6 in the coming years, to allow for a common understanding as the basis of A6 development.

If this is ensured, A6 may play a pivotal role in raising ambition towards reaching net-zero, as many countries may need to procure ITMOs to compensate for their residual territorial emissions. Whilst the impact from cancellation of credits for OMGE and voluntary purposes will likely be negligible, the reinvestments of cost-savings and the potential of technology transformation could be decisive for how A6 can increase ambition towards climate neutrality goals. Interestingly, even though the Paris Agreement clearly states that voluntary cooperation under A6 should allow for higher ambition in parties' NDCs, most interviewees argued that A6 should mainly be seen as a financing mechanism to cost-effectively achieve mitigation targets, and not as a tool for raising ambition.

Ultimately, however, it will be up to the "name-and-shame" approach, political pressure and ratchet mechanism of the Paris Agreement to ensure that countries substantially strengthen their NDC targets in the coming years. As outlined above, whilst NDC ambition could be doubled without extra cost in an ideal scenario of A6 implementation, this would still not be even nearly enough to limit global warming below 1.5°C. Carbon markets under A6 should therefore not be

viewed as a solution to reach net-zero and achieve the goals of the Paris Agreement, but rather as one of many potential instruments to help parties do so more cost-effectively.

Based on the analysis above, several key recommendations to strengthen the contribution of A6 in reaching net-zero are proposed:

Firstly, acquiring parties should clearly outline and specify their demand over time, avoid purchasing old CERs, assess host parties' NDC commitments for hot air before procuring ITMOs from them, concentrate on purchasing units from countries and technologies that might lead to transformative changes, and ensure that cost-savings gained from A6 are used for additional mitigation efforts and increased ambition.

In addition, non-state actors such as corporate buyers should consider only using authorized ITMOs with CA applied for offsetting purposes (for example towards net-zero or climate neutrality targets), only make contribution claims when procuring non-authorized A6.4ERs or NbS credits, and value the environmental integrity safeguards, UNFCCC oversight, SoP towards adaptation and OMGE when considering the procurement of A6 units compared to credits from other voluntary standards.

Finally, host parties should determine which sectors, industries and technologies are best suited for the utilization of carbon markets and develop domestic MAC curves with a clear pricing strategy for the sale of ITMOs, considering how A6 revenue can boost or complement other climate finance sources. They are recommended to carefully consider if old CDM projects are aligned with their overall mitigation strategies towards NDC achievement before approving their transition to A6.4M and prioritize projects that can generate substantial sustainable development co-benefits, to increase public support for mitigation actions. Clear strategies for how A6 revenue will be utilized or reinvested into additional mitigation efforts and increased NDC ambition should be communicated to attract potential buyers. To deliver on these recommendations, they are advised to take advantage of the support available and commence engagement through bilateral agreements or piloting activities with trusted parties under A6.2, to increase their capacity and institutional readiness.

Conclusion

With the Article 6 rulebook finally in place, this thesis has provided a holistic analysis of the potential impact of bilateral cooperation under Article 6.2 and the new centralized market under Article 6.4 on global mitigation efforts. Employing the EIMSA theoretical framework, the new mechanisms have been explored by considering its environmental integrity, estimated market size and potential to raise ambition. By interviewing a diverse sample of experts on the topic, this thesis has provided an early indication of how carbon markets under A6 may develop over time, and how it may influence the achievement of the Paris Agreement goals.

In summary, the A6 markets are likely to play a small but pivotal role in reaching net-zero and achieving the goals of the Paris Agreement. With the application of corresponding adjustments for ITMOs, A6 represents a completely new mechanism compared to the CDM, and environmental integrity have been significantly strengthened. As long as removals are properly accounted for, and host parties' mitigation commitments are bolstered to avoid the transfer of hot air, A6 is likely to have a positive impact on global emissions. Differences in MACs highlight a vast potential for A6 to reduce mitigation costs and facilitate emissions reductions. However, with several provisions still to be finalized and low institutional readiness among developing parties, the market may see a slow start. In the initial phase, the main buyers of authorized and non-authorized A6 units might be the VCM and smaller OECD countries, due to the limited demand projected from major emitters such as the EU and the US. In the critical task of halving emissions by 2030, A6 is therefore likely to have a marginal impact.

Over time, as parties move closer to their net-zero targets, the market value and ITMO prices are expected to grow, with a rising demand for removals. In this case, A6 may play a pivotal role in commercializing and scaling up NETs, which may facilitate an increased ambition in NDCs. The effect of credit cancellations towards reaching net-zero targets will likely be very marginal. On the other hand, the cost savings generated from A6 cooperation might be substantial, which if reinvested into additional mitigation efforts could have a significant impact on the ambition level of parties' NDCs. However, it is still too early to determine to which degree this will be done, and these preliminary projections will need to be revisited as the market develops in the coming years.

Based on the initial results from this study, several areas for further research have been identified. Most importantly, whilst this study has provided some initial insights of the volume

of A6 transfers, further empirical research is needed to understand the potential size of the market, taking parties' political considerations of corresponding adjustments, supply and demand into account. Secondly, additional studies should consider the impact of voluntary carbon markets on the Article 6 development and their possible convergence. Finally, further research employing the EIMSA framework should be considered for application and analysis of other carbon market mechanisms, such as the EU ETS or Chinese ETS, as well as to re-evaluate the impact of A6 when fully operationalized.

In conclusion, cooperative implementation through A6 is expected to have a net positive impact on global mitigation efforts towards achieving the goals of the Paris Agreement, if environmental integrity concerns regarding removals, transition of CDM credits and parties' mitigation commitments are effectively addressed. Whilst modelling studies have shown a significant potential of Article 6 markets to save costs with up to $300 billion and doubling NDC ambition until 2030, the political reality indicates a more marginal role of Article 6 in the coming years. As such, whilst Article 6 may contribute to some extent, the achievement of net-zero targets will ultimately depend on governments' willingness to strengthen climate targets, phase out of fossil fuels, and implement transformative policies and measures to rapidly reduce emissions. The upcoming COP27 in Egypt and the Global Stocktake in 2023 will therefore be crucial moments for parties to finally increase their climate ambition to the levels required, for the purpose of achieving the goals of the Paris Agreement and safeguarding our common future on this planet.

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Annex 1. Interview Guide

Analyzing the Potential of Carbon Markets under Article 6 of the Paris Agreement

Aim of Research:	The aim of this research is to analyze the potential role and impact of the new carbon market mechanisms under Article 6 of the Paris Agreement. Research will be conducted based on an extensive literature review as well as qualitative interviews with key parties and experts.
Researcher:	Björn Fondén, Master's Student in Global Economic Governance and Public Affairs
Terms:	The interview will be conducted using Zoom or Microsoft Teams, and will be subject to recording for transcription purposes, if accepted. Interviewees will be referred to with "Title & Country/Organization" and will have the chance to review quotations before publication to ensure correct citations.
Publication:	The Master's thesis will be made public on the website of CIFE in July 2022.

Guiding Questions:

1. Please introduce yourself, your position and background with regards to Article 6

2. What is your overall view on the decisions adopted at COP26 in Glasgow regarding Article 6? *E.g. on Share of Proceeds for Adaptation, Overall Mitigation in Global Emissions, Corresponding Adjustments & Transition of CDM Credits*

3. What is your view on environmental integrity when it comes to the Article 6 mechanisms?

4. How do you think the application of corresponding adjustments might impact the future of Article 6 transfers?

5. What is your view on the potential size and volume of transfers under Articles 6.2 and 6.4?

6. How do you think Article 6 might impact parties' ambition?

7. Finally, what do you see as the crucial challenges, barriers and opportunities for future development of the A6 market?