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Final report

Promoting transformational change through carbon markets

Strengthening the transformational impact of carbon market cooperation under Article 6 of the Paris Agreement

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Abstract: Promoting transformational change through carbon markets

A transition to sustainable development and net-zero greenhouse gas emissions is key to achieve the temperature limits established by the Paris Agreement (PA) and the global sustainable development goals (SDGs) agreed in the 2030 Agenda. To explore how carbon market approaches under Article 6 of the Paris Agreement can contribute to the transformational change required by these global agreements, the German Environment Agency (UBA) has commissioned UNEP DTU Partnership in collaboration with Perspectives Climate Research and First Climate to carry out this research project. The project aims to generate insights and recommendations for how to design and implement Article 6 rules and activities to promote transformational change (TC) through carbon markets. Based on insights from a literature review and expert interviews, the authors propose a definition of transformational change with four characteristics particularly relevant to Article 6 objectives, namely 'Digitalisation', 'Private sector and Governments', 'Carbon pricing' and 'Dynamic baselines'. In the context of Article 6 negotiations up to COP26 in Glasgow and an overview of Article 6 piloting efforts, conceptual options are presented for Article 6 activities to promote transformational change. An incentive structure for carbon markets to promote Nationally Determined Contribution (NDC) ambition raising, and transformational impact is introduced. Insights from a comparative case study analysis of different NDCs and sectors in Costa Rica, Morocco and Pakistan demonstrate how transformational impact can be designed and assessed at Article 6 activity level. Findings are used to identify implications for Article 6 design so that activities enhance their transformational impact. For instance, higher prices for internationally transferred mitigation outcomes (ITMOs) with transformational impact can enable the political will in host countries to undertake deep mitigation opportunities while achieving cost-efficient emission reductions with domestic means. Key conclusions and recommendations are that core carbon market principles such as of additionality and baselines-setting can be reinterpreted in order to promote transformational change aligned with the global 1.5°C temperature goal.

Kurzbeschreibung: Förderung eines transformativen Wandels durch Kohlenstoffmärkte

Ein Übergang zu einer nachhaltigen Entwicklung und Netto-Null-Treibhausgasemissionen auf allen Ebenen der Gesellschaft ist der Schlüssel zum Erreichen der im Übereinkommen von Paris (ÜvP) festgelegten Temperaturziele und der globalen Ziele für nachhaltige Entwicklung (engl. Sustainable Development Goals, SDGs) der Agenda 2030. Das Umweltbundesamt (UBA) hat UNEP DTU Partnership in Zusammenarbeit mit Perspectives Climate Research und First Climate mit der Durchführung dieses Forschungsprojektes beauftragt, um zu untersuchen, wie Kohlenstoffmarktansätze unter Artikel 6 des ÜvP zu der von diesen globalen Abkommen geforderten transformativen Wirkung beitragen können. Das Projekt zielt darauf ab, Erkenntnisse und Empfehlungen für die Gestaltung und Umsetzung von Artikel 6-Regeln und -Aktivitäten zur Förderung des transformativen Wandels durch Kohlenstoffmärkte zu generieren. Auf der Grundlage von Erkenntnissen aus einer Literaturrecherche und Interviews schlagen die Autoren eine Definition von transformativem Wandel vor: „Ein grundlegender, nachhaltiger Wandel eines Systems, der etablierte kohlenstoffintensive Praktiken beendet und zu einer emissionsfreien Gesellschaft beiträgt, im Einklang mit dem Ziel des Pariser Abkommens, die globale Erwärmung auf 1,5-2°C zu begrenzen, und den Nachhaltigkeitszielen der Vereinten Nationen", mit vier Merkmalen, die für die Ziele von Artikel 6 besonders relevant sind, nämlich "Digitalisierung", "Privatsektor und Regierungen", "Kohlenstoffpreisgestaltung" und "dynamische Baselines". Auf der Grundlage der Artikel 6-Verhandlungen bis zur COP26 in Glasgow und eines Überblicks über Artikel 6-Pilotprojekte werden konzeptionelle Optionen für Artikel 6-Aktivitäten zur Förderung eines transformativen Wandels vorgestellt. Eine Anreizstruktur für Kohlenstoffmärkte zur Förderung höherer Ambitionen in den national

festgelegten Beiträgen (engl. Nationally Determined Contributions, NDCs) und der transformativen Wirkung wird vorgestellt. Erkenntnisse aus einer vergleichenden Fallstudienanalyse verschiedener NDCs und Sektoren in Costa Rica, Marokko und Pakistan zeigen, wie transformative Auswirkungen auf der Ebene der Artikel-6-Aktivitäten konzipiert und bewertet werden können. Die Ergebnisse werden genutzt, um Implikationen für die Gestaltung von Artikel 6 zu identifizieren, damit Aktivitäten ihre transformative Wirkung verstärken. Beispielsweise können höhere Preise für international übertragene Minderungsergebnisse (engl. internationally transferred mitigation outcomes, ITMOs) mit Transformationswirkung den politischen Willen in den Gastgeberländern stärken, Möglichkeiten zur umfassenden Minderung zu ergreifen und gleichzeitig kosteneffiziente Emissionsminderungen mit eigenen Mitteln zu erreichen. Die wichtigsten Schlussfolgerungen und Empfehlungen lauten, dass Kernprinzipien des Kohlenstoffmarktes wie Zusätzlichkeit und stringente Baselines neu interpretiert werden können, um einen transformativen Wandel zu fördern, der auf das globale Temperaturziel von 1,5 °C ausgerichtet ist.

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ABM	Adaptation Benefits Mechanism
AEDB	Alternative Energy Development Board
ASVT	Association des Enseignants des Sciences de La Vie et de la Terre
ARE	Alternative and Renewable Energy
A6.4ER	Article 6.4 Emission Reduction
A6.4M	Article 6.4 Mechanism
BAT	Best Available Technology
BAU	Business As Usual
BMU	Bundesministeriums für Umwelt, Naturschutz und nukleare Sicherheit (German Ministry for the Environment, Nature Conservation and Nuclear Safety)
BTR	Biennial Transparency Report
CA	Corresponding Adjustment
CBDR-RC	Common but Differentiated Responsibilities and Respective Capabilities
CCF	Climate Cent Foundation
CCS	Carbon Capture & Storage
CER	Certified Emission Reduction
CDM	Clean Development Mechanism
CIF	Climate Investment Funds
CMA	COP serving as Meeting of the Parties to the Paris Agreement
CO_2	Carbon Dioxide
COP	Conference of the Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CTCN	Climate Technology Centre & Network
DAC	Direct Air Capture
DOE	Designated Operational Entity
EBRD	European Bank for Reconstruction and Development
EIB	European Investment Bank
ETF	Enhanced Transparency Framework
ETS	Emission Trading System
EU	European Union
FC	First Climate
FFS	Fossil Fuel Subsidies
FMO	Nederlandse Financierings-Maatschappij voor Ontwikkelingslanden N.V. (Dutch Entrepreneurial Development Bank)
GCF	Green Climate Fund
GDP	Gross Domestic Product
GGGI	Global Green Growth Institute
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Corporation for International Cooperation)
GOP	Government of Pakistan
GST	Global Stocktake
ICAO	International Civil Aviation Organization
ICAP	International Carbon Action Partnership
ICAT	Initiative for Climate Action Transparency

IETA	International Emissions Trading Association
IFC	International Finance Corporation
IKI	Internationale Klimaschutzinitiative (International Climate Initiative)
ITMO	Internationally Transferred Mitigation Outcome
JCM	Joint Crediting Mechanism
JI	Joint Implementation
KliK	Stiftung Klimaschutz und CO_2-Kompensation (Foundation for Climate Protection and Carbon Offset)
LT-LEDS	Long-term Low Greenhouse Gas Emission Development Strategies
LTTG	Long-Term Temperature Goal
MADD	Mitigation Activity Design Document
MEME	Ministère de l'énergie, des Mines et de l'Environnement (Ministry of Energy, Mining and Environment)
MIDEPLAN	Ministerio de Planificación Nacional y Política Económica (Ministry of National Planning and Economic Policy)
MINAE	Ministerio de Ambiente, Energía y Telecomunicaciones (Ministry of Environment, Energy, and Telecommunications)
MOI	Ministry of Interior
MO	Mitigation Outcome
MRV	Measuring, Reporting and Verification
NACAG	Nitric Acid Climate Action Group
NAMA	Nationally Appropriate Mitigation Action
NEFCO	Nordic Environment Finance Corporation
NEPRA	National Electric Power Regulatory Authority
NET	Negative Emission Technology
NDC	Nationally Determined Contribution
OECD	Organisation for Economic Co-operation and Development
OMGE	Overall Mitigation in Global Emissions
OWtE	Organic Waste-to-Energy
PA	Paris Agreement
PB	Planetary Boundaries
PCR	Perspectives Climate Research
PMI	Partnership for Market Implementation
PMR	Partnership for Market Readiness
PPA	Power Purchase Agreement
REDD+	Reducing Emissions from Deforestation and Forest Degradation
R&D	Research and Development
RMP	Rules, Modalities and Procedures
SB	Subsidiary Body
SBSTA	Subsidiary Body for Scientific and Technological Advice
SCF	Standardized Crediting Framework
SD	Sustainable Development
SDG	Sustainable Development Goal
SEA	Swedish Energy Agency
SEDD	Secretary of State for Sustainable Development
SINAMECC	El Sistema Nacional de Métrica del Cambio Climático (Costa Rica's National Climate Change Metrics System)

SNDD	Stratégie Nationale de Développement Durable (National Sustainable Development Strategy)
TC	Transformational Change
TCAF	Transformative Carbon Asset Facility
tCO_2e	Tons of Carbon Dioxide Equivalent
TER	Technical Expert Review
TWI	The World in 2015 Initiative
UDP	United Nations Environment Program and Technical University of Denmark Partnership
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
UNRISD	United Nations Research Institute for Social Development
WBGU	Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (German Advisory Council on Global Change)
CO_2	Carbon dioxide
COP	Conference of the Parties
EU-ETS	EU Emissions Trading Scheme
F-gases	Fluorinated greenhouse gases
FTIP	Federal Transport Infrastructure Plan
GHG	Greenhouse gas
HGV	Heavy goods vehicle
ICAO	International Civil Aviation Organization
IMO	International Maritime Organization
KSBV	UBA-study Klimaschutzbeitrag des Verkehrs bis 2050 [UBA, 2016a]
NDC	Nationally Determined Contributions (in Paris-Agreement)
NEDC	New European Driving Cycle
N_2O	Nitrous oxide (laughing gas)
PJ	Petajoule (energy measuring unit)
PtG	Power-to-Gas (any power-based gaseous fuels)
PtL	Power-to-Liquid (any power-based liquid fuels)
RDE	Real Driving Emissions
TWh	Terawatt hours (measuring units for energy)
UNFCCC	United Nations Framework Convention on Climate Change
WLTP	Worldwide Harmonized Light-Duty Vehicles Test Procedure

Executive Summary

This report presents a synthesis of the findings of the research project "Promoting transformational change through carbon markets" implemented by UNEP DTU Partnership, Perspectives Climate Research and First Climate between March 2020 and October 2021, commissioned by the German Environment Agency (dt. Umweltbundesamt, UBA). Findings are based on the authors own analysis documented in unpublished interim reports and a discussion paper published in August 2021 (Olsen et. al. 2021). The Executive Summary refers to chapters in this synthesis report for documentation of the findings presented. Already summarised findings in the discussion paper are repeated for a comprehensive presentation of all findings in the same report.

Aims of this study

In this report, the authors explore how transformational change (TC) can be promoted through Article 6 cooperation, comprising both Article 6.2 cooperative approaches and the Article 6.4 Mechanism (A6.4M). The report presents conceptual options for strengthening transformational impact through Article 6 activities and aims to inform Article 6 negotiators, policy-makers and market participants, as well as the larger expert and research community.

Methodological approach

The study follows a six-step methodological process and starts with a review of transformational change literature (see Chapter 4). To identify transformation features in existing finance and carbon market mechanisms, structured interviews with selected key players from the field of transformational financial and carbon-market mechanisms have been conducted. A definition and characteristics of transformational change for Article 6 cooperation are developed in the first two steps. In a third step, relevant Article 6 literature is analysed to derive favourable design options for transformational change (see Chapter 5) which subsequently guide the derivation of an incentive structure promoting these (see Chapter 6). Figure 1 shows the prerequisites and contributing factors that can lead to transformational change through an Article 6 activity (see Chapter 3). The prerequisites are shown on the left-hand side of the figure comprising the promotion of sustainable development and the ensuring of environmental integrity. Environmental integrity implies that an activity's additionality is ensured, robust baseline setting takes place and double counting is avoided. Building on these prerequisites, activities can have a transformational impact if they raise ambition and contribute to an "overall mitigation in global emissions" (OMGE).

Figure 1: Prerequisites and contributing factors to transformational change in draft Article 6 rules

Source: own illustration, UDP, PCR and FC.

Fourth, a comparative case study analysis demonstrates in practice how the conceptual definition of transformation in Article 6 activities can be applied within their respective sectoral

and NDC contexts (see Chapter 7). Fifth, the research team consulted an international expert audience, and presented preliminary results during virtual workshops. In a final step, the results are summarised and recommendations for strengthening the transformative impact of Article 6 cooperation are provided (see Chapters 8 & 9).

Literature review & Interviews

Understanding transformational change builds on a diverse and fast-growing body of scientific and applied literature focused on conceptual and empirical studies of sustainability transition, planetary boundaries and social perspectives (TWI2050[1] 2018; Sachs 2019; IPCC 2018; Raworth 2017; Rockström 2009; Hjalsted et al. 2020). In general, definitions of transformational change share a common focus on system change, different but complementary to incremental change and reform, which involves interrelated structural changes to economic, cultural, technological and institutional ways of doing things, engaging multiple actors at multiple levels (GIZ 2020; Geels 2002) (see Chapter 4.1.1).

Additional insights on the concept of transformation and how it is operationalised has been gained through interviews with selected key players from the field of transformative financial and carbon-market mechanisms. The main purpose of the interviews has been to better understand how the concept of transformation is defined, applied and assessed by leading financial institutions relevant to Article 6 mechanisms. Four selected funds and institutions (EBRD, FMO, KliK Foundation, TCAF) were interviewed in relation to their engagement in Article 6 activities (see Chapter 4.1.2).

Defining transformational change and deriving transformational characteristics for Article 6 cooperation

Building on the Transformational Change Methodology developed by the Initiative for Climate Action Transparency (ICAT)[2], Article 6-specific transformational characteristics are derived (see Chapter 4.2).

It is important to keep in mind that the proposed definition of transformation for Article 6 operational purposes is a working definition to initiate empirical analysis, development of transformation design, testing, updates, revisions, and refinement. It is not meant to be a final, authoritative definition. Rather, it is a starting point to enable co-creation, co-design and adaptations of the definition of transformation for particular purposes and applications in a way that enables a structured assessment, comparison and learning about transformation characteristics and impacts most relevant to carbon markets across diverse country and sectoral contexts.

The proposed definition of transformational change for Article 6 cooperation is as follows:

A fundamental, sustained change of a system that ends high-carbon practices and contributes to a zero-carbon society, in line with the Paris Agreement goal to limit global warming to 1.5–2°C and the United Nations Sustainable Development Goals.

The proposed characteristics of transformational change specific to Article 6 cooperation are presented below. To indicate how the ICAT definition is adapted to Article 6 purposes, the language and characteristics of the last four points of transformation are specifically important to Article 6 (highlighted in bold):

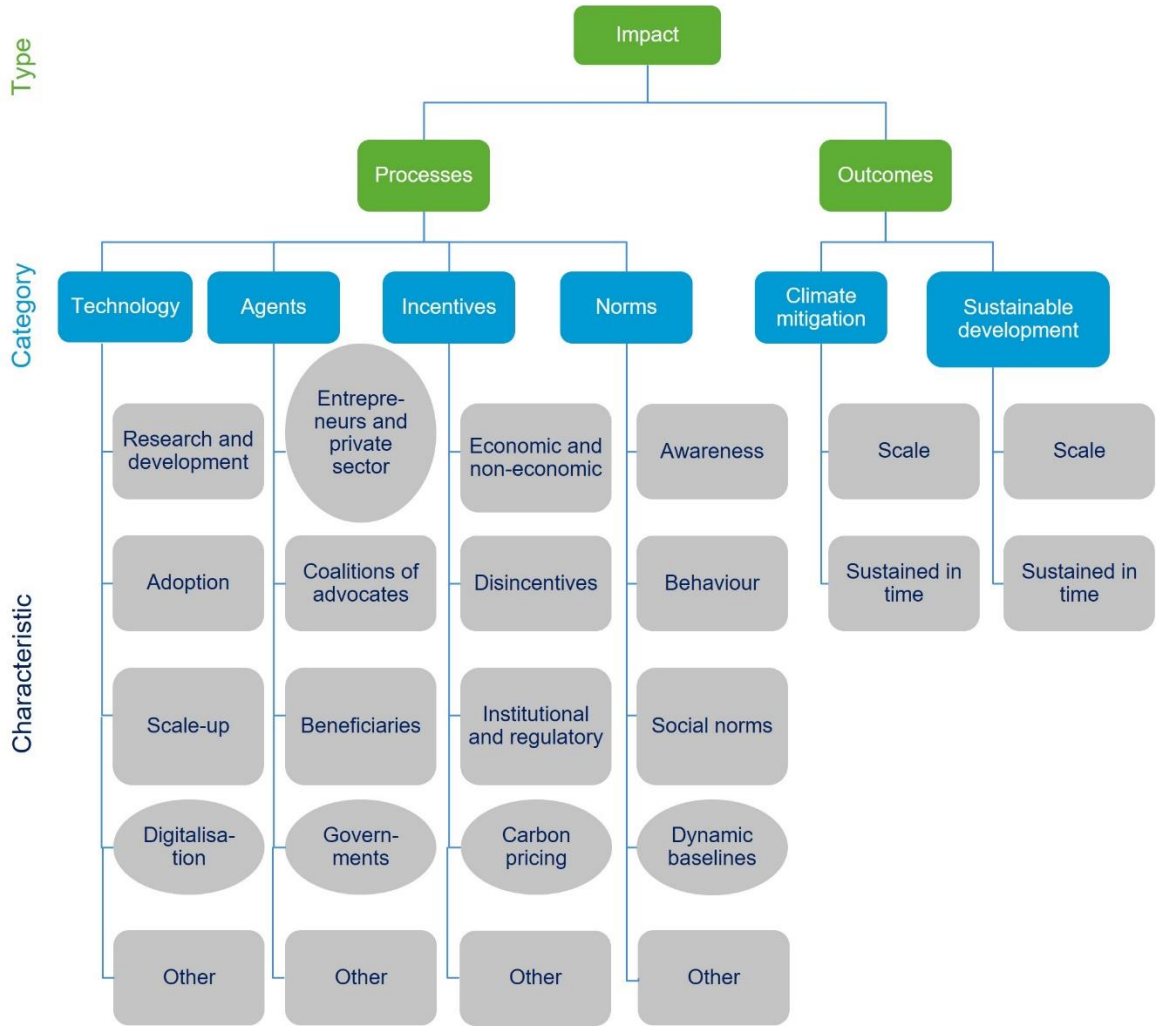
[1] The World in 2015 Initiative (TWI)

[2] ICAT defines transformational change as "A fundamental, sustained change of a system that disrupts established high-carbon practices and contributes to a zero-carbon society, in line with the Paris Agreement goal to limit global warming to 1.5–2°C and the United Nations SDGs" (ICAT, 2020).

- system-wide impacts, driven by large-scale outcomes or a multitude of smaller-scale changes
- sustained, long-term outcomes that reinforce zero-carbon practices while avoiding carbon lock-in and dependence on fossil fuels
- **a dynamic and adaptive process that makes use of emerging windows of opportunity to further increase countries' climate and sustainability ambition (e.g., calls for green recovery packages in the context of the COVID-19 pandemic; low oil and gas prices as an opportunity to phase out fossil fuel subsidies)**
- **a clear long-term perspective in terms of rendering technical and economic systems more robust or resilient (e.g., through an improved approach to internalisation of risks) and sets clear milestones and incentives for decarbonisation/low-carbon development and climate neutrality**
- **up-scaled direct investments in low-carbon technologies and green infrastructure (including R&D) by governments as enablers/drivers of transformation**
- **digitalisation can be a contributing factor to transformation, e.g., by allowing to reduce travel intensity and enabling real time, robust MRV of technology performance as well as digital payments in the context of Article 6**

The transformational characteristics identified through the literature review and interviews as particularly relevant to Article 6 are 'Digitalisation', 'Private sector and Governments', 'Carbon pricing' and 'Dynamic baselines'. For a comprehensive description of generic characteristics of transformational change, we refer to the ICAT Transformational Change Methodology (2020). Figure 2 below illustrates the taxonomy of transformational characteristics, where the characteristics particularly relevant for the Article 6 context and purpose are specified in an oval box in the flow chart.

Figure 2: Taxonomy of transformational characteristics for Article 6 activities



Source: adapted from the ICAT TC methodology (2020).

Conceptual options to unlock transformational change

The Article 6 draft negotiation texts from mid-2021 offer starting points for transformational change concepts. Specifically, the draft Article 6.2 guidance and Article 6.4 rules, modalities and procedures (RMP) stipulate two aspects. One aspect encompasses safeguards to avoid that the instrument's environmental integrity is undermined, and the other aspect includes provisions that promote higher ambition by Parties and net reduction contribution to the global emissions budget (see Chapter 3.1).

When looking at early Article 6 piloting efforts, few piloting activities incorporate transformational ideas such as up-scaled crediting activities, the alignment with country-specific Long-term Low Greenhouse Gas Emission Development Strategies (LT-LEDS) and the use of dynamic baselines. However, the piloting efforts do not signal a broad adoption of transformational activities, as these are often similar to previous Clean Development Mechanism (CDM) activities in terms of the promoted project type and operationalisation of key concepts (e.g., additionality testing and baseline setting). There was also a hesitant attitude when it comes to pilot implementation by host countries as the Article 6 rules had not been finalised at the time

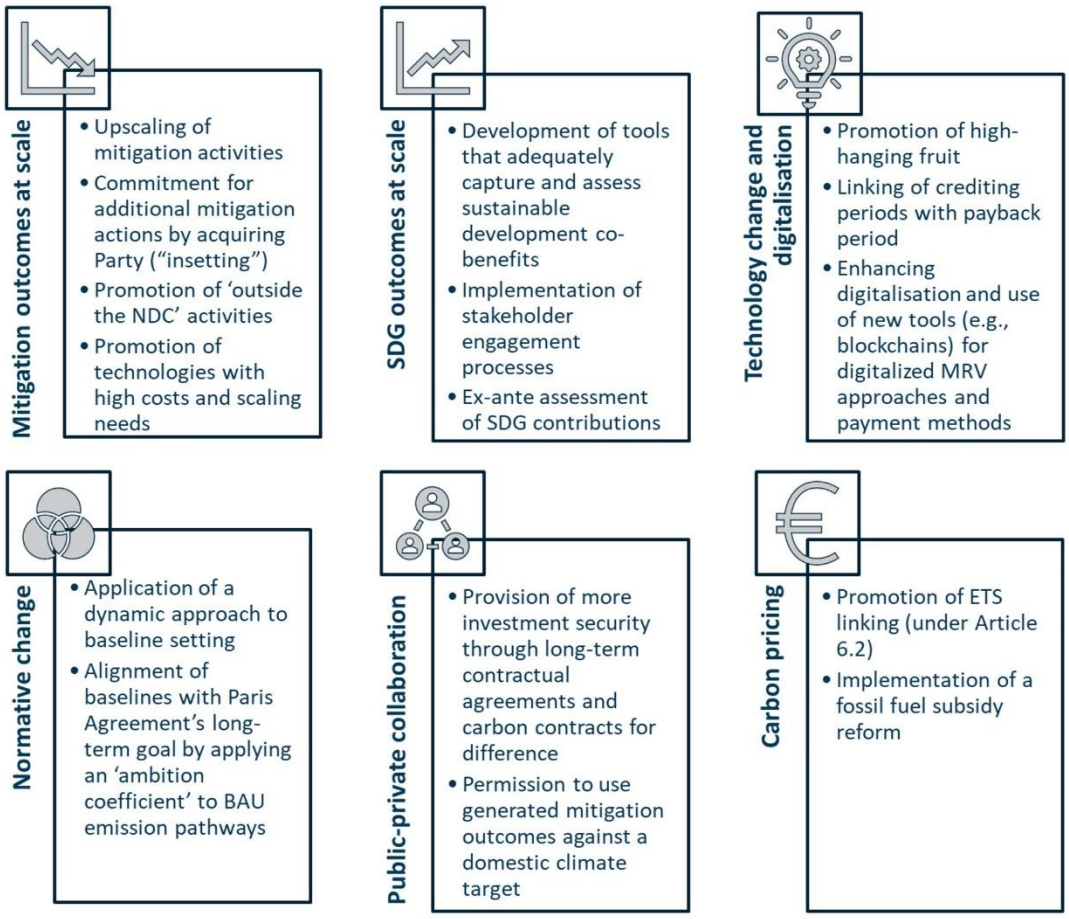
of writing this report and therefore the implications of transferring ITMOs on achieving domestic NDC goals remained unclear (see Chapter 3.2).

The authors have derived further options to unlock transformational change on a practical level. Regarding the implementation of safeguards, it has been noted that both target and financial additionality should be met. Besides, safeguards against detrimental sustainable development impacts could still be decisively strengthened, especially since Article 6.2 does not include any stringent provisions in this regard. In addition, overselling risks will require the sharing of mitigation outcomes between seller and buyer, a mechanism which is already in place in many piloting activities (see Chapter 5.1).

Design options that directly contribute to transformational change have been identified for six different characteristics: (1) mitigation outcomes at scale, (2) SDG outcomes at scale, (3) technology change and digitalisation, (4) normative change in the sense of alignment with net zero strategies, (5) agents of change in terms of an innovative public-private cooperation model and (6) incentives for change in the form of ambitious carbon pricing policies. Figure 3 below provides an overview of the different options identified under the transformational change characteristics (see Chapter 5.2).

While some of the outlined options for unlocking transformational change may be adopted by project developers and put into practice, governments, host and buyer countries as well as non-state actors and the international community can take an active role in promoting these by implementing incentives.

Figure 3: Overview of options that unlock transformational change through Article 6



Source: own illustration, UDP, PCR & FC.

Incentive structure to promote transformational change

In order to promote transformational change through Article 6 activities, appropriate incentives need to be provided, either at the international or national level. While at the international level incentives can be set through intergovernmental processes or non-state actor engagement, at the national level they can be set through the buyer or host country (see Chapter 6).

Regarding regulatory incentives (see Chapter 6.1), one specific example is the generation of positive lists of activities. They can either be adopted by host countries or by buying entities to promote specific activities and technologies which are in line with their specific interests and needs. Another regulatory incentive which could be mandated by an intergovernmental process would be to only allow buyer countries to count international credits towards their NDC, if their own NDC targets are aligned with a 1.5°C or well below 2°C pathway. Moreover, mitigation activities that are not compatible with countries' LT-LEDS or the Paris Agreement's long-term targets could simply be excluded from Article 6 cooperation. Closely related is the regulatory incentive to not allow generating carbon credits from activities that do not comply with the global GHG emissions budget to contain the temperature increase to well below 2°C or even 1.5°C. This can be achieved e.g., through using dynamic baselines which become more stringent over time.

Regarding monetary incentives (see Chapter 6.2), the authors propose the monetisation of ITMO price components such as a sustainable development premium or monetisation of positive effects on other planetary boundaries beyond climate (e.g., biodiversity). Such premium payments and potentially further incentives e.g., for introducing first-of-its kind technologies reward strong transformational impact beyond mitigation and therefore contribute to enabling higher-cost activities.

Behavioural incentives (see Chapter 6.3) include the formation of coalitions and the formation of a buyer's club in order to work towards good practices that exceed minimum standards at the international level.

The regulatory and monetary incentives have practical implications for core Article 6 elements such as ensuring environmental integrity, additionality testing and baseline setting. Additionality needs to be redefined in light of NDC targets and target additionality will play an important role in determining a transformational impact of an activity. In addition, new approaches to baseline setting with a normative aspiration are required in order to align crediting mechanisms with the Paris Agreement's long-term goals, considering the Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC) principle.

Comparative Case Study Analysis

The identified transformation characteristics are being applied to three Article 6 case studies of Morocco's waste sector, Costa Rica's transport sector and Pakistan's energy sector (see Chapter 7). The assessment of all Article 6 activities has been conducted prior to their implementation and final design stage and is thus necessarily ex-ante and explorative. The aim of the assessment was to generate some preliminary findings about how transformational current Article 6 design is and how it can be incentivised to become more transformational.

The activity's relationship to the NDC needs to be clear in order to specify, for example, the level of MOs that the host country can export without endangering its own NDC achievement. This is not the case for all Article 6 case studies. Therefore, it is important that the suggested incentive structure in the previous section is based on clear guidance that supports countries in deciding to which extent an activity is eligible for positive lists. The Article 6 activity designs consider the need to redefine additionality in the context of NDCs. The activities do not duplicate existing

national policies but build on them and expand them further. The Moroccan activity is also considering the application of an investment test in addition to target additionality (KliK 2021). The conceptual activity design in Pakistan foresees the use of a carbon price threshold for additionality testing. Costa Rica is currently developing positive lists, which include transformational change as an explicit criterion (MINAE & UDP,2021).

The Article 6 activities in Morocco and Pakistan could both potentially generate MOs at scale: In Morocco, the activity could be further upscaled by expanding investments in anaerobic biodigesters in other Moroccan cities. In Pakistan, the policy's application or redesign (e.g., into carbon contracts for difference) can also be expanded to other sectors such as the industry sector. The Costa Rica case study is a novel micro-scale activity with multiple SDG benefits; MOs at scale would be reached only if the activity would be taken up in several cities. The three Article 6 activity designs do not provide perverse incentives in terms of promoting MOs overselling or preventing any expansion of the NDCs' scopes.

While all Article 6 activities build on the national priorities expressed within the SDG agenda, safeguards against negative impacts on SDGs do not play a pronounced role yet. The intention to develop such safeguards has been raised by the Pakistan Ministry of Climate Change (Interview Pak2 2021). Thus, the analysis reveals that further emphasis should be put on the development of safeguards at the activity level.

The Costa Rica Article 6 case study shows that low-tech solutions such as promoting biking and walking could play a larger role in the Paris Agreement than in the CDM. Low-tech solutions entail many process-related transformational aspects such as a high number of locally relevant adaptation and sustainable development benefits (MINAE & UDP 2021). However, this is not only a design question but also depends on buyers' willingness to pay as such low-tech solutions are often more expensive (MINAE & UDP 2021). Still, smart MRV solutions due to enhanced digitalisation play an important role in this. For example, enhanced digitalisation enables the tracking of more dispersed activities through the use of apps (e.g., biking activity in Costa Rica). The Morocco case study makes use of short crediting periods compared to technical lifetime of the anaerobic biodigesters, thus generating transformational impacts through long-term benefits for the host country.

While some Article 6 activity design aspects promise transformational effects, Article 6 activities are generally still at early stages of their operationalisation and crucial aspects such as baseline setting often require further technical work. Still, the empirical analysis indicates that the Article 6 piloting landscape might become more diverse than under the Kyoto mechanisms, including through supporting transformational activities such as a modal shift towards biking. Regarding the setting of more stringent baselines, an adequate balance needs to be sought between predictability and stringency to not undermine investment incentives. Demand for stringency from buyer countries and entities will need to be met with the willingness to pay higher prices for internationally transferred mitigation outcomes.

Key messages regarding the promotion of Transformational Change through Article 6 (see Chapter 9)

Transformational change is essential to achieving the goals of the Paris Agreement but has not been widely achieved in practice**.** One barrier may be that transformational change has varying meanings in different expert communities. The Article 6-specific transformation characteristics put forward by the authors are an attempt to advance a shared understanding that can guide further operationalization in practical applications. So far, carbon market rules and activities do not show strong evidence of transformational change to date. This can also be explained by the early stage of Article 6 rulemaking and implementation. The three case studies in this report

reveal that the Article 6 landscape is only beginning to emerge, but likely to be more diverse than activities under the Kyoto Mechanisms, which broadens the possibilities to harness transformational change. While core sectors like waste and energy dominate the current Article 6 piloting landscape (Greiner et al. 2020), more innovative activities such as clean transport including cycling and walking, emerging technologies like hydrogen as well as practices using nature-based solutions may emerge more prominently – if sufficiently strong incentives are being provided. This challenge to deliver transformational change is faced not only by carbon markets, but also other climate policy instruments.

Transformational change requires clear carbon market rules that consider and incentivize transformational impacts, but also a predictable market environment that provides sufficient resources for ambitious activities over time. Based on the observations, the practical implementation of Article 6 baseline approaches and methodologies requires further guidance and incentives. Furthermore, an incentive structure that rewards SDG benefits, and safeguards may be required to be put in place to mitigate negative impacts. Finally, the case study analysis reveals that Article 6 cooperation requires a better integration of MRV systems at different levels for NDC accounting and reporting, as well as for SDG benefits.

Core carbon market principles such as additionality and stringency in baseline setting need to be reconsidered in the Article 6 context. Article 6 activities will need to be additional not only to business as usual (BAU) but also to existing policies and potentially to planned policies and measures laid out in countries' NDCs and LT-LEDS, even if these are defined as being conditional on international support. We argue that in order to enable transformational activities, these need to be additional to at least the unconditional NDC targets to safeguard against overselling by the host country. This will also depend on how the host country defines conditionality of its targets and what role it foresees for Article 6 cooperation. Besides, it is recommended that target additionality should not remain the only additionality test. In case of an absent NDC stringency test an investment test at activity level should be conducted in addition. Such a threefold approach to additionality testing (regulatory, financial and target additionality) represents a safeguard against 'hot air' and enables the host countries to prevent the sale of 'low-hanging fruit'.

We propose that an important incentive would be the development of conservatively established positive lists by host countries or buying entities for automatic additionality. This provides guidance to activity proponents on what kind of activities they are considering granting authorisation to or acquiring ITMOs from. These positive lists should have a clearly defined validity period that is regularly reviewed. The transformational change concept could itself become an additionality criterion for establishing positive lists.

It is widely recognised among negotiators that stringency in baseline setting is an important principle in the Paris Agreement context to ensure environmental integrity and contributions to host country NDC achievement. We recognise the need for making baselines more dynamic which can either be achieved by quantifying baseline parameters ex-post in a pre-defined calculation or by changing in value over time upon pre-defined changes in parameters. Especially the latter one is aligned with the proposed definition of transformational change, asking the question of what should be rather than what is. The determination of the 'normative reference' can be based on Best Available Technology (BAT)-derived benchmarks, long-term deep decarbonisation or net-zero goals. The operationalization would be most simple through 'ambition coefficients' that decline over time and be plugged upon existing baseline methodologies, while specification of benchmarks would entail significant transaction costs.

Carbon market rules need to consider the circumstances of the host country and provide incentives for equitable access to carbon market resources. Most importantly, we argue to consider differentiation, based on the application of the CBDR-RC principle in such a dynamic baseline approach which would imply that most countries would increasingly be limited to generating units from emission removals (e.g., nature-based solutions or negative emission technologies) after 2030 whereas low-income countries with limited historical responsibility and per capita emissions could sell emission reductions until the second half of the century. Yet, several practical concerns regarding stringent baseline setting remain. The shift from static to more dynamic baselines bears the risk of unpredictability for project developers. Therefore, a recommendation is that a good balance needs to be sought between predictability and stringency through, for example, the combination of ex-ante fixed declines in baseline parameters – like an ambition coefficient pre-defined for several decades – and updates to all baseline parameters at the point of crediting period renewal. The shortening of crediting periods can also contribute to the transformative impact of Article 6 activities. However, such a shortening should be based on technology characteristics and cost structures (e.g., payback period); the truly transformational technologies such as electric mobility or emerging technologies like hydrogen require long crediting periods.

Incentivising transformational change may reduce carbon credit supply but increase climate and development impacts. The stringent application of core carbon market principles will have an impact on the carbon credit volume, and therefore the supply-demand dynamics in the global carbon market. Investment incentives have to be set in a manner that they account for the reduced carbon revenues and demands from buyer countries and entities thus need to be paired with the necessary willingness to pay. This implies that the buyer can set favourable conditions for the activities' contribution to transformational change. However, this will also mean that ITMO buyers will need to show a willingness to pay adequately high prices for 'high-hanging fruit', i.e., mitigation outcomes from carbon market activities that are more expensive than the least-cost options that host countries should achieve increasingly with their own domestic resources.

In conclusion, the authors find that from a conceptual point of view carbon markets can drive transformational change. To realise this potential, both the rules and carbon market practices need to embed transformational design to align with the urgency and ambition of the Paris Agreement.

Zusammenfassung

Dieser Bericht stellt eine Zusammenfassung der Ergebnisse des Forschungsprojekts „Stärkung der transformativen Wirkung von Marktansätzen unter dem Übereinkommen von Paris“ dar, das von UNEP DTU Partnership, Perspectives Climate Research gGmbH und First Climate zwischen März 2020 und Oktober 2021 im Auftrag des Umweltbundesamtes durchgeführt wurde. Die Ergebnisse in diesem Synthesebericht basieren auf den eigenen Analysen der Autoren, die in unveröffentlichten Zwischenberichten und einem im August 2021 veröffentlichten Diskussionspapier dokumentiert sind (Olsen K.H. et. al. 2021). Die Zusammenfassung verweist dabei auf Kapitel in diesem Synthesebericht. Die bereits im Diskussionspapier präsentierten, zusammengefassten Ergebnisse werden für eine umfassende Darstellung aller Ergebnisse in diesem Bericht wiederholt.

Ziele dieser Studie

In diesem Bericht untersuchen die Autoren, wie der transformative Wandel (engl. transformational change, TC) durch Artikel 6 Kooperation gefördert werden kann, die sowohl kooperative Ansätze nach Artikel 6.2 als auch den Mechanismus nach Artikel 6.4 (A6.4M) umfasst. Der Bericht stellt konzeptionelle Optionen zur Stärkung der transformativen Wirkung durch Artikel 6-Aktivitäten vor und zielt darauf ab, Artikel 6-Verhandlungsteams, politische Entscheidungsträger*innen und Marktteilnehmende sowie die interessierte Öffentlichkeit zu informieren.

Methodischer Ansatz

Die Studie folgt einem sechsstufigen methodischen Prozess und beginnt mit einer Auswertung der Literatur zu transformativen Veränderungen (siehe Kapitel 4). Um Transformations-merkmale in bestehenden Finanz- und Kohlenstoffmarktmechanismen zu identifizieren, wurden strukturierte Interviews mit ausgewählten Schlüsselakteuren aus dem Bereich der transformativen Finanz- und Kohlenstoffmarktmechanismen durchgeführt. In den ersten beiden Schritten wurden eine Definition und Merkmale des transformativen Wandels für die Artikel 6-Kooperation entwickelt. In einem dritten Schritt wurde relevante Artikel 6-Literatur analysiert, um vorteilhafte Gestaltungsoptionen für transformative Veränderungen herzuleiten (siehe Kapitel 5), welche anschließend die Entwicklung einer Anreizstruktur leiten, die diese Gestaltungsoptionen fördert (siehe Kapitel 6).

Abbildung 1 zeigt die Voraussetzungen und beitragenden Faktoren, die zu transformativen Veränderungen durch eine Artikel 6-Aktivität führen können (siehe Kapitel 3). In der Abbildung sind die Voraussetzungen dargestellt, die die Förderung einer nachhaltigen Entwicklung und die Sicherung der Umweltintegrität umfassen. Umweltintegrität bedeutet, dass die Zusätzlichkeit einer Aktivität gewährleistet ist, eine solide Festlegung der Baseline erfolgt und Doppelzählungen vermieden werden. Aufbauend auf diesen Voraussetzungen können Aktivitäten eine transformative Wirkung haben, wenn sie Ambitionen steigern und zu einer „Gesamtminderung der globalen Emissionen“ (engl. overall mitigation in global emissions, OMGE) beitragen.

Abbildung 1: Voraussetzungen und beitragende Faktoren für einen transformativem Wandel im Entwurf der Artikel 6-Regeln

Quelle: eigene Darstellung, UDP, PCR & FC.

Der vierte Schritt umfasste eine vergleichende Fallstudienanalyse in der Praxis, wie die konzeptionelle Definition von Transformation in Artikel 6-Aktivitäten in ihren jeweiligen sektoralen und NDC-Kontexten angewendet werden kann (siehe Kapitel 7). Im fünften Schritt konsultierte das Autorenteam ein internationales Expertenpublikum und präsentierte vorläufige Ergebnisse in virtuellen Workshops. In einem letzten Schritt wurden die Ergebnisse zusammengefasst und Empfehlungen zur Stärkung der transformativen Wirkung der Artikel 6-Kooperation bereitgestellt (siehe Kapitel 8 & 9).

Literaturrecherche & Interviews

Das Verständnis des transformativen Wandels baut auf einer vielfältigen und schnell wachsenden Sammlung wissenschaftlicher und angewandter Literatur auf, die sich auf konzeptionelle und empirische Studien zum Übergang zur Nachhaltigkeit, planetaren Grenzen und sozialen Perspektiven konzentriert (TWI2050[3] 2018; Sachs 2019; IPCC 2018; Raworth 2017; Rockström 2009; Hjalsted et Al. 2020). Im Allgemeinen haben die Definitionen des transformativen Wandels einen gemeinsamen Fokus auf Systemveränderungen, die miteinander verbundene strukturelle Veränderungen der wirtschaftlichen, kulturellen, technologischen und institutionellen Vorgehensweisen beinhalten und verschiedene Akteursgruppen auf mehreren Ebenen einbeziehen (GIZ 2020; Geels 2002) (siehe Kapitel 4.1.1). Systemveränderungen unterscheiden sich von inkrementellen Veränderungen und Reformen, aber ergänzen diese.

Zusätzliche Einblicke in das Transformationskonzept und seine Operationalisierung wurden durch Interviews mit ausgewählten Schlüsselakteuren aus dem Bereich der transformativen Finanz- und Kohlenstoffmarktmechanismen gewonnen. Der Hauptzweck der Interviews bestand darin, besser zu verstehen, wie das Transformationskonzept definiert, angewendet und bewertet wird von führenden Finanzinstituten, die für Artikel 6-Kooperationen relevant sind. Vier ausgewählte Fonds und Institutionen (EBRD, FMO, KliK Foundation, TCAF) wurden zu ihrem Engagement in Artikel 6-Aktivitäten befragt (siehe Kapitel 4.1.2).

Definition von transformativem Wandel und Ableitung von Transformationsmerkmalen für die Artikel-6-Kooperation

Aufbauend auf der von der Initiative for Climate Action Transparency (ICAT) entwickelten Transformational Change Methode[4] werden Artikel 6-spezifische Transformationsmerkmale abgeleitet (siehe Kapitel 4.2).

[3] The World in 2015 Initiative (TWI)

[4] ICAT definiert transformativen Wandel als "Eine grundlegende, nachhaltige Änderung eines Systems, das etablierte kohlenstoffreiche Praktiken unterbricht und zu einer kohlenstofffreien Gesellschaft beiträgt, im Einklang mit dem Ziel des Pariser Abkommens, die globale Erwärmung auf 1,5–2 °C und den SDGs der Vereinten Nationen zu begrenzen" (ICAT, 2020).

Hierbei ist es wichtig zu beachten, dass die vorgeschlagene Definition von Transformation gemäß Artikel 6 eine Arbeitsdefinition ist, um empirische Analysen, die Entwicklung von Transformationsdesigns, Tests, Aktualisierungen, Überarbeitungen und Verfeinerungen zu ermöglichen. Es soll daher nicht als endgültige, verbindliche Definition verstanden werden. Vielmehr ist sie ein Ausgangspunkt, um Co-Kreation, Co-Design und Anpassungen der Transformationsdefinition für bestimmte Zwecke und Anwendungen in einer Weise zu ermöglichen, die eine strukturierte Bewertung, einen Vergleich und das Lernen über Transformationsmerkmale und -auswirkungen ermöglicht, die für Kohlenstoffmärkte am relevantesten sind in verschiedenen Länder- und Branchenkontexten.

Die vorgeschlagene Definition von transformativem Wandel für die Artikel 6-Kooperationen lautet wie folgt:

Ein grundlegender nachhaltiger Wandel eines Systems, der kohlenstoffreiche Praktiken beendet und zu einer kohlenstofffreien Gesellschaft beiträgt. Dies geschieht im Einklang mit den Zielen für nachhaltige Entwicklung der Vereinten Nationen sowie dem Ziel des Übereinkommens von Paris, die globale Erwärmung auf 1,5-2 °C zu begrenzen.

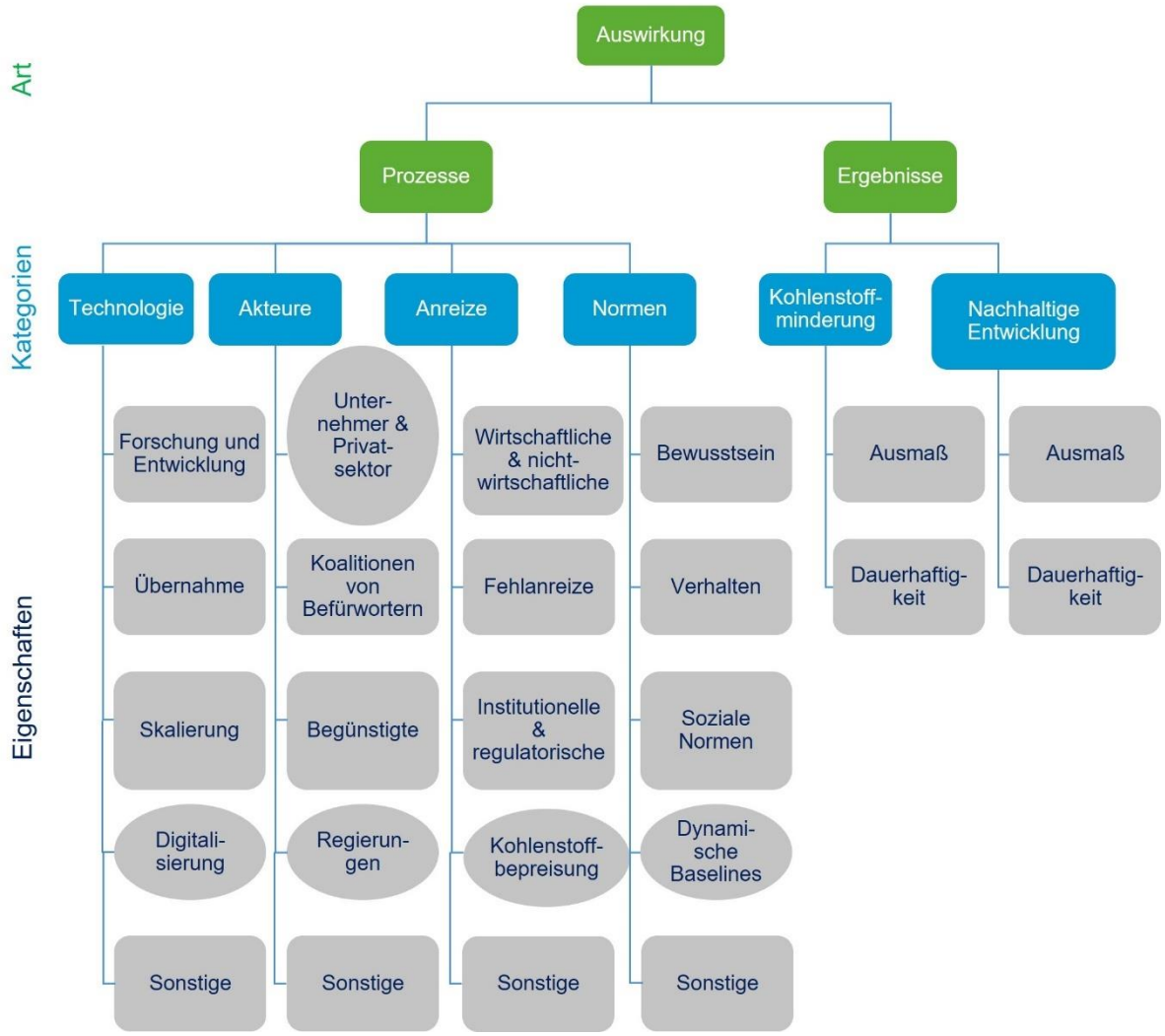
Die vorgeschlagenen Merkmale des transformativen Wandels, die spezifisch auf Artikel 6-Kooperationen abzielen, sind unten dargestellt. Die für Artikel 6 spezifischen ermittelten Merkmale der Transformation, im Vergleich zur ICAT Definition, sind dabei fett hervorgehoben.

- systemweite Auswirkungen, angetrieben durch umfangreiche Ergebnisse oder eine Vielzahl kleinerer Veränderungen
- nachhaltige, langfristige Ergebnisse, die kohlenstofffreie Praktiken stärken und gleichzeitig den Kohlenstoff-Lock-in und die Abhängigkeit von fossilen Brennstoffen vermeiden
- **ein dynamischer und anpassungsfähiger Prozess, der sich bietende Gelegenheiten nutzt, um die Klima- und Nachhaltigkeitsambitionen der Länder weiter zu steigern (z. B. Aufrufe zu grünen Konjunkturpaketen im Zusammenhang mit der COVID-19-Pandemie; niedrige Öl- und Gaspreise als Chance, Auslauf von Subventionen für fossile Brennstoffe)**
- **eine klare, langfristige Perspektive im Hinblick darauf, technische und wirtschaftliche Systeme robuster oder widerstandsfähiger zu gestalten (z. B. durch einen verbesserten Ansatz zur Internalisierung von Risiken) und klare Meilensteine und Anreize für eine Dekarbonisierung/kohlenstoffarme Entwicklung und Klimaneutralität zu setzen**
- **hochskalierte Direktinvestitionen in kohlenstoffarme Technologien und grüne Infrastruktur (einschließlich F&E) durch Regierungen als Wegbereiter/Antriebskräfte der Transformation**
- **Digitalisierung kann zur Transformation beitragen, indem sie z. B. eine Verringerung der Reiseintensität und eine robuste Überwachung, Berichterstattung und Verifizierung (engl. monitoring, reporting and verification, MRV) der Technologieleistung in Echtzeit sowie digitale Zahlungen im Zusammenhang mit Artikel 6 ermöglicht**

Die Transformationsmerkmale, die durch die Literaturrecherche und Interviews als besonders relevant für Artikel 6 identifiziert wurden, sind „Digitalisierung“, „Privatsektor und

Regierungen“, „CO_2-Preisgestaltung“ und „Dynamische Baselines“. Für eine umfassende Beschreibung der generischen Merkmale des transformativen Wandels verweisen wir auf die ICAT Transformational Change Methode (2020). Abbildung 2 unten veranschaulicht die Taxonomie von Transformationsmerkmalen, wobei die Merkmale, die für den Kontext und Zweck von Artikel 6 besonders relevant sind, durch ovale Formen hervorgehoben sind.

Abbildung 2: Taxonomie von Transformationsmerkmalen für Aktivitäten nach Artikel 6



Quelle: angepasst von der ICAT TC Methode (2020).

Konzeptionelle Optionen zur Erschließung eines transformativer Wandels

Die Artikel6-Verhandlungstextentwürfe bieten Ansatzpunkte für Konzepte des transformativen Wandels. Insbesondere die Artikel 6.2-Verhandlungstexte und Artikel 6.4-Regeln, -Modalitäten und -Verfahren (engl. rules, modalities and procedures, RMP) legen zwei Aspekte fest. Ein Aspekt umfasst Schutzmaßnahmen, um zu verhindern, dass die Umweltintegrität des Instruments untergraben wird, und der andere Aspekt umfasst Bestimmungen, die ehrgeizigere Ziele der Länder und einen Beitrag zur Nettoreduktion des globalen Emissionsbudget fördern (siehe Kapitel 3.1).

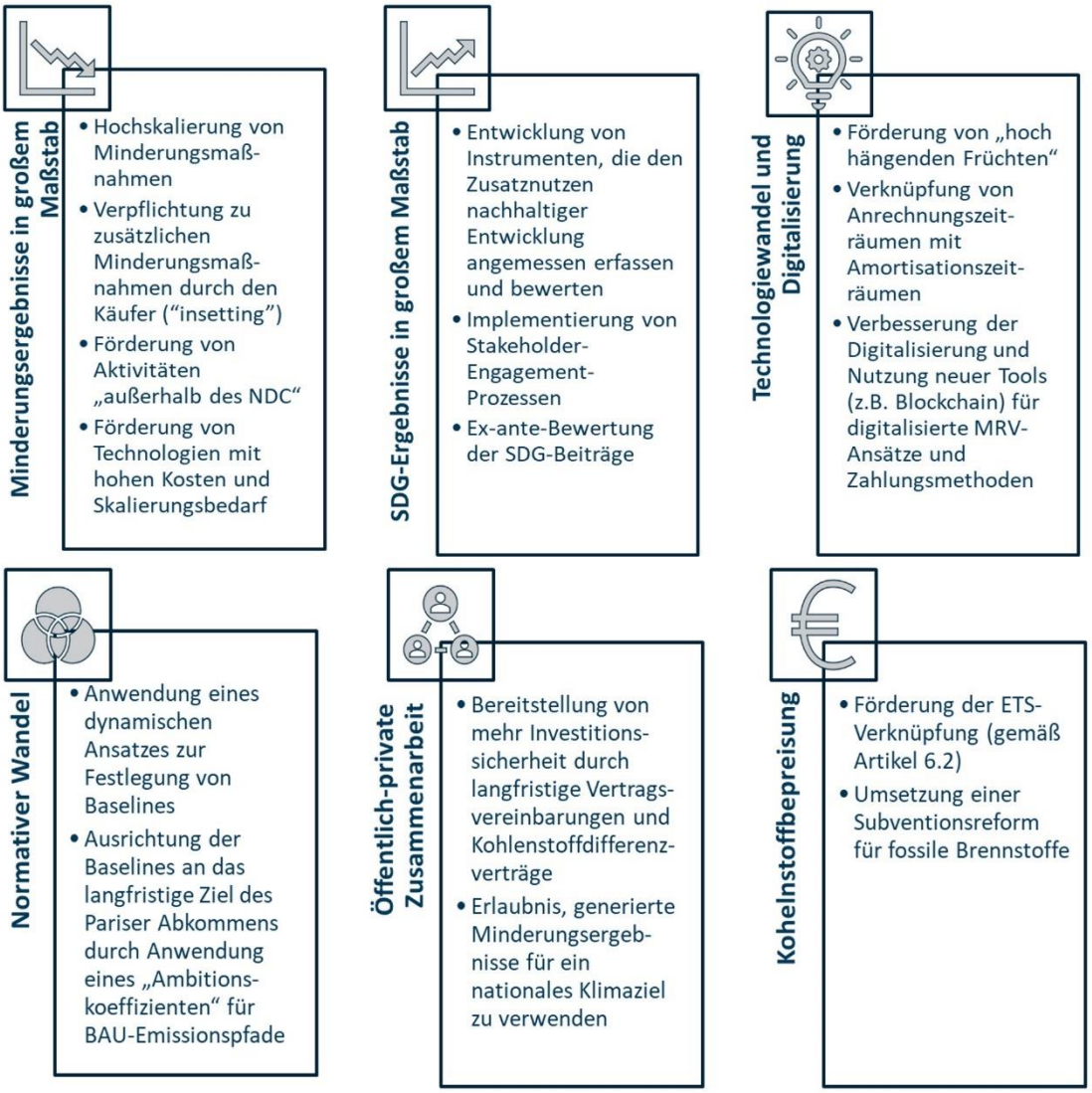
Betrachtet man die frühen Pilotbemühungen unter Artikel 6, beinhalten nur wenige Pilotaktivitäten Transformationsansätze wie hochskalierte Anrechnungsaktivitäten, die Ausrichtung an länderspezifischen langfristigen Strategien zur kohlenstoffarmen Entwicklung (engl. LT-LEDS) und die Verwendung dynamischer Baselines. Die Pilotierungsbemühungen signalisieren jedoch keine breite Akzeptanz von Transformationsaktivitäten, da diese häufig früheren Aktivitäten des Mechanismus für umweltverträgliche Entwicklung (engl. Clean Development Mechanism,CDM) in Bezug auf den geförderten Projekttyp und die Operationalisierung von Schlüsselkonzepten (z. B. Zusätzlichkeitstests und Baseline-Setting) ähneln. Es gab auch eine zögerliche Haltung in Bezug auf die Pilotimplementierung durch die Gastländer, da die Artikel-6-Regeln zum Zeitpunkt der Erstellung dieses Berichts noch nicht fertiggestellt waren und daher die Auswirkungen der Übertragung von ITMOs auf das Erreichen nationaler NDC-Ziele unklar blieben.

Die Autoren haben weitere Optionen abgeleitet, um transformativen Wandel auf praktischer Ebene zu erschließen. In Bezug auf die Umsetzung von Schutzmaßnahmen wurde festgestellt, dass sowohl die zielbasierte als auch die finanzielle Zusätzlichkeit erfüllt werden sollten. Außerdem könnte der Schutz vor nachteiligen Auswirkungen auf die nachhaltige Entwicklung noch entscheidend verstärkt werden, zumal Artikel 6.2 diesbezüglich keine strengen Bestimmungen enthält. Darüber hinaus erfordern Overselling-Risiken den Austausch von Kohlenstoffminderungsergebnissen zwischen Verkäufer und Käufer, ein Mechanismus, der bereits in vielen Pilotaktivitäten vorhanden ist (siehe Kapitel 5.1).

Für sechs verschiedene Merkmale wurden Gestaltungsoptionen identifiziert, die direkt zum transformativen Wandel beitragen: (1) Minderungsergebnisse im großen Maßstab, (2) SDG-Ergebnisse im großen Maßstab, (3) Technologiewandel und Digitalisierung, (4) normative Änderung im Sinne der Angleichung mit Netto-Null-Strategien, (5) Akteure des Wandels in Form eines innovativen öffentlich-privaten Kooperationsmodells und (6) Anreize für Veränderungen in Form einer ambitionierten CO_2-Preispolitik. Die folgende Abbildung 3 gibt einen Überblick über die verschiedenen Optionen, die unter den transformativen Änderungsmerkmalen identifiziert wurden (siehe Kapitel 5.2).

Während einige der skizzierten Optionen zur Erschließung eines transformativen Wandels von Projektentwicklern übernommen und in die Praxis umgesetzt werden können, können Regierungen, Gastgeber- und Abnehmerländer sowie nichtstaatliche Akteure und die internationale Gemeinschaft diese aktiv fördern, indem sie Anreize setzen.

Abbildung 3: Überblick über Gestaltungsoptionen, die transformative Veränderungen durch Artikel 6 freisetzen



Quelle: eigene Darstellung, UDP, PCR &nd FC.

Anreizstruktur zur Förderung des transformativen Wandels

Um den transformativen Wandel durch Artikel 6-Aktivitäten zu fördern, müssen geeignete Anreize geschaffen werden, entweder auf internationaler oder nationaler Ebene. Während auf internationaler Ebene Anreize durch zwischenstaatliche Prozesse oder das Engagement nichtstaatlicher Akteure gesetzt werden können, können sie auf nationaler Ebene durch den Käufer oder das Gastland gesetzt werden (siehe Kapitel 6).

Im Hinblick auf regulatorische Anreize (siehe Kapitel 6.1) ist ein konkretes Beispiel die Erstellung von Positivlisten von Aktivitäten. Sie können entweder von Gastgeberländern oder Käufern übernommen werden, um bestimmte Aktivitäten und Technologien zu fördern, die ihren spezifischen Interessen und Bedürfnissen entsprechen. Ein weiterer regulatorischer Anreiz, der durch einen zwischenstaatlichen Prozess vorgeschrieben werden könnte, wäre, dass Käuferländer Emissionszertifikate nur dann auf ihre national festgelegten anrechnen lassen dürfen, wenn ihre eigenen NDC-Ziele deutlich unter 2 C oder sogar auf 1,5 C oder ausgerichtet

sind. Dies kann z. B. durch die Verwendung dynamischer Baselines erreicht werden, die im Laufe der Zeit stringenter werden.

Hinsichtlich monetärer Anreize (siehe Kapitel 6.2) schlagen die Autoren die Monetarisierung von in Form von Preiskomponenten der international übertragenen Minderungsergebnisse vor. Beispiele hierfür wären eine Prämie für nachhaltige Entwicklung oder positive Effekte auf andere planetare Grenzen jenseits von Klimas (z.B. Biodiversität). Solche Prämienzahlungen und potenziell weitere Anreize, z.B. für die Einführung neuer Technologien, belohnen starke transformative Wirkungen über die Kohlenstoffminderung hinaus und tragen daher dazu bei, kostenintensivere Aktivitäten zu ermöglichen.

Verhaltensanreize (siehe Kapitel 6.3) umfassen die Bildung von Koalitionen und die Bildung eines Käuferclubs, um auf bewährte Verfahren hinzuarbeiten, die über die Mindeststandards auf internationaler Ebene hinausgehen.

Die regulatorischen und monetären Anreize haben praktische Auswirkungen auf die Kernelemente von Artikel 6, wie die Gewährleistung der Umweltintegrität, die Prüfung der Zusätzlichkeit und die Festlegung von Baselines. Die Zusätzlichkeit muss im Hinblick auf die NDC-Ziele neu definiert werden, und bei der Bestimmung der transformatorischen Wirkung wird die zielbasierte Zusätzlichkeit eine wichtige Rolle spielen. Darüber hinaus sind neue Ansätze zur Festlegung von Baselines erforderlich, um Anrechnungsmechanismen mit den langfristigen Zielen des ÜvP in Einklang zu bringen, und unter Berücksichtigung des Prinzips der „gemeinsamen, aber unterschiedlichen Verantwortlichkeiten und jeweiligen Fähigkeiten“ (engl. common but differentiated responsibilities and respective capabilities, CBDR-RC).

Vergleichende Fallstudienanalyse

Die identifizierten Transformationsmerkmale werden auf drei verschiedene Artikel 6-Fallstudien angewendet. Diese fokussieren sich auf den Abfallsektor in Marokko, den Transportsektor in Costa Rica und den Energiesektor in Pakistan (siehe Kapitel 7). Die Bewertung dieser Artikel 6-Aktivitäten wurde vor ihrer Umsetzung und der endgültigen Entwurfsphase durchgeführt und ist daher notwendigerweise ex-ante und explorativ. Das Ziel der Bewertung war es, einige vorläufige Erkenntnisse darüber zu gewinnen, wie transformativ das Design derzeitiger Artikel 6-Aktivitäten ist und wie es dazu angeregt werden kann, transformativer zu werden.

Die Verbindung der Artikel 6-Aktivität zum NDC muss klar sein, um beispielsweise die Menge an Minderungsergebnissen (engl. mitigation outcomes) zu ermitteln, die das Gastgeberland exportieren kann, ohne dadurch die Erreichung seines eigenen NDCs zu gefährden. Dies ist nicht bei allen drei Artikel 6-Fallstudien der Fall. Daher ist es wichtig, dass die vorgeschlagene Anreizstruktur, wie im vorherigen Abschnitt beschrieben, auf klaren Leitlinien basiert, die die Länder bei der Entscheidung unterstützen, inwieweit eine Aktivität für Positivlisten in Frage kommt. Das Design der drei Artikel 6 Aktivitäten berücksichtigen die Notwendigkeit, Zusätzlichkeit im Hinblick auf die NDCs neu zu definieren. Die Aktivitäten duplizieren nicht die bestehenden nationalen Strategien, sondern bauen darauf auf und erweitern diese. Die marokkanische Aktivität erwägt zusätzlich zur zielbasierten Zusätzlichkeit auch die Anwendung eines Investitionstests. Das konzeptionelle Aktivitätsdesign in Pakistan sieht die Verwendung einer CO2-Preisschwelle für Zusätzlichkeitstests vor, und Costa Rica entwickelt derzeit Positivlisten, die den transformativen Wandel als explizites Kriterium beinhalten (MINAE & UDP, 2021).

Die Artikel 6-Aktivitäten in Marokko und Pakistan könnten potenziell beide Minderungsergebnisse in großem Maßstab generieren: In Marokko könnte die Aktivität weiter

ausgebaut werden, indem Investitionen in anaerobe Biovergärungsanlagen auf andere marokkanische Städte ausgeweitet werden. In Pakistan kann die Anwendung oder Neugestaltung der Richtlinie (z. B. in Kohlenstoffdifferenzverträgen) auch auf andere Sektoren wie dem Industriesektor ausgeweitet werden. Die Fallstudie von Costa Rica ist eine neuartige Aktivität im Mikromaßstab mit mehreren SDG-Vorteilen; Minderungsergebnisse im großen Maßstab könnten nur erreicht werden, wenn die Aktivität in mehreren Städten aufgenommen würde. Die Designs der drei Artikel 6-Aktivitäten bieten keine falschen Anreize in Bezug auf die Förderung von Overselling von Minderungsergebnissen oder die Verhinderung einer Ausweitung des Geltungsbereichs der NDCs.

Während alle Artikel 6-Aktivitäten auf den in der SDG-Agenda zum Ausdruck gebrachten nationalen Prioritäten aufbauen, spielen Schutzmaßnahmen gegen negative Auswirkungen auf die SDGs bisher keine ausgeprägte Rolle. Die Absicht, solche Schutzmaßnahmen zu entwickeln, wurde jedoch vom pakistanischen Ministerium für Klimawandel (Interview Pak2 2021) geäußert. Die Analyse zeigt also, dass der Entwicklung von Schutzmaßnahmen auf Aktivitätsebene mehr Bedeutung beigemessen werden sollte.

Die Fallstudie zu Artikel 6 in Costa Rica zeigt, dass Low-Tech-Ansätze wie die Förderung des Radfahrens und Gehens im ÜvP eine größere Rolle spielen könnten als im CDM. Low-Tech-Ansätze bringen viele prozessbezogene Transformationsaspekte mit sich, wie z. B. eine hohe Anzahl lokal relevanter Anpassungs- und nachhaltiger Entwicklungsvorteile (MINAE & UDP, 2021). Dies ist jedoch nicht nur eine Designfrage, sondern hängt auch von der Zahlungsbereitschaft der Käufer ab, da solche Low-Tech- Ansätze oft teurer sind (MINAE & UDP, 2021). Dabei spielen smarte MRV-Lösungen aufgrund der fortschreitenden Digitalisierung eine wichtige Rolle. Beispielsweise ermöglicht eine verbesserte Digitalisierung das Tracking von stärker verstreuten Aktivitäten durch die Verwendung von Apps (z. B. Radfahren in Costa Rica). Die Marokko-Fallstudie nutzt kurze Anrechnungszeiträume im Vergleich zur technischen Lebensdauer der anaeroben Biovergärungsanlagen und erzeugt so transformative Auswirkungen durch langfristige Vorteile für das Gastgeberland.

Während einige Artikel 6-Designaspekte transformative Effekte versprechen, befinden sich Artikel 6-Aktivitäten im Allgemeinen noch in frühen Stadien ihrer Operationalisierung und entscheidende Aspekte, wie die Festlegung von Baselines, sind noch unausgereift. Dennoch deutet die empirische Analyse darauf hin, dass die Artikel 6-Pilotlandschaft vielfältiger werden könnte als unter den Kyoto-Mechanismen, einschließlich durch die Unterstützung von Transformationsaktivitäten wie einer Verkehrsverlagerung auf das Radfahren. Was die Festlegung stringenterer Baselines angeht, muss ein angemessenes Gleichgewicht zwischen Vorhersehbarkeit und Strenge gefunden werden, um Investitionsanreize nicht zu untergraben. Die Nachfrage nach strengeren Vorgaben seitens der Abnehmerländer und -institutionen muss mit der Bereitschaft einhergehen, höhere Preise für internationale Emissionszertifikate zu zahlen.

Kernaussagen zur Förderung des transformativen Wandels durch Artikel 6 (siehe Kapitel 9)

Transformativer Wandel ist wesentlich, um die Ziele des ÜvP zu erreichen, hat sich in der Praxis jedoch nicht weitgehend durchgesetzt. Ein Hindernis kann darin bestehen, dass der transformative Wandel in verschiedenen Expertengemeinschaften unterschiedliche Bedeutungen hat. Die von den Autoren vorgeschlagenen Artikel 6-spezifischen Transformationsmerkmale sind ein Versuch, ein gemeinsames Verständnis zu fördern, das die weitere Operationalisierung in praktischen Anwendungen anleiten kann. Bisher zeigen die Regeln und Aktivitäten des Kohlenstoffmarktes keine starken Hinweise auf einen

transformativen Wandel. Dies lässt sich auch durch das frühe Stadium der Regelsetzung und Umsetzung von Artikel 6 erklären. Die drei Fallstudien in diesem Bericht zeigen, dass sich die Artikel 6-Landschaft gerade erst zu entwickeln beginnt, aber wahrscheinlich vielfältiger sein wird als die Aktivitäten im Rahmen der Kyoto-Mechanismen, was die Möglichkeiten erweitert, den transformativen Wandel zu fördern. Während Kernsektoren wie der Abfall- und Energiesektor die aktuelle Artikel 6-Pilotlandschaft dominieren (Greiner et al. 2020), könnten innovativere Aktivitäten wie sauberer Verkehr, einschließlich Radfahren und Gehen, neue Technologien wie Wasserstoff sowie Praktiken mit naturbasierten Lösungen könnten stärker in den Vordergrund treten, wenn ausreichend starke Anreize gesetzt werden. Dieser Herausforderung, einen transformativen Wandel herbeizuführen, stehen nicht nur Kohlenstoffmärkte, sondern auch andere klimapolitische Instrumente gegenüber.

Transformativer Wandel erfordert klare Regeln für den Kohlenstoffmarkt, die transformative Auswirkungen berücksichtigen und fördern, aber auch ein vorhersehbares Marktumfeld, das im Laufe der Zeit ausreichende Ressourcen für ambitionierte Aktivitäten bereitstellt. Ausgehend von den Beobachtungen erfordert die praktische Umsetzung der Baseline-Ansätze und Methoden nach Artikel 6 weitere Leitlinien und Anreize. Darüber hinaus müssen möglicherweise eine Anreizstruktur, die die SDG-Vorteile belohnt, und Schutzmaßnahmen eingeführt werden, um negative Auswirkungen abzumildern. Schließlich zeigt die Fallstudienanalyse, dass die Zusammenarbeit nach Artikel 6 eine bessere Integration von MRV-Systemen auf verschiedenen Ebenen für das NDC-Accounting und die NDC-Berichterstattung sowie für die SDG-Vorteile erfordert.

Grundprinzipien des Kohlenstoffmarkts wie Zusätzlichkeit und Stringenz bei der Festlegung von Baselines müssen im Zusammenhang mit Artikel 6 überdacht werden. Die Artikel 6 -Aktivitäten müssen nicht nur zusätzlich zu dem Business-as-usual (BAU) Scenario sein, sondern auch zu bestehenden Strategien und möglicherweise zu geplanten Strategien und Maßnahmen, die in den NDCs und LT-LEDS der Länder festgelegt sind, sogar wenn diese als von internationaler Unterstützung bedingt (engl. conditional) eingestuft sind. Wir argumentieren, dass Aktivitäten, um transformativ zu sein, mindestens zusätzlich zu den bedingungslosen (engl. unconditional) NDC-Zielen sein müssen, um zu verhindern, dass das Gastgeberland zu viel verkauft. Dies hängt auch davon ab, wie das Gastgeberland die Konditionalität seiner Ziele definiert und welche Rolle es für die Artikel 6-Kooperation vorsieht.

Außerdem wird empfohlen, dass die zielbasierte Zusätzlichkeit nicht der einzige Zusätzlichkeitstest bleiben sollte. Bei fehlender Stringenz des NDC sollte zusätzlich ein Investitionstest auf Aktivitätsebene durchgeführt werden. Ein solcher dreifacher Ansatz für Zusätzlichkeitstests (regulatorische, finanzielle und zielbasiert Zusätzlichkeit) stellt einen Schutz vor „heißer Luft“ dar und ermöglicht es den Gastländern, den Verkauf von „tiefhängenden Früchten“ zu verhindern.

Die Autoren schlagen vor, dass ein wichtiger Anreiz die Entwicklung von konservativ erstellten Positivlisten durch Gastgeberländer oder kaufende Stellen für die automatische Zusätzlichkeit wäre. Dies gibt Ausschluss darüber für welche Art von Aktivitäten Unterstützer von Aktivitäten erwägen, ITMOs zu genehmigen oder von ITMOs auf dieser Grundlage zu erwerben. Diese Positivlisten sollten eine klar definierte Gültigkeitsdauer haben, die regelmäßig aktualisiert wird. Das Konzept des transformativen Wandels könnte selbst zu einem Zusätzlichkeitskriterium für die Erstellung von Positivlisten werden.

Unter Verhandlungsführern ist es allgemein anerkannt, dass Strenge bei der Festlegung von Baselines ein wichtiges Prinzip im Kontext des ÜvP ist, um die Umweltintegrität und Beiträge zur NDC-Erreichung des Gastgeberlandes sicherzustellen. Wir erkennen die Notwendigkeit,

Baselines dynamischer zu gestalten, was entweder durch nachträgliche Quantifizierung von Baseline-Parametern in einer vordefinierten Berechnung oder durch eine fortlaufend stringenter werdende Baseline durch die Anwendung vordefinierte Parameteränderungen erreicht werden kann. Besonders letzteres steht im Einklang mit der vorgeschlagenen Definition von transformativem Wandel und stellt die Frage, was sein sollte und nicht was ist. Die Bestimmung der „normativen Referenz" kann auf von der besten verfügbaren Technologie (BVT) abgeleiteten Benchmarks, langfristigen Dekarbonisierungs- oder Netto-Null-Zielen basieren. Die Operationalisierung wäre am einfachsten durch „Ambitionskoeffizienten", die im Laufe der Zeit abnehmen und an bestehende Baseline-Methoden anknüpfen, während die Festlegung von Benchmarks erhebliche Transaktionskosten mit sich bringen würde.

Die Regeln des Kohlenstoffmarktes müssen die Umstände des Gastgeberlandes berücksichtigen und Anreize für einen gerechten Zugang zu Ressourcen des Kohlenstoffmarktes bieten. Deshalb bedarf es einer Differenzierung auf der Grundlage der Anwendung des CBDR-RC-Prinzips in einem solchen dynamischen Baseline-Ansatz. Das würde bedeuten, dass die meisten Länder nach 2030 zunehmend auf die Erzeugung von Entfernungszertifikaten beschränkt wären (naturbasierte Lösungen oder negative Emissionstechnologien, während einkommensschwache Länder mit begrenzter historischer Verantwortung und geringen Pro-Kopf-Emissionen, Emissionsreduktionen bis zur zweiten Hälfte des Jahrhunderts verkaufen könnten. Dennoch bleiben einige praktische Bedenken hinsichtlich einer strengen Festlegung von Baselines bestehen. Der Wechsel von statischen zu dynamischeren Baselines birgt das Risiko der Unvorhersehbarkeit für Projektentwickler.

Daher wird empfohlen, ein gutes Gleichgewicht zwischen Planungssicherheit und Stringenz zu suchen, beispielsweise durch die Kombination von einer im Voraus festgesetzten Abnahme der Basisparameter – wie einem für mehrere Jahrzehnte vordefinierten Ambitionskoeffizienten – und Aktualisierungen aller Baseline-Parameter zum Zeitpunkt der Verlängerung des Anrechnungszeitraums. Die Verkürzung der Anrechnungszeiträume kann auch zur transformativen Wirkung von Artikel-6-Aktivitäten beitragen. Eine solche Verkürzung sollte sich jedoch an Technologiemerkmalen und Kostenstrukturen (z. B. Amortisationszeit) orientieren). Die wirklich transformativen Technologien wie die Elektromobilität oder neue Technologien wie Wasserstoff erfordern tatsächlich lange Anrechnungszeiten.

Anreize für einen transformativen Wandel zu schaffen, kann das Angebot an Emissionszertifikaten verringern, aber die Auswirkungen auf das Klima und die Entwicklung verstärken. Die strikte Anwendung der Grundprinzipien des Kohlenstoffmarktes wird sich auf das Volumen der Emissionszertifikate und damit auf die Angebot-Nachfrage-Dynamik auf dem globalen Kohlenstoffmarkt auswirken. Investitionsanreize müssen so gesetzt werden, dass sie den reduzierten CO_2-Einnahmen Rechnung tragen und die Nachfrage von Käuferländern und -Organisationen muss daher mit der notwendigen Zahlungsbereitschaft einhergehen. Dies impliziert, dass der Käufer günstige Bedingungen für den Beitrag der Aktivitäten zum transformativen Wandel festlegen kann. Dies bedeutet jedoch auch, dass ITMO-Käufer bereit sein müssen, angemessen hohe Preise für Minderungsergebnisse aus Kohlenstoffmarktaktivitäten mit hohen Vermeidungskosten zu zahlen, die teurer sind als die kostengünstigsten Optionen, die die Gastländer zunehmend mit eigenen finanziellen Mitteln erreichen sollten.

Zusammenfassend stellen die Autoren fest, dass Kohlenstoffmärkte aus konzeptioneller Sicht ein wichtiger Treiber für transformative Veränderungen sein können. Um dieses Potenzial auszuschöpfen, müssen sowohl die Regeln als auch die Praktiken des Kohlenstoffmarktes an der Dringlichkeit und den Ambitionen des ÜvP ausgerichtet werden.

1 Introduction

A transition to sustainable development and net-zero greenhouse gas emissions is key to achieve the temperature limits established by the Paris Agreement and the global sustainable development goals (SDGs) agreed in the 2030 Agenda. Article 6 of the Paris Agreement recognizes that Parties can voluntarily cooperate to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development. For mitigation, this is to be achieved through market-based cooperation. For market-based cooperation to supports such as transition, favourable design options will need to be implemented.

Against this background, the German Environment Agency (dt. Umweltbundesamt, UBA) has commissioned UNEP DTU Partnership, Perspectives Climate Research and First Climate to conduct the research project "Promoting transformational change through carbon markets: Strengthening the transformational impact of carbon market cooperation under Article 6 of the Paris Agreement".

The team of experts states their common understanding of the central question within the scope of this project as follows: "How can Article 6 cooperation in the Paris Agreement be designed and applied to enable transition pathways and transformational impacts for net zero greenhouse gas emissions and sustainable development?"

In order to answer the central question, the activities were organised in four work packages:

1) Understanding the characteristics of transformational change;
2) Formulating a concept for an incentive structure to support transformational change of Article 6 carbon market approaches;
3) Bringing together an international community of experts in a workshop, and;
4) Present the results of this research project.

This report synthesizes the overall results of this research project, based on several more detailed, unpublished technical research reports and consultations.

1.1 Objectives and structure of the report

The objective of this final report is to present the conceptual understanding and options as well as empirical examples and insights of how carbon markets can contribute to transformational change. The report relies on conceptual work and a literature review as well as empirical case studies in order to lay out a comprehensive incentive structure that is grounded in practical experiences. The report is written to present a synthesis of the interim results of the research project with the overall aim of informing the international expert debate. The report presents conceptual aspects of transformational change for Article 6 as well as insights from three Article 6 case studies at early implementation or conceptual stage in Morocco, Costa Rica and Pakistan, followed by implications for Article 6 design and implementation.

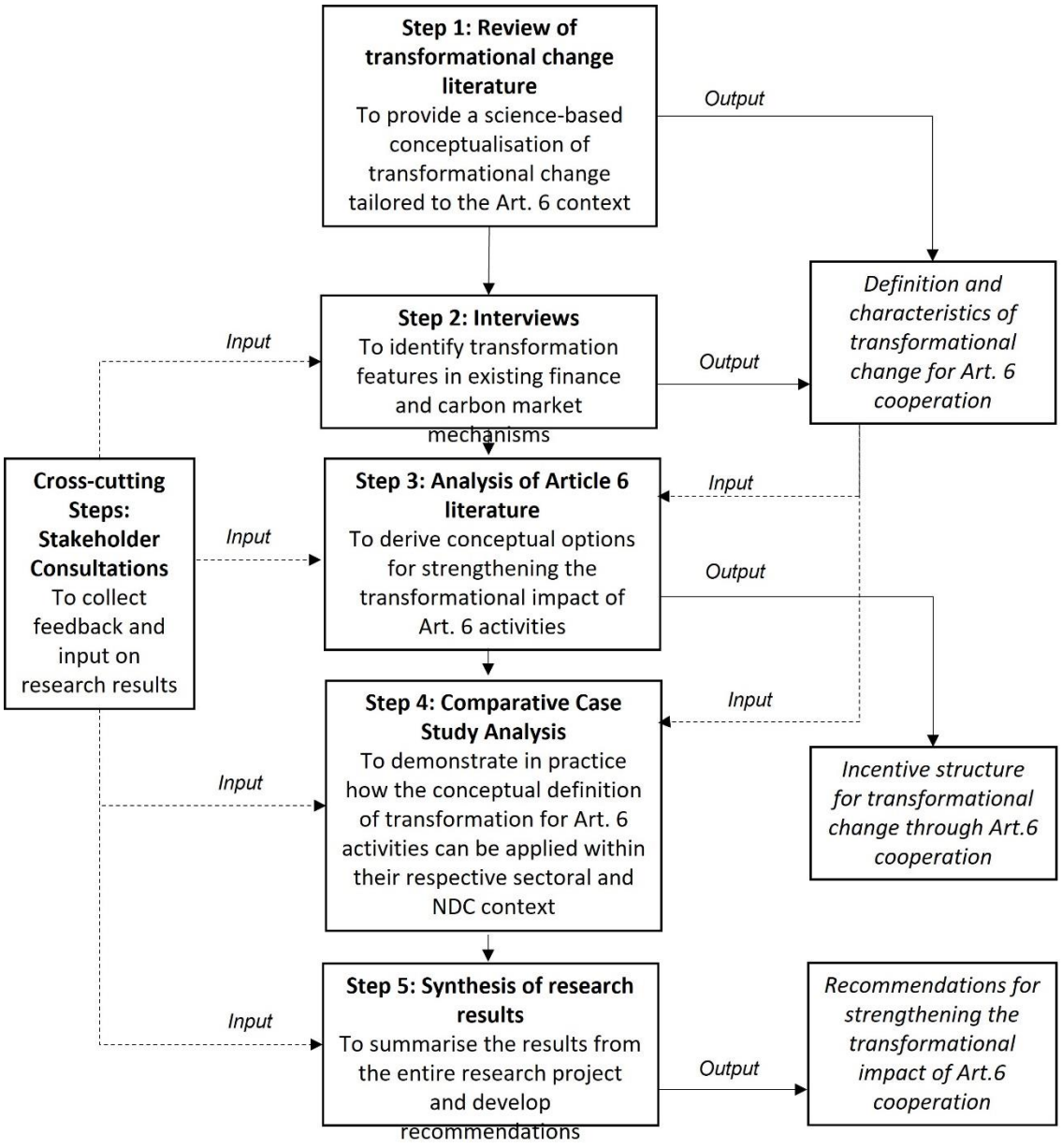
Specifically, Chapter 2 presents the research objectives and the different methodological steps, including cross-cutting steps, applied within this research to arrive at the results. Chapter 3 then contextualises the research by providing a general background and an overview of the status of the Article 6 negotiations and piloting efforts until October 2021. Based on the insights from the literature review and interviews with finance initiatives, Chapter 4 presents a definition of transformational change, a set of transformation characteristics as well as a taxonomy of transformational characteristics for Article 6 activities. In Chapter 5, conceptual options for Article 6 activities are presented building on a review of relevant Article 6 literature. Chapter 6

then introduces an incentive structure for ambition-enhancing and transformational change through Article 6 cooperation. Subsequently, in Chapter 7 insights from a comparative case study analysis of three different Article 6 activities in Costa Rica, Morocco and Pakistan are presented. Finally, Chapter 8 outlines the implications for Article 6 design and implementation, before in Chapter 9 conclusions and recommendations going forward are provided.

2 Methodology

This chapter presents the methodology applied to undertake the research project. In context of the overall aim of the research, namely to develop and explore transformational approaches to the design and implementation of Article 6 activities under the Paris Agreement, six methodological steps are applied as depicted in Figure 4 below. Hereby an iterative process has been followed where the output of step 1 and 2, namely the definition and characteristics of transformational change for Article 6 cooperation, serve as input for the steps 3 and 4, which in turn result in an incentive structure for transformational change through Article 6 cooperation. In addition, virtual stakeholder consultations have been conducted at different points in the research process to collect feedback and further input on preliminary research results. The final step of the process is the synthesis of the entire research process and results, as presented in this report. Each step is described in more detail below.

Figure 4: Methodological steps followed in the research process



Source: own illustration, UDP, PCR & FC.

2.1 Step 1: Review of transformational change literature

The purpose of the literature review is to provide a science-based conceptualisation of transformational change tailored to the objectives of Article 6 carbon-market mechanisms. Therefore, the review encompasses broad, diverse and scientifically sound sources of literature, ensuring a balanced representation across sources. The latest grey literature available on the concept of transformation was collected from leading institutions working in this field including but not restricted to the ICAT, NAMA Facility[5], WBGU[6], UNEP[7], UNEP DTU Partnership[8], Wuppertal Institute, CIF Transformational Change Learning Partnership[9], GIZ[10], OECD[11], UBA and the UN SDGs[12]. This literature is complemented with the latest scientific climate and sustainable development literature, in particular dealing with the planetary boundaries framework, along with peer-reviewed papers relevant to carbon markets. A total of 118 journal papers and reports have been reviewed. For the full list of literature, see Annex B.

As the current global COVID-19 pandemic continues to evolve and to affect all facets of global modern societies profoundly, the opportunity was taken to study the characteristics of this unexpected and undesired global transformation. Although the conceptual understanding of 'transformation' should not be affected by the current COVID-19 pandemic, it is considered useful to inform this work with regard to what transformational change can look like in a real-world example. Specific considerations include relevant subjects for climate and sustainable development, such as how the stimulus packages issued by countries have been used to accelerate the emergence of new 'green policies' or, on the contrary, to induce further fossil fuel lock-in, what are the long-term perspective impacts of the pandemic and which processes have been useful to overcome major barriers.

The literature is clustered into five categories based on their thematic focus, as depicted in Figure 5 below. These categories provide complementary insights to inform and support the definition of transformation relevant for carbon market mechanisms. The full list of literature (see Annex A) was examined across all categories in order to focus on the most relevant and insightful reports for the purpose of this paper. A colour code was applied to prioritise the sources of literature from most to least relevant. Relevance was assessed against the list of questions for each category (Figure 5 for the main questions for each category). Literature marked as not relevant was not assessed. The insights from the analysis within each category served as basis for deriving a general working definition of transformation including a list of transformation characteristics relevant for market approaches.

[5] Nationally Appropriate Mitigation Action (NAMA) Facility

[6] German Advisory Council on Global Change (dt. Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen, WBGU)

[7] United Nations Environment Programme (UNEP)

[8] United Nations Environment Programme (UNEP) Technical University of Denmark (danish Danmarks Tekniske Universitet, DTU))

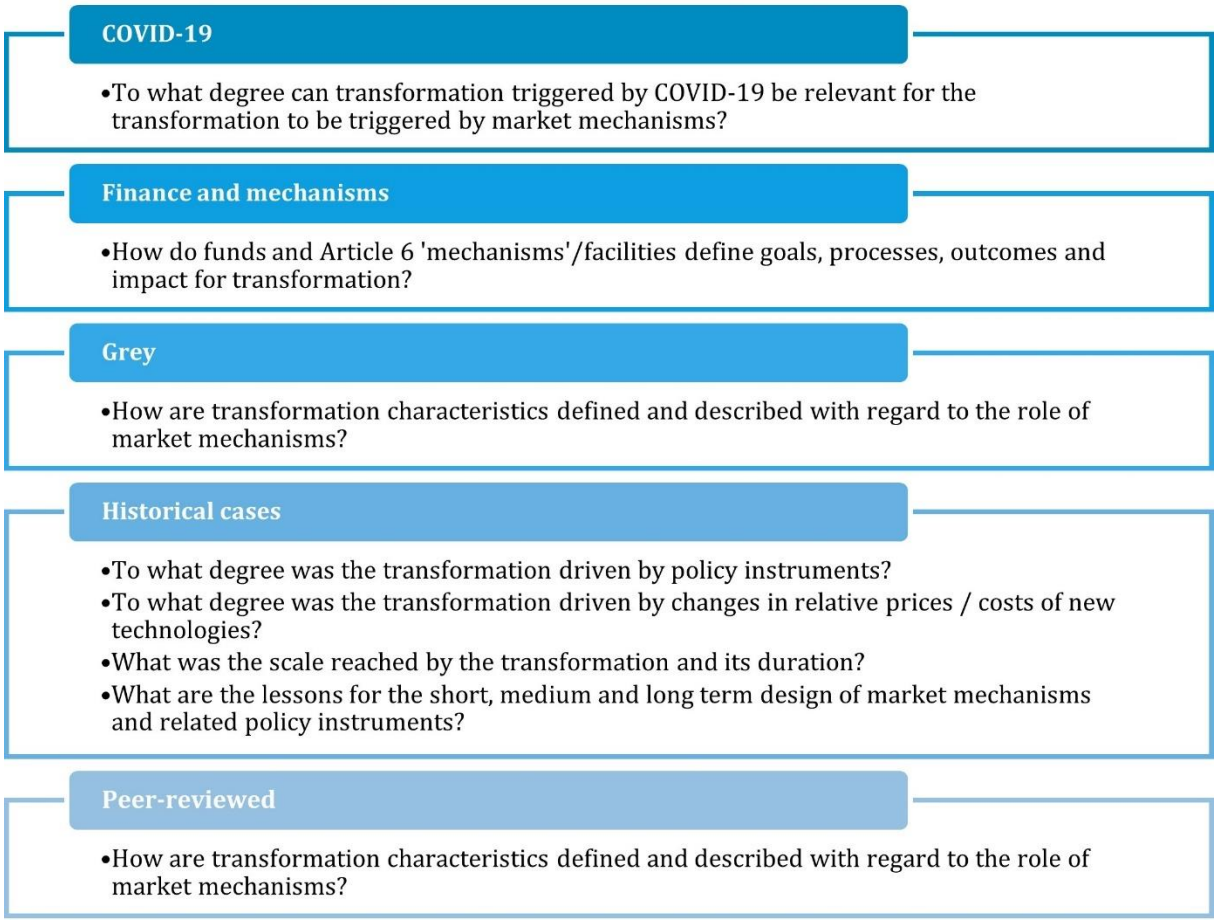
[9] Climate Investment Funds (CIF) Transformational Change Learning Partnership

[10] German Corporation for International Co-operation (dt. Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH, GIZ)

[11] Organisation for Economic Co-operation and Development (OECD)

[12] United Nations (UN) Sustainable Development Goals (SDGs)

Figure 5: Categories of reviewed literature and related questions guiding the review



Source: own illustration, UDP, PCR & FC.

2.2 Step 2: Interviews with selected finance and carbon market mechanisms

Additional insights on the concept of transformational change and how it is operationalised is gained through interviews with selected key players from the field of financial and carbon-market mechanisms striving for alignment with the Paris Agreement goals. The main purpose of the interviews is to better understand, how the concept of transformational change is defined, applied and assessed in leading financial institutions relevant to Article 6 mechanisms.

Multiple initiatives were considered such as the Partnership for Market Readiness (PMR)[13] of the World Bank, the Transformational Change Learning Partnership of the Climate Investment Fund, the Green Climate Fund (GCF), the Climate Technology Centre and Network (CTCN), the Nitric Acid Climate Action Group (NACAG), the NAMA Facility, the European Bank for Reconstruction and Development (EBRD) and others.

Four initiatives were selected for the purpose of this paper as presented in Table 1 below based on their role as thought leaders and front-runners in their respective fields of operation. The literature reviewed for the conceptual development of transformational change included publicly available reports on the four selected initiatives providing a sound preparation for the interviews.

[13] In 2021, the PMR was succeeded by the Partnership for Market Implementation (PMI).

Table 1: Interview details

Category	Details
Length	45 minutes
Dates	Between June 17 and 26, 2020
Format	Semi-structured, with prepared set of questions and interview guide
Topics covered	1) Definition of transformation 2) Transformation design and incentives 3) Methods and approaches for assessing transformative impact 4) Reporting and communication 5) Miscellaneous
Selected interviewees	**1) European Bank for Reconstruction and Development (EBRD):** Mr. Jan-Willem Van de Ven - Associate Director, Energy Efficiency and Climate Change **2) Dutch Entrepreneurial Development Bank (FMO):** Sam Nierop - Impact Officer, Impact Measurement & Integrated Reporting **3) Foundation for Climate Protection and Carbon Offset (KliK):** Mischa Classen - Director Carbon Procurement **4) Transformative Carbon Asset Facility (TCAF):** Klaus Oppermann - Policy Advisor at the World Bank's Carbon Finance Unit

2.3 Step 3: Review of relevant Article 6 literature

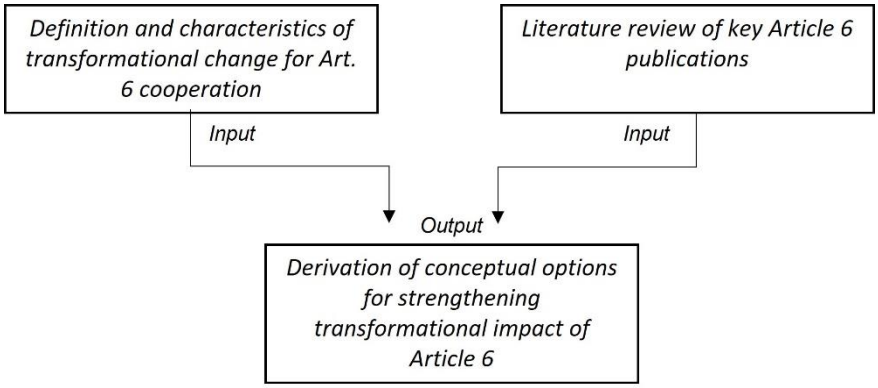
Building on the identified transformational change characteristics, an extensive Article 6 literature research is carried out in chapter 4 to identify potential design options, covering both impact dimensions:

- Design options that prevent compromising NDC ambition and integrity
- Design options that induce transformational change in the host country

While the first group of design options represents preconditions for transformational change, the second one comprises options that can induce transformational change if properly operationalised and implemented.

The derivation of the conceptual design options is thereby also informed by the background sections on the current status of Article 6 negotiations and piloting efforts. The overall process is described in Figure 6.

Figure 6: Process for analysis of transformational design options



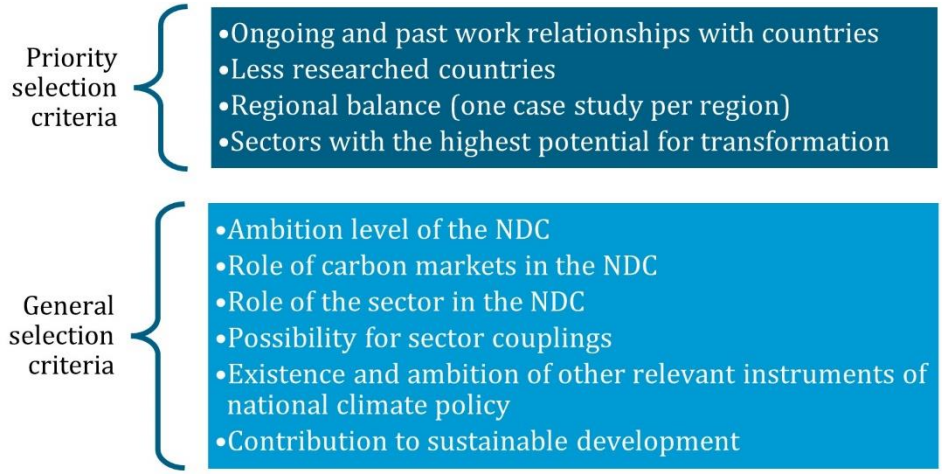
Source: own illustration, UDP, PCR & FC.

2.4 Step 4: Comparative case study analysis of three countries

The purpose of the comparative case study analysis is to understand how the characteristics of transformational change are applied across the three countries.

For the selection of the case countries a set of criteria were applied as shown in Figure 7. Priority selection criteria such as identifying sectors with the highest potential for transformation, focusing on less researched countries and ensuring regional balance as well as ensuring a good access to data were considered more important than general section criteria, such as other information considered secondary. Overall, the selection criteria and process were guided by the objective of the case studies to demonstrate in practice how the conceptual definition of transformation for Article 6 can be applied to generate insights at country, sector and activity levels.

Figure 7: Selection criteria for the case studies



Source: own illustration, UDP, PCR & FC.

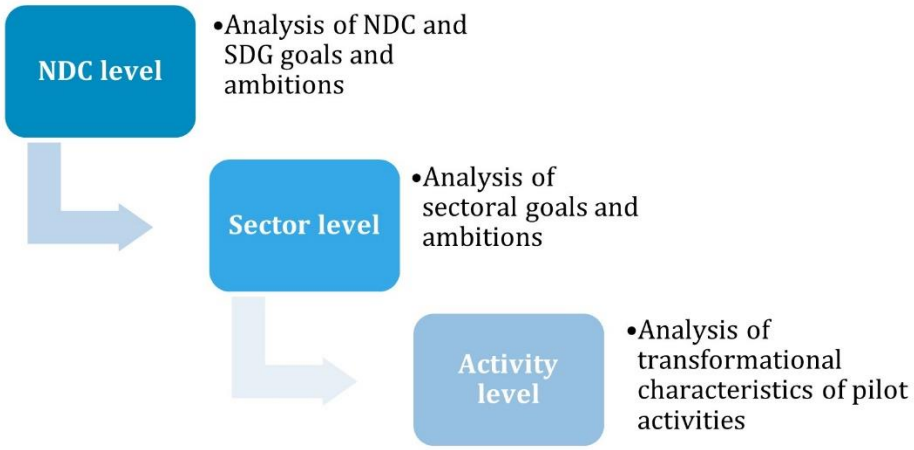
Applying the selection criteria and process described above, the countries and sectors chosen are shown in Table 2 below. Showing regional balance and a focus on sectors with a high potential for transformation, the following countries and sectors are selected: The waste sector in Morocco, the transport sector in Costa Rica focusing on sustainable mobility (biking and walking) and the energy sector in Pakistan focusing on a transition to renewable energy. Prior knowledge and access to case study data from country and sector experts also counted as priority selection criteria for the author team.

Table 2: Selected countries and sectors for the country analysis

Country	Transformative sector	Prior knowledge of the sector and country
Morocco (North Africa)	Waste	Sound (Perspectives Climate Research, First Climate)
Costa Rica (Central America)	Transport and sustainable mobility	Sound (UNEP DTU Partnership)
Pakistan (South Asia)	Energy	Limited (UNEP DTU Partnership)

The comparative case study analysis is conducted at three levels: at the NDC and sectoral level as well as at the activity level with a different analytical focus at each level as shown in Figure 8 below.

Figure 8: Levels of analysis for comparative case studies



Source: own illustration, UDP, PCR & FC.

2.5 Step 5: Stakeholder consultations

The research team conducted multiple stakeholder consultations including a workshop as part of the Carbon Markets Pavilion event jointly organised by the International Carbon Action Partnership (ICAP) and the International Emissions Trading Association (IETA) on 11 November 2020[14].

Moreover, on 31 May 2021, an international workshop was organized by Perspectives Climate Research, First Climate and UNEP DTU Partnership. The seminar took place virtually and invited leading experts to discuss interim results based on an initial input paper summarizing key findings (Olsen et al. 2021) as well as guest speaker contributions. The workshop aimed at discussing the interim results of the research project. Moreover, this consultation with leading international experts generated further input for the main publication of the research project. The workshop brought together government representatives, market participants and researchers from around the world. Key stakeholders in the field reacted to preliminary research results and provided additional feedback and reflections.

2.6 Step 6: Synthesis of research results

The final step brings together key insights from the various research steps and synthesizes them into a final report. This synthesis study integrates key results of more detailed interim reports, taking into account inputs from stakeholder consultations. These insights serve as a basis for specific recommendations on how well-designed incentives geared towards carbon market participants can promote transformational change through Article 6 carbon markets.

[14] https://carbonmarketpav.com/german-environment-agency-panel-discussion/

3 The role of carbon markets in the architecture of the Paris Agreement

The Paris Agreement having entered into force in 2016, confirms the internationally backed Long-Term Temperature Goal (LTTG) of limiting average global warming to well below 2°C above pre-industrial levels, and below 1.5°C to the extent possible (Article 2.1.a). To engage in this path, global greenhouse gas (GHG) emissions must reach net-zero by 2050, through a balance between GHG emission sources and sinks (Article 4.1). The IPCC 1.5° C Special Report (Masson-Delmotte et al. 2018) clearly underlines that the efforts required to achieve this target are technically and economically feasible yet require a fundamental transformation of economic and social action, for which only few years are available. For the transformation to be environmentally and socially compatible, climate action is considered in the context of the sustainable development goals (SDGs), defined in the Agenda 2030 for Sustainable Development. This interlocking of climate and development policy is encompassed in the preamble of the Paris Agreement, in accordance with the LTTG.

In order to operationalise the LTTG, the Paris Agreement binds signatory Parties to submit nationally determined contributions (NDCs) and to update and enhance them every five years in order to gradually close the gap between their collective, current targets and the emission reductions scientifically required to achieve the LTTG, as shown by UNEP's Emission Gap Report (2020). Beyond increasing NDC ambition over time, Parties should also develop and communicate LT-LEDS to achieve the long-term goals of the Paris Agreement, taking into account their common but differentiated responsibilities and respective capabilities. While NDCs comprise the short- to mid-term planning of Parties, LT-LEDS are intended to provide a long-term vision of the transformation required to meet the Paris Agreement's goals. There are no agreed modalities for developing LT-LEDS.

In accordance with the requirements of the Paris Agreement, a large number of countries have submitted a new or updated NDC in the run-up of COP26.[15] The United Nations Framework Convention on Climate Change (UNFCCC) Secretariat also published its second edition of this year's NDC synthesis report on 17 September 2021, comprising information from the 164 latest available NDCs, including 86 new or updated NDCs communicated by 113 Parties (as of 30 July 2021) (UNFCCC 2021b). The report found that most Parties with a new or updated NDC have strengthened their commitment to reduce or limit GHG emissions by 2025 and/or 2030, with an increasing number of Parties moving to absolute emission reduction targets in their new or updated NDCs (ibid). Importantly, the share of Parties that indicated their intent to use voluntary cooperation through carbon markets has doubled (from 44 to 87 percent) since their previous NDC (ibid). Overall, most Parties communicated their intent to use cooperative approaches (Art. 6.2), followed by the multilateral mechanism (Art. 6.4), while some also mentioned their intent to use the CDM (ibid). Carbon pricing was also highlighted by many Parties as an efficient way to incentive low-carbon behaviours and technologies. In addition, many Parties also emphasised policy coherence and synergies between their national mitigation measures and development priorities, including the SDGs (ibid).

While several COP decisions invited Parties to communicate their LT-LEDS by 2020 (e.g., COP21 and COP25), only few countries have submitted such a document within this timeline, largely due to the COVID-19 pandemic (Doyle 2020). As of 12 October 2021, 33 Parties representing 44 countries have submitted a long-term strategy document with several countries communicating

[15] As of 12 October 2021, 122 countries, representing 52% of global emissions have submitted a new or updated NDC, (UNFCCC 2021a.).

climate or carbon neutrality goals (UNFCCC 2021c). Most countries with a LT-LEDS are situated in the Global North, particularly in Europe with a few frontrunners from the Global South, such as Costa Rica, Benin and Indonesia (ibid.).

Article 6 is a central element of the Paris Agreement, enabling and stimulating higher ambition in Parties' mitigation and adaptation actions through voluntary cooperation comprising both market-based and non-market approaches (UNFCCC 2015, Article 6). In this context, a distinction is made between Article 6.2 for cooperative approaches - in which the participating countries can reach bilateral agreements (e.g., on the linking of emissions trading systems or the use of bilateral crediting mechanisms) - and Article 6.4, which establishes an UN-governed mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development (UNFCCC 2015, Article 6). The latter forms the successor of the Clean Development Mechanism (CDM), one of the three market-based mechanisms of the Kyoto Protocol. Article 6.4 emission reductions (A6.4ERs) can either be internationally transferred and acquired by other Parties or non-Party stakeholders according to the Article 6.2 guidance or used in the domestic context towards the NDCs (UNFCCC 2019a-c).

Article 6 market mechanisms are integrated in the agreement's structure in which NDCs are revised on a five-year basis. Article 6 is closely linked to other agenda items of the Paris Agreement, in particular the NDCs (Article 4), climate finance (Article 9), Enhanced Transparency Framework (ETF) (Article 13) and the Global Stocktake (Article 14) (see Figure 9). There are two feedback mechanisms in place regarding the continuous process of enhancing ambition until it is in line with the long-term goals of the Paris Agreement: The Global Stocktake and the ETF. The Global Stocktake represents an assessment of the "collective progress" towards achieving the purpose of the Paris Agreement and its long-term goal which will take place every five years starting from 2023 onwards (UNFCCC 2015, Article 14.3). The outcome of this assessment shall be the development of subsequent NDC updates, which need to be more ambitious than the previous one. The ETF for action and support was established to build mutual trust and confidence between Parties by providing a clear understanding of climate change action including clarity and tracking of NDC achievements as well as Parties' adaptation actions. The framework builds on the existing transparency arrangements and is implemented in a facilitative, non-intrusive, non-punitive manner, taking into account Parties' different capacities to avoid placing undue burden on them (UNFCCC 2015, Article 13). The ETF is based on regular submissions of Biennial Transparency Reports (BTRs) and a respective review process. All inputs and outputs of the ETF are important inputs to the global stocktake.

Figure 9: Embedding Article 6 into the Paris Agreement architecture

Source: own illustration, UDP, PCR & FC.

Article 6 explicitly calls for the promotion of sustainable development as a central objective (UNFCCC 2015, Article 6). A provision in the latest negotiation texts to agree on the Article 6 'rulebook' (from COP25 in Madrid 2019, negotiations to be continued at COP26 in Glasgow 2021) is, for example stakeholder consultations consistent with applicable domestic arrangements (UNFCCC 2019d-f). However, prior experience from the Kyoto mechanisms shows that adequately capturing and assessing sustainability impacts of climate actions was a challenge (Olsen and Fenhann 2008; Olsen, Arens and Mersmann 2018). The lack of internationally agreed tools and approaches to assess sustainable development impacts hindered the promotion of joint climate and sustainable development benefits (Olsen and Fenhann 2008; Olsen, Arens and Mersmann 2018). Although progress was made in the CDM with the introduction of the voluntary Sustainable Development (SD) Tool, few projects used it, due to its late availability after the CER market had already collapsed (Olsen, Arens and Mersmann 2018).

Although no international agreement on the Article 6 'rulebook' has been reached yet, major actors of carbon markets, including financial institutions, the private sector and think tanks have seized the opportunity to embrace an integrated approach to achieve climate and sustainable development goals together, seeing them as interlinked, a common basis for an analytically sound understanding of transformation processes. In particular, research on transformation processes related to market-based international cooperation is still in its infancy, although various scientific definitions of 'transformational change' have been presented (Olsen and Fenhann 2016; UNRISD[16] 2016; GIZ 2020 and ICAT 2020). Against this background, there is now an opportunity to anchor more deeply the concept of transformation, intrinsically related to the

[16] United Nations Research Institute for Social Development (UNRISD)

joint integration of climate and sustainable development objectives, in Article 6 mechanisms within the Paris Agreement.

Considering the key role of market mechanisms in NDC ambition raising, it becomes increasingly important to establish a common state of knowledge on that topic and to formulate a reference definition guiding the transformational change design of carbon-market approaches. Here the "Transformational Change Methodology" by the Initiative for Climate Action Transparency (ICAT) provides a suitable starting point for defining transformational change and its characteristics, given its integrated focus on mitigation and sustainable development outcomes aligned with the dual Article 6 objective to deliver mitigation outcomes[17] (MOs) and promote sustainable development. Specifically, ICAT defines transformational change as "a fundamental, sustained change of a system that disrupts established high-carbon practices and contributes to a zero-carbon society, in line with the Paris Agreement goal to limit global warming to 1.5–2°C and the United Nations SDGs" (ICAT 2020, p. 15). More detailed characteristics for transformational change are identified in Chapter 4.

3.1 Status of Article 6 negotiations and relevance for transformational change

This section summarises those aspects of Article 6 negotiations that are relevant for transformational change. This report was written before the finalisation of Article 6 rules at COP26 and the subsequent analysis is therefore based on Article 6 draft texts and not on the final decisions. The Article 6 rules had been negotiated for over five years with Parties not being able to reach an agreement at the previous international climate conferences in Katowice (COP24) and Madrid (COP25).

The Article 6 rulebook comprises the following items (UNFCCC 2019g):

- Guidance on cooperative approaches, as referred to in Article 6.2
- Rules, modalities and procedures (RMPs) for the mechanism established by Article 6.4
- A work programme under the framework for non-market approaches referred to in Articles 6.8 and 6.9

Non-market-based approaches will not be further examined in this report due to the study's focus on market-based cooperation. The analysis will build on the three last negotiation draft texts of Article 6.2 and Article 6.4 (UNFCCC 2019a-f) before COP26 as they all have the same status. Besides, the developments at the May-June 2021 session of the two Subsidiary Bodies (SBs) are reflected upon.

Article 6 paragraph 1 of the Paris Agreement recognises that "some Parties choose to pursue voluntary cooperation in the implementation of their NDCs to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity" (UNFCCC 2015, Article 6). Higher ambition of climate action is a key component of transformational change reflected both in the process dimension to assess drivers and barriers for system change and the outcome dimension for quantified GHG and SDG outcomes aligned with the global goals for climate and sustainable development. Consequently, Article 6.1 reveals that ambition raising through transformational change are intrinsic to Article 6 cooperation as it shall be used to go beyond planned climate policies and actions while promoting sustainable development. International cooperation, in particular through carbon markets, can play an

[17] Emission reductions and removals

important role in mobilising resources to align financial flows with low carbon and resilient development, enshrined in Article 2.1c of the Paris Agreement (UNFCCC 2015). Ideally, the activities promoted under Article 6 should thus induce transformational change, preparing the way for sustained GHG mitigation outcomes and SDG outcomes at scale.

In the following, specific aspects including prerequisites for and contributing factors to transformational change in the draft Article 6 rules are discussed. This is an effort to identify Article 6 aspects that are relevant for transformational change. We differentiate between prerequisites and directly contributing factors to transformational change as a way to structure the Article 6 analysis. The next chapter then looks into specific (ambition raising) characteristics of transformational change.

Ensuring the environmental integrity of a market-based cooperation meaning that it actually contributes to global mitigation efforts and the promotion of sustainable development, represent prerequisites for transformational change (see Figure 10 below)[18]. Therefore, we first have a look at these concepts and their relevance for transformational change before taking a look at ambition raising and the "overall mitigation in global emissions" (OMGE) which we understand as contributing factors. First, the different concepts are described based on scientific literature, then we describe how they are defined and/or operationalised in the current draft Article 6 rules and subsequently we outline their potential relevance for transformational change.

Figure 10: Prerequisites and contributing factors to transformational change in draft Article 6 rules

Source: own illustration, UDP, PCR & FC

3.1.1 Ensuring environmental integrity

Only a stringent operationalisation of environmental integrity[19] will safeguard the carbon market's integrity and thus enable transformational change. There is no internationally agreed definition of environmental integrity, but a general agreement seems to emerge as to that cooperation does not lead to an increase in global net GHG emissions (Schneider and Hoz Theuer 2018). This, in turn, relates to the following aspects according to Ahonen et al. (2020a):

- Mitigation that is achieved, credited or financed is real, permanent, verified and additional.
- There is no double counting of mitigation achieved.

[18] This is an effort to identify relevant Article 6 aspects that are relevant for transformational change. We differentiate between prerequisites and directly contributing factors to transformational change. This is a way to structure the Article 6 analysis. The next chapter then investigates specific (ambition raising) characteristics of transformational change.

[19] Hermwille and Obergassel (2018, p. 4-5) understand environmental integrity as "a situation where the individual elements or mechanisms of an overarching instrument do not undermine the (environmental) goals of this instrument".

- There are no negative impacts on the achievement of the long-term targets of the Paris Agreement, i.e., does not promote lock-in effects.

Core carbon market tools such as additionality, baseline setting, avoidance of double counting and lock-in effects thus need to be re-interpreted based on the new context of the Paris Agreement in which also host countries have their own climate targets that in the long term should lead to transformational change on the pathways towards global net zero GHG emissions.

3.1.1.1 Additionality

If a mitigation activity and the resulting MOs would not have occurred without the revenues generated from the sale of emission reductions, then the activity is considered additional (Michaelowa and Butzengeiger 2017). In this way, the generation of non-additional carbon credits is prevented, and scarce climate finance resources are not wasted. Reference scenarios are used to determine an activity's additionality (Michaelowa et al. 2019a). Under the CDM, different kinds of additionality tests including regulatory additionality, investment tests, barrier and common practice tests were used (Ahonen et al. 2021). To simplify and standardised additionality testing approaches, positive lists and technology diffusion rate thresholds were implemented under the CDM from 2011 onwards (Ahonen et al. 2021). In the context of the Paris Agreement, additionality determination gets more complex due to the consideration of dynamic perspectives of policy interventions[20] (Hermwille and Obergassel 2018; Ahonen et al. 2021).

Article 6.2

The current draft Article 6.2 texts specify that ITMOs must be "additional" (UNFCCC 2019a-c). However, no definition of the terms is provided since all concepts are to be determined between the Parties participating in an Article 6.2 cooperative approach. Despite this, some Parties argued at the May-June 2021 session of the two SBs that all elements on additionality under the A6.4M should also apply to activities promoted under Article 6.2.

Article 6.4

Under Article 6.4, activities are deemed additional, only if they are not mandated by existing national policies and laws (UNFCCC 2019c-f). Unclear is still whether activities must exceed mitigation policies and measures forming part of the NDC of the host country (Michaelowa et al. 2020a). It will probably need to be distinguished between those actions that contribute to the conditional and unconditional NDC. As this has not been addressed yet in the UNFCCC negotiations, open questions revolve around whether the activity needs to go beyond the activities associated with the NDC and whether planned measures are also included in that as well as the link with existing LT-LEDS (Michaelowa et al. 2020b). At the SBs session in May-June 2021, some Parties raised that additionality should incentivise transformative projects as financial viability is not enough as basis of assessment (SBSTA 2021). Besides, it was stressed that additionality does not mean to go beyond NDCs due to conditionality of the NDC (SBSTA 2021).

Relevance for transformational change

Robust additionality testing is crucial for ensuring environmental integrity of baseline-and-credit schemes. In the Paris Agreement context, the authors argue that three dimensions of additionality need to be met in order to ensure environmental integrity: financial, regulatory and target additionality. The latter implies that activities are not only additional to existing

[20] The dynamic perspectives of policy interventions refer thereby to the need to increase NDC ambition every five years in the form of a new or updated NDC.

national and subnational regulations (regulatory additionality) but also additional to planned policies and activities (target additionality) if these are not yet aligned with the Paris Agreement long-term targets (Ahonen et al. 2021). In case countries differentiate between an unconditional and conditional NDC target, the activity should at least be additional to the unconditional target. If countries have an LT-LEDS in place, the outlined measures can also be considered in additionality testing to go beyond the country's implemented neutrality target or long-term planning, thus contributing to further transformation.

3.1.1.2 Baseline setting

In the context of baseline and credit mechanisms, a baseline represents a scenario which reasonably reflects anthropogenic GHG emissions that would have occurred if a specific mitigation activity would not have been implemented (Shishlov and Bellassen 2012). Robust baselines ensure that the volume of generated credits is not higher than the actual emission reductions achieved (Michaelowa et al. 2021a).

Article 6.2

The draft Article 6.2 negotiation texts specify that baselines must be set in a conservative manner and below 'business-as-usual' (BAU) emission projections while considering all existing policies and addressing potential leakage (UNFCCC 2019a, 2019b, 2019c, para. 22b).

Article 6.4

The first and second iteration of the Article 6.4 negotiation text outline a range of baseline setting options including a performance-based approach, a benchmark approach and a best available technologies (BAT) approach (UNFCCC 2019d, para. 38-46; UNFCCC 2019e, para. 38-43). Historical and BAU baselines are only recommended if other approaches are not economically and technologically viable, feasible or appropriate. An essential question that Parties still need to resolve is whether the A6.4M can credit for mitigation against projected 'increasing' levels of ambitions. The draft RMPs also propose shorter crediting periods (excluding forest and land use related activities) and further functions of the mechanism under the SB's supervision (UNFCCC 2019d-f). The need for more dynamic baselines under Article 6.4 and its contribution to LT-LEDS have also been raised at the SB session in May-June 2021 (SBSTA 2021). Regarding concrete baseline setting options, the importance to deliver an explicit host country benefit was stressed and views continue to disperse on option A (hierarchy approach) or option B (menu approach) of the first and second iteration (SBSTA 2021).

Relevance for transformational change

Stringent baseline setting is essential for ensuring the environmental integrity of the crediting mechanism and the achievement of the Paris Agreement's long-term targets (Michaelowa et al. 2021a). As outlined above, below BAU is the minimum requirement for baseline setting under Article 6.2 and 6.4. While stringent baselines do not automatically lead to higher mitigation ambition in the host country, the use of dynamic baselines can unlock high host country ambition over time as will be further discussed in chapter 5.

3.1.1.3 Avoidance of double counting

If double counting is not avoided, an ITMO could be counted towards the targets of more than one NDC (Schneider et al. 2017). Consequently, the same MO could be claimed by more than one Party (double claiming) (Schneider et al. 2017). This would imply an increase in overall emissions and undermine environmental integrity. Robust and transparent accounting of ITMOs ensures that there is no double counting of the MOs between Parties but also between NDCs and other mitigation goals. In the following, the current state of the negotiations regarding (1)

accounting towards and (2) outside the NDC, as well as (3) the relevance of further international carbon market instruments is outlined.

(1) Accounting towards the NDC emissions balance

Article 6.2 and 6.4

Double counting of ITMOs towards NDC targets is avoided through the application of corresponding adjustments (CAs) by both the transferring and the buying Party (UNFCCC 2019a-f). The transferring country needs to account for the transferred emissions in its annual emissions balance of sources and sinks covered by its NDC. The Party that uses the MO needs to reduce it from the emission level in its annual emissions balance. In the case that ITMOs are not expressed in tons of carbon dioxide equivalent (tCO_2e) (e.g., renewable energy credits) and are not in line with the NDC metric, Parties must apply a CA to the relevant portion of the NDC quantified in this same metric. A transferring country must apply a CA on the 'first transfer' of an ITMO that will be used by another country towards its NDC (UNFCCC 2019a-f).

(2) Accounting for activities not covered in the NDC

Another issue that is currently still contested is whether MOs achieved "outside" the NDC can be transferred out of the country and if so, whether CAs need to be applied for that or not. There are currently two different understandings present in the Article 6 negotiations regarding what "outside" of the NDC means (Michaelowa et al. 2020a): Sectors or gases that are not included in the NDCs and not related to NDC targets as "outside" of the NDC or any action which goes beyond what is required to achieve the NDC targets. The latter understanding would include gases and sectors which are not mentioned in the NDC but also each mitigation action that goes beyond what is required for NDC implementation. Regarding the first interpretation, proponents hint towards the increase in mitigation ambition as this is not covered by the NDC. Especially many developing countries are against the first interpretation and the application of CAs in this context as this is seen as the sector already being covered by the NDC (Michaelowa et al. 2020a).

Article 6.2

In the last iteration of the draft guidance, "outside" of the NDC was interpreted as sectors and gases not included in the NDC. Also, the application of CAs for such a transfer of mitigation generated "outside" the NDC is required (UNFCCC 2019a-c).

Article 6.4

In the Article 6.4 negotiations, positions have not converged. Parties that promote CA exemptions note that additionality would need to be proven for such activities according to international rules. Two options are currently included in the draft texts (UNFCCC 2019d-f): Coherence with the Article 6.2 guidance or an opt-out-period, in which A6.4ERs "outside" the NDC would not trigger CAs. However, the definition of "outside" of the NDC as well as the determination of this opt-out-period (2023, 2025 or 2030) is currently still contested (Michaelowa et al. 2020a).

(3) Accounting for activities

In case ITMOs are transferred for other international mitigation purposes or other purposes, it still needs to be negotiated whether the host country needs to apply CAs with the authorisation or with the actual use of ITMOs (Michaelowa et al. 2020a). Under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), the use of post-2020 vintages of carbon credits is only allowed if procedures for the avoidance of double counting are in place (ICAO[21]

[21] International Civil Aviation Organization (ICAO)

2019). The link especially between the future compliance market and the voluntary carbon market is currently debated. There is a clear risk of double counting MOs between corporates' net-zero efforts in the voluntary carbon markets and governments' net-zero targets (Jeudy-Hugo et al. 2021) which poses a threat to environmental integrity.

Article 6.2 and 6.4

The draft negotiation texts enable – but do not require – authorisation of MOs for "other purposes" (UNFCCC 2019 c-f, para. 41-51). However, if MOs are authorised for other purposes, they are defined as ITMOs and the authorising country must apply a CA consistent with Article 6.2 guidance, "whether or not the mitigation outcomes have been internationally transferred" (UNFCCC, 2019a-c). Furthermore, authorising Parties face the same reporting, accounting and review requirements for MOs authorised for other purposes as for those authorised for use towards NDCs (UNFCCC, 2018).

Relevance for transformational change

It is clear that the application of CAs by both the host and buyer country is important for ensuring environmental integrity and a prerequisite for transformational change. The (temporary) non-application of CAs for activities "outside" the NDC could potentially provide an incentive to opt for carbon standards with weaker requirements, therefore jeopardising the contribution to transformational change. The application of CAs also to activities "outside" the NDC without a transition period is therefore vital. Ideally, CAs should be applied to mitigation outcomes used for voluntary offsetting as genuine offsetting requires the use of MOs exclusively for offsetting, which is enabled by CAs (EDF 2021; Gold Standard 2021; Kreibich and Hermwille 2020; Fearnehough et al. 2020). Only in this way non-state financing would contribute to mitigation action going beyond current NDC pledges, thus unlocking transformational change.

3.1.2 Promotion of sustainable development

To promote sustainable development as a key objective of Article 6 cooperative approaches and as an integrated outcome of transformational impact together with mitigation outcomes at scale and sustained over time, this sub-section describes the role of sustainable development (SD) in the draft negotiations texts to agree on an Article 6 'rulebook'.

Climate action must consider the interlinkages with the broader SD agenda (2030 Agenda for Sustainable Development) which was adopted by all UN Member States in 2015 to enable an environmentally and socially just and inclusive transformation of our society (United Nations 2015).

Article 6.2

The Paris Agreement stipulates that Parties which engage in Article 6.2 cooperative approaches shall promote sustainable development (UNFCCC 2015). The Article 6.2 negotiation draft texts state that Parties need to report on whether the cooperative approaches they engage in are "consistent with the sustainable development objectives of the host country, noting national prerogatives" (UNFCCC 2019a-c, para. 22). This does not represent strong provisions on safeguards against negative sustainable development impacts or promoting sustainable development benefits.

Article 6.4

In the case of the A6.4M, the provision for safeguarding and promoting sustainable development are stronger and require additional information compared to the CDM (Michaelowa et al. 2020a). Under the A6.4M a grievance mechanism will for example be implemented by the Supervisory Body (SB) which did not exist under the CDM (UNFCCC 2019d-f). The approval and

authorisation process of activities under the A6.4M requires confirmation that and information on how the activity fosters sustainable development in the transferring country according to the current draft RMPs (UNFCCC 2019d-f). In addition, the draft RMPs stipulate that the transferring country "shall prior to participating in the mechanism, ensure that […] it has indicated publicly how its participation in the mechanism contributes to sustainable development, while acknowledging that the consideration of sustainable development is a national prerogative" (UNFCCC 2019d-f, para. 26).

Relevance for transformational change

In general, it has been recognised that the safeguards and tools for sustainable development under the CDM have not been sufficient (Olsen and Fenhann 2008; Olsen, Arens and Mersmann 2018) and that there is a need to develop advanced methodologies and tools. To which extent such tools are also applied under Article 6.2 will depend on the requirements by buyer and host countries. Methodologies for market-based international cooperation should thus be designed in a way that they promote sustainable development through the design and monitoring of such contributions as well as positive impacts on other planetary boundaries and by introducing social, environmental and governance/procedural safeguards against potential adverse impacts (Day et al. 2020).

3.1.3 Ambition raising

As outlined above, Article 6 shall be used by Parties to raise the ambition of their mitigation and adaptation actions. How exactly this can be done, is not outlined in the Article 6 draft negotiation texts. The Article 6.2 draft texts refer to ambition when encouraging Parties to contribute to the Adaptation Fund and cancelling ITMOs (UNFCCC 2019b, 2019c). The Article 6.4 draft negotiation texts refer to 'ambition over time' as an important principle for the development of methodologies next to the contribution to mitigation in the host country (UNFCCC 2019d, 2019e, 2019f).

One concept that is clearly linked with ambition raising is the "overall mitigation in global emissions" (OMGE) concept. In the context of the Kyoto Protocol, the use of carbon market mechanisms was basically a zero-sum game which implies that the voluntary cooperation between Parties did not lead to a net reduction of GHG emissions at the global level[22] (Schneider and Warnecke 2019). Under the Paris Agreement, this looks different as voluntary cooperation shall enable higher ambition and an OMGE which can be equated with a net reduction of global GHG emissions is introduced.

Two different understandings of the OMGE concept have been discussed in the international climate negotiations (Michaelowa et al. 2020a):

- OMGE as a 'side mitigation benefit': By applying conservative baselines, the ITMO volume is underestimated compared to the actual MO. This difference will be accounted towards the host country's NDC. This implies that the host country can reduce its mitigation efforts elsewhere and the total global emissions do not change.
- OMGE as a principle on its own: This understanding of the principle foresees that additional mitigation is generated which cannot be claimed by any participant but will be cancelled in a mandatory or voluntary manner in the context of results-based climate finance.

[22] A net reduction implies the cancelling out of a ton of GHG emissions produced in one place by the reduction of a ton of GHG emissions in another place.

Article 6.2

According to the Article 6.2 draft guidance (UNFCCC 2019c, para. 39), "participating Parties and stakeholders are strongly encouraged to cancel ITMOs to deliver an overall mitigation in global emission that is commensurate with the scale delivered under the mechanism established by Article 6, paragraph 4". Furthermore, Parties shall report in their Regular Information (sometimes as part of the Biennial Transparency Report (BTR)) on the delivery of OMGE (UNFCCC 2019a-c). It would be the participating Parties' responsibility though to implement the OMGE concept.

Article 6.4

Compared to Article 6.2, Article 6.4 mandates that the mechanism must deliver an OMGE. Considering the two different understandings above, two options were retained in the iterations of the negotiation text:

1. Setting conservative baselines or using conservative default factors in baselines to deliver an OMGE.
2. Cancellation of a certain share of the issued A6.4ER, either voluntarily or mandatorily.
   a. Voluntary cancellation
      i) Any cancellation by non-state actors is considered OMGE (even if A6.4ER are used for carbon neutrality claims)
      ii) Cancellation only for OMGE delivery purposes
   b. Mandatory cancellation:
      i) A fixed cancellation rate of 2%

Initial fixed cancellation rate which is regularly revised afterwards

Relevance for transformational change

The OMGE concept could contribute to transformational change, also depending on the actual form its operationalisation will take. The operationalisation of OMGE as a principle on its own meaning the cancellation of a certain share of A6.4ERs would have a real transformational effect as it ensures an abatement benefit for the atmosphere beyond Parties' targets and also provides benefits to those Parties that are not engaging in Article 6 cooperation. Such an operationalisation of the OMGE concept may result in higher prices for ITMOs and a reduced transaction volume since the emission reductions diverted for the OMGE will not be available for trading (Schneider and Warnecke 2019).

3.2 Article 6 piloting efforts and their link to transformational change

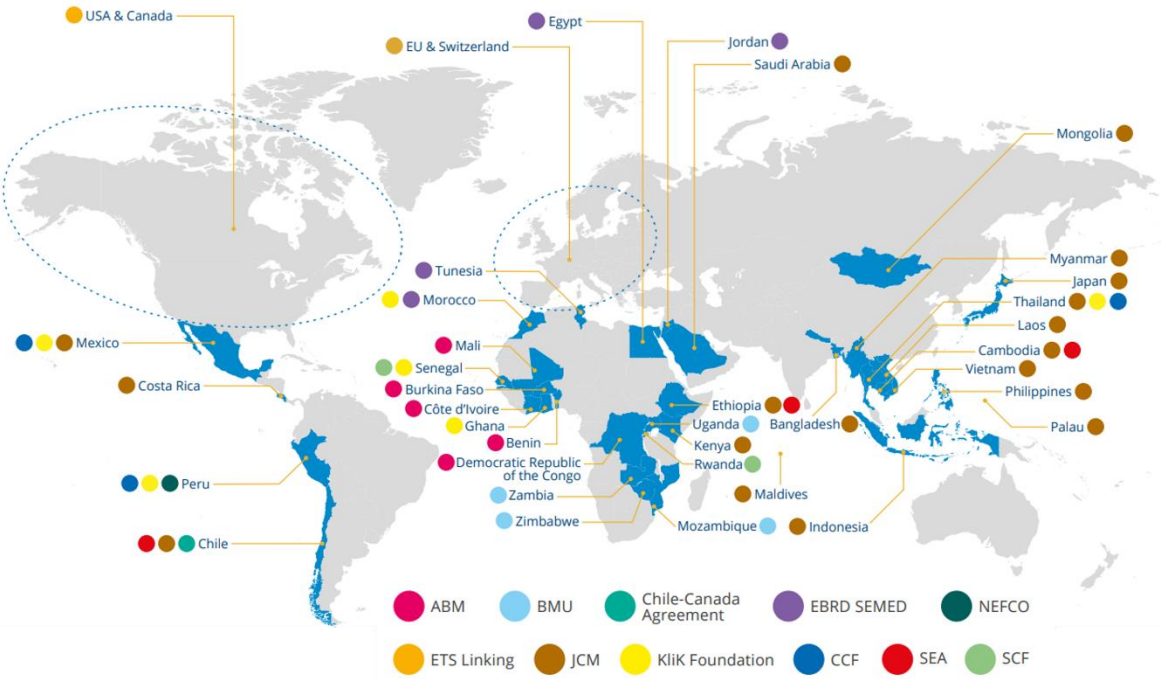
Some frontrunner countries have already begun pioneering practical Article 6 cooperation which generate practical experience that can inform the Article 6 negotiations. Subsequently, we provide a summary of observations on the key lessons from current pilot designs on enabling transformational change.

A general observation is that an increasing number of market participants such as the Global Green Growth Institute (GGGI) and Germany's International Climate Initiative (IKI) are now engaging in the Article 6 piloting landscape (Greiner et al. 2020, see Figure 11 below). Most recently, IKI has selected a project for funding titled 'Article 6 cooperative approaches for high ambition NDC implementation' to be implemented in four developing countries. Ambitious frontrunners in the piloting space are Switzerland, Sweden and Norway. The Swiss Foundation for Climate Protection and Carbon Offset (KliK Foundation) has for example already six piloting activities in place in Ghana, Morocco, Peru and Senegal (KliK Foundation 2021). The Swedish

Energy Agency (SEA) is moving from promoting virtual pilot studies to the implementation of selected activities and cooperates with GGGI on a programme that focuses on implementing Article 6 governance frameworks in host countries (SEA 2019). Norway supports a programme focusing on Article 6 policy crediting.

Regarding the development of piloting activities, it can be observed that even though important milestones have been reached such as the signing of a Swiss-Peruvian and Swiss-Ghanaian bilateral agreement under the KliK Foundation, the pace of pilot development has slowed down across the last three years (Greiner et al. 2020). This can be traced back to the fact that many pilots remain subject to bilateral and commercial negotiations. In addition, more emphasis is put on building the necessary capacities, the carbon market infrastructures, the implementation of regulatory processes and information exchange at the country level which is time-consuming.

Figure 11: Overview of Article 6 piloting landscape



Source: Greiner et al., 2020

provides an overview of the current Article 6 piloting landscape including all piloting initiatives and its implementation organisations such as the Adaptation Benefits Mechanism (ABM), the initiatives by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), the EBRD, the Nordic Environment Finance Cooperation, the KliK Foundation as well as the Climate Cent Foundation, SEA, Japan's Joint Crediting Mechanism (JCM) and the Standardized Crediting Framework (SCF). The figure shows that the majority of ongoing Article 6 pilots are based in Africa, followed by Southeast Asia with only few pilots in South America. The JCM is the initiative with the most ongoing piloting activities, followed by the KliK Foundation (Greiner et al. 2020).

The current Article 6 piloting landscape does not yet provide conclusive evidence of contributions to transformational change, although some promising conceptual elements emerge:

- All pilots clearly refer to NDCs and commit to robust accounting (Greiner et al. 2020). Some pilots go further by mentioning that the LT-LEDS will be taken into consideration as also outlined in the Swiss-Peruvian bilateral agreement (Greiner et al. 2020; Swiss Confederation and Republic of Peru 2020). There might thus be an alignment with the LT-LEDS which helps for example to avoid carbon lock-in effects.
- One of the first pilots considering the use of dynamic baselines is the BMU Article 6 pilot programme which focuses on reducing technical losses in the power grids of African countries (Greiner et al. 2020; Thioyé et al. 2018). In order to establish the baseline, the pilot builds on the modelling of certain parameters (e.g., standardised baseline for the CO_2 intensity of the power system, current technical losses) based on a CDM methodology (Greiner et al. 2020; Thioyé et al. 2018).
- GGGI has supported Nordic countries with an Article 6 initiative that promotes policy crediting (GGGI 2021). Upscaled crediting in the form of sectoral or jurisdictional activities as well as policy instruments is also promoted by the World Bank's TCAF (World Bank 2020). Sectoral crediting is explored by some SEA virtual pilots, the Nordic Environment Finance Corporation (NEFCO)-Peru conceptual pilot and EBRD's Integrated Carbon Programme for the Southern and Eastern Mediterranean (Ahonen et al. 2020b).

Some observations are, however, less promising and are currently not conducive of transformational change:

- Regarding baseline setting and additionality determination, Article 6 pilots have not yet lived up to the prospective future requirements (Greiner et al. 2020). For example, there is no consistent approach when it comes to activities outside[23] the NDC or to additionality testing that also includes planned policies. Besides, pilots show diverging approaches when it comes to the question how unconditional NDC targets should be reflected in baseline setting. BAU currently still features in baseline setting which is not in line with Article 6 provisions and far from inducing transformational change.

A general observation from the Article 6 pilot study is that many efforts are based on known project types so far, like renewable energies (solar, wind, biogas), energy efficiency and sustainable waste management activities (Greiner et al. 2020; World Bank 2021). Once the Article 6 rulebook is finalised and uncertainties due to COVID-19 subsides, it is expected that more innovative approaches such as electric vehicle mobility activities and activities focusing on promoting emerging technologies like hydrogen will emerge (World Bank 2021). New approaches such as policy crediting which were not allowed in CDM may further enable upscaled mitigation actions resulting in ambition increases.

[23] 'Outside the NDC' is understood as sectors or gases that are not included in the NDCs and not related to NDC targets in accordance with the most common interpretation

4 Understanding transformational change and its characteristics

4.1 Insights from the literature review and interviews

Following the methodology described in chapter 2 this section summarises the key insights from the literature review and the interviews. As a reminder, the purpose of the review and interviews is to comprehend how the concept of transformational change is understood from different perspectives, contexts, and purposes and to identify, what issues and characteristics of transformation are most relevant to Article 6. A full list of the literature reviewed is provided in Annex A.

4.1.1 The concept of transformation and its characteristics according to five groups of literature

Understanding transformational change builds on a diverse and fast-growing body of scientific and applied literature focused on conceptual and empirical studies of sustainability transition, planetary boundaries and social perspectives (TWI2050 2018; Sachs 2019; IPCC 2018; Raworth 2017; Rockström 2009; Hjalsted et al. 2020). In general, definitions of transformational change share a common focus on system change, different but complementary to incremental change and reform, which involves interrelated structural changes to economic, cultural, technological and institutional ways of doing things, engaging multiple actors at multiple levels (GIZ 2020; Geels 2002).

The main insights from the literature review are summarised in Table 3 below according to the different categories.

Table 3: Summary with examples of insights from the literature review

Category	Insights
COVID-19	Many voices are calling for a green recovery, with the COVID-19 crisis being a possible window of opportunity for climate action (Elkerbout et al. 2020; Fischedick and Schneidewind 2020; Hepburn et al. 2020; Steffen et al. 2020). The need for adaptive or dynamic policies to be able to withstand a shock or crisis is pointed out (Climate Action Tracker, 2020; Steffen et al., 2020) and hasty adjustment of baselines such as in the case of CORSIA should be avoided while baseline crediting should in general become more dynamic (see Annex A, COVID-19 literature). Many publications put an emphasis on the temporal aspect of transformational policies in the aftermath of COVID-19 and that the long-term perspective should be considered (Climate Action Tracker 2020; Fischedick and Schneidewind 2020; Hepburn et al., 2020; Steffen et al. 2020). Enhanced digitalisation is an important enabler of economic modernisation and thus transformational change, and the increased use of digital technologies is one of the sustained behavioural changes due to the COVID-19 pandemic (Climate Action Tracker 2020; Fischedick and Schneidewind 2020; Sarkis et al. 2020).
Grey	There is limited literature that provides a definition of transformational change. In general, broader definitions of transformational change going beyond climate change and mitigation are provided.

Category	Insights
	Hermwille (2020) focuses on methods of attributing mitigation outcomes and suggests a dynamic baseline as a basis for generating mitigation outcomes aligned with the Paris Agreement temperature goal. GIZ suggests methods for baseline establishment, specifically aiming at transformation determination, based on e.g., current market share of a transformative technology in order to capturing the 'right' time to consider possible transformation (GIZ 2020). Factors work against transformation through Article 6, such as: a) the environmental integrity of mitigation outcomes may be at risk, if additionality is not ensured under new crediting mechanisms; b) low ambition of NDCs could lead to the transfer of hot air (inflated baselines); c) a lack of robust accounting of international transfers could lead to double counting (see Annex A, grey literature).
Historical cases	The literature review of historical cases of transformative change revealed that policy instruments are decisive to drive transformation and need to be applied consistently over long periods of time, unless the transformation is driven by rapid autonomous technological development undercutting costs of incumbent technologies (see Annex A historical cases). The historical cases show that the mechanism needs to be operational for several decades without being “switched off and on” repeatedly in short periods, as is currently the case with the CDM and Article 6 Such short-term changes destroy trust, where trust in the persistence of the market is more important than a particular price level of emissions credit (see Annex A, historical cases).
Peer-reviewed	Climate mitigation options consistent with 1.5-degree pathways are often associated with multiple synergies and trade-offs with the SDGs, likely resulting in more synergies than actual trade-offs (IPCC 2018). Learning from past experiences, incl. the Kyoto mechanisms is crucial to avoid repeating the same mistakes and pursue inefficient paths to curb the GHG emission curve. Policy instruments and government interventions (incl. direct regulation, carbon pricing, and public investment support) have proved to be key to trigger more rapid transformations. (Michaelowa et al. 2018). According to the literature, system characteristics most relevant to understand and design market mechanisms for transformation include, but are not restricted to: the scale of intervention, the apprehended sectors, the ambition of NDC pledges and how baselines are set, the status of policy/technology development (sociotechnical context), the understanding of the ‘windows of opportunity’ for policy instrument implementation (timing), the processes and depth of change, the role of actors and the management approach (see Annex A, peer-reviewed literature).

Source: see in-table references.

These main insights, as highlighted in the table overview above, are used to tailor the ICAT definition of transformational change to Article 6 objectives as listed under chapter 4.2 below.

4.1.2 Views and operational criteria on how to promote transformational change in four funds and mechanisms

This section presents the main insights gained from the interviews with the four selected funds and mechanisms and related publicly available literature. A short overview of the four selected funds and mechanisms in relation to their engagement in Article 6 activities and their definition of transformation is provided in Table 4 below.

Table 4: Summary and examples of insights from the interviews with funds and mechanisms

Funds & Mechanisms	Insights on engagement in Article 6 activities & definition of transformation
EBRD	Engagement in Art. 6: No engagement in Article 6 activities, provides climate and development finance. Definition of transformation: 'Transition' and 'transformation' used synonymously as a means to create the right regulatory system for carbon markets and to bring in capacity building along with the Investments. Adherence to the transition concept was fostered by the increasing demand by donors. Focus on climate resilience and SDGs.
FMO	Engagement in Art. 6: No engagement in Article 6 activities, provides climate and development finance. Definition of transformation: Use of the SDGs (promotion of SDGs 8, 10 and 13) and ambition to align with the 1.5-degree target of the Paris Agreement. Definition of two labels for individual investments: 1) Green Label 2) Reducing inequalities
KLIK Foundation	Engagement in Art. 6: Facilitates Article 6 activities and transactions. Definition of transformation: Promotion of the concept of transformation based on 3 pillars: 1) Sustained nature of activities, that generates a sustainable income for local communities, 2) Paris compatible, incl. sustainable development and technology, 3) Policy congruence with host countries to support and supplement the achievements of NDCs.
TCAF	Engagement in Art. 6: No active pipeline of projects yet but aims for Article 6 transactions. Definition of transformation: Promotion of the concept of transformational change approached from economic theory: An activity is transformational if it has an impact beyond the project boundaries. Transformational change is defined separately from Sustainable Development; the latter is defined by Host countries.

Source: own compilation, UDP, PCR & FC.

Overall, the four funds and mechanisms all seem to address and conceptually promote transformation in a mitigation context. However, the adopted definition, wording and taxonomy for leveraging change varies across the groups of interest.

Support for the concept of transformation is not always central to the mandates of the institutions and sometimes it comes in the background. For example, KliK's clear mandate is to achieve mitigation while facilitating Article 6 activities for the country of Switzerland (see Table 4). Its field of action is well delimited by the CO_2 law of Switzerland (Federal Assembly of the Swiss Confideration, 2021), and therefore the selection of the program activities cannot primarily depend on the potential to trigger transformative change, aligned with their suggested framework. Subsequently, KliK projects are not selected or benchmarked as transformational,

rather windows of opportunity are identified to drive transformational change. This approach is similar to the EBRD, whose activities are very much market-driven and no benchmark for transformational change is conducted.

Most institutions are also cautious about being normative when it comes to defining what is considered transformational. This comes along the lines of not infringing national prerogatives in regards of deciding what is deemed transformational or not including how to define SD. For example, EBRD defines SD separately from TC and it is often in the hands of the host countries to define SD objectives in their national context (see Table 4). In that regard, host governments have a key role to set SD objectives and put their achievement high on the political agenda.

As an important driver of transformation, all funds and mechanisms integrate carbon pricing in their transformation incentives for designing transformational projects and activities. Practices include implicit pricing, e.g., shadow pricing in the design of their work and activities as an effective means to sustainably align with the Paris Agreement goals.

4.2 Defining transformational change and deriving transformational characteristics for Article 6 cooperation

The proposed definition of transformational change for Article 6 purposes takes the ICAT Transformational Change Methodology (ICAT 2020) as the starting point and adapts the definition and its characteristics of transformation based on insights from the literature review and interviews mentioned in chapter 4.1. The close links between transparency of NDC implementation and Article 6 requirements for MRV of mitigation outcomes (MOs) support drawing on the ICAT methodology as the basis for a tailored definition for Article 6.

It is important to keep in mind, the definition of transformational change for Article 6 is a working definition to initiate empirical analysis and start the development of transformational design, testing, updates, revisions and refinement. The proposed definition of transformational change for Article 6 is not meant to be final and authoritative. Rather, it is a starting point to enable co-creation, co-design and adaptations of the definition for particular purposes and national contexts. Yet, a common conceptual understanding does enable applications for a structured assessment, comparison and learning across diverse country and sectoral contexts regarding what generically constitute transformational characteristics and impacts relevant to carbon markets. The proposed definition of transformational change for Article 6 cooperative approaches and its characteristics are listed below.

The definition emphasises the achievement of the 'alignment with the Paris Agreement' objective in an integrated way with the 2030 Agenda for SDGs. It is consistent with the IPCC (2018) perspective on 1.5° pathways to net zero emissions by 2050 in the context of sustainable development assessments of synergies and trade-offs with the SDGs. However, the ICAT methodology and the taxonomy tailored to Article 6 purposes refer to the SDG framework, which does not build on an absolute, planetary boundary approach to sustainability assessment. The issue to avoid shifting the burden across the different dimensions of sustainability such as safeguarding biodiversity or jobs when transforming sectors and societies is therefore assessed more qualitatively through the mapping of interlinkages using the SDG framework.

A fundamental, sustained change of a system that ends high-carbon practices and contributes to a zero-carbon society, in line with the Paris Agreement goal to limit global warming to 1.5–2°C and the United Nations Sustainable Development Goals.

In addition, the proposed characteristics of transformational change for Article 6 cooperative are below. To indicate how the ICAT definition is adapted to Article 6 purposes, new language, and

characteristics of transformation specific to Article 6 are highlighted in bold (the last four bullet points):

- system-wide impacts, driven by large-scale outcomes or a multitude of smaller-scale changes
- sustained, long-term outcomes that reinforce zero-carbon practices while avoiding carbon lock-in and dependence on fossil fuels
- **a dynamic and adaptive process that makes use of emerging windows of opportunity to further increase countries' climate and sustainability ambition (e.g., calls for green recovery packages in the context of the COVID-19 pandemic; low oil and gas prices as an opportunity to phase out fossil fuel subsidies)**
- **a clear long-term perspective in terms of rendering technical and economic systems more robust or resilient (e.g., through an improved approach to internalisation of risks) and sets clear milestones and incentives for decarbonisation/ low-carbon development and climate neutrality**
- **up-scaled direct investments in low-carbon technologies and green infrastructure (including R&D) by governments as enablers/drivers of transformation**
- **digitalisation can be a contributing factor to transformation, e.g., by allowing to reduce travel intensity and enabling real time, robust MRV of technology performance as well as digital payments in the context of Article 6.**

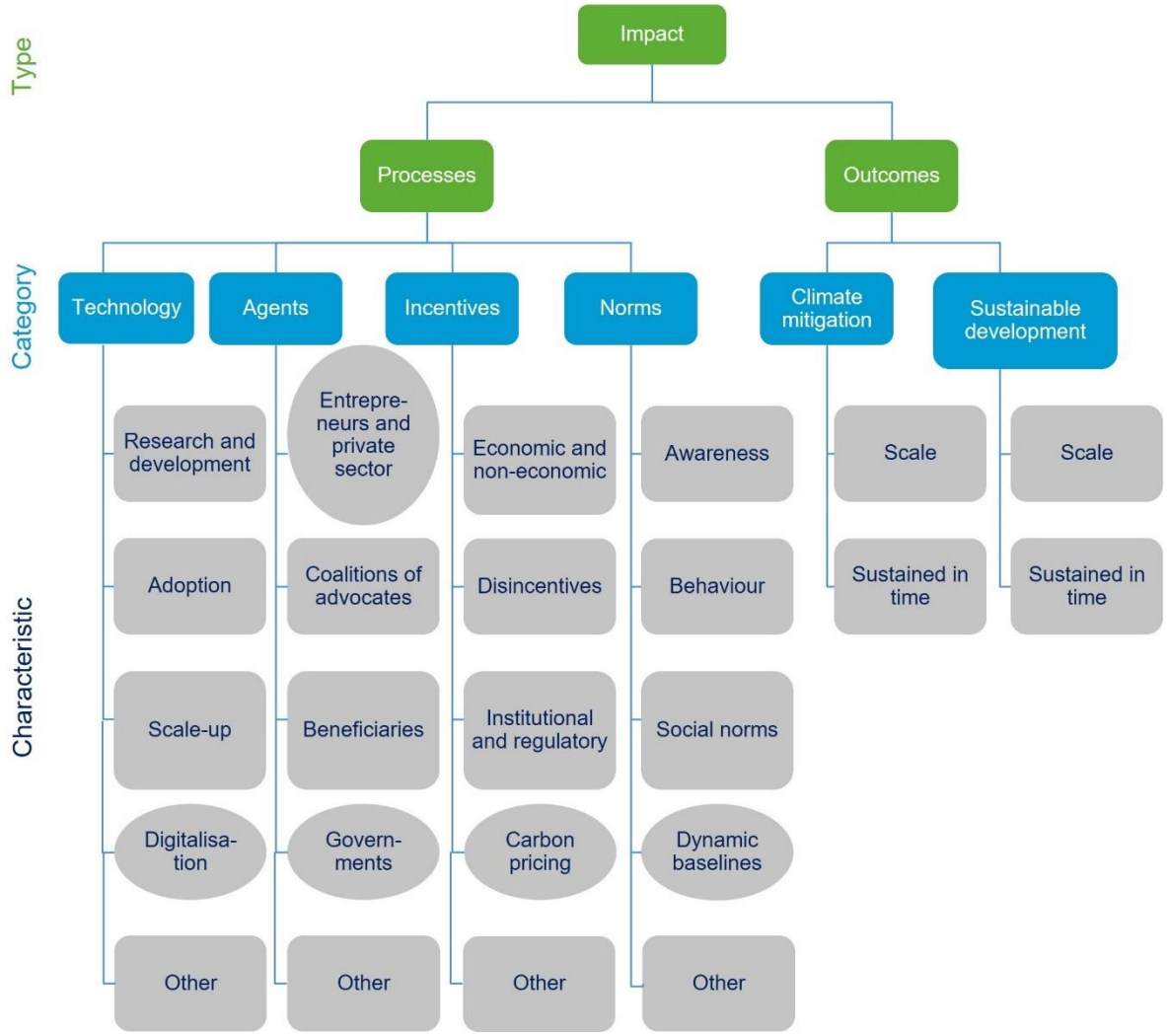
The ICAT Transformational Change methodology identifies four main drivers (or processes) of system change:

- *technology change* – processes, skills and practices from research and development, early adoption and widespread scale-up of clean technologies
- *agents of change* – governments, entrepreneurs, the private sector and civil society, as well as cross-cutting coalitions and networks as agents of transformational change
- *incentives*[24] *for change* – long-term, adaptive policies implemented consistently over long periods, but that are adaptive to shocks and crises through their design and mechanism (e.g., dynamic baselines in crediting mechanisms; carbon pricing through hybrid instruments combining ETS and carbon tax). These policies utilise economic and noneconomic incentives and disincentives that accelerate technology and behavioural change.
- *norms and behavioural change* –processes that influence awareness and behaviour of people to drive a long-lasting change in societal norms and practices

The transformational characteristics identified through the literature review and interviews as particularly relevant to Article 6 are 'Digitalisation', 'Private sector and Governments', 'Carbon pricing' and 'Dynamic baselines'. For a comprehensive description of generic characteristics of transformational change, we refer to the ICAT Transformational Change Methodology (2020). Figure 12 below illustrates the taxonomy of transformational characteristics relevant for Article 6 activities. Characteristics identified as particularly relevant to Article 6 purposes are marked with an oval shape.

[24] In the ICAT Transformational Change Methodology 'incentives' is used to refer to drivers of change that are both voluntary and mandatory, such as rules and regulation. This is a broader notion of the term compared to common dictionary definitions, which define 'incentive' as something that motivates or encourages someone to do something.

Figure 12: Taxonomy of transformational characteristics for Article 6 activities



Source: adapted from the ICAT TC methodology (2020)

4.3 Synergies between transformational change, sustainable development and the planetary boundaries concept

Advancing the concept of transformational impact of Article 6 activities helps to mainstream and promote synergies between sustainable development and mitigation activities to leverage ambition for outcomes at scale and sustained over time. Yet, the bottom-up approach to assess how policies and actions are aligned with national SDG and NDC targets and with the global goals for climate and sustainable development does not ensure that absolute, planetary boundaries are not crossed.

Nine planetary boundaries (climate change, biosphere integrity, land system change, freshwater use, biogeochemical flows, ocean acidification, atmospheric aerosol loading, stratospheric ozone depletion, and novel entities) are proposed by scientists to assess the stability of the Earth System (Rockström et al. 2009).

Furthermore, a social foundation perspective has been developed to define a safe and just operating space for society to stay within absolute environmental and social limits for sustainability (Raworth 2012). To safeguard planetary boundaries and a safe and just operation

space at any level of society, downscaling of global thresholds to the individual level based on ethical allocation principles (e.g., utilitarianism, egalitarianism, decent living standards), then up-scaling to the level of assessment (e.g., company, sector or country) can serve as a benchmark for absolute sustainability assessment. For climate change, the global carbon budget approach is used to determine how much CO_2e can be emitted globally to limit global warming to 1.5°C. However, for other aspects of environmental and social sustainability more research, conceptual and empirical studies are needed to operationalize an absolute approach to transformational impact assessment, also for the Article 6 context and issues.

4.4 Interim summary

Referring back to the central research question of this project: "How can Article 6 cooperation in the Paris Agreement be designed and applied to enable transition pathways and impacts for net zero GHG emissions and sustainable development?", chapter 4 answers this question by proposing a definition of transformational change with characteristics specific to Article 6 cooperation as listed in 4.2. The following chapters in this report use the definition of transformational change for Article 6 cooperation as the conceptual framework to assess case studies and propose design features for core carbon principles to promote transformational impact.

5 Conceptual options for transformational impacts

As described in the methodology section, this chapter will derive Article 6 conceptual design options to strengthen the transformational impact of carbon market approaches. We differentiate between options that prevent the compromising of NDC ambition and environmental integrity on one side and design options that unlock and promote transformational impact on the other side.

5.1 Addressing risks of compromising NDC ambition and integrity

In order to address the risks of compromising NDC ambition and integrity through Article 6 cooperation, safeguards must be introduced. The safeguards represent important preconditions for the realisation of transformational change by avoiding or mitigating the following risks: (1) the host country's overselling of mitigation outcomes, (2) perverse incentives for unambitious NDC target setting and (3) incentives to not expand the scope of the NDC.

5.1.1 Safeguards to avoid overselling of mitigation outcomes

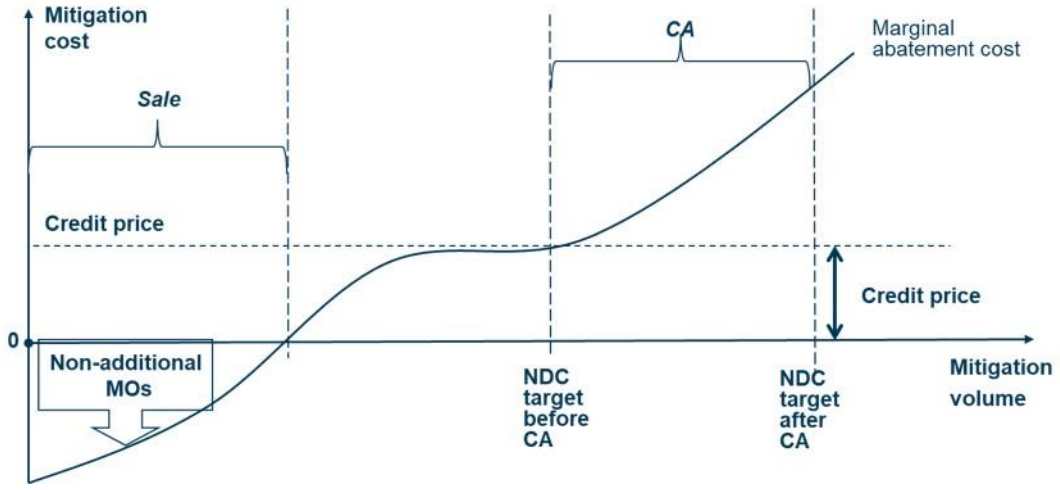
There is a risk that transferring countries 'oversell' their mitigation outcomes which could compromise their NDC achievement. Overselling of mitigation outcomes takes place if the country sells mitigation outcomes which it would have needed for achieving its own NDC targets. This can refer to the type or the number of transferred mitigation outcomes. There will be diverging interests of countries to safeguard against overselling risks, particularly on the host country side. Host countries with ambitious NDCs and high political willingness to achieve them, will be interested in safeguarding this achievement. Host countries with NDC targets above a credible BAU emissions pathway and/or lack of strategies to implement these targets, may not (Spalding-Fecher et al. 2020).

Also, on the buyer side there will be different interests: some acquiring governments and/or private entities will not want credits that are 'tainted' by an eventual default on the seller's NDC while others will not care as long as the credits can be counted towards their NDC targets. The situation will be complicated by time lags between credit acquisition, the application of CAs and the final NDC accounting two to three years after the NDC implementation period. Also, it will be difficult for market actors to assess in advance the likelihood of different factors contributing to a potential non-achievement of the NDC (Spalding-Fecher et al. 2020).

There are different degrees of overselling risks that are directly linked to the activity that generates ITMOs (also see Spalding-Fecher et al. 2020). Host countries can sell mitigation outcomes from non-additional activities which renders the achievement of their own NDCs more difficult in case the NDC does not contain 'hot air' (Michaelowa and Butzengeiger 2017), as sellers will need to 'make-up' the transfer through mitigation equal to the CA (see Figure 13). A similar, but lower risk occurs if 'low-hanging fruit' meaning low-cost mitigation is sold (Spalding-Fecher et al. 2020) and only higher cost options are available to cover the CA (see Figure 14). This risk only vanishes once the revenues from credit sales can be ploughed back into mitigation with lower cost[25] as otherwise the sale will make it more difficult for the host country to achieve its NDC goals.

[25] This does not necessarily need to be done by the recipient of the revenue but would apply on the level of the economy as a whole.

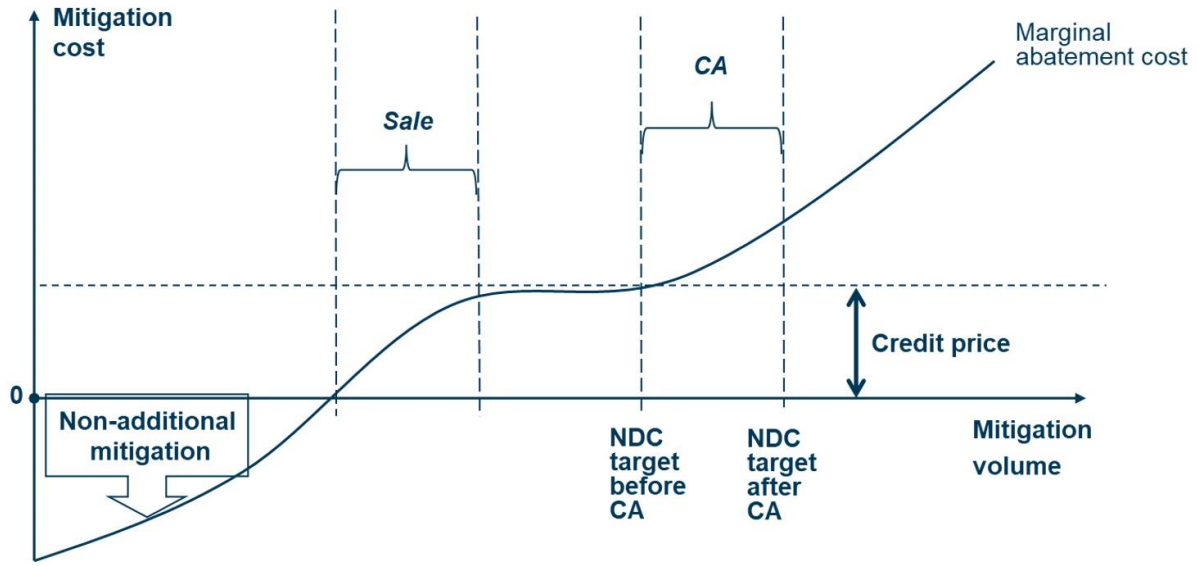
Figure 13: Overselling risk due to sale of non-additional MOs



Source: own illustration, UDP, PC & FC.

Note: The costs for the mitigation required for the CA (area below the marginal abatement cost curve for the difference between NDC target before and after CA) exceed by far the revenues from the sale of the non-additional mitigation outcomes.

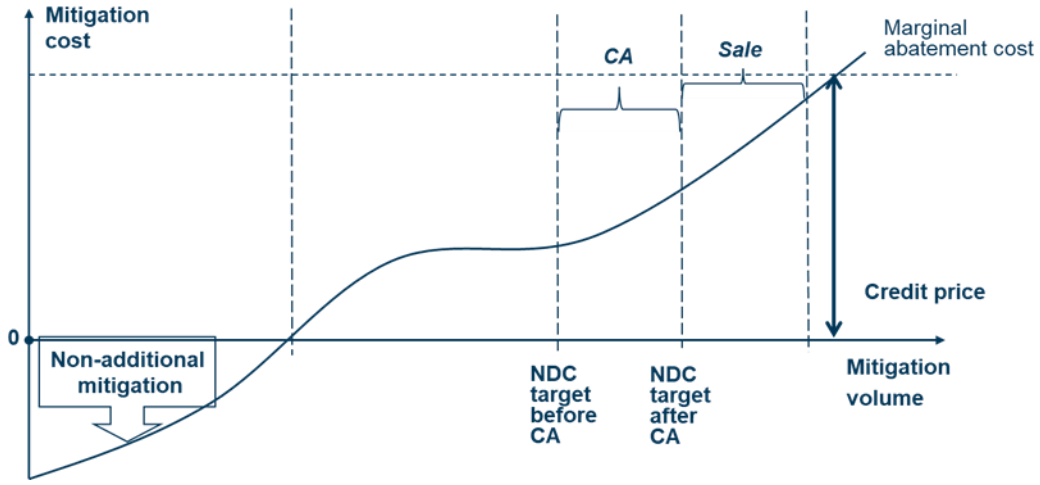
Figure 14: Overselling risk due to sale of low hanging fruits



Source: own illustration, UDP, PC & FC.

Note: The costs for the mitigation required for the CA (area below the marginal abatement cost curve for the difference between NDC target before and after CA) still exceed the revenues from the sale of the low-cost MOs.

Figure 15: No overselling risk as only high-cost MOs are sold



Source: own illustration, UDP, PC & FC.

Note: The costs for the mitigation required for the CA (area below the marginal abatement cost curve for the difference between NDC target before and after CA) are lower than the revenues from the sale of the high-cost MOs.

Design options that should be implemented in order to address the overselling risk and to enable transformational change comprise the exclusion of activities the host country needs for NDC achievement through the use of negative lists (Spalding-Fecher et al. 2020). In addition, the general derivation of baselines from NDC targets also minimises the risk of overselling credits as these are only generated for emission reductions below the NDC target (Michaelowa et al. 2021a). In case the Article 6 activity falls within the scope of the NDC, it needs to be ensured that all the unconditional targets and actions the country has committed to are considered when setting crediting baselines. However, the translation of NDC targets into baselines at sectoral or activity level bears many risks due to a lack of transparency in NDCs and clarity on measures' and policies' conditionality as well as diverging time frames (Howard et al. 2017). One risk for overselling credits remains if the host country is not on track of meeting its NDC target in sectors which are not covered by the crediting programme.

Another safeguard that should be implemented would be to retain a share of mitigation outcomes (Spalding-Fecher et al. 2020). This can either be reached through a simple decision between a transferring and an acquiring country to divide certain shares or setting 'overly' conservative baselines. Therefore, one potential design option could be the setting of crediting thresholds in such a manner that part of the GHG reductions would not be credited or otherwise accounted towards the host country NDC (Spalding-Fecher et al. 2020). Mitigation outcome sharing is also implemented by Article 6 pilots. In the case of the Joint Crediting Mechanism (JCM) for example, mitigation outcomes are usually shared between the transferring country and the Japanese government. TCAF is pursuing a hybrid approach with results-based climate finance sources for which resulting emission reductions stay in the host country and carbon finance sources for which ITMOs will be transferred (World Bank 2021). The KliK Foundation does not foresee a sharing of MOs at the level of bilateral agreements but leaves it up to the transferring country whether it wants to set stringent baselines to achieve the same result (Greiner et al. 2020). The number of credits to be withheld could be decided upon ex ante or ex post (Michaelowa et al. 2021a). Retaining a part of the mitigation outcomes is also an important hedge against the risk that the host country – contrary to its plans – is not able to achieve its NDC (e.g., unforeseen economic development etc.). In this case, a host country may be reluctant

to authorise ITMO transfers. The safeguard also provides certainty to the activity proponent/owner.

Another safeguard is to price potential opportunity costs if the marginal cost of a specific mitigation activity is lower than the marginal cost of meeting the NDC goal (Spalding-Fecher et al. 2020). The ITMO price would thus not only comprise the payment to the project implementer but also payments to the host country to close the gap between the marginal cost of the respective activity and the marginal cost of reaching the NDC goal after the CA (see Figure 15 above). The additional payments could then be reinvested in further (higher cost) mitigation activities.

For an activity to enable transformational change, these safeguards will need to be considered. However, it should be noted that ultimately NDC achievement cannot be guaranteed through these measures. Despite the best safeguards, NDC achievement may fail due to factors external to the pursued Article 6 cooperation. The threat of NDC non-achievement may lower the host countries' willingness to apply CAs to a mitigation outcome. Also, there may be reputational risks for the activity owner or the acquiring Party or entity implied. Here, insurance instruments may be developed by the financial industry to increase investment security in different carbon markets.

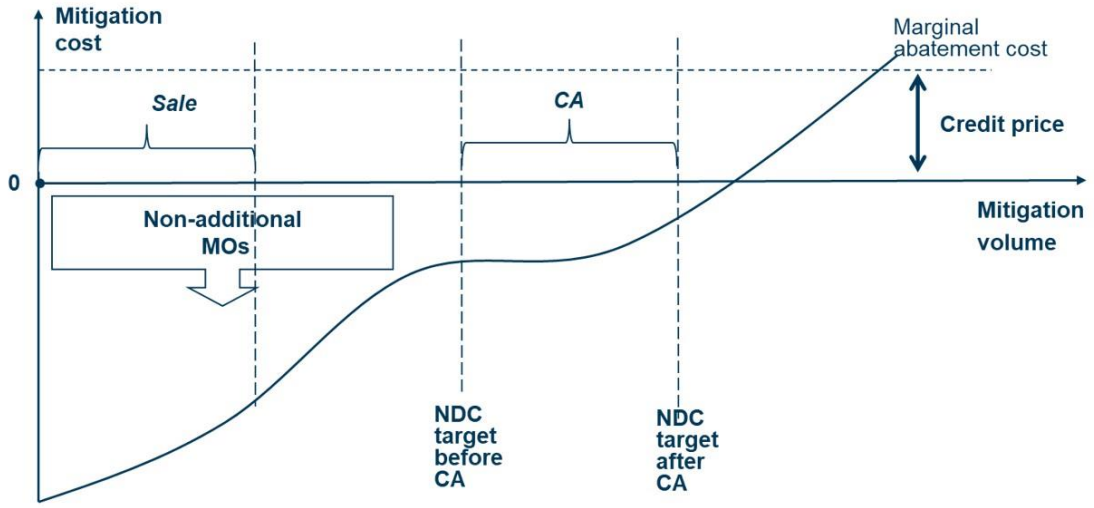
5.1.2 Safeguards against perverse market incentives for unambitious NDC target setting

Against the background that cooperation under Article 6 should lead to higher ambition in implementing NDCs and promoting sustainable development, the perverse incentive of setting unambitious NDC targets to increase the possibility of maximising carbon finance without jeopardising NDC achievement needs to be addressed. The level of ambition of NDCs is essential for the environmental integrity of Article 6 mechanisms (Michaelowa and Butzengeiger 2017).

If the NDC of the transferring country is unambitious (meaning that the section of negative cost mitigation options is large), there is a huge risk that the credits generated based on this NDC might not represent an emissions reduction from additional activities, assuming that the crediting baselines are directly derived from NDC targets. A lenient baseline under the NDC could thus be directly translated into a lenient baseline for mitigation activities, particularly for activities at the sectoral or policy level. Given that the NDC target is less stringent than the BAU development of national emissions, the NDC is creating so-called "hot air" (see Figure 16 and Figure 17) (Michaelowa and Butzengeiger 2017).

Only relying on non-ambitious NDCs for the determination of additionality can therefore be misleading. In practice, the absence of guidance on how to prevent the generation of hot air and the diversity of NDCs constitute significant risks for the determination of additionality (Michaelowa et al. 2021a). The question is though how additionality is assessed, either against the NDC's planned actions and binding targets or through so-called investment tests or both. All three options currently form part of the Article 6.4 negotiation text (UNFCCC 2019d-f).

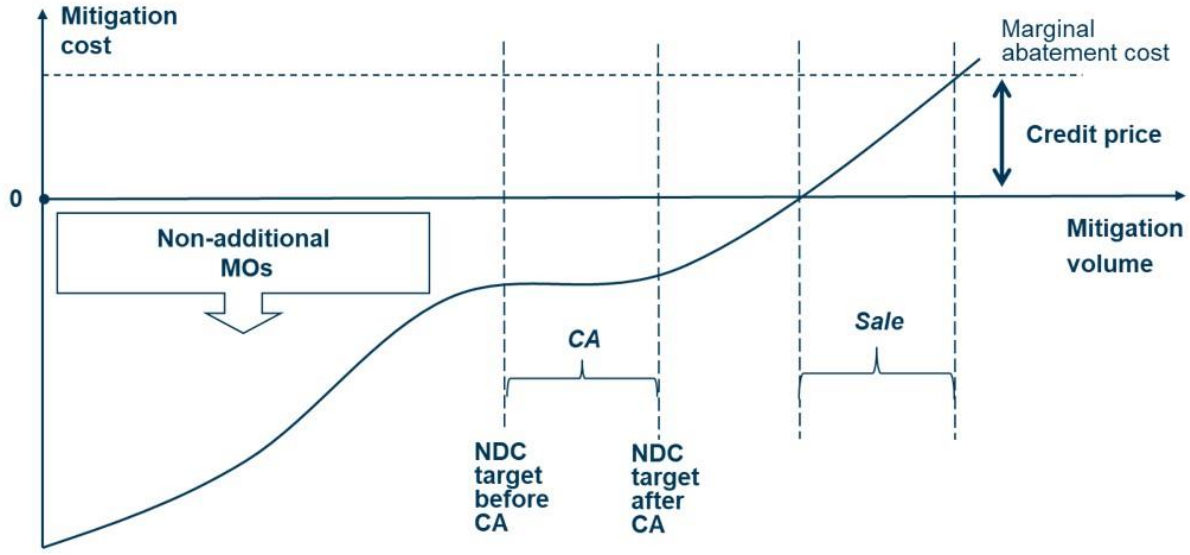
Figure 16: Hot air in the NDC and credit sales



Source: own illustration, UDP, PC & FC.

Note: The CA is not binding, therefore the sale of the non-additional mitigation outcomes 'contaminates' the international system.

Figure 17: Hot air in the NDC and additional credit sales



Source: own illustration, UDP, PC & FC.

Note: The CA is not binding, therefore the sale of the non-additional mitigation outcomes 'contaminates' the international system.

Due to the absence of international oversight by a regulatory body under Article 6.2, safeguards for crediting against unambitious NDC targets should be implemented to ensure environmental integrity. The draft Article 6.2 negotiation text foresees detailed reporting requirements for cooperative approaches including a reflection on how they contribute to increased NDC ambition (UNFCCC 2019a-c). The Article 13 technical expert review (TER) process will, however, not provide an assessment of the NDC targets as it is not judgmental (UNFCCC 2018). Hence, a safeguard with a compliance capability is lacking. This also reinforces the need for

credible additionality demonstration, particularly in the case of bilaterally designed cooperative approaches.

In order to prevent the generation of hot air and thus constituting important preconditions for the realisation of transformational change, additionality testing and baseline setting should never only relate to the NDC unless an NDC stringency test has been conducted beforehand. Additionality testing should also include an investment test, coupled with barrier tests where necessary. The implementation of investment tests is important against the background that only because the public sector cannot implement a measure that does not mean that there are no commercial incentives for private sector actors to do so.

Regarding baseline setting, only conservative baselines should be applied to enable transformational change.

5.1.3 Outside NDC' activities and perverse incentives not to expand the scope of NDCs

There are currently two different understandings present in international negotiation of what 'outside NDC' means. Regarding the understanding of outside relating to a sector or gas not covered by the NDC, there is a perverse incentive not to move to an economy wide NDC. In this case, safeguards are the inclusion of the sector in the next NDC revision, the application of stringent additionality testing and baseline setting in line with Paris Agreement goals to enable transformational change.

In case 'outside the NDC' is understood as an activity that goes beyond the measures the host country has committed to for that sector, there is a high risk of double counting if the host country does not implement necessary measures to achieve NDC targets or the measures are not sufficient. In fact, double counting of mitigation outcomes could still occur even if the activity is additional. This is why the only safeguard, and thus the only way to enable transformational change is the application of CAs without any exemptions.

5.1.4 Safeguards against negative impacts on sustainable development

Article 6 cooperation could entail negative social impacts regarding human rights, gender equality and rights of indigenous people if not properly designed and implemented. In addition, crediting activities could have negative economic impacts by destroying market development incentives, creating market distortions and causing job losses. Resulting negative path-dependencies and lock-in effects could also be a potential consequence. This refers for example to negative impacts on biodiversity (e.g., large hydro dams), air and soil pollution and the emission of ozone-depleting substances. To enable transformational change, the potential negative impacts should be assessed and prevented through the implementation of stringent safeguards (Day et al. 2020). In the context of the Kyoto mechanisms, such safeguards against negative effects were not made available. However, an increasing number of climate finance approaches (e.g., Green Climate Fund (GCF), Reducing Emissions from Deforestation and Forest Degradation (REDD+) and multi- and bilateral initiatives) have since adopted safeguards. Often the International Finance Corporation's (IFC) Environmental and Social Performance Standards have been adopted (IFC 2021).

Such safeguards comprise the introduction of strict protocols as well as ex-ante, during and ex-post impact assessments including stakeholder engagement (Day et al. 2020). Besides, a grievance and Measuring, Reporting and Verification (MRV) system for sustainable development impacts should be implemented in order to avoid potential negative consequences (Day et al. 2020). In the context of the A6.4M, the SB should facilitate the development of minimum sustainable development requirements to ensure projects do not cause any harm (Olsen et al.

2019). Regarding potential negative effects of certain activities, negative lists under the A6.4M should not only be implemented for technology which are not compatible with necessary decarbonisation pathways but also for activities that entail negative impacts on sustainable development. While it would be preferable to require the application of safeguards at UNFCCC-level, ITMO buyer countries should also insist on their application under Article 6.2 cooperation. These safeguards against negative impacts on sustainable development will play an important role in enabling transformational change.

5.2 Developing options that unlock the transformational impact of Article 6 cooperation

In chapter 4 we derived a definition of transformational change along with its characteristics:

A fundamental, sustained change of a system that ends high-carbon practices and contributes to a zero-carbon society, in line with the Paris Agreement goal to limit global warming to 1.5–2°C and the United Nations Sustainable Development Goals.

Based on the analysis of Article 6 negotiations and this definition, we derive the following transformational characteristics relevant for Article 6 activities: (1) mitigation outcomes at scale, (2) SDG outcomes at scale, (3) technology change and digitalisation, (4) normative change in the sense of alignment with net zero strategies, (5) agents of change in terms of an innovative public-private cooperation model and (6) incentives for change in the form of ambitious carbon pricing policies. In the following, it is discussed how Article 6 activities should be designed to promote these transformational change characteristics.

5.2.1 Mitigation outcomes at scale

The upscaling of mitigation activities is an important design option through which an increase in ambition over time and thus mitigation outcomes at scale and thus a contribution to transformational change can be achieved. Under the CDM, the expansion from projects to programmes[26] was essential as it allowed for the aggregation of decentralised mitigation activities with different component activities which were sometimes hosted by multiple countries. Sectoral or jurisdictional crediting approaches and crediting of policy instruments are likely also becoming eligible for market-based cooperation under the A6.4M. The Article 6.2 guidance is flexible to accommodate market-based approaches at different scales and levels of aggregation and also includes provisions to allow for the linking of Emission Trading System (ETSs) (Michaelowa et al. 2020a). With regard to baseline-and-credit schemes, the move beyond projects and programmes is often deemed necessary to achieve the long-term goals of the Paris Agreement and to increase ambition over time. In order to promote upscaled approaches to crediting, new methodologies need to be developed for additionality testing and baseline setting. These implications are further discussed in chapter 8. Investment tests for assessing a policy's additionality are rather challenging due to the large number of non-climate impacts (Kreibich and Obergassel 2018). Different additionality tests should be applied for the various policy types based on specific threshold values for key parameters (Michaelowa et al. 2019a). In the case of regulatory policies, it is for example suggested to use pay-back period[27] thresholds for the assessment of additionality, meaning that if the regulation creates investments that exceed this threshold the activity is deemed additional (Michaelowa et al. 2019a).

[26] The introduction of the Programme of Activities (PoA) concept in 2007 allowed for the registration of multiple activities of the same kind without any restrictions across a 28-year-period (Michaelowa et al. 2019b).

[27] A pay-back period refers to the time required to recover the costs of an investment.

Next to the upscaling of mitigation activities, other options for increasing the mitigation outcomes are for example if the acquiring Party makes a commitment to implement additional mitigation actions in its own country for (a part of) the received ITMOs. Kreibich (2018) refers to this as "insetting" at the country-level. Besides, mitigation activities that lie outside the scope of the (unconditional part of the) NDC should be promoted under the premise that the activity leads to an expansion of the (unconditional part of the) NDC in its next revision while the activity is continued beyond the crediting period (Kreibich 2018).

Another option for unlocking transformational change is the promotion of those technologies that will bring about the required emission reductions or removals in the longer term and which are currently not technically viable or overly costly as they are fully mature. The role of carbon markets after 2030 and 2040 is currently debated in light of the need to reduce global CO_2e emissions to net zero by 2050 to reach the Paris Agreement's temperature target to stay within the 1.5°C limit (Jeudy-Hugo et al. 2021; World Bank Group, 2021). However, some sectors such as heavy industries, long-distance transport and buildings are hard to decarbonise (Jeudy-Hugo et al. 2021, Obergassel et al. 2021). Therefore, experts argue that some residual emissions may remain around 2050 and need to be counterbalanced with emission removals (Jeudy-Hugo et al. 2021, Obergassel et al. 2021). This implies that the closer we get to 2050, the overall GHG emissions and resulting mitigation potentials will decline, while the role of GHG removals through technology or nature-based solutions will increase. Yet, technical solutions such as negative emission technologies are still very costly, and many open questions remain with regard to their availability at scale. Moreover, the capacity of natural sinks (forests, soils, oceans) is also under threat by both human activities and climate impact, so that international market-based cooperation needs to develop a robust set of baseline and monitoring methodologies as well as governance over long periods of time in order to ensure the permanence of such removals. Carbon markets can be an important driver of such transformational change but will gradually undergo a fundamental shift from emission reduction activities to transformative removal activities.

5.2.2 SDG outcomes at scale

Another transformation characteristic are SDG outcomes at scale. To enable such outcomes in the A6.4M context, the CDM Sustainable Development Tool should be decisively enhanced to demonstrate that sustainable development co-benefits are 'real, measurable, and long-term', since the adequate capturing and assessing of those benefits represented a challenge in the Kyoto context (see chapter 3) and transformational change seeks alignment with the SDGs (see chapter 4.2). The tool requires further changes such as the inclusion of monitoring and reporting guidelines, modalities, and procedures for third-party validation and verification of sustainable development claims as well as enhanced stakeholder requirements (Olsen et al. 2017; Braden et al. 2019). Stakeholder engagement processes are not only a safeguard but ensure in general that any project's impacts are addressed in the project design and communicated throughout its implementation, thus establishing a sustained feedback mechanism throughout the duration of the project. For Article 6.2 cooperative approaches, one design option would be the development of an international sustainable development assessment tool made available for voluntary use by Parties for adaptation to national and/or bilateral priorities.

Another conceptual option to be implemented in the context of the A6.4M is an ex-ante assessment of potential sustainable development contributions. The revised sustainable development tool could directly capture the relevant SDG indicators and prescribe their use for all activities that would like to generate emission reductions under the mechanism.

5.2.3 Technology change and digitalisation

Technologies with currently (very) high abatement costs will be important for unlocking the transformational potential of Article 6 activities to bring about large-scale mitigation outcomes also after 2030 and 2040, since technology change constitutes a main driver of system change (see chapter 4.2). The incentive structure of the global carbon market will be fundamentally reversed in the long-term, compared to the logic prevailing in the CDM. Due to the Paris Agreement's long-term temperature goal and the resulting NDC target, host countries have the incentive to use the low-cost mitigation options for their own NDC achievement. This implies that rather than identifying the cheapest mitigation options for ITMO export, high-hanging fruits should be supported by carbon market transfers. High-hanging fruits refer to technologies with (initially) high abatement costs such as e-mobility, hydrogen or direct air capture (DAC) whose development requires substantial investments to become more cost-efficient and reliable in the next years and decades.

A design option for unlocking technological development in line with transformational change is the linking of crediting periods with the payback period necessary to mobilise a specific technology. Costly technologies that require long payback periods should have long crediting periods while affordable technologies should have short crediting periods. The use of crediting periods that are relatively short compared to the technical lifetime of the technology generates long-term benefits for the host country (Ahonen et al. 2020b). Besides, it is important to regularly reconsider the shortening of crediting periods if the payback period of a technology declines, but not retroactively to already registered activities (Ahonen et al. 2020b). This implies that methodological elements such as reference cases, additionality and crediting periods should be technology-related and short enough to take account of technological development. In the case of methodologically robust NDCs and LT-LEDS, ex-ante modelling for each sector should be used as reference scenario for Article 6 cooperation when calculating activity's mitigation effects. Long-term activity types (forestry and agriculture, but possibly also carbon capture and storage (CCS)) should be treated differently in order to consider methodologically relevant properties such as the permanence of GHG sequestration, for example by introducing buffer accounts (cf. voluntary standards).

Enhancing digitalisation is another transformational change characteristic as it contributes to lowering transaction costs and improving data collection processes and accuracy (see chapter 4.2). Digitalisation is a key enabler for MRV frameworks for decentralised activities, for the transparency and integrity of carbon markets (Michaelowa et al. 2020c). Carbon markets should therefore push for the digitalisation of the activity cycle. Enhanced digitalisation enables the use of innovative tools such as blockchains which, in turn, support the linking of registries and the automatisation of reporting processes, thus further lowering MRV costs and increasing transparency (Climate Ledger Initiative 2018). Enhanced digitalisation will also contribute to an ongoing verification process where data is verified while it feeds GHG calculation algorithms (Verles 2021). Issuance and verification will thus become more near-real-time and data accuracy will be decisively improved in case digital transformation is considered as conceptual option for Article 6 cooperation. Moreover, digital payments can also contribute to facilitate the deployment of certain technologies, in particular those that involve metering of flows of electricity, water, vehicle mileage, among other.

5.2.4 Normative change: Reflecting global mitigation aspirations in baselines

As explained in chapter 4.2, policies that are adaptive to shocks and crisis through their design and mechanism are a main driver of transformational change. The design of carbon market mechanisms can build on more dynamic elements. In addition, a long-term perspective that sets

clear milestones for decarbonisation is an important transformational change characteristic (see chapter 4.2). Such ambition and dynamism can be reflected in baselines of Article 6 activities. Transformational change arguably implies that baselines need to be ambitious (i.e., crediting well below BAU) and indicative of reaching the levels of ambition needed. Carbon markets can be designed more directly to consider the aspirations of the temperature goals of the Paris Agreement and net-zero emissions by 2050. For this purpose, not only NDCs but also LT-LEDS and other national strategies should be taken into consideration. In the following, conceptual options for baseline setting to promote transformational change through Article 6 of the Paris Agreement are discussed.

Baseline setting should conceptualise the link to NDC targets, particularly where NDC targets are not quantified or related to a specific sector (Michaelowa et al. 2021a). In addition, a dynamic approach to baseline setting should be applied. One dynamic approach to baseline setting builds on a baseline calculation method that is determined ex-ante and key parameters which are quantified ex-post as well as updated on a regular basis (Michaelowa and Butzengeiger 2017). The regular updating of key parameters could be aligned with (short) crediting periods but also with NDC cycles. As mentioned above, the use of short crediting periods is only recommended in the case of short pay-back periods. In the case crediting periods are aligned with the host country's NDC cycle, ambition raising could directly be supported. Therefore, appropriate frequencies of updating baselines in the context of NDC cycles should be defined.

In case of inconsistencies between the NDC and the LT-LEDS, the Article 6 baseline can be used as a shifting tool between NDC and long-term pathways. If the NDC baseline is not in line with the long-term pathway as it would require a lower baseline already, the crediting activity could start at the NDC baseline but could then be continually reduced to bring the sector onto the lower LT-LEDS-aligned pathway.

The 'situation-ambition-approach' represents another approach to dynamic baseline setting (Hermwille 2020). It is suggested that in order to close the gap between the insufficient reality of climate action (the situation) and the transformational character of the Paris Agreement and its long-term goal (ambition), both perspectives shall be brought together when determining the baseline in a "combined margin" (ibid.). The 'ambition' is represented by a 'reference scenario'. Regarding baselines' alignment with the global long-term aspirations, a 'reference scenario' that is compatible with the long-term goals of the Paris Agreement at the country level should be defined against which Article 6 baselines can be defined against (Michaelowa et al. 2021a). Starting from a BAU baseline, the baseline emissions intensity would be gradually reduced through the multiplication with an 'ambition coefficient' to move towards a normative reference. Ideally, the normative reference should represent a net-zero national emissions path in line with the Paris Agreement target (Michaelowa et al. 2021b).

5.2.5 Agents of change: Public-private collaboration

The promotion of public-private collaboration in an Article 6 activity can contribute to transformational change as a main driver of such change are cross-cutting coalitions between different agents (see chapter 4.2). Thereby, the government needs to set the right incentives to create an enabling environment for private sector involvement in Article 6.

In the context of carbon markets, public sector actors can make use of private sector's expertise, implementation capability and financial resources (Holtedahl et al. 2021). Carbon markets encourage specific forms of public-private interaction by politically creating a market for national and/or global emissions trading. Governments thus need to reflect on the role of private sector actors in their (sectoral) Article 6 strategy. Governments should consider promoting the

private sector's involvement in Article 6 activities through setting tailored incentives (e.g., reduction of fees, tax breaks, subsidies) allow their private sector to participate in international carbon markets (as supplier or buyer).

Another incentive that can be set by the public sector is to provide more investment security for private actors. This can for example be achieved through long-term contractual agreements with which the government enables a minimum profitability over the cash flows to ensure and strengthen long-term investment security for the private sector to participate in high-risk projects (Gardiner et al. 2015). In addition, the promotion of so-called carbon contracts for difference between the government and an investing private sector actor can help to overcome a major barrier to investments in some renewable energies or the decarbonisation of the industry sector, fluctuating carbon prices in national or regional carbon pricing instruments (Neuhoff and Richstein 2021). In this case the government steps in if the strike price is higher than the respective CO_2 price level and supports the project.

Another concrete incentive in the Article 6 context is to allow the use of generated mitigation outcomes against a domestic climate target as part of a carbon pricing instrument (e.g., a sectoral carbon tax). Crediting would thus be used as a domestic tool for mitigation by utilising compliance or voluntary carbon standards. In this case the NDC ambition may be increased by mobilising domestic resources for the unconditional NDC targets since mitigation outcomes are not exported but used domestically. This could be expanded further through voluntary compensation of GHG emissions beyond compliance targets through private sector and individual actors. Moreover, the crediting approach also lowers costs of the carbon pricing instrument (Ahonen et al. 2020a).

5.2.6 Incentives for change: Carbon pricing

Incentives defined by long-term, adaptive policies such as various types of carbon pricing instruments and the linking of different carbon pricing policies are relevant for promoting transformational change through Article 6 as they accelerate technology development and deployment as well as behavioural change by shifting economic incentives in favour of low-emissions technologies (see chapter 4.2). Beyond emission trading systems and baseline and crediting systems, this also includes hybrid carbon pricing instruments (e.g., sectoral carbon taxes in the transport sector) that set a mandatory carbon tax, but allow for a partial, potentially temporal, use of offsets to achieve the compliance target.

In the context of Article 6.2, one policy crediting option with mitigation outcomes at scale is the linking of ETSs. Examples comprise the EU-Swiss ETS linking, the EU-Norway-Iceland ETS linking and the California-Quebec ETS linking (Greiner et al. 2020; World Bank 2021). The ETS linking brings about incentives for change through efficiency gains as entities can buy the lowest-cost emission reductions across both systems (Kreibich 2018; Greiner et al. 2020). Through the larger market size, the market liquidity can be enhanced (Kreibich 2018, Greiner et al. 2020). The linking itself and the resulting efficiency gains do not result automatically in increased ambition, but the effects should be factored into the design of mitigation policies, thus potentially resulting in a lower ETS cap from the outset (Kreibich 2018). In the case of linking domestic or regional ETSs under Article 6.2, the stringency of the ETS' emissions cap is essential (Hermwille and Obergassel 2018). Risks for environmental integrity emerge in case one of the schemes does not have a stringent cap which results in an overallocation of allowances. Consequently, the generated "hot air" in one system can be passed on to another scheme, thus undermining allowance prices (Hermwille and Obergassel 2018). Therefore, a stringency test should be applied to assess ETS' initial allocation with schemes showing an over allocation being

automatically not additional (Michaelowa and Butzengeiger 2017). In case, however, the over-allocation is absent in the ETS, the linking of ETSs can be considered additional.

Incumbent policies such as fossil fuel subsidies (FFS) bear the risk of decisively undermining NDCs' ambition and integrity as well as existing LT-LEDS. The implementation of a fossil fuel subsidy reform by shifting from subsidies to carbon pricing supported by the implementation of (upscaled) Article 6 action may be a promising approach to level the playing field. A transition to carbon pricing through carbon markets or taxes may contribute to overcome practical barriers to phasing out FFS and reversing the incentive structure by putting a price on GHG emissions.

5.2.7 Harnessing synergies with COVID-19 recovery packages

In response to the ongoing COVID-19 pandemic, some countries have implemented recovery measures and incentives for rebuilding their economies to address the negative impacts of the pandemic. Michaelowa et al. (2020d) assessed the adopted recovery packages until the end of 2020 and concluded that predominantly G20 countries introduced recovery packages while these were mainly absent in developing countries. In 2021, some developing countries and multilateral organisations have slowly introduced recovery measures. However, not all of the announced recovery policies can be considered green. There are also many brown recovery policies promoted by countries which comprise subsidised prices for fossil fuels, tax freezes on liquid fuels, approval of new or reactivation of frozen plans for coal-fired power plants, development of oil and coal infrastructure, promotion of coal gasification with tax incentives or a general reduction of regulatory restrictions for oil, gas and mining activities (Energy Policy Tracker 2021). When looking at the overview of recovery policies compiled by the Energy Policy Tracker (2021)[28], the following observations can be made:

Developing countries have mobilised broadly diverging volumes of available public resources (expressed in total USD and relative to its 2019 GDP): While Bangladesh at the low end has committed roughly USD 120 million (0.04% of its GDP), most developing countries have allocated between 0.12% and 0.31% of their GDP for recovery measures in the energy and electricity sector (for example Argentina, Brazil, China, Colombia, South Africa, and Vietnam). Noteworthy exceptions are Indonesia, that mobilised USD 6.7 billion (0.6% of GDP), and India with USD 43 billion (1.5% of GDP) (Energy Policy Tracker 2021). In addition, whereas some countries such as Argentina, Bangladesh, Colombia, Indonesia and South Africa have allocated available recovery resources for the energy sector to brown business activities, Brazil and China have mobilised more money for green recovery measures than for brown ones (Energy Policy Tracker 2021).

These emerging green recovery policies pursued by potential host countries are exactly where Article 6 activities should tap into to support transformational change in the country away from fossil fuel infrastructures. This is how Article 6 could further contribute to strengthening the transformational impact of the recovery packages.

The development of Article 6 activities should therefore focus on those sectors that see an increase of baseline emissions due to COVID-19 which is especially the case for the transport sector as people shift to private modes of transportation in many countries as they fear to catch the virus in public transportation (Michaelowa et al. 2020d). For example, China's recovery strategy promotes the expansion of electric vehicle charging infrastructure (ibid). This recovery policy is thus a good example for a policy that could draw on additional resources to accelerate sector transformation due to the economic stimulus in response to the COVID-19 pandemic. In

[28] The overview focusses largely on G20 countries, although some developing countries are included as well.

countries that pursue plans to expand coal power supported by recovery funding as for example Indonesia and Vietnam, baselines would increase in the long run as the 'built margin' becomes more carbon intensive (ibid). In this case, Article 6 activities should focus on large renewable energy power plants and green hydrogen production infrastructure replacing new coal power plants. Green hydrogen could then substitute fossil fuel use e.g., in energy-intensive industries.

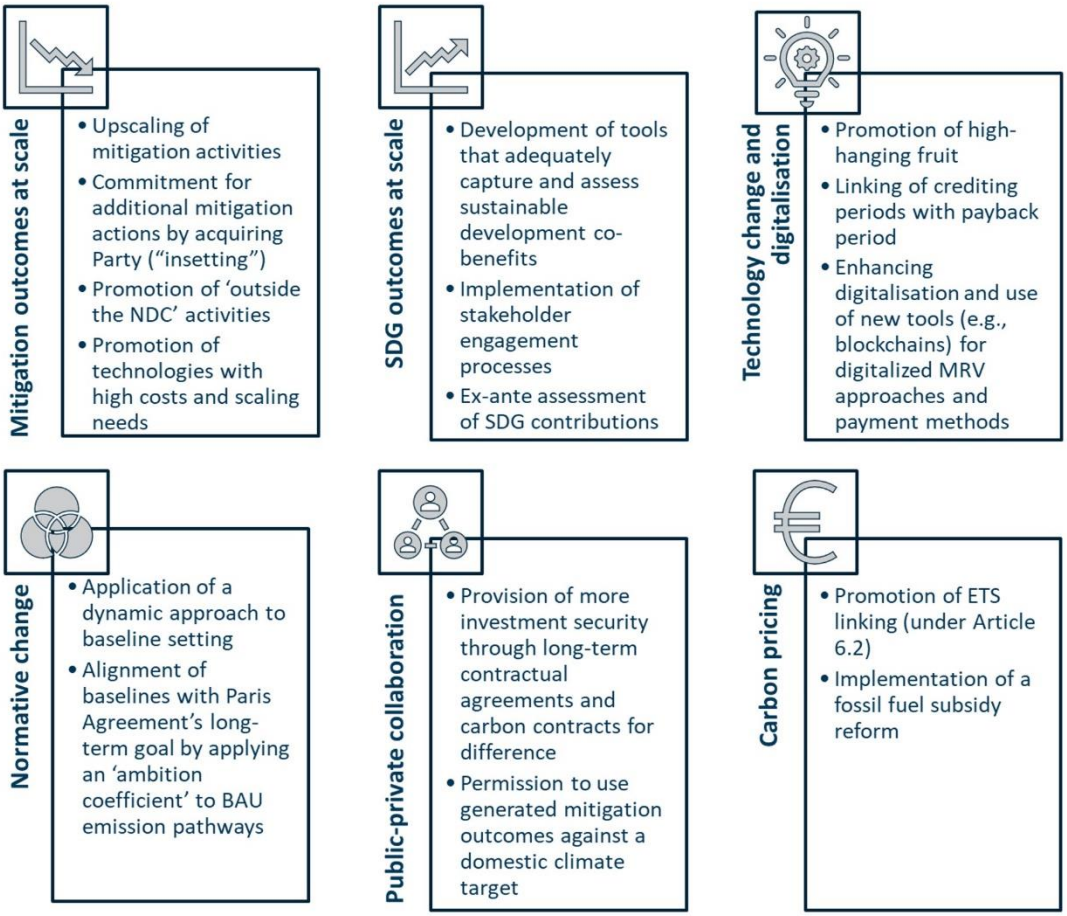
Consequently, Article 6 funding can contribute to closing funding gaps which have been created by emergency spending during the COVID-19 pandemic. Moreover, carbon market methodologies are important tools to provide transparency on climate impacts of recovery measures even if they do not lead to a transfer of mitigation outcomes but are still used for transparently monitoring emission reductions and removals. However, sub-sector specific effects would need to be considered in international carbon market cooperation to prevent hot air (Michaelowa et al. 2020d). This also implies that Article 6 pilot activities should consider these effects in the selection of their pilots and integrate it in the evaluation of submissions (Michaelowa et al. 2020d).

5.3 Interim summary

This chapter presented Article 6 design options that prevent the compromising of NDC ambition and environmental integrity as well as design options that promote transformational impacts. Design options that prevent compromising NDC ambition include safeguards to avoid overselling mitigation outcomes, safeguards against perverse market incentives for unambitious NDC target setting, and perverse incentives not to expand the scope of NDCs, as well as safeguards against negative impacts on sustainable development. Regarding the implementation of safeguards, it has been noted that both target and financial additionality should be met in addition to regulatory additionality. Besides, safeguards against detrimental sustainable development impacts could still be decisively strengthened, especially since Article 6.2 does not include any stringent provisions in this regard. In addition, overselling risks may lead to sharing mitigation outcomes between seller and buyer, which has already been practiced in some piloting activities e.g., those supported by the JCM.

In chapter 5.2., the authors have identified design options that directly contribute to transformational change according to the six characteristics: (1) mitigation outcomes at scale, (2) SDG outcomes at scale, (3) technology change and digitalisation, (4) normative change in the sense of alignment with net zero strategies, (5) agents of change in terms of an innovative public-private collaboration models and (6) incentives for change in the form of ambitious carbon pricing policies. The following Figure 18 provides an overview of the different options identified under the transformational change characteristics.

Figure 18: Overview of options that unlock transformational change through Article 6



Source: own illustration, UDP, PCR & FC.

While some of the outlined options for promoting transformational change may be adopted by project developers and put into practice, governments, host and buyer countries as well as non-state actors and the international community can take an active role in promoting these by implementing incentives. This is discussed in more detail in the subsequent chapter.

6 Incentivising transformational change through Article 6 cooperation

The global carbon market itself needs to transform fundamentally in order to be able to help achieve the long-term objectives of the Paris Agreement. The conceptual options for transformational change impacts outlined in chapter 5 therefore need to be translated into an incentive structure that considers the distinct roles of key stakeholders, including the multilateral level, buyer and host countries as well as non-state actors to ensure their realisation. In this manner, transformational change needs to be promoted to enable the international community to achieve the 1.5° target and the goals of the 2030 Agenda for Sustainable Development.

These incentives will need to consider the structural differences between Article 6.2 cooperative approaches and the A6.4M, especially when it comes to Party-level and international oversight. These degrees of oversight then determine which incentives are applicable to Article 6.2 and A6.4M activities. International oversight is mainly exercised through the reporting requirements according to the Article 6.2 draft guidance (UNFCCC 2019a-c). Party-level oversight under Article 6.2 covers the selection and development of methodological approaches and the authorisation of ITMO transfers. In the context of the A6.4M, Parties oversee the approval of activities including the establishment of specific requirements and the authorisation of ITMO transfers (UNFCCC 2019d-f). The A6.4 SB oversees the mechanism's operation rules and approves baseline and monitoring methodologies (UNFCCC 2019d-f). The Designated Operational Entities (DOEs) exercise international oversight through the independent assessment of activities against the mechanism's requirements (UNFCCC 2019d-f).

Keeping these structural differences in mind, the following sub-sections discuss what form incentives could potentially take. Incentives diverge in their nature, some set on enforcement while others use more indirect forms of pressure. We differentiate between regulatory (6.1), monetary (6.2) and behavioural (6.3) incentives but recognise that this list may not be exhaustive.

6.1 Regulatory incentives

This section will first address the regulatory incentives, which refer to the rules or guidance which can either be set at the international level in the form of international agreements or at the national level as part of the national legislative framework. We also reflect on the incentives' feasibility from a political and institutional perspective.

We identify four regulatory incentives for transformational change which are presented in the subsequent sub-chapters.

6.1.1 Regulatory incentives at the international level

At the international level, we identified two regulatory incentives, (1) the use of Article 6 cooperation only in case of ambitious NDCs, and (2) no generation of credits that do not comply with the budget for the 1.5° target.

6.1.1.1 Use of Article 6 cooperation only in case of ambitious NDCs

In general, Parties – including both host and buyer Parties – could only be allowed to participate in Article 6 cooperation if their NDCs show specific characteristics. For unlocking transformational change through Article 6, the level of ambition in underlying NDCs is decisive. Therefore, one regulatory incentive could be that only Parties are allowed to sell or acquire

ITMOs if their NDC targets are enhanced ex-ante to entering an Article 6 cooperation. Regarding the assessment of the ambition level, it could be required that NDC pathways are significantly lower than BAU or that the NDC contributes toward meeting the Paris Agreement's 1.5°C warming limit.

This would ensure that carbon finance is for example not considered an 'easy way out' for the acquiring countries but a tool to lower costs and potentially to reinvest these cost savings in domestic mitigation actions. Carbon finance should then be deployed for the remainder of emissions that cannot be reduced or for additional removal of emission that the country would need to store in order to be contributing to Paris Agreement targets. One example would be cost-containment measures to help industries transition to lower emissions pathways (e.g., through carbon contracts for difference for emissions-intensive industries as described above).

Regarding the incentive's feasibility, the continued ambition increase of NDCs over time is enshrined in the Paris Agreement. Potentially, Article 6 rules could be adjusted to make sure market-based cooperation is only available to Parties with ambitious NDCs. A barrier for this approach is the fact that no independent third-party assessment of the level of ambition in NDCs can take place as this would not be in line with the Paris Agreement's bottom-up nature. A new provision would need to be introduced that prescribes the provision of evidence of a Party's ex-ante enhancement of NDC ambition (e.g., target level, sector coverage) or the NDC's contribution to the Paris Agreement's 1.5°C warming limit. Alternatively, buyer and/or seller countries may define appropriate rules for example as part of 'climate clubs' that define more ambitious rules than what can be agreed through UNFCCC's consensus-based approach. Whether there can be a robust approach to assess NDC ambition that is credible enough to be accepted by such coalitions is an unresolved question. But there are different international initiatives in place that focus on building required capacities (e.g., NDC Partnership).

6.1.1.2 No generation of credits that do not comply with the budget for the 1.5°C target

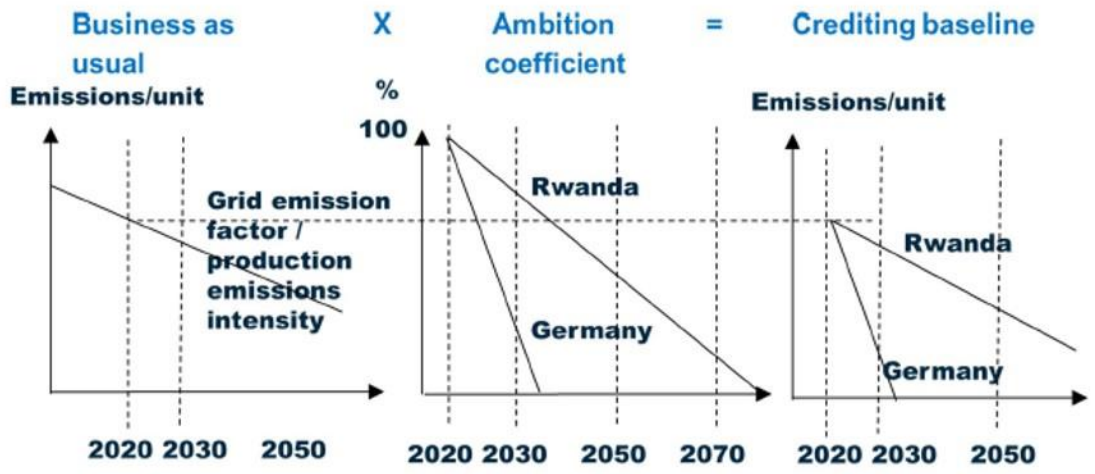
Another regulatory incentive that could be provided at the international level would be the further development of Article 6.2 and 6.4 rules to exclude the generation of credits that do not comply with the global GHG budget corresponding to the 1.5°C. The debate on breaking down the global 1.5°C budget to national emissions budgets is not a new one in the UNFCCC context (also see WBGU 2009). The budget approach has, however, not been possible to operationalise in international climate negotiations (also see discussion on the Contraction and Convergence model (Global Commons Institute n.d.)).

A new concept would be to set baselines in a manner that they are compatible with the 1.5°C emissions pathway at the country level as briefly outlined in section 5.2.4. Michaelowa et al. (2021b) propose a new approach to dynamic baselines that is in line with the long-term objectives of the Paris Agreement. By using an 'ambition coefficient' by which the BAU scenario is gradually decreased and reaches over time a 'normative reference' (Michaelowa et al. 2021b). This 'normative reference' or also called 'OUGHT margin' could also be derived from ambitious sectoral NDC targets (only if sufficiently ambitious), an ambitious performance benchmark (e.g., best available technology (BAT), long-term deep decarbonisation scenarios or a net-zero long-term benchmark (Hermwille 2020). Michaelowa et al. (2021b) propose to set the 'normative reference' in line with the long-term targets of the Paris Agreement, thereby deriving the 'ambition coefficient' from net zero emissions pathways at the national level. By applying the 'ambition coefficient' to BAU emissions intensity (as calculated in CDM baseline methodologies) the baseline will become more and more stringent over time until it reaches net zero. Besides, the ambition coefficient applicable during a certain crediting period should be determined ex-

ante to ensure investment certainty, ideally in line with NDC updates and the Global Stocktake (GST) (Michaelowa et al. 2021b).

Such an approach to baseline setting also needs to consider other normative aspects, most importantly the principle of CBDR-RC. This implies that the Paris Agreement -aligned pathways differ across countries. Therefore, the international rulebook could differentiate those normative aspects according to activity types of even country groups. Michaelowa et al. (2021b) propose that industrialised countries should reach net zero earlier than developing countries as the application of the CBDR-RC principle will lead to country mitigation paths being different depending on country's development status and historical emissions. The crediting baseline will thus fall steeper in the case of industrialised countries as a higher ambition coefficient will be multiplied with the BAU scenario (see Figure 19). The determination of the ambition coefficient should thereby not be based on countries' LT-LEDS for the reasons mentioned above. Instead, fair emissions pathways based on different indicators should be developed.

Figure 19: Application of the ambition coefficient to BAU to derive a dynamic crediting baseline



Source: Michaelowa et al. 2021b.

From a political feasibility perspective, this incentive would face headwinds. Technically, the derivation of the ambition coefficient from net zero emissions pathways at the national level, might also not be straightforward. Once the ambition coefficient has been established, its application to the BAU emissions pathway and the derivation of the crediting baseline will come naturally though.

6.1.2 Regulatory incentives at the national level

At the national level, we identified two further regulatory incentives: (3) host country and buyer-side promotion of specific activities and technologies and (4) exclusion or restriction of Article 6 activities which are not compatible with countries' LT-LEDS or the Paris Agreement's long-term targets.

6.1.2.1 Host- and buyer-side promotion of specific activities and technologies

Host countries and/or buying entities could develop positive lists of activities that can act as guidance to activity proponents on what kind of activities they are considering granting approval and/or authorisation to or acquiring ITMOs from as a regulatory incentive.

A positive list could for example comprise activities with high abatement costs and limited availability in the country or region. The more details the host country and/or buyer shares on their specific criteria, the easier it is for activity proponents to consider both host country and buyer priorities in the Article 6 activity design phase. Besides, host countries can promote activities which foresee that a high share of generated mitigation outcomes remains in the host country. Project developers could thus be asked to use crediting thresholds that are more ambitious than the BAU scenarios. Only a part of the reduction effects is issued in certificates, while the rest is allocated to the NDC of the host country. These thresholds may vary at country level depending on the level of development and/or technology.

A host country as well as a buyer may also consider the promotion of activities with high sustainable development outcomes. In the case of the host country, this can be linked to specific indicators in the approval and authorisation process. On the acquiring side, the entities could include the need for verified SD benefits in their purchase conditions. Especially in the case of Article 6.2 cooperative approaches, buyer countries can freely negotiate with the host country on the eligibility criteria of the underlying Article 6 activities. Host countries could also identify priority sectors for Article 6.2 cooperative approaches for which the simplified use of rules and methodologies would be eligible. This could be particularly relevant for innovative future technologies such as direct air capture (DAC).

In addition, buyers (countries or other entities) could require an assessment of the compatibility of certain activities or technologies with regional or national climate change paths scientifically verified before the conclusion of an ITMO purchase contract. This would mean that ITMO procurement programmes could set performance criteria and therefore provide national-level regulatory incentives for carbon market demand for ITMOs compatible with LT-LEDS.

What concerns the feasibility of the proposed incentive, it needs to be mentioned that in order to remain effective positive lists needs to be updated in a frequent manner. From a political feasibility perspective, positive lists at the national level provide host countries an oversight role and thus more control over the voluntary cooperation. The positive lists developed at the national level will vary depending on whether these are to be used for Article 6.2 or Article 6.4 activities. In the A6.4M context, positive lists will need to be aligned with principles and rules for positive lists established by the international body.

6.1.2.2 Exclusion or restriction of Article 6 activities which are not compatible with countries' LT-LEDS or the Paris Agreement's long-term targets

Next to positive lists, the adoption of negative lists that comprise activities that Parties do not want to promote can act as a regulatory incentive for transformational change. For example, activities that are not in line with a Paris Agreement-aligned decarbonisation pathway could be excluded. Activities could thus be excluded or restricted if they are not compatible with countries' long-term strategies or the long-term targets of the Paris Agreement. This could lead to a general exclusion of some technologies, in particular of those that rely on the continued use of fossil fuels. Highly efficient technologies relying on fossil fuels (e.g., combined-cycle gas turbine) which could potentially have contributed to real reduction effects for a transition period would then not be eligible anymore as they may not be in line with the Paris Agreement's decarbonisation pathway. In addition, activities that do not apply safeguards against negative effects on sustainable development could be excluded from the outset. Safeguards could not only be established against negative effects on sustainable development but also to prevent the crossing of other planetary boundaries next to the climate sphere.

Regarding the incentive's feasibility, a practical barrier to such a requirement could be that – at least during the pilot phase for Article 6 activities in which eligibility needs to be determined –

only some countries have developed LT-LEDS (UNFCCC 2021c). Further international guidance would thus be needed to help host countries undertake this compatibility assessment in a comparative manner. Besides, such compatibility assessments are unlikely to be feasible without mutual agreement on (sector-wise) trajectories, which may complicate the progress.

Next to the availability of a LT-LEDS, another important precondition for the incentive to be effective is that the adopted LT-LEDS needs to be transformational in terms of by when the net zero target is to be reached and the adoption of an underlying plan for its implementation. In addition, the sovereignty principle is highly likely to prevent clear methodological guidelines in order to develop transparent and comparable LT-LEDS in the long term. Therefore, it must be ensured that perverse incentives for unambitious LT-LEDS in potential seller countries are avoided in order to continue exporting ITMOs. However, the NDC formulation and updating process in itself is a source of perverse incentives with only peer review as potential moderation of inflated baselines. As a consequence, while compatibility with LT-LEDS is desirable, it may not be practicable as a formal aspect of the provisions of Article 6.

6.2 Monetary incentives

Next to the regulatory incentives introduced above, the incentive structure also comprises monetary incentives which are introduced in the following. In this chapter (1) the monetisation of ITMO price components and (2) the encouraging of specific forms of public-private interaction will be addressed.

6.2.1 Monetary incentives at international and national level

Current Article 6 piloting efforts have shown that many initiatives deploy tailored pricing models by including for example opportunity costs (see Greiner et al. 2020). ITMO prices can be recomposed entirely based on different components: Technology costs, transaction costs (e.g., registration fees, MRV procedures), host country's opportunity costs (e.g., for CAs, authorisation process), priced contributions to OMGE, a sustainable development and a market premium. The monetisation of ITMO price components also includes the monetisation of activities' positive effects on other planetary boundaries, the provision of ex-ante technical assistance for MRV of SDG impacts and the ex-post monetisation of transformation effects.

6.2.1.1 Monetisation of activities' positive effects on other planetary boundaries

While an activity's negative effects need to be examined and respective safeguards implemented, countries may price their ITMOs using different criteria in addition to emissions reduction based on other sustainable development criteria (e.g., reduced air pollution from electric mobility). Positive impacts on other planetary boundaries could build on established measurement and reporting structures (in particular SDGs) to achieve harmonisation and avoid duplication and fragmentation. Countries may consider such SD premiums in the overall pricing structure of the transaction. For the latter, an upfront payment by the buyer could decisively contribute to data accuracy as outlined in the next paragraph. Such incentives could be operationalised at the national level, regardless of whether Article 6.2 or Article 6.4 applies, as the international level does not get involved in pricing mechanisms. However, at the international level a label for highly transformational actions with many sustainable development benefits may emerge as a guidance to transactions.

6.2.1.2 Provision of ex-ante technical assistance for MRV of SDG impacts by buyers

An important precondition for the monetisation of transformational SDG impacts is a well-functioning MRV system from the outset. Technical assistance could be provided by buyer

countries for the implementation of such an MRV, thus indirectly incentivising the monetisation of activities' SDG benefits. Enhanced transparency will also benefit the transformational effect of activities. The contractual agreements underlying this provision of technical assistance could also provide an incentive for the implementation of safeguards against any negative impacts on SDGs. In case the MRV shows any negative impacts, buyers could stop the ITMO acquisition and reopen it once negative impacts have been remedied.

6.2.1.3 Ex-post monetisation of transformational effect of approaches

An important incentive for measuring and demonstrating an activity's transformational effect could be an ex-post price premium provided by the buyer country if MRV shows particularly strong performance on specific transformation characteristics. Declining prices for first-of its-kind projects due to technology's diffusion can accelerate technology development and achieve scale. Through such an incentive structure in which buyers show a willingness to pay higher prices for first movers, it can be ensured that the activity is deployed rapidly while achieving a long-lasting impact. Next to the demonstration of ex-post effects, buyers can also provide another essential incentive in the context of Article 6 cooperation, a certain risk tolerance. Risk tolerance is required and represents an important incentive for future-oriented technologies which require high upfront investments such as NETs.

However, this will require the blending of financing as carbon finance is results-based and will not be able to mobilise the necessary resources for associated research and development.

6.2.2 Encouraging specific forms of public-private interaction

As outlined in chapter 5.2.5, public-private collaboration is essential for successful and transformational Article 6 activities. The incentive can be provided in national context by the host country to a private sector within its territory. An agreed minimum profitability over the cash flows by the government through long-term contractual agreements is an example of an incentive that will ensure and strengthen long-term investment security for the private sector to participate in high-risk projects. In such a scheme the government cannot only guarantee up to a certain percentage of the revenues but also set a maximum revenue ceiling that a project developer can retain (UNESCAP 2008). Moreover, the governments can encourage investments from the private sector by using an effective mixture of financial assistance. One example for this are concessional and other sources of public finance along with technical assistance such as building capacity and supporting risk-taking initiatives (Gardiner et al. 2015). The policy instrument of integrating Article 6 in renewable power auctions in Pakistan represents such an incentive.

6.3 Behavioural incentives

Apart from regulatory and monetary incentives, behavioural incentives can play a critical role in reaching transformational change in Article 6 implementation. Such incentives rely on moral pressure, reputational pressures in peer-to-peer dynamics are crucial for the architecture and incentive structure of the Paris Agreement (e.g., through the NDC ambition cycles) as well as on global public opinion. Behavioural incentives unfold at the international level. As the focus of this paper lies on regulatory and monetary incentives only two examples for behavioural incentives are presented below in more detail, one from a buyer's and one from a seller's perspective.

6.3.1 Formation of coalitions

A prominent example of incentivising favourable behavioural practices is the formation of a coalition by over 30 countries interested in engaging in Article 6. This group of ambitious countries adopted the principles for "high ambition and integrity in international carbon markets", known as the San José Principles (MINAE[29] Costa Rica 2021). These countries include potential buyers and sellers that pledged to avoid double counting of emissions, pushing for progressive reduction, ensuring environmental integrity, and enabling highest possible mitigation ambition (MINAE Costa Rica 2021). Such a coalition will have the potential to set higher standards than what can be agreed through multilateral consensus-based decision-making procedures and may lead to spill-over effects through its indirect moral pressure on other countries and encourage them to adopt this high-integrity international carbon market framework and thus transformational change.

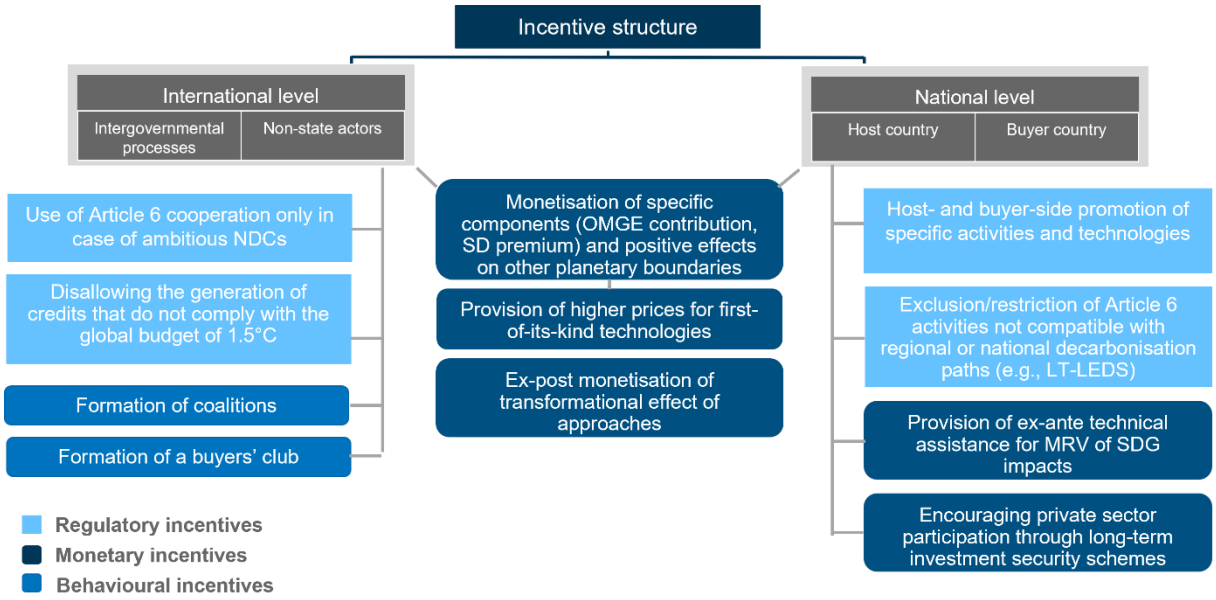
6.3.2 Formation of a buyers' club

Another way through which global mitigation ambition can be fostered and environmental integrity preserved is through the formation of a buyers' club in the context of Article 6. Establishing such a club along with a set of rules, detailing reporting requirements and avoidance of double counting, which participating entities need to adhere to would set new standards (Pollination Group 2021).

6.4 An incentive structure for inducing transformational change

The outlined incentives can help to promote certain characteristics of transformational change. The more of the incentives are in place, the stronger will be the effect on overall transformational change. As shown in Figure 20, many of the monetary incentives can be implemented either at the international or national level. This will also depend on whether they will be applied in the context of Article 6.2 cooperative approaches or in the A 6.4M.

Figure 20: Article 6 incentive structure for transformational change



Source: own illustration, UDP, PCR & FC.

[29] Ministry of Environment, Energy, and Telecommunications (span. Ministerio de Ambiente, Energía y Telecomunicaciones, MINAE)

At the national level, the host country will have a stronger oversight role under Article 6 compared to the CDM. This bring along opportunities to introduce country-specific provisions that are aligned with national policies and strategies. Buyer countries can also play an important role in supporting the MRV infrastructure and processes, thus enabling further activities to be implemented.

7 Insights from case studies of Article 6 activities

This chapter first elaborates on the analytical framework for the case study analysis. It is followed by an overview of the case study analysis demonstrating how the characteristics of transformational change are applied across the three countries. The following sections analyse the "Development and promotion of urban cycling in the municipalities of Curridabat and Montes de Oca in San José" in Costa Rica, the "Organic waste to energy" activity currently being implemented in Morocco, and the conceptual case study on "Integrating Article 6 in competitive power auctions" in Pakistan. For each country, the analysis is undertaken at the NDC and sectoral level, followed by an activity level analysis

7.1 Analytical framework for the case study analysis

In order to assess how market mechanisms can contribute to transformation, issues to assess the transformational characteristics identified in chapter 4 are explored at the activity-level, also informed by the discussion on the conceptual options in chapter 5. The issues outline aspects which need to be considered when designing Article 6. Empirical evidence is gathered to derive recommendations regarding transformational incentive structures in the practical implementation of Article 6 activities.

Table 5: Identification of issues relevant to design transformative Article 6 activities

Transformation characteristics	Issues to consider in designing Article 6 activities
GHG MOs at scale, sustained over time, aligned with the Paris Agreement temperature goal of well below 2°C	*To what extent does the activity contribute to additional mitigation in the host country, enhancement of unconditional NDC targets and innovation regarding mitigation policies?* **Issues** Stringency of additionality testing Mitigation potential Likelihood that activity leads to an expansion of the unconditional part of the NDC in its next revision Likelihood that activity leads to upscaling of mitigation Share of MOs kept by the host country Degree of innovation of underlying policy instruments
SDG outcomes at scale, sustained over time, aligned with the 2030 Agenda global goals and Planetary Boundaries (PB) framework	*To what extent is it guaranteed that SDG benefits accrue?* **Issues** Level of detail of accounting of SDG benefits Level of safeguards against adverse effects in development and on planetary boundaries Existence of ex-ante assessment of potential SD contributions and risks Level of detail of SDG benefit monitoring Existence of third-party verification of SDG benefits
Technology change and *digitalisation*	*How far is the technology including digitalization in an Art. 6 activity transformational?* **Issues** Broader technology development - R&D, adoption and scale-up : Likelihood of catalytic implementation of mitigation technology

Transformation characteristics	Issues to consider in designing Article 6 activities
	Degree of understanding of abatement costs of the technology and the ability to lower them Level of risk for lock-in fossil infrastructure? Digitalisation: Degree of support for acceleration of implementation of mitigation technology Level of reduction of transaction costs Degree of facilitation of MRV Degree of facilitation of digital payments/financing mechanism
Normative change – (*dynamic) baselines*	*Is the baseline approach and implementation of the baseline methodology in line with the promotion of transformational change?* **Issues** Degree of consistency of baseline approach with PB concept and long-term target of the Paris Agreement, e.g., through crediting thresholds and derivation of a baseline emissions path below BAU Degree of conservativeness Frequency of revision Length of crediting periods (relative to technology lifetime?)
Agents of change - *government and private sector*	*Are government and private sector involved in a way that promotes transformational outcomes and processes?* **Issues** Are actors involved that have the power to drive transformation? Does the activity create institutional capacity and improve effectiveness? Does the activity include a gradual phase-out of Article 6 funding through 'catalytic' finance?
Incentives for change - *carbon pricing*	*Does the activity increase the likelihood that carbon pricing is introduced or enhanced?* **Issues** Does the activity enhance the likelihood that carbon pricing policies are mentioned in the NDC? If carbon pricing already exists: Does the activity have a link to carbon pricing? Does the activity contribute to the reduction of fossil fuel subsidies (negative carbon pricing)?

Source: own compilation, UDP, PCR & FC.

In the following subchapters, the analytical framework is applied to three different case studies. For each case study desk reviews together with two to three semi-structured interviews. These interviews have been conducted with government representatives, national or international experts and/or project developers. The first sub-section in each of the three case studies describes how the NDC and SDG national and sectoral goals and ambitions can be described in terms of transformational outcome characteristics. The second sub-section looks at the practical implementation of the Article 6 activities to assess the process characteristics for how activities contribute towards transformation of the sector.

7.2 Costa Rica

The activity assessed is titled 'Development and promotion of urban cycling in the municipalities of Curridabat and Montes de Oca in San José'. San José is the capital of Costa Rica with a population of about one million people in 2020. The activity is based on a project im-plemented by the two municipalities Curridabat and Montes de Oca between 2019 and 2022. It is embedded in Costa Rica's National Decarbonisation Plan 2018-2050 to achieve the national goal of net-zero emissions by 2050. A pilot case study on MRV and transparency aspects is currently undertaken on the project with support from the Initiative for Climate Action Transparency (ICAT) based on the ICAT Transformational Change methodology (2020).

7.2.1 NDC and sector level goals

Costa Rica presented its National Decarbonisation Plan in 2018 (Government of Costa Rica 2019), setting the objective to achieve full decarbonisation and net-zero emissions by 2050, placing the country in the position of a pioneer for developing new approaches to reduce emissions and transform society. The decarbonisation plan was developed through the collaboration of several ministries, leading to a proper integration of the decarbonisation objective with other development plans that seek economic development in an environmentally friendly way at all levels (MIDEPLAN[30] Costa Rica 2018). Importantly, to avoid any trade-offs with sustainable development, the country will assess linkages between the Decarbonisation Plan and the 2030 Agenda for Sustainable Development. In addition, instruments such as carbon taxes and a domestic carbon market are currently under discussion (MINAE[31] Costa Rica 2019).

The sector in focus for Costa Rica is the transport sector. The decarbonisation plan elaborates the goals to be achieved by the transport sector, such as developing a mobility system based on safe, efficient and renewable public transport, transforming the light-duty vehicles fleet to have zero emissions and promoting a cargo transport that adopts sources of energy with zero or the lowest possible emissions. The specific focus of the decarbonisation plan on the transport sector is because it is the largest sector in terms of GHG emissions in Costa Rica (~44%) (Government of Costa Rica 2019), caused by an increased rate of urbanisation and lack of public transport options. While the sector itself is not expected to reach net-zero emissions by 2050, Costa Rica aims to reach net-zero emissions at the national level through negative emissions from the forestry sector. Significant emission reductions in the transport sector are expected to be achieved through fuel switch, use of electric vehicles and efficiency improvements.

Digitalisation has been identified as a key contributor for transforming the sector. It is part of a knowledge-based economy strategy to foster accumulation, processing and analysis of data based on (Government of Costa Rica 2019) a digital transparency system “SINAMECC”[32] to track transformational processes. Green tax reforms (Sengupta and Villegas 2019), eco-taxes on cars and fossil fuels, restrictions of the use of private vehicles in city centres (San Jose) and the creation of a favourable institutional and regulatory framework for the use of sustainable transport (MINAE Costa Rica 2019) will be important drivers for the decarbonisation of the transport sector. While awareness has increased on the use of sustainable modes of transport, the focus needs to be directed towards investing in infrastructure such as roads, expanding public transport reach to facilitate the ongoing efforts to transform the sector.

[30] Ministry of National Planning and Economic Policy (span. Ministerio de Planificación Nacional y Política Económica, MIDEPLAN)
[31] Ministry of Environment, Energy, and Telecommunications (span. Ministerio de Ambiente, Energía y Telecomunicaciones, MINAE_
[32] The National System of Climate Change Metrics (span. El Sistema Nacional de Métrica del Cambio Climático, SINAMECC)

7.2.2 Activity level: Modal shift to non-motorised transport in Costa Rica

The activity assessed for Costa Rica is the development and promotion of urban cycling in the municipalities of Curridabat and Montes de Oca in San José, the capital. The assessment is based on unpublished project activity descriptions and notes from three semi-structured interviews. The interviews were conducted between January and February 2021 with a representative from the Ministry of Environment and Energy of Costa Rica, a national consultant working for ICAT and two representatives from the municipality of Curridabat.

The activity is aimed at creating more space for bikes and extending the network of bicycle paths. The focus lies on building infrastructure and stimulating the use of bikes for short-distance commuting. Currently, speeding and resulting accidents by car drivers are key challenges for the safe use of bikes. This project therefore aims to decrease speeding and make the streets safer for other users than car drivers. Streets are envisioned to be converted to green corridors. Furthermore, the project aims to enable urban greening through the development of parks and green areas around bicycle and walking paths. This can help address other urban problems such as congestion, poor air quality, inequality and well-being through improved health and reduced costs from active mobility. Urban greening also contributes to adaptation for enhanced resilience to heat and flooding. E-bikes will also play a role in the project to reduce GHG emissions as they allow for longer travels.

The activity's objective is to promote urban cycling as a means of transport through a four-phased approach: 1) training and data collection from consolidated urban cycling communities, 2) data analysis, 3) design of infrastructure interventions and regulatory incentives for urban cycling and 4) implementation and operation of these interventions. Moreover, the project activity is integrated into a more comprehensive sustainable transport intervention also aiming at improving public transport more generally.

The activity is implemented by the two municipalities between 2019 and 2022 and is embedded in Costa Rica's National Decarbonisation Plan 2018-2050 to achieve the national goal of net-zero emissions by 2050. While a CDM small-scale methodology exists (UNFCCC 2018) to calculate the emission reductions from urban cycling, the project activity is not developed as an Article 6 pilot. Given the project's alignment with the long-term decarbonisation plan and a significant potential for replication and upscaling to other cities country wide, the activity has the potential to be developed as an Article 6 programme. A novel aspect of the project is that its many sustainable development benefits qualify the activity as transformational more so than the mitigation outcomes, which are small-scale unless the project is replicated country wide.

Table 6: Assessment of Costa Rican activity's contributions towards transformational change

Transformation characteristics	Issues to consider in designing Article 6 activities
GHG MOs at scale, sustained over time, aligned with the Paris Agreement temperature goal of well below 2°C	**Stringency of additionality testing** The pilot activity's aim is not to assess additionality as the Government of Costa Rica does not currently intend to sell emission reduction units. However, it can be explored for up-scaled similar projects in the future. **Mitigation potential** Minimal as it is a local activity. But the activity has the potential to be upscaled. **Likelihood that activity leads to an expansion of the unconditional part of the NDC in its next revision**

Transformation characteristics	Issues to consider in designing Article 6 activities
	Costa Rica does not have a conditional NDC component. There are several political reasons for this: First, that Costa Rica's ability to achieve its net-zero goal depends on foreign technologies being available and supported nationally. Second, the practical implementation of tracking and distinguishing between conditional vs unconditional parts of an NDC is not (yet) possible. **Likelihood that activity leads to upscaling of mitigation** The aim of the activity is to pilot local activities in two municipalities which may be replicated in other municipalities to achieve national targets on transport as outlined in the Decarbonisation Plan. The focus of the pilot activity is also about sustainable development and active mobility as goals in their own right. **Share of MOs kept by the host country** It is not yet determined whether Costa Rica is ready to sell emission reduction units internationally in 2021. The infrastructure and design for a compensation/offset mechanism is under development. **Degree of innovation of underlying policy instruments** Very innovative; there is a new vision for transformational change in the transport sector – shifting to low-carbon modes of transport.
SDG outcomes at scale, sustained over time, aligned with the 2030 Agenda global goals and Planetary Boundaries (PB) framework	**Level of detail of accounting and monitoring of SDG benefits** Existence of qualitative assessment of SDGs, which over time will be integrated into the SINAMECC system including provisions for quality assurance through technical review. **Level of safeguards against adverse effects in development and on planetary boundaries** No safeguards discussed yet. **Existence of ex-ante assessment of potential SD contributions and risks** SD impacts are assessed ex-ante and eventually ex-post. **Existence of third-party verification of SDG benefits** Technical review as part of quality assurance for reporting under the domestic transparency system.
Technology change and *digitalisation*	**Broader technology development - R&D, adoption and scale-up:** **Likelihood of catalytic implementation of mitigation technology** E-mobility has upscaling potential. Will have a catalytic effect on how people think about transportation. Implementation will also depend on broader policy development such as policies on road safety and public transport infrastructure. **Degree of understanding of abatement costs of the technology *and the ability to lower them*** Abatement costs are not assessed but may be relatively high due to the local and small scale of MOs. **Level of risk for lock-in fossil infrastructure** No risk for lock-in fossil infrastructure. **Digitalisation:** **Degree of support for acceleration of implementation of mitigation technology** Project will create infrastructure and increase awareness which will translate in greater participation of private sector and the civil society.

Transformation characteristics	Issues to consider in designing Article 6 activities
	Degree of facilitation of MRV Mitigation impact will be tracked through MRV of GHG and SDG impacts using the SINAMECC. **Degree of facilitation of digital payments /financing mechanism** Digital payment methods are not used in Costa Rica to disincentivise use of cars.
Normative change – *(dynamic) baselines*	**Degree of consistency of baseline approach with PB concept and long-term target of the Paris Agreement, e.g., through crediting thresholds and derivation of a baseline emissions path below BAU** TBD **Degree of conservativeness** Baseline scenario is assumed to be the continuation of the use of existing modes of transport in the absence of the project according to the CDM small-scale methodology (see UNFCCC 2018). **Length of crediting periods (relative to technology lifetime)** TBD
Agents of change - *government and private sector*	**Are actors involved that have the power to drive transformation?** The local governments/municipalities and the civil society play an important role. The municipal governments are responsible for promoting policies and formulating mobility strategies to promote non-motorised transport. Furthermore, the private sector is also expected to play an important role to drive new business opportunities. **Does the activity create institutional capacity and improve effectiveness?** Central government is required to step in for this aspect as infrastructure and services of public transport are managed by the central government. They would be the main force to promote intermodal transport. **Does the activity include a gradual phase-out of Article 6 funding through 'catalytic' finance?** TBD
Incentives for change - *carbon pricing*	**Does the activity enhance the likelihood that carbon pricing policies are mentioned in the NDC?** Carbon pricing is not applicable because emissions are difficult to measure due to the local scale issue.

Source: own compilation, UDP, PDR & FC.

The concept for 'Development and promotion of urban cycling in the municipalities of Curridabat and Montes de Oca in San José' is well aligned with Costa Rica's National Decarbonisation Plan for net-zero emissions by 2050. However, it is not yet clear whether it can be designed and implemented as an Article 6 activity. Yet, it could be as the activity is intended for replication in other municipalities and its trans-formational characteristics, especially regarding sustainable development outcomes indicate its transformational nature. The mitigation outcome of the activity has not been assessed but is expected to be micro-scale given the activity type and currently limited scope. Methodological challenges persist and need to be addressed to collect data cost-efficiently and integrate MRV at local level with the national level GHG inventory and tracking progress of NDC implementation as part of the domestic transparency system, SINAMECC. Digital MRV solutions such as the use of apps to track kilometres travelled from dispersed bike activities are still to be developed and applied.

However, the pilot's clear links to NDC implementation for upscaling and replication does present new opportunities for low-tech, more behavioural oriented and decentralised mitigation solutions to play a larger role under the Paris Agreement than they did in the CDM.

7.3 Morocco

The activity under assessment is the Organic Waste to Energy activity in Morocco, which has been pre-selected by the KliK Foundation as an Article 6 piloting project for the Mitigation Activity Design Document (MADD) phase. The project has been chosen due to its novelty in the focus country and the important role the waste sector plays in Morocco's NDC in terms of the identified mitigation potential. The transformational potential of the waste sector in Morocco makes the case study an ideal testing ground for combining Article 6 and transformational change characteristics.

7.3.1 NDC and sector level

In 2017, the country adopted the National Sustainable Development Strategy (fr. Stratégie Nationale de Développement Durable, SNDD) with the goal of achieving a green and inclusive economy by 2030 (Kingdom of Morocco 2017). In its NDC, Morocco committed to an unconditional target of reducing greenhouse gas (GHG) emissions by 17% compared to BAU by 2030 (SEDD[33] 2016), backed up by a list of over 60 specific actions differentiated into unconditional and conditional components (SEDD 2016). This made Morocco's NDC one of the most ambitious and detailed NDCs (Climate Action Tracker 2019). Recently, the country updated its NDC (SEDD 2021) and is developing a national climate plan that will integrate all national climate policies, which intends to build resilience to climate risk and accelerate the country's transition to a low carbon economy (Centre de Compétences Changement Climatique (4C) du Maroc 2019).

The waste sector in Morocco accounts for 8% of Morocco's net GHG emissions (MEME[34] 2016). Of this, 41.2% emissions are caused by uncontrolled waste disposal, 21.9% by controlled landfills and the rest by wastewater treatment (MEME 2019). A very ambitious GHG emission target has been set for the solid waste sector in the NDC. Several sectoral policies like the National Household Waste Programme 2008 are aimed at improving solid waste management systems, e.g., by rehabilitating uncontrolled landfills and establish recycling centres (Ministry of Interior 2008; MEME 2016).

The high mitigation potential of the waste sector was identified in its NDC with nearly 13% of the country's expected mitigation efforts between 2021 and 2030 coming from the waste sector (SEDD 2016). The National Strategy for the Reduction and Recycling of Waste specifies recycling targets for each waste segment and endorses a move towards the concept of circular economy (Kingdom of Morocco 2019). Morocco has made considerable advances in energy recovery rates from waste management as well as established new disposal sites and rehabilitating old ones (MEME, 2016). Civil society is an active participant in the sector with its most influential association being the Association des Enseignants des Sciences de La Vie et de la Terre (AESVT) that engages with parliamentarians as well as organises local trainings in waste sorting (AESVT 2019).

While entrepreneurs have been driving progress in management of solid waste, strong political support and coordination between responsible ministries is still lacking. This was shown by the

[33] State Secretariat for Sustainable Development

[34] Ministry of Energy, Mines and Sustainable Development (fr. Ministère de l'énergie, des Mines et de l'Environnement, MEME)

fact that the engagement of the Ministry of Interior in the NDC update process was rather limited, leading essentially to a 'recycling' of the approach undertaken in the first NDC. Furthermore, the waste sector has been facing issues due to lack of funding, planning and technical capacity at the local level (Climate Chance 2020). The mixed success of carbon crediting approaches under the CDM due to low volumes of emission reductions achieved by Moroccan landfills caused by the semi-arid conditions and failure of the eco-tax on plastics (Zero Mika Law) are examples that show that carbon pricing is not a panacea to solve all problems of the waste sector (Fenhann 2021; MEME 2016). Educational programmes about recycling and training programmes to promote proper waste segregation may improve reactivity of waste sector actors to incentives (AESVT 2019; SEDD 2016).

7.3.2 Activity level: Waste-to-energy activity in Morocco

This ex-ante assessment analyses the initial project design of the Organic Waste to Energy (OWtE) activity in Morocco, supported by the KliK Foundation. The activity aims to generate energy from organic waste in food processing between 2021 and 2030. Organic waste is converted into biogas instead of being transferred to landfills, and the biogas is then used to produce combined heat and power. The avoided methane emissions via this Article 6 activity can be certified and sold as ITMOs. It is a highly innovative, first of its kind project in Morocco that will introduce large anaerobic biodigesters (KliK 2021).

The start date of the project implementation is contingent upon Morocco and Switzerland signing a bilateral agreement along the lines of the agreements undertaken with Peru and Ghana. Individual projects will be implemented at the city/municipality level starting with larger cities. These can be scaled up and replicated in other cities and provinces in Morocco and other countries. Apart from reducing Morocco's GHG emissions, the programme will also generate several co-benefits such as reduced landfill leachate and groundwater contamination, job creation, improved resource efficiency, raising awareness about waste treatment and know how transfer among others. KliK Foundation is slated to be a compliance buyer. The activity is pre-selected by KliK Foundation for the MADD phase, which started in late Q1 2021 (KliK Foundation 2021).

Table 7: Assessment of Moroccan activity's contributions towards transformational change

Transformation characteristics	Issues to consider in designing Article 6 activities
GHG MOs at scale, sustained over time, aligned with the Paris Agreement temperature goal of well below 2°C	**Stringency of additionality testing** The activity envisages two types of additionality testing: (1) additionality against the unconditional part of the NDC, and (2) financial additionality. **Mitigation potential** The avoidance of uncontrolled release of methane results in approx. 15,000 tCO_2e per year per project which will be sold as ITMOs. This would amount to approx. 1.5 to 2 million tCO_2e reductions until 2030, if 15 projects are introduced that generate ERs for seven years (KliK 2021). **Likelihood that activity leads to an expansion of the unconditional part of the NDC in its next revision** Depends on an increased engagement of the line ministry MOI[35] and MEME in the sector which was not visible in the 2020 NDC update.

[35] Ministry of Interior (MOI)

Transformation characteristics	Issues to consider in designing Article 6 activities
	Policy instrument is highly likely to contribute to existing conditional NDC elements given the cap on eligibility limited through market penetration. The activity represents only about 3% of the sectoral mitigation target in cumulative terms until 2030. Thus, the activity can play a small but important part of achieving the sectoral emission reduction targets of Morocco´s conditional NDC. **Likelihood that activity leads to upscaling of mitigation** High likelihood that the activity is expanded to be implemented in other cities and provinces in Morocco and other countries if technically robust. **Share of MOs kept by the host country** Details still need to be elaborated; will need to be approved by all relevant stakeholders. **Degree of innovation of underlying policy instruments** Highly innovative with great mitigation potential; such an activity has not yet been implemented in Morocco at this scale.
SDG outcomes at scale, sustained over time, aligned with the 2030 Agenda global goals and Planetary Boundaries (PB) framework	**Level of detail of accounting of SDG benefits** Programme contributes mainly towards SDG 12, but also SDGs 3, 6, 7 and 8. Detailed analysis of the social benefits will be conducted in the MADD phase. **Level of safeguards against adverse effects in development and on planetary boundaries** "Do no harm" criteria will play a key role in assessing potential Article 6 programmes (KliK 2021). Standard terms of references for calls of proposals must specify that the availability of safeguards to prevent negative impact on SDGs is considered in the pre-selection process. However, no comprehensive set of safeguards is foreseen nor available at the current stage. **Existence of ex-ante assessment of potential SD contributions and risks** When submitting a proposal, the applicants will need to explain what SDG goals are affected and in what way (KliK 2021). **Level of detail of SDG benefit monitoring** The depth at which SDG benefit monitoring will be conducted is still undetermined. A direct alignment of SDG reporting with MRV could also be explored for this activity, depending on whether the activity's MRV can be based to an extent on existing carbon standards. **Existence of third-party verification of SDG benefits** Third-party verification is currently not planned nor envisaged but could become more relevant once the concept development is further advanced.
Technology change and *digitalisation*	**Broader technology development - R&D, adoption and scale-up:** **Likelihood of catalytic implementation of mitigation technology** If successful, the programme could lead to the desired catalytic effect as the OWtE is aimed at to be a step-by-step scale-up of projects, eventually covering most larger municipalities in Morocco. **Degree of understanding of abatement costs of the technology *and the ability to lower them*** Feasibility studies authorised for two potential project locations were conducted to better understand the abatement costs of processing organic waste in anaerobic biodigesters. Indicative calculations from the studies suggest that a price between

Transformation characteristics	Issues to consider in designing Article 6 activities
	EUR 20-30/tCO_2e over a seven-year period could make such projects financially feasible. **Level of risk for lock-in fossil infrastructure?** The project proposal was regarded as having no risk for lock-in into fossil fuel infrastructure because it generates renewable energy while avoiding the uncontrolled release of methane. **Digitalisation:** **Degree of support for acceleration of implementation of mitigation technology** Minor role in OWtE programme. **Degree of facilitation of MRV** Linking of registries and the automatization of reporting processes can significantly lower MRV costs and increase transparency. If feasible, the OWtE will make use of such advances.
Normative change – *(dynamic) baselines*	**Degree of consistency of baseline approach with PB concept and long-term target of the Paris Agreement, e.g., through crediting thresholds and derivation of a baseline emissions path below BAU** Cannot be determined yet, as these issues will be decided on later in the process. **Degree of conservativeness** BAU scenario is deemed to be the most realistic baseline at this stage. Further considerations will be taken into account during a later stage. Project baselines need to consider the situation in the respective cities and what would happen with the organic waste if it were not treated in an anaerobic biodigester. **Length of crediting periods (relative to technology lifetime?)** The OWtE programme intends to set up a structure and a pricing model where the individual projects should be able to operate without carbon revenues after a term of seven years.
Agents of change - *government and private sector*	**Are actors involved that have the power to drive transformation?** Yes, the actors involved have the power to facilitate and foster an effective institutional design for the activity. But a stronger engagement of relevant ministries is needed. Additionally, OWtE plants will be developed by private sector companies who will drive technology transfer for this technology.
Incentives for change - *carbon pricing*	**Does the activity enhance the likelihood that carbon pricing policies are mentioned in the NDC?** It is unlikely that the activity has led to a more prominent role of carbon pricing in the updated NDC and will likely not do so for future Moroccan NDC submissions. But if the activity is a success, this picture could change.

Source: own compilation, UDP, PDR & FC.

This Article 6 activity is still in its early stage of development and preliminary assessment indicates the NDC conditionality is favourable for enabling the activity to participate in Article 6. Initial discussions regarding a bilateral agreement between Morocco and Switzerland to establish a framework for cooperative approaches under Article 6 are underway. This activity is unique to Morocco with great mitigation and upscaling potential. There are several SD benefits associated with the activity. These include SDGs 3, 6, 7, 8, 12. However, details still need to be

discussed by agencies involved in the MADD phase with regards to appropriate assignment of roles and responsibilities to government and non-government agencies, better understanding of abatement costs, degree of consistency and conservativeness of baseline approaches, SDG benefit monitoring among others.

7.4 Pakistan

The following conceptual case study deals with competitive auctioning for renewable energy in Pakistan. It has been selected as the activity is an innovative policy instrument that will accelerate technology deployment through an effective price discovery mechanism and shows indicators of transformational change. With this example an assessment of how Article 6 can be integrated into competitive auctions is conducted.

7.4.1 NDC and sector level

The Government of Pakistan (GOP) has been proactive in mainstreaming the SDGs in all its policies, plans and strategies, being the first country to adopt the 2030 agenda for SD back in 2016 (GOP 2019). In 2018, the National SDG Framework was approved by the National Economic Council which prioritises the global goals into several categories. Pakistan has committed to reducing up to 20% of its 2030 projected GHG emissions, conditional on international support (GOP 2016). Furthermore, the Ministry of Climate Change is actively considering the use of market mechanisms in the context of Article 6 of the Paris Agreement to achieve this target. The country has always focused its polices and plans towards the energy sector which is responsible for nearly 46% of total emissions, making it the largest contributor in Pakistan's emissions profile (GOP 2016). Additionally, the country is suffering from an ongoing energy crisis due to a lack of sustainable energy sources and an imbalance between supply and demand in the energy sector (GOP 2016; Aleluia et al. 2019). It is crucial to tackle these problems in this sector as reliable energy supply is critical to sustaining economic growth. As a result, the National SDG Framework prioritises the goal of 'Affordable and Clean Energy'. In its first NDC submission, GOP has identified large scale and distributed grid-connected solar and wind power as high priority mitigation options (GOP 2016).

The institutional and regulatory framework in the country at present are favourable as the country is trying to engage private entities in the public sector dominated power sector. Pakistan's policy framework at the national level (e.g., National Climate Change Policy) is fully supportive of instruments such as carbon taxes (GOP 2012) and emissions trading (Aleluia et al. 2019) as part of its mitigation strategy. The country can draw on its successful experiences with CDM revenues for wind power and generate further awareness about the benefits of wind power. However, despite the pledge to increase the share of renewable energy to 60% (IISD 2020), there are coal-fired plants with a capacity of 2640 MW still under construction (Lo 2020). The importance of its ties with China has put pressure on the country to expand coal power and take coal power plant loans. Additionally, efforts must be directed towards managing the unrealistic power tariffs, high inefficiencies, low payment recovery and effective management of subsidies mechanism as these issues pose a great barrier for future energy sector investment.

7.4.2 Activity level: Integrating Article 6 in competitive power auctions in Pakistan

This conceptual case study delves into how competitive power auctions for renewable energy projects, specifically wind power projects can be supported through Article 6. The activity under consideration is an innovative policy instrument that will result in the proliferation of wind power technologies, whose potential remains largely untapped, into the country's energy mix thereby making it transformative in nature. Renewable energy auctioning is expected to be

implemented at the sectoral level with the duration of the policy being connected to the contract duration of the power purchase agreement. Such a policy is crucial to Pakistan for achieving the recently announced ambition increase to achieve a share of renewables of 60% by 2030 according to the country's Prime Minister (IISD 2020), significantly higher than the 30% increase by 2030 announced by the Alternative and Renewable Energy Policy which was adopted in 2020 (GOP 2020). The ability of this policy instrument to accelerate technology deployment stems from the fact that power auctions set a fixed offtake price over a certain period which promotes investments in new and expensive low-carbon technologies. This fixed CO2 price supports the off taker in providing continuous and reliable incentives for emission reductions to investors.

The upscaling of renewable energies will not only help reduce Pakistan's GHG emissions but also contribute towards achieving SDG 7 and results in other sustainable development benefits such as job creation and improved health of its citizens. Furthermore, this policy is likely to set a precedent for how investments can be mobilised towards capital-intensive technologies beyond renewable energies. Actors such as the Alternative Energy Development Board, responsible for drafting the Alternative and Renewable Energy (ARE) Policy, National Electric Power Regulatory Authority, the independent regulator in the power sector, and Ministry of Climate Change would play a key role in the effective implementation of the Article 6 policy instrument. These agencies will need to work in close cooperation with each other in order to drive transformational change.

Table 8: Assessment of Pakistani activity's contributions towards transformational change

Transformation characteristics	Issues to consider in designing Article 6 activities
GHG MOs at scale, sustained over time, aligned with the Paris Agreement temperature goal of well below 2°C	**Stringency of additionality testing** Additionality testing in the case of direct financial support should start from the calculation of an implicit carbon price and to then apply a threshold of at least 5 EUR/tCO_2 (Michaelowa et al. 2019a). Can be promoted by international carbon market mechanisms until a penetration threshold of 5% is reached. Once the threshold has been surpassed the generated emission reduction could be sold in a national voluntary carbon market, MOs could then be accounted towards domestic NDC achievement (Source). **Mitigation potential** Potentially large mitigation potential depending on how broadly the instrument will be applied (which technologies, scale). **Likelihood that activity leads to an expansion of the unconditional part of the NDC in its next revision** Policy instrument is likely to contribute to existing conditional NDC elements but statements on the expansion of unconditional NDC targets purely speculative at the current stage; a precondition would be the clear distinction between the conditional and unconditional targets in the updated NDC. **Likelihood that activity leads to upscaling of mitigation** Likelihood of upscaled mitigation is high as policy instrument can easily be applied for other technologies and sectors. **Share of MOs kept by the host country** To be determined bilaterally between buyer and seller country.

Transformation characteristics	Issues to consider in designing Article 6 activities
	Degree of innovation of underlying policy instruments Highly innovative; can be applied for capital-intensive technologies (e.g., hydrogen).
SDG outcomes at scale, sustained over time, aligned with the 2030 Agenda global goals and Planetary Boundaries (PB) framework	**Level of detail of accounting of SDG benefits** Existing task forces and SDG support units at the national and provincial levels to monitor and support the activity's contribution to affordable and clean energy (SDG 7), GHG reduction (SDG 13), job creation (SDG 8) and improved health (SDG 3). Existing SDG data collection and institutional challenges (e.g., data at district level) need to be addressed (Ministry of Planning, Development and Reforms Pakistan 2017). **Level of safeguards against adverse effects on sustainable development and on planetary boundaries** No safeguards established yet but can be integrated with pre-bid qualifications.
Technology change and *digitalisation*	**Likelihood of catalytic implementation of mitigation technology** High likelihood of catalytic implementation of policy instrument across multiple sectors. **Degree of understanding of abatement costs of the technology *and the ability to lower them*** Policy will contribute to reduced abatement costs of the technology GOP can partially recover the capital needed in foreign currency for PPAs through carbon revenues. **Level of risk for lock-in fossil infrastructure** No risk for a lock-in in fossil infrastructure as incentives are set in such a manner that decarbonisation of the sector is clearly accelerated. **Degree of support for acceleration of implementation of mitigation technology** Digitalisation would need to be enhanced decisively in order to accelerate the implementation of mitigation technology. Digitalisation would also help in grid automation, thereby stabilising the existing grid infrastructure (NEPRA[36] 2021).
Normative change – *(dynamic) baselines*	**Degree of consistency of baseline approach with PB concept and long-term target of the Paris Agreement, e.g., through crediting thresholds and derivation of a baseline emissions path below BAU** Boundaries need to be set for the baseline scenario and drivers of emissions identified in the absence of the policy (Kreibich and Obergassel, 2018). Policy instrument can build on extensive experience with establishing grid emission factors in the CDM. Some adjustments will need to be made to CDM baseline scenarios including the application of OMGE or ambitious crediting thresholds. **Length of crediting periods (relative to technology lifetime?)** Need to shorten crediting periods compared to technology lifetime to generate transformative impacts.
Agents of change - *government and private sector*	**Are actors involved that have the power to drive transformation?** AEDB[37] thanks to its new proactive role and NEPRA are powerful actors who have the capacity to drive the transformation of the energy sector. Ministry of Climate Change will play an important role in the policy instrument's coordination with other policies, including the implementation of a potential ETS.

[36] National Electric Power Regulatory Authority
[37] Alternative Energy Development Board

Transformation characteristics	Issues to consider in designing Article 6 activities
	Does the activity create institutional capacity and improve effectiveness? Institutional capacity to implement effective policies for the promotion of renewable energies already exists (Interview Pak2 2021; NEPRA 2021); few institutions in the power sector infrastructure like NTDC[38] still need to enhance institutional capacity. Activity will improve effectiveness as the instrument would ensure that GOP allocates subsidies more efficiently (Malik et al. 2018).
Incentives for change - *carbon pricing*	**Does the activity enhance the likelihood that carbon pricing policies are mentioned in the NDC?** Yes; Policy activity requires an existing carbon price; it would most likely go hand in hand with the establishment of an ETS. **Does the activity contribute to the reduction of fossil fuel subsidies (negative carbon pricing)?** Activity could result in the reduction of fossil fuel subsidies but increasing electricity costs would need to be prevented (NEPRA, 2021).

Source: own compilation, UDP, PDR & FC.

This Article 6 activity is at a conceptual stage. However, this explorative assessment indicates the transformative and mitigation potential that renewable power auctions have. The activity has great upscaling potential as it can be applied to various new technologies within and beyond the power sector. The activity will contribute to SDG goals at national and regional levels, more specifically SDG 7. However, scrutiny is required when it comes to setting baselines (below BAU) and crediting periods in order to generate transformative impact. Positive and negative lists could be a viable approach to provide ex-ante certainty at which technology at precise scales will be eligible for Article 6 cooperation and ITMO transfers. Furthermore, all public and private agents involved need to work in close collaboration with each other to ensure smooth and effective implementation of the policy instrument.

7.5 Observations across the activities

The assessment of all the above-mentioned Article 6 activities has been conducted prior to their implementation and final design stage and is thus ex-ante and explorative. The aim of the assessment was to generate some preliminary findings about how transformational current Article 6 design is and how it can be incentivised to become more transformational. The findings are presented in Table 9 below. The activity's relationship to the NDC needs to be clear in order to specify, for example, the level of MOs that the host country can export without overselling its MOs and endangering NDC achievement. This is not the case for all Article 6 case studies. Therefore, it is important that the suggested incentive structure in chapter 6 is based on clear guidance that supports countries in deciding to which extent an activity is eligible for positive lists. The Article 6 activity designs consider the need to redefine additionality in the context of NDCs. The activities do not duplicate existing national policies but build on them and expand them further. The Moroccan activity is also considering the application of an investment test in addition to target additionality. The conceptual activity design in Pakistan foresees the use of a carbon price threshold for additionality testing. Costa Rica is currently developing positive lists which include transformational change as an explicit criterion.

The Article 6 activities in Morocco and Pakistan could both potentially generate MOs at scale: In Morocco, the activity could be further upscaled by expanding investments in anaerobic

[38] National Transmission Distribution Company

biodigesters in other Moroccan cities. In Pakistan, the policy's application or redesign (e.g., into carbon contracts for difference) can also be expanded to other sectors such as the industry sector. The Costa Rica case study is a novel micro-scale activity with multiple SDG benefits; MOs at scale would be reached only if the activity would be taken up in several cities. The three Article 6 activity designs do not provide perverse incentives in terms of promoting MOs overselling or preventing and expansion of the NDCs' scopes. However, it is difficult to assess at this stage whether the activity might contribute to its potential integration into the NDC's unconditional targets as not all countries have already submitted updated NDCs. MO overselling risk are considered through stringent baseline setting (Pakistan) or the sharing of MOs (Morocco).

While all Article 6 activities build on the national priorities expressed within the SDG agenda, safeguards against negative impacts on SDGs do not play a pronounced role yet. The intention to develop such safeguards has been raised by the Pakistan Ministry of Climate Change. Thus, the analysis reveals that further emphasis should be put on the development of safeguards at the activity-level.

The Costa Rica Article 6 case study shows that low-tech solutions such as promoting biking and walking could play a larger role in the Paris Agreement than in the CDM. Low-tech solutions entail many process-related transformational aspects such as a high number of locally relevant adaptation and sustainable development benefits. However, this is not only a design question but also depends on buyers' willingness to pay as such low-tech solutions are often more expensive. Still, smart MRV solutions due to enhanced digitalisation play an important role in this. For example, enhanced digitalisation enables the tracking of more dispersed activities through the use of apps (e.g., biking activity in Costa Rica). The Morocco case study makes use of short crediting periods compared to technical lifetime of the anaerobic biodigesters, thus generating transformational impacts through long-term benefits for the host country. However, the Article 6 case study designs reveals that baseline setting for transformational change requires more guidance and such approaches need to be strongly incentivised.

Table 9: Comparative results of the Article 6 activity analysis

	Morocco	Costa Rica	Pakistan
Activity builds on existing national policies to develop national and sectoral pathways to align with the Paris Agreement goals	The activity builds on the National Strategy for the Reduction and Recycling of Waste and extends recycling activities also to organic waste.	The activity is embedded in Costa Rica's National Decarbonisation Plan but can be considered a new measure.	The concept foresees the integration of Article 6 in an existing policy instrument, thus further extending it.
Activity contributes to the conditional part of the NDC	Activity contributes to the conditional NDC target in the solid waste sector.	Costa Rica's NDC comprises only unconditional targets but mentions that it will still rely on financial support, capacity building and technology transfer (MINAE 2020, p. 5).	It is likely that some NDC targets in the energy sector will be defined in the updated NDC, potentially also of conditional nature.
Additionality testing approaches	Activity design considers target additionality and	Not applicable for this activity.	Concept foresees application of an

	Morocco	Costa Rica	Pakistan
	financial additionality (investment test).		implicit carbon price (at least 5 EUR/tCO_2) for investment test.
Does not set perverse incentives	Activity lies within the NDC's scope, thus not providing a perverse incentive against extending the country's NDC scope.	Activity forming part of the national decarbonisation plan.	Activity will most likely fall under NDC scope.
Likelihood of inclusion in the unconditional part in next NDC revision	Shows potential but depends on engagement of line ministries.	Not applicable for this activity.	First, a clear distinction between conditional and unconditional NDC targets would need to be made.
Upscaling potential	Activity has large upscaling potential if implemented in further Moroccan cities.	Micro-scale activity could be decisively upscaled and even elevated to the national level in the form of a policy that promotes biking.	The conceptual activity is particularly well-suited to upscaling due to its applicability as a policy instrument to various technologies.
Activity to address country's priorities within SDG agenda	Waste-to-energy forms part of prioritised SDGs in Morocco.	The biking activity contributes to SDG goals at the national and local levels; effect to be measured through established indicators.	SDG 7 clearly represents a priority for Pakistan.
Establishment of safeguards against negative impacts on SDGs	Not yet addressed	Not yet addressed	Government considers the introduction of safeguards an important precondition for carbon market engagement.
Use of digitalisation for increased transformational impact	Not specifically considered	Apps will be used for the biking activity.	Emphasis on digitalisation as electricity grid malfunction solution.
Smart MRV solutions discussed	Smart MRV solutions are considered in the sense of linking registries and automisation of reporting processes.	Mitigation will be tracked through MRV of GHG impacts using SINAMECC.	-
Consistency and conservativeness of baseline approaches	Currently under consideration	Currently under consideration	-
Use of short crediting periods	Project design foresees short crediting periods.	Not applicable for this activity.	Crediting periods to be in line with payback period.

	Morocco	Costa Rica	Pakistan
Agent involved have the ability and power to drive transformation	Powerful agents are involved but further engagement required especially from the line ministries.	Powerful agents are involved at the local level.	Powerful agents are pushing for engagement in new carbon markets and piloting activities.

Source: own compilation, UDP, PDR & FC.

8 Implications for Article 6 design and implementation

Based on the comparative analysis of the three case studies, undertaken at NDC and sectoral level, chapter 8 addresses key implications for Article 6 design and implementation. A first part addresses potential synergies between Article 6, sustainable development, and the planetary boundary concept, introducing the doughnut model. Second, the links between additionality and transformational impact are analysed. Furthermore, what could be the role of negative and positive lists to address this topic. And finally, the chapter touches upon the discussion of baseline setting, taking into account the different aspects, roles and actors in Article 6 activities.

8.1 Reflection on synergies between Article 6, sustainable development and the planetary boundaries concept

Advancing the concept of transformational Article 6 activity design mainstreams the integration of sustainable development into climate change mitigation activities, the former so-called 'co-benefits' of mitigation actions, to leverage ambition for MOs at scale and sustained over time to achieve net zero emissions by 2050. An integrated climate and sustainable development perspective applied to Article 6 activity design and implementation can help to identify, how the activity contributes to interlinked NDC and SDG synergies and trade-offs as the basis for mitigating negative impacts and accelerating enhanced climate action and transition to sustainability (IPCC 2018). In a short guide 'Good Practice Guidance for the Preliminary Assessment of Sustainable Development in Article 6 actions' five key areas are identified to assess and promote sustainable development. These are activity governance, safeguards, stakeholder inclusivity, sustainable development impact assessment and transparency (SDI[39] 2020). The five aspects to promote sustainable development have been identified through Party submissions to the UNFCCC Article 6 negotiations and in roundtable discussions with carbon market stakeholders and hence they reflect issues regarded as important to both host country governments and to buyer countries (SDI 2018).

The planetary boundaries (PB) framework developed by Rockström et al. (2009) identifies the increasing human pressures on the Earth System and quantifies nine environmental boundaries. Combining the PB framework with a social foundation perspective Raworth (2012) has further developed the concept of a Safe and Just Operating Space to define a space for society to stay within absolute environmental and social limits for sustainability. Using the case of how such a framework applies to determine the transformative impact of a Geothermal Policy in Uganda; the boundaries are illustrated as a 'doughnut' as shown in Figure 21.

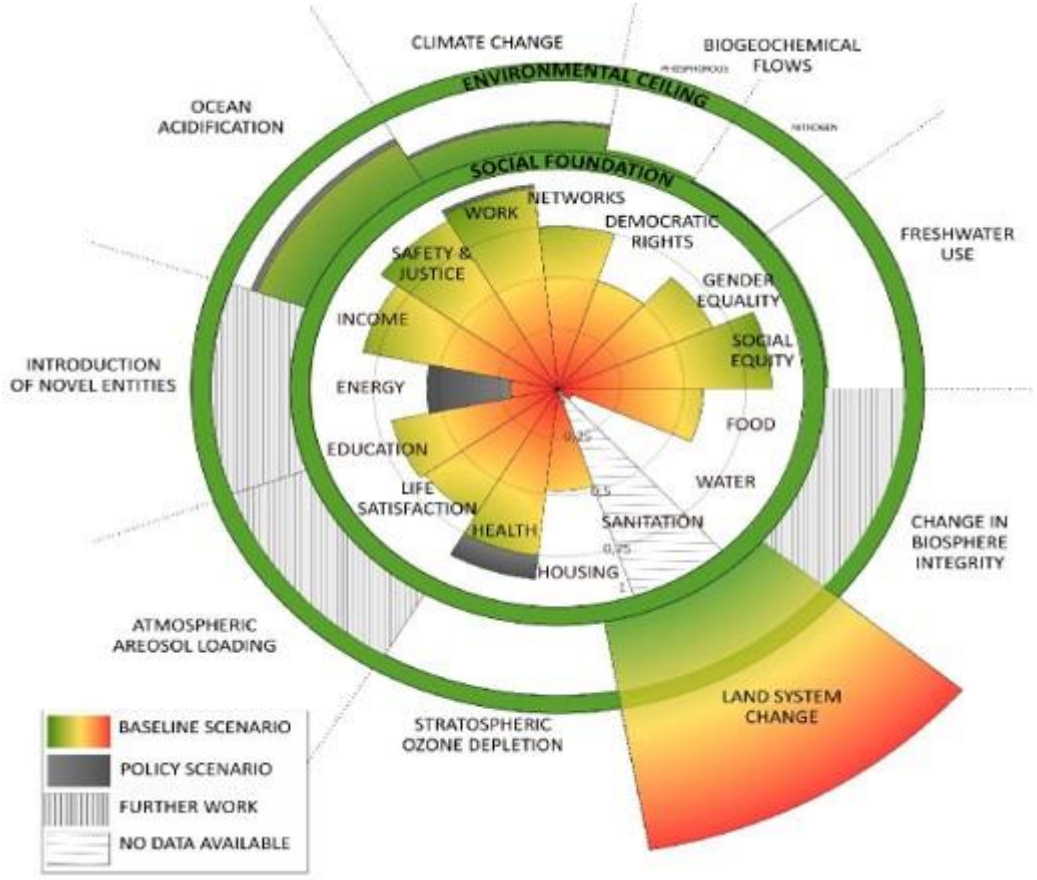
To operationalise the planetary boundaries and socially just principles for decision support at any level of assessment, for example an individual, a company or a country, ethically sound allocation principles are needed to determine the share of the Safe Operating Space that the studied entity can occupy within absolute sustainability limits (Hjalsted et al., 2020). Hjalsted et al. (2020) propose a two-step process, where the operating space is first downscaled to the individual level considering ethical allocation principles (e.g., utilitarianism, egalitarianism, prioritarianism and sufficientarianism), then upscaled using methods appropriate to the level of assessment.

While an absolute approach to sustainability assessment is not yet integrated into the 2030 Agenda SDG framework, nor into the ICAT Transformational Change Methodology (2020), it does provide a conceptual framework and an emerging research agenda to offer insights on what is the level of environmental impact that the activity should not exceed in order to be

[39] Sustainable Development Initiative (SDI)

sustainable, not just greener. As such it can help explore, how concerns for biodiversity, nature-based solutions and synergies between the Paris Agreement and other environmental agreements can be better integrated into Article 6 activities to respect planetary boundaries and enable a just and environmentally safe transition at all levels of society.

Figure 21: Application of the doughnut model to the geothermal policy in Uganda



Source: Kolenda & Desmoitier 2019

Note: The social and environmental results are plotted in their normalised form for each social dimension and Planetary Boundary. Results for social foundation dimension Sanitation and the Planetary Boundaries Change in biosphere integrity, Introduction of novel entities and Atmospheric aerosol loading are not shown as relevant indicators and impact assessment model could not be derived.

8.2 Additionality for transformational impact and the role of negative and positive lists

One implication for ensuring that Article 6 activities contribute meaningfully to transformational change is the need to reinterpret key carbon market principles such as additionality not only in the context of NDCs but also of LT-LEDS. If these are not available, regional GHG emission pathways determined in scientific studies may serve as an interim proxy, although further work needs to be done in order to operationalise such novel ways of establishing additionality for transformational impact. More practically, as briefly addressed in the preceding chapter, the use of so-called negative and positive lists could be one way for host countries, project developers and buyers to deal with this. Negative lists and positive lists have already been rudimentarily used in the CDM for automatically being non-additional and additional. Negative lists can be

established at global or national level and can be used to exclude activities that do not comply with the emission paths required by LT-LEDS (considering technology lifetime in light of required GHG emission pathways). As described above, such negative lists may exclude coal and/or nuclear power, but are more difficult for other technologies, including possibly highly efficient fossil fuel technologies during a transition period. Positive lists could define activity types that are automatically additional at a global or country level. In the CDM, for example, certain micro technologies for sustainable access to energy in rural areas were automatically classified as additional (Michaelowa et al. 2019a).

The development of negative and positive lists for the CDM was a top-down exercise at the global level (Ahonen et al. 2021). There are no known examples of developed positive or negative lists at the national level. This will, however, change for international carbon market transactions in the context of the Paris Agreement. Negative or positive lists could be determined at the national level (host country, buyer country) or at international level (CMA for 6.2, SB 6.4). Some countries such as Peru are currently developing criteria for the introduction of positive lists (BMU 2021). KliK specifies for example that activities promoting nuclear energy and fossil fuels as well as bio-logical carbon sequestration are not eligible to be promoted by the foundation (Greiner et al. 2020). The latter is due to concerns about the permanence of biological carbon sequestration and might be reversed if methodological issues get resolved. KliK's eligibility criteria thus represent a negative list from a buyer country. A transferring country example is Peru. Peru is currently in the process of developing a national framework for eligible MO activities for Article 6 cooperative approaches including a positive list of technologies and/or subsectors (BMU 2021).

Even though it still needs to be seen what form these lists will exactly take in terms of which activities they will consider eligible, one observation is that positive lists will not only focus on additionality as defined for CDM but will also consider other aspects such as the NDC's scope and other factors which might be relevant at the national level. Article 6 activities with demonstrated ex-ante transformational impacts could be deemed automatically additional. Besides, positive lists could also refer to certain carbon credit vintages (the year in which the MO is generated) to determine eligibility. Positive lists may also differ across various segments of the increasingly fragmented global carbon market: For instance, CORSIA allows the use of post-2020 vintages only if procedures for the avoidance of double counting are in place. Moreover, CERs are only allowed for a narrowly defined range of years (2016-2020) (ICAO 2019). Fact is that the lists will most likely be very diverse, reflecting the underlying national contexts and political priorities. A follow-up research study could focus on assessing to which extent the developed lists consider the established transformation characteristics.

Regarding the development of negative and positive lists, a consultative process that uses transparent indicators and consults national and sectoral stakeholders should be established. Another process-related aspect is that positive lists need be updated frequently in fixed intervals which will be more relevant for some aspects such as additionality than for others (e.g., NDC scope). Such a regular update process might be less feasible in the context of a multilaterally governed SB such as the Article 6.4 Mechanism. The inertia of such a multilateral process might, in turn, render lists obsolete which constitutes one of the biggest risks to environmental integrity. Positive lists which are developed at the national level can, on the contrary, be more easily updated. Still, in order to achieve a certain level of predictability, updates of such lists may be aligned with NDC implementation periods. An advantage of a potential alignment with the NDC implementation period would be that the lists would then also need to incorporate the higher level of ambition communicated by the Party.

Regarding additionality testing, it was stressed throughout this report that it should not only rely on one approach but also consider contribution to transformational change and possibly include an investment test for each activity or programme. One implication of this would be that the SB under Article 6.4 could provide standardised input parameters such as default values for rate of return thresholds for project- and programme-based additionality tests to promote transformational impact.

8.3 Baseline setting considerations

The previous chapter also stressed that newly developed rules at the international level could provide important incentives for more stringent baseline setting, e.g., through performance benchmarks. The draft negotiation text until October 2021 includes different suggestions for potential benchmarks. The most stringent benchmark approach would be a BAT-derived performance benchmark which would be implemented under the Article 6.4 Mechanism. One important observation in this regard is that BAT-derived performance benchmarks or other performance baselines are only suitable for some sectors that feature homogenous products (e.g., metals, electricity generation) and processes such as certain industry processes (Füssler et al. 2019). The Article 6.4 SB would need to take this into account in the top-down determination of parameters. The implementation of such benchmarks could, however, also be relevant for Article 6.2 cooperative approaches. Host countries could see a great incentive in the fact that all MOs until BAT would be accounted towards their own NDCs. The JCM which has been established prior to the adoption of the Paris Agreement but which might strive for Article 6 recognition has for example been including the BAT approach among its eligible reference scenarios (ADB 2016).

In addition, these parameters would need to be updated on a regular basis. The Article 6.4 draft negotiation text foresees updates at the end of a crediting period which would translate into an update every five years (UNFCCC 2019d-f). The new approaches to baseline setting introduced in this report (chapter 5.2.4) such as dynamic baseline setting with ex-ante quantified parameters which are updated ex-post are calling for more regular update of key baseline parameters. Dynamic baselines should especially be required for sectoral and policy crediting. This should also be taken up by Article 6 negotiations or subsequent methodological/technical work by the SB under Article 6.4. In the case of Article 6.2, Parties could be invited to also report on this aspect, or a requirement could be adopted that parameters have to be checked by an accredited designated operational entity (DOE). The latter could also be implemented in the case of Article 6.4. It is considered appropriate to update most parameters every three years. There is a comprehensive level of experience with standardised baselines for various sectors in the CDM (UNFCCC 2021d) which provide a steppingstone for the broader use of benchmarks. In the context of the CDM, standardised baselines are only valid for up to three years. It is likely and favourable that new CDM approaches such as standardised baselines will be maintained with the same updated periods.

Another way in which baselines can become more stringent is to render key parameters or baselines more stringent over time. Baseline approaches must reflect the context of NDCs and LT-LEDS as has been shown in the chapters 4 and 5. In the case of methodologically very robust NDCs and LT-LEDS, the ex-ante modelling for the respective sector could be considered for establishing ex-ante reference scenarios for Article 6 activities. However, given the lack of agreed methodological approaches for determining NDC GHG emission pathways, baselines will need to be established according to activity-type specific methodologies. Long-term activity types such as forestry, agriculture and potentially carbon capture and storage should be treated

differently to consider methodologically relevant properties such as the permanence of GHG sequestration, for example by introducing buffer accounts (cf. voluntary standards).

Setting crediting baselines in manner that they are compatible with the 2°C emissions pathway is another approach which could be incentivised, and which would entail many implications. Whether the 'ought margin' or 'normative reference' is BAT or net zero does not change a lot about the general approach as the concept behind them is the application of a dynamic transition factor. In the case of a BAT 'ought margin', the issue that the baseline is too stringent to incentivise any investments (Füssler et al. 2019) is reduced, as the crediting baseline would gradually move towards BAT and not be set from at BAT-level from the onset. Hermwille (2020) argues that 'is margin' and 'ought margin' could also be determined by building on the CDM's Combined tool in the case of individual projects. The 'is margin' could be determined in the same way as crediting baselines are set under the CDM (Hermwille 2020). The 'ought margin' could then be established according to the tool's first step in which alternative scenarios with other technical options have to be identified. This implies that the tool could be transitioned to the Article 6.4 mechanism. The period in which a transition factor is applied should be dependent on technologies' lifetimes (Hermwille 2020). Longer transition periods should be considered for technologies with long technical lifetimes (e.g., power sector infrastructure). It would be possible to derive the 'ought margin' also from the LT-LEDS which would imply a reference date for the transition period of 2050 in most cases. Michaelowa et al. (2021b) put forward concrete indicators for 'fair' ambition coefficients that are in line with a country's development status and thus the CBDR-RC principle:

- Gross National Income per capita
- Cumulated historical emissions
- Mitigation potential
- Geographic criteria

Based on these indicators, country-specific pathways would be developed to be applied also to crediting activities. It is unlikely that such an approach can be taken up by ongoing Article 6.4 negotiations as discussions on such approaches warrant further research.

From a practical viewpoint, however, the dynamic baseline concepts described above face important challenges:

Incentives: Highly stringent baselines, e.g., defined in deviation from a very strictly identified 'best available technology' (e.g., the upper 5-10% of market penetration, or based on global technology assessments instead of regional ones) can reduce incentives for Article 6 activities that support conditional NDC targets and are based on investment tests. A good balance must be found to ensure the promotion of technologies or practices that raise ambition in the host country but consider a gradual shift towards a wider adoption to the regional or globally 'best available' technologies. This could mean that higher carbon prices may be needed for a potentially smaller amount of verified mitigation outcomes for technologies with strong benefits for transformational change. This implies that there needs to be the necessary willingness to pay for such higher ITMO prices from the buyer entity side. Otherwise, the mechanism may be too unattractive for project owners and carbon buyers.

- **Predictability:** Project owners will only invest in additional mitigation actions if they have a reasonable degree of certainty about the carbon revenues they can expect. Periods of baseline validity and of key parameters should be known upfront. Under the CDM, baselines were

generally set to give a "realistic" representation of the business-as-usual scenario. In contrast, the duration of the crediting period (7 years renewable or 10 years) was, inevitably, an arbitrary choice prescribed by the CDM rules, modalities and procedures (Ahonen et al. 2021). Moving from "realistic" to "dynamic" baselines may imply risk of introducing a second arbitrary element into the mechanism, thereby rendering it less transparent and robust. Baselines could also be made 'dynamic' based on ex-ante fixed and conservative reductions of baseline parameters to avoid uncertainty for project owners and investors. Frequent and unpredictable revisions to baselines will undermine project owner's readiness to invest.

- **Efficiency:** Stringent baselines require proportionally longer crediting periods to yield the same number of creditable emission reductions and monetary carbon revenues. Project owners will, however, discount the carbon revenues at the "far" end of the crediting period in their investment decisions. Therefore, a higher price per tCO_2 will be required to create equivalent investment incentives under a crediting scheme with "stringent" baselines. Higher carbon prices will require an increase of ambition and willingness to pay on the 'buyer' side.
- **Resources and capacity:** The experience with CDM and Joint Implementation (JI) has shown that defining and agreeing on standardised baselines is a highly complex, resource-intensive and contentious process even for seemingly "homogeneous" products such as cement. Given the many potential technologies and highly varying host country circumstances, this will require significant resources at the level of the Article 6.4 SB and potentially the Regional Collaboration Centres, as many host countries will not have the institutional capacity, technical know-how nor the resources to ensure robust standardised baseline setting.

The raised points identify unresolved challenges for redesigning Art.6 baseline rules. Taken together, these challenges may be seen as speaking in favour of exposing the dynamic baseline concept to a "reality check" against the incentive structure for project developers, buyers and sellers prior to design and implementation. As a starting point, this could mean that baselines would need to reflect the more stringent of (i) commercial business-as-usual and (ii) the requirements of policy instruments put in place by the host country and those planned to be adopted in order to achieve unconditional NDC targets. Dynamic elements could then be introduced to ensure the baseline declines in congruence with the expected level of increased ambition needed by the host country to achieve its NDC targets. A combination of ex-ante fixed declines in baseline parameters and updates to all baseline parameters at the point of crediting period renewal, could help to find a balance between predictability and stringency.

In addition to crediting baselines, crediting periods should be kept to the minimum necessary for making the targeted mitigation action commercially viable at the prevailing carbon price levels which will have to be significantly higher than under the CDM context. This may result in a much greater market differentiation in particular for early-stage technologies with higher costs that are needed to accelerate long term transformations. After the end of the crediting period, the projects would usually continue to operate and thereby fully count towards the host country's NDC.

9 Conclusion and recommendations

To answer the research question how Article 6 cooperation in the Paris Agreement can be designed and practically applied to enable transition pathways and transformational impacts for net zero greenhouse gas emissions and sustainable development, the authors propose the following definition of transformational change tailored to the objectives of Article 6 (see chapter 4):

> *A fundamental, sustained change of a system that ends high-carbon practices and contributes to a zero-carbon society[40], in line with the Paris Agreement goal to limit global warming to 1.5–2°C and the United Nations Sustainable Development Goals.*

Within the broader conceptual framework introduced above, four transformational change characteristics are particularly relevant to Article 6 objectives, namely 'Digitalisation', 'Private sector and Governments', 'Carbon pricing' and 'Dynamic baselines' (see chapter 4). While transformational change is essential to achieving the goals of the Paris Agreement, the Article 6-specific transformation characteristics do not show any broad application to date. This can be explained by the fact that there is little empirical experience due to the early stage of Article 6 rulemaking and implementation. The final rulebook for Article 6 was agreed at COP26 in November 2021. The three case studies presented in this report (chapter 7) reveal that the Article 6 landscape is still at an early stage but likely to be more diverse than activities under the Kyoto Mechanisms and offers potential to harness transformational change. While core sectors like waste and energy dominate the current Article 6 piloting landscape (Greiner et al. 2020), more innovative activities such as clean transport including cycling and walking, emerging technologies like hydrogen as well as nature-based solutions may emerge more prominently.

Based on the transformational change definition and the relevant characteristics, favourable Article 6 safeguards and design options for transformational change have been identified by the authors (see chapter 5). Regarding mitigation outcomes at scale, options include progressive upscaling from projects and programmes towards sectoral mitigation activities and policy crediting, promoting early-stage technologies, as well as taking on additional commitments by the acquiring Party to implement further mitigation actions ("insetting") for purchased ITMOs. Regarding sustainable development outcomes at scale, the authors argue that tools (of voluntary nature for Article 6.2 cooperative approaches) need to be developed that adequately capture and assess co-benefits and that stakeholder engagement processes need to be promoted. Article 6 design options for the 'technology development and digitalisation' characteristics include a shift to high-hanging fruit meaning emerging technologies with currently high, but potentially declining abatement costs such as hydrogen or direct air capture and storage, the linking of crediting periods with the payback period and digitalised MRV approaches and payment methods that allow for more transparency and efficiency. Regarding normative change, crediting baselines will need to better reflect global mitigation aspirations by making them more dynamic and align them with the Paris Agreement's temperature target. In addition, specific forms of public-private collaboration are required in which the public sector actors set incentives that promote private sector involvement in Article 6 activities including through the use generated mitigation outcomes for domestic compliance and voluntary carbon pricing instruments. Finally, carbon pricing incentives through for example the linking of ETS and COVID-19 recovery policies and funding could be harnessed by Article 6 cooperation.

[40] Zero carbon means, "net zero carbon", which implies that some remaining CO_2 emissions can be compensated by the same amount of CO_2 uptake, provided that the net emissions to the atmosphere are zero.

Based on the observations made in this report, the practical implementation of Article 6 baseline approaches and methodologies requires further guidance and incentives (chapter 8). For example, an incentive structure (see chapter 6) that rewards SDG benefits with both regulatory and monetary incentives, and safeguards may be required to be put in place to mitigate negative impacts. COP26 delivered important high-level guidance on these issues, but further technical work and negotiations are required to operationalise these decisions. The authors propose an incentive structure that comprises multiple regulatory, monetary and behavioural incentives that can be implemented both at the international level (through an intergovernmental process or non-state actors) and the national level (through the host country and buyer country). Regulatory and behavioural incentives at the international level include the use of Article 6 cooperation only in case of ambitious NDCs, the ban of credit generation that do not comply with the 1.5°C emissions pathway, the formation of coalitions and the formation of a buyer's club in order to work towards good practices that exceed minimum standards. Regulatory and monetary incentives at the national level comprise host- and buyer-side promotion of specific activities and technologies, the exclusion of Article 6 activities that are incompatible with regional or national decarbonisation paths, provision of ex-ante technical assistance for MRV of SDG impacts and the encouragement of private sector involvement through specific incentives.

Finally, the case study analysis (chapter 7) reveals that Article 6 cooperation requires a better integration of MRV systems at different levels for NDC accounting and reporting, as well as for SDG benefits.

First, incentives for transformational change need to be reflected in emerging Article 6 rules. Core carbon market principles such as additionality and stringency in baseline setting need to be reconsidered to promote transformational impact from international carbon markets in line with the long-term objectives of the Paris Agreement. Article 6 activities will need to be additional not only to BAU but also to existing policies and potentially to planned policies and measures laid out in countries' NDCs and LT-LEDS, unless these are defined as being conditional on international support. We recommend that in order for cooperative approaches to promote transformational impact:

- **Activities generating ITMO's need to be additional to at least the unconditional NDC** targets to safeguard against overselling by the host country. This will also depend on how the host country defines conditionality of its targets and what role it foresees for Article 6 cooperation.
- **In case of an absent NDC stringency test, an investment test at activity level should be conducted**. Such a dual approach to additionality testing represents a safeguard against 'hot air' and enables the host countries to prevent the sale of 'low-hanging fruit'.
- We propose that an important incentive would be the development of conservatively established **positive lists by host countries or buying entities for automatic additionality**. This provides guidance to activity proponents on what kind of activities they are considering granting authorisation to or acquiring ITMOs from. These positive lists should have a clearly defined validity period that is regularly reviewed.
- **The transformational change concept could itself become an additionality criterion** for establishing positive lists.
- **Promoting the sustainable development outcomes of actions at scale**, aligned with Host Party national objectives, while safeguarding against negative impacts, respect for human

rights and other rights, enabling stakeholder consultations and public participation can leverage ambition raising for mitigation outcomes, sustained over time.

It is widely recognised among negotiators and experts that stringency in baseline setting is an important principle in the Paris Agreement context to ensure environmental integrity and contributions to host country NDC achievement. To incentivise NDC ambition raising over time, we recommend a transformational change approach to baseline-setting:

- **Make baselines more dynamic** which can either be achieved by quantifying baseline parameters ex-post in a pre-defined calculation or by changing in value over time upon pre-defined changes in parameters. Especially the latter one is aligned with the proposed definition of transformational change, asking the question of what *should be* rather than what is. The determination of the 'normative reference' can be based on BAT-derived benchmarks and long-term deep decarbonisation or net-zero goals. The operationalization would be most simple through 'ambition coefficients' that decline over time and be plugged into existing baseline methodologies, while specification of benchmarks would entail significant transaction costs.
- Most importantly, to consider differentiation, based on the **application of the CBDR-RC principle in such a dynamic baseline approach** which would imply that most countries would increasingly be limited to generating units from emission removals (nature-based solutions or negative emission technologies) after 2030 whereas low-income countries with limited historical responsibility and per capita emissions could sell emission reductions until the second half of the century. Yet, several practical concerns regarding stringent baseline setting remain. The shift from static to more dynamic baselines bears the risk of unpredictability for project developers.
- **A good balance needs to be sought between predictability and stringency** through, for example, the combination of ex-ante fixed adjustments in baseline parameters – like an ambition coefficient pre-defined for several NDC periods– and updates to all baseline parameters at the point of crediting period renewal. The shortening of crediting periods can also contribute to the transformative impact of Article 6 activities. However, such a shortening should be based on technology characteristics and cost structures (e.g., payback period) as truly transformational technologies may actually require long crediting periods as they may result in higher costs, especially if technologies are at an early stage of development.

The stringent application of core carbon market principles will have an impact on the carbon credit volume and price of ITMOs. Some of these regulatory changes and innovations could initially be driven by voluntary carbon market standards or bilateral Article 6.2 cooperation, which are not as constrained by the need to build consensus in the intergovernmental UNFCCC process. However, a more substantial shift in the global carbon market can only be expected if investment incentives will be set in a manner that they account for the reduced amount of mitigation outcomes that can be monetized. Demands from buyer countries and entities thus need to show a necessary willingness to pay a higher price for ITMOs with transformational impact. This implies that the buyer can set favourable conditions and incentivise carbon market activities' that contribute to transformational change aligned with the global goals for climate and sustainable development. Real world applications of such an approach, initially driven by governments, but potentially also be the private sector through voluntary initiatives, will be needed in order to ensure that market participants understand and work towards these same objectives.

Moreover, having transparent and predictable incentives in place for supporting transformational 'high-hanging fruit' through carbon markets, seems crucial in order to foster the political will of host countries to undertake more cost-efficient mitigation options with their own means. Therefore, raising awareness for additional requirements to achieve transformational change through carbon markets beyond 'minimum participation requirements' should also be considered in any Article 6 capacity building efforts that are expected upon finalizing the Art.6 rulebook.

As a result, the study clearly demonstrated that from a conceptual point of view, carbon markets can be an important driver of transformational change. However, this is not yet well reflected either in multilateral rules or in early-stage Article 6 piloting and associated incentive structures, in large part owing to the continued uncertainty on the rules for global carbon markets prior to COP26. Yet, it will be crucial to ensure that both rules, incentives, and carbon market practices fully align with the urgency and ambition of the Paris Agreement.

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UNFCCC (2019d): Draft text on matters relating to Article 6 of the Paris Agreement - Rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement. Version 1 of 13 December 11:45, Madrid

UNFCCC (2019e): Draft text on matters relating to Article 6 of the Paris Agreement - Rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement. Version 2 of 14 December 9:00, Madrid

UNFCCC (2019f): Draft text on matters relating to Article 6 of the Paris Agreement: Rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement. Version 3 of 15 December 1:10, Madrid

UNFCCC (2019g): Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its second session, held in Madrid from 2 to 15 December 2019, Matters relating to Article 6 of the Paris Agreement, 9/CMA.2, Madrid

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A Comprehensive list of the literature reviewed

Category	Title	Year	Reviewed? Yes/No
COVID-19	Coronavirus questions that will not go away: interrogating urban and socio-spatial implications of COVID-19 measures	2020	Yes
	German environment minister defends airline bailout, promises green recovery	2020	Yes
	COVID-19 and the policy sciences: initial reactions and perspective	2020	No
	Environmental consequences of COVID-19 on the global and Russian economics	2020	No
	The Corona Crisis and Climate Protection – Keeping Long-Term Goals in Mind	2020	Yes
	Socialising tourism for social and ecological justice after COVID-19	2020	Yes
	Coronavirus crisis and its effects on the economy	2020	No
	Does the COVID-19 outbreak mark the onset of a sustainable consumption transition?	2020	Yes
	A Brave New World: Lessons from the COVID-19 Pandemic for Transitioning to Sustainable Supply and Production	2020	Yes
	COVID-19, Klimawandel und Konjunkturpakete	2020	No
	Foresight of Coronavirus (COVID-19) Opportunities for a Better World	2020	No
	The Impact of COVID-19 on Public Space: A Review of the Emerging Questions	2020	Yes
	The European Green Deal after Corona: Implications for EU climate policy	2020	Yes
	Germany ' s Angela Merkel calls for ' climate-friendly ' coronavirus response	2020	No
	2020 State of the EU ETS Report	2020	Yes
	UN chief: don 't use taxpayer money to save polluting industries	2020	No
	How the necessary economic support measures can cushion the corona crisis and accelerate the ecological transition	2020	Yes
	Towards a sustainable European ‘ Marshall Plan ': How to turn the crisis into an opportunity	2020	No
	For crisis management and a sustainable future: Making our economy more resilient with a climate stimulus	2020	Yes
	Navigating the Clean Energy Transition in the COVID-19 Crisis	2020	Yes

Category	Title	Year	Reviewed? Yes/No
	Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change?	2020	Yes
	A government roadmap for addressing the climate and post COVID-19 economic crises	2020	Yes
	A net-zero emissions economic recovery from COVID-19	2020	Yes
	Restoring the Economy with Climate Solutions	2020	Yes
	Green Swan 2 - Climate change and COVID-19: reflections on efficiency versus resilience	2020	Yes
Finance and mechanisms	Transformational change in the Climate Investment Funds. A synthesis of the evidence	2019	No
	Reflections Report	2019	No
	Swedfund's Policy for Sustainable Development	2015	No
	Sustainability Policy		No
	India - India Energy Efficiency Scale-up Program: Program Appraisal Document	2018	No
	Discussion Note: Corresponding adjustments	2018	Yes
	Harmonized EDFI Exclusion List	2011	No
	Implementing FMO ' s Sustainability Policy – Considerations for FMO	2016	Yes
	Jahresbericht 2018 - Der Blick weitet sich bis 2030	2018	No
	Evaluation of Transformational Change in the Climate Investment Funds	2019	No
	Diálogo Formal Perú-Suiza sobre la Implementación del Artículo 6. 2 del Acuerdo	2019	No
	Swedfund's Position Paper on Climate Impact	2017	No
	Program Information Note India Energy Efficiency Scale up Program		No
	ALIGNING INVESTMENTS WITH THE PARIS AGREEMENT TEMPERATURE GOAL	2018	No
	Jahresbericht 2017	2017	No
	Carbon Markets and Policy Crediting	2019	No
	TCAF - Light Touch Review	2017	Yes
	Driving the transformation to a climate-resilient financial system	2019	No
	Joint Multilateral Development Bank report on climate-related finance, June 2018, Annex A.C.1. 1	2019	No
	Deriving a 1 . 5 ° C Pathway for a Financial Institution	2018	Yes

Category	Title	Year	Reviewed? Yes/No
	Serious Challenges: Experiences from piloting activities under Article 6.2	2019	Yes
	International climate finance: Measures to adapt to climate change and reduce greenhouse gas emissions in the agriculture sector of the Philippines	2018	No
	Formal dialogue betweem Peru and Switzerland on a bilateral agreement under Art 6	2018	Yes
	Designing toolkit for transformation	2019	No
	Position Statement on Coal Power Generation and Coal Mining	2016	Yes
	The EIB Group - a sustainable institution	2017	No
	Guidance note: Determination of the crediting period	?	No
	Climate & Development Strategy 2017-2022	2016	No
	Foundation KliK: Enabling private Sector engagement in Foundations KliK and CCF[41]	2015	Yes
	Transformative Carbon Asset Facility (TCAF): Status update	2017	Yes
	Climate Strategy	2016	No
	Green Climate Fund Proposal Toolkit 2017	2017	No
	Sustainability Report	2016	Yes
	Core parameters for TCAF operations	2018	Yes
	Further Development of the Initial Results Management Framework	2014	No
	Signals of Transformational Change - Insights from the Evaluation of Transformational Change in the Climate Investment Funds	2020	No
	Absolute GHG Accounting Approach for Financed Emissions	2018	Yes
	Guidance note: Attribution of emission reductions to TCAF operations	?	No
	The environment & climate	2016	No
	Call for Proposals to supply ITMOs	2019	Yes
	Different approaches to carbon crediting	?	Yes
Grey	A Social Contract for Sustainability - Full report	2011	No
	Emissions Gap Report 2019	2019	No
	Extent to which ICF intervention is likely to lead to Transformational Change	2018	No

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Category	Title	Year	Reviewed? Yes/No
	Fostering Effective Energy Transition 2019 Edition	2019	No
	Navigating a New Agenda	2014	No
	Transformational Change Taxonomy. Methodological framework for the assessment of transformational change in NAMAs Version 1	2016	No
	Policy Innovations Transformative Change	2016	Yes
	SD-Benefits in Future Market Mechanisms under the UNFCCC	2017	No
	ICAT Transformational Change Methodology	2019	Yes
	Transformationsforschung	2017	No
	Supporting vulnerable CDM projects through credit purchase facilities	2019	Yes
	The Great Transformation	2013	No
	Towards our common digital future	2019	No
	Financing Climate Futures - Rethinking Infrastructures	2018	Yes
	Transformational Change for Low Carbon and Sustainable Development	2015	No
	Analysing the interactions between new market mechanisms and emissions trading schemes: Opportunities and prospects for countries to use Article 6 of the Paris Agreement	2019	Yes
	Article 6 Pipeline	2019	No
	Transformative environmental policy: Consistently promote and shape sustainable development	2018	No
	Working Paper Driving Transformative Change: the Role of the Private Sector in Advancing Short-Term and Long-Term Signals in the Paris Climate Agreement	2015	No
	Systemic Thinking for Policy Making: The Potential of Systems Analysis for Addressing Global Policy Challenges in the 21st Century	2020	No
	Shifting Paradigms: Unpacking Transformation for Climate Action	2014	No
	Transformations to Achieve the Sustainable Development Goals	2018	No
	Development and justice through transformation: The Four Big 'I's	2016	Yes
	transformational-definition-global-action-networks-waddell.pdf		No

Category	Title	Year	Reviewed? Yes/No
	The Future is Now – Science for Achieving Sustainable Development	2019	Yes
	A Clean Planet for all - A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy	2018	Yes
	Unlocking The Inclusive Growth Story Of The 21st Century: Accelerating Climate Action	2018	No
	Transforming our work: Getting ready for transformational projects Guidance	2020	Yes
	Hermwille: Reconciling Pretensions and Reality – The Situation-Ambition Approach for Dynamic Baselines under Article 6.4	2020	Yes
	Kreibich/Obergassel: New Paths to Policy Crediting? Challenges and Opportunities of Policy-based Cooperation under Article 6 of the Paris Agreement	2019	Yes
Historical cases	The Public Role in Economic Transformation: Lessons from World War II	2020	Yes
	The First World War and the Latin American transition from coal to petroleum	2019	Yes
	Sustainable energy transition: the case of the Swedish pulp and paper industry 1973–1990	2016	Yes
	Conditions for politically accelerated transitions: Historical institutionalism, the multi-level perspective, and two historical case studies in transport and agriculture	2019	Yes
	Radical change and deep transitions: Lessons from Europe's infrastructure transition 1815–2015	2019	No
	Conditions and intervention strategies for the deliberate acceleration of socio-technical transitions: lessons from a comparative multi-level analysis of two historical case studies in Dutch and Danish heating	2019	Yes
	Imagining the Age of Oil: Case Studies in British Petrocultures , 1865-1935	2018	No
	Past and prospective energy transitions: Insights from history	2012	Yes
	Alternative liquid fuels in the UK in the inter-war period (1918–1938): Insights from a failed energy transition	2016	Yes
	Political acceleration of sociotechnical transitions - Lessons from four historical case studies	2018	No
	The Aftermath Of The Closure Of The Dutch Coal Mines In South Limburg: Regional Economic And Social Reconstruction	2012	Yes
	Energy transitions research: Insights and cautionary tales	2012	Yes

Category	Title	Year	Reviewed? Yes/No
Peer-reviewed	Achieving the 17 Sustainable Development Goals within 9 planetary boundaries	2019	No
	A Doughnut for the Anthropocene: humanity's compass in the 21st century	2017	Yes
	Six Transformations to achieve the Sustainable Development Goals	2019	Yes
	Defining transformative climate science to address high-end climate change	2019	No
	Sustainability transitions: A political coalition perspective	2014	No
	A safe operation space for humanity	2009	No
	From theory to practice: understanding transformational change in NAMAs	2014	Yes
	An agenda for sustainability transitions research: State of the art and future directions	2019	Yes
	The implications of how climate funds conceptualize transformational change in developing countries	2018	Yes
	Planetary boundaries: Guiding human development on a changing planet	2015	Yes
	Experimenting for sustainability transitions: A systematic literature review	2019	No
	Assessing transformational change potential: the case of the Tunisian cement Nationally Appropriate Mitigation Action (NAMA)	2018	No
	Transformation in a changing climate: a research agenda	2018	No
	Who determines transformational change in development and climate finance?	2016	Yes
	Policy instruments for limiting global temperature rise to 1.5°C–can humanity rise to the challenge?	2018	Yes
	IPCC, 2018: Summary for Policymakers	2018	Yes
	Additionality revisited: guarding the integrity of market mechanisms under the Paris Agreement	2019	Yes
	Ten key short-term sectoral benchmarks to limit warming to 1.5°C	2018	Yes
	Powering sustainable development within planetary boundaries	2019	No
	Allocating planetary boundaries to large economies: Distributional consequences of alternative perspectives on distributive fairness	2020	Yes

Category	Title	Year	Reviewed? Yes/No
	From Planetary Boundaries to national fair shares of the global safe operating space — How can the scales be bridged?	2016	No
	Transformational change in the Climate Investment Funds. A synthesis of the evidence	2019	No