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VCMI Voluntary Carbon Markets Integrity Initiative

Article 6.2 Toolkit

A Strategic Guide For Carbon Market Stakeholders

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Pranjal Kothari | George Hodgetts
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Disclaimer
This guidance was prepared by IIED, SKUAST-K, and VCMI and reflects independent views of the authors who takesole responsibility for the information presented in this report, as well as for any errors or omissions.

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We wish to express particular appreciation to the Ministry of Agriculture and Farmers' Welfare (MoAFW), Government of India, for their foundational support and institutional endorsement of this publication. MoAFW provided the enabling policy environment and inter-institutional coordination essential to the development of this toolkit, reflecting the Ministry's commitment to integrating climate-smart agricultural practices and carbon market opportunities into India's national agricultural development agenda. Their recognition of the importance of voluntary carbon markets as a mechanism for delivering co-benefits to farming communities including income diversification, sustainable land management, and livelihood resilience, has been instrumental in shaping the scope and direction of this work. MoAFW's engagement also reinforced the alignment of the toolkit's objectives with India's Nationally Determined Contributions (NDCs) and its broader commitments under the Paris Agreement, particularly in advancing agricultural mitigation pathways and rural sustainable development.

IIED, VCMI, and SKUAST-K actively participated in the project Technical Support for Developing Agricultural Voluntary Carbon Markets in India, under which the Article 6.2 Toolkit: A Strategic Guide for Carbon Market Stakeholders has been developed as an important technical and capacity-building resource. Their commitment to transparent, credible, and high-integrity climate action has shaped the direction, technical rigour, and practical relevance of this publication.

This publication provides a comprehensive and practical guide to understanding and implementing cooperative approaches under Article 6.2 of the Paris Agreement, with a focus on promoting transparent, equitable, and high-integrity carbon market mechanisms that support sustainable development and global climate goals. The publication aims to strengthen awareness and technical understanding of key concepts such as Internationally Transferred Mitigation Outcomes (ITMOs), corresponding adjustments, measurement, reporting and verification (MRV) systems, carbon accounting frameworks, authorization procedures, and climate finance opportunities, while offering strategic and operational guidance for governments, institutions, project developers, researchers, and other stakeholders seeking to engage effectively in international carbon market cooperation and advance the implementation of Nationally Determined Contributions (NDCs).

We would also like to acknowledge the contributions received from a diverse range of stakeholder groups, including:

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- **International climate and development organisations:** We acknowledge experts and practitioners associated with IIED and VCMI for sharing knowledge and technical perspectives on Article 6 implementation, carbon market governance, integrity frameworks, transparency requirements, and international cooperation mechanisms under the Paris Agreement.
- **Carbon market practitioners and technical experts:** We thank carbon market professionals, project developers, MRV experts, and sustainability practitioners who provided practical insights into carbon project development, ITMO transactions, MRV systems, baseline methodologies, and integrity safeguards for cooperative approaches.
- **Government agencies and extension institutions:** We appreciate the engagement of agricultural departments, policymakers, extension agencies, and rural development institutions whose policy insights helped contextualise the opportunities and challenges associated with Article 6.2 implementation, corresponding adjustments, registry systems, and national carbon market readiness.

This project also recognises the importance of ensuring that Article 6.2 implementation contributes not only to emissions reductions but also to broader sustainable development objectives, including livelihood enhancement, environmental protection, technology transfer, social inclusion, biodiversity conservation, and resilience-building for vulnerable communities. The toolkit therefore aims to encourage responsible and equitable participation in carbon markets while maintaining environmental integrity and alignment with national development priorities.

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Prof. Nazir A. Ganai
Vice-Chancellor

Message

It is with great pleasure that I write this message for the edited volume ***"Article 6.2 Toolkit: A Strategic Guide for Carbon Market Stakeholders."*** This publication is both timely and significant, as the global community transitions from ambition to implementation under the Paris Agreement and seeks robust, transparent, and cooperative pathways to achieve climate goals.

Article 6.2 represents one of the most complex yet promising pillars of international climate cooperation. It enables countries to engage in bilateral and multilateral approaches for the transfer of mitigation outcomes, while safeguarding environmental integrity and promoting sustainable development. However, its effective operationalization demands deep technical understanding, institutional readiness, and strategic coordination among governments, market actors, and development partners. This edited volume responds to that need with clarity, depth, and practical insight.

What distinguishes this toolkit is its strong emphasis on usability. By bringing together diverse expert perspectives, it translates intricate regulatory frameworks, accounting rules, and governance requirements into a coherent strategic guide for policymakers, project developers, financial institutions, and other carbon market stakeholders. The volume thoughtfully addresses critical issues such as corresponding adjustments, authorization processes, risk management, transparency, and alignment with national climate strategies, areas that are essential for building trust and credibility in Article 6.2 mechanisms.

I particularly value the book's role in strengthening capacity and fostering informed participation from both public and private actors, especially in developing and emerging economies. It reflects the power of academic leadership in shaping applied knowledge that informs policy, supports market innovation, and contributes to global climate action. I commend the editors and contributing authors for their intellectual rigor, collaborative spirit, and commitment to advancing high-integrity carbon markets. I am confident that this toolkit will become a key reference for institutions and professionals navigating Article 6.2 cooperation, and that it will meaningfully contribute to accelerating climate ambition through effective and equitable international partnerships.

(Nazir Ahmad Ganai)

Place: SKUAST-K, Shalimar, Srinagar
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Prof. Haroon R. Naik

Message

It is a pleasure to present this message for the edited volume *"Article 6.2 Toolkit: A Strategic Guide for Carbon Market Stakeholders."* As global climate action enters a decisive implementation phase, the need for credible, well-designed cooperative approaches under the Paris Agreement has never been greater. This volume responds to that need with clarity, depth, and strong analytical grounding.

From the standpoint of an agricultural university, Article 6.2 represents a uniquely challenging domain one that sits at the intersection of climate science, international law, economics, governance, and digital systems for accounting and transparency. This edited work is commendable for addressing these complexities in an integrated and applied manner. Rather than treating Article 6.2 as a purely regulatory construct, the toolkit frames it as an operational system that must function effectively across national institutions, markets, and stakeholders.

The strength of this volume lies in its emphasis on strategic readiness. Through expert contributions, it provides practical guidance on institutional arrangements, authorization processes, risk allocation, and accounting integrity, while remaining firmly aligned with national climate objectives. The focus on corresponding adjustments, safeguards against double counting, and transparency mechanisms reflects a strong commitment to environmental integrity—an essential foundation for trust in international carbon cooperation.

I appreciate the toolkit's potential to support capacity building in emerging economies, where Article 6.2 can unlock investment, technology transfer, and policy innovation when implemented responsibly. The volume demonstrates how rigorous research and evidence-based analysis can inform real-world decision-making and market design.

I congratulate the editors and contributing authors for producing a resource that balances conceptual clarity with practical relevance. I am confident that this toolkit will serve as a key reference for researchers, policymakers, market practitioners, and institutions seeking to engage effectively in Article 6.2 cooperation and to advance high-integrity, outcome-oriented carbon markets.

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ABOUT IIED

The International Institute for Environment and Development (IIED) is a globally respected policy and action research organisation that works to promote sustainable development and social justice. Founded in 1971 and headquartered in London, IIED collaborates with partners across the world to ensure that the voices of the most vulnerable are heard in decisions affecting their lives and the environment.

IIED's mission is to build a fairer,more sustainable world through evidence, action, and influence. It focuses on pressing global challenges such as climate change, biodiversity loss, sustainable markets, urban development, and natural resource governance. The organization operates with a strong commitment to locally led solutions, placing equity and inclusion at the heart of its work.

A hallmark of IIED's approach is its emphasis on partnerships, particularly with organisations in the Global South. Rather than imposing external solutions, IIED supports local research institutions, civil society groups, and communities to develop strategies rooted in local knowledge and context. This ensures that sustainable development policies and practices are both effective and equitable.

Through rigorous research, policy analysis, and advocacy, IIED plays a key role in shaping international debates and policies. It is a trusted advisor to governments, multilateral institutions, NGOs, and private sector stakeholders. IIED also produces influential publications, including the Environment and Urbanization Journal and numerous policy briefs that help bridge the gap between research and real-world action.

In an era of mounting environmental and social challenges, IIED's work is more critical than ever. By combining research excellence with inclusive, collaborative methods, IIED contributes to a future where people and the planet thrive together.

For more information, visit: iied.org

ABOUT VCMI

The Voluntary Carbon Markets Integrity Initiative (VCMI) is a global non-profit working to mobilize private sector finance for climate action and sustainable development by scaling high-integrity carbon credit markets.

VCMI sets the global benchmark for credible corporate use of carbon credits through its Codes of Practice, helping build trust, confidence and consistency across the market. VCMI also supports governments to unlock corporate demand for carbon credits by hosting the Secretariat for The Coalition to Grow Carbon Markets.

Through its Access Strategies Program and partnership with the Climate Vulnerable Forum and its V20 Finance Ministers (CVF-V20), VCMI supports emerging markets and developing economies to build the policies, capacity and infrastructure needed to leverage carbon markets to deliver finance for their climate and sustainable development priorities.

VCMI collaborates with stakeholders from civil society, the private sector, Indigenous Peoples, local communities, and governments to harness the full potential of high-integrity carbon markets. This includes participation from civil society, academia, government, business and other relevant initiatives focused on high-integrity carbon credit markets.

A separate governance structure exists for VCMI's work as host of the Secretariat for The Coalition to Grow Carbon Markets. The Coalition's strategy and policy positions are determined solely by its member governments.

VCMI is an independent non-profit operating as a sponsored project of Social Change Nest. VCMI was announced by COP26 President-Designate Alok Sharma on 31 March 2021, and has received funding from the Ballmer Group, Bezos Earth Fund, Children's Investment Fund Foundation, ClimateWorks Foundation, Google LLC, David and Lucile Packard Foundation, and UK Department for Business, Energy and Industrial Strategy.

For more information, visit: vcmintegrity.org

HOW TO USE THIS TOOLKIT

The Article 6 Toolkit is structured to function as both a technical manual and a strategic planning tool, and can be used in the following ways:

i. Understand the Foundations of Article 6

Start with Chapter 1, which introduces the overall structure and intent of Article 6, including the mechanisms under Article 6.2 (cooperative approaches) and Article 6.4 (centralized crediting mechanism). The section also explains corresponding adjustments and their critical role in ensuring environmental integrity and transparency.

ii. Overview of Reporting Requirements for Participating Parties

Chapter 2 covers the Initial Reports required before transferring ITMOs, and guidance for demonstrating that a participating Party fulfils its participation responsibilities under Article 6. This section serves as a roadmap for meeting UNFCCC reporting obligations.

iii. Follow the Participation Process

Use Chapter 3 as a practical guide for navigating the full project cycle, from pre-assessment and registration to credit issuance, authorization, and reporting. This chapter provides a procedural blueprint that governments and project proponents can adapt to their national systems.

Key tools include: Project Idea Note (PIN), template, validation protocols, MRV guidance, and grievance redress procedures.

iv. Leverage India's Framework as a Reference

Refer to Chapter 4, which presents India's strategic and institutional approach to Article 6 implementation. This includes sectoral prioritization, governance structures (e.g., NDAIAPA), and policy innovations that can serve as a model for other developing countries seeking to operationalise their participation.

v. Leverage Agricultural Waste for Sustainable Aviation Fuel: A Prime Carbon Project Opportunity

Chapter 5 introduces a high-potential mitigation pathway transforming agricultural waste into Sustainable Aviation Fuel (SAF) as a scalable carbon project. Given the aviation sector's rising emissions and the global push to decarbonise through CORSIA and net-zero targets, SAF presents a near-term climate solution. This chapter explains:

- How agricultural residues like rice husk and sugarcane bagasse can be valorized for SAF
- The GHG mitigation potential of SAF (up to 94% emission reduction)
- How such projects generate carbon credits and align with circular economy principles
- Socio-economic benefits such as rural employment, reduced air pollution, and energy security
- Case studies from Colombia (rice husk in Tolima) and India (sugarcane molasses), demonstrating techno-economic viability, process integration, and local impacts

vi. Case Studies

Real-world applications of Article 6.2 cooperative approaches covered under Chapter 6:

- Thailand: Governance, pilot projects, and sustainable development safeguards.
- Ghana: Bilateral agreements, institutional structures, and initial project pipeline.

vii. Annexes

- Annex 1: Initial report outline template.
- Annex 2: Voluntary standardised template for authorization of ITMO use under a cooperative approach

CONTENTS

1. Introduction 1
1.1 Overview 1
1.2 Understand Article 6 5
1.3 Corresponding Adjustments under Article 6 12
2. Overview of reporting requirements for participating Parties 17
2.1 Initial reports 17
2.2 Demonstration that the participating Party fulfils its participation responsibilities 20
3. Participation Processes 23
3.1 Pre-Assessment and Account Creation 24
3.2 Permit Issuance and Host Country Approval 25
3.3 Project Validation and Registration 25
3.4 Conditional Authorization and Priority Evaluation 26
3.5 Implementation, Monitoring, and Verification 27
3.6 Credit Issuance and Final Authorization 27
3.7 Reporting and Compliance 28
3.8 Grievance Redress and Continuous Improvement 29

4. India's Strategic Framework for Article 6 Cooperative Approaches under the Paris Agreement 33
4.1 Authorization Arrangements India for Article 6.2 34
5. Leveraging Agricultural Waste for Sustainable Aviation Fuel: A Prime Carbon Project Opportunity 39
5.1 SAF from Rice husk/straw 43
5.2 SAF from Sugar Cane 47
Case Study: Thailand's Participation in Article 6.2 Cooperative Approaches under the Paris Agreement 51
Case Study: Ghana's Article 6.2 Cooperative Approach in the Paris Agreement . . . 52
Annex 1: Initial report outline template 54
Annex 2: Voluntary standardized template for the authorization of the use of the internationally transferred mitigation outcomes from a cooperative approach 65

1. INTRODUCTION

1.1 Overview

Since the adoption of comprehensive operational guidance for Article 6 of the Paris Agreement in Glasgow in 2021, where Decision 2/CMA.3 established the foundational guidance on cooperative approaches under Article 6, paragraph 2, of the Paris Agreement. Further detailed implementation guidance for the full suite of Article 6 mechanisms was subsequently adopted at CMA.6, held in Baku in November 2024, through a package of four decisions: Decision 4/CMA.6 (cooperative approaches under Article 6.2); Decision 5/CMA.6 (guidance on the mechanism under Article 6.4); Decision 6/CMA.6 (further guidance on the Article 6.4 mechanism)[1] countries have shown increasing interest in cooperating internationally to meet their climate commitments. Article 6 establishes a framework for both market-based and non-market approaches, enabling Parties to achieve their nationally determined contributions (NDCs) more cost-effectively while mobilizing investment, facilitating technology transfer, and strengthening institutional and technical capacities.

1 Draft Decision /CMA.6 -https://unfccc.int/sites/default/files/resource/CMA_14b_dt_Article6.4.pdf

A handful of early movers, including Switzerland, Singapore, Japan, Ghana, and Chile, have made notable progress in implementing Article 6. These countries have signed bilateral cooperation agreements, tested pilot activities, and begun setting up domestic MRV systems. Switzerland, for example, concluded the first bilateral Article 6 agreement with Peru in 2020, while Japan continues expanding its JCM with partner countries worldwide.

However, most nations are still developing their readiness to use Article 6. Many developing countries face hurdles such as weak MRV systems, gaps in regulatory frameworks, limited institutional capacity, and insufficient experience managing complex forms of international cooperation. This uneven progress underscores the importance of tailored, country-specific support.

To bridge these capacity gaps, multiple international initiatives have been created. The World Bank's Climate Warehouse,[2] the Asian Development Bank's[3] Article 6 Support Facility, and UNDP's Climate Promise are among the programmes offering financial and technical assistance. Their support focuses on building strong governance structures, establishing transparent MRV systems, and ensuring that emissions reductions are accurately accounted for and free of double-counting. The ultimate aim is to uphold environmental integrity while enabling more countries to participate in carbon markets and related cooperation mechanisms.

Globally, the implementation of Article 6 remains in its early stages. Only a few countries have operational systems in place, and many are still interpreting and adapting to evolving international rules. Strengthening readiness will require a deep understanding of national circumstances, coherent domestic regulatory frameworks, and alignment of national policies with global standards.

These developments sit within the broader objectives of the Paris Agreement, adopted in 2015 and in force since 2016. Its central goal is to limit global temperature rise to well below 2°C, while striving to remain within 1.5°C[4] above pre-industrial levels, an objective motivated by the urgent need to prevent severe climate impacts, including extreme weather, sea-level rise, and ecological disruption.

Meeting this goal requires swift, substantial emissions cuts: global emissions must peak by 2025 and decline by about 43% by 2030.[5] Countries submit and update their NDCs every five

2 World Bank's Climate Warehouse- https://ppp.worldbank.org/library/climate-warehouse
3 ADB- https://www.adb.org/what-we-do/topics/climate-change/overview
4 UNFCC The Paris Agreement- https://unfccc.int/process-and-meetings/the-paris-agreement#:~:text=The%20Paris%20Agreement%20is%20a,force%20on%204%20November%202016
5 IPCC AR6 WGIII Summary for Policymakers (2022)

years to outline their plans for mitigation and adaptation. They are also encouraged to prepare LT-LEDS that chart pathways toward sustainable, low-carbon development.

To support implementation, the Paris Agreement highlights the importance of international cooperation through climate finance, technological support, and capacity-building. Developed countries are expected to take the lead in assisting, while all nations may engage voluntarily in cooperative action.[6]

The support facilities highlighted in this document were selected because of their relevance to India's current priorities under the Paris Agreement, particularly in strengthening transparency systems, preparing for carbon markets, and advancing readiness for Article 6. These programmes are actively collaborating with Indian institutions through capacity-building activities, technical support, and knowledge exchange.

In addition to the initially mentioned initiatives, several other global platforms also play an important role in enabling Article 6 implementation and supporting carbon market development. These include:

- The Article 6 Implementation Partnership, which connects governments and practitioners to share tools, methodologies, and experiences;
- GGGI's CTF, which helps countries design high-quality mitigation activities and gain access to carbon finance;
- The World Bank's Carbon Markets and Climate Finance Programs, including the Climate Warehouse and the Partnership for Market Implementation (PMI), which strengthen technical and institutional readiness;
- VCMI's Access Strategies Programme, which guides countries in participating credibly in voluntary carbon markets and aligning those efforts with Article 6 principles.

Collectively, these initiatives contribute to a more coordinated international ecosystem supporting India and other countries in building institutional capacity, engaging the private sector, and ensuring environmental integrity in carbon transactions.

6 UNFCC The Paris Agreement - https://unfccc.int/process-and-meetings/the-paris-agreement

A cornerstone of the Paris framework is the Enhanced Transparency Framework (ETF) under Article 13. Beginning in 2024, all countries submitted Biennial Transparency Reports (BTRs), which include emissions inventories, progress toward NDCs, and information on climate finance provided or received. This information feeds into the GST under Article 14, conducted every five years to evaluate overall progress and encourage greater ambition.[7]

Article 6, though still developing, is another vital component of the Paris system. It facilitates cooperation through mechanisms such as Internationally Transferred Mitigation Outcomes (ITMOs), enabling countries to achieve emissions reductions more efficiently, provided robust accounting rules and institutional safeguards are in place.[8]

Asian Development Bank

Established in 1966, the Asian Development Bank (ADB) supports developing member countries (DMCs) in Asia and the Pacific through loans, technical assistance, grants, and equity investments. ADB enhances the impact of its aid by facilitating policy dialogues, advisory services, and mobilizing financial resources through co-financing. Currently, the ADB actively aids DMCs in participating in Article 6 mechanisms of the Paris Agreement by providing technical assistance, capacity building, and policy development through its Article 6 Support Facility. ADB also helps DMCs understand Article 6 requirements, develop institutional infrastructure, engage the private sector, and facilitates the use of market-based approaches to meet and exceed NDC goals.

The Climate Promise 2025

The Climate Promise 2025 is a UN System-wide initiative led by UNDP to help countries align their national climate pledges (NDCs) with the 1.5°C goal, improve their quality and investability, and accelerate implementation for sustainable development. Building on the success of UNDP's original Climate Promise, which supported the majority of developing countries in raising their mitigation and adaptation ambitions in their NDCs, Climate Promise 2025 aims to leverage existing UN support to assist countries in the next NDC cycle ahead of COP30. Recognizing NDCs as vital tools for integrating climate action with national development, the initiative focuses on-

7 Decision 19/CMA.1 Matters relating to Article 14 of the Paris Agreement and paragraphs 99–101 of decision 1/CP.21- https://unfccc.int/sites/default/files/resource/cma2018_3_add2_new_advance.pdf#page=57

8 UNFCC Article 6.2 - https://unfccc.int/process-and-meetings/the-paris-agreement/article-6/article-62

raising ambition, accelerating implementation, and enabling whole-of-society approaches while supporting National Adaptation Plans (NAPs) to enhance climate resilience and achieve long-term sustainable and inclusive development goals.

World Bank's Climate Warehouse

The World Bank's Climate Warehouse is a digital infrastructure initiative using blockchain technology to bring transparency, trust, and integrity to global carbon markets under Article 6 of the Paris Agreement. Acting as a public, open-source metadata platform, it connects diverse carbon registries, enabling accurate tracking, reporting, and harmonization of ITMOs to prevent double counting. It supports digital MRV systems, capacity building, and knowledge sharing. Prototypes are tested for operationalization, including the ClimateAction Data (CAD) Trust, national carbon registries, and tokenization tools, positioning the Climate Ware house as a cornerstone for scalable, credible climate action and enhanced Nationally Determined Contribution (NDC) achievement.

1.2 Understand Article 6

Article 6 of the Paris Agreement provides a framework for countries to voluntarily cooperate in achieving their climate goals. By enabling the transfer of emission reductions referred to as Mitigation Outcomes between Parties, Article 6 aims to raise ambition, support sustainable development, and uphold environmental integrity.[9]

There are three key forms of cooperation under Article 6:

(a) Bilateral or multilateral cooperative approaches involving the transfer of Internationally Transferred Mitigation Outcomes (ITMOs) covered under Article 6.2.

(b) A centralized mechanism for mitigation and sustainable development, governed by international oversight – established under Article 6.4.

(c) Non-market approaches that promote collaboration through policy coordination and capacity-building without using carbon markets detailed in Article 6.8.

To ensure transparency and credibility, the Agreement mandates the use of robust accounting practices, including the application of corresponding adjustments to avoid double-counting of emission reductions.[10] These adjustments must align with each country's NDC and reflect the

9 UNFCC Article 6 of the Paris Agreement- https://unfccc.int/process-and-meetings/the-paris-agreement/article6

10 UN 2015 Adoption of the Paris Agreement - https://unfccc.int/sites/default/files/english_paris_agreement.pdf

chosen approach, whether based on single-year or multi-year targets and using GHG metrics.[11] These rules were finalized by the Conference of the Parties serving as the Meeting of the Parties to the Paris Agreement (CMA) at its third session.[12]

In 2024, the completion of the Paris Rulebook marked a critical shift from negotiation to implementation of Article 6. With the rules in place, countries now face strategic decisions on whether and how to engage. Participation is entirely voluntary, but it offers new opportunities for collaboration, investment, and innovation in carbon markets and climate action.

Governments can engage in various ways. Under Article 6.2, they may pursue project-based partnerships or broader programs at the sectoral or jurisdictional level, potentially linking with independent carbon markets. Under Article 6.4, countries can authorize specific mitigation projects aligned with the Sustainable Development Goals.[13] The mechanism serves as a successor to the Clean Development Mechanism (CDM), with enhanced integrity and oversight.[14]

However, meaningful participation requires domestic readiness, including legal frameworks, institutional capacity, and clear strategies. Governments must carefully assess the costs and benefits of participation, define their level of engagement, and determine how these cooperative approaches can complement existing domestic climate policies and enhance the achievement or even exceedance of NDC targets.

As implementation unfolds, Article 6 has the potential to become a cornerstone of global climate cooperation, driving both cost-effective mitigation and sustainable development across borders.[15]

Nationally Determined Contribution (NDC):

An NDC is the formal plan each country submits under the Paris Agreement describing how it intends to address climate change. This plan outlines national objectives for lowering greenhouse gas (GHG) emissions, improving carbon absorption through natural or technological

11 Article 6.2 Reference manual for the accounting, reporting and review of cooperative approaches - https://unfccc.int/sites/default/files/resource/Article_6.2_Reference_Manual.pdf

12 Decisions 2/CMA.3, 3/CMA.3 and 4/CMA.3 - https://unfccc.int/documents/460950

13 Development of a sustainable development tool for Article 6.4 of the Paris Agreement - https://unfccc.int/sites/default/files/resource/a64-sb007-aa-a07.pdf

14 UNFCC The Clean Development Mechanism - https://unfccc.int/process-and-meetings/the-kyoto-protocol/mechanisms-under-the-kyoto-protocol/the-clean-development-mechanism

15 Section 1.2 has been adapted from VCMI Toolkit for consistency with existing guidelines and reference frameworks.

means, and strengthening resilience to climate impacts. Every country sets its own targets in line with its development priorities, available resources, and level of ambition. NDCs are revised every five years so nations can enhance their commitments and showcase progress.

Cooperative Approaches (Article 6.2):

Article 6.2 provides a platform for countries to collaborate voluntarily in meeting their climate goals. Through bilateral or multilateral cooperation such as linking emissions trading systems or exchanging carbon credits countries can share mitigation results. These approaches are intended to reduce overall costs, support transparent reporting, encourage higher climate ambition, and uphold environmental integrity through rigorous accounting procedures.

Internationally Transferred Mitigation Outcome (ITMO):

ITMOs represent verified reductions or removals of GHG that one country can transfer to another. The receiving country can count these transferred units toward achieving its NDC goals. ITMOs may consist of carbon credits, emissions units from linked Emissions Trading Schemes (ETS), or other approved mitigation outputs. Their use introduces flexibility in how countries reach their targets and helps mobilize global investment in low-carbon initiatives. All transactions involving ITMOs must comply with UNFCCC rules covering tracking, reporting, and transparency.

Corresponding Adjustments:

Corresponding adjustments are accounting steps that countries must apply when ITMOs are exchanged to ensure emissions reductions are never counted twice. This system guarantees that each tonne of avoided or removed CO_2 equivalent is credited to only one country.

The process works as follows:

- For the transferring country: Its NDC accounting balance increases by the number of mitigation units sold, reflecting that these reductions are no longer counted toward its own target.
- For the acquiring country: Its NDC balance decreases by the same amount, acknowledging that the purchased reductions support its target.

These adjustments affect only NDC accounting and do not change national emissions inventories. The timing of adjustments may vary, as countries can hold, carry over, or apply ITMOs at different points within an NDC cycle.

Article 6.2: Cooperative approaches

Article 6.2 defines cooperative approaches that enable countries to authorize the transfer of Mitigation Outcomes in the form of ITMOs. Mitigation outcomes may be transferred to other countries for use toward their own NDCs, applied to "other international mitigation purposes" such as for use by airlines under the scheme known as Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), or for other purposes, including for trade in independent carbon markets or voluntary cancellation. If a government authorizes Mitigation Outcomes to be used by another country or used in CORSIA, the Mitigation Outcome becomes an ITMO. When ITMOs are transferred, the transferring as well as the receiving country are required to make "corresponding adjustments" to their own NDC accounting (see Section 1.3).

Article 6.2 enables governments to engage in cooperative mitigation action. Article 6.2 engagement is open to various forms of climate action across all countries, activities, emission sources, and sinks, which enables partnerships tailored to specific needs and governance structures. To participate in Article 6.2 activities, governments must meet certain participation requirements: they need to have an NDC in place, be able to track ITMOs, and have arrangements for authorizing the use of ITMOs.[16] Governments

UNFCCC Secretariat

The UNFCCC secretariat (UN Climate Change) is the operational arm of the United Nations Framework Convention on Climate Change, serving as a critical support structure for global climate action. Established in 1992 and based in Bonn, Germany, its key functions include:

- **Supporting Global Climate Negotiations:** Organizing and facilitating intergovernmental climate change negotiations, including the annual Conference of the Parties (COP) and sessions of subsidiary bodies.
- **Providing Technical Expertise:** Offering technical guidance and assisting in the analysis and review of climate change information reported by Parties.
- **Facilitating Implementation:** Supporting the implementation of the UNFCCC, the Kyoto Protocol, and the Paris Agreement.
- **Managing Registries:** Maintaining key registries, such as the registry for NDCs under the Paris Agreement.
- **Promoting Collaboration:** Supporting the Marrakech Partnership for Global Climate Action, encouraging collaboration between governments, non-Party stakeholders, and the UN system.

16 Decision 2/CMA.3, Annex II, para 3. FCCC/PA/CMA/2021.10/add1. Available at: https://unfccc.int/sites/default/files/resource/cma2021_10a01E.pdf#page_11

have to report on their planned Article 6.2 activities through Initial Reports,[17] which are publicly available on the UNFCCC Secretariat's recording platform, and to provide periodic reports on implementation progress. In their Initial Report, governments must describe how each cooperative approach ensures environmental integrity, including through making the case for the quality of Mitigation Outcomes and for measures to reduce the risks of reversal events, as well as any negative environmental, economic, or social impacts.[18]

Reporting further includes the cooperative approaches, authorizations of Mitigation Outcomes, transfers of ITMOs, and emission balances. However, beyond those quality criteria and reporting requirements, governments are free to define the nature, methodology, implementation modalities, and verification of country-led Article 6.2 activities. Governments can unilaterally develop Article 6.2 activities and later engage in cooperative agreements for ITMO transfer or consider auctioning credits through regulated platforms.[19]

In addition, governments can enhance the integrity and efficiency of Article 6.2 transactions by leveraging established methodologies and infrastructure from independent carbon mar-

- **Organizing Events:** Coordinating regional Climate Weeks and other events to drive forward the implementation of the Paris Agreement at the regional level.

Essential Features of ITMOs Under Article 6.2 : Ensuring Credibility and Integrity

- ITMOs generated under cooperative approaches in Article 6.2 of the Paris Agreement must meet specific criteria to ensure environmental integrity and consistency with international climate goals:
- They must represent real, verified, and additional emission reductions or removals.
- Eligible outcomes can include co-benefits from adaptation actions or economic diversification strategies when transferred between countries.
- All ITMOs must be quantified in metric tonnes of CO_2 equivalent (tCO_2e) using methodologies approved by the IPCC or other agreed non-GHG metrics aligned with countries' Nationally Determined Contributions (NDCs).

17 Draft Decision-/CMA.6, Annex I, Table of supplementary elements of information in initial report and any updated initial reports, as referred to in decision 2/CMA.3, annex, paragraphs 18-19. UNFCCC/PA/CMA/2024/L.15, Available at: https://unfccc.int/event/cma-6?item=15%20a

18 Decision2/CMA.3, Annex II,para18

19 Indonesia has recently offered 1.78mn credits from five energy projects on IDX Carbon, a trading platform operated by its national stock exchange.

kets, avoiding the need to build systems from scratch. For example, the Verra-Gold Standard-Singapore Toolkit[20] offers a standardized protocol that integrates existing voluntary carbon market frameworks into Article 6.2 implementation, streamlining processes and ensuring alignment with national climate goals. Complementing this, the Integrity Council for the Voluntary Carbon Market (ICVCM)'s Core Carbon Principles (CCPs)[21] provide a rigorous benchmark for quality by setting clear criteria on baseline setting, permanence, additionality, and sustainable development that align closely with Article 6 requirements. Governments can authorize ITMOs to be transferred to private and public entities. Many actors engaging in independent carbon markets consider seeking authorizations for their projects and the resulting emission reductions and removals to enable the transfer of these as ITMOs.It is through these Article 6.2 authorizations that independent carbon market projects can be linked to Article 6.

- They must originate from cooperative approaches that involve authorized international transfers of mitigation outcomes for use toward an NDC, as outlined in Article 6.3.
- Only mitigation generated from 2021 onward is eligible.
- ITMOs can also be authorized for uses beyond NDCs, such as participation in global schemes like CORSIA, or other purposes defined by the host country.
- Emission reductions from the Article 6.4 mechanism may also qualify as ITMOs when transferred internationally.
- These standards aim to uphold transparency, ensure accurate accounting, and support the environmental integrity of carbon markets under the Paris Agreement.

In most cases where independent carbon market credits are transferred as ITMOs, the ITMOs are not used by another country to meet their NDC but are retired without being accounted against by any NDC. However, even if an ITMO is not used to meet NDCs, the transferring country must report the corresponding adjustment, document ITMO retirements, and make the necessary accounting adjustments.

The main benefit of Article 6.2 for countries is that it is flexible and that governments can set and negotiate the terms of their engagement. Transferring governments have full power to decide whether, to what extent, and under what conditions to authorize Mitigation Outcomes. Governments can use the promise of ITMOs to incentivize investment in priority sectors. They can

20 Fortheinitialrecommendations,see: https://verra.org/wp-content/uploads/2024/11/Article-6-Crediting-Protocol-v1-11Nov2024-final.pdf

21 See the10 Carbon Core Principles here:https://icvcm.org/core-carbon-principles/

steer carbon projects to align with government programs and conditional targets in NDCs.Investment in mitigation activities with the promise of ITMOs could attract investment at scale, provide

CORSIA

The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) is the first global market-based mechanism targeting CO_2 emissions from international aviation,developed by the International Civil Aviation Organization (ICAO). Launched in 2016, CORSIA aims to cap net carbon emissions from international flight sat 85% of 2019 levels from 2024 to 2035, requiring airlines to off set any growth in emissions above this baseline by purchasing eligible carbon credits.

CORSI Aapplies only to international flights,with domestic aviation covered by nationalsystems like the EU's Emissions Trading System (ETS). Participation is voluntary in the initial phases (2021–2026) and becomes mandatory for most countries from 2027. Airlines must report, and verify their emissions annually, and offsetting requirements are enforced every three years. CORSIA supports the aviation sector's long-term goal of net-zero emissions by 2050, complementing efforts such as sustainable aviation fuel and operational improvements.

Conditional and Unconditional NDC

Conditional and unconditional targets represent two distinct forms of national commitments under the Paris Agreement.

- Unconditional targets reflect the level of emission reductions a country pledges to achieve using its own domestic resources, without depending on international finance or technology transfer. These targets define the minimum level of national effort that the country commits to deliver independently.
- Conditional targets, in contrast, express enhanced ambitions that a country can achieve only with international support such as climate finance, technology transfer, or capacity-building assistance. These conditions are explicitly stated in the NDC and reflect the country's reliance on external resources to go beyond its unconditional commitment.

The distinction between these two target types is particularly important for carbon markets. Generally, carbon market finance whether through Article 6 mechanisms or voluntary carbon markets can only support activities linked to the conditional portion of an NDC. This is because external finance or crediting should not be necessary to meet unconditional targets, which must be achieved using domestic means.

Therefore, mitigation activities contributing to the unconditional NDC may not qualify as carbon market projects unless they clearly demonstrate financial and environmental additionality that is, proof that the activity would not have occurred without the carbon market incentive. Aligning project design with the conditional components of an NDC helps ensure that carbon finance supports genuinely additional, high-integrity emission reductions and strengthens the host country's ability to meet its enhanced climate ambition.

access to innovation, technology, and capacities. Some governments have already entered into bilateral or multilateral agreements to trade Mitigation Outcomes.

However, most of these agreements only represent future intentions to trade ITMOs and depend on the institutions and infrastructure to enable the transfer of ITMOs.[22]

1.3 Corresponding Adjustments under Article 6

Corresponding adjustments are a critical accounting requirement under Article 6 of the Paris Agreement, established to ensure transparency and environmental integrity in the international transfer of emission reductions. These adjustments are specifically designed to prevent the double-counting of mitigation outcomes between countries, particularly when such outcomes are transferred and used towards the achievement of NDCs. In simple terms, corresponding adjustments ensure that each tonne of reduced or removed carbon dioxide equivalent (tCO_2e) is claimed by only one country, either the one transferring the emissions reduction or the one acquiring it, not both.

22 UNEP Copenhagen Climate Center has developed a database for tracking Article 6 activities, providing insights into project contributions to Nationally Determined Contributions (NDCs) and Sustainable Development Goals (SDGs).

The process does not change a country's actual GHG inventory; instead, it modifies an emissions balance used specifically for NDC reporting. When a host country sells a portion of its emission reductions, known as ITMOs, it must add back the amount transferred to its reported emissions. The buying country, in turn, subtracts the same amount from its reported emissions. This accounting method ensures that only the buyer can count those reductions toward its NDC, preserving the credibility of global climate efforts.

This is clearly shown in Figure 1, which illustrates how corresponding adjustments work in practice. Suppose Country A reduces its emissions from 100 to 50 million tonnes. If it decides to sell 30 million tonnes as ITMOs to Country B, it must report its adjusted emissions as 80 million tonnes (50 actual +30 transferred). Country B, which has emissions of 100 million tonnes, is the 30 ITMOs it bought and reports 70 million tonnes. This ensures the emission reduction is counted only once by Country B and not by both.

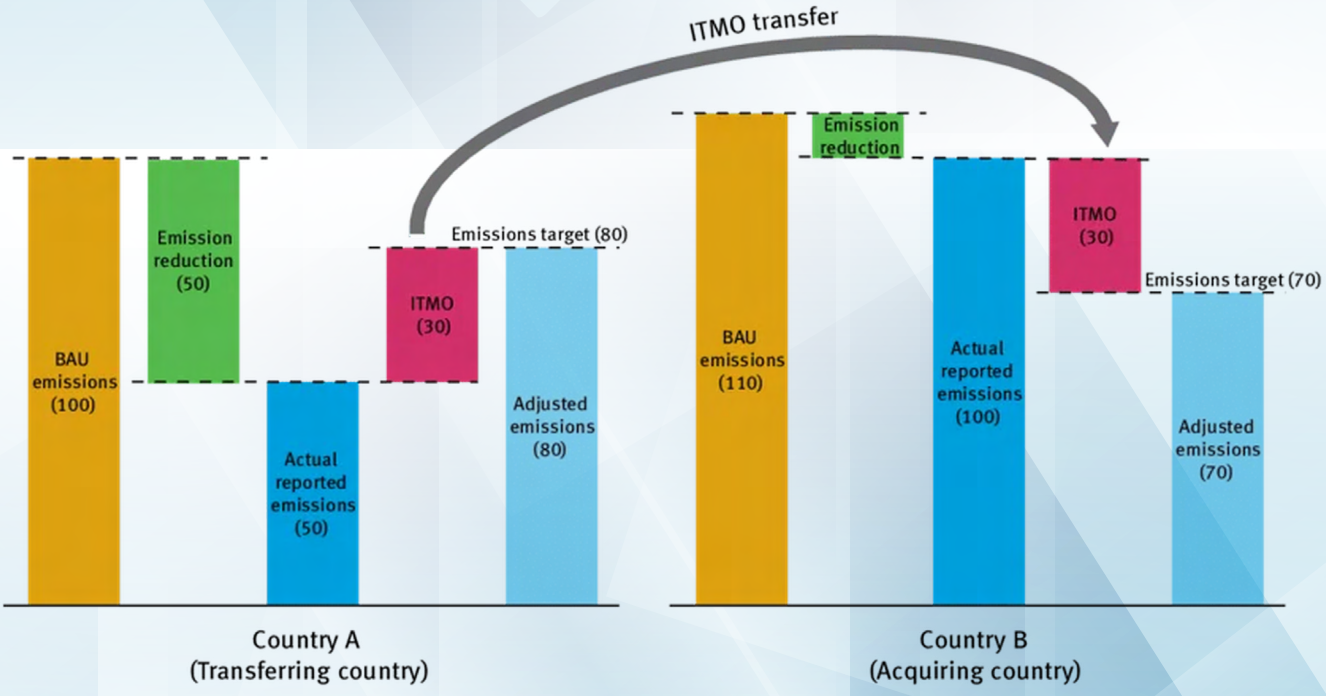

Figure 1: Application of corresponding adjustment to reported emissions

Figure 2 presents another way of looking at corresponding adjustments. Instead of adjusting reported emissions, countries can adjust their emission targets. In this approach, Country A's original target is 80 million tonnes. After transferring 30 million tonnes of reductions, it adjusts its target downward to 50 million tonnes. Meanwhile, Country B adjusts its emissions target upward, from 70 to 100 million tonnes, to account for the imported mitigation outcomes. This method ensures balance is maintained from the perspective of emission budgets rather than emissions outcomes.

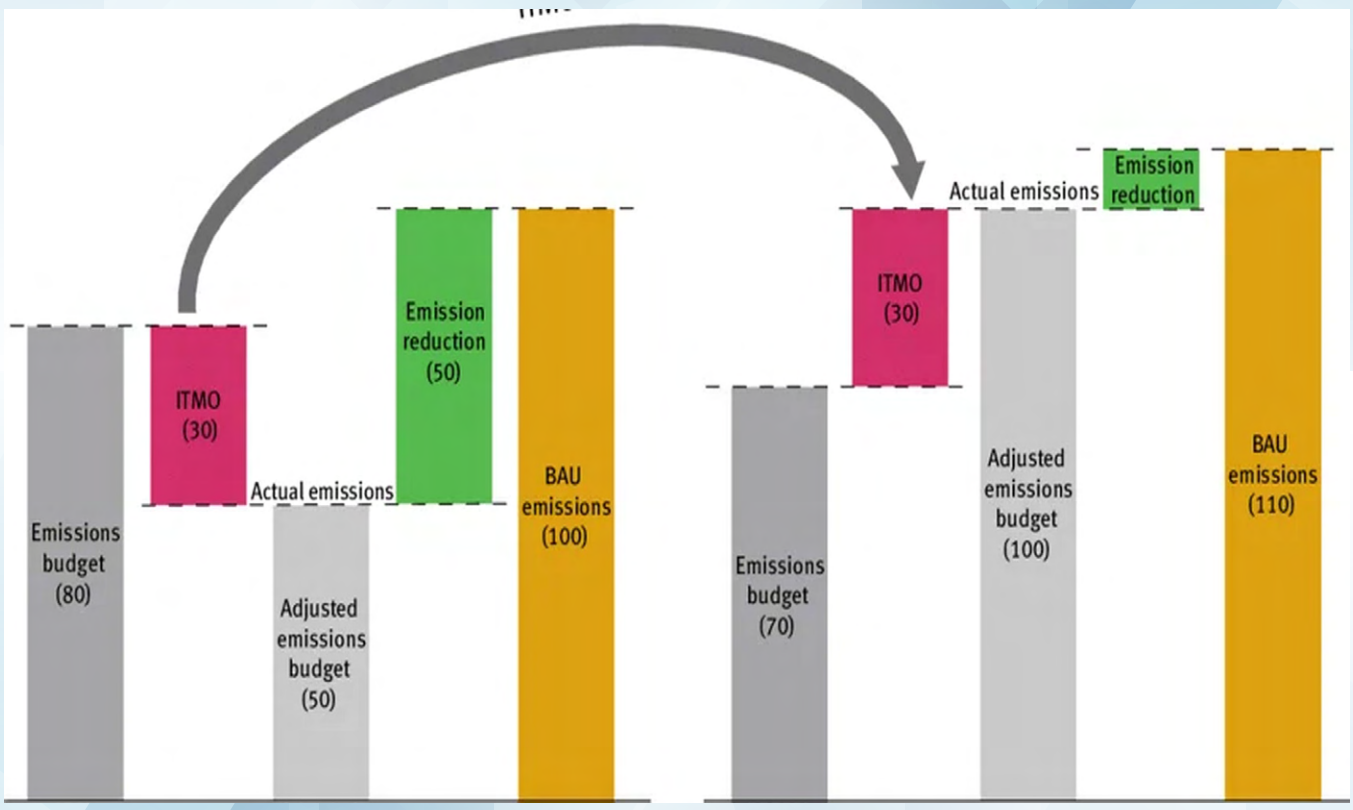

Figure 2: Application of corresponding adjustments to emission budgets

Source: Robust Accounting of International Transfers under Article 6 of the Paris Agreement

The Paris Agreement's Article 6.2 guidance outlines how corresponding adjustments are to be made for various cases, including GHG-based metrics, non-GHG metrics, and policy-based NDCs. It also distinguishes between single-year and multi-year NDC targets, ensuring flexibility in application while maintaining accounting consistency.

Authorisation: A Voluntary and Strategic Choice

While corresponding adjustments are essential for transfers under Article 6.2, it is important to clarify that authorisation of carbon credits is not mandatory. Countries have full discretion to determine which, and how many, mitigation outcomes they wish to authorise for transfer. Authorised credits designated as ITMOs require corresponding adjustments and can be used by acquiring countries toward their own NDCs or other compliance purposes.

However, not all credits must be authorised. Countries may retain some or all credits to achieve their own NDC targets, or issue and sell unauthorised credits in voluntary carbon markets without applying corresponding adjustments. This flexibility allows governments to pursue a balanced approach mobilising international finance while safeguarding domestic climate objectives.

Overselling Risk

Excessive authorisation of credits can expose a country to overselling risk, where too many mitigation outcomes are transferred abroad, leaving insufficient reductions to meet its own NDC. This can jeopardize national targets and undermine confidence in both the country's climate commitments and the integrity of Article 6 mechanisms.

To avoid overselling, countries should establish clear authorisation strategies, quantitative limits, and tracking systems that ensure a sufficient share of mitigation outcomes is retained domestically. Transparent oversight and strong institutional capacity are essential to maintain a balance between cooperation and national climate ambition.

Mitigation Contribution Units (MCUs) under Article 6.4

Beyond cooperative approaches under Article 6.2, the Article 6.4 mechanism introduces Mitigation Contribution Units (MCUs) credits that represent verified emission reductions contributing to the host country's own NDC rather than being transferred internationally. These units provide an alternative for countries that wish to enhance global mitigation while retaining full ownership of their reductions.

Acknowledging MCUs is important, as they demonstrate that both authorised and unauthorised credits can coexist in the carbon market. This dual approach offers countries and project developers flexibility to align carbon market participation with national priorities and global climate objectives.

Exercise1: ITMOs and Corresponding Adjustments

Objective: *To practice calculating corresponding adjustments for ITMO transfers to ensure no double-counting of emission reductions.*

Instructions: *Below are scenarios describing the transfer of ITMOs between two countries, Country A and Country B. For each scenario, match the correct corresponding adjustments to each. The country must make its emissions accounting. Match the correct adjustments for each country from the lists provided.*

Scenarios:

Scenario 1:

Country A reduces emissions from 150 $MtCO_2e$ to 100 $MtCO_2e$.
Country A transfers 40 $MtCO_2e$ of ITMOs to Country B.

Scenario 2:

Country B has baseline emissions of 200 $MtCO_2e$.
Country B purchases 75 $MtCO_2$ of ITMOs from Country A.

Possible Adjustments for Country A:

1. Report adjusted emissions of 100 $MtCO_2e$
2. Report adjusted emissions of 140 $MtCO_2e$
3. Report adjusted emissions of 50 $MtCO_2e$

Possible Adjustments for Country B:

1. Report adjusted emissions of 125 $MtCO_2e$
2. Report adjusted emissions of 275 $MtCO_2e$
3. Report adjusted emissions of 200 $MtCO_2e$

Matching Table:

Scenario	Country	Adjustment Number	Corresponding Adjustment
1	Country A		
1	Country B		
2	Country A		
2	Country B		

2. OVERVIEW OF REPORTING REQUIREMENTS FOR PARTICIPATING PARTIES[23]

In addition to the information to be reported in the BTR of ETF, Parties participating in cooperative approaches will need to present specific information, including:

- Initial report;
- Annual information;and
- Regular information.

2.1 Initial reports

The initial report required under Article 6 may be submitted either as a stand-alone document or together with a BTR, depending on the timing of the authorization for the cooperative approach or use of ITMOs. For example, if a Party has already established cooperative agree-

23 This section is taken from the Article 6.2 reference manual chapter 4 Initial Report - https://unfccc.int/sites/default/files/resource/Article_6.2_Reference_Manual.pdf

ments and authorized ITMOs but has not yet submitted its BTR, it can choose to submit the initial reports separately via the Centralized Accounting and Reporting Platform (CARP) (see Figure 4).

The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA) has adopted a standardized outline for the initial report and encourages participating countries to follow this structure. The CMA has also requested the UNFCCC Secretariat to develop and provide an electronic reporting template, which is now available on the CARP (see Annex III: Initial Report Outline).

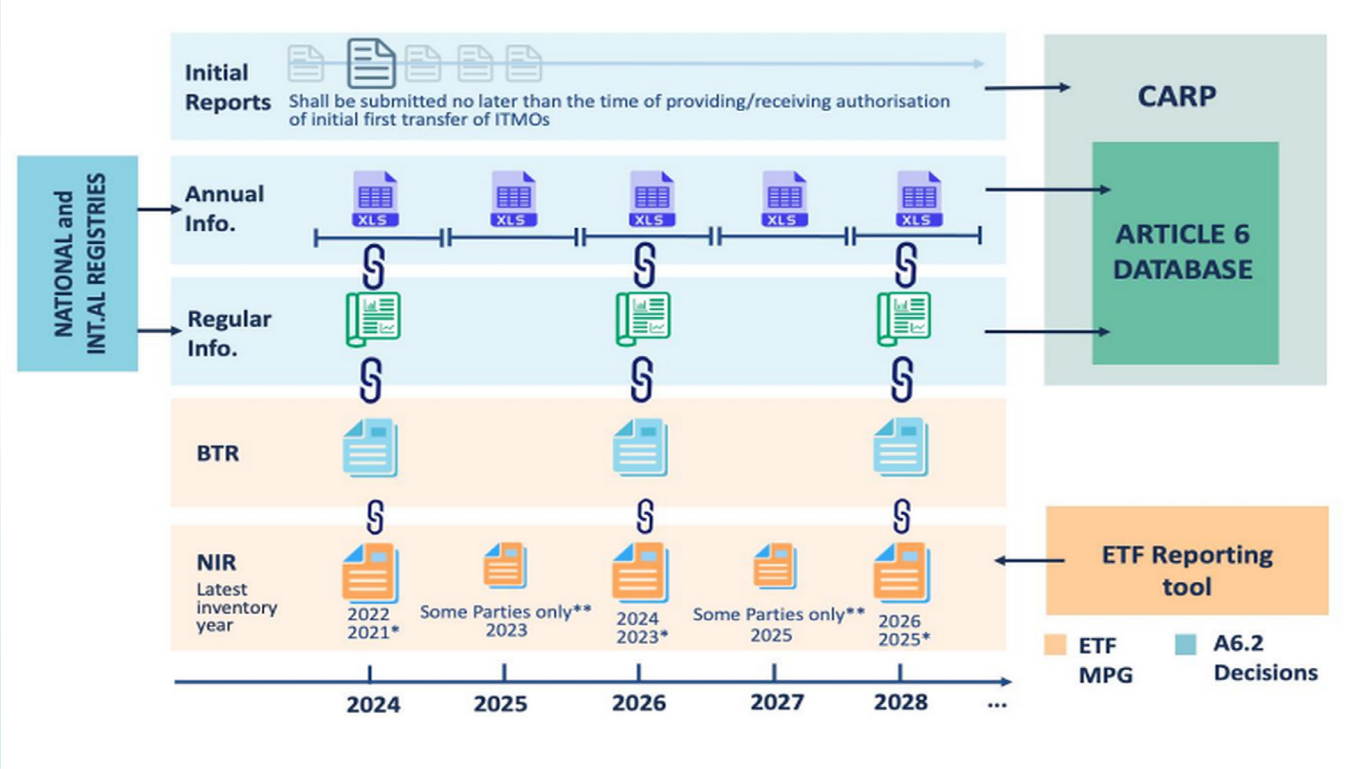

Figure 3: Illustration of the relationships between Article 6 reports and the biennial transparency report

The initial report must contain detailed and transparent information, as described in the relevant reporting sections, to ensure consistency, transparency, and environmental integrity in the implementation of cooperative approaches under Article 6.

Initial reports and updated initial reports

Party	NDC period	Original submission date	Reports	Article 6 Technical Expert Review Reports	Status of review
Zimbabwe	2025–2035	07 July 2025	**Initial report** Original initial report 07 July 2025		Review pending
Cambodia	2021–2030	30 April 2025	**Initial report** Original initial report 30 April 2025		Review pending
Mongolia	2021–2030	29 January 2025	**Initial report** Original initial report 29 January 2025		Review pending
Japan	2021–2030	31 October 2024	**Initial report** Original initial report 31 October 2024		Review pending
Suriname	2020–2030	29 May 2024	**Initial report** Original initial report 29 May 2024 Revised initial report 30 January 2025		Review pending
Guyana	2016–2025	22 February 2024	**Initial report** Original initial report 22 February 2024	FCCC/A6/IRTERR.1/2024/GUY FCCC/A6/IRTERR.1/2024/GUY/Add.1	Review finalized and inconsistencies identified
Thailand	2021–2030	07 December 2023	**Initial report** Original initial report 07 December 2023	FCCC/A6/IRTERR.1/2024/THA FCCC/A6/IRTERR.1/2024/THA/Add.1	Review finalized and inconsistencies identified

Vanuatu	2021-2030	06 October 2023	**Initial report** Original initial report 06 October 2023	FCCC/A6/IRTERR.1/2024/VUT FCCC/A6/IRTERR.1/2024/VUT/Add.1	Review finalized and inconsistencies identified
Ghana	2021-2030	14 September 2023	**Initial report** Original initial report 14 September 2023	FCCC/A6/IRTERR.1/2024/GHA FCCC/A6/IRTERR.1/2024/GHA/Add.1	Review finalized and inconsistencies identified
Switzerland	2021-2030	17 May 2023	**Initial report** Original initial report 17 May 2023	FCCC/A6/IRTERR.1/2024/CHE FCCC/A6/IRTERR.1/2024/CHE/Add.1	Review finalized and inconsistencies identified

Figure 4: Initial reports submitted to the centralized accounting and reporting platform
Source: UNFCCC-CARP (visited on 5 August 2025).

2.2 Demonstration that the participating Party fulfils its participation responsibilities

To participate in cooperative approaches under the Paris Agreement, a Party must include in its initial report evidence that it meets the following requirements:

- It is a Party to the Paris Agreement;
- It has developed, submitted, and is upholding its NDC;
- It has established procedures for authorizing the use of ITMOs towards achieving its NDC;
- It has systems in place for tracking ITMOs;
- It has submitted the latest national inventory report in line with decision 18/CMA.1; and

- It can demonstrate that its participation supports the implementation of its NDC, any submitted long-term low-emission development strategy,andthe overarching goal oft-he Paris Agreement.

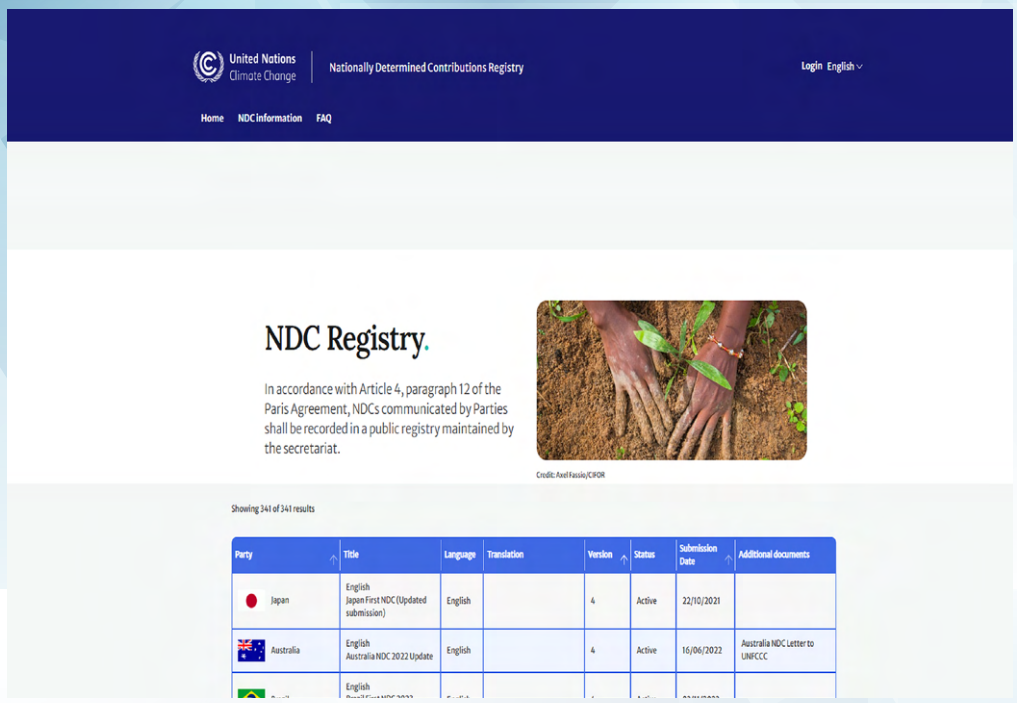

Figure 6: NDC Registry
Source: UNFCCC NDC Registry (visited on 29 October 2023).

To verify that a Party is part of the Paris Agreement, it is sufficient to include a link to the United Nations Treaty Repository, showing the date of ratification, acceptance, approval, or accession. Similarly, a link to the latest NDC in the UNFCCC NDC Registry can be used to show that the Party has communicated its NDC.

Each Party decides on its own arrangements for authorizing the use of ITMOs, based on its national legal, institutional, and governance context. There is no standardized model. However, the initial report may include the following to describe these arrangements:

- The name and contact details of the responsible institution(s);
- A general overview of the authorization procedures; and
- The legal framework supporting the authorization.

Tracking arrangements for ITMOs also vary depending on the Party's systems and choices. A Party may use its own registry, a registry, or an international one.The initial report should provide information such as:

- The name of the registry used;
- Contact details of the responsible institution(s);
- A general description of the registry's procedures and how they align with accounting requirements, including corresponding adjustments, reporting obligations under Article 6, and the structured summary; and
- The legal basis for ITMO tracking.

The UNFCCC secretariat is currently developing an international registry and an interim solution that Parties may use until the official system becomes operational.

Under decision 18/CMA.1, the most recent national inventory report will only be available after submission of the BTR, which has been submitted by 31 December 2024. Until then, Parties may reference their most recent GHG inventories submitted under the UNFCCC. This includes inventories from Annex I Parties and those submitted through national communications or biennial update reports by developing countries.

Finally, to show how participation in cooperative approaches contributes to achieving its NDC, any long-term low-emission strategy (if submitted), and the long-term goals of the Paris Agreement, a Party should explain how it believes such cooperation supports:

(a) Its specific NDC targets and long-term mitigation goals (if available);and
(b) The broader objective of limiting the global temperature rise to well below 2°C above pre-industrial levels, while pursuing efforts to keep the increase below 1.5°C.

3. PARTICIPATION PROCESSES

This chapter provides a comprehensive overview of the procedural steps involved in the registration and issuance of GHG emission reduction credits under a national carbon framework. It outlines the full project cycle from the initial pre-assessment phase through to the final issuance of credits, highlighting the key stages of permit granting, project documentation, validation, and, where applicable, project authorization.

For activities requiring formal authorization, the chapter further details the subsequent phases, including conditional approval, implementation, monitoring, third-party verification, certification, and the issuance of credits accompanied by corresponding adjustments to ensure environmental integrity and avoid double-counting.

Prior to engaging in any of these processes, all Project Proponents (PPs) intending to undertake GHG mitigation activities must register with the national carbon registry and complete a mandatory Know Your Customer(KYC)procedure.This KYC process is specifically applied to the proponents themselves and not to the mitigation activities they intend to develop.

As part of this preliminary step, PPs must apply to open an account and obtain a unique identification number for their proposed mitigation activity. An application fee is required to activate the account, which supports administrative operations and ensures efficiency by preventing duplicate account creation. Upon completion of this process, the PP receives a unique identifica-

tion number and may proceed with the formal authorization and registration steps necessary for credit issuance.

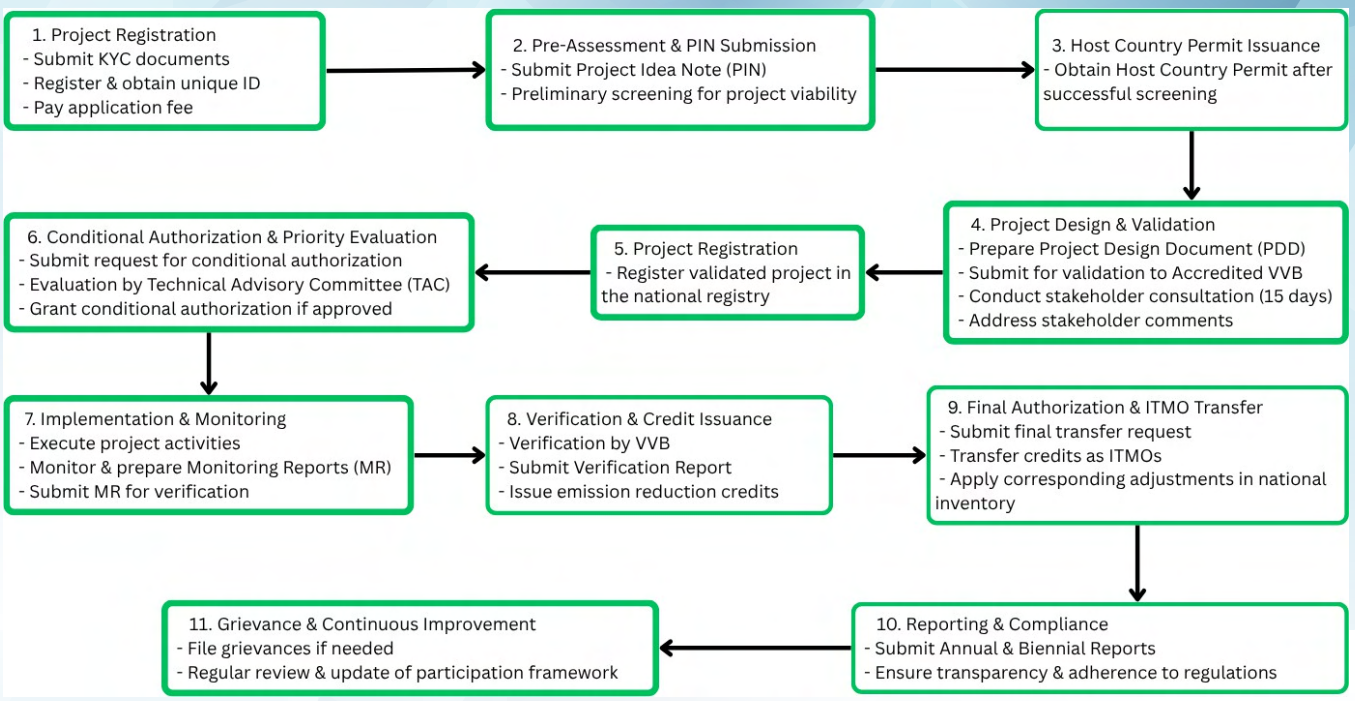

Figure 7: Participation Processes

3.1 Pre-Assessment and Account Creation

Project Proponent Registration

All entities such as private companies, government agencies, or non-governmental organizations wishing to develop GHG mitigation activities must first register with the carbon registry. This process involves the completion of Know Your Customer (KYC)checks, which include the submission of necessary documents such as:

- Proof of legal incorporation
- Authorized signatory documents
- Official identification of representatives
- Letters of approval or endorsements (If applicable)

This step ensures that only credible and compliant entities are granted access to the carbon registry.

Preliminary Screening

Following account creation, PPs must submit a Project Idea Note (PIN) to the national implementing entity. The PIN is a concise document that provides a high-level overview of the proposed mitigation activity, including:

- Type and scale of the project
- Estimated annual and total emission reductions
- Targeted sector and technology
- Safeguards for environmental and social impacts
- Anticipated co-benefits (e.g., SDGs, job creation)
- Preliminary alignment with the host country's NDC targets

This stage helps filter out non-viable or misaligned projects before entering formal review.

3.2 Permit Issuance and Host Country Approval

Host Country Permit Issuance

Upon successful completion of the pre-assessment phase, the implementing agency will issue a Host Country Permit.This formal document confirms that the project aligns with national priorities and is eligible to proceed to the validation and registration stage. It serves as a prerequisite for further development and international recognition under Article 6 mechanisms.

3.3 Project Validation and Registration

Preparation of Project Design Document (PDD)

The Project Proponent must prepare a comprehensive PDD in accordance with approved methodologies. The PDD must include:

- Project objectives and baseline scenario
- Methodological approach and monitoring plan

- Additionality justification
- Contribution to the host country's NDC
- Environmental and social safeguard measures
- Risk assessments and mitigation strategies

Validation by an Accredited Entity

An independent and accredited Validation and Verification Body (VVB) conducts a thorough assessment of the project. The validation process ensures that the project complies with technical standards, exhibits additionality, and meets environmental integrity criteria.

Stakeholder Consultation

A public consultation period, typically 15 days, is held through the registry platform to solicit input from stakeholders, including local communities, civil society, and government agencies. Comments received are documented and addressed by the PP before final registration.

Registration in the Registry

Once validation and stakeholder engagement are completed satisfactorily, the project is formally registered in the national carbon registry. This registration confirms the project's eligibility to generate emission reductions under recognized carbon crediting frameworks.

3.4 Conditional Authorization and Priority Evaluation

Submission of Authorization Request

The PP submits a request for conditional authorization, which is required to generate ITMOs. This includes the payment of applicable administrative and evaluation fees.

Evaluation by the Technical Advisory Committee (TAC)

The TAC conducted a detailed assessment of the project against national criteria, which may include:

- Alignment with NDC Priorities
- Contribution to high-cost abatement sectors
- Environmental and social co-benefits
- Potential risk of over-crediting or market imbalance
- Technology transfer and innovation impact

Issuance of Conditional Authorization

Based on TAC recommendations, the Executive Body (EB) reviews and, if appropriate, grants conditional authorization. This status allows the project to proceed with implementation and later seek credit issuance, subject to verification.

3.5 Implementation, Monitoring, and Verification

Project Implementation

The PP executes the project in accordance with the approved PDD, implementing the technology, infrastructure, and management systems as committed.

Monitoring and Reporting

The PP conducts monitoring based on the agreed monitoring plan. A Monitoring Report (MR) is prepared, detailing actual emissions reductions or removals over the reporting period, and is submitted to an accredited VVB for verification.

Verification of Emission Reductions

The VVB conducts an audit of the MR, including site inspections and data accuracy checks.A Verification Report is issued, confirming the quantity of verified emission reductions achieved during the monitoring period. This report is then submitted to the registry for further review.

3.6 Credit Issuance and Final Authorization

Issuance of Emission Reduction Credits

Upon satisfactory review of the Verification Report, the implementing authority or registry administrator issues carbon credits such as Verified Emission Reductions (VERs) or other nationally recognized units into the PP's registry account.

Request for Final Authorization and ITMO Transfer

The PP submits a formal request for final authorization to transfer credits as ITMOs under Article 6.2.This includes the payment of issuance and transfer-related fees.

Final Authorization by Executive Body

The EB grants final authorization based on a final review. The corresponding quantity of credits is transferred to the acquiring Party, and the transaction is recorded.

Corresponding Adjustments

To avoid double-counting, a corresponding adjustment is applied in the national inventory. The transferred credits are deducted from the host country's balance and recorded transparently in the registry.

3.7 Reporting and Compliance

Annual and Biennial Reporting

The host country prepares and submits reports in accordance with Article 6 and the ETF, including:

- **Initial Report:** Submitted before the first authorization
- **Annual Information Report:** Submitted by April 15 each year, detailing authorized and transferred ITMOs
- **BTR:** Includes regular updates on progress toward NDCs and international cooperation

Revocation and Appeals Mechanism

If a project is found to be non-compliant, the EB has the authority to revoke authorizations or credits. PPs have the right to appeal decisions through a transparent grievance and review process.

3.8 Grievance Redress and Continuous Improvement

Grievance Mechanism

PPs or stakeholders may file grievances regarding procedural issues, delays, or disputes. A dedicated grievance unit under the EB will investigate and provide resolutions. If unresolved, matters may be escalated to a higher decision-making body or steering committee.

Review and Update of Participation Framework

To ensure alignment with international best practices and emerging UNFCCC guidance, the participation framework will undergo regular reviews and revisions. This ensures its continued effectiveness,integrity, and responsiveness to evolving climate finance dynamics.

Exercise 3: Project Development Simulation

Objective:

To guide participants through the key steps of developing a real-world Article 6 project, from initial concept to final authorization.

Overview:

This simulation puts participants in the role of project developers seeking to createan Article 6-compliant project. Participants will work through the phases of project development, considering the necessary steps, documentation, and stakeholders involved.

Scenario:

You are a team of project developers focused on implementing a clean cookstove project in a rural region of a developing country.Your goal is to develop a project that can generate ITMOs by reducing GHG emissions through the distribution of efficient cookstoves.

Steps:

1. Project Concept & Idea Note (PIN):

- Task: Define the project's scope, location, and scale. Estimate potential emission reductions and co-benefits.
- Deliverable: Draft a PIN outlining the project's key elements:

(a) Project description: Type and scale of the project
(b) Estimated annual and total emission reductions: The estimated total emission reductions generated by the project.
(c) Targeted sector and technology: Target sectors, a description of the technology or approach to be used, and the estimated GHG emissions
(d) Safeguards for environmental and social impacts: Potential impacts and proposed mitigations
(e) Anticipated co-benefits: Anticipated co-benefits (e.g., SDGs, job creation),including details and supporting data
(f) Preliminary alignment with the host country's NDC targets: How the projects support national climate and development goals

2. Stakeholder Engagement and Host Country Approval

- Task: Identify key local stakeholders (e.g., community members, local government, NGOs) and outline a strategy for engagement. Consider national priorities and ensure alignment with the host country's NDC.
- Deliverable: Prepare a Stakeholder Engagement Plan that includes:

(a) A list of stakeholders.
(b) A description of engagement methods (e.g., consultations, surveys).
(c) A summary of how stakeholder feedback will be incorporated into the project design.

- Deliverable: Prepare a letter explaining the reason and information in the request to be submitted to the NDAIAPA

3. Project Design Document (PDD)

- Task: Develop a detailed PDD in accordance with a recognized carbon standard (e.g., Gold Standard). Include a description of the chosen methodology, baseline scenario, monitoring plan, and additionality assessment.
- Deliverable: Create a PDD outline that includes:

(a) Project objectives and baseline scenario.
(b) Methodological approach and monitoring plan
(c) Additionality justification
(d) Contribution to the host country's NDC
(e) Environmental and social safeguard measures
(f) Risk assessments and mitigation strategies

4. Validation & Registration

- Task: Determine the steps needed to hire a VVB. Submit your project design and prepare for the validation process. Address any comments or requests for further information from the VVB.
- Deliverable: Develop a presentation that addresses the following:

(a) What criteria did you use in selecting the VVB?
(b) What are the key findings in the validation report?
(c) If issues were found, how did you remediate them?
(d) What lessons did you learn from the validation process?

5. Monitoring & Verification

- Task: Outline the ongoing monitoring activities for the project. Detail the process for verification of emission reductions by an accredited VVB.
- Deliverable: Created a draft Monitoring Plan that includes:

(a) Monitoring parameters and frequency.
(b) Data collection methods.
(c) Quality control procedures.
(d) Outline what will be included in the Monitoring Report
(e) Who would you hire to develop the Monitoring Report

6. Credit Issuance & Authorization

- Task: Develop a detailed plan on how you will secure the proper authorization to ensure ITMO transfers are compliant with all requirements.
- Deliverable: Develop a plan to:

(a) Identify all key stakeholders.
(b) Ensure alignment with Article 6 requirements, especially corresponding adjustments.
(c) How will the country achieve approval from the Executive Board?

This simulation provides a hands-on experience in the complexities of developing an Article 6 project, highlighting the importance of careful planning, stakeholder engagement, and alignment with international standards.

4. INDIA'S STRATEGIC FRAMEWORK FOR ARTICLE 6 COOPERATIVE APPROACHES UNDER THE PARIS AGREEMENT

India stands at a pivotal moment in its climate transition journey. With firm commitments under the Paris Agreement, India has pledged to reduce the emissions intensity of its GDP by 45% below 2005 levels by 2030, and to achieve net-zero emissions by 2070.[24] These targets reflect both urgency and ambition, requiring integrated strategies that balance development needs with environmental stewardship. A key element of this transition is the establishment of a robust, market-based carbon pricing mechanism, aligned with Article 6 of the Paris Agreement.

Article 6 offers Parties the flexibility to pursue cooperative approaches and international carbon trading to achieve their NDCs. It provides a structured framework through Article 6.2 (bilateral/multilateral cooperation), Article 6.4 (centralized mechanism supervised by the UNFCCC), and Article 6.8 (non-market approaches). India recognizes that participation in these mecha-

24 PIB - https://www.pib.gov.in/PressReleasePage.aspx?PRID=1885731&reg=3&lang=2

nisms, particularly Articles 6.2 and 6.4, will be essential in mobilizing finance, accessing technology, and accelerating cost-effective emission reductions across sectors.[25]

India's experience in carbon markets is both deep and extensive. The country was an early and active participant in the Clean Development Mechanism (CDM), registering the second-highest number of CDM projects globally. Domestically, India has successfully implemented compliance mechanisms such as the Perform Achieve and Trade (PAT) scheme and the Renewable Energy Certificates (RECs) system, generating substantial mitigation outcomes and building institutional familiarity with carbon trading frameworks.[26]

To consolidate and scale these efforts, the Government of India has notified the Carbon Credit Trading Scheme(CCTS) under the Energy Conservation (Amendment) Act, 2022.[27] The scheme establishes the legal and institutional backbone for a national carbon market, encompassing both compliance and voluntary offset mechanisms. The market aims to catalyze decarbonization across energy-intensive industries while also incentivizing climate action in sectors such as agriculture, transport, waste, and land use, many of which are not covered under existing regulatory mechanisms.

India's emerging Article 6 framework is designed to be transparent, high-integrity, and aligned with global standards, including the Core Carbon Principles of the ICVCM and the emerging guidance under the UNFCCC Article 6 supervisory bodies. It envisions establishing a national registry, a system for corresponding adjustments, and a pathway for ITMOs for international transfer. At the same time, India seeks to ensure environmental integrity, local co-benefits, and equitable access for small actors and vulnerable sectors.

4.1 Authorization Arrangements India for Article 6.2

India has established its institutional framework for participation in international carbon markets under Article 6 of the Paris Agreement through the notification of the National Designated Authority for the Implementation of the Paris Agreement (NDAIAPA), as per the Gazette notification dated 30 May 2022.[28]

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25 Implementing Article 6 – An Overview of Preparation in Selected Countries - https://goldstandard.org/sites/default/files/implementing_article_6-an_overview_of_preparations_in_selected_countries.pdf

26 BEE - https://www.beeindia.gov.in/carbon-market.php

27 Ministry of Power, The Energy Conservation (Amendent) Act, 2022 - https://powermin.gov.in/sites/default/files/The_Energy_Conservation_Amendment_Act_2022_0.pdf

28 PIB - https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1900216

The NDAIAPA is empowered to determine the types of mitigation activities eligible for participation in cooperative approaches and carbon credit trading under Article 6 mechanisms.

In alignment with the finalized Rulebook of the Paris Agreement, particularly Article 6.2 focusing on bilateral and cooperative approaches, India has taken proactive steps to fulfill its obligations as a host country. The NDAIAPA has identified a preliminary list of priority activities authorized for carbon credit trading under Article 6.2. These activities are intended to support the deployment of emerging low-carbon technologies and to attract international climate finance.

Authorized Categories of Activities:

I. GHG Mitigation Activities

1. Renewable energy integrated with storage systems (limited to the stored component)
2. Solar thermal power
3. Offshore wind energy
4. Green hydrogen production
5. Compressed biogas
6. Advanced mobility technologies, including fuel cell-based solutions
7. High-end energy efficiency technologies
8. Best available technologies (BAT) for emissions reduction in hard-to-abate industrial sectors
9. Marine-based renewable energy technologies,including:

   - Tidal energy
   - Ocean Thermal Energy Conversion (OTEC)
   - Ocean Salt Gradient Energy
   - Ocean Wave Energy
   - Ocean Current Energy

10. High-Voltage Direct Current (HVDC) transmission infrastructure linked with renewable energy projects

II. Removal Activities

11. Carbon Capture, Utilization, and Storage (CCUS)

III. Agricultural Activities

12. Sustainable aviation fuel
13. Production and deployment of Green Ammonia

These activities have been prioritized for initial implementation under Article 6.2 for a period of three years, during which they will be subject to periodic review and potential revision by the NDAIAPA based on technological developments and national priorities.[29]

Through this authorization framework, India aims to facilitate the transfer of advanced technologies and mobilize international finance to support its transition to a low-carbon economy while contributing meaningfully to global climate goals.

Sources of Demand for Article 6.2 Credits

Demand for Article 6.2 credits arises from both compliance and voluntary buyers seeking transparent, Paris-aligned mitigation outcomes. The key sources of demand include:

1. CORSIA

CORSIA, established by the ICAO, is one of the largest compliance-based markets for carbon credits. It aims to achieve carbon-neutral growth from 2020 levels by requiring airlines to offset emissions exceeding their 2019 baseline.

Airlines can purchase eligible emission reduction units - including Article 6.2 credits - if they meet ICAO's integrity and transparency criteria. With limited short-term decarbonization options, CORSIA creates sustained demand for high-quality, government-authorized credits.

Phases of implementation:

- Pilot (2021–2023): Voluntary participation.
- First (2024–2026): Expanded voluntary phase.
- Second (2027–2035): Mandatory for most major aviation countries.

29 PIB - https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1900216&reg=3&lang=2

By aligning with Paris-based accounting, Article 6.2 credits give airlines a credible means to meet offsetting obligations while supporting global mitigation.

2. Voluntary Corporate Climate Targets

Companies pursuing net-zero or science-aligned goals often buy carbon credits to address residual emissions. Under initiatives such as the SBTi and Race to Zero, Article 6.2 credits are increasingly favored because they are government-authorized, transparently tracked, and Paris-aligned.

For corporates, such credits offer:

- Credibility – backed by national accounting and authorizations.
- Transparency – each transfer is reported under host and acquiring NDCs.
- Reputational value – alignment with official Paris mechanisms.

Multinational firms in aviation, energy, and manufacturing are already incorporating Article 6.2 credits into voluntary portfolios, helping to finance early cooperative projects.

3. Countries' NDC Ambition and International Cooperation

Countries with ambitious NDCs may find it cost-effective to acquire ITMOs through Article 6.2 cooperation. This allows nations to meet part of their mitigation targets while enabling host countries to access finance, technology, and capacity-building support.

Examples include:

- Switzerland – purchasing ITMOs from Ghana, Peru, and Thailand.
- Singapore – partnerships with Bhutan, Cambodia, and Papua New Guinea.
- Sweden and Norway – bilateral deals for renewable and efficiency projects.

Such cooperation embodies the principle of "cooperative ambition", where international trade complements domestic climate action.

4. Bilateral and Plurilateral Cooperation Models (e.g., JCM)

Bilateral and plurilateral frameworks create structured platforms for implementing Article 6.2. These agreements define how mitigation outcomes are generated, verified, and shared, stimulating practical demand for ITMOs.

Key examples include:

- Japan's Joint Crediting Mechanism (JCM): 24 partner countries implementing renewable energy and efficiency projects with credits shared between Japan and hosts.
- Switzerland's Carbon Agreements: Clean cooking, transport, and renewable energy projects in Africa, Asia, and Latin America.
- Singapore's Carbon Partnerships: Frameworks with Bhutan, Cambodia, and PNG for ITMO generation.
- Regional Platforms: The Nordic Dialogue and West African Alliance building capacity and harmonizing approaches.

These cooperative models are translating Article 6.2 from concept to practice — mobilizing finance, driving technology transfer, and expanding global demand for high-integrity, government-backed credits.

5. LEVERAGING AGRICULTURAL WASTE FOR SUSTAINABLE AVIATION FUEL: A PRIME CARBON PROJECT OPPORTUNITY

In 2023, the global aviation sector accounted for about 2.5% of global energy-related CO_2 emissions, with total emissions reaching nearly 950 Mt CO_2, more than 90% of pre-pandemic levels. As international travel continues to recover, the sector faces mounting pressure to decarbonize in line with ICAO objectives, the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), and the industry's collective commitment to achieve net-zero emissions by 2050[30]. Among the available mitigation options, Sustainable Aviation Fuel (SAF), particularly when produced from agricultural waste, represents the most scalable near-term pathway for reducing lifecycle emissions, while maintaining compatibility with existing aircraft and fuel infrastructure.

SAF, a renewable alternative to fossil-based jet fuel, can be blended directly with conventional Jet A fuel ("drop-in") and used in existing aircraft and infrastructure, with blending limits cur-

30 Iea - https://www.iea.org/energy-system/transport/aviation

rently ranging from 10% to 50% depending on the production pathway. In some cases, 100% SAF can achieve up to 94% GHG emission reductions compared to conventional jet fuel, depending on the feedstock and technology used[31]. This value represents the upper range of performance achievable for specific SAF production pathways and should not be considered representative of all SAF feedstocks or technologies.

However, the commercial deployment of SAF remains constrained by high production costs, feedstock aggregation challenges, and technological barriers. Converting agricultural residues such as rice husks, sugarcane bagasse, or corn stover into SAF requires advanced, capital-intensive technologies such as gasification, Fischer-Tropsch synthesis, or alcohol-to-jet (ATJ)[32] processes that face limited financial viability compared to fossil jet fuel. In this context, carbon market finance, as outlined in Article 6.2 of the Paris Agreement, provides a crucial mechanism to enhance project bankability by monetizing verified emission reductions and directing international investment toward SAF producers in developing countries.

Under Article 6.2 cooperative approaches, countries can authorize the transfer of ITMOs from SAF projects to partners in the aviation or energy sectors seeking cost-effective, Paris-aligned emission reductions. Such transactions can support compliance under CORSIA, corporate climate targets, or NDCs, while also enabling host countries to access finance, technology transfer, and capacity-building support for sustainable biofuel value chains.

Demonstrating additionality is key for SAF projects to qualify under carbon market mechanisms. Despite their mitigation potential, these projects often face economic and institutional barriers such as high upfront capital expenditure, uncertain policy frameworks, and the absence of mature domestic SAF markets that prevent them from proceeding under “business-as-usual” conditions. Revenues from Article 6.2 crediting help overcome these barriers, ensuring that the resulting emission reductions are truly additional and would not occur without carbon finance.

Moreover, SAF-from-agricultural-waste projects deliver dual climate benefits:

- Upstream – avoiding methane and black carbon emissions from open burning or landfill disposal of agricultural residues.
- Downstream – displacing fossil-based jet fuel with a renewable, low-carbon alternative.

31 US Department of Energy - https://afdc.energy.gov/fuels/sustainable-aviation-fuel

32 FEASIBILITY STUDY ON THE USE OFSUSTAINABLEAVIATION FUELSIN INDIA: https://www.icao.int/sites/default/files/environmental-protection/Documents/ACT-SAF/Feasibility_Study_India.pdf

These projects also advance circular economy principles, create new income streams for farmers, and contribute to broader sustainable development co-benefits aligned with SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action).

Looking toward 2050, feedstocks from woody plants and lignocellulosic agricultural waste are expected to dominate SAF production, particularly with the advancement of alcohol-to-jet technologies utilizing sugars and cereals such as corn, beet, wheat, rice husk, and sugarcane. By linking these technological pathways with Article 6.2 carbon market mechanisms, countries can scale up investment in next-generation SAF projects that deliver high-integrity, Paris-aligned mitigation outcomes, bridging the gap between climate ambition, technology deployment, and sustainable development.

Production Pathways - Six methods of creating SAFs

FT-SPK	HEFA-SPK	SIP-HFS	FT-SPK/A	ATJ-SPK	CHJ
Process Name Fischer-Tropsch hydroprocessed synthesized paraffinic kerosene	**Process Name** Synthesized paraffinic kerosene produced from hydroprocessed esters and fatty acids	**Process Name** Synthesized iso-paraffins produced from hydroprocessed fermented sugars	**Process Name** Synthesized kerosene with aromatics derived by alkylation of light aromatics from nonpetroleum sources	**Process Name** Alcohol-to-jet synthetic paraffinic kerosene	**Process Name** Catalytic hydrothermolysis Jet Fuel
Feedstock/Waste Solid biomass resources: wood residues, municipal solid waste	**Feedstock/Waste** Cooking oils, animal fat, algae and vegetable oil (e.g. camelina)	**Feedstock/Waste** Microbial conversion of hydrocarbon from sugars	**Feedstock/Waste** Municipal solid waste, forestry residue	**Feedstock/Waste** Agricultural waste: crop straws, fine woody debris, stover	**Feedstock/Waste** Plant oils, soybean oils, waste oil, algal oils etc.
Blending Limit Up to 50%	**Blending Limit** Up to 50%	**Blending Limit** Up to 10%	**Blending Limit** Up to 50%	**Blending Limit** Up to 30%	**Blending Limit** Up to 50%

Figure 7:Production Pathways

Production Pathway	Description	Possible Feedstock	Blend Ratio
Hydrotreated Esters and Fatty Acids (HEFA)	Involves feedstock refinement through decarboxylation and hydroprocessing.	• Bio-oils • Animal fat • Recycled oils	**50%**
Fischer-Tropsch (FT)	A chemical reaction whereby a mixture of carbon monoxide and hydrogen in a syngas are converted into liquid hydrocarbons.	• Gasified municipal solid waste (MSW • Biomass • Hydrogen and Carbon Dioxide	**50%**
Alcohol to Jet synthetic paraffinic kerosene (AtJ-SPK)	Converts alcohol into SAF by removing the oxygen and linking molecules together.	• Biomass from ethanol and iso-butanol	**50%**
Synthesised Iso-Paraffins from hydroprocessed fermented sugars (SIP)	A biological process whereby microbes convert C6 sugars into farnesene, thereafter being treated with hydrogen to then be used as SAFs.	• Biomass used for sugar production	**10%**
Synthesised kerosene with aromatics derived by alkylation of light aromatics from non-petroleum sources (FT-SKA)	A chemical reaction whereby a mixture of carbon monoxide and hydrogen in a syngas is converted into liquid hydrocarbons.	• Coal • Natural gas • MSW	**50%**
Catalytic Hydrothermolysis jet fuel (CHJ)	Uses catalytic hydrothermolysis to convert fatty acids into SAF.	• Plant oils such as soybean oil, jatropha oil, and carinata oil	**50%**
Hydroprocessed Hydrocarbons, Esters and Fatty Acids (HC-HEFA-SPK)	HC-HEFA SAF production processes are like HEFA but remove all oxygen during the feedstock refinement.	• Algae	**10%**
Co-processing of HEFA	Esters and fatty acid oils are co-hydroprocessed with conventional crude oil in existing refining complexes.	• Waste oils, fats and greases co-processed with petroleum	**5%**
Co-processing of FT	FT hydrocarbons are co-hydroprocessed with conventional crude oil in existing refining complexes.	• Fischer-Tropsch hydrocarbons co-processed with petroleum	**5%**

Table1:Production Pathways Description

5.1 SAF from Rice husk/straw

Rice is the most widely consumed staple food in the world, serving as the dietary foundation for more than half of the global population[33]. It plays a particularly critical role in Asia, Sub-Saharan Africa, and Latin America, where it supports the livelihoods of over 144 million people, most of them smallholder farmers. As global demand for rice is expected to increase by 30% by 2050 due to population growth and changing consumption patterns, the sustainability of rice production is under increasing scrutiny[34]. The sector is confronted with serious challenges, including vulnerability to climate change, stagnating yield improvements, high water usage, significant GHG emissions, and the generation of large quantities of agricultural waste.

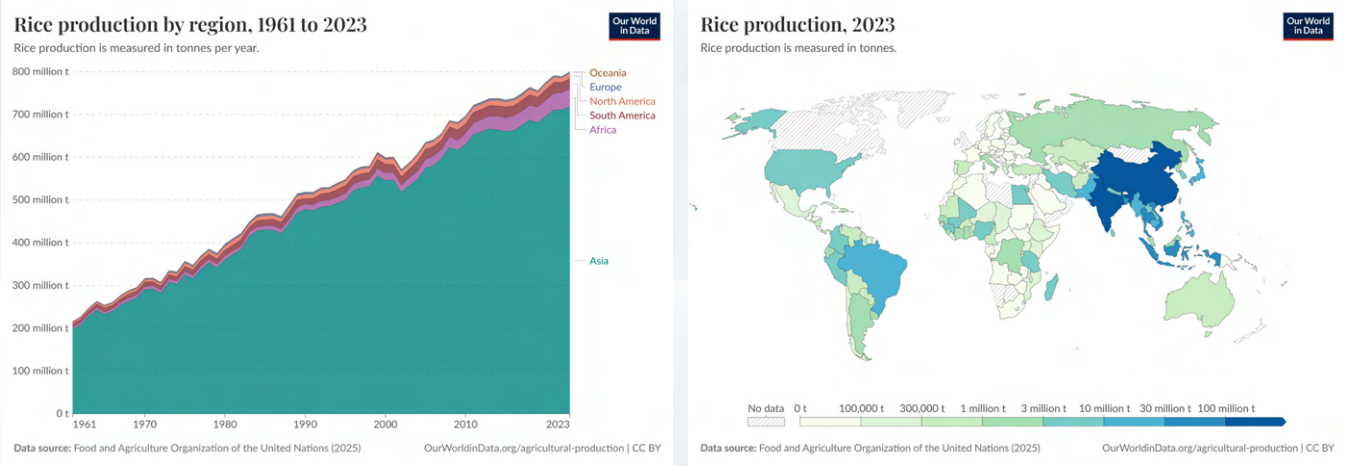

Figure 8: Rice Production (1962-2023)

One of the most problematic residues from rice processing is rice husk, which constitutes about 20% of the weight of harvested rice. Globally, millions of tons of rice husk are generated annually, much of which is either burned in the open or left to decay, leading to environmental degradation and the release of harmful emissions. However, with the right technology and investment, rice husk can be transformed into a valuable resource. It is rich in carbon and other

33 FAO, The International year of rice : https://www.fao.org/4/Y5167E/y5167e02.htm

34 World Bank Group - https://www.worldbank.org/en/news/feature/2025/06/09/reinventing-rice-as-countries-cultivate-change?utm_source=chatgpt.com

organic compounds, making it an ideal feedstock for the production of Sustainable Aviation Fuel (SAF), a renewable, low-carbon alternative to conventional jet fuel.

The production of SAF from rice husk involves advanced thermochemical processes such as fast pyrolysis, steam gasification, and catalytic upgrading. These processes convert biomass into intermediates like bio-oil and syngas, which can be further refined into drop-in fuels that meet aviation standards. Notably, SAF derived from rice husk has the potential to reduce lifecycle GHG emissions by up to 80% compared to fossil-based jet fuels, especially when integrated with renewable energy sources and carbon capture and storage technologies. This reduction reflects the performance of a specific feedstock pathway and operating conditions and is therefore lower than the maximum reduction of up to 94% reported for certain SAF pathways. The latter figure represents a pathway-dependent upper ceiling, whereas the 80% value is a more specific estimate for rice husk-based SAF production. Furthermore, rice husk-based SAF contributes to a circular bioeconomy by turning agricultural waste into high-value fuel, minimizing waste streams, and enhancing resource efficiency.

The co-benefits of this approach extend beyond climate mitigation.In rural regions where rice is cultivated, establishing SAF production facilities based on rice husk can stimulate local economic development, generate employment opportunities, and create new income streams for farmers. It also supports energy security by reducing reliance on imported fossil fuels and diversifying the national energy mix with domestically produced renewable fuels. Countries such as India, Vietnam, and Indonesia, where rice production is significant and agricultural residues are abundant, are ideally positioned to pilot and scale SAF initiatives rooted in rice husk valorisation.

Moreover, incorporating rice husk into SAF production complements ongoing climate-smart agriculture (CSA) initiatives. Techniques like alternate wetting and drying (AWD), precision fertilizer application, and mechanization not only improve productivity and reduce methane emissions but also ensure that rice farming systems are resilient and resource-efficient. In this context, the integration of waste-to-energy pathways such as SAF enhances the overall sustainability of the rice value chain.

In conclusion, utilizing rice husk for SAF production represents an innovative, impactful solution that addresses pressing challenges in both agriculture and aviation. It aligns with global goals for climate action, sustainable development, and rural transformation, offering a pathway to cleaner skies and more resilient farming communities. As technological readiness improves and policy frameworks support biofuel deployment, ricehusk-derived SAF could become a cornerstone of the green energy transition, turning a once-overlooked waste product into a catalyst for low-carbon growth.

Case Study: Jet Fuel Production from Rice Husk in Tolima, Colombia[35]

In Colombia, the rice industry produces nearly half a million tons of rice husk annually, much of which remains an underutilized by-product. The department of Tolima, one of Colombia's main rice-growing regions, offers a significant opportunity to deploy sustainable biomass-to-energy technologies. With an estimated annual generation of 492,738 tons of rice husk, translating to an energy potential of approximately 7,136.53 TJ, Tolima is well-positioned to become a hub for renewable fuel production, especially sustainable aviation fuel (SAF) derived from agricultural waste.

Traditionally, rice husks in Colombia have been disposed of through open burning or low-value uses, contributing to local pollution and missed economic opportunities. In light of increasing energy demands and climate commitments, researchers have explored the potential of converting this agricultural residue into valuable bioenergy products through pyrolysis, a thermal decomposition process conducted in the absence of oxygen. The study conducted in Tolima proposes the conversion of rice husk into bio-oil, a precursor for SAF, along with biochar and biogas, as part of a circular bioeconomy model.

Physicochemical characterization of rice husk from Tolima reveals it as a suitable candidate for pyrolysis. With an organic carbon content of 38.04%, a relatively low moisture level of 7.68%, and significant silica (18.39%) and ash content (19.4%), the material has favorable properties for thermal conversion. The pH value of 6.41 and a nitrogen content of 0.74% further support its potential in energy applications. These factors collectively indicate the rice husk's capacity to yield energy-rich outputs, particularly bio-oil, under the right processing conditions.

The proposed process involves a carefully integrated system beginning with the pre-treatment of rice husk drying it at around 100°C and milling it to the desired particle size. It is then fed into a pyrolysis reactor operating at approximately 400°C. In this oxygen-limited environment, the rice husk decomposes into three main products: bio-oil, biochar, and biogas. A set of cyclone separators, condensers, and filters is used to recover each product stream. The system is designed to optimize energy recovery by recyclingheat from the pyrolysis process to aid in feedstock drying and maintain reactor temperature, thus improving overall thermal efficiency.

The bio-oil derived from fast pyrolysis contains a mix of oxygenated hydrocarbons and can be further processed via catalytic hydrodeoxygenation to remove oxygen and enhance its compat-

35 National Library of Medicine, Rice husk reuse as a sustainable energy alternative in Tolima, Colombia: https://pmc.ncbi.nlm.nih.gov/articles/PMC11074129/

ibility with jet fuel specifications. This refining step is critical to transforming raw bio-oil into drop-in SAF that meets the stringent quality and performance standards of the aviation sector. This approach aligns with Colombia's goals to diversify energy sources, reduce dependence on fossil fuels, and promote low-emission transportation alternatives.

From an energy and economic standpoint, the modeled plant in Tolima achieves impressive results. With a thermal efficiency of about 50–52%, it effectively converts the energy content of rice husk into usable heat, estimated at around 3180 kW from the boiler. The project also shows strong financial viability, boasting an internal rate of return (IRR)that exceeds the prevailing opportunity cost of capital by 6%. These indicators suggest that the initiative is not only environmentally sustainable but also economically attractive over a five-year investment horizon. Furthermore,a high-capacity factor ensures stable energy production year-round, supporting consistent SAF output.

Beyond energy and economic metrics, the project delivers substantial environmental and social co-benefits. Utilizing rice husk waste prevents methane emissions that would otherwise result from decomposition or burning, while simultaneously reducing fossil fuel consumption. The project promotes circular economy principles by transforming waste into value-added products. At the local level, it fosters job creation, skills development, and entrepreneurial opportunities, particularly in rural communities. It also enhances energy access and resilience by generating renewable fuel sources domestically.

However, the implementation of such a system is not without challenges. Rice production in Colombia is subject to seasonal variation, which may affect the continuous availability of feedstock. Additionally, the infrastructure required for pyrolysis and subsequent bio-oil upgrading such as refining units demands significant upfront investment. The high silica content in rice husk ash also poses technical concerns, particularly regarding equipment wear and maintenance, and must be effectively managed through appropriate design and material selection.

The rice husk pyrolysis project in Tolima represents a compelling model for sustainable jet fuel production from agricultural residues. It highlights the transformative potential of agro-industrial waste when integrated into a value chain designed around renewable energy, climate-smart innovation, and rural development. By leveraging pyrolysis technology, Colombia can turn its rice production by-products into high-value SAF, contributing to global decarbonization goals in the aviation sector while promoting inclusive and sustainable local development.

5.2 SAF from Sugar Cane

As the global aviation industry intensifies its efforts to reduce GHG emissions and transition toward low-carbon alternatives, sustainable aviation fuel (SAF) has emerged as a critical solution for decarbonizing air transport. Among the various feedstocks identified for SAF production, sugarcane (Saccharum officinarum L.) stands out due to its high biomass yield, well-established cultivation practices, and its dual role as a source of fermentable sugars and lignocellulosic residues.

Sugarcane is cultivated extensively in tropical and subtropical regions, with global production exceeding 1.8 billion tons annually. Brazil and India are the leading producers, together accounting for over 60% of the world's sugarcane output. Traditionally valued for its sucrose content, used in the food industry, sugarcane is now recognized as a versatile bioenergy crop that can be harnessed for the production of bioethanol, biogas, and advanced biofuels such as SAF.

Sugarcane is uniquely positioned to support SAF production due to its dual bioenergy streams:

1. Sugar-Rich Juice and Molasses: These components are rich in fermentable sugars (glucose, fructose, and sucrose), which can be directly fermented into bioethanol. Through Alcohol-to-Jet (AtJ) technology, this ethanol is then chemically upgraded into drop-in SAF that meets international aviation fuel standards (ASTM D7566).
2. Lignocellulosic Residues (Bagasse and Trash): After juice extraction, the fibrous material known as bagasse remains. This biomass is composed of cellulose, hemicellulose, and lignin and can be converted into syngas via gasification or into bio-oil through pyrolysis, followed by catalytic upgrading (e.g., Fischer-Tropsch synthesis) to produce SAF. These thermochemical pathways enable full crop valorization, enhancing carbon efficiency and economic viability.

Sugarcane's high biomass yield, long growing season (up to 24 months in some regions), and the potential for multiple ratoon (regrowth) tonnage per hectare. It grows well in deep, well-aerated soils with moderate nutrient inputs and can be cultivated in tropical and subtropical climates across more than 100 countries. Its photosynthetic efficiency (C4 metabolism), deep root system, and efficient use of solar energy make it an excellent candidate for sustainable biomass supply.

Furthermore, sugarcane cultivation and processing generate a wide variety of by-products that are suitable for circular use. Bagasse, previously used mostly for on-site power generation in sugarmills, isnow being considered a feedstock for second-generation biofuels, including SAF.

Similarly, vinasse (a distillation residue) and press mud can be integrated into biogas or fertilizer production, ensuring minimum waste and maximum resource efficiency.

Industrial Pathways for SAF from Sugarcane

Sugarcane-derived SAF can be produced via the following conversion routes:

- Alcohol-to-Jet (AtJ): Bioethanol from sugarcane juice or molasses is dehydrated to ethylene, oligomerized, and then hydrogenated into jet-range hydrocarbons. This pathway is commercially promising and already in pilot and early commercial phases in Brazil and the U.S.
- Fischer-Tropsch Synthesis: Lignocellulosic biomass, such as bagasse, is gasified into syngas (CO and H_2), cleaned, and catalytically converted into long-chain hydrocarbons, which are further refined into SAF.
- Pyrolysis and Upgrading: Fast pyrolysis of sugarcane bagasse produces bio-oil, which undergoes hydrodeoxygenation to yield synthetic aviation-grade fuels.

Each pathway has unique benefits and challenges related to feedstock preparation, conversion efficiency, capital investment, and product quality, but all represent technologically viable routes for scaling SAF from sugarcane.

The use of sugarcane as a feedstock for Sustainable Aviation Fuel (SAF) offers significant socio-economic and environmental benefits. One of the most important advantages is the reduction in GHG emissions. Lifecycle emissions from sugarcane-derived SAF are estimated to be 70–80% lower than those of conventional jet fuels, especially when renewable electricity and carbon capture technologies are incorporated into the production process[36]. Additionally, sugarcane-based SAF contributes to national energy security by reducing dependence on imported fossil fuels, particularly for the aviation sector, which faces challenges in transitioning to electric alternatives. The development of sugarcane biofuel industries also promotes rural development by generating employment across various stages, including cultivation, processing, and logistics, while fostering rural entrepreneurship and encouraging investments in infrastructure. Moreover, sugarcane processing supports a circular economy approach. Co-products such as bagasse, vinasse, and filter cake can be repurposed for bioenergy generation, soil enrichment, and nutrient recycling, ensuring efficient resource use and minimal environmental waste.

36 IATA, Sustainable Aviation Fuel (SAF): https://www.iata.org/en/programs/sustainability/sustainable-aviation-fuel-saf/#:~:text=Today%2C%20most%20SAF%20production%20uses,compared%20to%20conventional%20aviation%20fuel.

Case Study: India's Journey Toward Energy Atmanirbharta through SAF

India has set an ambitious vision to achieve energy Atmanirbharta (self-reliance) by 2047, in alignment with its broader developmental goals and commitment to environmental sustainability. A significant component of this vision involves transitioning towards alternative fuels, with a strong emphasis on Sustainable Aviation Fuel (SAF) as a key enabler of decarbonization in the aviation sector.

A landmark moment in this journey was marked by the successful operation of India's first commercial passenger flight powered by indigenously produced SAF blended with aviation turbine fuel (ATF). The flight, which flew from Pune to Delhi, was a result of collaboration between domestic fuel producers, aviation stakeholders, and biofuel technology innovators. The SAF was produced using indigenous feedstock such as sugarcane molasses, showcasing the capabilities of domestic technology and resources.

This development represents a major milestone in the country's broader effort to reduce carbon emissions and achieve Net Zero by 2070. Unlike conventional jet fuels, SAF is derived from renewable sources like agricultural residues, municipal solid waste, and forestry waste. The use of SAF can reduce GHG emissions by up to 80%, making it a crucial tool in India's climate strategy.

Looking ahead, the potential demand for SAF in India is substantial. With just 1% blending in jet fuel by 2025, the requirement would be around 140 million litres annually. More ambitious targets, such as 5% blending, would require approximately 700 million litres per year. India has sufficient feedstock potential to produce 19 to 24 million tons of SAF annually, while the estimated maximum domestic demand at 50% blending could be about 8 to 10 million tons per year by 2030.

The production of SAF using locally sourced biomass not only supports environmental goals but also significantly boosts the rural economy. Farmers benefit directly from the increased demand for feedstock like sugar cane molasses, with estimates suggesting that over 500,000 farmers could see increased income. Furthermore, the SAF industry is expected to generate more than 100,000 green jobs, contributing to employment growth in both rural and industrial sectors.

India's initiative to produce and use SAF domestically positions the country as a potential global hub for sustainable aviation fuel. With the necessary technological expertise, raw material availability, and industrial collaboration in place, India is well-placed to lead in the global energy transition. This progress supports national objectives like reducing import dependence, promoting renewable energy, and creating a self-reliant energy ecosystem.

The successful demonstration of SAF in commercial aviation marks a defining step in India's energy transformation. Through the integration of sustainable practices, indigenous innovation, and a focus on economic inclusivity, India is progressing toward a future of clean energy, environmental responsibility, and energy self-sufficiency.

Pathway	Feedstock	Certification Name & Blend Limit
Fischer-Tropsch	Energy crops, lignocellulosic biomass, solid waste	FT-SPK (up to 50%)
Hydroprocessed Esters and Fatty Acids (HEFA)	Waste fats, oils, greases (FOGs) from vegetable and animal sources	HEFA-SPK (up to 50%)
Direct Sugars to Hydrocarbons (DSHC)	Conventional sugars, lignocellulosic sugars	HFS-SIP (up to 10%)
Fischer-Tropsch with Aromatics	Energy crops, lignocellulosic biomass, solid waste	FT-SPK+A (up to 50%)
Alcohol to Jet (AtJ)	Sugar, starch crops, lignocellulosic biomass	ATJ-SPK (up to 50%)
Catalytic Hydrothermolysis Jet (CHJ)	Waste fats, oils, greases (FOGs) from vegetable and animal sources	CHJ or CH-SK (up to 50%)
HEFA from Algae	Micro-algae oils	HC-HEFA-SPK (up to 10%)
FOG Co-Processing*	Waste fats, oils, greases (FOGs) from vegetable and animal sources	FOG-CP (up to 5%)
FT Co-Processing*	Fischer-Tropsch biocrude	FT-CP (up to 5%)

Table 2: SAF production Pathway

Case Study: Thailand's Participation in Article 6.2 Cooperative Approaches under the Paris Agreement[37]

Thailand ratified the Paris Agreement in September 2016 and has since committed to ambitious climate action, targeting a 30% reduction in GHG emissions from the business-as-usual (BAU) baseline by 2030, with the potential to increase to 40% if provided with adequate technology, finance, and capacity-building support. This target is anchored in the country's 2nd Updated NDC and its Long-Term Low Emission Development Strategy (LT-LEDS), aiming for carbon neutrality by 2050 and net-zero GHG emissions by 2065.

To facilitate international cooperation under Article 6.2 of the Paris Agreement, Thailand established the Carbon Credit Management Guideline (CCMGM) in 2022. This framework enables the authorization, issuance, and tracking of ITMOs through the Thailand Carbon Credit Registry, ensuring environmental integrity and preventing double-counting. The registry is managed by the Thailand Greenhouse Gas Management Organization (TGO).

One notable initiative is the Implementing Agreement with the Swiss Confederation, approved in 2022, which allows the transfer of ITMOs generated from approved mitigation activities. The Bangkok e-Bus Program serves as the pilot project, replacing conventional buses with electric vehicles on scheduled public routes. Between 2022 and 2030, the program is expected to generate up to 500,000 tCO_2e in emission reductions eligible for international transfer.

Thailand's cooperative approach emphasizes robust governance, transparent reporting, and conservative baseline setting. Projects must be additional to national mitigation plans and adhere to sustainable development safeguards, including contributions to at least two Sustainable Development Goals (SDGs) beyond climate action. Environmental and social impact assessments are required to minimize adverse effects, and co-benefit reporting is made publicly accessible.

Through these measures, Thailand positions itself as a proactive participant in international carbon markets, leveraging cross-border collaboration to accelerate domestic decarbonization, attract investment, and promote technology transfer while safeguarding environmental integrity and sustainable development.

37 UNFCCC, Thailand LT-LEDS - https://unfccc.int/sites/default/files/resource/Thailand%20LT-LEDS%20%28Revised%20Version%29_08Nov2022.pdf

Case Study: Ghana's Article 6.2 Cooperative Approach in the Paris Agreement

Ghana ratified the Paris Agreement in September 2016 and, in its 2021 updated NDC, committed to reducing GHG emissions by an absolute 64 $MtCO_2e$ by 2030, of which 24.6 $MtCO_2e$ is unconditional and 39.4 $MtCO_2e$[38] is conditional upon international finance, technology transfer, and capacity building. The NDC covers CO_2, CH_4, N_2O, and HFCs, representing 88% of national emissions. Recognising the potential of carbon markets to mobilise climate finance and attract green investment, Ghana developed a National Operational Framework for Article 6.2 Cooperative Approaches and guidance on the VCM, approved by Cabinet in 2022, to ensure transparent, high-integrity transactions of ITMOs.

Ghana has pursued bilateral agreements with Switzerland (signed November 2020, in force July 2021), Sweden, and Singapore (both concluded November 2022) to operationalise Article 6.2. Participation is voluntary, and the framework authorises ITMOs only from conditional NDC programmes and eligible activities outside the NDC, excluding unconditional NDC activities (the"red list") to prevent over-crediting. Governance is coordinated by the Ministry of Environment, Science, Technology, and Innovation (MESTI), with the Environmental Protection Agency (EPA) hosting the Carbon Market Office (CMO) to operate the Ghana Carbon Registry (GCR), supported by the Carbon Market Inter-Ministerial Committee, Carbon Market Committee, and Carbon Market Technical Advisory Committee.

The mitigation activity process involves design and submission of a Mitigation Activity Design Document (MADD), validation by accredited entities, issuance of a Letter of Authorisation (LOA) before registration, registry listing, monitoring and verification, issuance of ITMOs with unique identifiers, and first transfer via the GCR with corresponding adjustments applied. All projects must meet environmental integrity and sustainable development criteria, contribute to at least two additional Sustainable Development Goals (SDGs) beyond climate action, and pass social and environmental safeguard assessments.

Ghana's readiness is supported through partnerships with the West African Alliance on Carbon Markets, the World Bank Climate Market Club, SECO, and UNDP. Financial mechanisms include participant registration fees, corresponding adjustment fees to account for NDC opportunity costs, and registry listing fees.The initial pipeline of Article 6.2 activities includes climate-smart rice cultivation, clean energy access programmes, biomass pellet production, effi-

38 UNFCCC, Ghana NDC - https://unfccc.int/sites/default/files/NDC/2022-06/Ghana%27s%20Updated%20Nationally%20Determined%20Contribution%20to%20the%20UNFCCC_2021.pdf

cient cookstoves, composting, landfill gas management, green split air conditioners, and REDD+ programmes. This framework positions Ghana as a pioneer in African carbon markets, with strong governance, clear eligibility rules, and transparent operations aimed at mobilising foreign direct green investment, accelerating technology transfer, strengthening local capacity, and supporting NDC achievement while safeguarding environmental integrity.

ANNEX 1: INITIAL REPORT OUTLINE TEMPLATE

OUTLINE FOR THE INITIAL REPORT AND UPDATED INITIAL REPORT REFERRED TO IN DECISION 2/CMA.3, ANNEX, CHAPTER IV.A (INITIAL REPORT)[39] [40] [41] (Version 02.0)

[English only]

Party	Party name
NDC period	yyyy - yyyy
Report number for the NDC period[a]	1
Report type: Initial report Updated initial report	☐ ☐
Updated initial report number	1
Version[b]	1.0
Date	dd/mm/yyyy
Name(s) of cooperative approach(es) included in this report (Include a line for each additional cooperative approach)	Cooperative approach 1 Cooperative approach 2

- Ascribe sequential number for updated initial reports. The number '1' is reserved for the initial report.
- Ascribe version number as follows: decimal increase for minor revisions (typos, corrections) and digit increase for content changes.

Note: For updated initial report fill in only section IV. Information on each cooperative approach (para. 18(g–i), para. 19 of the annex to decision 2/CMA.3).

39 This template has been developed based on the outline adopted by decision 6/CMA.4. Para 36 of decision 6/CMA.4 further encourages participating Parties to prepare their initial report, updated initial report and annex 4 to the biennial transparency report (Regular information) in accordance with the outlines contained in annexes V and VI respectively, as referred to in decision 2/CMA.3, annex, chapter IV.A (Initial report) and IV.C (Regular information); Supplementary elements of information have been added as per decision 4/CMA.6, annex 1.

40 The list of the acronyms and abbreviations used in this template are available in decision 6/CMA.4: https://unfccc.int/documents/624474.

41 References to chapters and paragraphs in the outline are to chapters and paragraphs in the annex to decision 2/CMA.3, unless stated otherwise. "Article" refers to an Article of the Paris Agreement.

A: Information on how the Party ensures that it is a Party to the Paris Agreement (para. 21(a), para. 4(a), update to para. 18(a))
B. Information on how the Party ensures that it has prepared, communicated and is maintaining an NDC in accordance with Article 4, paragraph 2 (para. 18(a), para. 4(b), to be updated by para. 21(a))
C. Information on how the Party ensures it has arrangements in place for authorizing the use of ITMOs towards achievement of NDCs pursuant to Article 6, paragraph 3 (para. 18(a), para. 4(c), to be updated by para. 21(a))
D. Information on how the Party ensures it has arrangements in place that are consistent with the Article 6, paragraph 2, guidance and relevant decisions of the CMA for tracking ITMOs (para. 18(a), para. 4(d), to be updated by para. 21(a))
E. Information on whether the most recent national inventory report required in accordance with decision 18/CMA.1 has been provided (para. 18(a), para. 4(e), to be updated by para. 21(a))
F. Information on how the Party ensures participation contributes to the implementation of its NDC and long-term low-emission development strategy, if it has submitted one, and the long-term goals of the Paris Agreement (para. 18(a), para. 4(f), to be updated by para. 21(a))

II. Description of the Party's NDC, as referred to in decision 18/CMA.1, annex, paragraph 64, where a participating Party has not yet submitted a biennial transparency report (para. 18(b), to be updated by para. 21(b))
A. Target(s) and description, including target type(s) (decision 18/CMA.1, annex, para. 64(a))
B. Target year(s) or period(s), and whether they are single-year or multi-year target(s) (decision 18/CMA.1, annex, para. 64(b))
C. Reference point(s), level(s), baseline(s), base year(s) or starting point(s), and their respective value(s) (decision 18/CMA.1, annex, para. 64(c))
D. Time frame(s) and/or periods for implementation (decision 18/CMA.1, annex, para. 64(d))
E. Scope and coverage, including, as relevant, sectors, categories, activities, sources and sinks, pools and gases (decision 18/CMA.1, annex, para. 64(e))
F. Intention to use cooperative approaches that involve the use of internationally transferred mitigation outcomes under Article 6 towards NDCs under Article 4 of the Paris Agreement (decision 18/CMA.1, annex, para. 64(f))
G. Any updates or clarifications of previously reported information (e.g. recalculation of previously reported inventory data, or greater detail on methodologies or use of cooperative approaches) (decision 18/CMA.1, annex, para. 64(g))
III. Information on ITMO metrics, method for applying corresponding adjustments and method for quantification of the NDC (para. 18(c–f))

A. ITMO metrics (para. 18(c))	
B. Method for applying corresponding adjustments as per chapter III.B (Application of corresponding adjustments) (para. 18(c))	
1. Description of the method for applying corresponding adjustment for multi- or single year NDCs that will be applied consistently throughout the period of NDC implementation, if applicable (para. 18(c))	
2. Description of the method for applying corresponding adjustments where the method is a multi-year emissions trajectory, trajectories or budget, if applicable (para. 18(c))	
3. Description of how the method for applying corresponding adjustments aligns with decision 2/CMA.3, annex, paragraph 7 (para. 18(c) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant[42]	
4. Description of the methods used for establishing the indicative trajectory, trajectories or budget and the resulting trajectory, trajectories or budget and their relationship to the indicators referred to in decision 18/CMA.1, annex, paragraph 65, to which corresponding adjustments will be applied (para. 18(c) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant[43]	
C. Quantification of the Party's mitigation information in its NDC in t CO2 eq, including the sectors, sources, GHGs and time periods covered by the NDC, the reference level of emissions and removals for the relevant year or period, and the target level for its NDC or, where this is not possible, the methodology for the quantification of the NDC in t CO2 eq (para. 18(d)).	

42 Decision 4/CMA.6 para. 18 requests each participating Party to incorporate the elements contained in annex I when providing information in its initial report and any updated initial reports, as referred to in decision 2/CMA.3, annex, paragraphs 18–19, as relevant. These elements are supplementary elements of information. These elements are referred to across the template as supplementary elements and are written in italic to differentiate them from the initial elements of the outline of the initial and updated initial reports.

43 Ibid.

>>
D. Quantification of the Party's NDC, or the portion in the relevant non-GHG indicator, in a non-GHG metric determined by each participating Party, if applicable (para. 18(e))
>>
E. For a first or first updated NDC consisting of policies and measures that is not quantified, information on quantification of the Party's emission level resulting from the policies and measures that are relevant to the implementation of the cooperative approach and its mitigation activities for the categories of anthropogenic emissions by sources and removals by sinks, as identified by the first transferring Party pursuant to paragraph 10, and the time periods covered by the NDC (para. 18(f))
>>
IV. Information on each cooperative approach (para. 18(g–i), para. 19)
Note: For the initial report and the updated initial report, chapters A–H below should be repeated for each cooperative approach. For each further cooperative approach, each participating Party shall submit the information referred to in para. 18(g–i) of the annex to decision 2/CMA.3 in an updated initial report (decision 2/CMA.3, annex, para. 19)
A. Copy of the authorization by the participating Party (para. 18(g))
B. Description of the cooperative approach (para. 18(g))
C. Duration of the cooperative approach (para. 18(g))
D. Expected mitigation for each year of the duration of the cooperative approach (para. 18(g))
E. Participating Parties involved in the cooperative approach (para. 18(g))

F. Authorized entities (para. 18(g))	
G. Description of any arrangements for authorizing using participating Parties and authorized entities, if applicable (para. 18(g) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant[44]	
H. Type of cooperative approach, if applicable (para. 18(g) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant[45]	
1. Description of how the cooperative approach ensures that there is no net increase in global emissions within and between NDC implementation periods (para. 18(h)(i), to be updated by para. 22(b)(i))	
2. Description of how the cooperative approach avoids locking in emission levels, technologies or practices that are inconsistent with achieving the long-term goals of the Paris Agreement (para. 18(h)(i) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant[46]	
3. Description of how the mitigation outcomes from the cooperative approach are shared between the participating Parties (para. 18(h)(i) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant	

44 Ibid.
45 Ibid.
46 Ibid.

4. Description of how it is ensured that decision-making processes in an underlying policy or regulatory framework, and relevant activities, are transparent and inclusive, and whether they include opportunities for public participation and scrutiny, including the standards and procedures for conducting stakeholder consultation, including with civil society organizations, Indigenous Peoples and local communities (para. 18(h)(i) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant	
5. Description of how participation in the cooperative approach and the combination of all cooperative approaches in which the Party participates contributes to the implementation of the Party's nationally determined contribution and long-term low-emission development strategy, if it has submitted one, and the long-term goals of the Paris Agreement (para. 18(h)(i) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant	
6. Description of how the cooperative approach ensures environmental integrity through robust, transparent governance and the quality of mitigation outcomes, including through conservative reference levels and baselines set in a conservative way and below 'business as usual' emission projections (including by taking into account all existing policies and addressing uncertainties in quantification and potential leakage) (para. 18 (h)(ii), to be updated by para. 22(b)(ii))	
8. Description of how baseline and reference levels are established ensure they are conservative and below 'business as usual' emission projections, and information on what assumptions have been made (para. 18(h)(ii) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant	

9. Description of the methodological approaches used for quantifying the mitigation outcomes derived from the cooperative approach (para. 18(h)(ii) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant	
10. Description of how uncertainties in the quantification of emission reductions and removals are assessed and how such uncertainties are taken into account (para. 18(h)(ii) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant	
11. Description of how the risk of leakage is assessed, and prevented or minimized, and how any remaining leakage will be quantified and deducted in the quantification of mitigation outcomes (para. 18(h)(ii) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant	
12. Description of how the cooperative approach is minimizing the risk of non-permanence of mitigation across several NDC periods and how, when reversals of emission reductions or removals occur, the cooperative approach will ensure that these are addressed in full (para. 18(h)(iii), to be updated by para. 22(b)(iii))	
13. Description of how the risk of non-permanence is assessed under the cooperative approach and minimized across several nationally determined contribution periods, including the frequency and timing of risk assessments, the methodological approaches used for those assessments, the types of risk identified, the likelihood, scale and potential impacts of such risks, and the time-horizons considered (para. 18(h)(iii) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant	

14. Description of how reversals are monitored and quantified, and when they occur, how they are addressed in full, including which methodological approaches are used to address reversals, how the responsibility for addressing reversals is assigned, the duration and frequency of monitoring for reversals, and the measures envisaged in case of failures in monitoring (para. 18(h)(iii) supplemented by decision 4/CMA.6, annex 1) - Supplementary element of information to be provided by Parties as relevant	
J. Additional description of the cooperative approach (para. 18(i))	
1. Description of how the cooperative approach minimizes and, where possible, avoids negative environmental, economic and social impacts (para. 18(i)(i), to be updated by para. 22(f))	
2. Description of how the cooperative approach reflects the eleventh preambular paragraph of the Paris Agreement, acknowledging that climate change is a common concern of humankind, Parties should, when taking action to address climate change, respect, promote and consider their respective obligations on human rights, the right to health, the rights of indigenous peoples, local communities, migrants, children, persons with disabilities and people in vulnerable situations and the right to development, as well as gender equality, empowerment of women and intergenerational equity (para. 18(i)(ii), to be updated by para. 22(g))	
3. Description of how the cooperative approach is consistent with the sustainable development objectives of the Party, noting national prerogatives (para. 18(i)(iii), to be updated by para. 22(h))	
4. Description of how the cooperative approach applies any safeguards and limits set out in further guidance from the CMA pursuant to chapter III.D (para. 18(i)(iv), to be updated by para. 22(i))	
5. Description of how the cooperative approach contributes resources for adaptation pursuant to chapter VII (Ambition in mitigation and adaptation actions), if applicable (para. 18(i)(v), to be updated by para. 22(j))	

6. Description of how the cooperative approach delivers overall mitigation in global emissions pursuant to chapter VII (Ambition in mitigation and adaptation actions), if applicable (para. 18(i)(vi), to be updated by para. 22(k))	

ANNEX 2: VOLUNTARY STANDARDIZED TEMPLATE FOR THE AUTHORIZATION OF THE USE OF THE INTERNATIONALLY TRANSFERRED MITIGATION OUTCOMES FROM A COOPERATIVE APPROACH

Voluntary Standardized Template[47] [48] [49]

AUTHORIZATION OF USE OF THE INTERNATIONALLY TRANSFERRED MITIGATION OUTCOMES FROM A COOPERATIVE APPROACH

(Version 01.0)

Purpose

1. This document provides the information outlined in paragraph 5 of decision x/CMA.6 in relation to the authorization of the use of internationally transferred mitigation outcomes from a cooperative approach as referred to in decision 2/CMA.3, annex, paragraph 18. [50] [51]
2. This document is:

- The authorization referred to in decision 2/CMA.3, annex, paragraph 18; or
- An attachment to the authorization referred to in decision 2/CMA.3, annex, paragraph 18.

I. ELEMENTS OF THE AUTHORIZATION OF USE OF THE INTERNATIONALLY TRANSFERRED MITIGATION OUTCOME FROM A COOPERATIVE APPROACH

A: Elements related to the authorization process

Party:	>> Name of Party as per common nomenclatures.
Authorization ID:	>> ID of the authorization as per the tracking system of the authority that provides the authorization.

47 When filling in this template the values for specific information attributes shall be provided as per the list of common nomenclatures under Article 6, as applicable and available. The list of common nomenclatures under Article 6.2 of the Paris Agreement is available at https://unfccc.int/documents/641433.

48 Guidance on the completion of the template provided in grey is to be overwritten or deleted, as appropriate.

49 If the template is used to prepare a document attached to an authorization, information already included in the authorization should be referenced accordingly.

50 The list of acronyms and abbreviations used is available in decision 6/CMA.4: https://unfccc.int/documents/624474.

51 References to paragraphs are to paragraphs in the annex to decision -/CMA.6, unless stated otherwise. "Article" refers to an Article of the Paris Agreement.

Authorization date:[52]	Click or tap to enter a date.
Version:	01.0
Date of last change to the authorization, if applicable:	Click or tap to enter a date.
Effective date of the change to the authorization:[53]	Click or tap to enter a date.
Duration of the authorization:[54]	**Start date:** Click or tap to enter a date.
	End date: Click or tap to enter a date.
NDC period of the authorizing Party:	**Start date:** Click or tap to enter a date.
	End date: Click or tap to enter a date.
Components covered by the authorization:	☐ Authorization of the cooperative approach ☐ Authorization of ITMOs ☐ Authorization of entities *Any combination of options is possible.*
Where changes to the authorization may occur, information on the applicable terms and conditions of the authorization that specify the circumstances for such changes and a description of the process for managing them in a way that avoids double counting:	
>>	
Where changes to the authorization have occurred consistent with the provided terms and conditions of the authorization, a description of the circumstances in which the changes occurred and how changes follow the process for managing them in a way that avoids double counting:	
>>	
Where changes to the authorization have occurred, a description of the specific changes in respect to the earlier version of the authorization:	
>>	

52 Date and time refer to UTC, universal coordinated time.

53 The effective date of the change to the authorization shall not be before the date of submission of the revised voluntary standardized template of authorization.

54 The date and duration of the authorization, including the final date for mitigation outcomes to be issued or cancelled, in connection with the first transfer specified by the Party as per decision 2/CMA.3, annex, paragraph 2(b), as applicable.

B. Elements related to the authorization of the cooperative approach			
Name of the cooperative approach included in this authorization:	>> *Name of the cooperative approach identifier as per common nomenclatures, where available.*		
Unique identifier for the cooperative approach, if available:[55]	>> *Cooperative approach identifier as per common nomenclatures, where available.*		
The name(s) of other participating Party(ies) covered by the authorization, if known: Other participating Party(ies) indicated are those authorized to acquire ITMOs under this authorization.	>> *Party ISO as per common nomenclatures*	>> *Name of Party as per common nomenclatures.*	
	>> *Party ISO as per common nomenclatures*	>> *Name of Party as per common nomenclatures.*	
	(add rows as necessary)		
Duration of the cooperative approach:	**Start date:**	Click or tap to enter a date.	
	End date:	Click or tap to enter a date.	
Where authorizing for OIMP, the specification of the first transfer of the mitigation outcome by the participating Party in accordance with decision 2/CMA.3, annex, paragraph 2(b):	☐ The authorization of the mitigation outcomes ☐ The issuance of the mitigation outcomes ☐ The use or cancellation of the mitigation outcomes *Only one option is possible. The selected option cannot change for the cooperative approach.*		
Metrics covered:	☐ GHG (t CO_2 eq.) ☐ Non-GHG (consistent with the NDC metrics)[56] *Mutually exclusive options.*		

55 The cooperative approach identifier will be available if the initial report has been submitted.

56 As per decision 2/CMA.3, annex, paragraph 1(c).

Units of measurement (applicable to non-GHG metric) and units of conversion to CO2 eq:	
>> *Units of measurement*	>> *Units of conversion*
>> *Units of measurement*	>> *Units of conversion*
(add rows as necessary)	
Sector(s):	>> *Provide sector(s) as per common nomenclatures separating each sector with commas.*
Mitigation types:	☐ Emission reductions ☐ Removals ☐ Emission reductions and removals *Mutually exclusive options.*
Activity types	>> *Provide activity types as per the common nomenclatures separating each type with commas.*
Activity(ies), if applicable:	
>> *Activity ID, if any*	>> *Name of the activity*
>> *Activity ID, if any*	>> *Name of the activity*
(add rows as necessary)	
The identification of or cross-reference to underlying regulations, frameworks, standards or procedures, including any specific methodologies underpinning the cooperative approach:	
>>	
C. Elements related to the authorization of ITMOs	
Scope of authorization of use of ITMOs:	☐ NDC ☐ IMP ☐ OP ☐ OIMP ☐ NDC and OIMP ☐ NDC and IMP ☐ NDC and OP *Mutually exclusive options.*

OIMP authorized, if applicable:	>> *This field is applicable if the authorization includes OIMP and is to specify the purpose(s) by the appropriate title(s) or description(s), e.g. Carbon Offsetting and Reduction Scheme for International Aviation.*	
The quantity of ITMOs being authorized, if applicable:	>> *Quantity.*	
Vintage(s):	>> *Years during with mitigation occurred as covered by the authorization:* *YYYY* *YYYY* *YYYY* *Add rows as necessary.*	
The registry the participating Party has, or has access to, for the purpose of tracking and recording internationally transferred mitigation outcomes:	>> *Registry identifier as per common nomenclatures, where available.*	>> *Registry name as per common nomenclature, where available.*
Relevant registry(ies) in any underlying regulations, frameworks, standards or procedures that contain mitigation outcomes and track the status of mitigation activities and outcomes and participation and transactions by entities, as applicable:	>> *Name of the relevant registry(ies) in an underlying regulation, framework, standard or procedure as per common nomenclatures.*	>> *Name of the underlying regulation, framework, standard or procedure under which the relevant registry operates.*
	(add rows as necessary)	
D. Elements related to the authorization of entities		

Entities covered by the authorization, if known;[57]	*Name:*		*Entity ID: as per common nomenclatures.*
	Name:	*Entity ID: as per common nomenclatures.*	
	(add rows as necessary)		
II. FURTHER ELEMENTS FOR THE AUTHORIZATION			
>> *Additional information at the discretion of the authority providing the authorization. e.g., authorization terms and conditions, etc.*			
III. Information On the INstituTional arrangementS for Authorization			
Name	>> *Name of the authority that provides the authorization.*		
Address	>> *Address of the authority that provides the authorization.*		
E-mail	>> *E-mail of the authority that provides the authorization.*		
Representative of the authority	>> *Name of the person authorized to represent the authority that provides the authorization.*		
Signature, stamp or equivalent means of authentication	*As relevant.*		

57 Entities covered by the authorization are those authorized by the participating Party providing the authorization.

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and protect the environments on which these livelihoods are built. We specialise in linking local priorities to global challenges. IIED is based in London and works in Africa, Asia, Latin America, the Middle East and the Pacific, with some of the world's most vulnerable people. We work with them to strengthen their voice in the decision-making arenas that affect them - from village councils to international conventions.

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About Book

This toolkit is a comprehensive, practice-oriented resource for governments, project developers, researchers, and institutions navigating cooperative approaches under Article 6.2 of the Paris Agreement. It demystifies key concepts such as Internationally Transferred Mitigation Outcomes (ITMOs), corresponding adjustments, and MRV systems, while offering a clear procedural roadmap from project registration to credit issuance and authorization. Drawing on India's institutional experience alongside case studies from Thailand and Ghana, the toolkit illustrates how countries can build credible, high-integrity carbon markets. A dedicated chapter explores an emerging opportunity: converting agricultural waste into Sustainable Aviation Fuel, linking climate finance to rural livelihoods and circular economy principles. Complete with practical exercises, templates, and annexes, this guide equips stakeholders to engage effectively in international carbon market cooperation and advance their Nationally Determined Contributions.

Developed by IIED, VCMI, and SKUAST-K, with the support of India's Ministry of Agriculture and Farmers' Welfare.

कृषि एवं किसान कल्याण मंत्रालय
MINISTRY OF AGRICULTURE AND FARMERS WELFARE

iied International Institute for Environment and Development

VCMI Voluntary Carbon Markets Integrity Initiative