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HOW CAN THE PARIS AGREEMENT CREDITING MECHANISM DELIVER UPSCALED CREDITING?

Existing experiences and options for future implementation

Analytical report

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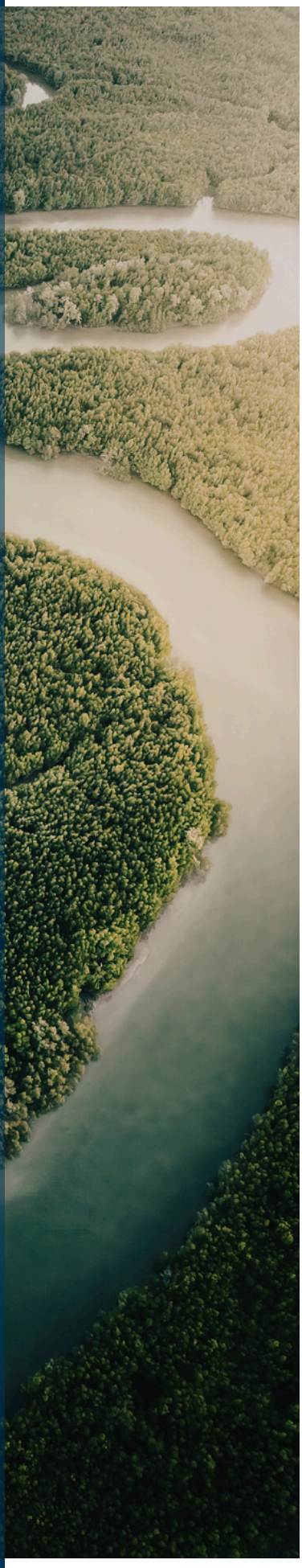

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Executive Summary

Introduction and Objectives

The gap between the sum of nationally determined contributions (NDCs) and a global greenhouse gas (GHG) emissions pathway in line with the long-term global temperature goal of the Paris Agreement (PA) of limiting temperature increase from the pre-industrial period to "well below" 2°C remains persistently high. As governments' willingness to provide public international climate finance is decreasing due to geopolitical crises, the role of international carbon markets to channel resources for mitigation to the most effective opportunities is becoming more important. Following the finalisation of the PA's Article 6 rulebook at COP29 in Baku, both Article 6.2 cooperative approaches as well as the Article 6.4 Paris Agreement Crediting Mechanism (PACM) present opportunities to enable a larger role of these markets in the future. This report identifies options for upscaled crediting in international carbon markets going beyond specific projects, assesses experiences with such crediting in the past and provides recommendations for the PACM regulators to enable rapid upscaling if significant demand for PACM credits materialises.

Scope and Experience with Upscaled Crediting

Conceptually, upscaled crediting can be differentiated by level of aggregation into programmatic approaches which bundle different projects, crediting of the introduction of mitigation policy instruments, jurisdictional crediting and sectoral crediting that covers several jurisdictions. Of these approaches, programmatic and jurisdictional crediting have been applied in practice, while policy and sectoral crediting remain largely theoretical.

The concept of Programmes of Activities (PoAs) was introduced under the Clean Development Mechanism (CDM) of the Kyoto Protocol in 2005 and operationalised from 2009 onwards. Over 350 PoAs were registered that had an annual credit generation potential of 90 million. Close to 75 million credits have been issued to date. While this is less than could be extrapolated from the overall PoA credit generation potential, the issuance volume can be explained by the reduction of the price for CDM credits and the freezing of credit issuances from 2020 onwards. One PoA has more than 1000 component projects. PoAs involving several activity types and countries are more likely to achieve issuance than those with few components situated in one country. PoAs have been developed both for large and small-scale technologies, showing their versatility. A large share of the activities that aim for transition from the CDM to the PACM are PoAs which can be expanded further.

Jurisdictional crediting has been operationalised in the field of avoided deforestation by the World Bank's Forest Carbon Partnership (FCPF) Carbon Fund and the private carbon market programme Architecture for REDD+ Transactions - The REDD+ Environmental Excellence Standard (ART TREES) since the late 2010s. They have each achieved issuance of about 50 million credits to date. ART TREES

has achieved recognition by the International Civil Aviation Organization (ICAO) offsetting scheme CORSIA which has led to significant demand for its credits at prices reaching a peak of USD 23 in late 2025, but which have fallen to USD 12 since. The FCPF Carbon Fund is closing in 2028 and the jurisdictions covered by it are shifting to ART TREES, and potentially to the newly emerging Scaling Climate Action by Lowering Emissions (SCALE) fund - a World Bank umbrella programme that helps participating countries turn high-emission-reduction World Bank projects into access to debt-neutral carbon finance for low-emission, resilient development. As 26 jurisdictions are covered by ART TREES, which will be enabled to issue credits over the next years, supply of ART TREES credits is likely to exceed 100 million before 2030. However, these credits face ongoing criticism regarding the current ART TREES approach to additionality determination, baseline setting – especially in the context of high forest-low deforestation (HF-LD) jurisdictions - and preventing reversals.

As for policy crediting, while various approaches to policy crediting have been prepared by the multilateral development institutions World Bank - through the Transformative Carbon Asset Facility (TCAF) - and Global Green Growth Institute (GGGI) through its Designing Article 6 Policy Approaches (DAPA) initiative, proven cases remain limited with only one pilot transaction reaching implementation – with 2 million credits have generated by a TCAF-structured reduction of electricity subsidies in Uzbekistan. GGGI's Carbon Feed-In Premium Programme in Zambia represents a new type of hybrid approach that uses a programmatic approach that is directly linked with policy instruments that promote solar power with battery storage.

Sectoral crediting has been discussed for over 15 years but not yet been implemented in practice as various attempts to pilot this approach have failed to move into implementation.

Enabling conditions for upscaled crediting include availability of appropriate baseline and monitoring methodologies. Methodologies for programmes are widely available and could be rapidly implemented under PACM. Generally, the use of default parameters needs to be scrutinised carefully to prevent structural over-crediting. Policy crediting methodologies, for example for applying a price threshold to carbon pricing policies or crediting policies that enable infrastructure investments unlocking expansion of mitigation technologies deemed non-additional on a stand-alone basis should be tested in pilots. Currently applied methodologies for jurisdictional crediting need to be significantly revised in order to satisfy PACM requirements. Furthermore, host country governments need to be enabled to address over-crediting risks, particularly if modelling is applied to determine the baseline, potential conflicts of interest given their strong role in most types of upscaled crediting as well as potential harm to sustainable development if policy instruments are designed in a manner that does not take into account vulnerable populations. Capacity building for Article 6 should include these aspects. Given that successful upscaling requires trust in long-term policy persistence, long term ITMO purchase contracts with indicators that reward host country policy consistency should be pursued.

NDC Alignment and Transparency: All Article 6 activities must contribute to NDC implementation and long-term low-emission development strategies (LT-LEDS). Upscaled crediting offers greater transformational potential than project-based approaches, but baselines, additionality and other features must be set conservatively and should be set ideally below unconditional NDC targets. Ambiguity in the PA rulebook around NDC target conditionality creates practical challenges for host countries when determining which activities and resulting mitigation outcomes to authorise for ITMO transfers. Given the need to report corresponding adjustments and national annual emissions balances to the UNFCCC in the biennial transparency reports (BTR), governments need to ensure close collaboration between the institutions overseeing upscaled crediting and those compiling the inventory and drafting the BTRs.

Environmental and Social Integrity: Standard integrity requirements – additionality, conservative baselines, robust MRV, leakage and non-permanence – can become harder to apply at larger scales. Programmatic crediting can extend project-level methodologies, but policy and jurisdictional approaches face significant challenges in attribution of mitigation and baseline modelling. Critically, increasing scale can amplify over-crediting risk in absolute terms as a parameter overestimated by a specific percentage leads to a ten times higher over-crediting if the scale is increased by a factor of ten, making conservative parameters even more important than at project level. Article 6.4 introduces mandatory safeguards – including the SD Tool and grievance mechanisms – marking a significant upgrade over the CDM. Experiences generated by international climate finance institutions regarding implementation of safeguards and gender mainstreaming should be taken into account then designing upscaled crediting.

The scale of CDM transition into PACM could become substantial – covering almost 1400 activities and 119 programmatic activities with more than 950 component activities, supporting energy efficiency in households, solar PV and methane avoidance activities. However, host party approvals were a critical bottleneck, with only 526 activities (~70 million tCO_2e/yr) approved as of early 2026, concentrated in Eastern Africa and Southern Asia.

1,100+ prior consideration notifications signal strong interest among project developers to register with PACM, especially in renewables and energy efficiency across Asia and Africa. Among these, several activity types are relevant for upscaled crediting, in particular through programmatic approaches.

On the regulatory side, **while PACM standards have been sufficiently complete to operationalize the mechanism, they remain incomplete for PoAs**: key standards for additionality, baselines and leakage have yet to be extended to cover programmatic approaches. **Further types of upscaled crediting including policy, jurisdictional and sectoral crediting are not yet addressed**. The SBM has initiated conceptual work on large-scale crediting, but this will focus initially on programmatic crediting, rendering the timeline for other types of upscaled crediting unclear.

Among the five activity types – electric cooking, electric mobility, waste management, carbon dioxide removals (BECCS/DACCS), and REDD+ **electric cooking and waste management are well-suited to programmatic approaches given their replicable, dispersed nature, while e-mobility faces a critical near-term barrier in the absence of any approved PACM methodology.** Waste management also can be upscaled rapidly given the first PACM methodology approved in 2025, supports landfill gas flaring or use. Electric cooking faces affordability constraints but the methodological bases are expected to be available in 2026. CDR remains nascent in PACM host countries but is gaining traction in Europe, with cross-border Article 6.2 pilots beginning to emerge, and non-state crediting mechanisms, even though policy support and blended finance continue to be needed to support this early-stage technology. REDD+ has the most developed jurisdictional crediting experience and methodological toolkit. While there have been efforts to address integrity concerns around baselines, additionality and permanence, reflecting the Article 6.4. rules, modalities and procedures is a precondition for PACM approval. This would require baseline to move below-business as usual, and to apply more stringent additionality tests to demonstrate how carbon finance enables new measures in line with the PACM additionality standard Together, the case studies reinforce that there is enormous potential for PACM to promote upscaled crediting for new activity types not prevalent in CDM, but this is contingent on closing regulatory, methodological, and financing gaps simultaneously.

We would like to stress that while upscaled crediting holds significant potential, practical implementation remains **limited to programmatic and jurisdictional approaches**, with policy and sectoral crediting still largely theoretical. Programmatic crediting is the most immediately deployment-ready option, jurisdictional crediting has made improvements with integrity frameworks continuing to evolve as practical experience is gained and national Article 6 frameworks mature, and the currently small number of approved PACM methodologies remains a barrier in the short term.

We make six key recommendations that should be addressed as a basis for integrating upscaled crediting into the PACM regulatory standards and activity portfolio:

1. **Complete the programmatic regulatory framework:** Prioritize and accelerate the update of all relevant PACM standards (e.g. additionality, baselines, sampling) to fully operationalize programmatic crediting. This enables the existing transition pipeline to expand as well as the development of new programmatic activities.
2. **Accelerate development of methodologies that serve activity types that can rapidly be upscaled:** While regulatory standards are increasingly in place, methodology updates remain slow, with only one approved PACM methodology approved for landfill gas. While there is ongoing work on updating several important methodologies for renewable energy and clean cooking, key scalable activity types such as e-mobility remain absent from the

MEP work plan. The UK and other actors engaged in upscaled crediting should support bottom-up methodology submissions for rapidly scalable activity types.

3. **Prioritize host country partnerships based on presence of scalable activity types:** Focus capacity building, investments, and offtake commitments on countries and sectors with proven activity pipelines and high Article 6 readiness, for instance Eastern Africa and South/South-East Asia, where programmatic structures and host party engagement are already advanced. Build on existing jurisdictional REDD+ as well as just energy transition initiatives.
4. **Work towards environmental and social integrity of upscaled crediting pilots**: Given mixed experiences with co-benefit generation of jurisdictional and policy crediting pilots specifically build in environmental and social integrity elements in future upscaled crediting initiatives.
5. **Establish and harmonize buyer clubs to provide certainty on long term demand at scale:** Upscaled crediting requires predictable, long-term demand signals. Coordinated buyer clubs could build on initiatives like the Forest and Climate Leaders' Partnership (FCLP) Scaling Jurisdictional REDD+ Coalition and offer multi-decadal offtake agreements as well as and blended finance arrangements combining upfront capital with results-based revenues are essential to attract the investment scales required.
6. **Develop a carbon pricing policy crediting pilot**: A concrete pilot testing additionality determination and baseline setting for a carbon pricing policy, including a methodology submission to PACM, is needed to move policy crediting from theory towards implementation.

Upscaled crediting holds substantial potential to strengthen global NDC ambition through well-designed approaches under carbon markets that are fully anchored in the Paris Agreement rulebook. Building on the significantly strengthened PACM rules we need to show in the next three years that PACM deliver mitigation at scale beyond projects with high social and environmental integrity. The Coalition to Grow Markets and similar initiatives could be used as a framework for developing and testing upscaled crediting approaches and to rapidly feed them into PACM

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Abbreviations

AAU	Assigned Amount Unit
AER	Authorised Emission Reduction
AFOLU	Agriculture, Forestry and Other Land Use
ART	Architecture for REDD+ Transactions
BAU	Business-as-usual
BECCS	Bioenergy with Carbon Capture and Storage
CARP	centralised accounting and reporting platform
CCfD	Carbon Contracts for Difference
CCS	Carbon Capture and Storage
CCUS	Carbon Capture, Utilisation and Storage
CDM	Clean Development Mechanism
CDR	Carbon Dioxide Removal
CER	Certified Emission Reduction
CFIP	Carbon Feed-In Premium
Ci-Dev	Carbon Initiative for Development
CLEAR	Comprehensive Lowered Emissions Assessment and Reporting
CMA	Conference serving as the Meeting of the Parties to the Paris Agreement
CME	Coordinating and Managing Entity
CNG	compressed natural gas
COP30	30th Conference of the Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CPA	Component Project Activity
CPs	component projects
CRCF	Carbon Removal and Carbon Farming Certification Framework
CSI	Cement Sustainability Initiative
DAC	Direct Air Capture
DACCS	Direct Air Carbon Capture and Storage
DAPA	Designing Article 6 Policy Approaches
DESNZ	Department for Energy Security and Net Zero
dMRV	digital Measurement, Reporting and Verification
EE	energy efficiency

EIB	European Investment Bank
ERPA	Emission Reduction Purchase Agreement
ETA	Energy Transition Accelerator
ETF	Enhanced Transparency Framework
EU	European Union
ETS	Emissions Trading System
EV	Electric Vehicle
FCLP	Forest and Climate Leaders' Partnership
FCPF	Forest Carbon Partnership Facility
fNRB	fraction of Non-Renewable Biomass
GCS	Geological Carbon Storage
GGGI	Global Green Growth Institute
GHG	Greenhouse Gas
GIS	Green Investment Schemes
HF-LD	High Forest-Low Deforestation
ICAO	International Civil Aviation Organization
ICE	Internal Combustion Engine(s)
ICVCM	Integrity Council for the Voluntary Carbon Market
IFC	International Finance Corporation
IGES	Institute for Global Environmental Strategies
IPCC	Intergovernmental Panel on Climate Change
ITMO(s)	internationally transferred mitigation outcome(s)
JI	Joint Implementation
LFG	Landfill Gas
LPG	Liquefied Petroleum Gas
LT-LEDS	Long-Term Low GHG Emission Development Strategies
MDB	Multilateral Development Bank
MCU(s)	Mitigation Contribution Unit(s)
MEP	Methodological Expert Panel
MIGA	Multilateral Investment Guarantee Agency
MRV	Measurement, Reporting, and Verification
MSW	Municipal Solid Waste

N2O	Nitrous Oxide
NACAG	Nitric Acid Climate Action Group
NAMA	Nationally Appropriate Mitigation Action
NDC	Nationally Determined Contribution
NOx	Nitrogen Oxides
OEM	Original Equipment Manufacturer
PA	Paris Agreement
PACM	Paris Agreement Crediting Mechanism
PAF	Pilot Auction Facility
PM	Particulate Matter
PMUY	Pradhan Mantri Ujjwala Yojana
PoA	Programme of Activities
PPP	Public-Private Partnership
RBF	Results-Based Financing
REDD	Reducing Emissions from Deforestation and Forest Degradation
SBM	Supervisory Body of the Article 6.4 Mechanism
SBTi	Science Based Targets initiative
SGF	Sector Growth Factor
TCAF	Transformative Carbon Asset Facility
TREES	The REDD+ Environmental Excellence Standard
UNAM	National Autonomous University of Mexico
UNEP	United Nations Environment Programme
UNEP-CCC	UN Environment Programme Copenhagen Climate Centre
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
VAT	Value-Added Tax
VCM	Voluntary Carbon Market
VCS	Verified Carbon Standard
WB	World Bank
WBCSD	World Business Council on Sustainable Development
WFR	Warsaw Framework on REDD+
WtE	Waste-to-Energy

1. Introduction

Background

This report assesses the potential of the Paris Agreement Crediting Mechanism (PACM) to deliver upscaled crediting. As of early 2026, the window to achieve the long-term goal of the Paris Agreement (PA) of limiting global warming to "well below" 2°C, ideally 1.5° C, is rapidly closing. This increasing urgency of addressing the global climate crisis requires increasing the ambition of nationally determined contributions (NDCs) needs to be significantly enhanced, including by scaling up mitigation action across sectors and jurisdictions (United Nations Environment Programme, 2025). International carbon markets are a key policy instrument for delivering mitigation outcomes effectively and efficiently. They have evolved from the Kyoto Protocol's Clean Development Mechanism (CDM) and Joint Implementation (JI) to the cooperative approaches under the PA's Article 6.2 and the Paris Agreement Crediting Mechanism (PACM) under Article 6.4. However, to date they have been mostly limited to specific mitigation projects and to a lesser extent to programmatic approaches. Upscaling crediting beyond projects could be an important means to enhance mitigation ambition. Conceptually, different types of upscaled crediting have been discussed in the past, including crediting of clusters of similar component projects (Programmes of Activities, PoAs), crediting of mitigation policies, crediting of sectoral mitigation overseen by sector institutions, and crediting on the level of jurisdictions. Only the former has been implemented in practice, while the others have generated important conceptual insights but struggled to move towards implementation at scale. Still, they hold significant promise. As PACM is moving firmly towards implementation, a key question is how the mechanism can support upscaled crediting approaches.

Objectives

As PACM has recently decided to consider rules for upscaled crediting from late 2026 onward, this study assesses the past experiences and future potential of different forms of this policy instrument in order to inform PACM's rule setting. It assesses the current gaps in PACM rules and methodologies for upscaled crediting approaches and makes recommendations to move these closer to implementation while ensuring environmental integrity and encouraging mitigation ambition. As the CDM and JI generated substantial experience with programmatic approaches, a prudent approach for the PACM would be to initially focus on programmatic crediting, and subsequently to approach other forms of upscaled crediting. Besides considering the specific PACM context, the study also looks at the alignment of upscaled crediting approaches with the overall Paris Agreement Rulebook, including cooperation involving internationally transferred mitigation outcomes (ITMOs) under Article 6.2, characteristics of NDCs (Article 4) and the reporting requirements of the Enhanced Transparency Framework (Article 13). These rules are directly relevant

for key carbon market design features such as governance, activity cycle management, methodologies for baseline and additionality determination, measurement, reporting, and verification (MRV), and NDC alignment and accounting.

This report:

I. **Proposes a typology for upscaled crediting** that includes programmatic, policy, sectoral, and jurisdictional crediting, with a focus on how each can be scaled and integrated into international carbon markets
II. **Reviews existing experiences** with upscaled crediting approaches,
III. **Assesses alignment of upscaled crediting with key requirements of the PA,** such as additionality, avoidance of double counting, conservativeness of baselines, sustainable development, and NDC alignment
IV. **Assesses the current state of play in terms of PACM regulatory progress** relevant for upscaled crediting
V. **Undertakes a quantitative analysis of the PACM activity portfolio** (CDM transition, prior consideration) regarding the potential for upscaled crediting
VI. **Assesses case studies of selected activity types for their potential for upscaled crediting under PACM,** including electric cooking and mobility, waste management, carbon dioxide removals as well as jurisdictional REDD+
VII. **Provides recommendations for implementing upscaled crediting under PACM** for the policymakers, focusing on methodologies, governance, and market development

Methodology

This study builds on multiple methodological approaches, drawing on both qualitative and quantitative data and information. Both its conceptual as well as empirical elements are based on a thorough analysis of the scientific and practitioners' literature on international carbon markets. The quantitative analysis builds on databases of international carbon market activities administered by the UN Framework Convention on Climate Change (UNFCCC) Secretariat and other institutions including United Nations Environment Programme Copenhagen Climate Centre (UNEP-CCC) and Institute for Global Environmental Strategies (IGES). Selected case studies are assessed in depth. Semi-structured interviews with carbon market practitioners are used to elicit information that is not reflected in other sources. Participant observation in UNFCCC negotiations, PACM Supervisory Body and Methodology Expert Panel meetings, as well as other relevant international fora further contributed to the expert knowledge in the author team and helped guided their interpretations and analysis. This research utilized ChatGTP and Microsoft Copilot to assist with specific research tasks. While AI contributed to the process, all text, interpretations and conclusions drawn from this work remain the sole responsibility of the authors.

2. Scope and experiences with upscaled crediting

2.1. Historical evolution of upscaled crediting

Theoretically, the degree of aggregation of baseline and credit systems for greenhouse gas (GHG) mitigation can range from the level of a spatially distinct implementation of a mitigation activity to the coverage of an entire sector of the economy in multiple countries. Figure 1 below shows the different conceptually possible layers of aggregation ranging from projects over programmes that combine many projects, policies that trigger mitigation action, entire jurisdictions and finally entire sectors on a global level. Please note that the actual level of aggregation in terms of the absolute emissions level addressed may be higher for a large jurisdiction than for a small sector.

Figure 1: Different levels of aggregation of baseline and credit systems

Source: Perspectives

Historically, the implementation of baseline and credit systems in international climate policy started from a project-specific approach in the 1990s. For over a decade, this was the only approach considered. The first attempt to upscale beyond projects was triggered in 2002 by Christiana Figueres who would later become the Executive Secretary of the UNFCCC. In a seminal piece (Samaniego and Figueres, 2002), she argued for an approach where credits could be generated on a sectoral or jurisdictional basis. When these suggestions did not generate traction in the international negotiations, Figueres pragmatically proposed a programmatic approach. This approach was adopted for the CDM under the Kyoto Protocol at the first meeting of its parties in Montreal in 2005, which stated that “project activities under a programme of activities can be registered as a single clean development mechanism project activity” (UNFCCC, 2005). It then took until 2009 until the detailed rules for Programmes of Activities (PoAs) could be agreed. By then, it was too late for programme developers to benefit from the phase of high CDM credit prices but PoAs became a very relevant “niche” in the post-2012 hibernation phase of the CDM, particularly for hitherto underrepresented Africa.

After Christiana Figueres had thus successfully engaged on programmes, she pushed for a policy crediting approach (Figueres, 2006). In the early years of the CDM, it was unclear whether policy crediting would be allowed. The key discussion at that time was that taking mitigation policies into account in baseline and additionality determination for projects could lead governments to hold back introduction of mitigation policies in order to get credits (Bode and Michaelowa, 2003). As late as 2004, the baseline methodology submission NM0072 was made for the introduction of a mandatory energy efficiency standard for room air conditioners in Ghana. This then led the CDM Executive Board to refer the issue to the Conference of the Parties, which decided in 2005 that "a local/regional/national policy or standard cannot be considered as a clean development mechanism project activity" (UNFCCC, 2005). At the same time, the decision was taken that "national and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies" introduced after November 11, 2001, the date of the decision to allow an early start of the CDM, the so-called E- policies, should not be taken into account for baseline and additionality determination (UNFCCC, 2005b), and thus projects driven by these policies could claim credits. At the same time, policy crediting became part of a broader discussion (Bosi and Ellis, 2005; Cosbey *et al.*, 2005; Sterk and Wittneben, 2005; Baron and Ellis, 2006) on upscaled crediting for the post-2012 period, which became particularly active in the run-up to the Copenhagen conference.

In parallel to the discussion of policy crediting, sectoral crediting became hotly debated (Baron et al., 2008; Schmidt et al., 2008; Schneider and Cames; 2009). Such mechanisms would credit emission reductions achieved by a sector either globally or jurisdiction by jurisdiction. The baseline would be defined by a global sector benchmark, or by jurisdiction-specific emission targets for the sector. It could be operated directly through international sector associations, like the World Steel Association or the International Aluminium Institute, specific business initiatives such as the Cement Sustainability Initiative (CSI) of the World Business Council on Sustainable Development (WBCSD) or governments. Going into the Copenhagen negotiations, the EU (2009) proposed a sectoral crediting mechanism for the power sector and sectors subject to global competition such as steel, cement and aluminium, operating through global benchmarks as baselines for crediting.

The failure of Copenhagen to agree on a successor agreement to the Kyoto Protocol created a lot of uncertainty on the future of post-2012 carbon markets as well as a lack of demand for compliance carbon credits. As a result, the debates on policy and sectoral crediting stopped brusquely. Only the crediting of Nationally Appropriate Mitigation Actions (NAMAs) was still discussed as an approach for upscaling but did not get traction due to the lack of an overarching policy framework (Okubo, Hayashi and Michaelowa, 2011; Michaelowa, 2013), demand and limited availability of financing for NAMAs. Building on this discussion, the design of Article 6 of the PA was done in a sufficiently broad manner to enable coverage of upscaled crediting, both through PACM as well as Art.6.2. During the

almost ten years in which the Article 6 rules were negotiated, researchers advanced conceptually building on the discussions during the Kyoto Protocol period (Wooders *et al.*, 2016).

Over the last 20 years, several initiatives to promote upscaled crediting emerged:

- **Programmatic crediting**
  - In 2011, the World Bank set up the Carbon Initiative for Development (Ci-Dev), targeting comprehensive multi-technology PoAs in 13 low-income countries - with primary focus on energy access (clean cooking, off-grid solar, mini-grids) and predominantly in Sub-Saharan Africa. To date, Ci-Dev has spent USD 78 million so far on credit purchases, aiming at a total credit volume of 8 million. More recently, Ci-Dev explored Art. 6.2 piloting through the standardized crediting framework which sought to further simplify methodological approaches based on country data and circumstances.
  - From 2008, the German Development Bank KfW developed a PoA Support Programme, which provided capacity building aimed at helping to get the first PoAs implemented by publishing various toolkits for PoA developers including two editions of a detailed "Blueprint" for PoA developers.
  - In 2011, Germany provided EUR 10 million for the "Future of Carbon Markets Foundation", which financed four PoAs supporting access to clean energy and water. The foundation wound up in 2021, as originally planned. For an evaluation of the Foundation's work see Geyer et al. (2019).
- **Policy crediting**
  - The Transformative Carbon Asset Facility (TCAF), a World Bank led initiative set up in 2017 funded with USD 210 million by seven countries and a private foundation (TCAF, 2021), focused on transformative policy interventions including subsidy reform, carbon pricing and sectoral-scale instruments. In October 2023, the facility announced the implementation of the first policy crediting approach in Uzbekistan with credits determined through a modelling approach (World Bank, 2024).
  - The Designing Article 6 Policy Approaches (DAPA) project run by the Global Green Growth Institute (GGGI) identifies and provides readiness support for GGGI's Carbon Transaction Facility (CTF) to generate ITMOs from upscaled activities for Norway in various countries (GGGI, 2021). GGGI has established the Norwegian Article 6 Climate Action (NACA) Fund within its CTF which specifically focuses on ITMOs generated from policy crediting (GGGI, 2026c).
  - The DAPA Programme has been designed to identify and design policy crediting activities that can mobilize ITMOs. Therefore, DAPA prepares the technical and regulatory readiness required for carbon market transactions, with the Carbon Transaction Facility performing transactions on behalf of sovereign buyers such as

Norway. Beyond DAPA, the CTF has a readiness facility that could be used to expand the lessons from DAPA.

- **Jurisdictional crediting**
  - Various jurisdictional approaches exist in the context of avoided deforestation. The most advanced one is the Forest Carbon Partnership Facility (FCPF) Carbon Fund operated by the World Bank since 2007 (FCLP, 2026; FCPF, 2026). 15 countries have signed emission credit purchase agreements with the World Bank starting in 2017, and with the first credits issued to Mozambique in 2021 (FCPF, 2025). The second one is the Architecture for REDD+ Transactions (ART) with The REDD+ Environmental Excellence Standard (TREES) (Architecture for REDD+ Transactions, 2020). Here, the first credits were issued to Guyana in 2022. The ART TREES approach has been formally accepted by the ICAO to generate Eligible Emissions Units valid under the CORSIA system for international air travel. While ICAO has approved ART TREES' HFLD credits for CORSIA, the Integrity Council for the Voluntary Carbon Market (ICVCM) has provided CCP (Core Carbon Principles) approval at the programme level in 2024 but recently issued a decision that ART TREES v2.0's HFLD and Removals crediting levels require further improvements e.g. to historical emissions during the baseline period prior to becoming CCP-approved (ICVCM, 2026a).
- **Sectoral crediting**
  - The Energy Transition Accelerator (ETA), a US Biden Administration driven initiative for mitigation in the electricity sector, which re-invented itself as a private sector-led Kinetic Coalition since the Trump administration slashed all international climate policy initiatives. A sector-scale baseline methodology is under development since 2023, built around a performance standard that declines over time (Bumpers *et al.*, 2023). It is differentiated between countries where emissions have peaked, those with high energy demand growth and those with significant energy access needs.
  - The Climate Teams approach (Climate Action Teams, 2021) developed by the Environmental Defense Fund, Motu, University of Chile and Perspectives. Key elements include a multi-year emissions crediting baseline aligned with the host country's NDC target, a pre-agreed price range for credit payments at which the host country is being paid and quantification of mitigation based on the host's national GHG inventory. To date, the approach has not yet been implemented.

Based on the history of the discussion on upscaled crediting laid out above, as well as on the recent OECD overview of upscaled crediting (Wiest *et al.*, 2025), we identify four **types of upscaled crediting**:

a. **Programmatic crediting refers to crediting mitigation outcomes from a potentially large number of similar component project activities aggregated under a dedicated**

Programme of Activities (PoA). This approach can be implemented across multiple countries using several technologies typically within a single sector. With a strong track record of implementation in practice over more than a decade, programmatic crediting has shown its effectiveness under different circumstances and scales as discussed in section 2.2 below, in our view making it the most mature and implementation-ready vehicle for upscaled crediting. The potential of programmes to deliver crediting at scale can be enhanced through linking with policies and access to finance.

b. **Policy crediting which refers to crediting mitigation outcomes that are directly attributable to a specific policy intervention or policy package**. It can trigger one or more activity types within a sector, across multiple sectors or even jurisdiction-wide, in a single jurisdiction. Policy crediting has been discussed conceptually but has been implemented to date only at a limited scale due to methodological challenges including (additionality determination of policy instruments and attribution of mitigation to the policy as well as the scale of resources required to mobilise policy instrument introduction, despite being underwritten by relevant institutions.
c. **Jurisdictional crediting which refers to crediting the aggregate mitigation outcomes achieved relative to a jurisdictional crediting baseline within a specific national or subnational jurisdiction.** This type of crediting is quite advanced for mitigation activities in the forestry sector (REDD+), with early-stage efforts in the energy sector (coal-phase out). Thus far, there are no real-life examples of jurisdiction-wide crediting that spans across multiple sectors.
d. **Sectoral crediting which refers to crediting the aggregate mitigation outcomes achieved relative to a sectoral crediting baseline that is applied across jurisdictions or at the level of a jurisdiction.** Like policy crediting, sectoral crediting has not thus far been implemented at scale. This is due to the "dilution" of mitigation by entities in a sector that increase emissions, as well as insufficient incentives for global sector associations to engage in emissions mitigation. It is relevant for sectors characterised by technical rather than jurisdictional boundaries, such as the power generation and waste management sectors and hard-to-abate industries such as cement and steel.

Therefore, jurisdictional and sectoral crediting do not aim to quantify the impacts of a specific policy instrument but rather the aggregate mitigation impact against a sectoral baseline (compare Wiest *et al.* (2025)). While Wiest *et al.* (2025) categorise programmatic approaches as a "mainstream crediting approach" rather than an "upscaled crediting approach" we recognise programmatic crediting as a key type of upscaled crediting approach, reflecting the fact that it was developed specifically for that purpose, as described above, that it is the form of upscaled crediting that has been applied in practice under different circumstances, in some cases also achieving considerable scale in terms of number of component activities and mitigation outcomes (see Section 4.1). Moreover, programmatic crediting is treated under the PACM as a distinct form of crediting with

dedicated rules and procedures, rather than simply as a conventional project-based approach. Recent discussions under the MEP on 'large-scale crediting programmes' also indicate increasing consideration of PoAs within broader discussions on scaled-up or larger-scale crediting approaches alongside policy, sectoral, and jurisdictional approaches (UNFCCC, 2026b). In our assessment, programmatic crediting is likely to emerge – besides jurisdictional crediting - as the main type of upscaled crediting to deliver mitigation at scale in the short term due to mature rules, experience and investment boundaries. It is also worth noting that policy, jurisdictional and sectoral crediting generate credits for the jurisdictional authority (hereafter referred to as "government") while programmatic crediting generates credits for the programme's coordinator which could be a public or private entity (Wiest *et al.*, 2025, 2025). This openness to private companies, road-tested in hundreds of PoAs across the CDM, Gold Standard and Verra, renders programmatic approaches the only form of upscaled crediting which is not contingent on government intervention beyond providing initial host party approval as well as ITMO authorisation and thus more flexible, and versatile with regards to private sector engagement.

2.2. Experiences with upscaled crediting in international carbon markets to date

As noted above, some upscaled crediting approaches have been implemented in practice, while others remain largely conceptual. This section synthesizes three decades of experience by outlining where each approach has been applied (with brief examples) and assessing the methodologies used against key performance criteria, i.e., effectiveness, environmental integrity, and social safeguards needed for scale. While definitions and boundaries (especially between sectoral and jurisdictional approaches) remain blurred, strengthening the empirical evidence can support a clearer typology, highlight methodology and governance gaps, and provide an initial estimate of credit volumes achieved.

I. Programmatic crediting

Programmatic crediting has by far been the most broadly applied upscaled crediting approach, due to its significant uptake in the CDM and non-state crediting programmes. The CDM developed its rules for programmatic crediting over four years between 2005 and 2009 (Hayashi *et al.*, 2009), before the first registration of a PoA was done in July 2009. PoAs are structured as follows: A "Coordinating and Managing Entity" (CME) registers the PoA using one or several activity types and corresponding methodologies, with at least one Component Project Activity (CPA). An unlimited number of CPAs can be added to the PoA without the need for validation, since that has taken place at the level of the programme already. Baseline and monitoring methodologies under the CDM were initially not automatically eligible for PoAs but had to be developed as revised versions of project-specific methodologies. Several methodologies can be integrated into the same PoA, for instance, a PoA for off-grid electrification could simultaneously support mini-grids, household and institutional appliances, as well as solar irrigation under the same programmatic umbrella, even

though each activity type requires a separate methodology. Such multi-technology PoAs have been pioneered e.g. by the World Bank Carbon Initiative for Development under the CDM. In the voluntary carbon market, Verra has applied a programmatic approach since November 2007 (VCS, 2007) but uses different terminology - "grouped project" for PoA and "instance" for CPA. The Gold Standard has started to allow programme of activities since 2008.

A total of 353 PoAs[1] have been registered under the CDM, with a total annual mitigation potential of around 89.6 million tCO_2e. 101 PoAs (or approx. 29% of the total) have had at least one issuance. PoAs have issued 74 million CERs to date. Key reasons that issuance volume remained so low include the late upswing of PoAs when the price for CDM credits had already crashed from around USD 12 in early 2012 to less than USD 0.5 in 2013 (Michaelowa et al. 2019b) and the temporary measures (UNFCCC 2022) that prevented issuance of post-2020 credit vintages under the CDM. Importantly, all mitigation outcomes going back to January 2021 can still be issued under PACM if the PoAs successfully meet all transition requirements. **Under the PACM, PoAs make up a substantial share of the portfolio of activities transitioning from the CDM and a significant volume of 2021-2025 credits from PoAs is awaiting issuance under PACM.** Developing new PoAs is currently not yet possible as PACM standards and methodologies still need to be updated to enable PoAs (see 4.2).

Table 1: Overview of registered CDM PoAs and PoAs with CER issuance

	Registered PoAs	PoAs with issuance
Number of PoAs	353	101
Estimated credit volume for full crediting period (million)	127.3	94.3
Estimated annual reductions (million tCO2e/yr)	89.7	57.4
Actual issuance achieved to date (million CERs)	74.1	

Source: Authors, based on UNEP CCC (2026)

Out of 353 registered programmes, 60% (212) have up to one CPA, 29% (100) have between 2 and 9 CPAs, while only 12% have over 10 CPAs (39 with 10–99) and less than 1% (2) over 100. Only 6% of PoAs with one CPA have reached issuance, compared to ~57% for 2– 9 CPAs, ~80% for PoAs with 10–99 CPAs, and 50% for those with more than 100 CPAs. **The more CPAs are covered by a PoA, the higher the likelihood of issuance.** A large number of PoAs did not manage to expand beyond their

[1] This includes all PoAs registered under the CDM including ones that did not request for transition to PACM

initial CPA, which is mainly due to the crisis on the CDM market that erupted in 2012 and led to a precipitous decline of credit prices and demand[2].

Table 2: CPAs in PoAs

CPAs in PoA	Registered PoAs	PoAs with issuance
1 CPA	212	12
2 to 9 CPAs	100	57
10 to 99 CPAs	39	31
>100 CPAs	2	1
TOTAL	**353**	**101**

Source: Authors, based on UNEP CCC 2026

The two PoAs with more than 100 CPAs have the following characteristics. A Brazilian PoA reducing methane from pig farms (#2767) has **1050 CPAs** (2010: 961 CPAs, 2011: 88 CPAs; 2019: 1 CPA) and issued 1.5 million credits. The timing of CPA addition shows that the PoA was attractive before the downfall of the CDM market in 2013, but not afterwards anymore. The Impact Carbon Global Safe Water PoA (#9948) **gradually expanded up to a total of 105 CPAs** (2014: 2 CPAs, 2017: 20, 2018: 15, 2019: 68). While these are only two examples, they **demonstrate that PoAs can scale up significantly over time, if enabling conditions are conducive.**

Multi-country PoAs perform well once established, but they represent a small share of the portfolio, accounting for only around 3% (47) of the total PoA registered, but 10% (21) of the total PoAs that issued, totalling 14.3 million credits. 23 are registered in 3 to 9 countries, and two in 10 and more countries (see Annex A, table 10). While representing 13% of the total number of registered PoAs, multi-country PoAs represent around 24% of the issued credits and 30% of the total mitigation potential of PoAs (on annual basis). Out of 353 registered PoAs, 51% cover small-scale technologies[3]. 35% of the small-scale PoAs have achieved issuance, but only 22% of the large-scale technology ones.

The activity-type breakdown shows a highly concentrated portfolio in which energy efficiency in households dominates, followed by solar power and methane avoidance PoAs. Together,

[2] The 2012 CDM market crash was driven by a sharp drop in EU compliance demand (EU ETS surplus after the financial crisis) combined with tighter EU restrictions on CER use and a persistent oversupply of credits, which together pushed CER prices and demand down abruptly.

[3] The technologies considered small scale are: charcoal production, domestic manure, EE in buildings, irrigation, lighting and street lighting, manure, more efficient vehicles, scrapping of old vehicles, solar lamps and solar water disinfection, solar water heating, stoves, water purification.

these three categories account for 214 of 353 activities (~61%), indicating that programmatic pipelines have historically gravitated toward highly replicable, standardized interventions with comparatively low mitigation costs (see Annex A Tables 11, 10).

The quantitative data also shows that a range of private sector Coordinating/Managing Entities (CMEs) managed to reach scale through programmatic crediting under the CDM. By comparing CMEs across (i) programme breadth (PoAs managed), (ii) deployment depth (CPAs added), and (iii) realized outcomes (issued credits), the analysis distinguishes between actors who have set up frameworks and those who can convert planned scale into actual issuance. The distribution is top-heavy: Carbon Gold Beijing Technology Co.,Ltd. leads with 10 PoAs, followed by Additional Energy Limited with 6, and several CMEs with 3 or 4 PoAs (see Annex A Figures 8, 9, and 10).

CPA volume shows whether planned programmes are translated into actual action on the ground. Here the ranking changes sharply: Korea Carbon Management Ltd. leads with 75 CPAs, followed by Envirofit (40) and ALLCOT (37), while Carbon Gold, despite having the largest PoA count, shows only 10 CPAs (see **Figure**). **Actual CER issuance of these large-scale PoAs also underlines that some of them have generated mitigation outcomes at scale.** Leading CMEs include Additional Energy Limited (~1.29M CERs), Envirofit (~0.98M), and Korea Carbon Management (~0.93M); meanwhile some PoA/CPA-active actors show 0 issued CERs in this cut (e.g., Carbon Gold, ALLCOT, Zhenjiang Qiangling, one C-Quest Capital entity) (see Annex A Figures 8, 9, and 10).

Figure 2: PoAs added per year

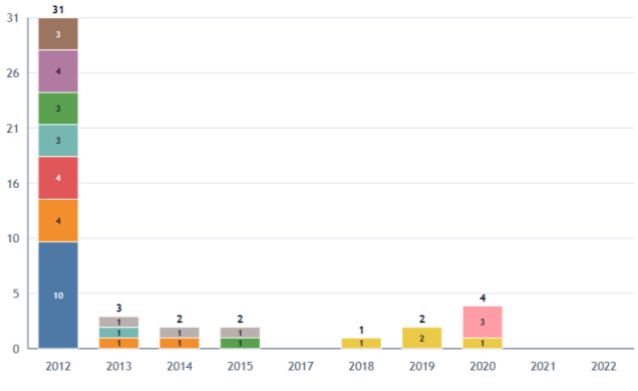
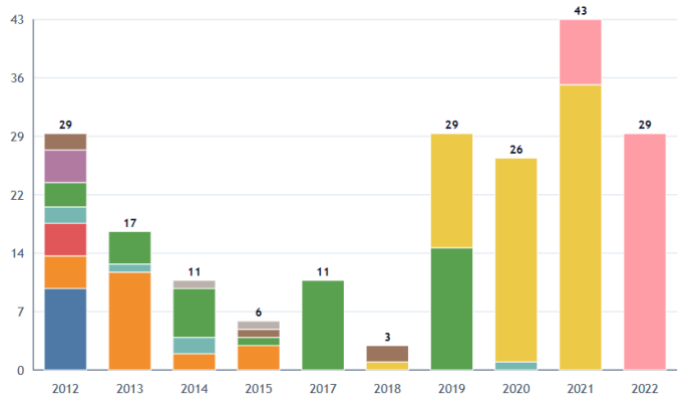


Figure 3: CPAs added per year



Carbon Gold Beijing Technology Co.,Ltd. | Additional Energy Limited | Carbon Protocol of SA | Carbonbay GmbH & Co. KG | Envirofit International Ltd | Korea Carbon Management Ltd. | Zhenjiang Qiangling Energy-saving Light Source Co., Ltd. | ALLCOT AG | C-Quest Capital LLC | C-Quest Capital Malaysia Global Stoves Limited

Source: Authors, based on UNFCCC CDM 2026

The figures above show that a large number of new registrations occurred in 2012 (due to the deadline for eligibility of activities to export CERs to the EU) with 31 PoAs registered. After this peak, annual PoA additions drop sharply and remain comparatively low (e.g., 2019 and 2020 each s how 4 PoAs while 2013–2015 average ~2–3 PoAs per year). These values confirm that after 2012 the unclear prospects for the carbon market did not incentivize many new activities for several years. In 2019 the number of new CPAs rose again to 2012 levels, reaching 43 new additions in 2021. While some delays can be expected from the moment of the PoA registration until new CPAs are included, it also shows that the market slowly reacted to positive signals from the Paris Agreement's Article 6 advancements and a rekindled interest in carbon markets at the international level after the 2012 crash. However, it is interesting to note that **almost all of the 98 new CPAs included in the period 2020-2022 are from only two CMEs.** The remaining CMEs have not undertaken new additions, indicating that **limited carbon credit demand restricted many CMEs in expanding their existing programmes.** A key driver of demand and resulting CPA inclusions have been Korea's efforts to procure credits to provide flexibility in their ETS. This also shows that new market segments are emerging that can stimulate new activities.

Please see Annex A for more CME data.

Policy crediting

Mitigation policies can generate mitigation volumes of hundreds of millions of tCO_2e (Eslahi, Creti and Sanin, 2026). No international carbon crediting programme has to date accepted policy crediting and covered it in its rules. As discussed above, the CDM explicitly prohibited policy crediting due to its methodological complexity. The closest analogy to policy crediting were the Green Investment Schemes (GIS) under International Emissions Trading of the Kyoto Protocol. Countries in Eastern Europe agreed to earmark the revenues of Assigned Amount Unit (AAU) sales to cover costs related to mitigation policies. Some GIS worked well, e.g. for energy efficiency technology policies in the Czech Republic (Karásek and Pavlica, 2016), but others failed, like the one in Ukraine (Korppoo and Gassan-Zade, 2014).

The World Bank's Transformative Carbon Asset Facility (TCAF) has been among the first initiatives to pioneer the practical implementation of policy crediting (TCAF, 2022). Still, it has taken six years before TCAF could unveil the first pilot in Uzbekistan in late 2023. The World Bank agreed with Uzbekistan to provide USD 46.25 million for the Innovative Carbon Resource Application for Energy Transition Project (iCRAFT), to cushion the impact of the increase in energy prices foreseen until 2026 for the lowest income users as well as to finance an awareness campaign of the necessity and advantages of cost-covering tariffs. The World Bank estimates emissions reduction from subsidy removal at 60 million tCO_2 over the project's lifetime (WB 2023). Of this, around 2 million tCO_2 are attributed to the TCAF intervention and issued as credits under Article 6.2 (Climate Cent Foundation 2023). Earlier attempts in Morocco and India did not get the agreement of host country

governments. The Uzbekistan pilot generates many methodological questions (Michaelowa and Kessler, 2024). Its baseline is derived through modelling. In contrast to typical project level crediting, the credit quantity was not determined as the difference between the baseline and activity emissions but negotiated between the World Bank and the Uzbek government.

Building on the GGGI-led DAPA, the CTF announced its first (forward) transaction in late 2025. It covers a feed-in tariff for floating solar PV in Indonesia (The Jakarta Globe, 2025) and has a volume of USD 13 million. This has been followed up in January 2026 by a second MOPA for ITMO transaction from Zambia to Norway, targeting 1.5 million ITMOs generated by the Carbon Feed-In Premium (CFIP) Programme (GGGI, 2026b) which provides performance-based payments for verified emissions reductions from up to 300MW of grid-connected solar PV combined with electricity storage (GGGI, 2026c).

Determining additionality of policies is challenging, as discussed by Michaelowa and Keßler (2024). Theoretically, a policy would pass an additionality test if it can be made clear from a societal point of view that the policy generates more costs than benefits. They see additionality most easy to prove for carbon pricing policies and propose to apply a minimum carbon price threshold, determined by looking at jurisdictions with a comparable level of development before a carbon pricing policy is deemed additional. For regulation, a payback period test should be applied where the policy is additional if the payback period of the measures mandated by the regulation exceeds the value that private entities would see as the limit for private investment decisions. Gold Standard (2024) has developed an additionality test for policy instruments similar to that for specific activities, but Gold Standard explicitly excludes carbon pricing, thereby limiting the applicability to policy instruments that are unlikely to upscaled mitigation. The Art. 6.4 SBM should request a technical paper on additionality testing for policy crediting as a basis for its note on upscaled crediting approaches. The UK may want to support such an exercise by underwriting a comparative study of additionality approaches for policy crediting..

Historical baselines, while commonly used, may not always capture future emission trajectories accurately, and the attribution of mitigation outcomes to policies remains highly complex to translate into methodologies. Model-based baselines promise improvements but are technically challenging and need to be fully anchored with NDC emission pathways modelling. Assumptions and inputs into modelling need to be carefully tailored, and ex-ante baseline projections differ strongly from the ex-post perspective taken by established types of crediting, which rely on monitoring and independent verification of actual mitigation outcomes as a basis for credit issuance.

Governance and regulatory integrity of policy crediting are key concerns if buyer countries and/or international organizations like the World Bank are both designing crediting programmes and purchase the mitigation outcomes. Clear distinctions between implementation and regulatory

oversight assurance roles are needed especially in Art.6.2 cooperation. A possible solution can be to use established crediting programmes such as PACM or the Gold Standard, among others, to provide full transparency in the activity including independent third-party verification, as is being practiced in GGGI's CFIP programme. An alternative would be to apply PACM rules to Article 6.2 policy crediting approaches, once these rules are available.

II. Jurisdictional crediting

Proponents argue that jurisdictional approaches can enable better governance of key risks such as accounting for reversals and leakage better than in project-based approaches (see discussion in Kessler et al., 2026). To date, jurisdictional crediting has been attempted or discussed in a limited set of circumstances: predominantly in the context of avoided deforestation (REDD+). Energy system transitions, especially coal phase-out are emerging fields for jurisdictional crediting for which first methodologies and pilot activities are being designed e.g. by the Kinetic Coalition.

Avoided deforestation of old growth forests has significant benefits for biodiversity and prevention of flooding. Its potentially very large scale of mitigation, even if later reversed, could unlock benefits from temporary carbon storage with regard to reducing the rate of climate change and thus climate change damages, and preventing that temperature exceeds tipping points that lead to irreversible and large climate change impacts. However, if the time in which the temporary storage accrues is not used to develop mitigation technologies that are ready to be used once reversals accrue, multiple tipping points could be exceeded in quick sequence (see Box 1 in Ve et al. (2026).

Under the FCPF Carbon Fund 15 countries are currently selling credits to the fund, with 144 million credits contracted at a price of USD 5 per credit. 46.9 million credits have been issued to date and paid. Credits accruing beyond these contracted can be sold by governments on the voluntary market, possibly under Article 6.2 approaches in the future; the first such transaction involving 0.1 million credits was implemented by Costa Rica in 2025 (FCPF, 2025). The FCPF Carbon Fund is scheduled to close in 2028. The World Bank's Scaling Climate Action by Lowering Emissions (SCALE) Fund builds on the FCPF's activities and may be able to carry forward some FCPF supported activities (FCPF, 2024). Similarly, the World Bank BioCarbon Initiative for Sustainable Forest Landscapes Fund takes a similar approach of a potential transition to SCALE and is expected to issue first credits soon (BioCarbon Fund, 2026).

ART TREES is the second case of full implementation of upscaled jurisdictional crediting on the national level, and the countries currently covered by the FCPF Carbon Fund are encouraged to move to ART TREES after 2028 (FCPF, 2025). The state of Guyana (ART, 2024) had 33.5 million avoided deforestation credits issued in 2022, another 7.1 million in 2024, and 9.1 million in 2026, and has already sold 37.5 million credits (LCDS, 2022) to oil producer Hess for USD 750 million, and several million credits under the airline offset system CORSIA. The latter credits have to be authorised by

host parties as ITMOs under Article 6.2 in order to qualify for CORSIA. Prices for such credits have fallen from a high of USD 23 in October 2025 to USD 12 in March 2026 (S&P Global Energy, 2026). ART TREES 26 jurisdictions have signed up for ART TREES of which Costa Rica, Ghana, Tocantins and Vietnam are currently in the validation and verification phase (ART, 2026a), the last one before credits can be issued. The Brazilian states Acre and Para have completed important documentation as preparation for validation and verification. Mercuria has committed up to USD 2 billion for credits accruing from Tocantins until 2030 while Standard Chartered has agreed with the state of Acre to sell resulting credits. While it takes several years for a jurisdiction to reach the credit issuance stage, one can expect several hundred million credits to accrue by the early 2030s.

ART TREES therefore most explicitly focuses on REDD+ activities at jurisdictional and national scale, and aims to "help accelerate progress toward national scale accounting and implementation to achieve emissions reductions and removals at scale and to achieve Paris Agreement goals", thus overcoming weaknesses in project-based REDD+ (ART, 2026b). However, (Schneider *et al.*, 2024, 2025) have criticized ART TREES for various methodological shortcomings and incentive problems. The ART TREES baseline methodology establishes the crediting level based on the average deforestation levels observed in a jurisdiction in a historical five year reference period, and issues credits against that baseline. Schneider et al. (2024) describe risks for baseline overestimation as well as for a selection bias where jurisdictions with falling deforestation are more likely to participate than those with increasing deforestation. Moreover, a jurisdiction can terminate its participation in ART TREES without penalty after one baseline period, even if deforestation levels increase in subsequent periods (e.g. through slash-and-burn agriculture). Particularly the adder of 0.05% of carbon stocks in the baseline methodology for high forest-low deforestation (HF-LD) countries has been criticized as arbitrary (Schneider et al., 2025), while other researchers (Teo et al., 2024) argue, based on modelling that HF-LD baselines should increase over time[4]. Regarding additionality determination, they argue that the proposed ART TREES 3.0 strengthens REDD+ implementation plans with new requirements to describe measures for addressing drivers of deforestation. Still, additionality demonstration is broad and does not require governments to undertake new forest protection activities, programmes and policies, as well as evidence that carbon credit revenues are necessary for enabling forest protection. Finally, the reversal risk provisions of ART TREES are limited to a buffer pool contribution currently ranging from 5% (Costa Rica, Ghana and Guyana) to 15% (Vietnam), and no post-crediting monitoring is required.

Verra has developed its jurisdictional REDD+ approach considerably since 2024, reacting on criticisms of its previous REDD+ methodologies. Researchers have found that the methodology

[4] Schneider et al. (2025) stress that Teo et al. (2024) find lower deforestation rates in the future than in the past for 43% of jurisdictions assessed by them.

leads to more conservative outcomes than the previous one (Prasad et al., 2024). However no jurisdictions have taken up this approach so far.

In sum, there is a comprehensive shift towards jurisdictional crediting across REDD+ crediting standards. Further insights from implementation experience as well as further methodological enhancements (e.g. updating ART TREES 3.0 with additional improvements) will strengthen the effectiveness of these approaches and their alignment with Article 6. Developing good practice for jurisdictional REDD+ is particularly important to prevent much less robust initiatives, such as the Coalition for Rainforest Nation's (CfRN) REDD.plus approach. Given the past damage to carbon market reputation triggered by concerns about low-integrity credits, it is imperative that large-scale credit issuances from jurisdictional approaches proactively ensure the integrity of upscaled crediting as a basis for its deployment at scale and over long timeframes.

III. Sectoral crediting

The only attempt for sectoral crediting undertaken to date is the German-funded Nitric Acid Climate Action Group (NACAG) (NACAG, 2026), which was proposing buying of credits from nitrous oxide (N20) mitigation in nitric acid plants globally. The approach included acquisition of credits for a five-year period, with the host countries signing a contract that they would continue to run the mitigation technology after the end of this period and integrate it into its NDC. However, this approach did not materialise and the initiative adopted a climate finance delivery approach that did not involve carbon credits even though it was still relying on UNFCCC methodologies for its MRV framework. Sectoral crediting remains a conceptually interesting option in particular for larger point-source emissions with similar or standardized features and has the potential to contribute substantially to harmonizing methodological frameworks, for instance by integrating best-available-technology approaches in baseline-setting on national, regional and global levels.

2.3. Enabling conditions for upscaled crediting based on existing experience

While the literature agrees on the significant potential for all types of upscaled crediting to achieve significant scale, real world experience shows that upscaled crediting has not yet been implemented at scale, with the exception of REDD+, primarily through the FCPF Carbon Fund and ART TREES. Therefore, we attempt to provide key lessons from existing experiences to establish **enabling conditions for upscaled crediting** which go beyond the scope of what carbon crediting programmes are directly regulating. These include:

- **Availability of appropriate methodologies for upscaled crediting**

Defining appropriate methodologies is crucial to enable upscaled crediting with high environmental integrity, especially as **larger scales of mitigation action amplify the importance of conservative parameters to avoid over-crediting and resulting overselling**. Examples from

cookstove PoAs have shown that overestimates of the fraction of non-renewable biomass could lead to substantial over-crediting. **Methodologies for programmatic approaches are most mature and can meet all PACM requirements in the short run** by building on methodologies, standards, capacities and experiences implemented under the CDM. Policy crediting faces important challenges regarding additionality determination, baseline and monitoring methodologies, but approaches to resolve these have been proposed by the literature (e.g. Michaelowa et al., 2025) and **should be tested through pilots**. For sectoral and jurisdictional crediting, additionality is typically demonstrated through conservative crediting baselines, while for policy crediting, the appropriate approach for additionality testing will depend on the type of policy instrument in question (Michaelowa *et al.*, 2025; Wiest *et al.*, 2025). For example, **carbon pricing policies could be deemed additional if the carbon price generated by the policy exceeds a pre-determined level**. Policies **unlocking infrastructure investments that enable expansion of technologies that are deemed non-additional as a stand-alone activities** should also be creditable, like in the case of intermittent renewable electricity plants with battery storage, or grid strengthening. A key complicating factor for policy crediting is to ensure the direct attribution of mitigation outcomes to the policy intervention. Baseline and monitoring methodologies for jurisdictional crediting for avoided deforestation have begun to respond to challenges that led to intense discussions between researchers and practitioners. Particularly the determination of baselines for HF-LD jurisdictions through the use of default parameters, the duration of monitoring and incentives for governments to leave the initiatives when parameters become unfavourable have been contested (Wiest *et al.*, 2025). Summarising, programmatic approaches have mature baseline and monitoring methodology approaches in line with key principles of PACM. Methodologies and safeguards for jurisdictional crediting have recently improved and generated practical experience but are still evolving and **will have to be further revised to enable PACM approva**l based on meeting the requirements of the Article 6.4 standards for baselines (setting baselines below BAU, further adjusted downwards throughout the crediting period) and additionality (requiring investment tests). For other types of upscaled crediting, even more **intense work on methodologies is required to anchor these approaches in the PACM as less experience exists**.

The forestry and land-use sectors as well as the energy sector are considered to be better suited for sectoral crediting than the transport and building sectors, due to the complex MRV requirements of the latter (Wiest *et al.*, 2025). Furthermore, energy-intensive, trade-exposed sectors, such as aluminium, may be less suitable for sectoral crediting than more local sectors such as electricity (Ellis and Baron, 2005). Regarding policy instrument types, mandates, financial incentives and the elimination of restrictions or prohibitive barriers are deemed to be better suited for policy crediting than information-based tools and research and development (Michaelowa, Ahonen, *et al.*, 2025). As for cost structure, policies with low upfront costs and high operating costs are also considered suitable for policy crediting (Wiest *et al.*, 2025).

- **Institutional host country readiness for upscaled crediting, taking into account NDCs**

The Article 6 rulebook comprehensively redefines global carbon market rules, with a focus on strengthening environmental integrity as carbon markets are instruments to help countries achieving their NDCs and prevent emissions increase across/between NDC periods. Therefore in line with Article 6 rules, any type of carbon crediting activity should be aligned with and anchored within the host countries' NDC targets, GHG emissions pathways and related emission budgets. This creates a **particular challenge for upscaled crediting approaches that rely on modelling to estimate the emissions in the (unconditional NDC) baseline scenario and the mitigation attributed to the credited activity**, such as a policy instruments. Furthermore, an upscaled crediting approach could cover a significant share of a host government's national emissions. If designed well, crediting can complement national mitigation efforts, but if not, it could seriously undermine the host country's NDC achievement (Wiest *et al.*, 2025). As shown in the preceding sections, there is evidence that **baselines of actually implemented upscaled crediting approaches to date have not been sufficiently aligned with host country NDCs**. To safeguard NDC achievement, it is vital that upscaled crediting is integrated into the national processes for NDCs and long-term strategies (Wiest *et al.*, 2025). Moreover, under Article 6 and particularly the PACM a stronger focus is put on ensuring sustainable development co-benefits and preventing harm to local communities, than was the case under the CDM. Given the absence of a formal international oversight institution for cooperative approaches under Article 6.2, participating governments face detailed requirements for reporting on their activities and ensuring due process for authorisation of ITMOs and corresponding adjustments. Robust carbon market national frameworks are particularly relevant for upscaled crediting, given that **the scale of potential harm through ITMO overselling but also the opportunity to mobilise substantial resources which can be reinvested by host country governments**. Clear strategic alignment of Article 6 with host country NDCs needs to be achieved, with procedures for activity approval, ITMO authorisation, NDC accounting and reporting including corresponding adjustments taking into account the specific challenges of upscaled crediting regarding the risks of conflict of interest and over-crediting. Confidence in the complementarity of upscaled crediting can be increased if, for example, crediting targets sectors where external support is necessary to overcome barriers, and the crediting baseline is set well below the BAU emissions pathway (Wiest *et al.*, 2025). Where host governments lack the capacity or institutional coordination to design and implement effective upscaled crediting approaches, project- and programme-level crediting can be more impactful in delivering mitigation (Wiest *et al.*, 2025). A specific issue is to **avoid double counting that could arise if both specific projects as well as upscaled crediting covering the same mitigation are authorised** (Wold Bank, 2021). Ongoing efforts on harmonise nesting of project-based approaches within jurisdictional efforts can address such risks.

Capacity building by UNFCCC and development partners (see e.g. (*SPAR6C*, 2026), including through innovative formats like subregional Alliances on Carbon Markets in West Africa, Eastern Africa, and the Eastern Caribbean, should include **training on how to prevent such negative outcomes in the context of Article 6 readiness support** (Weldner *et al.*, 2022).

- **Predictable policy and regulatory environment, including credit demand**

Frequently, upscaled crediting will require large financial resources from government institutions or PoA coordinators in an early stage. Therefore, the predictability of the regulatory environment is crucial. **PoAs require long term policy consistency in order to generate sufficient trust to add CPAs over time and across jurisdictions**. This is especially relevant for "high-hanging fruit" such as early-stage technologies (e.g. green hydrogen, electric mobility) which may have technology lifetimes that are much longer than crediting periods. Direct policy crediting can only work if the policy that generates the credits is sustained for many election periods. Sectoral crediting requires an alignment between sector institutions and host country governments that is sufficiently stable to survive changes in governments and sector institutions. The checkered history of international carbon markets to date has shown that the absence of a predictable policy environment led to the downfall of promising international carbon market approaches (Michaelowa et al., 2019b). So upscaled crediting can only thrive if general trust in the international carbon market rules and demand for credits increase steadily in the long run. This could be supported by **long term ITMO purchase contracts**, linked to indicators that ensure persistence of the upscaled crediting approach in the host country, comparable to multi-decadal delivery contracts for relevant international resources like liquified natural gas (see Neumann et al., 2015). The **emerging ITMO demand from large players like the EU and Japan** could be streamlined in that way. The new World Bank approach SCALE (2025) could also help to aggregate large-scale demand.

- **Access to finance (incl. blended finance)**

The absence of upfront financing has been a huge barrier for carbon market activities. Upscaled crediting can be more effective in mobilizing upfront finance than project-based approaches especially when sovereign buyers make clear demand commitment and provide capital through financing institutions. For instance, MDB initiatives such as the FCPF Carbon Fund, ISFL, TCAF and Ci-Dev have integrated access to finance (e.g. credit lines) with carbon crediting approaches. GIS have shown that policies can be mobilized if financing is available. While there are transaction models that integrate upfront payments based on carbon asset futures, **predictable financing is crucial for defining a clear role for carbon finance in more comprehensive blended finance arrangements**. This calls for further exploring innovative linkages between climate finance and carbon markets to balance out respective strengths and weakness.

Key take-aways regarding experience with upscaled crediting

There are **four generic levels** of upscaled crediting: **programmatic**, **policy**-based, **jurisdictional** and **sectoral** that have been discussed in scientific and practitioner literature for over 15 years. **Programmatic** and **jurisdictional** crediting have already **been implemented at scale**. The CDM has shown that it is possible to have programmes involving **many countries** and **over 1000 components**; 74 million credits have been issued to date. Baseline and monitoring methodologies are mature. **Overcrediting linked to default parameters in baseline methodologies** has been an issue for **cookstove** programmes. The **larger** programmes have been **more successful in issuing credits** than the smaller ones. Some coordinating and managing entities have been successful over several countries and programmes. Jurisdictional crediting approaches include the FCPF Carbon Fund and **ART TREES,** both focusing on avoided deforestation. The latter is **likely to become the largest upscaled crediting approach** in the next couple of years, with 26 jurisdictions involved. There are clear benefits of operating activities at jurisdictional scale and there have been substantial improvements in methodologies (including MRV, interoperability, consistency, benefit-sharing potential, government ownership that promise transformational impact. Yet, there are also remaining challenges with clearly demonstrating the **additionality** of measures and **baseline methodologies**, particularly **regarding HF-LD countries**.

While policy crediting has been attempted for over ten years, only a single pilot in Uzbekistan has been implemented. Policy crediting faces issues regarding **additionality determination of policy instruments** as well as applying **modelling for calculation of baseline emissions**. As for sectoral crediting, it has not been implemented to date in practice.

A breakthrough of upscaled crediting could be achieved if the following preconditions are satisfied. **Baseline and monitoring methodologies that satisfy the principles of Article 6 and PACM** have to be developed. If this is **structurally impossible for certain forms of upscaled crediting, these should no longer be pursued**. Host countries need to be able to **address potential conflicts of interest** given their important role in upscaled crediting. They need to understand the **consequences of over-crediting for their NDC and of double counting between projects and upscaled approaches**, and be enabled to prevent these as well as **harm regarding sustainable development parameters**. Capacity building initiatives need to take up these issues to enable host countries to address these challenges ex ante. A **predictable policy environment** – both on the side of the host country and the credit buyer – is key to all forms of upscaled crediting; it can be bolstered by **long-term ITMO purchase contracts**.

3. Aligning upscaled crediting with the Paris Agreement rulebook

3.1. Overview of the Paris Agreement rulebook

The PA rulebook refers to the international decisions that operationalize the agreement. Article 6.1 of the PA provides for voluntary cooperation between parties in the implementation of their NDCs to "allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity". These apply to cooperation under Article 6.2 and 6.4 as well as under Article 6.8. The core set of international rules for Article 6 were adopted in Glasgow in 2021 (UNFCCC, 2021b, 2021a). These rules are complemented with subsequent decisions. For Article 6.2 cooperation, the rulebook includes general rules, focusing on the international transfer and use of mitigation outcomes and their robust accounting, to be implemented through national, bi- and multilateral frameworks. For PACM, the rulebook includes detailed rules, modalities and procedures, which are then translated into standards and procedures adopted by the mechanism's Supervisory Body (SBM), focusing on the integrity of carbon credits and underlying activities. Since Article 6 cooperation serves as a tool for NDC achievement, the Paris rules for NDCs (Article 4) and the ETF for tracking progress on climate action and NDC achievement (Article 13) are directly relevant for Article 6 cooperation.

From the global perspective, the case for accelerating mitigation at scale is stronger than ever, given the large and widening gap between current action and the Paris Agreement's long-term goals (United Nations Environment Programme, 2025). **Upscaled crediting has the potential to contribute to higher ambition in mitigation, adaptation and sustainable development at a greater scale and more consistently than stand-alone projects, provided that environmental and social integrity are upheld. The opposite is also true: if implemented with low integrity, upscaled crediting could undermine global ambition at a greater scale than project-based crediting.** From the host country perspective, aligning crediting with NDCs and national GHG inventories is important, alongside ensuring environmental integrity and robust accounting, to ensure that crediting contributes to – and does not undermine – NDC achievement.

3.2. Contributing to NDCs and long-term goals and encouraging ambition

Under both Article 6.2 and the PACM, participating Parties must ensure that their participation contributes to the implementation of NDCs, long-term low GHG emission development strategies (LT-LEDS) and the long-term goals of the Paris Agreement (UNFCCC, 2021a, 2021b). For Article 6.2, the Paris rulebook does not specify how this should be implemented. Under PACM, methodologies must align with NDCs, LT-LEDS and the long-term temperature goal of the Paris Agreement, contribute to the equitable sharing of mitigation benefits between participating Parties and encourage ambition (UNFCCC, 2021b). According to the Methodologies Standard of the PACM,

these can be implemented, inter alia, by targeting broader deployment and progressively increasing performance of replicable and scalable mitigation action, applying increasingly ambitious crediting baselines and limiting the length of the crediting period (UNFCCC, 2024c). The PACM also includes the mandatory cancellation of 2% of issued credits to deliver overall mitigation in global emissions. For Article 6.2, delivering overall mitigation in global emissions is encouraged but voluntary. Similarly, the share of proceeds for the Adaptation Fund of 5% of issued credits is mandatory under PACM, but only encouraged for Art. 6.2 approaches. Compared with stand-alone projects, upscaled crediting activities have potential to contribute to NDCs and long-term goals at a greater scale, both directly by enabling scalable mitigation and indirectly by delivering overall mitigation in global emissions at scale.

The effectiveness of the contribution of crediting to NDCs and long-term goals depends on several factors (Ahonen *et al.*, 2023). For one, ensuring environmental integrity is key to making a real contribution to achieving NDCs and global climate goals. Furthermore, mitigation contributes to the NDC only to the extent that it is within the scope of the NDC and reflected in the national GHG inventory. Keeping track of the contributions to NDCs and long-term goals requires transparent reporting and robust accounting. Last but not least, ensuring social integrity, sustainable development co-benefits and equitable benefit-sharing increase the likelihood of broad support and lasting impacts. These are discussed in the following sub-sections, including key implications for upscaled crediting.

The power and land-use sectors, which are suitable candidates for upscaled crediting, are also expected to reach net zero emissions earlier than many other sectors (Wiest *et al.*, 2025). This means that, over time, the scope of upscaled crediting would decrease or shift to harder-to-abate sectors.

The PA rulebook does not provide explicit guidance on how NDCs should be presented nor how Article 6 should contribute to NDCs. In practice, this has led to differing NDC features, which adds complexity to establishing how Article 6 activities contribute to NDCs (Howard *et al.*, 2017). A complicating factor is that the demarcation between unconditional and conditional NDC targets has evolved through the precedent of NDCs setting both types of targets. However, the Paris rulebook does not mention NDC target conditionality anywhere, making it challenging for host countries to determine which mitigation outcomes should be eligible for international transfer (Greiner *et al.*, 2021).

International initiatives provide further perspectives on best practice and guidance on aligning carbon crediting with NDCs and global goals. For example, the Oxford Principles for Responsible Engagement with Article 6 recommend crediting mitigation that goes beyond the unconditional NDC (Johnstone *et al.*, 2025). Note that, even in this case, crediting activities could contribute to the host country's unconditional NDC to the extent that the additional mitigation generated by the activity is not credited, for example due to a stringent crediting baseline or limited crediting period

(see Box 1). A notable exception could be the use of a type of PACM unit by the host country as a domestic tool to meet its unconditional NDC. In this case, suitable credits could represent additional mitigation that is needed to meet the domestic (unconditional) NDC and should be so-called Mitigation Contribution Units (MCUs), which are a type of PACM unit that are not authorized as ITMOs under Article 6.2 and therefore not eligible for international transfer.

3.3. Ensuring transparency and applying robust accounting

Transparency is a central cross-cutting principle of the Paris Agreement. The Enhanced Transparency Framework (ETF) sets modalities, procedures and guidelines for tracking progress towards achieving NDCs (including through Article 6.2), adaptation actions and climate finance goals (UNFCCC, 2018).

For Article 6.2, the Paris Agreement rulebook includes requirements for ensuring transparency (including in governance) through reporting, recording and tracking ITMO-related information, and applying robust accounting (including to avoid double counting), through applying corresponding adjustments to the emissions and removals from the sectors and GHGs covered by its NDC, resulting in an emissions balance (UNFCCC, 2021, p. 16). Host countries must apply corresponding adjustments for all ITMOs that they authorize and first-transfer, while acquiring countries must apply corresponding adjustments for ITMOs that are used towards their NDCs. This must be done consistently with the participating Party's NDC implementation and achievement, applying methods that are appropriate for single- and multi-year NDCs and NDCs containing GHG and non-GHG metrics. The Paris Agreement rulebook does not specify how NDCs are presented, for example, in terms of their coverage, metrics, level of detail and conditionality to international support (Howard *et al.*, 2017). The consequent diversity of NDCs complicates the elaboration of common accounting rules and their consistent application across different NDCs. Risks for environmental integrity and NDC achievement can arise especially if a host country have a single-year target; applies an averaging method to corresponding adjustments, and transfers an increasing ITMO volume over time (Wiest *et al.*, 2025).

The information reported by Parties for Article 6.2 is published in an Article 6 database, which is a part of a centralized accounting and reporting platform (CARP). Information about ensuring environmental integrity and promoting sustainable development is due at the time of authorization, while information about the corresponding adjustments might only be submitted after the generation and transfer of the associated mitigation outcomes. The reporting cycle is specified in the ETF rules rather than in the rules for Article 6.2 (UNFCCC, 2018).

The host country must apply corresponding adjustments for all ITMOs that it authorizes and first-transfers, meaning that the associated mitigation cannot be counted towards achievement of the host country's NDC. Thus, the host country should grant ITMO authorisation only for mitigation that

is truly additional to what is needed to achieve its (unconditional) NDC, that is within the sectoral and GHG scope covered by its NDC and that is reflected in the national GHG inventory. Otherwise, corresponding adjustments would make it more difficult for the host country to achieve its NDC (Ahonen *et al.*, 2023). Thus, informed Article 6.2 decision-making that safeguards – rather than jeopardizes – NDC achievement, requires a deep understanding of the host country's NDC and national GHG inventory methodologies, as well as the international rules for GHG inventories specified in the enhanced transparency framework. Due to the greater scale and higher aggregation level, methodologies for upscaled crediting should align with national GHG inventories more closely than project-level methodologies.

For PACM, transparency provisions reflect the mechanism's focus on the registration of activities and issuance of credits. Methodologies must be transparent, information about carbon credits and the underlying activities must be publicly disclosed, local and global stakeholders must be consulted, double registration and issuance must be avoided, and credits are recorded and tracked in the mechanism's registry. For authorised PACM credits (so-called Authorized Emission Reductions, AERs), the Article 6.2 rules apply. Transparency on parameters, assumptions and uncertainties are especially important for upscaled crediting approaches that rely on modelling. **For upscaled crediting, the risk of double registration and issuance is pertinent in cases where the upscaled crediting activity, such as a programme or policy, overlaps with and/or targets activities that could also be registered as stand-alone project activities, or a jurisdictional programme in an area with existing individual project activities.** These types of double counting would undermine environmental integrity by resulting in the issuance of more than one credit for the same mitigation outcomes. **To address these risks, host governments need to have oversight of all crediting activities in the sector or jurisdiction and put in place nesting arrangements that align crediting that is implemented at different levels.** Large-scale crediting provides governments with the opportunity to have a consolidated oversight of all the crediting activities within in the country, which can facilitate a consistent approach to integrity and avoidance of double counting. Sectoral and jurisdictional baselines serve as a ceiling for crediting of nested activities in the sector or jurisdiction in question (Wiest *et al.*, 2025).

3.4. Ensuring environmental integrity

In the context of the Paris Agreement, and carbon credits more generally, environmental integrity typically refers specifically to mitigation impacts, while integrity refers more broadly to environmental and social impacts (Wiest *et al.*, 2025). This section focuses on the mitigation impacts, while the broader environmental and social impacts – including both the minimisation of negative and the promotion of positive impacts – are covered in Section 3.5 below. Demand-side environmental integrity, i.e., complementary use Article 6 to enable higher ambition, is covered in Section 3.2 above. Ensuring environmental integrity is important for safeguarding the achievement of NDCs and global mitigation goals (Michaelowa *et al.*, 2019). For both Article 6.2 and PACM, the

Paris Agreement rulebook requires ensuring environmental integrity, building on well-established criteria for demonstrating additionality, setting baselines, quantifying and verifying emissions and mitigation outcomes, and addressing non-permanence and leakage (see Box 1 for further information). These criteria were developed already under the Kyoto Protocol to ensure that credits represent real mitigation. Under the Paris Agreement, environmental integrity criteria need to be interpreted in the dynamic and diverse context of NDCs, which are to be updated at least every five years, ensuring that there is no net increase in global emissions within and between NDC implementation periods. For Article 6.2, the rulebook provides only high-level requirements for participating countries to ensure environmental integrity and report about their approaches (UNFCCC, 2021, p. 19). By contrast, for the PACM, the SBM has elaborated detailed policy standards for various aspects of environmental integrity, such as additionality demonstration and baseline setting. Under Article 6.2, participating countries are responsible for implementing the rulebook's provisions for environmental integrity through national arrangements, and describing how they ensure environmental integrity, in their reporting under the Paris Agreement. Due to this national flexibility, the criteria for upscaled crediting could vary across countries. By contrast, the PACM standards for upscaled crediting would apply across countries, even though host countries have some potential to tailor methodologies to national circumstances, e.g., through sector-specific standardised baselines applicable to activities in that sector in the host country. Under Article 6.2, participating countries can make use of PACM and/or other crediting programmes in their efforts to ensure environmental integrity but are not required to do so.

While environmental integrity is of utmost importance for upscaled crediting, there is less experience with ensuring environmental integrity at larger scales than at the level of projects and programmes. Existing approaches to ensuring environmental integrity do not fully apply to some types of upscaled crediting. **This requires the development of standards and tools that are tailored to upscaled crediting,** taking into account the challenges of attributing and quantifying mitigation outcomes at higher levels of aggregation.

Box 1. Ensuring environmental integrity of carbon credits

Demonstrating additionality

For Article 6.2, the Paris Agreement rulebook states that ITMOs are "real, verified and additional" but does not specify how additionality should be ensured. Under the PACM, detailed requirements for additionality demonstration are specified in the Methodologies and Additionality Standards, covering prior consideration, regulatory additionality and financial additionality, or performance-based approaches as an alternative to financial additionality (UNFCCC, 2024c, 2025h). Regulatory additionality includes showing that the "activity represents mitigation that exceeds any mitigation that is required by law or regulation, unless the law or regulation refers to or formally integrates the mechanism as an instrument for implementation" (UNFCCC, 2025, p. 5). The exception is relevant for policy crediting; policies could be credited to the extent that they result in mitigation exceeding any mitigation required by laws and regulations other than the policy in question (Michaelowa, Ahonen, *et al.*, 2025). For policy

crediting, additionality entails demonstrating that the policy instrument would not have occurred (to the same extent) without the crediting incentive and that the credited mitigation is clearly attributable to the policy instrument(s) in question. **This may be challenging in cases where multiple policies, macroeconomic factors and/or behavioural and market responses influence the targeted emissions** (Michaelowa and Kessler, 2024; Michaelowa, Ahonen, *et al.*, 2025). This can apply also for sectoral and jurisdictional crediting, although they are not based on quantifying the impacts of particular policy instruments. Instead, they typically demonstrate additionality through stringent crediting baselines. **While stringent baselines can increase the likelihood of additionality, they do not guarantee it, since mitigation can also be driven by exogenous factors unrelated to government efforts** (Wiest *et al.*, 2025). For programmes of activities, attribution is straightforward and additionality standards and tools have already been developed under the CDM and other carbon crediting programmes. The PACM additionality standard has yet to be updated to cater for programmes or other large-scale crediting approaches. Standardised one-size-fits-all additionality testing is not suitable for policy crediting, given differences in the characteristics of policy instruments as well as factors influencing decision-making across sectors and jurisdictions (Wiest *et al.*, 2025). For policy crediting, additionality demonstration could be done at the level of the policy and/or the activity types triggered by the policies, depending on the policy instrument type and the type of mitigation activities driven by that policy instrument (Michaelowa, Ahonen, *et al.*, 2025). This would require further **revision of the PACM Additionality Standard and the development of tailored methodologies for different types of policy instruments**.

Setting baselines conservatively and below business-as-usual

Under both Article 6.2 and PACM, the Paris rulebook requires setting crediting baselines conservatively and below business-as-usual (BAU), addressing uncertainties in quantification and taking into account all existing policies. This could be interpreted to mean that only mitigation above and beyond the host country's unconditional NDC target would be credited, although this is not explicitly stated in the Paris rulebook (Wiest *et al.*, 2025). For Article 6.2, the Paris rulebook does not provide further guidance on baselines while, for the PACM, the rulebook provides three baseline approach options (best available technology, ambitious benchmarks and existing actual or historical emissions adjusted downwards) and detailed requirements for their implementation in methodologies (UNFCCC, 2024c, 2025i). Moreover, PACM baselines are subject to progressive downward adjustment over time. Note that this adjustment is distinct from, and in addition to, conservativeness and accounting for uncertainties. The PACM Baseline Standard (UNFCCC, 2025i) allows to focus on the most relevant causes of uncertainties. These may be quantified using expert judgment and other approaches provided by relevant IPCC guidelines, based on approaches that address uncertainty overall or separately for the baseline scenario and the quantification of baseline emissions and/or removals. In many cases, project-level approaches to baseline setting can be applicable also to programmatic crediting. Standardized baselines can be applicable for projects, programmes of activities, sectoral crediting and some types of policy and jurisdictional crediting. By rewarding aggregate mitigation outcomes, upscaled crediting reflects overall progress in mitigation better than project-level crediting. **For upscaled crediting, the scale of uncertainties can be high and conservative approaches are particularly important to avoid inflated baselines and consequent overcrediting.** This is especially relevant for approaches that rely on historical emissions, default values or modelling. In the context of jurisdictional land use sector crediting, **model-based baselines can be more accurate than predictions based on historical trends, especially when they include ex-post adjustments** (Pauly et al. 2024, Wiest *et al.*, 2025). However, model-based baselines are also more challenging to implement, they have a risk of being "black boxes" and ex-post adjustments can involve disputable assumptions and increase investment uncertainty (Wiest *et al.*, 2025). **Transparency and robust governance are key to building trust in model-based baselines** (Wiest *et al.*, 2025). **Further research and piloting are needed to develop approaches that strike a balance between acceptable accuracy in quantification and sufficient incentives for action**.

Quantifying emissions and mitigation outcomes

For Article 6.2, the Paris Agreement rulebook requires addressing uncertainties in quantification but does not provide further guidance on the issue. For the PACM, the Methodologies Standard requires methodologies to contain credible methods for estimating emission reductions and removals, based on up-to-date scientific information and reliable data, using conservative estimations and assumptions, and accounting for uncertainties in emissions factors, activity data and other parameters (UNFCCC, 2024c). The standard also provides for data-driven technical performance standards, sampling and secondary data sources. **Programmatic and sectoral crediting could apply project-level methods, including sampling in cases where direct measurements of all covered activities are not feasible.** The power sector already has relatively robust MRV while, in the forest sector, remote sensing is significantly improving MRV (e.g., AIM4F work) (Wiest *et al.*, 2025). For policy crediting, MRV may be more complex than for other types of upscaled crediting, due to the broader scope, systemic interactions and indirect nature of mitigation impacts, as well as the need to track also policy implementation and account for external impacts (Michaelowa, Ahonen, *et al.*, 2025). While the establishment of MRV at the sectoral or jurisdictional scale can be challenging, **it can provide a valuable foundation for effective domestic mitigation policies, also beyond crediting** (Wiest *et al.*, 2025). Maturing BTR reporting frameworks as well as digitalisation may help to overcome these challenges over time.

Addressing leakage and non-permanence

For both Article 6.2 and PACM, the Paris rulebook requires minimising the risk of non-permanence of mitigation across several NDC periods and addressing any reversals in full. Leakage must also be addressed. For Article 6.2, the rulebook does not provide further requirements while, under the PACM, further requirements are detailed in dedicated standards (UNFCCC, 2025e, 2025f). The risk of reversals is particularly relevant for the forestry sector. Compared with project-level crediting, upscaled crediting can have better opportunities for reducing the risks of reversals and leakage, due to broader coverage, especially in jurisdictional approaches. To reduce reversal and leakage risks, host governments should address the underlying drivers, such as agricultural expansion (Wiest *et al.*, 2025). These risks cannot be fully eliminated, so measures to assess these risks and monitor and compensate for reversals are needed (Ahonen and Kessler, 2025). Research suggests that current approaches to addressing non-permanence need to be improved and complemented with a broader suite of measures, such as insurance (Ahonen and Kessler, 2025; Michaelowa, Kessler, *et al.*, 2025; Wiest *et al.*, 2025). Cross-sectoral and international leakage can be challenging to quantify and address in a systematic way (Wiest *et al.*, 2025).

Encouraging broad participation, avoiding lock-in and recognizing suppressed demand

The PACM requires methodologies to include provisions to encourage broad participation and avoid locking in emissions, technologies or practices incompatible with NDCs and the Paris Agreement's long-term goals. Upscaled crediting may have the potential to deliver on these at significantly greater scale and consistency than project-level crediting, if well-designed.

PACM methodologies are also required to provide for recognizing suppressed demand, in line with the related standard (UNFCCC, 2025g). This could be especially relevant for crediting of programmes and policy instruments e.g. for clean cooking and energy access that target poor rural households. Upscaled crediting could draw on the extensive experience gained through Kyoto-era PoAs on addressing suppressed demand.

3.5. Ensuring social integrity: Promoting sustainable development benefits and establishing safeguards against negative impacts

The Paris Agreement gives increased attention to promoting sustainable development, and elaborates requirements for minimising negative and promoting positive environmental and social

impacts and aligning with national sustainable development objectives. Under both Article 6.2 and the PACM, participating Parties must ensure that their participation contributes to sustainable development. Negative environmental and social impacts must be minimised and, where possible, avoided. The Paris Agreement broadens the concept of integrity also to social aspects beyond mitigation, for example by stating that Parties should "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" (UNFCCC, 2021a, 2021b). For Article 6.2, the Paris rulebook does not specify how these requirements should be implemented. Under Article 6.2, participating countries are required to report how they ensure that these requirements are implemented, as part of their reporting under the Paris Agreement. The PACM includes a mandatory Sustainable Development Tool for identifying and addressing social and environmental risks and assessing and enhancing the contributions to sustainable development, as well as requirements for local and global stakeholder consultations (UNFCCC, 2025j). The PACM also introduces processes for appealing against the SBM's decisions and submitting grievances in respect of adverse social, economic or environmental effects directly caused by an Article 6.4 activity (of any scale) (UNFCCC, 2024a). Contributing to adaptation is encouraged but voluntary under Article 6.2, while the PACM requires 5% of credits to be forwarded to the Adaptation Fund.

Promoting sustainable development

The updated Article 6.4 Sustainable Development Tool establishes a mandatory, structured framework that requires comprehensive environmental and social risk assessment, mitigation planning, indicator-based monitoring, continuous stakeholder engagement, and grievance mechanisms – covering 11 safeguard areas ranging from human rights and labour to biodiversity, Indigenous Peoples, gender, and anti-corruption. This strengthens the CDM's earlier sustainable development tool, which lacked mandatory safeguards, had no grievance mechanism, and used a voluntary, largely qualitative SD tool that focused on positive impacts without systematically assessing negative ones. By contrast, the Art.6.4 SD tool requires activities to assess both positive and negative SDG-linked impacts, align with host-country SD priorities, and undergo annual DOE-verified monitoring.

Safeguarding environmental and social integrity

Historically, compliance carbon markets under the Kyoto Protocol (the CDM) lacked mandatory environmental and social safeguards and grievance mechanisms, leaving this responsibility to host countries or financing institutions. The Cancun Safeguards for REDD+ activities, established at COP16 in 2010 (Decision1/CP.16, Appendix I, para2) was an early attempt to prevent negative impacts (UN-REDD Programme, 2014). While they are non-binding, they have been taken up by FCPF and ART TREES. Article 6 elevates safeguards to become an integral feature, with Article 6.4 adopting a mandatory Sustainable Development (SD) Tool that operationalizes a "do-no-harm" approach across the full activity cycle. Safeguards have a much longer history in climate and development finance, with the IFC Performance Standards being most widely used. The GCF also adopted IFC Performance Standards and applied them to REDD+ activities. Article 6.4 aligns thematically, but the IFC performance standards provide more technical detail. Therefore, safeguards have moved from an optional tool in the Kyoto era to become a mandatory element of Article 6. Still, safeguards are less developed in carbon markets than in climate finance and

PACM should consider a comprehensive assessment of lessons from climate finance (e.g. use of IFC PS in GCF and MDBs) can inform strengthening PACM safeguards.

Promoting gender equality in carbon markets

Gender considerations have become significantly more prominent in international carbon markets under Article 6 of the Paris Agreement. Gender considerations were largely ignored in the CDM rules, even though they have already been relevant for specific activity types, especially those supporting household and community-based measures such as energy access and reforestation. Recent studies on Article 6 readiness show that Gender Equality and Social Inclusion (GESI) provisions – such as inclusive consultations, gender-responsive activity design, and sex-disaggregated monitoring – are increasingly important (GGGI, 2026a).

This shift has been strongly shaped by lessons from international climate finance, where gender mainstreaming frameworks are more mature. The Green Climate Fund (GCF), for example, has embedded gender considerations from its inception, requiring gender and social assessments and gender-responsive implementation (GCF, 2023). Similarly, the International Climate Initiative (IKI) advances gender justice as a core principle, highlighting that gender-responsive or transformative approaches not only minimize social risks but also improve the ambition, effectiveness, and sustainability of climate action (IKI, 2026). These experiences underscore the value of gender policies, capacity-building, and inclusive participation and related action plans.

In addition, emerging tools such as the W+ Standard have helped translate gender impacts into measurable benefits, offering dual certification for carbon projects to demonstrate tangible contributions to women's empowerment (IKI, 2026).

4. The potential of PACM to deliver upscaled crediting approaches

4.1. Quantitative assessment of the potential of the PACM portfolio to support upscaled crediting

CDM transition of activities to PACM – Host party approved activities

Understanding the geographic distribution and host-party approval status of eligible CDM activities is central to assessing the real potential for upscaled crediting. **While the legacy CDM pipeline provides a substantial theoretical volume of mitigation outcomes, only a subset of these activities has so far managed to obtain host-party approval[5].** The deadline for providing host party approval, extended at COP30, is at the end of June 2026, which will provide clarity on the final portfolio of activities. Examining in which sectors and geographic regions PoAs, CPAs, and PAs are concentrated, and how many have secured host party approval so far, indicates not only the theoretical mitigation potential by region but also the institutional readiness and policy alignment required to operationalize upscaled crediting pathways.

Table 3: Geographic distribution of activities and sum of annual reductions

Sub-region	Eligible CDM activities					Host Party approved activities (as of Feb 2026)				
	PA	PoA	CPA	Count of activities (PA+CPA)	Sum of Planned Annual ERs (million tCO2e/yr)	PA	PoA	CPA	Count of activities (PA+CPA)	Sum of Planned Annual ERs (million tCO2e/yr)
Central Africa	6	2	9	15	0.98	-	-	-	0	-
Eastern Africa	59	41	504	563	34.12	11	12	277	288	17.92
Northern Africa	27	2	4	31	5.31	2	1	-	2	1.39
Southern Africa	45	4	13	58	10.18	-	4	11	11	2.42
Western Africa	28	14	139	167	15.21	1	5	23	24	1.73
Central Asia	6			6	3.42	-	-	-	0	-

[5] Host Parties have been slow or hesitant to approving the transition of activities as many are still putting Article 6 governance/authorization processes in place and are cautious about implications of CDM transition for NDC targets.

Eastern Asia	1300	8	97	1397	191.20	-	-	-	0	-
South-Eastern Asia	334	22	148	482	40.43	4	2	56	60	3.21
Southern Asia	1061	36	238	1299	157.77	28	10	63	91	36.57
Western Asia	46	1	7	53	7.89	6	-	-	6	1.57
Melanesia	5	3	4	9	0.53	-	-	-	0	-
Caribbean	9	2	2	11	0.81	2	-	-	2	0.14
Central America	84	3	12	96	11.42	7	-	-	7	0.77
South America	303	15	87	390	71.93	35	-	-	35	4.45
Eastern Europe	5			5	1.16	-	-	-	0	-
Southern Europe	15			15	1.93	-	-	-	0	
multiple		16		0	0.00	-	8	-	0	0
Grand Total	3333	169	1264	3930	554.31	83	25	142	225	70.17

Source: Authors, based on UNEP CCC 2026

Eastern Africa stands out as the most region with the largest share of programmatic activities, with 563 activities comprised of 504 CPAs (component projects of PoAs), and ~34.1 million tCO_2e/yr planned reductions. Notably, it retains strong momentum regarding host approval (288 activities; ~17.9 million tCO_2e/yr) than many regions. **By contrast, Eastern Asia and Southern Asia dominate the eligible pool of activities by sheer scale** (1397 and 1299 activities respectively; ~191.2 and ~157.8 million tCO_2e/yr), and a much smaller approved subset in Southern Asia (91 activities; ~36.6 million tCO_2e/yr), suggesting either stricter host screening, slower administrative processing, or weaker alignment with current host requirements. It is worth noting that China and India make up the dominant share of this portfolio and have not yet announced their willingness to provide authorisation. Western Africa has a sizable eligible portfolio (167 activities; ~15.2 million tCO_2e/yr) but a small, approved remainder (24 activities; ~1.7 million tCO_2e/yr), while Southern Africa retains approvals mainly through PoA/CPA structures (11 activities; 2.4 million tCO_2e/yr).

Overall, host-party approval remains a key constraint shaping what portion of the pipeline of existing activities can realistically transition. Regions with strong presence of programmatic activities and sufficient institutional capacity (e.g., Eastern Africa) appear better positioned to transition their activities. This picture may change as countries still have time to provide approval until June 2026.As shown in Table 13 under Annex A, the transition pipeline is broad and heavily weighted toward renewables and large-scale programmes, but Host Party approvals are progressing unevenly across activity types. **Approvals to date appear to cluster around activity types such as programmatic energy efficiency, suggesting that host countries are prioritizing transitions where the underlying intervention, monitoring approach, and policy fit are clearer**. By contrast, several categories that feature in transition requests have yet to secure approvals, indicating either higher perceived integrity/policy sensitivities, more complex methodological questions, or slower alignment with host-country NDC priorities. Overall, the data suggests that the early PACM portfolio generated through selective transition will be shaped less by the "largest" CDM categories in the pipeline and more by where host countries are ready to provide approvals.As shown in Table 14 under Annex A, activity types well-suited to upscaled crediting have already been structured programmatically through PoAs and associated CPAs, particularly in household energy efficiency, small-scale renewables, and methane-related activities. **Energy efficiency in households dominates the number of approved CPAs in Eastern Africa, Southern Asia, and Western Africa, demonstrating that dispersed, small-scale interventions can be aggregated effectively at scale.** Hydro, wind, and solar are also important, but are more often implemented as stand-alone project activities, even though there are also programmatic approaches supporting these technologies. Methane avoidance, landfill gas, and fugitive emissions also show potential, especially where multiple similar installations can be grouped under a common framework. **Overall, sectors characterised by many small, replicable units, such as clean cooking, distributed renewables, and waste management, are the most viable entry points for upscaled crediting among the existing transition portfolio, as they benefit from aggregation, standardised monitoring**

approaches and reduced transaction costs per activity. However, large-scale activities are also part of the portfolio of programmatic activities.

Activities requesting transition show a highly uneven distribution of planned annual emission reductions across vintages: volumes are moderate and broadly stable from 2021 through 2024, before a sharp step-change in 2025. This pattern suggests the transition pipeline is back-loaded, with a large share of anticipated reductions concentrated in the latest vintage, potentially reflecting a combination of (i) activities timing their transition and/or monitoring to align with the post-transition crediting framework, and (ii) a build-up of larger or more scalable activities coming through in the most recent vintage year rather than being evenly spread across earlier periods.

The approvals are highly front-loaded into 2025, which accounts for 48.9 million tCO_2e/yr, two-thirds of the total approved planned reductions (70.2 million tCO_2e/yr). Earlier years contribute much smaller, suggesting that the bulk of the upscaled crediting opportunity is expected to materialise in a narrow time window rather than gradually.

Strategically, this points to a near-term surge as host approvals may be clustering close to key transition deadlines, which could create bottlenecks for validation/verification, registry processing, and host country oversight.

Further detailed data analysis is provided in Annex A.

Prior consideration notifications

A key prior consideration notification for assessing upscaled crediting potential is the geographic and sectoral distribution of PAs and PoAs that have submitted prior consideration notifications. While the number of such activities will continue to grow as more proponents notify under the PACM, the existing portfolio already indicates substantial mitigation potential in specific regions and sectors. Reviewing the regional concentration of PoAs and PAs, together with their sectoral activity types, is therefore essential not only to gauge the scale of potential mitigation outcomes but also to understand where host Parties and activity developers are most actively seeking participation and in which technologies. This, in turn, provides an indicative initial empirical basis for identifying future upscaled crediting potentials and pathways by region and by activity type ranging from expanded PoA pipelines to policy, sectoral and jurisdiction-level approaches.

Table 4: Regional distribution of prior consideration activities and sum of annual reductions

Prior consideration (as of Feb 2026)				
Region	**PA**	**PoA**	**Count of activities (PA+PoA)**	**Sum of Planned Annual Reductions (million tCO2e/yr)**
Asia	669	153	822	582.1
Africa	119	55	174	353.6
Americas	85	17	102	65.6
Oceania	2	1	3	8.2
Europe	6	2	8	0.4
Multiple Region	-	3	3	14.5
Total	**881**	**231**	**1112**	**1024.4**

Source: Authors, based on UNEP CCC 2026

Projects dominate the prior consideration portfolio which has expressed interest in using the Article 6.4 mechanism, with Asia and Africa as the leading regions in terms of both the number of activities and potential emission reductions. Yet, since CPA numbers are not provided during prior consideration, a substantial share of the PoAs can be expected to aggregate several activities which means that the number of prospective activities may be higher when factoring in PoA component activities (see CDM precedent in sections 2.2, 4.1). Asia accounts for 822 notified activities (669 PAs and 153 PoAs), representing approximately 582.1 million tCO_2e/yr in planned annual reductions, making it the largest regional contributor. Notably, China has been absent from this pipeline to date but could potentially re-emerge as a dominant country again due to the scale of its economy,

technology leadership, and associated mitigation potentials. Africa follows with 174 activities (119 PAs and 55 PoAs) and 353.6 million tCO_2e/yr, indicating substantial mitigation potential and early engagement. By comparison, the Americas contribute a more limited share of the portfolio, with 102 activities (85 PAs and 17 PoAs) and 65.6 million tCO_2e/yr in planned annual reductions, while Europe and Oceania account for a small share of notified activities, collectively with just 8 PAs and 4 PoAs. Notably, part of the activity anticipated in these regions reflects multi-regional PoA structures that also extend into other regions, rather than purely stand-alone regional pipelines.

Overall, the prior consideration portfolio clearly reflects a strong PACM activity pipeline and high mitigation potential in Asia and Africa, as well as the growing interest of stakeholders in implementing Art.6.4 activities to mobilize carbon finance. Among this portfolio, there is a substantial of programmatic activities, which reinforces the case for prioritizing the update of PoA rules to enable them to expand towards upscaled crediting.

However, the conversion rate of activities expressing prior consideration entering into the PACM activity cycle remains unclear, **especially as the lack of approved methodologies remains a barrier for new activity development in the next months, potentially years**.

Please refer to Table 17 in Annex A for more data on prior consideration at the sub-regional level, where the concentration of prior consideration notifications is heavily skewed toward a few key areas. For each major region, the two sub-regions with the highest number of activities are:

- **Asia:** Southern Asia leads with 713 activities (588 PAs and 125 PoAs), representing ~ 466 million tCO_2e/yr, followed by Southeast Asia with 58 activities (43 PAs and 15 PoAs; ~67.6 million tCO_2e/yr).
- **Africa:** Eastern Africa dominates with 90 activities (59 PAs and 31 PoAs; ~81.9 million tCO_2e/yr), followed by Western Africa with 45 activities (36 PAs and 9 PoAs; ~40.4 million tCO_2e/yr).
- **Americas:** South America leads with 89 activities (76 PAs and 13 PoAs; ~64.2 million tCO_2e/yr).

Southern Asia in Asia and Eastern and Western Africa in Africa host the majority of PAs and PoAs, contributing most of their regions' potential mitigation outcomes. This concentration reflects the CDM experience in these regions, the high mitigation potential of developing countries with higher-emitting baselines in key sectors, degree of reliance on international project-based approaches across regions and early demand signals from bilateral agreements, such as Japan in Asia and the EU/South Korea in Africa.

Table 5: Sectoral Distribution of Prior Consideration Activities

Prior consideration (as of Feb 2026)				
Activity Type	**PA**	**PoA**	**Count of activities (PA+PoA)**	**Sum of Planned Annual Reductions (million tCO_2e/yr)**
Renewables	**398**	**42**	**440**	**520.4**
Buildings	5		5	0.3
Energy	393	41	434	520.0
Industry	-	1	1	0.1
En Efficiency	**166**	**88**	**254**	**259.0**
AFOLU		1	1	2.6
Buildings	145	75	220	250.8
Energy	-	2	2	0.2
Industry	12	6	18	2.5
Transport	3	-	3	0.8
Waste	6	4	10	2.1
Fuel switch	**169**	**58**	**227**	**110.3**
Buildings	20	9	29	24.2
Energy	129	15	144	9.3
Industry	8	-	8	0.4
Transport	12	34	46	76.4
Sinks	**43**	**37**	**80**	**90.6**
AFOLU	43	37	80	90.6
GHG management	**105**	**6**	**111**	**44.2**
AFOLU	51	4	55	12.3
Energy	3	1	4	12.0
Industry	4		4	0.4
Waste	47	1	48	19.5
Grand Total	**881**	**231**	**1112**	**1.024.4**

Source: Authors, based on UNEP CCC 2026

The sectoral composition of the portfolio highlights the clear dominance of renewable energy and efficiency-related activities followed by fuel switch. Renewables account for 440 activities (398 PAs

and 42 PoAs), while energy efficiency activities comprise 254 activities. Together, these two sectors represent approximately ~779.4 million tCO_2e/yr, or about 76% of the total planned emission reductions across all 1112 activities (881 PAs and 231 PoAs). Renewables lead the portfolio, whereas energy efficiency offers high mitigation potential at relatively low cost, supported by standardized methodologies. **This combination makes both sectors particularly attractive for programmatic crediting approaches that aggregate multiple interventions.**

Please refer to Table 16 in Annex A for more detailed information on the distribution of projects and programmes by sector and region. Overall, activity is concentrated in a few key sectors, particularly renewable energy, efficiency, fuel switching are as follows:

Asia : PoAs in Asia are overwhelmingly concentrated in Southern Asia, which represents the dominant regional market with 588 PAs, 125 PoAs, and approximately 466.0 million tCO_2e/yr. The region is strongly driven by cleaner cooking activities, accounting for 75 PAs, 41 PoAs, and nearly 148.0 million tCO_2e/yr, making it the single largest technology category in Asia.

The second most important technology in Southern Asia is mixed renewables, contributing 36 PAs, 12 PoAs, and around 84.6 million tCO_2e/yr, followed by electric vehicles with 6 PAs, 7 PoAs, and approximately 57.0 million tCO_2e/yr. Together, these technologies highlight the strong dominance of household energy access, renewable energy expansion, and transport electrification within Asia's carbon market activities.

Outside Southern Asia, Southeast Asia represents the second-largest Asian market with 43 PAs, 15 PoAs, and approximately 67.6 million tCO_2e/yr. Activities in the region are dominated by mixed renewables (1 PA, 5 PoAs; ~33.0 million tCO_2e/yr) and cleaner cooking (2 PAs, 5 PoAs; ~20.6 million tCO_2e/yr), alongside growing contributions from wind and forest management activities.

Western Asia records 22 PAs, 12 PoAs, and around 34.7 million tCO_2e/yr, where mixed renewables dominate the market with 5 PoAs contributing nearly 27.1 million tCO_2e/yr. Other notable technologies include oil field gas recovery, solar, and waste-to-energy activities.

Africa: POAs in Africa are primarily concentrated in Eastern Africa and Western Africa. Eastern Africa represents the dominant regional market with 59 PAs, 31 PoAs, and approximately 81.9 million tCO_2e/yr. The region is strongly driven by cleaner cooking activities, which account for 40 PAs, 15 PoAs, and nearly 50.4 million tCO_2e/yr, making it the largest technology category in Africa. Other important technologies include water purification (6 PAs, 6 PoAs; ~15.0 million tCO_2e/yr) and mixed renewables (1 PA, 1 PoA; ~14.0 million tCO_2e/yr).

Similarly, Western Africa records 36 PAs, 9 PoAs, and around 40.4 million tCO_2e/yr, also dominated by cleaner cooking, which contributes 26 PAs, 3 PoAs, and approximately 23.0 million tCO_2e/yr.

Additional significant activities include tree plantation (2 PAs; ~8.3 million tCO_2e/yr), forest management (1 PoA; ~4.4 million tCO_2e/yr), and carbon capture (1 PA; ~3.0 million tCO_2e/yr).

.At the regional level, existing activities most suited to upscaled crediting are those already structured programmatically through PoAs and CPAs, particularly in cleaner cooking, distributed renewables (solar, wind, hydropower, mixed renewables), electric vehicle, and bioenergy. Cleaner cooking dominates in Asia and Africa. Distributed renewable energy also represent a substantial portion of the portfolio in Asia and Africa, complemented by other sub-regions. While many activities are implemented as stand-alone PAs, programmatic approaches have the potential to move towards upscaled crediting providing the enabling conditions described above are in place.

4.2. Design of PACM standards to enable upscaled crediting

This section explores the need to develop PACM standards and tools to also "cover methodological requirements for mitigation actions implemented at larger scales (e.g. PoAs or large-scale crediting programmes" (UNFCCC, 2025, p. 9). It provides an overview of the current status of PACM standards, from the perspective of PoAs and large-scale crediting (policy, jurisdictional, sectoral) and outlines how PACM standards need to be further developed to enable these larger-scale crediting activities. The section also discusses the roles of the SBM and host countries in the development of standards and tools for upscaled crediting, and where CMA decisions could be required. It also considers the extent to which provisions for upscaled crediting could be integrated into existing policy standards or methodologies and where new standards could be required.

Current status and next steps of PACM standards and tools

For programmatic approaches, standards and tools have already been elaborated in great detail under the CDM and non-state crediting programmes. However, these have not yet been comprehensively revised to meet PACM requirements nor fully integrated into PACM standards. **The integration of provisions for programmatic approaches is more pressing than for other upscaled crediting approaches, since many existing activities that have transitioned to the PACM are PoAs which are already under implementation.**

In July 2024, the SBM adopted the first batch of PACM standards and procedures, for activities and validation and verification. There are separate activity standards and activity cycle procedures and validation and verification standards for projects and PoAs, as was the case under the CDM. The activity standard for PoAs has specified eligibility criteria for generic component projects (CPs) and the activity standard lists the necessary elements, including for additionality, baseline setting and avoiding double counting. Large-scale crediting approaches are not covered and likely require the development of new activity standards, validation and verification standards and activity cycle procedures.

The PACM's Methodologies Standard, which was initially adopted in October 2024, applies to project-level and PoAs, but not to other large-scale crediting approaches. Already in November 2023, the SBM noted that it may "at a future point in time undertake consideration of eligibility of other types of activities such as policy, jurisdictional or sectoral programme to incentivize increased ambition and mitigation at a large scale, and improve understanding of policy, jurisdictional or sectoral programme crediting approaches, acknowledging that these approaches are inherently different" (UNFCCC, 2023).

Similarly, the current version of the Article 6.4 Sustainable Development Tool, which was also initially adopted in October 2024, applies to projects and PoAs only. PoA-specific provisions for deviation from elements and criteria of this tool are included in the activity and validation and verification standards for PoAs.

In 2025, the SBM adopted standards for additionality, baseline setting and removals, and for addressing non-permanence and reversals, leakage, and suppressed demand. In contrast to the methodologies standard and SD Tool, these currently apply only to projects, not PoAs. As under the CDM, provisions for PoAs were integrated into the standards and methodologies that applied also at the project level. PACM could follow this approach. The PoA standards developed under the CDM, and private crediting programmes could be adjusted to align with the PACM's methodological requirements. The SBM appears to follow this option. During 2025, the SBM requested the MEP to amend the additionality, baseline and leakage standards to also cover methodological requirements for mitigation actions implemented at larger scales (e.g., PoAs or large-scale crediting programmes). At its 16th meeting in May 2025, the SBM requested an expedited revision of these standards especially to cover methodological requirements for PoAs, noting the significant number of PoAs transitioning to the PACM.

At its 20th meeting in February 2026, the SBM adopted work plans for the SBM and MEP 2026 (UNFCCC 2026), including the development of a concept note for large-scale crediting and revision of existing standards and tools. However, this concept note will initially focus only on programmatic approaches and will later be updated to include other types of upscaled crediting. It decided to finalise the revision of the PoA activity standard and activity cycle procedure only in 2027. **This deferral will delay the expansion of transitioning PoAs and the development of new PoAs, ultimately slowing the implementation of scalable mitigation activities under Article 6.4.** This delay could significantly impact the ability to scale up emission reduction efforts in the near term.

The work agreed at SBM 20 kicked off in the 12th MEP meeting in March 2026. **Due to the large number of PoAs transitioning to the PACM, the work will initially focus on programmatic crediting, with other large-scale crediting approaches to be addressed in the future.**

Key considerations include comparing the CDM and PACM approaches to PoAs, including key similarities and differences, and whether and why PoAs should be specifically mentioned in standards. Under the CDM, PoA-specific provisions are integrated into methodologies rather than the tools for, e.g., additionality. PACM standards and tools that need revisions for PoAs include standards for additionality, baseline setting, leakage, suppressed demand and non-permanence as well as the tools for common practice analysis and investment analysis. The draft standard and guidelines for sampling and surveys for projects and PoAs is also highly relevant for PoAs, and potentially also other large-scale crediting approaches (see Table 6 below).

Table 6: Current PACM standards, methodologies and their coverage of upscaled crediting

Existing PACM Standards, including methodologies	Projects	PoAs	Other large-scale
Article 6.4 activity standard for projects	✓	-	-
Article 6.4 activity standard for programmes of activities	-	✓	-
Article 6.4 validation and verification standard for projects	✓	-	-
Article 6.4 validation and verification standard for programmes of activities	-	✓	-
Transition of CDM activities to the Article 6.4 mechanism	✓	✓	-
Standard: Application of the requirements of Chapter V.B (Methodologies) for the development and assessment of Article 6.4 mechanism methodologies	✓	✓	-
Standard: Addressing leakage in mechanism methodologies	✓	-	-
Standard: Addressing non-permanence and reversals in mechanism methodologies	✓	-	-
Standard: Addressing suppressed demand in mechanism methodologies	✓	-	-
Standard: Demonstration of additionality in mechanism methodologies	✓	-	-
Standard: Setting the baseline in mechanism methodologies	✓	-	-
Standard: Requirements for activities involving removals under the Article 6.4 mechanism	✓	-	-
Methodology: Flaring or use of landfill gas	✓	-	-

In mid-April 2026, the MEP is scheduled to provide input on, inter alia, the concept note on large-scale crediting as well as for the revision of the additionality, baseline setting and leakage standards. A call for public input will also be launched. In its 21st meeting in May 2026, the SMB plans to consider a standard and guidelines for sampling and surveys for projects and PoAs. In the following meeting

in July 2026, the SBM is scheduled to consider the concept note for large-scale crediting, as well as revised standards for additionality and baseline setting and the tool for common practice analysis.

Key aspects to be considered for integrating upscaled crediting into PACM

Eligibility criteria have to be defined for policy, jurisdictional and sectoral crediting, based on generic ability to assess additionality of the approach and robustly monitor, report and verify its outcomes. This should be based on a full coverage of programmatic approaches by PACM. Combinations of PoAs with dedicated policy instruments, access to finance and predictable ITMO demand are the key short term opportunity for upscaling.

For "pure" policy crediting, practitioners have diverging views. The Gold Standard (Gold Standard, 2025b) wants to limit eligibility to policies that directly affect specific activities and exclude policies with "diffuse outcome" such as carbon pricing, whereas Michaelowa et al. (2025) see exactly the latter policies as more appropriate for policy crediting than the former. The discrepancy between the estimated volume of mitigation outcomes and the actually credited volume under TCAF in the first concrete transaction of the pilot activity in Uzbekistan, in which modelling is used to specify the baseline, shows the degree of uncertainty in the modelling approach (see section 2.2). For jurisdictional crediting, eligibility should require proof that the government engages in policies that have not been undertaken to date; ART TREES has generated a lot of controversy regarding its broad approach to determining additionality and the static historical average baseline in the HF-LD baseline setting. Eligibility for sectoral crediting should be based on the ability of the institution governing the sectoral crediting approach to ensure robust MRV of the sector across countries.

With regard to additionality, the approach for PoAs should mirror that of the CDM where additionality was to be demonstrated at the CPA level building on conditions in the PoA-DD that would systematically demonstrate the additionality of the CPAs as part of the eligibility criteria for inclusion of CPAs in the PoA. For policy crediting, additionality testing would have to become highly specific. As suggested by Michaelowa et al. (2025), a minimum carbon price at a threshold appropriate for the level of economic development of the host country should determine the additionality of a carbon pricing policy. For policies other than carbon pricing, additionality would have to be determined both on the level of the policy – is the incentive from the sale of emission credits needed to enable policy implementation - and the level of the activities to be triggered by the policy

With regard to baseline setting, all new concepts of the PACM RMP such as initial and continuous downward adjustment need to apply to all approaches of upscaled crediting. Baselines for policies as well as jurisdictional approaches would have to apply modelling. Robust and transparent modelling accepted by all relevant stakeholders is a precondition for progress for upscaled crediting. A work programme involving key modelling institutions, such as those involved in joint

modelling exercises for IPCC reports, could to be set up to develop an appropriate evidence base, in case such approaches would be integrated into PACM standards. Sectoral crediting would most likely be based on a benchmarking approach and baseline setting for sectoral crediting therefore should build on the requirements for benchmarking specified in the baseline standard. Provisions for standardized baselines would be most relevant for PoAs given that baselines for the other approaches (sectoral, jurisdictional) would by nature be standardized.

MRV requirements for PoAs should mirror those for projects, with specific considerations on sampling. **Sampling requirements have been refined over time, and not been contentious, so could be directly transitioned to the PACM.**

Addressing non-permanence is not conceptually different for upscaled crediting and projects. While administrators of jurisdictional crediting approaches for avoided deforestation (ART TREES) argue that there is a lower probability of reversals on the jurisdictional level than at the level of projects, there is no robust evidence for that, at least in the context of unavoidable reversals (see Veen et al., 2026). Obviously, the relative share of reversals compared to the total mitigation will be lower for a jurisdiction than for a project given that a geographically large jurisdiction will only partially be exposed to an event triggering a full reversal for a project covering a small area The responsibility of government institutions to address reversal risks will be higher for jurisdictional approaches compared to project-based ones, so principally the coverage of risk should be more robust as government institutions are likely to exist for longer periods than private sector institutions and therefore have a higher in-built ability to monitor for long periods.

4.3. Role of different actors in governance and infrastructure provision for upscaled crediting

Besides the SBM, upscaled crediting approaches beyond PoAs require a strong role for host country governments. This makes prior consideration and authorization easier as the government entity will typically control the process of setting up a policy or a jurisdictional approach and own the credits and thus not need to collect fees. Also benefit-sharing and the provision of sustainable development co-benefits will be simplified. However, weak governance would lead to failure of the upscaled crediting - if the host country fails to translate credit sales revenue into effective incentives/obligations for action on the ground, the crediting approach could remain an empty shell with no mitigation achieved, creating accounting issues of authorisation for ITMO transfers has been provided.

For sectoral crediting, the governance abilities of global sector organisations will be critical. Only if the organisations are able to incentivize emissions reductions of their members, the approach will yield credits. Given that any “free rider” increasing emissions in the sector will reduce the volume of credits generated, the ability of the sectoral organization to “rein in” on free riders will be critical.

However, governments also have the authority to design and deploy policy instruments and regulatory reforms as well as financial incentives (e.g. lower taxes, import duties or rebates) that can be linked with upscaled crediting approaches, including programmatic ones.

5. Case studies on how innovative activity types can benefit from upscaled crediting

This section explores how activity types that are not yet widely covered under the project-based approach could benefit from upscaled crediting. We develop five case studies for the following technologies and activity types:

1. **Electric cooking in low-income countries**
2. **Electric mobility**
3. **Methane reduction in waste management**
4. **Carbon dioxide removals in Europe and emerging economies**
5. **REDD+**

Each case study below covers: existing experience, methodological approaches, complementary policy instruments, access to finance, NDC alignment and demand outlook.

5.1. Electric cooking in low-income countries

Approximately one-third of the global population continues to rely on rudimentary cooking methods with significant climate, health, and socio-economic costs (IEA, 2023a), which makes clean cooking in general highly relevant for low-income countries. Electric cooking (e-cooking) replaces traditional biomass and fossil fuel cooking (e.g., three-stone fires, charcoal, kerosene) with electricity-based devices such as induction stoves or electric pressure cookers. **Due to its high replicability, homogenous emission reduction logic, and direct link to household energy use, electric cooking is particularly well suited for upscaled crediting approaches under the PACM.** E-cooking delivers a stronger transformational impact as it completely eliminates the use of biomass compared to the incremental improvement of efficiency of biomass-based cooking. However, a pre-condition is that the electricity use for cooking is clean. In fossil-fuel-intensive grid systems, switching to e-cooking may deliver only limited net GHG reductions although this may improve if decarbonizing the power sector is successful. Additionally, intermittent supply and high connection costs remain binding constraints in many low-income settings, limiting e-cooking viability even where grid electricity is available.

This type of activity lends itself to PoA approaches, simplified inclusion of participants, and reduced transaction costs, which are widely recognized as prerequisites for scaling mitigation in sectors characterized by small, dispersed emission sources.

Existing experience with programmatic approaches and methodologies

Clean cooking has been widely applied both under the CDM and private carbon market programmes, primarily through small-scale methodologies aggregated under PoAs:

- **AMS-I.E** (switch from non-renewable biomass), covering fuel switching to cleaner alternatives such as renewable biomass or renewable-based electric cooking;
  AMS-II.G (energy efficiency in thermal applications of non-renewable biomass), used for improved biomass cookstoves

Despite the strong presence of clean cooking in the CDM and availability of AMS I.E to support it, there was not a single e-cooking activity in the CDM. This reflects the early-stage development of e-cooking technology during peak CDM activity, resulting high appliance costs at the time, weak electricity infrastructure in target markets, and the absence of a dedicated e-cooking methodology as well as government support, all of which effectively precluded e-cooking from the CDM pipeline. Instead, the dominant clean cooking activity type was biomass efficiency (34 PAs and 71 PoAs), with a limited share of fuel switch to sustainable biomass (9 PoAs) (UNEP-CCC, 2025).

Methodological reliance on default parameters, particularly the fraction of non-renewable biomass (fNRB), wood-charcoal conversion and survey-based cookstove usage rates has been a focus of controversy due to concerns about over-crediting. This led to reticence among governments to issue authorization letters as they felt that the activity developers structurally overestimated the key parameters.

The CDM Executive Board has recently updated regional and national fNRB default values that are much lower than previous ones, and made the use of updated values mandatory during the transition to PACM (UNFCCC, 2025d). Subsequently, A6.4SBM17 clarified that additional documentation during transition should include the re-evaluation of fNRB values and leakage factors, resulting in a substantial reduction of future carbon credit yields. For example, the regional fNRB default for sub-Saharan Africa is set at 40%, while Kenya's national value is 29%. In stark contrast, the KOKO project implemented in Kenya applied an fNRB rate of 93%, meaning this single metric alone over credited the project by more than 2.4 times, reducing the claimed 15 million carbon credits to less than half (Lang, 2026).

A clean cookstove methodology "Comprehensive Lowered Emissions Assessment and Reporting (CLEAR)", covering e-cooking, has already been submitted to the SBM with the objective to address over crediting concerns by the Clean Cooking Alliance (2025). Both the CLEAR methodology and updated CDM fNRB values rely on the MoFuSS model, which is managed by National Autonomous University of Mexico (UNAM) and the Stockholm Environment Institute (SEI). Under CLEAR, fNRBs can be determined by using national/subnational MoFuSS default values, the MoFuSS-Default Scenarios (DS) interface for customized areas, or by running the model with validated inputs for

marginal fNRB. It should be noted that CLEAR applies a less conservative wood to charcoal conversion rate than the CDM methodologies.

Due to higher costs and other non-monetary barriers, the additionality of clean cooking, especially fuel switch such as e-cooking and sustainable biomass, has generally not been critiqued by CDM review panels or independent academic reviewers, given that upfront appliance costs alone are typically sufficient to establish financial additionality in low-income country contexts.

Policy instruments to enable upscaled crediting

Clean cooking consistently lags behind electrification across most countries, with policies supporting electricity access generally being stronger and better funded than those targeting clean cooking (ESMAP, 2022). Cost analyses show that affordability remains the dominant barrier to e-cooking adoption, requiring targeted subsidies, tariff reform, and dedicated financing mechanisms (ESMAP, 2020). In Nepal, for example, electric cooking adoption has been supported through government subsidy schemes, preferential electricity tariffs, and coordinated appliance distribution programmes (Malla, Timilsina and Heger, 2025). More broadly, the range of policy instruments relevant to upscaled crediting in electric cooking includes:

- Electricity tariff reform (e.g., time-of-use or cooking-specific tariffs)
- Appliance subsidies or VAT exemptions
- Appliance standards and certification schemes (Minimum Energy Performance Standards, MEPS)

In addition, further complementary measures that have been applied include:

- National clean cooking strategies
- Public awareness campaigns
- Integration with electrification and grid expansion plans

International agencies underline that transforming the clean cooking landscape requires the establishment of clear policies and robust regulatory frameworks as foundational elements for attracting and driving investment (IEA, 2023a). **As a result, there is significant potential to combine programmatic carbon market approaches to promote clean cooking with the policy instruments and interventions mentioned above to enhance established carbon market approaches towards upscaled crediting approaches.**

A further analogy can be drawn to India's Pradhan Mantri Ujjwala Yojana (PMUY), which provided over 100 million subsidized LPG connections to low-income households (PIB, 2025). While PMUY focused on LPG rather than electricity, it demonstrates how coordinated, large-scale public

programmes can unlock rapid transitions. Similar policy-led approaches could be applied to electric cooking, with carbon revenues incentivizing implementation at scale.

Access to finance

Electric cooking programmes involve significant upfront investment in appliances, distribution systems, and enabling electricity infrastructure. In low-income settings, these costs cannot be fully recovered through end-user payments. The International Energy Agency estimates that achieving universal access to clean cooking by 2030 requires around USD 8 billion per year in investment globally (IEA, 2023a), and around USD 23 billion each year for electricity until 2035 (IEA, 2025a).

Experience with results-based financing (RBF) demonstrates that **blending concessional public finance with performance-based carbon revenues can play a catalytic role** (Energy Sector Management Assistance Program, 2020). Carbon credit revenues under an upscaled crediting framework can provide a performance-based revenue stream that strengthens financial viability by complementing core public funding.

Yet, public finance is limited, and carbon revenues are results-based and therefore often are not able to mobilize upfront finance needed for capex investments. To overcome such gaps, international financial institutions have recently begun floating innovative outcome-linked bonds to support clean cooking carbon market activities, for example, the World Bank's USD 200 million Clean Cooking Outcome Bond, issued in December 2025, which channels capital to UpEnergy projects in Ghana with investor returns linked to carbon credits generated from clean cooking technologies (World Bank, 2025). **Such blended finance approaches seem highly promising and could be tailored to e-cooking to improve the enabling conditions for upscaling**.

More established blended finance structures may include concessional credit lines for appliance distributors, PAYGO consumer finance models, and forward carbon purchase agreements that reduce revenue uncertainty. **For upscaled crediting under PACM, structured access to upfront finance beyond individual emission reduction purchase agreements (ERPAs) will be critical to achieving transformational scale.** The World Bank's Ci-Dev is ideally suited to explore such approaches in practice, as it has established a portfolio of clean cooking PoAs in large countries with relatively clean electricity grids such as Ethiopia, Kenya, Rwanda and Uganda. Expanding these PoAs after having completed the transition to PACM and tapping into their upscaling potential by combining programmes with policy instruments and finance mentioned above.

NDC alignment

Clean cooking is already a priority measure in many NDCs, including in the Eastern African countries mentioned above. Electric cooking interventions are typically embedded within national electrification strategies, clean cooking roadmaps, and broader energy access policies. Moreover,

the strong uptake of clean cooking in the CDM and non-state crediting programmes has generated carbon market experience in many countries.

Under Article 6, credited mitigation must exceed the host country's unconditional NDC and be reflected in national GHG inventories. Electric cooking offers advantages in this regard: E-cooking typically uses metering devices which offer transparency and reduced transactions costs through digital MRV (dMRV). Electricity consumption data can be aligned with national grid emission factors, and mitigation impacts can be integrated into national reporting frameworks under PA Article 13.

However, careful baseline design is essential. In fossil-intensive grid systems, electrification could yield lower mitigation benefits than assumed. Conversely, in low-carbon power systems such as hydropower-dominated countries, electric cooking can contribute meaningfully to both mitigation and energy security objectives (Malla, Timilsina and Heger, 2025). **Anchoring crediting activities explicitly within national clean cooking targets, electrification and energy transition plans reduces fragmentation risks and strengthens coherence with host country climate strategies.**

The collapse of KOKO Networks in Kenya described above highlights the risks of over-crediting for Nationally Determined Contributions (NDCs). Kenya's National Environment Management Authority (NEMA) had explicitly asked KOKO to use a more accurate fNRB and base its calculations on actual bioethanol sold, but KOKO refused (Lang, 2026). Independent ratings agency BeZero gave KOKO's credits a "B" overall grade, indicating a low likelihood of achieving one tonne of CO_2 avoided, and a "D" sub-grade specifically for carbon accounting, the lowest rating possible. The Kenyan government subsequently declined to issue the Letter of Authorisation (LoA), and KOKO entered administration, though no formal government statement has been made on the specific grounds for refusal.

Demand considerations

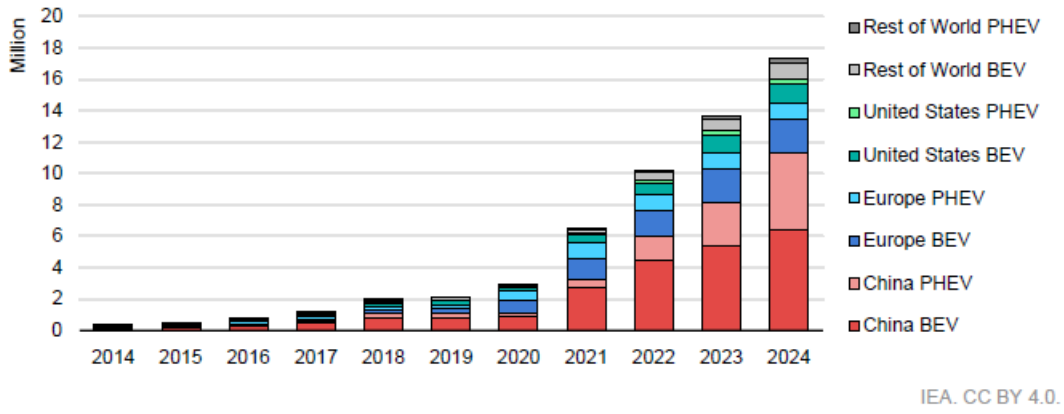
credits currently find demand primarily in voluntary carbon markets, where corporate buyers value strong sustainable development co-benefits, including health improvements, gender equity, and reduced deforestation pressure. However, demand remains price-sensitive and highly influenced by integrity debates, particularly around biomass baseline assumptions. Controversies around overcrediting have persisted, exemplified by the KOKO case. While methodological improvements have the potential to rectify this situation, e-cooking as a novel technology that has not penetrated markets widely can legitimately be considered a high-hanging fruit, with prices for e-cooking reportedly substantially higher than established clean cooking credits from biomass efficiency interventions. Unlike carbon dioxide removal markets, there is no clearly differentiated compliance buyer segment specifically targeting electric cooking credits. However, KLIK and other Art.6.2 buyers have already established offtake agreements for e-cooking. The scalability of

upscaled crediting approaches in this sector will therefore depend on business models, sustained demand confidence, methodological robustness under Article 6.

5.2. Electric mobility

Electric mobility (e-mobility) is an increasingly relevant mitigation measure that relies on the substitution of traditional internal combustion engines (ICE) utilizing mainly gasoline, diesel or CNG, with electric vehicles. The benefits of this activity type are manyfold: e-vehicles reduce GHG emissions per km driven, as well as other local pollutants such as NOx or particulate matter (PM) that have a heavy negative impact on public health, reduce the cost and forex burden of fuel imports for countries that do not have domestic fossil fuels and refineries (such as Kenya and many other African countries); can rely on clean grid electricity which is already the case in many African countries. This trend is expected to continue as the transition towards renewable energy advances. For instance, 91% of the total electricity generation in Kenya in 2024 came from renewable sources (geothermal, hydro, wind, solar and biofuels) (IEA, no date). In Ethiopia in 2023, almost 100% of the electricity generated came from hydropower and wind (IEA, 2023b). Increasing the share of renewable energy generation further reduces the emissions associated charging EVs. This activity type is relevant in virtually any geography: ICE vehicles are widespread in every country and the transition to e-vehicles is underway with different degrees of implementation. Figures 4 and 5 show the increase in e-vehicles at global level for both electric cars and electric two-wheelers (IEA, 2025). Electric cars at the end of 2024, had reached almost 58 million, about 4%, of the global fleet (sales of electric cars reached 25% of the total); electric 2 and 3 wheelers reached 9% of the global fleet (new sales reached around 15%) in 2024 (IEA, 2025). As shown below, the degree of uptake of the electric vehicles varies in the different countries, with China increasingly dominating the market.

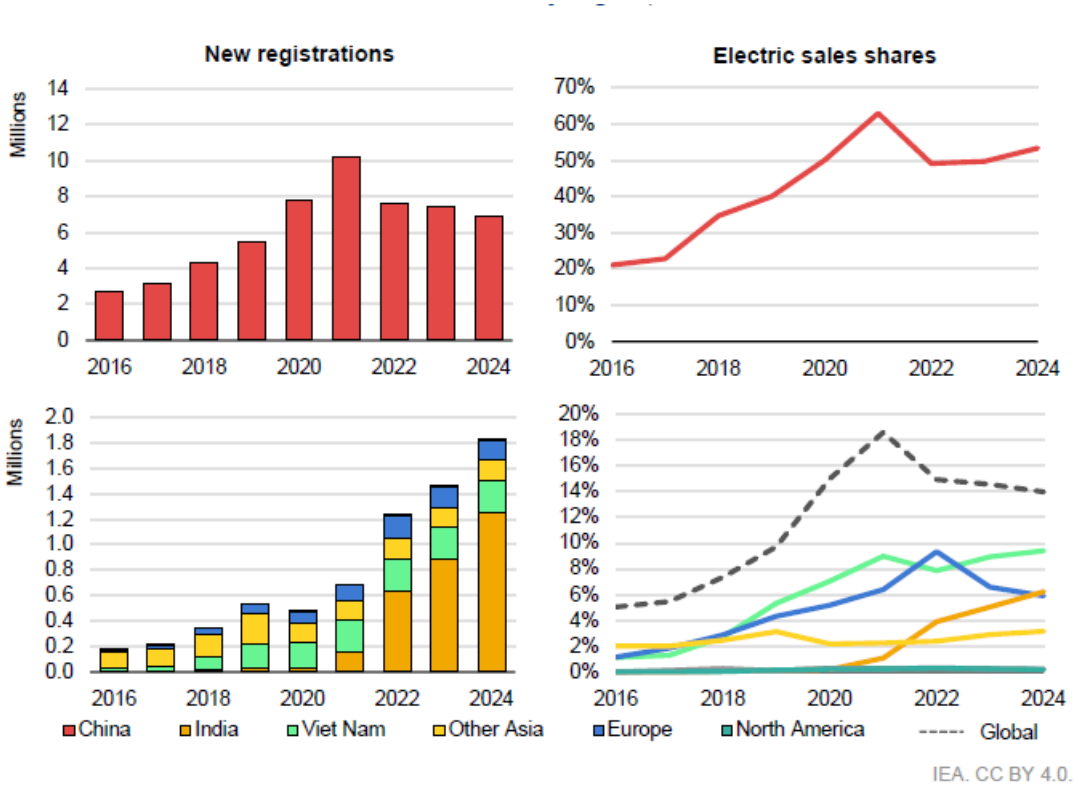
Figure 4: Global electric car sales, 2014-2024



Notes: BEV = battery electric vehicle; PHEV = plug-in hybrid vehicle. Includes new passenger cars only.
Sources: IEA analysis based on country submissions and data from the European Automobile Manufacturers Association (ACEA), European Alternative Fuels Observatory (EAFO), EV Volumes and Marklines.

Source: IEA, 2025

Figure 5: Electric two-wheeler sales and sales share by region, 2016-2024



Notes: "Other Asia" includes Afghanistan, Bangladesh, Brunei, Cambodia, Lao People's Democratic Republic, Myanmar, Mongolia, Nepal, Pakistan, Singapore, Sri Lanka and Chinese Taipei. "Two-wheeler" refers to vehicles with a top speed of at least 25 km/hr and which fit the L1 and L3 classes defined by UNECE.
Sources: IEA analysis based on country submissions and data from MotorcyclesData.com and AutocarPro.in.

Source: IEA, 2025

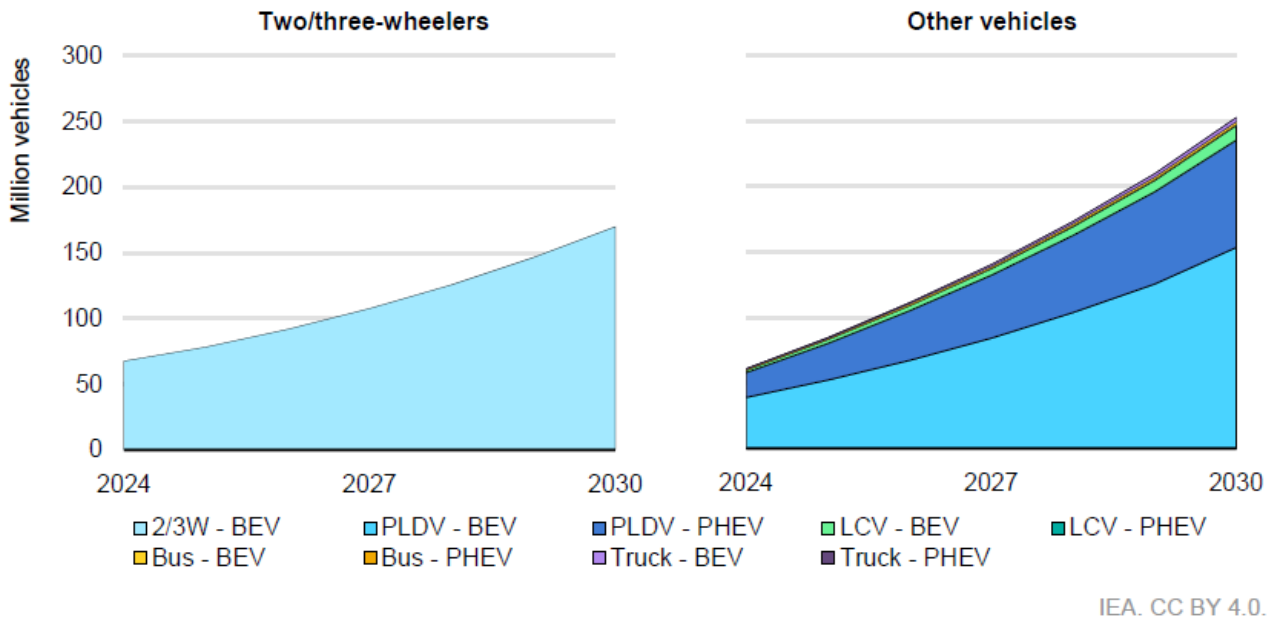
E-mobility covers all types of vehicles: 2 and 3 wheelers, cars, trucks, buses, mobile machinery[6]. In many developing countries in Asia and in Africa, small vehicles (2-3 wheelers) are common and a source of income e.g. through the delivery of taxi services for passengers and goods. Such business models can accelerate the dissemination of GHG emitting vehicles and reduce the need for private ownership of vehicles. Asia dominates with 80% of global motorbikes, but sub-Saharan Africa is also witnessing a steep increase in numbers (Pochet and Lesteven, 2025). In Kenya, for instance, 67% of all new vehicle registrations were motorcycles over the period 2017–2022 (Mwangi *et al.*, 2025). On the other hand, many developing countries see slower advancements for passenger cars and other light-duty vehicles, which are more common in high income regions such as Europe or the US.

[6] Rails and bicycles are not considered here due to the different nature of the mitigation impacts mainly due to the modal shift, instead of fuel switch/efficiency.

Generally, e-vehicles have a lower operating cost compared to ICE vehicles, at least if electricity costs are lower than for gasoline and diesel. However, in many countries the initial investment is higher for EVs than for ICE and high capital costs can widen viability gaps even though these are declining depending on country circumstances and vehicle type. India, China and South-East Asia lead the market for 2/3 wheelers, with 80% of global sales in 2024 (IEA, 2025). Moreover, the technology is still new and sometimes perceived as risky by users (range anxiety). Other barriers are represented by the limited charging infrastructure, lack of professionals for the maintenance and repairs of e-vehicles. These elements slowed down the uptake of e-vehicles, although the broader market trends towards EVs and resulting technological advances may help overcome such barriers.

E-vehicles sales are increasing, and some forecasts show that 2/3 wheelers would reach approx. 170 units in 2030, while cars would reach approx. 250 million (90 % of them are cars), as shown in Figure 6. The trend in the sales of e-vehicles indicates an increasing mitigation potential, with progressively less ICE vehicles circulating.

Figure 6: Electric vehicle stock by mode 2024-2030[7]



Notes: 2/3W = two/three-wheeler; PLDV = passenger light-duty vehicle; LCV = light commercial vehicle; BEV = battery electric vehicle; PHEV = plug-in hybrid electric vehicle. There are no plug-in hybrid electric two/three-wheelers.

Source: IEA, 2025

[7] The outlook is based on the Stated Policy Scenario, i.e. IEA takes into account relevant existing and planned policies for e-mobility (IEA, 2025b)

An upscaled approach is well suited for e-mobility: many vehicles are required to achieve significant mitigation (i.e. the emission reductions achievable by a single e-vehicle are rather limited, e.g. between 1-3 tCO_2e/year for two wheelers, up to 60-70 tCO_2e/year for e-buses, from 80 tCO_2e/year for trucks[8]). In addition, the deployment of the e-vehicles is likely to occur over several years and is likely to be complemented by regulatory and financial incentives.

Existing experience with PACM programmatic approach & methodology

CDM: Two methodologies have been developed to promote e-mobility under the CDM:

- AMS-III.C. Emission reductions by electric and hybrid vehicles
- AMS-III.S. Introduction of low-emission vehicles/technologies to commercial vehicle fleets

Transport has been historically underrepresented in the carbon markets: under the CDM a total of only 35 activities (six of which are PoAs) have been registered. However, the majority of the activities focuses on bus rapid transit and modal shift. Only four e-mobility projects supporting 2-wheelers in India achieved registration in 2012 but did not reach issuance and are not requesting transition to the PACM. The limited representation of e-mobility under the CDM can be explained by the early stage of technology development at the time of strong CDM demand (late 2000s/early 2010s), resulting in prohibitive technical limitations (e.g. battery capacity), high costs and low consumer acceptance.

VCM: When looking at the voluntary carbon market, the picture looks different: 30 activities have been registered under Verra/Verified Carbon Standard (27 activities) and the Gold Standard (3 activities). They all use either AMS-III.C., AMS-III.S. and the VCS methodology VM0038 (which is based on AMS-III.C.). Gold Standard has one methodology: Two and three wheeled personal transportation that covers specific EVs. Advancements in the technology (range, charge time) and the engagement of the main global manufacturers of vehicles can explain this stronger performance during regulatory uncertainty on the future of CDM/PACM.

PACM: Currently, there is no PACM methodology for EVs**. Even though existing methodologies will eventually be updated, the timeline is unclear as methodologies for EVs are not yet prioritized and included in the MEP workplan** until the end of 2026 (UNFCCC, 2026c), despite the future relevance of electric mobility for the transport sector. This prevents new activities entering the PACM activity cycle in the short term, despite 33 e-mobility activities have formally submitted their prior consideration notification under PACM. All of these are programmatic, located mainly in

[8] Mitigation estimates vary depending on distance driven, fuel efficiency of the baseline vehicles, fuel used in the baseline, carbon intensity of the electricity used for charging the e-vehicles.

Africa (14 activities) and Asia (13 activities) and two programmes targeting multiple regions (UNEP CCC 2026).

Article 6.2: Electric mobility has already been featured prominently in bilateral Article 6.2 cooperation, including agreements between Switzerland, Sweden and Korea and their partners. There are 8 activities in the Art.6.2 pipeline[9], with 3 activities located in Africa, 3 in South America and 2 in Asia expected annual mitigation potential is only indicated for one activity, i.e. 60.000 tCO_2e, and one activity expected to reduce 19,000 tCO_2e (UNEP-CCC, 2026).

This clearly indicates a stronger role of EVs in PACM and Article 6.2 compared to CDM/VCM and suggests that **updating Art.6.4 methodologies that are suitable for upscaled crediting through programmatic approaches should gain higher priority,** including through bottom-up methodology development that builds on CDM and VCM methodologies. These updated methodologies should **pay close attention to additionality, since EVs are increasingly competitive, but still face barriers depending on vehicle type and country circumstances.**

Policy instruments to enable upscaled crediting

The main policy instruments used globally focus on reducing the cost of e-vehicles to become competitive with ICE. The most commonly policy instruments include tax rebates, duty excises, and also other incentives such as exemption from registration fees. The EU has recently revised the decision to ban completely new ICE sales from 2035, requiring now to achieve 90% tailpipe emission reductions from the same year onwards, leaving a role for hybrid and ICE vehicles also in beyond 2035 (European Commission, 2025). While certain supporting policies and public expenditure are being phased out (see Figure 7), national governments still need to support e-mobility, for instance with the development of standard for interoperability of the charging infrastructure; facilitate and standardize procedures to connect to the grid. These policies are effective in supporting e-mobility, with some countries beginning to consider their phase out, such as Germany or France (IEA, 2025). Kenya and Ethiopia provide some instructive experiences for how policy instruments can shape the uptake of EVs in PACM host countries.

Ethiopia has achieved rapid EV uptake by introducing a very ambitious policy to ban imports of ICE cars, complemented by a national e-mobility strategy. These are fully reflected in the updated NDC 3.0 with a target to reduce GHG emissions by approx. 70% by 2035, of which around 40% would be achieved with domestic (unconditional) contributions (UNFCCC, 2025a). The ban is triggering e-vehicles dissemination (IEA, 2025) with some estimates indicating 100,000 electric vehicles introduced by 2024 and 200 charging station operational ((UNFCCC, 2025a)). Ethiopia is

[9] A ninth activity focuses on e-bicycles and thus not considered for the purpose of this report

also deploying other instruments such as reducing import duties for EVs while increasing those for fossil-fuel based vehicles which effectively leads to a form of carbon pricing based on the emissions intensity of the vehicles. Moreover, electricity is cheap and clean, which his ideal for delivering mitigation outcomes through EVs. Ethio telecom has been engaged in integrated EV charging stations with mobile phone infrastructure. This has led to a rapid acceleration of new EV registrations which have now far surpassed those of ICE vehicles in the country (IEA, 2025).

Kenya pioneers electric mobility policies and financial incentives. Kenya has strengthened its mitigation commitments in the latest NDC aiming at reducing emissions by 35% by 2035 (or approx. 75 million tCO_2e) of which 20% will be achieved through unconditional contributions and the remaining 80% through conditional contributions including participation in carbon markets. Transport electrification is indicated as one priority measure. Kenya has recently unveiled its new e-mobility policy and the following financial incentives have been included (Ministry of Roads and Transport, 2026) :

- Zero-rating of VAT on electric buses, electric bicycles, electric motorcycles and lithium-ion batteries; and
- Reduction of excise duty to zero per cent on electric bicycles, electric motorcycles and lithium-ion batteries.

Kenya also reports that cumulatively almost 40,000 EVs have been registered in the country. This represents a significant leap from almost 1,400 EVs in 2022. Overall, in Africa sales of 2 wheelers increased by 40% year-on-year basis, reaching 9,000 units (IEA, 2025).

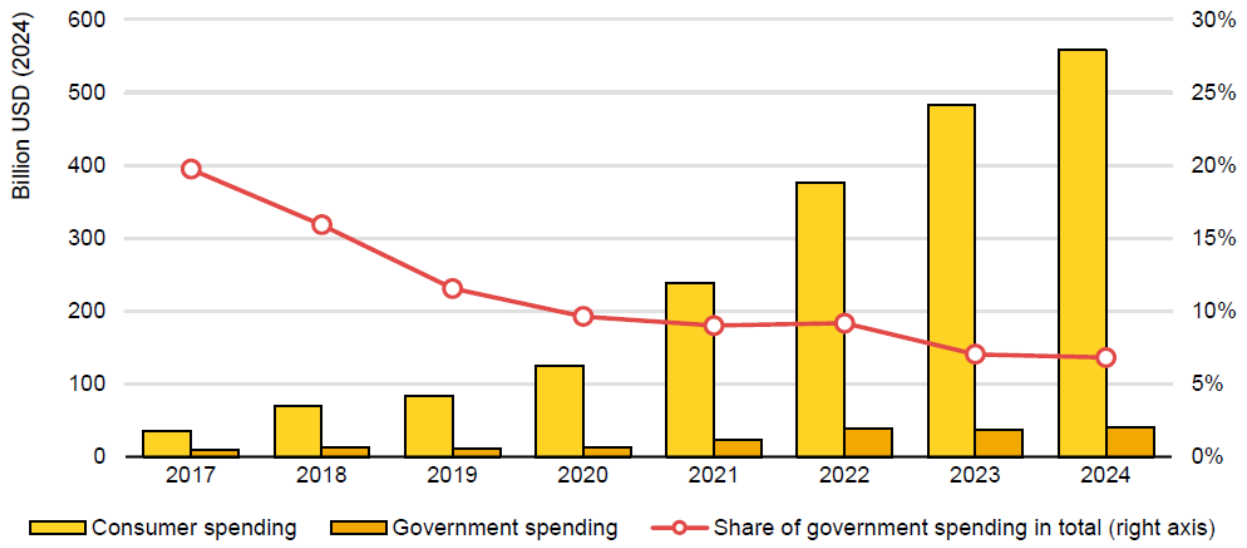
Other policy instruments could be deployed to incentivize the use of EVs, such as preferential tariffs for EV charging or subsidies for charging infrastructure; limiting access to specific (urban) areas for ICE vehicles; as well as phasing out subsidies for fossil fuels. Another business model element that contributes to the uptake to e-vehicles is the concept of battery-as-a-service. Customers benefit from a reduced initial cost, as the battery is not purchased but rented and exchanged in dedicated swapping stations. The capex differential between ICE and electric vehicles is reducing, and in some cases prices have already reached parity, which indicates that EVs are becoming economically more attractive in several jurisdictions due to the lower operational (fuel and maintenance) costs. Still, capex costs and non-monetary barriers can prevent e-mobility uptake, including limited expertise for maintenance, software licensing, availability of spare parts and limited charging infrastructure.

Access to finance

Kenyan e-mobility entrepreneurs have been very active in the past years, with several original equipment manufacturers (OEM) expanding their production facilities and being able to expand

also the charging infrastructure, as well as testing different business models, such as battery swapping. In some cases, the OEM are also developing their own carbon programmes currently in the crediting standards pipelines. The main e-vehicle types are 2-3 wheelers although a programme for e-buses has been registered by Gold Standard. Several financing companies are active in the country and provide significant financial resources to the OEMs, enabling a slow but steady expansion until numbers increased more significantly in the last 2-3 years. Financing providers and OEMs are also testing innovative payment systems and providing flexible alternatives especially for those drivers that generate their income from EVs and may be at risk of defaulting. In the past years e-mobility development has been possible mainly through public support in the form of cost rebates or tax reductions/exemptions. However, the trend is shifting now, as the overall expenditure from government has been declining in the last few years. At the same time, private investment are growing significantly (see Figure 7).

Figure 7: Global consumer and government spending on electric cars, 2017-2024



Source: IEA. 2025

As the market for e-mobility matures, the phasing out of government subsidies is a reasonable development in light of lowering costs and increasing private investments. While initial barriers may still have to be removed by government action, especially in the early stages of market penetration, private capital is seeking to accelerate market expansion. While the above-mentioned policies provided support to EV dissemination, it is not easy to single out their impact on actual EV sales. Several elements may affect the decision-making of consumers: fuel prices vary for reasons not related to the policy (e.g. sudden fuel price spikes due to international developments); increase in tariffs imposed; potential interactions with other policies not directly targeting e-mobility (e.g. a carbon tax on fossil fuel imports); the price of electricity; variations in the cost of EVs and ICE vehicles not related to a policy (e.g. battery costs are constantly declining); development of domestic

production capacity to reduce costs; availability of charging/swapping stations, etc. **Thus, a clear and transparent attribution of the mitigation impacts to a specific policy requires a careful consideration of additionality that takes into account recent economic, technical and regulatory developments in a quickly changing market**. A more ambitious policy such as a complete ban (potentially supported by other policy measures to speed up uptake) like in Ethiopia may face less challenges in the attribution of the mitigation measures and can prove very effective. However, political and economic implications of such a ban as well as technical issues (e.g. availability of charging infrastructure, spare parts need to be considered (IEA, 2025). As a result, a programmatic approach based on appropriate methodologies (especially additionality testing) and combined with conducive policies and access to finance seems to be best suited for upscaling crediting in support of e-mobility. Such an approach has been demonstrated by GGGI's CFIP programme in Zambia (see section 2.2).

NDC alignment

The increasingly prominent role of e-mobility led to comprehensive integration into NDCs. For instance, the second Kenyan NDC (MECCF, 2025) mentions transport as a priority sector for mitigation and specifically, and specifically transport electrification. Both countries seek participation in the carbon market to contribute to NDC implementation, which indicates that upscaled crediting under the PACM could play a relevant role to support transport electrification.

While e-mobility can deliver mitigation outcomes, it has also other benefits that contribute to a high interest from host countries: it contributes to reducing imports of fossil fuels with volatile costs, and associated needs to spend scarce foreign currency which in turn cannot be used for investing into renewable energy and other mitigation actions. It can contribute to improve the livelihood of low-income groups when EVs (2-3 wheelers, taxis, public transport) are widely used to generate income from transport services. Expanding the domestic production capacity of e-vehicles can contribute to creating more jobs through green industrialization.

Sector coupling such as electrifying transport requires expanding renewable energy generation as well as grid-strengthening. Countries like Kenya with its high share of renewable energy generation are well-placed but require further investments into large-scale infrastructure. The policy direction is clear, as Kenya has a target of reaching 100% renewables by 2035 (MECCF, 2025). Beside inclusion in the priority sectors under the NDC, Kenya has also issued a new e-mobility policy targeting specifically EV dissemination and related charging infrastructure. However, **reaching these targets requires long term, predictable infrastructure financing which upscaled crediting can only deliver if integrated into long term transaction partnerships, embedded into blended financing arrangements.** This means in particular that access to finance for purchasing EVs is made available, which can often build on existing financing models for ICE vehicles, which is well-established in many local banks. Potentially, carbon credit revenues could be integrated into loan repayment

schedules. Moreover, expanding charging infrastructure would benefit from public-private partnerships and aggregating demand at predictable prices.

5.3. Waste management to avoid methane emissions

Waste management interventions suitable for upscaled crediting include source separation of organic waste, composting and anaerobic digestion, sanitary landfill upgrades, landfill gas capture and flaring or use, and methane capture from wastewater and sludge treatment systems. This sector is well suited to upscaled crediting because emissions arise from many small and dispersed waste generators but can be addressed through municipal systems, landfill operators, and regional treatment facilities. The climate relevance is high: the waste sector accounts for about **20 per cent of anthropogenic methane emissions**, and global municipal solid waste (MSW) generation is estimated at 2.1 billion tonnes in 2020 and could rise to 3.8 billion tonnes by 2050 without urgent action (UNEP, 2024).

MSW disposal in landfills is a particularly important source of methane, a GHG with a global warming potential significantly higher than carbon dioxide over short time horizons. Landfills alone contribute around **11% of global anthropogenic methane emissions**, highlighting the climate relevance of waste management interventions (US EPA, 2026). Solid waste disposal and wastewater treatment therefore represent important mitigation sources in many developing countries where waste infrastructure remains underdeveloped (Kaza *et al.*, 2018).

Existing experience with programmatic approaches and methodologies

Waste management activities have a long history within international carbon markets, particularly under the CDM. Many early CDM projects focused on capturing methane from landfill gas systems and either flaring it or using it for electricity generation.

Under the CDM, the most relevant methodologies were **ACM0001** for flaring or use of landfill gas, **AMS-III.G** for landfill methane recovery, and **TOOL04** for emissions from solid waste disposal sites. For waste diversion and treatment, **ACM0022, AMS-III.E,** and **AMS-III.F** have been used for alternatives such as composting and anaerobic digestion that prevent organics from reaching disposal sites.

One of the largest and most successful methane avoidance projects under the CDM is the *Lages Methane Avoidance Project* (0268), which has issued a total of **2,514,403 tCO_2e in carbon credits**. This project, implemented in Lages, State of Santa Catarina, Brazil, focuses on preventing methane emissions from waste wood biomass by converting it into energy, making it one of the largest-scale waste management initiatives under the CDM (UNFCCC, 2016).

Despite the waste sector's long presence in international carbon markets, CDM experience with programmatic approaches remained extremely limited. Landfill gas crediting under the CDM was dominated by large-scale individual projects (Table 7) rather than by Programmes of Activities. The five highest-issuing landfill project activities collectively generated over 39.8 million CERs, led by Brazil's Caieiras project with nearly 10 million CERs, a clear indication that large-scale crediting activities concentrated in well-capitalised, standalone infrastructure projects in middle-income countries (UNEP-CCC, 2025).

Table 7: Top 5 Landfill CDM Projects (PA) with more CERs issued

#	CDM Ref	Project Title	Country	Total CERs Issued
1	#171	Caieiras Landfill Gas Emission Reduction	Brazil	9,840,724
2	#941	Sudokwon Landfill Gas Electricity Generation (50MW)	South Korea	8,821,017
3	#822	Loma Los Colorados Landfill Gas Project	Chile	7,988,476
4	#52	Salvador da Bahia Landfill Gas Management Project	Brazil	7,419,506
5	#165	ESTREs Paulínia Landfill Gas Project (EPLGP)	Brazil	5,791,818

Only a handful of CDM Programmes of Activities specifically targeting solid waste disposal were ever registered (Table 8). The five most active landfill PoAs combined reached barely 20 issuances, with the Brazilian Caixa Econômica Federal programme standing out as a clear outlier with 13 issuances and 5.4 million CERs (UNEP-CCC, 2025).

Table 8: Top 5 Landfill CDM Programmes of Activities (PoA) with more CERs issued

#	CDM Ref	Programme Title	Country	Total CERs Issued
1	#6573	Caixa Econômica Federal Solid Waste Management and Carbon Finance Project	Brazil	5,469,290
2	#6707	Landfill Gas Recovery and Combustion with RE Generation (Land Bank of the Philippines)	Philippines	448,557
3	#6568	Landfill Gas Capture, Flaring and Use Programme in Morocco	Morocco	20,892
4	#10004	City of Cape Town Landfill Gas Extraction and Utilisation Programme	South Africa	241,511

5	#2956	Uganda Municipal Waste Compost Programme	Uganda	16,549

Source: UNEP Copenhagen Climate Centre — CDM Pipeline (data as of January 2024 / April 2025)

This absence of a programmatic tradition in waste crediting is a critical gap to acknowledge when assessing the sector's readiness for upscaled approaches under PACM. Yet, at the same time these few PoAs demonstrated the viability of programmatic approaches. The structural logic for upscaling in this sector is compelling. Methane emissions from solid waste arise from millions of dispersed generators (households, businesses, markets, institutions) whose waste flows converge into a relatively small number of municipal collection systems, managed landfills, and regional treatment facilities. This concentration of physical infrastructure creates a natural architecture for PoA-style or policy-based crediting: rather than aggregating thousands of individual household-level interventions, mitigation can be monitored, reported, and verified at the level of a landfill operator, a municipal waste authority, or a regional anaerobic digestion plant. The challenge is not one of physical dispersion, but of institutional capacity, regulatory enforcement, and financing for infrastructure. These conditions are addressable through the combination of carbon finance and targeted policy instruments.

Waste management projects also play a significant role in the voluntary carbon market. As of October 2024, more than 300 registered waste management projects have collectively issued over 35 million credits by converting waste into biogas (MSCI, 2025). China leads the world in registered waste management projects, primarily focused on manure-based initiatives. Additionally, wastewater management projects are notably prevalent in China and Southeast Asia, particularly in countries like Thailand.

Under non-state crediting mechanisms, CDM methodologies ACM0001 (flaring or use of landfill gas) and AMS-III.G (landfill methane recovery) methodologies have received CCP approval under both the Verified Carbon Standard (VCS) and the Gold Standard. Additionally, the U.S. Landfill Protocol under the Climate Action Reserve (CAR) and the Landfill Gas Destruction and Beneficial Use Projects under the American Carbon Registry (ACR) have also gained CCP approval (ICVCM, 2026b).

Methodological developments under PACM

The waste sector is expected to play an important role in the PACM under Article 6.4. A major milestone was the approval of the **first PACM methodology** addressing methane emissions from landfills. The methodology **A6.4-AMM-001: Flaring or use of landfill gas** enables projects that capture methane from solid waste disposal sites to generate carbon credits under the new UN-supervised carbon market. The methodology also explicitly references tools for common practice, investment analysis, solid waste disposal site emissions, project emissions from flaring, and gas

mass flow (UNFCCC, 2025b). This methodology builds on earlier CDM approaches while introducing stricter safeguards to ensure alignment with the Paris Agreement. These include:

- Conservative baseline setting
- Improved monitoring requirements
- Adjustments to crediting levels over time
- Clearer alignment with national climate targets

The methodology allows landfill gas to be:

- flared to destroy methane,
- used to generate electricity,
- or upgraded to biomethane and injected into gas networks.

The approval of this first PACM methodology is widely seen as an important step in operationalizing the Article 6 carbon market, as landfill methane reduction represents a large and measurable mitigation opportunity. As of the latest Article 6 pipeline data (UNEP-CCC, 2026), waste management projects account for **48 out of 1122 total prior consideration notifications**, representing approximately 4% of the portfolio of activities signalling intent to engage in Article 6 carbon trading. PACM does not yet support sectoral or jurisdictional upscaled crediting for waste. Upscaled crediting beyond PoAs remains under development in the PACM methodology work programme.

Policy instruments to enable upscaled crediting

Experience across countries shows that large-scale improvements in waste management systems typically require a combination of policy instruments, regulatory frameworks, and financial incentives. In many developing countries, landfill sites remain unmanaged or semi-managed due to limited municipal budgets and weak regulatory enforcement. Without targeted policy interventions, landfill methane capture systems are often not economically viable. **Key policy instruments that can enable large-scale waste mitigation** include:

- **Landfill regulations and methane capture requirements** - Governments can mandate methane capture systems at large landfill sites. Such policies have been implemented in several high-income countries and have significantly reduced methane emissions from waste disposal
- **Waste separation and organic waste diversion policies** - Separating organic waste streams enables composting or anaerobic digestion instead of landfill disposal. The IPCC identifies reducing organic waste sent to landfills as one of the most effective mitigation measures in the waste sector

- **Extended producer responsibility (EPR) frameworks** - These policies require producers to take responsibility for the lifecycle management of products and packaging, increasing recycling rates and reducing landfill volumes
- **Integrated waste management strategies** - Many countries are developing national strategies aligned with circular economy principles, integrating waste reduction, recycling, and energy recovery
- **Compost quality standards:** The EU's revised Fertilising Products Regulation (2019/1009) and Germany's Biowaste Ordinance (BioAbfV) are established models; without equivalent standards in developing countries, compost offtake remains a barrier to organic waste diversion at scale.
- **Biogas grid injection standards:** The EU's Renewable Energy Directive (RED III) introduced a binding 2030 target for renewable gas, spurring national biogas action plans across member states. In the Global South, countries such as India (under the SATAT scheme), have introduced compressed biogas purchase obligations to create stable demand for biogas projects linked to urban waste treatment (MOPNG, 2024).

When combined with carbon crediting activities, these policy frameworks can significantly enhance the scalability of mitigation activities.

Access to finance

Waste management projects such as landfill gas capture, anaerobic digestion, and waste-to-energy systems require substantial upfront capital investment in infrastructure, monitoring systems, and long-term operational capacity. The lack of funding hinders the development of efficient waste systems and climate-focused interventions. To overcome this, innovative financing mechanisms, like **public-private partnerships** and **blended finance**, are needed to support infrastructure development and integrate climate solutions into waste management (Smyth, 2024). A particular feature of this sector is that waste management is typically owned and often managed by the public sector, in particular municipalities. Therefore, financing models need to be tailored to these actors. At the same time, this features may enable aggregation through upscaled crediting approaches, e.g. on a sectoral and/or jurisdictional level.

An illustrative example is the development of the Santa Rosa landfill in Brazil aligned with a Brazilian development project backed by a **USD 50 million** World Bank loan to Caixa Econômica Federal (World Bank, 2016). Caixa created a CDM PoA for landfill gas (LFG) activities, including flaring and energy generation. The Santa Rosa landfill was the first component project under this PoA, with Caixa providing technical assistance and using carbon revenues to attract private sector investment. Such blended finance structures may provide useful models for mobilising investment for waste methane mitigation under Article 6 frameworks.

The International Finance Corporation (IFC), alongside the Multilateral Investment Guarantee Agency (MIGA) have backed projects like the Belgrade waste-to-energy project, which captures landfill methane to generate renewable energy and carbon credits (World Bank, 2019). They supported **EUR 259.6 million** financing and guarantees package under a public-private partnership (PPP) mode.

Such projects demonstrate that blended finance approaches are particularly relevant for upscaled crediting under Article 6, as they can **combine public finance, private capital, and carbon credit revenues to reduce investment risks.**

In the past, the World Bank's Pilot Auction Facility (PAF) has mobilized USD 78 million and developed an **innovative model for setting an auctioned price floor for carbon credits** focusing initially on methane projects as a way to channel finance to carbon projects that were suffering from the low-price market environment in the mid-2010s (*Pilot Auction Facility*, no date). Such approaches can offer forward looking experiences for carbon price discovery for upscaled crediting mechanisms (Bodnar *et al.*, 2018), complemented by experiences with power auctions and carbon contracts for differences.

NDC alignment

Waste management is increasingly recognized as a critical mitigation sector in many countries' NDCs, especially through the lens of methane reduction and circular economy strategies. Methane emissions from unmanaged waste disposal remain a significant global climate concern, with anaerobic decomposition of organic waste accounting for a substantial share of greenhouse gas emissions from the waste sector.

Aligning crediting baselines and monitoring approaches with NDC modelling for 2030 targets and beyond as well as national inventory methods is essential to ensure consistency between activity-level mitigation outcomes and national accounting and reporting frameworks which are the basis for corresponding adjustments for ITMO transfers. **In practice this requires:**

- **using nationally consistent waste composition and decay parameters**
- **ensuring that credited mitigation goes beyond unconditional NDC implementation**
- **aligning monitoring parameters with national inventory categories for waste and wastewater**
- **avoiding double counting between project-level crediting and national mitigation programmes**
- **integration into BTRs and annual GHG emissions balance**

Because waste methane mitigation sits close to national inventory accounting, robust alignment with NDC planning and MRV systems is particularly important. Despite the vast potential for GHG

reductions through waste management and circular economy pathways, only 77% of Parties referenced waste as a specific priority area (UNEP, 2024), which is actually lower than expected for a sector with such cost-effective mitigation potential.

Demand considerations

Growing demand for waste management solutions is being driven by rapid increases in waste generation and the expanding economic opportunities tied to circular economy practices. According to the Global Waste Management Outlook 2024 (UNEP, 2024), global municipal solid waste is projected to nearly double from around **2.3 billion tonnes** in 2023 to **3.8 billion tonnes** by 2050, highlighting an escalating need for scalable waste management systems and value-chain solutions. Parallel to this, the global waste management market is experiencing strong growth, with market valuations forecast to reach approximately **USD 238 billion** by 2029 at an annual growth rate of around 8.7%, reflecting broad demand across services such as collection, recycling, and landfill operations (Technavio, 2025).

Demand for waste management solutions is expected to be **concentrated in the Asia-Pacific region** in the coming decade, driven by rapid urbanization, rising consumption, and expanding municipal and industrial waste streams. The Asia-Pacific waste management market was valued at around **USD 290.6 billion in 2023** and is projected to grow to **USD 560.3 billion by 2030** at a **CAGR of 8.8%**, reflecting significant scaling of services across collection, recycling, and disposal infrastructure. China, India, and Southeast Asian countries are leading this demand surge, with policy incentives for waste-to-energy (WtE) and recycling technologies further reinforcing investment flows (NMSC, 2025).

Within Southeast Asia specifically, the waste management market is forecast to nearly **double from USD 9.5 billion in 2024 to USD 18.7 billion by 2032** at an **8.8% CAGR**, underscoring strong growth prospects for formal waste services as urban populations expand and regulatory frameworks strengthen (VMR, 2026). Meanwhile, rapid increases in mismanaged plastic waste, projected to rise by 69% in the Asia Pacific region from 33 million tonnes in 2022 to 56 million tonnes by 2050, highlight the urgent need for enhanced capacity across sorting, recycling, landfill management, and recovery systems (OECD, 2025).

5.4. Carbon dioxide removals in Europe and emerging economies (BECCS, DACCS)

Upscaled crediting for CCS projects

Carbon Capture and Storage (CCS) refer to technologies that capture carbon dioxide (CO_2) emissions from large point sources such as power plants and industrial facilities before they enter the atmosphere and store them in deep geological formations for long-term isolation (Hanson, Nwakile and Hammed, 2025).

Scientific assessments, including reports from the Intergovernmental Panel on Climate Change (IPCC), identify CCS as a key component of long-term climate mitigation pathways required to meet the Paris Agreement goal of limiting global warming to well below 2 °C and ideally 1.5 °C. The IPCC Sixth Assessment Report indicates that CCS will need to be deployed at the gigatonne scale before mid-century, alongside substantial reductions in fossil fuel use, electrification, and other carbon removal strategies (Shukla, Skea and Reisinger, 2022).

CCS is also increasingly linked to international climate policy frameworks under Article 6 of the Paris Agreement, which enables cooperation through carbon markets and crediting mechanisms. These mechanisms may allow CCS projects to generate tradable carbon credits for verified emissions reductions or removals, helping mobilize investment and support large-scale deployment.

Recent analysis suggests that integrating CCS into Article 6 mechanisms, public incentives, compliant emissions trading systems and voluntary carbon crediting approaches could expand access to carbon finance and accelerate large-scale deployment (IEAGHG, 2023). As there is limited experience with CCS in the Global South i.e. PACM host countries, this case study focuses on Europe, although the activity is expected to gain relevance for emerging economies as technologies mature and decarbonisation deepens.

These policy frameworks create opportunities for real-world CCS deployment. Ørsted's bio-energy with CCS (BECCS) project in Denmark provides a practical example of how CCS can scale from pilot initiatives to commercial deployment. The project captures biogenic CO_2 from bioenergy operations from the Asnæs and Avedøre heat and power plants in Denmark. Approximately 430,000 tCO_2 per year will be transported to a Norwegian offshore North Sea reservoir for permanent geological storage operated by Northern Lights JV (NLJV). This cross-border arrangement demonstrates how countries can cooperate in large-scale CCS deployment while supporting national climate targets.

The project leverages established methodologies, aligns with policy support mechanisms, responds to market demand, and benefits from private finance, despite facing early-mover disadvantages and inherent risks. Ørsted's BECCS project exemplifies the integrated approach needed to overcome technical, financial, and regulatory barriers, highlighting the role of cooperative, cross-border solutions in enabling the upscaling of CCS technologies.

Existing experience with programmatic approaches and methodologies

The current landscape for CCS under the PACM presents a unique opportunity for growth and upscaling, despite its near-nil experience level to date. **While the Article 6.4 removals standard (UNFCCC, 2024b) clearly aims at enabling engineered carbon removals such as Direct Air Capture (DAC) and BECCS in the future, no approved CCS methodologies existed as of March 2026.**

A further limitation arises from the absence of historical precedent under the CDM. COP17 (Durban, 2011) adopted the modalities and procedures for CCS, which were later included in the CDM project standard (Dixon *et al.*, 2013), establishing a legal pathway and monitoring procedures for future CCS projects. However, no methodologies were approved to date that could migrate to PACM, leaving the new mechanism without prior practical experience for this project type.

Traditional PoA may be unsuitable for CCS, due to the complex large-scale nature of the projects, making a standardized approach difficult. While the UNFCCC defines a PoA as a coordinated mechanism allowing multiple CPAs to be added under a single umbrella each following standardized eligibility criteria and monitoring, CCS does not fit neatly into this modular structure. CCS projects typically involve **large, integrated, site-specific value chains** that require tailored engineering, permitting, transport, storage, monitoring, and liability arrangements.

However, **multi-methodology PoAs anchored in nationally standardised geological and monitoring parameters are not only suitable but may be the most coherent upscaling pathway for modular CCS**. CCS projects consist of different activities (capture, transport, and storage), each with their dedicated monitoring requirements, and often operated by multiple project proponents. The sector has made significant progress through methodologies developed by non-state carbon crediting programmes, which identify and separate the CCS value chain, supporting conceptual aggregation while retaining individual project validation. Key methodologies include:

Table 9: Key CCS methodologies available in non-state crediting programmes

Carbon Crediting programme	Methodology
Verra	VM0049 Carbon Capture and Storage (methodology framework with additional modules and tools)
Gold Standard	Biomass fermentation with carbon capture and geologic storage (methodology with additional tools)
Puro.earth	Geologically Stored Carbon (only removals)
Isometric	Biogenic Carbon Capture and Storage Direct Air Capture (Methodologies made up of several protocols)
American Carbon Registry	Methodology for the quantification, monitoring, reporting and verification of greenhouse gas emissions reductions and removals from carbon capture and storage (draft version, adopted version was only applicable to enhanced oil recovery (EOR).

Other methodologies for geological CO_2 storage are described in the geo-storage and crediting version 2.0 published by IETA (IETA, 2025).

In addition to non-state crediting programmes, the EU has introduced its **Carbon Removals and Carbon Farming (CRCF) framework**, where the first delegated act for permanent carbon removal was adopted by the EU Commission in February 2026, including methodologies for DACCS and BECCS (European Commission, 2026). CRCF establishes a Union-backed standard for certifying permanent carbon removals and carbon farming reductions, providing regulatory guidance and a methodology framework ready for relevant project types in Europe. The EU debates whether to include CRCF-certified removals into the next phase of the EU ETS. The UK has already made that decision and is working on legislation for certified engineered removals to be included in the UK ETS from 2029 (UK ETS, 2025). This offers useful lessons for future PACM approaches, particularly for methodology design, stakeholder awareness, and practical project implementation.

Verra (and Gold Standard to a degree) has introduced "GCS Expansion" models (GCS stands for geological carbon storage) (Gold Standard, 2025a; Verra, 2025), which allows for a storage "hub" to receive multiple CO_2 streams from different emitters eligible for crediting added to an existing PDD, comparable to a PoA structure that combines multiple methodologies (as piloted e.g. by Ci-Dev in the energy access space and possible in CDM already). However, the main project proponent of generating and receiving credits is the emitter, rather than the storage provider, therefore, the emitter controls the process and not the storage provider. The benefits of GCS expansion need more awareness and practical implementation by all relevant stakeholders, including, emitters, transport and storage operators, regulators and investors. Ørsted's BECCS project applies the Verra VM0049 framework methodology, they are the main project proponent. Verra only allows issuance of credits to the operator of the carbon pool, which is NLJV. Ørsted and NLJV have a bilateral contract stating that Northern Lights JV transfers the issued credits into Ørsted's account, who is then free to sell them. Other project proponents with similar project activity and plans to store their captured CO_2 with NLJV were not keen to have an addition to the Ørsted-NLJV PDD and wanted their own, with full validation, which is much more expensive and not effective from an economic point of view and hampers upscaling. PACM should incorporate these learnings and create a more efficient approach.

Policy instruments to enable upscaled crediting

The first policy incentive for CCS in Europe was the implementation of the Norwegian carbon tax in the 1990s. It has been more cost-effective for Equinor (then Statoil) to capture and store CO_2 from sour gas production rather than venting it over the lifetime of the project (Hauber, 2023). Other key policy instruments in Europe for supporting CCS deployment are discussed below.

Both Sweden and Denmark use reverse auctions to support pre-commercial (bio-)CCS projects. Applicants bid on how much CO_2 they can capture and store and at what cost, with the lowest-cost

bid winning. Support can cover up to 100% of capture, transport, and storage costs for 15 to 20 years. In 2025, the first Swedish auction awarded Stockholm Exergi SEK 20 billion (around $ 2.2 billion) for their BECCS project at the Värtaverket (KVV8) plant, capturing 800,000 tCO_2 per year (over 11 Mt total biogenic CO_2) (Stockholm Exergi, 2025)[10]. The second auction is open until August 2026, highlighting ongoing support for scaling bio-CCS in Sweden.

The Danish CCS Fund (Energistyrelsen, 2024) will allocate around DKK 1.77 billion annually (approximately $255–260 million per year) between 2026 and 2045. Ørsted won the first bid in 2023, and the results of the second bid are to be announced in April 2026.

In the **Netherlands**, incentives are provided through the SDE++ scheme, with a cap for CCS projects of 9.7 million tons per year for the industry sector and 3 million tons per year for the energy sector (Flöer *et al.*, 2025) (Flöer *et al.*, 2025). The budget for CCS projects is EUR 6.7 billion and is financed by revenues from carbon pricing signals (bid price, ETS forecast). It closely resembles carbon contracts for difference (CCfD), where the project developer sets a strike price per tCO_2 captured and stored that it needs to receive through carbon pricing instruments and the government pays the difference between the carbon price below the strike price and the project developer should pay back the government when the carbon price is higher than the strike price. It is funding the Aramis transport and storage infrastructure, however it does not have to pay back the state should the carbon price go higher than the strike price (CATF, 2024).

Globally, governments have introduced a variety of financial incentives to support the deployment of CCS and related carbon removal technologies. For example, in the USA 45Q tax credit (Carbon Capture Coalition, 2025) provides financial support for carbon capture and geological storage in the U.S. Projects beginning construction before January 1, 2033, can earn up to $180 per tCO_2 for Direct Air Capture (DAC) and $85 per tCO_2 for industrial and electricity sources, over a 12-year period. As of July 2025, the credit has supported more than 270 announced or operational projects. 45Q operates through tax equity financing rather than direct procurement, providing a complementary mechanism to incentivize CCS deployment.

In India, the Union Budget 2026–27 announced a $2.4 billion scheme to scale up Carbon Capture, Utilisation and Storage (CCUS) across five high-emitting industrial sectors (Goyal, 2026). The scheme, spread over five years, is part of India's long-term strategy to achieve Net Zero by 2070 under the Paris Agreement and is one of the clearest commitments to pioneer these technologies in emerging economies.

[10] The Stockholm Exergi BECCS project at Värtaverket (KVV8) referenced in the reverse auction and Northern Lights cross-border CCS contract is the same project; the financial support from the Swedish auction and the CO_2 deliveries to Norway .

Other countries are also **implementing domestic carbon pricing** and crediting mechanisms to support CCS. In **Canada**, Alberta province introduced carbon market instruments in 2020 (Singh, Gordner and Lingley, 2025), that allow industrial emitters to generate credits for permanently storing CO_2 in geological formations. These credits can be sold or used to meet regulatory obligations, helping companies comply with Alberta's carbon reduction requirements while reducing the financial barriers associated with CCS projects.

Australia operates the Australian Carbon Credit Units (ACCUs) under the Safeguard Mechanism (2023) (Clean Energy Regulator, 2024; Gordon, 2025). It covers 215 large industrial facilities emitting over 100 ktCO_2-e per year. Only these facilities can earn Safeguard Mechanism credits for verified CO_2 storage or emission reductions below their baselines, which can be traded, banked, or surrendered, providing a targeted financial incentive for CCS among these facilities.

Several emerging frameworks are laying the foundation for cross-border CCS and upscaled carbon removal crediting.

The Government of Switzerland signed bilateral agreements under Article 6.2 of the Paris Agreement, establishing a **sovereign framework for cooperation on geospheric removals and CCS with Norway and Sweden,** enabling removal ITMOs of and cross-border CO_2 transport for permanent geological storage (Norway MoE, 2025). As part of this framework, pilot projects are planned to begin in 2028–2029, as well as a transaction of 1,000–10,000 tCO_2 of Norwegian BECCS credits to Swiss buyers and 100–1,000 tCO_2 of ex-situ CO_2 mineralisation credits from Switzerland to Norway as well as pilot transfers involving Swedish credits, though specific volumes for Sweden are not fixed (EMP, 2025). These pilots will test operational and accounting systems and lay the groundwork for larger-scale cross-border transfers in the 2030s.

Beyond national policies and bilateral agreements, adjustments to international regulatory frameworks have also been necessary to accommodate the development of CCS. For example, amendments to the London Protocol under the International Maritime Organization (EPA, 2015), which classifies CO_2 as waste and generally prohibits dumping at sea or cross-border transport. A 2006 amendment permits the geological storage of captured CO_2 beneath the seabed, allowing offshore CCS as a climate mitigation measure.

Ørsted's BECCS project in Denmark exemplifies how policies, crediting methodologies, and cross-border arrangements enable operational CCS at scale. The project is the first beneficiary of Denmark's CCS Fund. The MoU between Denmark and Norway enables cross-border CO_2 transport & storage and rules towards transparent emission reporting of CO_2 towards EU ETS and National Inventory reporting (TMEN, 2024; Northern Lights, 2025). However, even with all this in place the final investment decision was taken due to pre-contracted sales of carbon credits as discussed in the next section.

Access To Finance

Access to finance remains a critical barrier for CCS deployment. CCS technologies are highly capital-intensive and face substantial first-mover barriers, which limit private investment and slow large-scale deployment. For instance, a representative BECCS project with a nominal capacity of 0.5 $MtCO_2$ per year and a 20-year lifetime has total costs (CAPEX + OPEX) of around $1.1 billion USD. Even with $359 million USD in public funding, the project still faces a significant cost gap that must be covered by revenue from carbon credit sales or other support mechanisms (Veen *et al.*, 2025). High upfront costs, long project timelines, technical risks (e.g., capture efficiency, storage leakage) lowest market price <$200/$tCO_2e$ for 20,000 t and 2024 and 2025 vintage (S&P Global, 2025), policy uncertainty, or need for secure offtake agreements further hinder investment. In Europe, these challenges contribute to an estimated funding gap of around €10 billion for currently announced CCS projects as of 2025, underscoring the need for additional EU and national support, as highlighted by the Industrial Carbon Management (ICM) strategy (Flöer *et al.*, 2025).

Given these substantial costs, Ørsted's BECCS project employs a blended finance strategy, combining public funding from Denmark's CCS Fund with private revenue from carbon credit sales through long-term offtake agreements with partners like Microsoft and Equinor. **This blended finance plays a crucial role in bridging the investment gap by creating a viable carbon-finance enabled business model.** The success of these first mover projects can create trust in the business model, lowering risks and attract financial institutions to lower upfront cost, receiving sellable carbon credits in return. This approach can contribute to technology learning and cost depreciation and eventually making the opportunity replicable in the Global South. However, international climate finance may have to compensate for the role of public finance in these business models, depending on the financial abilities of the host country which again highlights the **importance of blended finance approaches for early-stage, high-cost technologies.**

NDC alignment

CCS technologies are increasingly included in national climate strategies with over 30 countries explicitly including CCS or bio-CCS in their NDCs, specifically focussing on reducing emissions from hard-to-abate sectors. Countries such as the United Kingdom, EU, Norway, Australia, Canada, Colombia, Indonesia, the United Arab Emirates, Saudi Arabia, and Russia mention CCS in their climate plans , from exploring GCS to actively developing GCS potential (Kuci, Sundvor and Wang, 2026). Looking at the Global South, NDC 3.0, at least 4 more African and 6 more Latin American and Caribbean countries mention CCS, in comparison to the NDC 2.0 study done by the global CCS institute (Amer, 2024). While this number is still small, it can be expected to increase as technologies mature, and their deployment expands in the long term.

Despite these challenges, Ørsted's BECCS project directly contributes to the EU and the country's national targets of reaching climate neutrality or even carbon negative in 2050 (110% based on 1990 emission baseline) (DCCC, 2025), where negative emissions from DACCS and BECCS play a significant role. which explicitly includes carbon removal via BECCS. By linking CCS to NDC targets, projects like Ørsted's translate the IPCC's gigatonne-scale CCS requirements into actionable national strategies with clear budgets, timelines, and measurable outcomes.

Demand considerations

More and more corporates set their own net zero targets, either on their own initiative or following the SBTi. A 100% reduction is often not reachable, and corporates use carbon market mechanisms to compensate (offset) their emissions. Microsoft has a target to become carbon negative by 2030 and removing historical emissions by 2050 (Smith, 2020). They are significantly engaging on the carbon market to reach this goal, including purchasing credits from BECCS and DACCS projects.

The International Civil Aviation Organization (ICAO) released 2024 emissions data and sector growth factor (SGF) for the first phase (compliance period 2024-2026) of Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) participation. The emissions totalled approximately 597 million tonnes (12.6% increase compared to 2023 levels), of which 363.5 $MtCO_2$ are eligible under CORSIA (ICAO, 2025b). Based on and SGF of 0.154, 146-236 $MtCO_2$ are projected for the full first phase (ICAO, 2025a). The first large-scale procurement of CORSIA-eligible Guyana credits took place at the end of 2024, through an IATA-led fixed-price procurement event(Resilient, 2024). The first CORSIA-labelled credits were issued in early 2026, when registries formally tagged eligible units for CORSIA use (VERRA, 2026).

CCS removals (DACCS) have become eligible to supply CORSIA in 2025, opening the door for other CCS project types for phase 2 (2027-2029). The main constraint is the letter of authorisation from the host countries that enable ITMO transfers and subsequent corresponding adjustments.

Ørsted's BECCS project has pre-operation contracted a total of 4 million tCO_2 over a time span of 10 years. The project is capturing 430,000 tCO_2/y annually, of which approximately 407,000 tCO_2/y are considered removals (after subtracting project and leakage emissions from the baseline). This adds up to a total of 8.1 million tCO_2, thus another 50% of the credits are still to be sold either through bilateral agreements, voluntary carbon market buyers, or CORSIA once BECCS will become eligible.

CRCF demand and the trajectory for EU domestic removals to provide flexibility for EU climate policy in particular the ETS.

The EU (Emissierechten, 2026) is actively preparing to transition from climate neutrality to net-negative emissions, with the EU Climate Law committing the bloc to become climate negative after 2050 and an interim target of -90% emissions reduction by 2040, compared to a 1990 baseline. This

ambitious pathway acknowledges that certain hard-to-abate sectors will continue to produce residual emissions that cannot be fully eliminated through conventional measures. To address this, the EU plans to integrate permanent Carbon Dioxide Removal (CDR) into the EU ETS, encompassing technological solutions such as DACCS and BECCS alongside nature-based solutions with the European Commission expected to propose the detailed rules and conditions in July 2026.

The EU Carbon Removal and Carbon Farming Certification Framework (CRCF) is designed to provide a high-quality, reliable source of domestic CDR credits. Demand for CRCF-certified removals is expected to rise sharply as the EU ETS transitions toward a negative emissions system, when no new CO_2 allowances will be issued and residual emissions from hard-to-abate sectors must be fully offset. Linking CDR to the ETS will create a regulatory and market-based mechanism to ensure high-quality removals, mobilize private and public investment as well as auction revenues and gradually build a negative emissions budget. Various approaches are under consideration, including the establishment of an "EU Buyers' Club" (Zero Emissions Platform, 2026) to promote European investment and diversify the buyers base (e.g., banks, financial institutions), boost and coordinate existing EU and national financing instruments (e.g., Innovation Fund), facilitate demand creation and support market access for new buyers.

By 2040–2050, as the EU moves toward climate neutrality and then net-negative emissions, CRCF domestic removals are expected to provide flexibility to meet ETS and overall EU climate targets. Domestic CRCF credits will complement international credits under Article 6 of the Paris Agreement, reducing reliance on imports. This trajectory ensures that domestic CDR both supports ETS compliance and strengthens climate targets using its own resources, allowing policymakers to balance ambition, cost, and supply reliability while gradually phasing in negative emissions obligations across sectors.

5.5. Can REDD+ become part of PACM?

Despite its importance for global mitigation efforts and the NDCs of forested nations, the forest sector has played minor role in the CDM and was restricted to afforestation and reforestation activity types. REDD+ has been explicitly excluded as a result of controversial UNFCCC negotiations in the mid-2000s, initially still focused on project-based approaches. However, REDD+ has become increasingly relevant in the voluntary carbon market and results-based climate finance by achieving large volumes of issued carbon credits. More recently, REDD+ has evolved towards a much stronger presence of jurisdictional approaches (see section 2.2).

Brief history of REDD+ in the UNFCCC process since the early 2000s, leading to the Warsaw Framework

REDD+ emerged in UNFCCC negotiations in the early 2000s as the importance of new approaches to achieve GHG mitigation in the forest sector had been increasingly recognized. It was not included

in the Kyoto Protocol's Clean Development Mechanism (CDM) because of concerns over environmental integrity. The Coalition of Rainforest Nations (CfRN, including countries like Papua New Guinea and Costa Rica) actively advocated for the inclusion of REDD+ in carbon markets. The CfRN argued that rainforest nations need to access carbon finance for protecting forests rather than cutting them down. They also argued that excluding REDD+ limited the ability of rainforest nations to benefit from global carbon markets from an equity perspective. Fonseca et al (2007) have made the case for preventing perverse incentives by awarding carbon credits primarily to countries with high deforestation rates, thereby creating the foundation for HFLD approaches in REDD+. On the other hand, the EU was among the strongest voices expressing concern over the environmental integrity of REDD+ in the early UNFCCC negotiations, due to risks regarding baselines, MRV (particularly given technical limitations in the early 2000s), permanence, leakage, and the resulting risk that credits would not represent real emission reductions. Others such as the UK supported REDD+ but, like the EU, emphasized the need for robust safeguards and credible accounting. Moreover, there were concerns about REDD+ credits which were inexpensive at the time potentially flooding markets, lowering prices and undermining incentives for other mitigation actions.

As a result, the implementation of project-based REDD+ in the 2010s focused on climate finance and voluntary carbon markets (see section 2.2). Over time, technical and political progress led to increasing acceptance, resulting in the Warsaw Framework for REDD+ (WFR, 2013), which provided detailed guidance for implementation, safeguards, monitoring, and results-based payments in the context of jurisdictional REDD+. The WFR focuses clearly on national level jurisdictional approaches, while allowing subnational jurisdictional approaches as an interim step. It is therefore legally and functionally differentiated from project-based REDD+ as implemented in the voluntary carbon markets. However, the WFR was explicitly not designed to be a carbon market framework. Still it provides an important foundation especially for more recent jurisdictional approaches that are anchored in NDCs.

Links between Article 5 and 6 of the Paris Agreement

Recognizing the importance of protecting the world's forests, including through REDD+ despite the concerns mentioned above, **Article 5 of the Paris Agreement establishes results-based payments** as an approach to support climate action in the forest sector. Moreover, it anchors the Warsaw Framework on REDD+ in the PA architecture. Article 5.1 states that Parties should "take action to conserve and enhance [...] sinks and reservoirs of GHGs [...]"including forests." Article 5.2 encourages the implementation of the Warsaw Framework, including through results-based payments. **Forest Reference Emissions Levels (FREL) serve as the baseline** against which a country's actual forest-sector emissions are compared to determine whether emission reductions have occurred and whether results-based payments are justified. Accounting and reporting on FRELs is included in biennial transparency reports and subject to the technical expert review of BTRs.

However, Art.5 was specifically designed not to create tradable carbon credits that can also be used for compliance purposes. While Art.5 can provide a useful foundation for REDD+ as a market mechanism, it clearly needs to **meet additional criteria, enhanced (jurisdictional) crediting methodologies and governance features** to meet all Article 6 requirements. However, Art.6.2 enables governments to authorize REDD+ units to become ITMOs. This has already been implemented by Guyana (ART TREES) and Suriname (CfRN).

Overall, Article 5 is a useful foundation for REDD+ carbon market activities, but not sufficient on its own as a basis for generating carbon credits or even transferring them internationally. The improvement of methodologies for jurisdictional REDD+ is the key foundation on which efforts to integrate REDD+ into PACM would need to build.

Existing experience with programmatic approaches and methodologies

Although REDD+ was excluded from the CDM, there is comprehensive experience with carbon arket methodologies from non-state crediting programmes. Verra became the leading standard for project-level REDD+ since 2011. More recently, ART TREES focused fully on jurisdictional carbon credits and was designed to align more closely with the WFR and Cancun Safeguards. An extreme position is that of the Coalition for Rainforest Nations (CfRN) that claims that emission reductions identified under the WFR should directly become emissions credits, without the need to meet any additional requirements (Carbon Mechanisms Review, 2025). The most recent Verra jurisdictional REDD+ methodology, building on VM0048 together with module VMD0055 (v1.1) and the updated Jurisdictional and Nested REDD+ Framework (JNR v4.1), represents a methodological reform intended to improve baseline integrity and align project-level and jurisdictional accounting. The update removes project-level baselines and shifts to jurisdictional baselines, supported by external data providers and a six-year reassessment period. This design aligns Verra's baselines more closely with national Forest Reference Emission Levels (FRELs) reported to UNFCCC. Similar developments have taken place for jurisdictional approaches through FCPF, ISFL and the Architecture for REDD+ Transactions (ART) and its TREES Standard, with the draft TREES 3.0 currently under public consultation. FCPF and TREES also use jurisdictional REDD+ crediting and aim at strengthening environmental and social safeguards, including obtaining free prior, informed consent (FPIC) by Indigenous Peoples' and local communities.

A major development in late 2024 was the ICVCM's approval of both Verra's revised REDD+ methodology (VM0048), the JNR Framework v4.1, and ART TREES (v2.0 crediting level) as meeting the Core Carbon Principles, which marked the first CCP endorsements for REDD+ methodologies. However, these decisions attracted criticism from ICVCM expert panel members who argued that, despite improvements, these methodologies still fail to meet key CCP requirements relating to baseline robustness, additionality tests, and safeguards. This case underscores an ongoing debate between those emphasizing the urgent need for delivering forest finance at scale, including from

carbon markets, and those warning of integrity risks of crediting approaches if baseline inflation, demonstrating how carbon finance enables additional measures in REDD+ jurisdictions, leakage, or social safeguards are not sufficiently resolved while REDD+ carbon credits are used as offsets against NDC, CORSIA or other mitigation targets. Since then, Equitable Earth's project-based REDD+ standard has also received ICVCM CCP label at the programme level, with the crediting methodology still under assessment at the time of writing (March 2026).

In theory, a REDD+ methodology could already be submitted to the PACM for approval. Any such methodology would need to satisfy all A6.4 standards, including stringent requirements codified in PACM standards that baselines be set below BAU, demonstrating additionality, safeguards, and MRV, aligned with a new approach to FRELs that avoids over-crediting, and assessing leakage consistent with Art. 6.4 regulatory guidance. These requirements are more stringent than existing REDD+ methodologies and would likely require an update of the PACM baseline standard to accommodate jurisdictional baselines. Similarly, Art. 6.4's reversal risk provisions would need to be met, which would require additional adjustments to Verra's or ART's permanence frameworks. Moreover, there are additional caveats: As PACM remains in an early stage of regulatory development, it initially focuses on project-based and programmatic approaches and has not yet taken up work on regulatory standards for jurisdictional approaches (compare section 4.2). Moreover, there have been contested, inconclusive UNFCCC negotiations at COP28 on the role of emissions avoidance in Art.6.4, which are crucial for REDD+ as mitigation outcomes are generated in part through avoided deforestation. SBSTA 60 in June 2024 decided that emissions avoidance is currently not included in Art.6.4 RMP and deferred the issue to SBSTA 68 in 2028.

In sum, while the revised Verra/VCS jurisdictional REDD+ and provisional ART TREES 3 (still under consultation) can be seen as a step forward for high integrity jurisdictional forest crediting, they do not yet meet all Art.6.4 requirements, and methodological discussions persist. **Further work is needed especially for integrating jurisdictional REDD+ into the Article 6.4 mechanism which initially remains focused on project-based and programmatic crediting, without excluding jurisdictional and other types of large-scale crediting. A clear starting point would be a comprehensive assessment of existing experience with jurisdictional REDD+ methodologies gathered in non-state crediting programmes in order to identify remaining gaps that need to be closed to meet evolving PACM requirements. Such efforts could helpfully inform the further evolution of PACM's regulatory standards for large-scale crediting.**

Policy instruments to enable upscaled crediting

Appropriate policy instruments for REDD+ should enable countries to reduce deforestation while ensuring high environmental and social integrity. Effective jurisdictional REDD+ implementation depends on strong national strategies, robust FRELs, national forest monitoring systems, and safeguards. Complementary policy instruments could include clear carbon rights and

benefit-sharing mechanisms, which determine how incentives flow to stakeholders such as governments, implementers and communities. Broader economic and governance instruments such as land-use planning, tenure reform, law-enforcement measures, and incentives for sustainable forest management can also help address drivers of deforestation.

Access to finance

Existing experience with access to REDD+ finance shows a gradual shift from early public sector results-based programmes to larger, blended public-private jurisdictional models. The KfW REDD Early Movers (REM) programme demonstrated that early action can be rewarded at scale by providing results-based payments to jurisdictions such as Acre and Mato Grosso in Brazil, Colombia, and Ecuador, helping strengthen monitoring systems, safeguards, and inclusive benefit-sharing, particularly for Indigenous and local communities, while also revealing practical challenges around safeguard implementation and governance capacity (Liswanti *et al.*, 2024). The World Bank's FCPF expanded this model by supporting 47 countries in establishing REDD+ readiness systems (MRV, reference levels, national strategies, benefit-sharing mechanisms) and piloting *Emission Reduction Payment Agreements*, which have begun to deliver substantial payments, including Vietnam's US$51.5 million disbursement in 2024.

The GCF has also provided results-based payments for jurisdictional REDD+ which are also supporting continual technical and governance improvements. The GCF's 40th Board Meeting in October 2024 (Decision B.40/16), permanently integrates REDD+ results-based payments into GCF's regular programming cycle, replacing the previous pilot phase. This has delivered USD 750 million in results-payments (originally USD 500 million in the 2017-2022 pilot phase, with additional subsequent approvals in 2025-26) to 12 countries.

Yet experience also highlights risks of inequitable access and insufficient protection of Indigenous rights, as seen in critiques of the East Kalimantan ER Programme (Liswanti *et al.*, 2024). More recently, the LEAF Coalition has introduced a jurisdictional public-private model that purchases ART TREES-certified credits and offers advance payments to overcome upfront financial barriers. Although consultations and a BSP are required under the LEAF framework prior to credit issuance, challenges remain in ensuring transparent fund flows and equitable community participation – as underscored by Nepal's 2026 LEAF agreement (Mongabay, 2026). Collectively, these initiatives show that while REDD+ finance can mobilize significant resources, equitable access, strong safeguards, and robust governance remain central to delivering durable climate and community outcomes.

NDC alignment

Jurisdictional REDD+ is increasingly aligned with Nationally Determined Contributions (NDCs), especially as LULUCF holds the most significant mitigation potential in some countries. As more

than 75% of NDCs reference LULUCF and roughly 25% of global NDC reductions are expected to come from forests, jurisdictional REDD+ provides a pathway for governments to meet these commitments by addressing deforestation drivers at scale and embedding REDD+ within national NDCs, sector policies, reference levels, and monitoring systems. Jurisdictional approaches enable governments to establish national forest reference emission levels, safeguard systems, and MRV frameworks that align REDD+ results directly with NDC accounting. The newer jurisdictional standards (e.g., Verra's JNR, ART-TREES) further strengthen this alignment by requiring consistency with national climate targets, jurisdiction-wide baselines, and policies that integrate forest protection into NDC implementation. Still, unresolved issues remain such as how FRELs relate to NDC baselines, how to assign mitigation outcomes to conditional versus unconditional contributions as a basis for defining eligibility for ITMO transfers from REDD+ activities, leading to corresponding adjustments under Article 6. Yet, the overall trend suggests that jurisdictional REDD+ is becoming a recognized instrument for countries to operationalize and finance their NDCs while delivering forest conservation at scale. However, for carbon market finance delivered through jurisdictional REDD+, remaining methodological issues as described above need to be further strengthened to meet PACM requirements on baselines (below BAU, downward adjustment) and additionality (demonstrate how carbon finance enables new activities that result in mitigation), building on ongoing methodological improvements.

Demand considerations

Carbon-market demand for REDD+ credits is increasingly polarized, with older, lower-integrity vintages losing value while high-integrity jurisdictional credits gain strategic importance. In the voluntary carbon market, legacy REDD+ credits trade at deep discounts as buyers prioritize newer vintages certified under ICVCM-approved methodologies, reflecting a strong shift toward quality and away from older project-level credits whose prices have sharply declined. This example shows how concerns over both environmental (overcrediting) and social (benefit-sharing, FPIC) integrity can affect demand for carbon credits. Conversely, compliance demand, including from CORSIA, has strengthened this market segment, with airlines relying on jurisdictional REDD+ (notably credits from Guyana). Parallel to this, results-based climate finance channels—such as the World Bank's FCPF, BioCarbon ISFL, and the GCF continue to reward verified jurisdictional reductions, with more recent vehicles such as SCALE reinforcing demand. The LEAF Coalition has further expanded demand by committing large volumes of finance to ART-TREES jurisdictional credits and offering advance payments that help overcome supply-side barriers. Additional demand is emerging from Article 6.2 bilateral cooperation, with countries such as Norway and Japan (JCM) exploring or securing REDD+-based ITMOs, signalling growing interest in internationally transferred jurisdictional reductions. Meanwhile, global initiatives including the Scaling J-REDD+ Coalition and the broader Forest & Climate Leaders' Partnership (FCLP) aim to mobilize USD 3–6 billion annually by 2030 and expand the market for jurisdictional REDD+ through stronger integrity standards and

policy alignment. Overall, demand is consolidating around high-integrity jurisdictional REDD+ driven by compliance needs, corporate quality preferences, and jurisdictional finance platforms – while older, lower-quality credits continue to see weakening market interest and low prices.

Whether jurisdictional REDD+ will be integrated in PACM remains a complex issue with many open questions. While PACM has started working on large-scale crediting, conceptual work on jurisdictional crediting is likely to take more time as UNFCCC and SBM capacities remain absorbed by updating methodologies and standards for projects and programmes, as well as building up the activity portfolio (see section 4). Ongoing debates around how to address reversal risks as well as the deferral of further Art.6.4 negotiations about the role of emissions avoidance further complicate a short term integration of REDD+ into PACM. However, it seems evident that Verra, ART TREES and other crediting programmes will continue to advance jurisdictional REDD+, complemented by demand aggregators such as the LEAF Coalition. **Similar to ongoing work e.g. at the Gold Standard, these initiatives should aim at aligning their methodology improvements with Art.6.4 quality principles regarding baselines and additionality described in the previous section.** Conversely, conceptual work on jurisdictional crediting under Art.6.4 should seek to fully build on work in non-state crediting mechanisms as well as results-based climate finance and **make recommendations which elements from existing jurisdictional REDD+ methodologies can be integrated into PACM (e.g. governance, role of country-specific activity data)**, and which ones require further updates (baselines, additionality, and reversal risks as elaborated above). This would also facilitate a potential future integration of jurisdictional REDD+ into PACM.

6. Key insights on the state of play of upscaled crediting and recommendations for enhancing implementation through PACM

This section discusses key take-aways from the qualitative and quantitative analysis including the case studies in order to take stock of the current state of play of all types of upscaled crediting (programmatic, policy, jurisdictional and sectoral crediting). Moreover, we identify practical and strategic recommendations regarding the appropriateness of specific types of upscaled crediting under PACM as well as Art.6.2 approaches (for which well-designed PACM elements may serve as a benchmark).

6.1. Discussion of the state of play and key gaps of upscaled crediting

The report shows that there is already substantial experience with upscaled crediting, even though practical implementation has so far been delivered primarily through programmatic crediting for a wide range of sectors, with a strong methodological and regulatory foundation in both CDM and non-state crediting programmes. Therefore, the typology of upscaled crediting with four different types (programmatic, policy, jurisdictional, sectoral) works well in real world carbon market contexts even though some overlaps between sectoral and jurisdictional crediting may benefit from further clarity.

Upscaled crediting has been shown to have the potential to help close the global mitigation ambition gap by moving more systematically beyond single carbon market projects to programmatic, policy, jurisdictional and sectoral approaches that aggregate mitigation actions across technologies, actors and geographies, in support of host country NDCs. The empirical data clearly shows the potential of **programmatic approaches** to deliver mitigation outcomes at scale, even if only few programmes have achieved this to date. Still, **PoAs are the most immediately "issuance-ready" upscaled crediting approach for PACM, with tested rules, and a sizeable activity portfolio both from the transition from CDM to PACM as well as new activities that have expressed prior consideration to register with PACM.** Under the CDM, several hundred PoAs were registered, showing that large, multi-year, multi-country aggregation can work in practice**. PoAs have proven particularly effective for household energy efficiency, distributed renewables and methane management, where numerous replicable units benefit from standardized MRV, sampling and streamlined inclusion rules.** This approach has been applied to both small- and large-scale activity types. A considerable subset of these PoAs has requested transition and/or obtained host-party approval for PACM. Moreover, the temporary measures applied to CDM after 2020 has prevented a substantial share of 2021-2025 mitigation outcomes from being issued under

CDM, which will become available under PACM once the transition has been completed. Open questions about host party approval render it speculative to predict the volume of resulting mitigation outcomes, but the deadline for providing this approval by June 2026 is imminent and will provide further clarity. However, the emerging geographical distribution of the PACM portfolio but also other Article 6 approaches is encouraging. While Asia continues to dominate, African countries have a much stronger presence than in early CDM days, with East Africa hosting a sizable share of programmatic activities, of which many have already received host party approval for transitioning to PACM. Moreover, emerging green technologies such as electric cooking and mobility, but also other productive use applications of renewable energy such as solar irrigation and sustainable cooling have become more accessible and are already more visible in the PACM prior consideration portfolio, signalling interest among project developers. Truly high-hanging fruit such as engineered CDR activity types are likely to surface in PACM on a project level, but demand is likely to remain limited due to high costs unless there are sovereign compliance demand emerging e.g. from the EU or the UK as well as supportive host country policies and incentives as pioneered by India in the Global South.

However, the lack of approved PACM methodologies remains a key barrier for implementing new activities in the short term. As it will likely take several years to have a comprehensive toolkit of PACM methodologies and complementary regulatory standards, these gaps may continue to be filled by non-state crediting programmes, which are already in the process of aligning with the PA rulebook as well as further evolving towards upscaled crediting. Whether these PACM methodologies meet expectations about strengthened environmental and social integrity based on the Art.6.4 RMP will also impact the acceptance of PACM and therefore demand signals substantially. Finally, it is encouraging that the SBM has decided to take up conceptual work on large-scale crediting. While this initially continues to focus on programmatic approaches, it is expected to also concentrate on other types of upscaled crediting in the medium term. The combination of programmatic approaches with policy instruments, offtake agreements, and access to finance as pioneered by GGGI CFIP shows how carbon market implementation can build on road-tested concepts such as programmatic crediting while enhancing effectiveness through an integrated approach which also has the benefit of avoiding some shortcomings of policy crediting (attribution). **Such lessons should be considered in future PACM rules e.g. on the additionality of upscaled crediting approaches and should be explored in detail in the technical concept note on large-scale crediting which is to be prepared by the MEP.** Once more resources become available for the UNFCCC Secretariat e.g. from the Art.6.4 administrative share of proceeds and other fees, these may be dedicated to advance the role of upscaled crediting in PACM, focusing on jurisdictional approaches as well as sectoral approaches where data availability allows to establish clear benchmarks and other relevant features.

Jurisdictional crediting has generated substantial experience in REDD+ but has only generated limited experience in the energy sector. These have been, however, more recent than REDD+ and hold significant promise if they mature further by aligning further with the Article 6 rulebook and are being complemented by enabling conditions. Jurisdictional approaches have thus demonstrated their ability to deliver substantial volumes of mitigation outcomes but continue to be subject to discussions about their integrity (baseline conservativeness, additionality, permanence, leakage and benefit-sharing), even though improvements have recently been achieved. Aligning jurisdictional REDD+ methodologies further with the high level quality principles in the Article 6.4 RMP on baselines, additionality and reversal risks has the potential to reduce or eliminate the criticism of previous REDD+ approaches and improve their acceptance among major buyers.

Still, the stronger role of governments in jurisdictional approaches holds significant promise for putting in place key enabling conditions, in particular policy and regulatory reforms and incentives, which are crucial for the structural transformation required to deliver mitigation at scale. **A key lesson for PACM is therefore to not defer conceptual work on jurisdictional approaches, but to thoroughly explore existing experiences with REDD+ and the energy transition already in the upcoming work on large-scale crediting, taking into account both promises but also critical views.** Key issues that deserve attention include establishing conservative, transparent baselines (with ex post adjustments), additionality, addressing reversal risks, transparent MRV aligned with national GHG inventories and NDC accounting and reporting through BTRs.

Policy crediting remains largely a theoretical discussion even though there are some pioneering efforts, notably by Norway and GGGI, as well as by the World Bank to deploy policy crediting. Recent transaction structures of the NACA fund and CFIP in Zambia demonstrate how programmatic approaches can be supported by policies, finance and capacity building. This aligns also with the recently approved Gold Standard approach. Early policy crediting pilots show the potential to mobilize large-scale mitigation outcomes and structural transformation, but they also expose methodological sensitivities, especially related to the attribution of outcomes to a policy (amid multiple drivers), robust baseline modelling, and a credible treatment of additionality at both the policy instrument and the underlying activity levels. Governance risks also need to be addressed especially under Art.6.2 approaches, if the same institution designs, implements and purchases credits. Crediting programmes (both PACM and non-state) can add value by providing independent checks and balances (e.g. methodology approval, validation and verification). Until those guardrails and improved methodological features are put in place, policy crediting should be advanced through conceptual work and targeted pilots to generate further experience on dealing with key stumbling blocks such as the challenge of attributing mitigation outcomes to policy instruments, rather than system-wide roll-out. The MEP concept paper should reflect on the relevance of policy crediting based on the current state of play, without prioritizing practical implementation of PACM

through policy crediting in the short term, due to unresolved questions. However, how policy instruments that are combined with projects, programmes or other upscaled approaches is a key aspect for determining additionality, and should also take into account historical debates such as the E+/E- policies in the CDM mentioned in section 2.

Sectoral crediting shows some overlaps with programmatic, jurisdictional, and policy-crediting, but offers potential especially for homogeneous, point-source emissions (e.g., nitric acid, cement, steel, grid electricity), using benchmark based on best-available technologies if robust sector data is available. **Past initiatives that shifted away from crediting (e.g. NACAG) underscore the remaining gaps in credible MRV architectures, governance and sectoral oversight, as well as host-country commitment to manage leakage and deliver structural reforms, likely not least due to unclear prospects for mobilizing predictable carbon finance at the scale and timeframes required.** For PACM, early sectoral efforts should focus on where methodologies and data are most mature (e.g., large point-source methane, industrial N_2O).

However, currently PACM is lacking regulatory provisions for upscaled crediting with the notable exception of methodologies and regulatory standards for programmatic crediting.. The option to provide bottom-up methodology submission is encouraging, as it can accelerate the uptake of high-hanging fruit such as green hydrogen, which are already under development for PACM. Moreover, there is precedent for the mutual interaction between non-state crediting programmes and UNFCCC Mechanisms, e.g. for PoAs and micro-scale. Building on methodological experience in both CDM and non-state crediting programmes activity types that are relevant for upscaled crediting can rapidly expand the PACM's methodological toolkit once capacities at the Secretariat have been established.

6.2. Recommendations

The findings presented above lead to a set of actionable recommendations for how upscaled crediting approaches can be firmly integrated into PACM. These recommendations are building on current ongoing regulatory developments at PACM as well as other pilots for upscaled crediting.

Recommendation 1: Focus on and accelerate the completion of the regulatory framework for programmatic approaches in PACM

Experience with programmatic approaches is comprehensive, and it would be strategically wise to prioritize accelerating the update of PACM regulatory standards in the short termto enable the implementation of programmatic approaches. This has been elaborated in detail in section 4.2 and includes additionality, baselines, leakage, non-permanence, and suppressed demand standards sampling & surveys standards to cover PoAs. This would enable existing programmes to expand once fully registered with PACM, and once methodologies have become available. Existing experience in the CDM enables the UNFCCC Secretariat and SBM to immediately update and

implement existing PACM rules and standards. The conceptual work on large-scale crediting should further explore how programmatic approaches can be combined with supportive policy instruments, access to finance and capacity building, as pioneered e.g. by CFIP in Zambia.. Such integrated approaches accelerate implementation and can be taken forward in bilateral cooperation and non-state crediting programmes as long as PACM does not yet provide the required methodologies. An additional conceptual question that deserves more attention is how activity types relevant for upscaled crediting can **move more systematically from a project based to a programmatic or even sectoral or jurisdictional approach.** The waste sector is a case in point as elaborated in section 5.3 as it has generated large volumes of credits before and is structurally implemented and overseen by the public sector, especially municipalities. Previous innovative approaches such as the Pilot Auction Facility as well as ongoing efforts such as the Global Methane Pledge (a coalition of 159 countries aiming to reduce methane emissions) offer insights and entry points for large-scale crediting activity design.

Recommendation 2: Accelerate the development and updating of PACM methodologies that are fit-for-purpose regarding upscaled crediting.

The methodology update process is taking substantial time. The absence of crucial methodologies e.g. for electric mobility in the SBM and MEP work plan clearly demonstrates that more efforts are needed to enable such technologies to be supported by PACM. While the UNFCCC is currently structurally underfunded, this situation is likely to change when revenues from the administrative share of proceeds begins to flow once credit issuance materializes at scale. However, development partners could also choose to provide more resources to the UNFCCC Secretariat. Moreover, methodology development can also be conducted in a bottom-up approach where existing methodologies from CDM and other crediting programmes are being updated by external experts to meet all Art.6.4 requirements and are then submitted to UNFCCC for approval. The same applies to the development of new methodologies, which is already underway for instance for green ammonia-based fertilizer production, an activity type not seen under CDM. Activity types that are particularly relevant for upscaled crediting should be prioritized here. However, both generating experience in other crediting programmes (aligned with PACM RMP) as well as engaging with PACM either through bottom-up methodology development or other types of cooperation with the UNFCCC Secretariat are needed to enable new PACM activities relevant for upscaled crediting to enter the activity cycle. **This interplay between PACM and non-state crediting programmes can accelerate methodological progress, as even during CDM the mutual acceptance of methodologies was common practice.** This means that methodologies approved under Gold Standard, Verra or other crediting programmes can be integrated later into PACM, which helps to overcome bottlenecks in the capacity of the UNFCCC Secretariat. Standardized baselines have already been developed in the CDM and are also included in the Art.6.4 RMP. Therefore, developing national or regional sector-specific standardized baselines can also benefit upscaled crediting as they harmonize MRV for carbon market activities and reduce the need for data collection. **The**

combination of programmatic approaches and standardized baselines can therefore simplify the technical design of upscaled crediting approaches.

Recommendation 3: Prioritise host countries and activity types that have demonstrated their readiness and ability to deliver mitigation outcomes at scale

Focus capacity building, investments, and offtake commitments on countries and regions that have existing activity pipelines and Article 6 participation requirements already in place. This includes for instance the substantial CDM transition portfolio in Eastern Africa. Existing initiatives such as Ci-Dev have established strong foundations through existing programmes that are already designed to support multiple technologies and can be scaled further. COP32 in Ethiopia in 2027 is likely to shine a spotlight on this region, and regional governments have established ambitious NDCs, national Article 6 frameworks, and regional capacity building initiatives such as the Eastern African Alliance on Carbon Markets and Climate Finance. Moreover, the partnership between the UK, Kenya and other countries in the Coalition to Grow Markets holds substantial promise for deeper collaboration. This also applies to South and South-East Asia, where host party approvals and CPA density are high, and the forest sector, energy transition and industry decarbonization are all of high priority. Regional institutions such as ASEAN can also harmonize Article 6 readiness and implementation approaches. Such partnership should also integrate sustainable development impacts and safeguards, potentially building on the Article 6.4 SD Tool (SD impacts, safeguards, grievance mechanism). Capturing lesson from climate and development finance can, for instance allow for a stronger consideration of gender equity in order not only to address environmental, but also social integrity.

Structural features such as substantial forest covers or high potential to decarbonize their power systems also provide entry points for advancing the practical implementation of upscaled crediting through PACM. While it seems unlikely that jurisdictional REDD+ will be integrated into PACM in the short term, PACM can potentially support certain elements that are important for REDD+, once methodological progress has been achieved. This includes in particular afforestation and reforestation, which have already been included in the CDM and are also an element of REDD+. In particular in countries where jurisdictional REDD+ is already under implementation at subnational level, a potential expansion to national jurisdictional approaches may mean that projects or programmes may need to be absorbed into national approaches. Similarly, PACM may not immediately support jurisdictional approaches to the energy transition. However, Just Energy Transition Partnership (JETP) countries may provide opportunities for a fast and comprehensive push towards expanding renewable energy, storage and transmissions lines.

Recommendation 4: Strengthening environmental and social integrity by aligning upscaled crediting pilot activities with Art.6.4 and the broader PA rulebook.

Existing activities in the forest and energy sector require further strengthening to proactively address integrity concerns and alignment with the PA rulebook to unlock their full potential. This includes methodological aspects (in particular baselines below BAU, additionality), but also governance and NDC alignment. Demonstrating high integrity carbon market approaches for the energy transition and forest conservation that is fully aligned with the long-term objectives and rules of the Paris Agreement can strengthen the confidence in carbon markets as an effective policy instrument. However, it is important to treat these activities explicitly as pilots that serve to generate experience, which means they should be complemented by time-bound reviews and evaluation, as well as further adjustments in line with developments in PACM and further global carbon market dynamics, including non-state initiatives such as VCMI and IC-VCMI. In particular safeguards and the grievance mechanism are new features, for which experience will build once the activity portfolio expands. REDD+ implementation experience suggests that applying robust safeguards requires careful attention and a willingness to pay appropriate carbon prices which allow host country jurisdictions and their implementation partners to meaningfully establish and operate such institutional features. Moreover, new issues regarding social integrity such as strengthening gender equity and national benefit-sharing mechanisms are new developments that need to be watched closely.

Recommendation 5: Establish and harmonize buyer clubs to provide certainty on long term demand at scale

Upscaled crediting aims at structural transformation and demands policy reforms. Carbon prices have historically been highly volatile, with significant policy shifts among major buyers such as the EU. The architecture of the Paris Agreement has been designed to serve in the long term, and NDCs are expected to increase their ambition continually over time. If carbon markets are to make a substantial contribution to strengthening ambition, they need to become a more predictable source of finance and strengthen investment certainty. This means that both providing finance at scale for upfront capex investments and reliable demand and offtake agreements are needed. While this is true for any type of carbon market activity, it is even more essential for upscaled crediting, especially if large-scale investments in energy, transport or waste management infrastructure with long payback periods are needed. Therefore, blended finance approaches are needed to combine access to upfront with results-based finance. This could be achieved through different instruments such as **multi-decadal advance sale contracts** or **price floors** for carbon market activities but will need to be tailored to the specific features of specific activities. Such approaches also have potential to accelerate the deployment of early-stage technologies that are still expensive but required for structural transformation e.g. green hydrogen and CCU/S for industry decarbonisation.

Recommendation 6: Develop a carbon pricing policy crediting pilot including PACM methodology submission

In order to test additionality determination and baseline setting for a concrete carbon pricing policy, the introduction of a carbon tax in a medium-scale jurisdiction should be undertaken as policy crediting pilot. This should entail the development and submission of a baseline and monitoring methodology to the PACM.

In closing, upscaled crediting holds substantial potential to strengthen global NDC ambition through well-designed carbon markets. The Paris Agreement rulebook and specifically the rules for PACM have significantly strengthened carbon markets by addressing concerns about overcrediting and non-additionality. Still, these rules require further elaboration of guidance, methodologies, as well as broader implementation and demand signals in an iterative process that captures lessons from real-world implementation to updating and strengthening PACM regulatory standards that can deliver upscaled crediting with high social and environmental integrity. However, this remains work in progress, and substantial technical work and mobilization of finance will be required for this potential to materialize. It is crucially important to prevent reputational damage of carbon markets due to insufficient social and environmental integrity in methodologies for specific activity types as that would risk the legitimacy of carbon market overall. Past scandals and controversies have led to the downfall of carbon markets in the past. Repeating such mistakes would render the carbon markets unavailable for much-needed mitigation ambition increases, as it took years to strengthen the UNFCCC rules in order to overcome past shortcomings. However, existing foundations in conceptual work, carbon market rules and the activity portfolio are encouraging and can be further strengthened both through PACM and beyond. The Coalition to Grow Markets and similar initiatives are well-placed to make a key difference as they deepen cooperation between buyer and seller countries which is crucial for nurturing long term partnerships that enhance their mutual understanding of respective needs and priorities.

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Annex A: Additional data and information on CDM activities

This annex provides supplementary data and evidence to support the analysis and conclusions presented in the report. These tables and figures have been taken out of the main report in order to enhance readability and flow of the argument. Still, they add valuable information on which the analysis in the report builds. The tables and figures are clearly assigned to specific sections in the report to enable the reader to quickly access relevant data and information.

Chapter 2.2: Multi-country PoA data

Table 10: Multi-country PoA characteristics

Number of countries covered by the PoAs	Registered PoAs	Registered PoAs with > 1 CPA per country	PoAs with issuance	PoAs with issuance >1CPA per country
2 countries	22	3	10	3
3 to 4 countries	15	7	5	6
5 to 9 countries	8	1	4	1
10 or more countries	2	1	2	1
TOTAL	**47**	**12**	**21**	**11**

Source: Authors, based on UNEP CCC 2026

Chapter 2.2: PoA data showing distribution of activity types for CDM activities

Table 11: PoA distribution by activity type

Activity type	Count of PA/PoA
Agriculture	2
Biomass Energy	9
Coal bed/mine methane	2
EE households	108
EE Industry	6
EE service	12
EE supply side	1
Energy distribution	5
Fossil fuel switch	3
Fugitive	3
Geothermal	2
Hydro	31
Landfill gas	11
Methane avoidance	48

Activity type	Count of PA/PoA
Mixed renewables	29
Reforestation	1
Solar	58
Transport	6
Wind	16
Grand Total	**353**

Source: Authors, based on UNEP CCC 2026

Chapter 2.2: Coordinating/Managing Entities (CMEs) data

Figure 8: Top 10 CMEs by PoA count

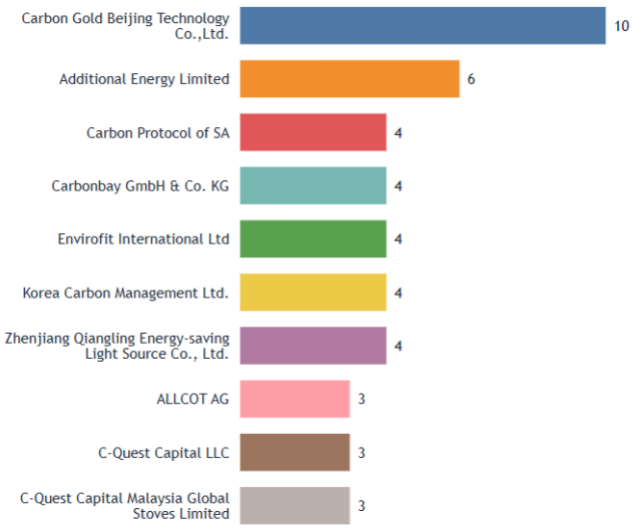
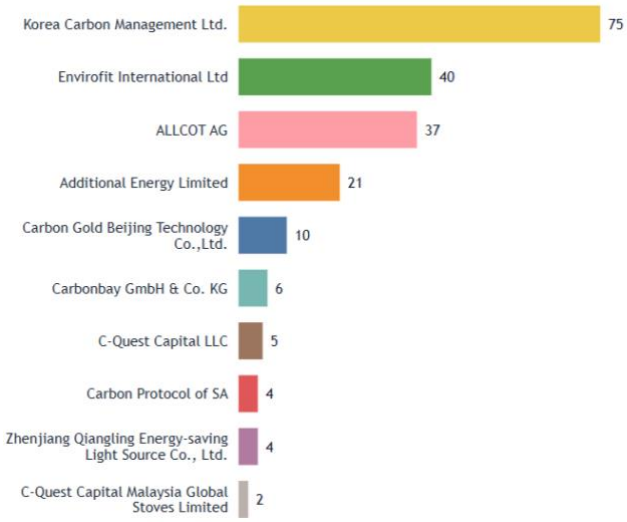
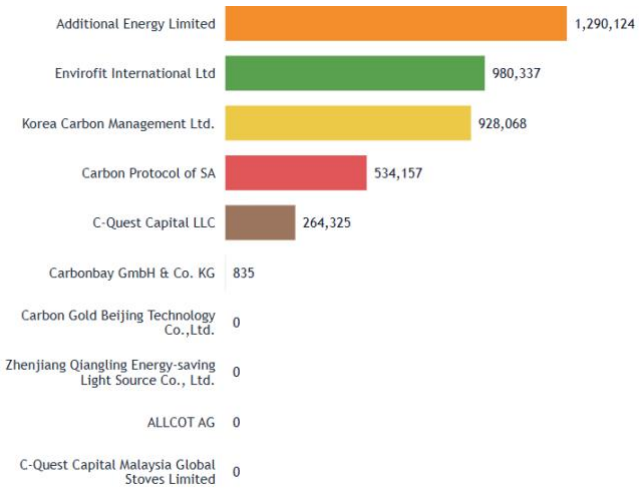


Figure 9: CPA count for PoAs managed by CMEs



Source: Authors, based on UNFCCC CDM 2026

Figure 10: Total credits issued per CME



Source: Authors, based on UNFCCC CDM 2026

Figure 11 2: Yearly CER issuances per CME

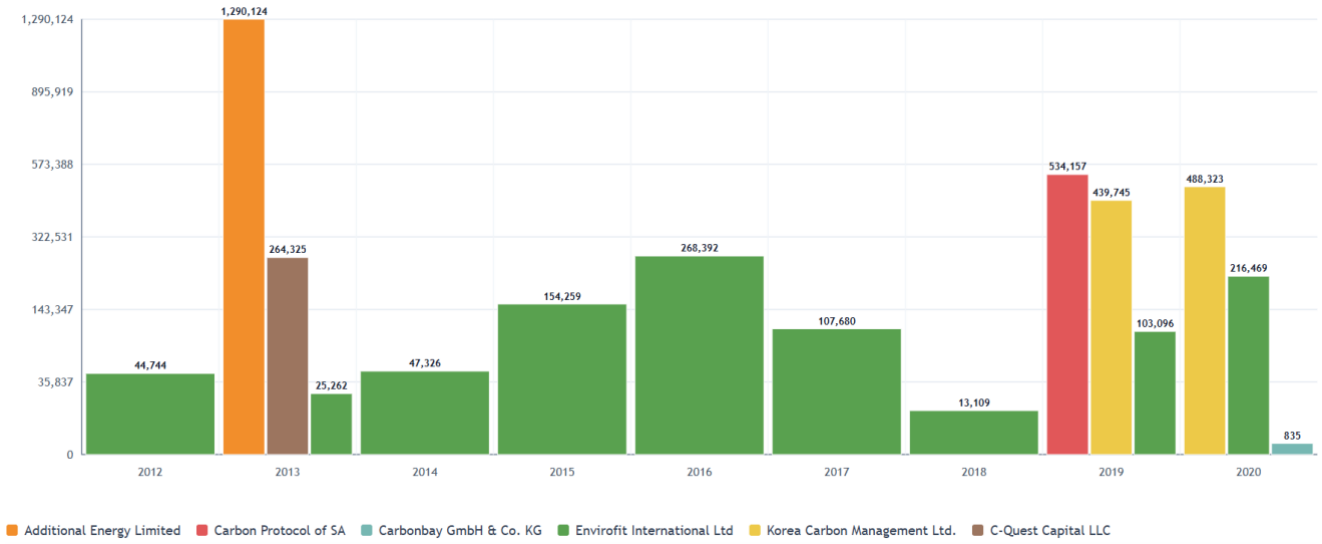
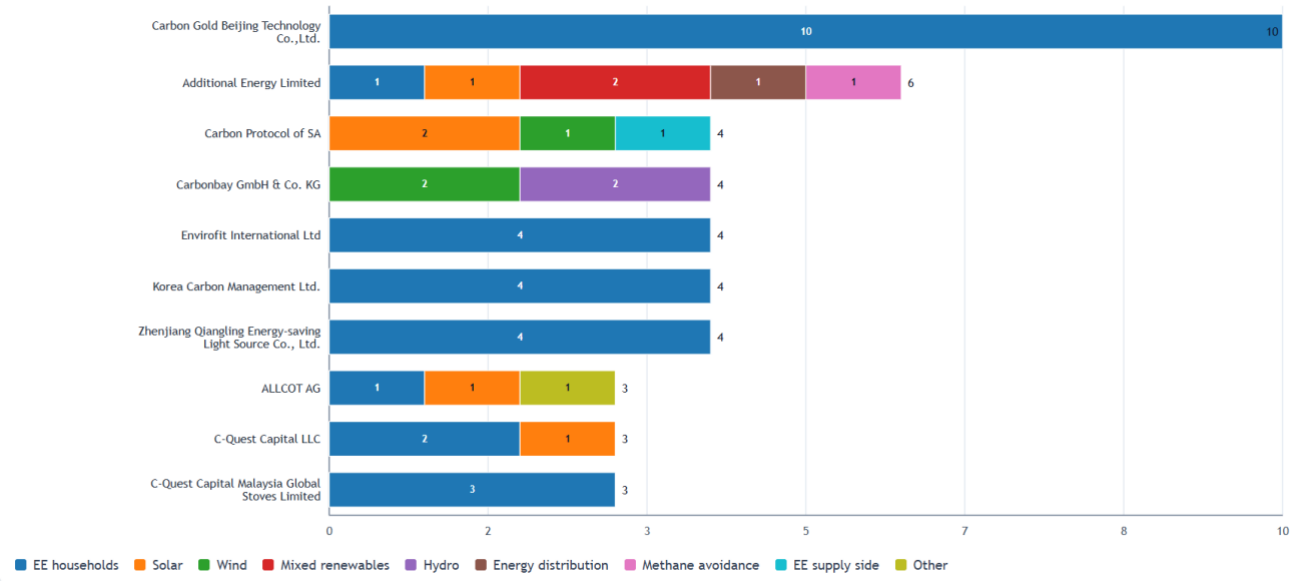


Figure 12 3: Breakdown by activity type



Chapter 4.1: CDM PoA distribution, activity types and their transition status

Table 12: CDM PoA distribution by activity type and sub-type

Activity types/Sub-type	Count of PA/PoA	Activity types/Sub-type	Count of PA/PoA
Agriculture	2	Hydro	31
Irrigation	1	Existing dam	1
Rice crops	1	New dam	3
Biomass Energy	9	Run of river	25
Agricultural residues: other kinds	2	Run of river+new dam	2
Agricultural residues: rice husk	2	Landfill gas	11
Biomass briquettes	1	Biogas from MSW	1
Forest residues: other	1	Integrated solid waste management	1
Gasification of biomass	1	Landfill composting	2
Palm oil solid waste	1	Landfill flaring	1
Switch from fossil fuel to piped biogas	1	Landfill power	6
Coal bed/mine methane	2	Methane avoidance	48
CMM & Ventilation Air Methane	1	Composting	4
Coal Mine Methane	1	Domestic manure	13
EE households	108	Manure	17

Appliances	5	Palm oil waste	7
Biogas from MSW	1	Waste water	7
EE public buildings	1	Mixed renewables	29
Lighting	24	Hydro	1
Stoves	76	Run of river	1
Water purification	1	Solar & Hydro	1
EE Industry	6	Solar & wind	9
Building materials	2	Solar & wind & hydro	5
Construction	1	Solar & wind & other	8
Iron & steel	2	Solar PV	3
Textiles	1	Wind & Solar	1
EE service	12	Reforestation	1
EE commercial buildings	1	Mangroves	1
Lighting in service	3	Solar	58
Street lighting	2	Geothermal electricity+Wind+Tidal+Solar PV+Solar thermal power	1
Water purification	6	Solar & wind	1
EE supply side	1	Solar & wind & other	1
Cogeneration	1	Solar lamps	10
Energy distribution	5	Solar PV	33
Connection of isolated grid	1	Solar PV water disinfection	1
Efficient electricity distribution	4	Solar thermal power	1
Fossil fuel switch	3	Solar water heating	10
Oil to LPG	1	Transport	6
Oil to natural gas	2	Mode shift: road to rail	3
Fugitive	3	More efficient vehicles	2
Charcoal production	1	Scrapping old vehicles	1
Oil field flaring reduction	2	Wind	16
Geothermal	2	Wind	16
Geothermal electricity	1	Grand Total	353
Geothermal heating	1		

Source: Authors, based on UNEP CCC (2026)

Table 13: Activity type distribution and their transition status

Activities requesting transition					Host Party Approved (as of Feb 2026)				
Activity type	**PA**	**PoA**	**CPA**	**Grand Total**	**Activity type**	**PA**	**PoA**	**CPA**	**Grand Total**
Afforestation	2			2	Afforestation	1			1
Agriculture	1	3		1	Agriculture				0
Biomass Energy	58	3	6	64	Biomass Energy	8	1	1	9
CO2 usage	1			1	CO2 usage				0
Coal bed/mine methane	5			5	Coal bed/mine methane				0

EE households	5	50	526	531	EE households	1	24	294	295
EE Industry	5	2		5	EE Industry	2	1		2
EE own generation	26			26	EE own generation	1			1
EE service	13	4	128	141	EE service		3	77	77
EE supply side	3			3	EE supply side				0
Energy distribution		2	3	3	Energy distribution		2	3	3
Fossil fuel switch	12			12	Fossil fuel switch				0
Fugitive	11	1		11	Fugitive	6			6
Geothermal	11	1		11	Geothermal	5			5
HFCs	1			1	HFCs				0
Hydro	272	7	30	302	Hydro	25	3	15	40
Landfill gas	59	6	17	76	Landfill gas	11	1	3	14
Methane avoidance	39	3	46	85	Methane avoidance	4	1	10	14
Mixed renewables	4	17	93	97	Mixed renewables		2	12	12
N2O	24			24	N2O	3			3
PFCs and SF6	2			2	PFCs and SF6				0
Reforestation	8	1	1	9	Reforestation	2			2
Solar	111	12	77	188	Solar	9	3	15	24
Tidal	1			1	Tidal				0
Transport	2	3	4	6	Transport		1		0
Wind	713	4	23	736	Wind	18			18
Grand Total	**1389**	**119**	**954**	**2343**	**Grand Total**	**96**	**42**	**430**	**526**

Source: Authors, based on UNEP CCC 2026

Chapter 4.1. Geographic distribution of Host Party approved activities

Table 14: Activity type by geographic distribution and sum of annual reductions

Host Party Approved (as of Feb 2026)					
Sub-region	**PA**	**PoA**	**CPA**	**Count of activities (PA+CPA)**	**Sum of Planned Annual Reductions (ktCO2e/yr)**
Africa					
Eastern Africa	**11**	**12**	**277**	**288**	**17,919**
EE households	1	8	194	195	10477
EE service	-	-	75	75	4032
Energy distribution	-	2	3	3	472
Geothermal	3	-	-	3	1370
Hydro	3	1	3	6	635
Reforestation	2	-	-	2	115
Solar	-	1	2	2	66
Wind	2	-	-	2	752
Southern Africa	-	**4**	**11**	**11**	**2,423**
Biomass Energy	-	1	1	1	274
Landfill gas	-	1	3	3	233
Mixed renewables	-	1	7	7	1916
Solar	-	1		0	0
Western Africa	**1**	**5**	**23**	**24**	**1,730**
EE households	-	5	23	23	1710

Host Party Approved (as of Feb 2026)					
Sub-region	PA	PoA	CPA	Count of activities (PA+CPA)	Sum of Planned Annual Reductions (ktCO2e/yr)
Solar	1	-	-	1	20
Asia					
South-Eastern Asia	**4**	**2**	**56**	**60**	**3,209**
EE households	-	2	56	56	2279
Hydro	2	-	-	2	884
Landfill gas	2	-	-	2	47
Southern Asia	**28**	**10**	**63**	**91**	**36,568**
EE households	-	3	21	21	17855
EE Industry	2	1	-	2	95
EE own generation	1	-	-	1	29
EE service	-	1	2	2	26
Fugitive	5	-	-	5	8317
Hydro	7	2	12	19	7815
Landfill gas	1	-	-	1	140
Methane avoidance	4	1	10	14	832
Mixed renewables	-	1	5	5	445
Solar	1	1	13	14	668
Wind	7	-	-	7	346
Western Asia	**6**	-	-	**6**	**1,571**
Fugitive	1	-	-	1	433
Hydro	2	-	-	2	652
Landfill gas	3	-	-	3	487
Americas					
Caribbean	**2**	-	-	2	**136**
Wind	2	-	-	2	136
Central America	**7**	-	-	7	**774**
Geothermal	1	-	-	1	140
Hydro	4	-	-	4	183
Wind	2	-	-	2	451
South America	**35**	-	-	**35**	**4,447**
Afforestation	1			1	22
Biomass Energy	8	-	-	8	718
Geothermal	1	-	-	1	376
Hydro	7	-	-	7	954
Landfill gas	5	-	-	5	649
N2O	2	-	-	2	1036
Solar	6	-	-	6	85
Wind	5	-	-	5	607
multiple		**8**		**0**	**0**
EE households	-	6	-	0	0
EE service	-	2	-	0	0
Northern Africa	**2**	**1**	-	**2**	**1,390**
N2O	1	-	-	1	1111
Solar	1	-	-	1	279
Transport	-	1	-	0	0
Grand Total	**96**	**42**	**430**	**526**	**70,168**

Source: Authors, based on UNEP CCC 2026

Table 15: Activity types and their sub-types

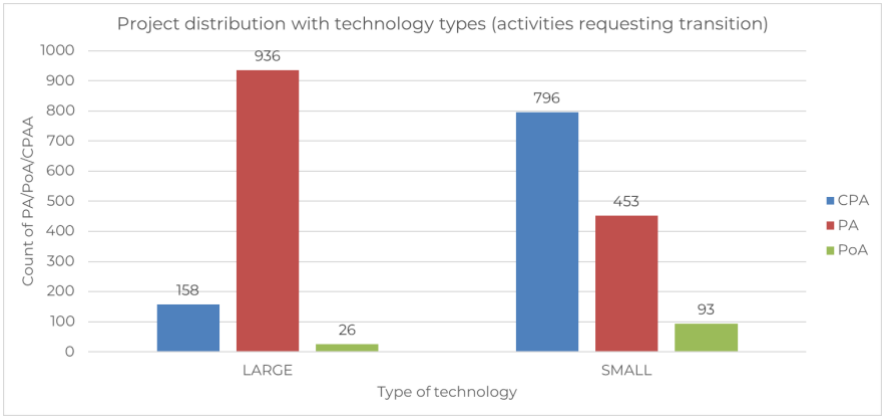
Host party approved activities (as of Feb 2026)				
Activity types	PA	PoA	CPA	Grand Total
Afforestation	**1**			**1**
Biomass Energy	**8**	**1**	**1**	**10**
Agricultural residues: other kinds		**1**	**1**	**2**
Black liquor	**3**			**3**
Forest residues: sawmill waste	**5**			**5**
EE households	**1**	**24**	**294**	**319**
Appliances		**1**		**1**
Biogas from MSW		**1**	**1**	**2**
Stoves	**1**	**22**	**293**	**316**
EE Industry	**2**	**1**		**3**
Building materials	**2**	**1**		**3**
EE own generation	**1**			**1**
Cement heat	**1**			**1**
EE service		**3**	**77**	**80**
Water purification		**3**	**77**	**80**
Energy distribution		**2**	**3**	**5**
Connection of isolated grid		**1**	**2**	**3**
Efficient electricity distribution		**1**	**1**	**2**
Fugitive	**6**			**6**
Natural gas pipelines	**5**			**5**
Oil field flaring reduction	**1**			**1**
Geothermal	**5**			**5**
Geothermal electricity	**5**			**5**
Hydro	**25**	**3**	**15**	**43**
Existing dam	**2**			**2**
Run of river	**23**	**3**	**15**	**41**
Landfill gas	**11**	**1**	**3**	**15**
Landfill flaring	**4**			**4**
Landfill power	**7**	**1**	**3**	**11**
Methane avoidance	**4**	**1**	**10**	**15**
Domestic manure	**4**	**1**	**10**	**15**

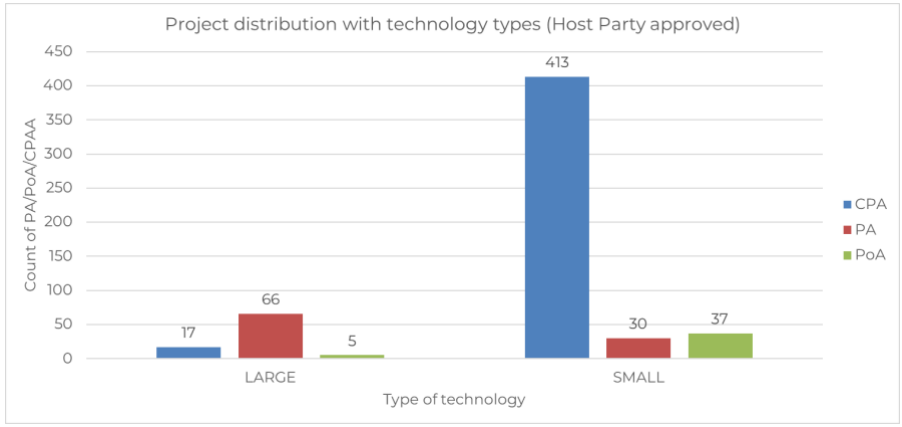
Host party approved activities (as of Feb 2026)				
Activity types	PA	PoA	CPA	Grand Total
Mixed renewables		**2**	**12**	**14**
Solar & wind		**1**	**7**	**8**
Solar & wind & hydro		**1**	**5**	**6**
N2O	**3**			**3**
Nitric acid	**3**			**3**
Reforestation	**2**			**2**
Solar	**9**	**3**	**15**	**27**
Solar lamps		**1**	**2**	**3**
Solar PV	**8**	**2**	**13**	**23**
Solar thermal power	**1**			**1**
Transport		**1**		**1**
Scrapping old vehicles		**1**		**1**
Wind	**18**			**18**
Grand Total	**96**	**42**	**430**	**568**

Source: Authors, based on UNEP CCC (2026)

Chapter 4.1: CDM data on technology type, vintages and their transition status

Figure 13: Technology type distribution - activities requesting transition vs Host party approved activities



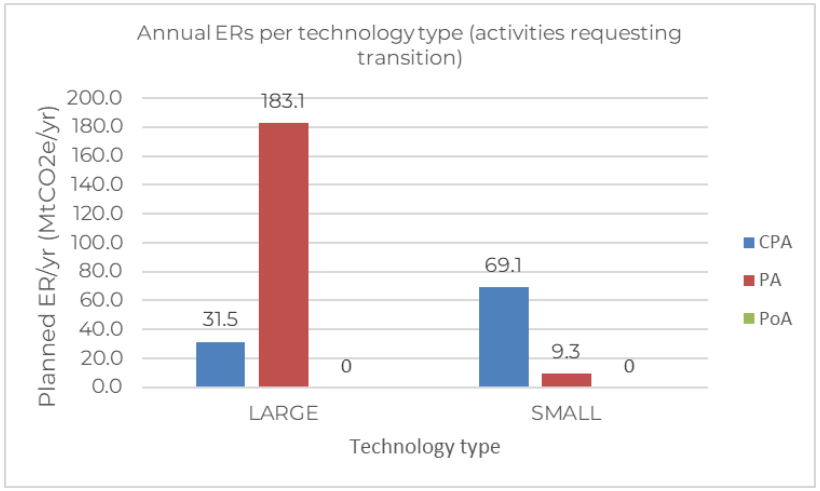


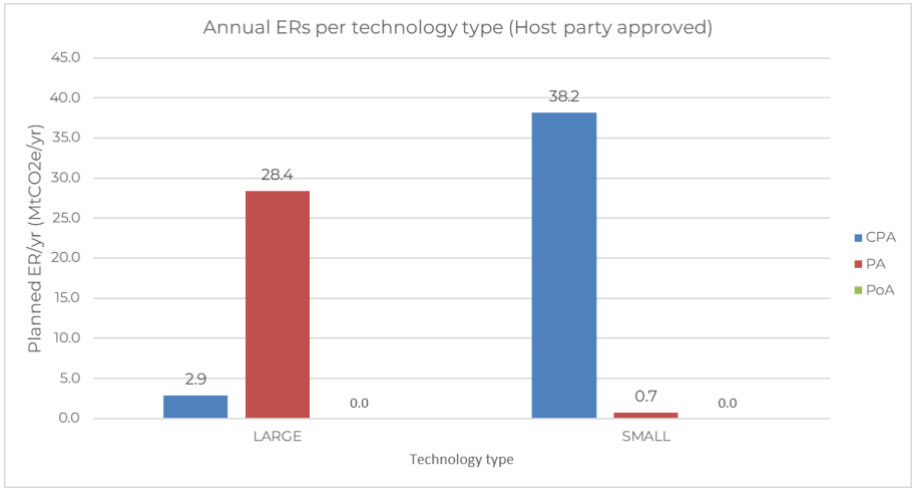
Source: Authors, based on UNEP CCC 2026

For activities requesting transition, large technologies are dominated by standalone project activities (PAs) (936), with comparatively few CPAs (158) and PoAs (26), suggesting that most "large" transition demand sits in traditional, project-by-project structures. By contrast, small technologies are much more programmatic and granular: they account for the majority of CPAs (796) and a higher number of PoAs (93), even though they have fewer standalone PAs (453).

The host-party-approved portfolio is dominated by small activities in terms of count, but not necessarily in terms of emissions impact per activity. Out of 568 approved activities, 480 are small (vs 88 large), and this skew is especially strong for CPAs: 413 small CPAs compared to only 17 large CPAs. This matters for upscaled crediting which is likely to come from aggregating activities – large and small scale – under programmatic structures.

Figure 14: Project type and sum of sum of annual reductions activities requesting transition vs Host party approved activities





Source: Authors, based on UNEP CCC 2026

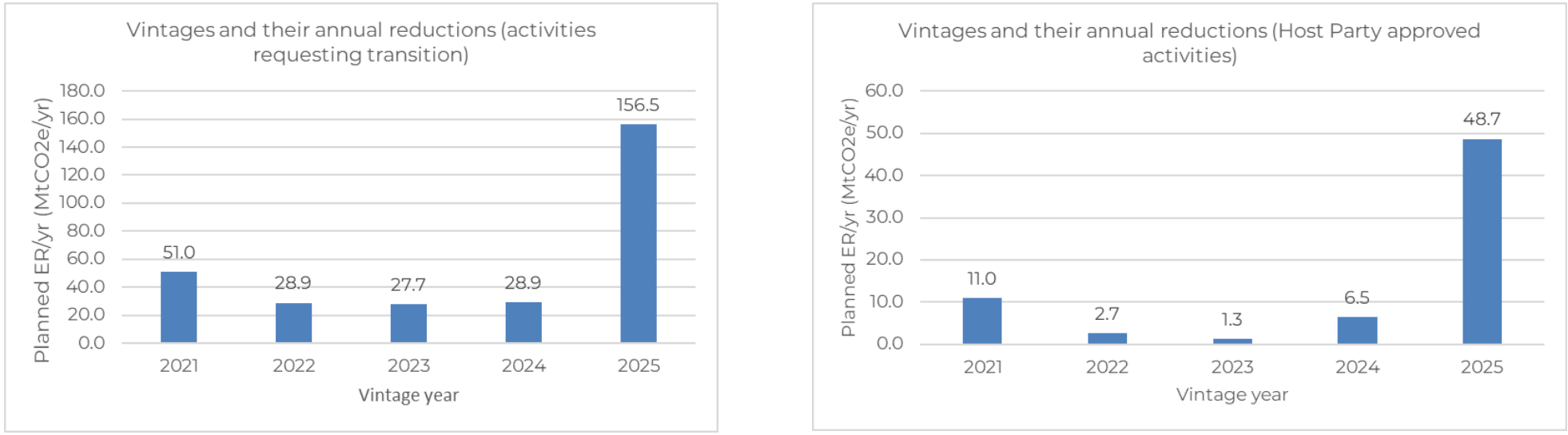
Activities requesting transition show a clear split by technology type: large technologies are predominantly represented as standalone PAs, whereas small technologies are largely represented through CPAs (and a higher presence of PoAs). This pattern suggests two distinct transition pathways, one driven by individual, project-by-project submissions for large technologies, and another driven by programmatic aggregation for small technologies, where scale is achieved through the repeated inclusion of many component activities under umbrella programmes.

For approved projects, the planned annual reductions are more balanced: small activities account for 38.9 million tCO_2e/yr versus 31.3 million tCO_2e/yr for large activities, but the composition differs sharply - large reductions are concentrated in a small number of PAs (28.4 million tCO_2e/yr across 66 PAs), while small reductions are driven overwhelmingly by CPAs (38.2 million tCO_2e/yr across 413 CPAs). Overall, the data suggests that an upscaled crediting strategy should prioritise CPA-heavy portfolios and the enabling systems that make high-volume, small-activity verification workable (standardisation, streamlined MRV, and efficient audit cycles), while recognising that a limited number of large PAs can still contribute sizeable volumes.

Methodologies for large-scale project activities can be used for project activities of any size, whereas small-scale methodologies can only be applied if the mitigation potential of project activities is within certain thresholds (UNFCCC 2022). Small-scale methodologies are grouped into three different types:

- Type I: Renewable energy project activities with a maximum output capacity of 15 MW (or an appropriate equivalent)
- Type II: Energy efficiency improvement project activities which reduce energy consumption, on the supply and/or demand side, with a maximum output (i.e. maximum savings) of 60 GWh per year (or an appropriate equivalent)
- Type III: Other project activities that result in emission reductions of less than or equal to 60 kt CO2 equivalent per year (UNFCCC 2022).

Figure 15: 2021 - 2025 issuances – activities requesting transition vs Host Party approved activities



Source: Authors, based on UNEP CCC 2026

Chapter 4.1: Data on prior consideration notifications

Table 16: Regional distribution of prior consideration activities by activity type

Prior consideration (as of Feb 2026)		
Activity Type	**Count of activities (PoA)**	**Sum of Planned Annual Reductions (million tCO_2e/yr)**
Asia	**153**	**270.3**
Cleaner cooking	46	55.3
Mixed renewables	22	115.6
Electric vehicles	12	57.7
Bioenergy	10	1.2
Tree plantation	9	8.9
Agriculture	8	3.9
Afforestation/Reforestation	7	1.9
Solar	6	0.7
Hydropower	6	11.0
Water purification	5	3.3
Industrial efficiency	5	1.8
Waste management	3	1.7
Green hydrogen	2	2.6
Waste to energy	2	0.8
Efficient appliances	2	1.7
Rice cultivation	2	1.1
Grid efficiency	2	0.2
Wind	1	0.1
Forest management	1	0.7
Green ammonia	1	0.1
Carbon capture	1	0.1
Africa	**55**	**258.5**
Cleaner cooking	23	23.5
Electric vehicles	14	2.1
Water purification	6	2.7
Mixed renewables	3	221.5
Efficient appliances	2	0.1
Rewilding	1	0.2
Waste to energy	1	0.1
Solar	1	3.6
Composting	1	>0
Industrial efficiency	1	>0
Bioenergy	1	0.1
Forest management	1	4.4
Americas	**17**	**5.3**
Forest management	4	1.7
Electric vehicles	4	1.0
Agriculture	3	2.4
Afforestation/Reforestation	2	0.1
Waste to energy	2	0.1

Prior consideration (as of Feb 2026)		
Activity Type	**Count of activities (PoA)**	**Sum of Planned Annual Reductions (million tCO_2e/yr)**
Tree plantation	2	>0
Europe	**2**	**>0**
Agriculture	2	>0
Multiple Region	**3**	**11.1**
Electric vehicles	3	11.1
Multiple Region	**1**	**3.5**
Landfill gas	1	3.5
Grand Total	**231**	**548.7**

Source: Authors, based on UNEP CCC 2026

Table 17: Sub Regional Distribution of Prior Consideration Activities by Activity Type

Prior consideration notification activities							
Sub Region and Activity type	**PA**	**PoA**	**Sum of Planned Annual Reductions (ktCO2e/yr)**	**Sub Region and Activity type**	**PA**	**PoA**	**Sum of Planned Annual Reductions (ktCO2e/yr)**
Southern Asia	**588**	**125**	466,025	Agriculture	**-**	4	38
Afforestation/Reforestation	12	7	7,513	Biochar	1	-	5
Agriculture	10	4	8,408	Bioenergy	5		508
Biochar	2	-	42	Electric vehicles	-	2	45
Bioenergy	105	10	8,028	Industrial efficiency	2	-	130
Carbon capture	2	1	116	Landfill gas	5		124
Cleaner cooking	75	41	148,040	Mixed renewables	-	5	27,080
Composting	3	-	125	Oil Field Gas Recovery	1	-	4,600
Efficient appliances	4	2	1,845	Solar	6	-	1,292
Electric vehicles	6	7	57,007	Waste to energy	1	1	898
Energy storage	2	-	6,099	Wind	1	-	20
Forest management	**-**	1	650	**Northern Africa**	**12**	**5**	16,433
Fossil gas leaks	1	-	1,124	Electric vehicles	-	3	390
Green ammonia	-	1	100	Mixed renewables	1	1	7,889
Green hydrogen	5	2	7,691	Nitric acid	2	-	426
Grid efficiency		2	161	Solar	5	1	6,111
Heat recovery	4	-	558	Wind	4	-	1,618
Hydropower	21	6	33,070	**Central Asia**	**11**	**1**	12,549
Industrial efficiency	2	5	1,794	Electric vehicles		1	90
Landfill gas	2	**-**	302	Fossil gas leaks	1	--	7,742
Mixed renewables	36	12	84,641	Industrial efficiency	1		39
Public transit	3	-	763	Solar	4	-	697
Rice cultivation	41	2	3,278	Tree plantation	1	-	28
Solar	196	6	60,986	Wind	4	-	3,954

Prior consideration notification activities							
Sub Region and Activity type	**PA**	**PoA**	**Sum of Planned Annual Reductions (ktCO2e/yr)**	**Sub Region and Activity type**	**PA**	**PoA**	**Sum of Planned Annual Reductions (ktCO2e/yr)**
Tree plantation	13	7	9,133	**Australia and New Zealand, Central America, Eastern Africa, Eastern Asia, Eastern Europe, Northern America, Northern Europe, South America, Southeast Asia, Southern Africa, Southern Asia, Southern Europe, Western Africa, Western Asia, Western Europe**	-	**1**	10,000
Waste management	-	3	1,716	Electric vehicles	-	1	10,000
Waste to energy	14	1	1,926	**Australasia**	**1**	-	7,000
Water purification	5	4	2,398	Agriculture	1	-	7,000
Wind	24	1	18,512	**Middle Africa**	**6**	**3**	6,687
Eastern Africa, Middle Africa, Southern Africa	-	**1**	200,000	Cleaner cooking	6	1	6,540
Mixed renewables	-	1	200,000	Efficient appliances		2	147
Eastern Africa	**59**	**31**	81,850	**Eastern Africa, Western Africa**	**-**	**1**	4,000
Afforestation/Reforestation	1	-	436	Cleaner cooking	-	1	4,000
Bioenergy	1	-	250	**Southeast Asia, Western Europe**	-	**1**	3,500
Cleaner cooking	40	15	50,432	Landfill gas	-	1	3,500
Composting	-	1	10	**Southern Africa**	**6**	**2**	3,206
Electric vehicles	1	6	940	Bioenergy	-	1	138
Industrial efficiency	-	1	10	Efficient appliances	1	-	36
Mixed renewables	1	1	14,038	Electric vehicles	-	1	150
Solar	8	-	520	Solar	3	-	1,830
Tree plantation	1	**-**	198	Wind	2	-	1,052
Waste to energy		1	52	**Eastern Asia**	**5**	-	1,231
Water purification	6	6	14,964	Landfill gas	2	-	227
Southeast Asia	43	**15**	**67,575**	Solar	1	**-**	114
Bioenergy	7	**-**	895	Wind	2	-	890
Cleaner cooking	2	5	20,631	**Melanesia**	**1**	-	1,080
Composting	2	-	46	Forest management	1	-	1,080
Electric vehicles	2	2	1,246	**Eastern Africa, Middle Africa, Western Africa**	-	**2**	1,016
Forest management	1		4,000	Cleaner cooking	-	2	1,016
Geothermal	2	-	490	**Australia and New Zealand, Eastern**	-	**1**	1,000

Prior consideration notification activities							
Sub Region and Activity type	**PA**	**PoA**	**Sum of Planned Annual Reductions (ktCO2e/yr)**	**Sub Region and Activity type**	**PA**	**PoA**	**Sum of Planned Annual Reductions (ktCO2e/yr)**
				Asia, Southeast Asia, Western Asia			
Hydropower	4	-	250	Electric vehicles	-	1	1,000
Industrial efficiency	1	-	4	**Central America**	**7**	**2**	634
Mixed renewables	1	5	32,983	Electric vehicles	-	1	300
Solar	5	-	189	Forest management	1	-	1
Tree plantation		2	2,750	Hydropower	1	-	120
Waste to energy	1	-	44	Landfill gas	1	-	100
Wastewater treatment	4	-	233	Solar	3	-	29
Water purification		1	1,863	Waste to energy		1	84
Wind	11	-	1,950	Wastewater treatment	1	-	0
South America	**76**	**13**	64,208	**Northern America**	-	**2**	542
Afforestation/Reforestation	2	1	43,463	Afforestation/Reforestation	-	1	42
Agriculture		2	1,935	Agriculture	-	1	500
Bioenergy	5	-	412	**Western Europe**	**2**	-	245
Electric vehicles	-	3	670	Industrial efficiency	1	-	5
Forest management	-	4	1,678	Waste management	1	-	240
Hydropower	9	-	313	**Caribbean**	**2**	-	229
Landfill gas	31	-	10,381	Bioenergy	1	-	150
Solar	21	-	1,441	Solar	1	-	79
Tree plantation	1	2	38	**Southern Europe**	**2**	**2**	124
Waste to energy		1	44	Agriculture		2	8
Wind	7	-	3,833	Biochar	1	-	20
Western Africa	**36**	**9**	40,379	Solar	1	-	96
Carbon capture	1		3,000	**Australia and New Zealand**	-	**1**	70
Cleaner cooking	26	3	23,031	Electric vehicles	-	1	70
Electric vehicles	-	4	750	**West Africa**	-	**1**	52
Forest management	-	1	4,437	Cleaner cooking		1	52
Rewilding	1	1	390	**Eastern Europe**	**2**	-	41
Solar	6	-	431	Industrial efficiency	1	-	1
Tree plantation	2	-	8,339	Reforestation and ecosystem restoration	1	-	40
Western Asia	**22**	**12**	34,740				
Grand Total	**881**	**231**	**1,024,414**				

Source: Authors, based on UNEP CCC (2026)

Table 18: Sub-regional dominance in prior consideration activities and sum of annual reductions ($ktCO_2e/yr$)

Prior consideration notification activities							
Subregion	**PA**	**PoA**	**Sum of Planned Annual Reductions (ktCO2e/yr)**	**Subregion**	**PA**	**POA**	**Sum of Planned Annual Reductions (ktCO2e/yr)**
Asia	**669**	**153**	**582,120**	Caribbean	2	**-**	229
Central Asia	11	1	12,549	Central America	7	2	634
Eastern Asia	5	-	1,231	Northern America	-	2	542
Southeast Asia	43	15	67,575	South America	76	13	64,208
Southern Asia	588	125	466,025	**Africa, Americas, Asia, Europe, Oceania**	-	**1**	10,000
Western Asia	22	12	34,740	Australia and New Zealand, Central America, Eastern Europe, Northern America, Northern Europe, South America, Southern Europe, Western Europe	-	1	10,000
Africa	**119**	**55**	353,623	**Oceania**	**2**	**1**	8,150
Eastern Africa	59	31	81,850	Australasia	1		7,000
Eastern Africa, Middle Africa, Southern Africa	-	1	200,000	Australia and New Zealand	-	1	70
Eastern Africa, Middle Africa, Western Africa	-	2	1,016	Melanesia	1	-	1,080
Eastern Africa, Western Africa	-	1	4,000	**Asia, Europe**	-	**1**	3,500
Middle Africa	6	3	6,687	Southeast Asia, Western Europe	-	1	3,500
Northern Africa	12	5	16,433	**Asia, Oceania**	-	**1**	1,000
Southern Africa	6	2	3,206	Australia and New Zealand, Eastern Asia, Southeast Asia, Western Asia	-	1	1,000
West Africa	-	1	52	**Europe**	**6**	**2**	409
Western Africa	36	9	40,379	Eastern Europe	2	-	41
Americas	**85**	**17**	**65,612**	Southern Europe	2	2	124
				Western Europe	2	-	245
Grand Total	**881**	**231**	**1,024,414**				

Source: Authors, based on UNEP CCC (2026)

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