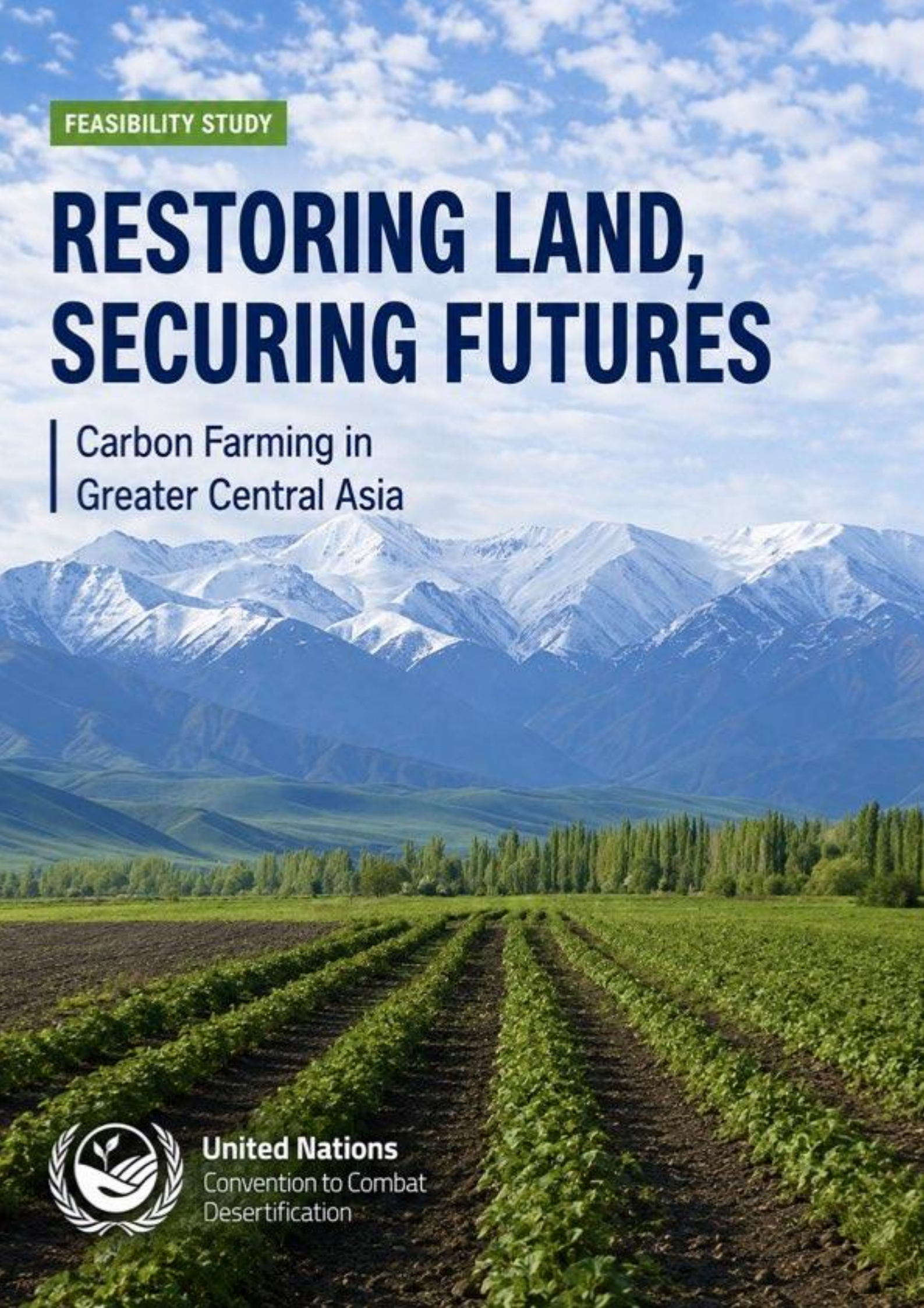
FEASIBILITY STUDY

RESTORING LAND, SECURING FUTURES

Carbon Farming in Greater Central Asia



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Restoring Land, Securing Futures: Carbon Farming in Greater Central Asia

Scientific Leads:

Michael Obersteiner, Director, Environmental Change Institute, University of Oxford, UK and Principal Research Scholar, International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria

Barron Orr, Chief Scientist, United Nations Convention to Combat Desertification (UNCCD)

Lead Authors:

Elena Rovenskaya, Principal Research Scholar and Program Director, Advancing Systems Analysis Program, International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria

Olga Andreeva, Programme Officer Scientific Affairs, United Nations Convention to Combat Desertification (UNCCD)

Pradeep Monga, Senior Advisor, International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria

Contributing Authors:

Alexey Ivanov, Director, BRICS Competition Law and Policy Centre, Moscow, Russia

Johns Muleso Kharika, Chief of Science, Technology and Innovation Unit, United Nations Convention to Combat Desertification (UNCCD)

Reviewers:

German Kust, Principal Researcher, Institute of Geography, Russian Academy of Sciences

Mandakh Nyamtseren, Science and Technology Correspondent, Institute of Geography and Geoecology, Mongolian Academy of Sciences

Alisher Mirzabayev, Senior Scientist, Policy Analysis and Climate Change, International Rice Research Institute (IRRI), Los Baños, Laguna, Philippines

Study Coordinator:

Nicole Rohde, Research Assistant, International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria

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List of abbreviations

Abbreviation	Full name
A6ISR	Article 6 Implementation Status Report
A6.4ER	Article 6.4 emission reduction
ACCU	Australian Carbon Credit Unit
ACR	American Carbon Registry
ADB	Asian Development Bank
AFOLU	Agriculture, Forestry and Other Land Use
AIFC	Astana International Financial Centre
AMP	Adaptive Multi-Paddock grazing
ARB	California Air Resources Board
ART	Architecture for REDD+ Transactions
BTR	Biennial Transparency Report
CACILM	Central Asian Countries Initiative for Land Management
CAR	Climate Action Reserve
CAREC	Central Asia Regional Economic Cooperation
CCER	China Certified Emission Reduction
CCM	Compliance carbon market
CCP	Core Carbon Principle
CCRCC	Climate Change Research and Cooperation Centre
CDM	Clean Development Mechanism
CDR	Carbon dioxide removal

CER	Certified emission reduction
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
COP	Conference of the Parties
DNA	Designated national authority
DOE	Designated operational entity
ER	Emission reduction
ERPA	Emission Reductions Payment Agreement
ESG	Environmental, social and governance
ETF	Enhanced Transparency Framework
ETS	Emissions trading system
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GCA	Greater Central Asia
GCF	Green Climate Fund
GDP	Gross domestic product
GEDI	Global Ecosystem Dynamics Investigation
GEF	Global Environment Facility
GHG	Greenhouse gas
GIS	Geographic information system
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GLO	Global Land Outlook
ICVCM	Integrity Council for the Voluntary Carbon Market

IIASA	International Institute for Applied Systems Analysis
IPCC	Intergovernmental Panel on Climate Change
IRRI	International Rice Research Institute
ITMO	Internationally transferred mitigation outcome
JCM	Joint Crediting Mechanism
LDN	Land degradation neutrality
LDN TSP	Land Degradation Neutrality Target Setting Programme
LULUCF	Land use, land-use change and forestry
MoU	Memorandum of understanding
MRV	Measurement, reporting and verification
NbS	Nature-based solution
NDC	Nationally determined contribution
NGO	Non-governmental organization
NMA	Non-market approach
OECD	Organisation for Economic Co-operation and Development
OTC	Over-the-counter
PACM	Paris Agreement Crediting Mechanism
QA/QC	Quality assurance and quality control
REDD+	Reducing emissions from deforestation and forest degradation, including conservation, sustainable management of forests and enhancement of forest carbon stocks
RFP	Request for proposals
SCALA	Scaling up Climate Ambition on Land Use and Agriculture

SDG	Sustainable Development Goal
SIMOCUTE	National System for Monitoring Land Cover, Land Use and Ecosystems
SLM	Sustainable land management
SOC	Soil organic carbon
TCAF	Transformative Carbon Asset Facility
T-VER	Thailand Voluntary Emission Reduction Program
TREES	The REDD+ Environmental Excellence Standard
UAV	Unmanned aerial vehicle
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollar
VCM	Voluntary carbon market
VCS	Verified Carbon Standard
WOCAT	World Overview of Conservation Approaches and Technologies
WWF	World Wide Fund for Nature

Units used

Abbreviation	Meaning
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
GtC	Gigatonnes of carbon
$GtCO_2e$	Gigatonnes of carbon dioxide equivalent
$MtCO_2e$	Million tonnes of carbon dioxide equivalent
tCO_2e	Tonnes of carbon dioxide equivalent

Executive Summary

The report assesses the opportunities and requirements for developing carbon farming in Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan. Together, these countries encompass Greater Central Asia's major landscapes and land-use systems, from mountain pastures and fragile watersheds to vast rangelands, irrigated croplands, saline soils and severely degraded drylands. The central conclusion is that carbon farming can provide a near-term vehicle for mobilizing additional investment to fulfill climate mitigation objectives, while generating important longer-term co-benefits for land restoration, rural livelihoods and resilience.

This potential however can be realized only through context-specific pathways that deliver credible, measurable carbon outcomes and are socially legitimate and financially viable. The strong case for carbon farming in the region is a structured financing approach that can reward measurable climate outcomes while supporting better land management. At current prices, near-term carbon revenues will generally be catalytic and complementary rather than sufficient to finance the full transition. Over the longer term, the more durable economic value will arise from healthier soils, more productive and resilient pastures, improved water management, reduced erosion, stronger rural livelihoods and lower exposure to drought and land degradation.

A substantial but context-specific opportunity

Greater Central Asia contains extensive landscapes where improved management can contribute simultaneously to climate mitigation, adaptation, land degradation neutrality, biodiversity, food and water security, and rural development. Relevant pathways include conservation agriculture and soil rehabilitation; agroforestry, shelterbelts and riparian buffers; forest restoration and afforestation; erosion and salinity control; rehabilitation of marginal or severely degraded land; and improved grazing and pasture restoration. National approaches are consequently best developed as portfolios of interventions rather than as a single carbon-farming model.

The opportunity is nevertheless constrained by the ecological realities of arid and semi-arid systems. Soil-carbon gains can be slow, spatially variable and difficult to distinguish from the effects of rainfall and temperature. Drought, fire, episodic overgrazing and management failure can reverse accumulated gains. Water-dependent interventions, including agroforestry, orchards, shelterbelts and afforestation, need to be assessed against landscape- and basin-level water availability, salinity, irrigation reliability and possible downstream effects. In pastoral landscapes, projects also need to preserve seasonal mobility, avoid displacement of grazing pressure and recognize customary users. Carbon claims therefore require locally validated evidence, sufficiently long monitoring periods and conservative accounting.

Differentiated national pathways

The four countries share land-degradation and climate challenges, but their carbon-farming pathways likely differ. In Kyrgyzstan, major opportunities may concern mountain-pasture restoration, erosion control, forest and watershed rehabilitation, and improved soil management in irrigated valleys. Mongolia's main pathway may lie in adaptive grazing management and rangeland restoration, complemented by forest management and context-appropriate afforestation. In Tajikistan, major pathways may include erosion control, highland-pasture and watershed restoration, agroforestry and improved management of scarce arable land where water conditions permit. Uzbekistan offers opportunities in irrigated-soil restoration, salinity management, water-efficient agriculture, agroforestry and shelterbelts, rangeland rehabilitation, and restoration of the Aral Sea landscape.

Finance and market prospects

Voluntary carbon markets offer the most accessible near-term route because established standards already provide methodologies, registries and verification systems. Yet participation from Greater Central Asia remains very limited and agricultural and rangeland projects face high measurement and transaction costs. Paris Agreement Article 6 mechanisms could provide larger and potentially more durable government-backed demand, but require national authorization, tracking, corresponding adjustments and safeguards against exporting mitigation outcomes needed for domestic targets. None of the four countries currently operates a fully functioning domestic compliance carbon market. Green and sustainability bonds, results-based payments and other labelled finance can complement carbon markets by funding restoration, aggregation and monitoring before carbon revenues materialize.

The economics reinforce the need for blended finance. The report's illustrative calculations suggest carbon-farming revenues can help cover additional costs or reward early adoption, but will rarely finance the full transition. Grants, concessional loans, guarantees, insurance, advance purchase agreements and public support remain important, particularly for smallholders, herders and restoration projects with high upfront costs and long lead times.

Conditions for credible and investable carbon farming

A physical emission reduction or removal becomes a trusted unit of value only when it is measurable, additional, durable, uniquely accounted for and socially legitimate. The report identifies ten domestic enabling conditions plus one international interface. These include clear links among land tenure, pasture or forest-use rights, carbon rights, project authority, benefit sharing and long-term liability; assigned institutional mandates and predictable approval procedures; credible baselines, additionality, leakage control, permanence and reversal-risk management; safeguards and independent verification;

registries and controls against double counting; extension and local advisory capacity; aggregation and finance; alignment with land, agricultural and water policies; and the ability to authorize, track and report internationally transferred outcomes.

National land, soil, forest, pasture, water and climate datasets need to become usable project infrastructure. Monitoring systems for drylands can combine stratified field sampling, remote sensing and calibrated modelling, with transparent treatment of uncertainty and carbon-specific reversal accounting. National land-condition and land degradation neutrality monitoring can provide complementary evidence on ecosystem change, but cannot replace the carbon-specific monitoring required for crediting. Meaningful consent, grievance mechanisms, fair benefit sharing and risk sharing are equally important where land is communal, state-owned, fragmented or used by mobile pastoralists.

Priority action agenda

The report translates these findings into 20 recommendations organized in the SCALE framework:

- **S**trengthening the evidence base involves sharing and standardizing data, improving national reference information, developing dryland-appropriate monitoring, investing in testing sites and creating a regional learning platform.
- **C**reating country-specific pathways requires differentiated national priorities, alignment of carbon finance with land-management goals while safeguarding additionality, sequencing by readiness and potential, clearer legal and institutional frameworks, and ecosystem-specific management approaches.
- **A**dvancing financial opportunities requires differentiated financing, fair benefit sharing, aggregation of smallholders and herders, and public or concessional support to lower entry barriers and share risks.
- **L**inking carbon farming with land, water and development agendas involves integrating carbon measurement into existing sustainable land-management and restoration programs, connecting soil-carbon management with water security, and embedding projects in national priorities. Fragile landscapes, including the dried Aral seabed, remain strategic restoration priorities even where their near-term carbon potential is uncertain.
- **E**nhancing capacity for arid and semi-arid landscapes requires realistic expectations, long-term monitoring, locally validated evidence and stronger collective and landscape-level governance. Carbon finance is most appropriately directed toward activities that generate demonstrably additional mitigation outcomes, including interventions that would not otherwise occur or that increase the scale, speed or ambition of restoration. Implementation can be

sequenced according to both readiness and long-term value. Clearly delineated shelterbelts, afforestation on ecologically and hydrologically suitable land, selected forestry measures and some conservation-agriculture practices may offer early entry points because baselines and monitoring are more tractable. Pasture and landscape restoration may generate larger land, livelihood and resilience benefits but requires stronger governance, longer baselines, more sophisticated MRV and cautious carbon accounting. Testing sites can validate practices, quantify costs, trial benefit-sharing models and clarify institutional responsibilities before wider scaling. A regional learning platform can lower costs through shared technical infrastructure, comparable protocols, scientific peer review and coordinated training across ecosystems with similar conditions, while leaving national legal and policy frameworks differentiated.

Overall, Greater Central Asia can become an important frontier for high-integrity carbon farming if carbon finance is used to accelerate restoration rather than determine land-management priorities. Success depends less on building credible evidence, secure rights, fair institutions, fit-for-purpose monitoring and financing arrangements that leave farmers, herders and landscapes more resilient after carbon payments end.

1 Introduction: Why carbon farming? Why Greater Central Asia?

1.1 Climate change and land degradation: Two interconnected challenges of the 21st century

Climate change and land degradation present two persistent crises of the 21st century, bound in a vicious, self-reinforcing cycle. A critical driver is the extractive nature of modern agriculture that "mines" soil carbon and releases it as CO_2 into the atmosphere, leaving behind a simplified, depleted substrate with poor structure, low fertility, and minimal biological activity – a state that actively undermines productivity and resilience. The degradation of land directly contributes to climate change by transforming a vital terrestrial carbon sink into a net carbon source. The very land that should be helping to regulate atmospheric CO_2 becomes a driver of its increase. Global warming, in turn, drives more intense droughts, heatwaves, and extreme weather that further erode soil health, degrade land, and cripple ecosystems. Locked in this mutually destructive cycle, climate change and land degradation act as a single, compounding force that erodes the very basis of Earth's life-support systems (Figure 1.1).

[Figure to be included in the final edition]

Figure 1.1: A stylized causal loop diagram visualizing a climate change – land degradation – extractive agriculture vicious cycle. Source: Authors' elaboration.

The international community has responded to this interconnection of crises with frameworks for coordinated action. The Paris Agreement (2015), under the United Nations Framework Convention on Climate Change (UNFCCC), ratified by 194 countries, set the goal to limit global warming to well below 2°C, preferably to 1.5°C. Crucially,

Article 5 explicitly encourages parties to conserve and enhance sinks and reservoirs of greenhouse gases, including forests and soils.

The United Nations Convention to Combat Desertification (UNCCD) and its central concept of Land Degradation Neutrality (LDN) explicitly recognize climate change as both a key driver of land degradation and an area where land restoration can provide critical solutions. The UNCCD's flagship Global Land Outlook (GLO) reports consistently frame land restoration as a powerful, nature-based solution to climate change (United Nations Convention to Combat Desertification, 2022).

1.2 Nature-based solutions at the intersection of climate and land

Nature-based solutions (NbSs) occupy a unique and critical niche in the portfolio of climate solutions. While rapid decarbonization of energy, transport, and industry is necessary, residual emissions from hard-to-abate sectors (e.g., aviation, certain industrial processes) necessitate active carbon dioxide removal (CDR) to achieve net-zero targets and technological CDR methods, like direct air capture, are nascent and expensive. NbSs offer an immediately deployable, cost-effective, and multi-benefit CDR pathway that can be implemented at scale by the world's millions of land managers in a bottom-up manner provided appropriate incentives are in place (Griscom et al., 2017). Across various mitigation scenarios consistent with the 2°C target presented in the IPCC 6th Assessment Report, carbon dioxide removals from AFOLU (Agriculture, Forestry, and Other Land Use) constituted 0.01-4.11 GtCO2e/yr by 2030 and 0.23-6.38 GtCO2e/yr, dominated by afforestation/reforestation (Babiker et al., 2022; page 1265). Their role is also increasingly reflected in international climate policy, with a growing number of Nationally Determined Contributions under the Paris Agreement incorporating AFOLU measures (Boehm et al., 2022).

NbSs for climate mitigation can also support the achievement of Land Degradation Neutrality (LDN) targets under the UNCCD by improving soil health, increasing vegetation cover, and reducing erosion. As of 2025, over 110 countries have set voluntary LDN targets, aiming to restore nearly 600 million hectares. The same land-management changes that enhance carbon removals can also improve the core dimensions of land condition used to assess progress towards LDN, creating important synergies between climate mitigation and land-restoration objectives.

First, improving soil condition can advance both LDN and climate-mitigation objectives. Soil organic carbon (SOC) is one of the three global LDN indicators, alongside land cover and land productivity, and is also a key carbon pool. Practices such as reduced tillage, cover cropping, agroforestry, and organic amendments can increase SOC while improving soil structure, water retention, and resilience. In this way, measures that build or maintain soil carbon can contribute simultaneously to carbon removal and improved land condition.

Second, increasing and maintaining vegetation cover can support the other two LDN indicators – land cover and land productivity – while also contributing to carbon removal through increased above- and below-ground biomass. Measures such as grassland restoration, agroforestry, and vegetative buffers can support the recovery of productive capacity, improve biodiversity, and strengthen resilience to climate variability. Where additional biomass accumulation occurs relative to the baseline, these interventions may also generate measurable carbon-removal benefits.

Third, preventing erosion contributes directly to the LDN objective of avoiding land degradation while also helping preserve existing soil carbon stocks. Erosion can remove carbon-rich topsoil and expose soil organic matter to further decomposition. NbSs such as contour farming, soil bunds, vegetative barriers, terracing, and riparian buffers can reduce runoff, trap sediment, and stabilize soils. By retaining topsoil and supporting vegetation recovery, erosion-control measures can protect existing carbon stocks and, in some contexts, create conditions for additional carbon accumulation.

NbS focusing on Land Degradation Neutrality and NbS focusing for climate mitigation pursue distinct objectives. The LDN framework focuses on maintaining and improving land condition and follows a response hierarchy that prioritizes avoiding degradation, followed by reducing ongoing degradation and reversing degradation where it has already occurred. NbS for climate mitigation, by contrast, seek to reduce net greenhouse-gas emissions by avoiding emissions and carbon-stock losses while also increasing carbon removals. They can therefore complement the LDN response hierarchy by providing incentives for land-management interventions that also generate credible, measurable, and additional mitigation benefits.

1.3 The concept of carbon farming: Economic incentives for land-based mitigation with environmental, economic, and social co-benefits

Carbon farming has emerged as a pragmatic approach to aligning agricultural production by farmers with the global climate agenda. Carbon farming broadens the role of farms and ranches beyond the production of food and fibre to include measurable and verifiable climate-regulation services. Crucially, carbon farming aims to provide tangible economic incentives for farmers to adopt land-management practices that deliver measurable climate benefit through market and non-market mechanisms. As an integrated land-management framework, it encompasses a broad range of agricultural, agroforestry, and grazing practices designed to increase carbon sequestration, reduce greenhouse-gas emissions, and avoid losses of existing carbon stocks. These outcomes can be achieved by enhancing the photosynthetic capture and storage of CO_2 in vegetation and soils, protecting existing carbon pools, and modifying land-management practices that generate greenhouse-gas emissions.

Carbon farming can be understood as an operational lens within the broader family of sustainable agriculture and land management approaches. While sustainable agriculture aims to maintain long-term productivity, environmental integrity, and livelihoods, carbon farming places explicit emphasis on measurable climate-mitigation outcomes from land management, including reduced greenhouse-gas emissions, avoided losses of existing carbon stocks, and increased carbon sequestration in soils and biomass.

It overlaps strongly with regenerative agriculture, climate-smart agriculture, agroecology, and conservation agriculture, all of which promote practices such as reduced tillage, diversified rotations, cover crops, improved grazing management, agroforestry, and organic amendments. The distinction is that carbon farming makes climate outcomes explicit and measurable: practices are selected, monitored, and incentivized based on their quantified impact on carbon sequestration and emissions reductions, linked to carbon markets or climate finance. In this sense, carbon farming does not replace sustainable or regenerative agriculture, but translates their principles into a climate-accounting framework that can mobilize policy support, private investment, and incentives, while also delivering co-benefits for soil health, resilience, biodiversity, and farm profitability.

Besides economic benefits, carbon farming can generate important social and environmental co-benefits when it is designed as a land-restoration and rural-development strategy rather than only a carbon-crediting activity. Improved grazing management, soil restoration, agroforestry, shelterbelts, afforestation, and degraded-land rehabilitation can enhance soil fertility, reduce erosion, improve water retention, support biodiversity, strengthen climate resilience, and reduce pressure on fragile ecosystems. Socially, such activities can create new income streams for farmers, herders, and rural communities, support advisory and extension services, and encourage collective management of pastures, forests, and degraded lands. This combination of ecological restoration, climate mitigation, and direct livelihood incentives that makes carbon farming particularly relevant for many developing parts of the world.

1.4 Carbon markets: Catalytic finance for scaling sustainable land management

Over the long term, sustainable land management (SLM) is an environmentally and economically meaningful strategy: healthier soils, better vegetation cover, improved water retention, and reduced erosion lead to higher productivity and stronger resilience. Research shows that the costs of inaction on degraded lands often exceed the costs of taking action to prevent, restore, and sustainably manage land degradation (Mirzabaev et al., 2015; Nkonya et al., 2011).

In practice, however, many SLM practices are difficult to scale because they require high upfront costs while returns are delayed and uncertain. Their viability is therefore weakened by short-term decision-making by farmers, investors, and public authorities – alongside limited access to modern knowledge, advisory services, equipment, and other inputs; insecure or unclear land-use rights. These barriers are especially important in smallholder and pastoral systems, where upfront costs and income risks can outweigh future ecological gains.

Grant-based finance, subsidies, concessional loans, and donor-supported programs remain essential for enabling SLM, but they are often insufficient to transform practices at scale. Carbon farming can add a complementary revenue stream. It will not fully finance sustainable land management, and in many cases carbon revenues may cover only a small share of total costs. However, even modest carbon payments can be decisive where they help cover transition costs, reduce risk, or provide an additional income layer that makes restoration, agroforestry, improved grazing, or soil-carbon practices economically viable (World Bank, 2014). As a benchmark, voluntary carbon credits generally trade in the single digits to low double digits per tCO_2e, with some premium for agriculture, forestry and nature-based removals (Forest Trends' Ecosystem Marketplace, 2025). At this stage, therefore, carbon finance should be treated as catalytic rather than sufficient, helping to close viability gaps and reward measurable outcomes. It will need to be combined with grants, concessional finance, technical assistance, and public support to scale sustainable land management.

Demand for carbon offsets comes from several distinct sources. In the voluntary carbon market, demand is mainly generated by companies, financial institutions, traders, and sometimes individuals that purchase credits to support climate claims, compensate for residual emissions, meet internal net-zero or carbon-neutrality commitments, or demonstrate support for nature-based solutions and sustainable development. In Article 6.2 markets, demand comes from governments or authorized entities seeking internationally transferred mitigation outcomes (ITMOs) that can be used toward NDCs or other international mitigation purposes. Under Article 6.4, demand may come from both public and private buyers, depending on how units are authorized and used. Domestic compliance offset demand arises where governments create regulated systems that allow emitters to use eligible offsets to meet part of their legal obligations. In addition, public procurement, development banks, climate funds, and philanthropic or blended-finance actors can create demand where they buy credits, fund results-based payments, or provide advance purchase commitments. For carbon farming, the most valuable demand is likely to come from buyers seeking high-integrity credits with strong co-benefits, such as land restoration, biodiversity, rural livelihoods, water resilience, and adaptation benefits, but this demand will materialize only if credits are credible, traceable, and backed by robust MRV, safeguards, and clear ownership rules.

Furthermore, the UNCCD's LDN framework and the SDG target 15.3/ indicator 15.3.1 foster a compelling policy narrative, making credits from restored degraded lands more attractive to impact-driven buyers.

1.5 Major categories of carbon farming strategies

A systematic portfolio of carbon farming strategies can be organized into four broad categories based on their primary leverage point, each employing distinct mechanisms for carbon capture and storage across terrestrial ecosystems.

In-Field Agronomic Management. This foundational category comprises practices applied within existing annual or perennial cropping systems to directly enhance the soil organic carbon (SOC) pool. The focus is on manipulating agronomic inputs and disturbances to optimize the flow of carbon from plants to stable soil fractions. Core practices include:

- Reduced or no-till farming: Minimizing soil disturbance to prevent the oxidation of existing SOC and protect soil structure.
- Cover cropping and perennial ground cover: Maintaining living roots in the soil year-round to provide continuous carbon inputs via root exudates and biomass, while suppressing erosion.
- Diverse crop rotations and polycultures: Enhancing root diversity and biomass input to support a more complex and active soil microbiome, which is central to forming stable soil aggregates that protect carbon.
- Organic amendments: Applying compost, manure, or biochar to directly add stable organic carbon to the soil matrix, improving fertility and water retention while sequestering carbon for centuries in the case of biochar.

These practices operate on the principle of turning the soil from a carbon source, common under conventional tillage-based systems, into a net carbon sink by systematically feeding soil biology and reducing losses.

Perennial Woody Integration. This leverage point recognizes trees and shrubs as potentially powerful, long-term carbon sinks. Integrating perennial woody vegetation into agricultural systems – a practice broadly known as agroforestry – can sequester carbon both in above-ground biomass (trunks, branches) and in extensive root systems, while profoundly modifying the microclimate and ecology of the site (De Stefano & Jacobson, 2018). Key implementations include:

- Silvopasture: The deliberate integration of trees, forage plants, and livestock grazing on the same land, creating a synergistic system that enhances animal welfare, diversifies income, and maximizes vertical carbon storage.

- Alley cropping: Planting rows of trees or shrubs alongside companion crops, providing shade, wind protection, and nutrient cycling while adding a perennial carbon pool.
- Riparian and field buffers: Establishing tree strips along waterways or field edges to filter runoff, prevent erosion, create wildlife habitat, and establish linear carbon sinks.
- Multistrata agroforestry: Mimicking forest structure with multiple layers of trees, shrubs, and crops, offering the highest biomass carbon potential per hectare of any agricultural system.

This category leverages the unique capacity of perennial plants to accumulate carbon over decades and to channel it deep into the soil profile.

Grazing System Optimization. Improved grazing management can contribute to vegetation recovery, soil function, forage productivity, and drought resilience, and under suitable ecological and management conditions may also increase soil organic carbon. Approaches include adaptive and rotational grazing, adjusted stocking rates and grazing duration, strategic pasture resting, and management that maintains sufficient recovery periods. However, carbon outcomes are highly context-dependent and vary with baseline land condition, climate, soil type, grazing pressure, management history, and the duration of monitoring. Adaptive Multi-Paddock (AMP) grazing, for example, has shown positive outcomes in some settings, but evidence for additional and durable soil-carbon sequestration is variable and cannot be generalized across grazing systems. This is particularly important in cold steppe and mountain pastures, where climate variability, low and spatially heterogeneous productivity, livestock mobility, and collective pasture use can strongly influence outcomes. Improved grazing management may therefore provide a strong foundation for land restoration and resilience, with additional carbon sequestration offering a further opportunity where it can be credibly demonstrated.

Land Use Change & Ecosystem Restoration. This is the most transformational leverage point, involving the deliberate conversion of degraded, marginal, or unsustainable land uses into high-carbon-storage ecosystems. It targets areas where the greatest carbon "deficits" and opportunities for gain exist. Interventions include:

- Reforestation and afforestation: Establishing forests on previously forested (reforestation) or non-forested (afforestation) lands, creating a large, permanent biomass carbon sink.
- Peatland and wetland restoration: Rewetting drained organic soils (paludiculture) to halt the massive emissions from peat oxidation and restore these naturally carbon-dense ecosystems.

- Re-vegetation of eroded and marginal lands: Stabilizing severely degraded soils with deep-rooted perennial grasses, legumes, or shrubs to halt erosion and initiate carbon accumulation.
- Perennial bioenergy crops: Planting fast-growing, deep-rooted perennials (e.g., switchgrass, miscanthus) on marginal land for biomass energy, coupled with carbon sequestration in soils.

This category addresses legacy degradation head-on, offering the highest per-hectare carbon sequestration rates by fundamentally altering the ecosystem's trajectory.

The full potential of carbon farming is realized in a strategic combination of multiple practices. A farm might employ in-field agronomic practices in its cropping zones, integrate silvopasture in its grazing areas, and dedicate a riparian corridor to buffer restoration. This integrated approach creates a synergistic effect, where practices in one area support outcomes in another, leading to a whole-farm system that is more resilient, productive, and a net contributor to climate stabilization.

1.6 The untapped potential of carbon sequestration by soils

In degraded landscapes, soil is a compromised carbon pool. It is not merely empty, but functionally impaired, having shifted from a resilient carbon sink to a fragile carbon source. Regenerative carbon sequestration restores the lost carbon stock and repairs the soil's innate ability to secure it. Through photosynthesis, plants convert CO_2 into organic compounds. A portion of this carbon is allocated to roots and exudates, which feed soil microorganisms. These organisms, in turn, create stable soil aggregates that can protect carbon from decomposition for decades to centuries (Lal, 2004).

Paradoxically, the legacy of loss presents a strategic opportunity. Degraded lands possess a significant "carbon deficit", meaning they have a higher theoretical potential to sequester carbon once restorative practices are implemented. Consequently, shifting to regenerative carbon farming on these lands achieves a powerful dual impact: it simultaneously mitigates climate change by drawing down atmospheric CO_2 and enhances land productivity by enriching soil with carbon. Additionally, regenerative carbon sequestration by soil enhances climate adaptation by rebuilding soil capacity to withstand droughts, floods, and temperature extremes. Carbon farming can therefore turn zones of past extraction into frontiers for carbon sequestration where ecological conditions, land-use history, water availability, and restoration feasibility allow.

The global soil carbon sequestration potential was first estimated by (Lal, 2004) at 0.4–1.2 GtC/yr (1.47-4.4 GtCO2e/yr). This seminal benchmark was sustained and refined by contemporary syntheses that converged on 2-5 GtCO2e/yr (Fuss et al., 2018). To contextualize this scale: this means global soils could, at the upper end, counterbalance all current annual emissions from land-use change (~4.2 $GtCO_2$/yr in 2024) – a source

responsible for approximately one-tenth of humanity's total carbon footprint (Friedlingstein et al., 2025).

The total sequestration potential of soils breaks down across major land uses (Lal, 2004):

- Cropland soils (1.35 Gha): 0.4-0.8 GtC/yr (1.5-2.9 GtCO2e/yr) via widespread adoption of improved management practices;
- Degraded lands (1.1 Gha): 0.2-0.4 GtC/yr (0.7-1.5 GtCO2e/yr) via dedicated restoration; and
- Rangelands & grasslands (3.7 Gha): 0.01-0.3Gt C/yr (0.04-1.1 GtCO2e/yr) through optimized grazing and land management.

To contextualize these figures, the potential scale of soil carbon sequestration can be compared with other key nature-based CDR approaches (Fuss et al., 2018):

- Afforestation and reforestation: 0.5-3.6 GtCO2e/yr;
- Biochar: 0.5-2 GtCO2e/yr; and
- Enhanced weathering: 2-4 Gt GtCO2e/yr.

Broadly aligned with this, the 2022 Global Land Outlook report highlights that soil organic carbon constitutes 25% of the full potential of natural climate solutions (United Nations Convention to Combat Desertification, 2022). Furthermore, improving soil health comprises 9% of the mitigation potential of forests, 72% of wetlands, and 47% of agriculture and grasslands worldwide (Bossio et al., 2020). The potential of soil to contribute to climate action is increasingly recognized, with a growing number of NDCs incorporating AFOLU measures – many explicitly naming soil carbon sequestration and agroforestry as key mitigation strategies (Boehm et al., 2022).

1.7 Carbon farming as an emerging finance and implementation pathway

Carbon farming aspires to transform agriculture and land management into a comprehensive industry where producers cultivate a diversified portfolio of marketable outputs – not only traditional commodities like food, fiber, and fuel, but also verified atmospheric carbon reductions, sequestered in soils, perennial vegetation, and woody biomass. Each of these products enters a distinct marketplace, with demand for sequestered carbon driven by corporate net-zero commitments, regulatory compliance frameworks, and evolving consumer expectations for climate-responsible goods. This paradigm reframes working lands as vital, dual-purpose systems for both production and planetary healing. By embedding carbon removal as a core, profitable output, the model incentivizes widespread adoption of regenerative practices – restoring soil health, boosting biodiversity, and strengthening ecological resilience. Ultimately, it sees carbon

farming not as a niche activity, but as the foundation of a scalable, market-driven climate solution that aligns economic viability with environmental regeneration.

While the vision is powerful, the practical reality is that carbon farming remains at an early stage of development and its feasibility varies substantially across land-use systems. Early adopters – including farmers, ranchers, project developers, and innovative startups – are testing new approaches and generating valuable experience and data. These initiatives demonstrate that carbon farming can support changes in land management, but they also reveal significant constraints related to economics, carbon-credit pricing and price uncertainty, measurement and verification costs, permanence, transaction costs, land tenure, aggregation, and access to finance. These challenges are particularly important in drylands, where carbon gains may be slow, spatially variable, and costly to measure, while climate variability can increase reversal risk.

The broader transformation that carbon farming aspires to achieve therefore requires credible and context-specific evidence that proposed practices improve land condition and livelihoods while generating additional and durable mitigation outcomes, together with viable financing models, sufficiently attractive and predictable carbon prices, and appropriate institutional and governance arrangements. Carbon farming may become an important mechanism for reshaping land use and land management, but its contribution is likely to differ substantially across regions and practices, and in many cases carbon revenues will need to complement rather than replace public, concessional, or other forms of restoration and resilience finance.

1.8 Greater Central Asia as an emerging frontier for carbon farming

This report discusses the opportunities and challenges of establishing carbon farming as an industry in the region of the Greater Central Asia. The Greater Central Asia is a variously defined region encompassing areas of Central Asia with its five countries (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan) and extending to neighboring areas including Afghanistan, Iran, Mongolia, Pakistan, parts of China, India, and Russia. This region has been historically interconnected culturally and economically and is unified by shared geographic and environmental conditions. These include predominately arid climates, extensive dryland ecosystems, a critical dependence on glacial river systems, and acute vulnerability to land degradation processes such as desertification and soil salinization. It is these common environmental challenges and opportunities that make a regional approach to carbon farming both relevant and necessary.

The report focuses on Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan. These four nations serve as critical case studies for the Greater Central Asia region, representing a

cross-section of its core agro-ecological zones – from high mountain pastures to vast arid steppes – and facing the region's defining challenges of high impact of climate change, high degree of land degradation, and water scarcity head-on.

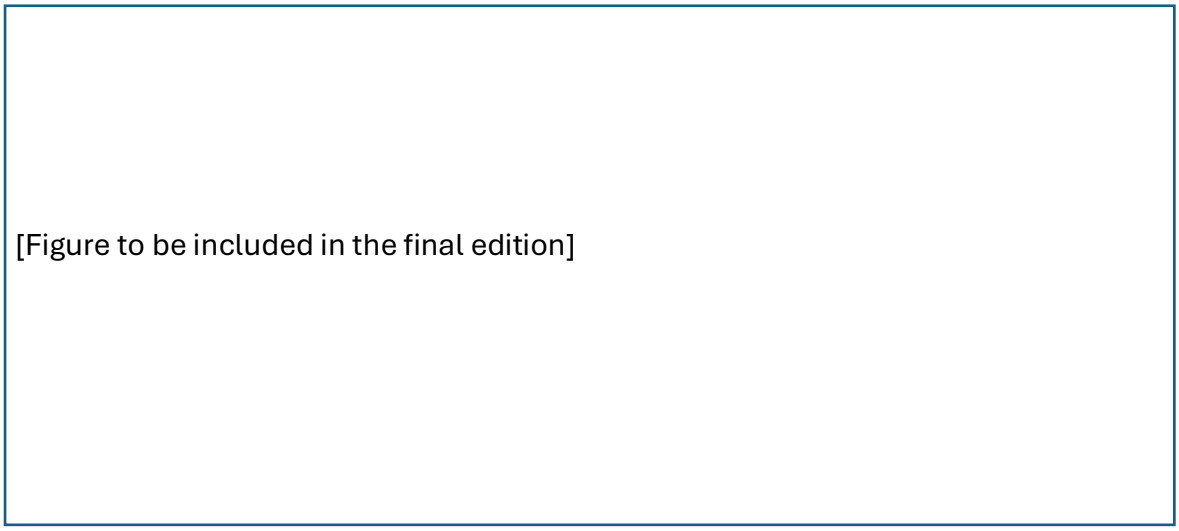

Figure 1.2: Sustainable Development Goal Indicator 15.3.1: Greater Central Asia. Source: United Nations Convention to Combat Desertification (n.d.-b).

Chapter 2 of this report reviews the environmental conditions in the four focus countries and establishes that they possess substantial biophysical potential for carbon farming, rooted in the scale of their rangelands, drylands, degraded landscapes, and opportunities for improved land management. **Chapter 3** turns to the demand side, examining whether different forms of climate finance could create viable revenue streams for land-based mitigation and removals. Taken together, the two chapters point to a clear opportunity, but also to a critical gap.

Each country has considerable unrealized potential to use sustainable land management to advance land restoration and climate resilience while also contributing to climate mitigation, soil health, biodiversity, water security, and rural livelihoods. Several demand channels could support land-based mitigation and removals that, once established, could be sustained and renewed over time. However, the opportunity remains largely latent. While the biophysical potential is substantial, the systems to convert land-management outcomes into trusted units of value are either absent or incomplete. **Chapter 4** therefore focuses on the enabling architecture needed to turn this opportunity into a functioning carbon farming industry. It examines the practical conditions required to connect land-based mitigation potential with real sources of finance, including clear policy and legal frameworks, land and carbon rights, credible MRV systems, project aggregation models, institutional coordination, safeguards, capacity development, and access to buyers and investors. The chapter moves from

"potential" and "demand" to "implementation," identifying what needs to be in place for carbon farming to become investable, scalable, and credible in the four focus countries. Based on the analysis of the biophysical potential (Chapter 2), demand prospects (Chapter 3), and current readiness (Chapter 4), **Chapter 5** formulates recommendations for Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan on how to develop credible, demand-driven carbon-farming pathways that can convert land-based mitigation and removal outcomes into durable funding streams while supporting sustainable land management, rural livelihoods, and climate resilience.

2 Land-based carbon sequestration opportunities in Greater Central Asia

2.1 Environmental and biophysical conditions in Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan

2.1.1 Mountain ecosystems of Kyrgyzstan

Kyrgyzstan is a profoundly mountainous nation, with over 90% of its territory lying above 1,500 meters. Its geography is defined by the towering ranges of the Tien Shan and Pamir-Alay systems, interspersed with high-altitude valleys and basins. The climate varies sharply with altitude, ranging from arid continental in the low-lying Fergana Valley fringe to severe alpine conditions in the highlands.

Agriculture is a cornerstone of Kyrgyzstan's economy, contributing about 14% of GDP and employing roughly 25% of the workforce. The sector is characterized by a stark dualism: small-scale intensive farming in the fertile, irrigated valleys and extensive mobile pastoralism on the vast natural highland pastures (jailoos). Key agricultural outputs include:

- Livestock: The heart of the rural economy, focusing on sheep, goats, cattle, and horses, with meat, wool, and dairy as critical products. Seasonal migration to highland pastures is a defining practice.
- Crop Production: Concentrated in the Chui, Talas, and Fergana valleys, producing wheat, barley, maize, potatoes, and vegetables for domestic consumption.
- Horticulture: A growing sector, with significant production of apples, apricots, cherries, walnuts, and berries.
- Hay and Fodder: Essential for sustaining livestock through long winters, produced on dedicated plots and natural meadows.

Kyrgyzstan's environment faces severe pressures. Overgrazing and unsustainable pasture management are the primary drivers of land degradation, leading to soil erosion, loss of plant biodiversity, and reduced pasture productivity on an estimated 60% of grassland area. The country's water resources, while abundant in glaciers and rivers, are vulnerable to climate change, with glacial retreat threatening long-term water security for irrigation and hydroelectric power.

Given these conditions, carbon farming in Kyrgyzstan could focus on the restoration of the degraded mountain pastures, improvement of soil health in irrigated valleys, and reducing erosion on fragile slopes while supporting rural livelihoods. However, projects must be carefully designed to avoid restricting pastoral mobility, creating conflicts over land and pasture access, or overstating carbon benefits in highly variable mountain

ecosystems. A community-centered approach that strengthens local pasture governance and balances carbon gains with food security and resilience would help reduce the risk that carbon farming undermines rural livelihoods or creates new pressures on fragile mountain ecosystems.

2.1.2 Grasslands and rangelands of Mongolia

Mongolia is one of the world's largest remaining pastoral landscapes. Natural rangelands occupy about 70% of the national territory (Food and Agriculture Organization of the United Nations & United Nations Development Programme, 2025) and underpin livestock production, rural employment, food security, and a mobile herding culture adapted to highly variable dryland conditions. The country spans forest steppe and mountain steppe in the north, extensive central steppe, desert steppe, and the Gobi in the south. National assessments report that approximately 76.9% of the country's territory is affected by desertification to varying degrees (Government of Mongolia, 2025b; Ministry of Environment and Climate Change of Mongolia, 2025). Because crop production is limited mainly to the more humid north and agriculture is overwhelmingly rain-fed, the productivity and resilience of the rural economy depend directly on rangeland condition.

Rangeland degradation is extensive – although national estimates vary depending on the indicators used, reference conditions, ecological zones, and assessment years. Based on the national monitoring network and ecological-site reference models, Mongolia's first National Rangeland Health Assessment found that 65% of assessed rangelands had departed to some degree from their reference condition in 2014; 40% of monitoring sites required more than three years to recover and 7% showed highly persistent degradation or desertification (National Agency for Meteorology and Environmental Monitoring & Ministry of Environment, Green Development and Tourism, 2015). The second assessment reported 57.7% of sites in degraded classes in 2017: 13.5% slightly, 21.1% moderately, 12.8% heavily, and 10.3% fully degraded (Bulgamaa et al., 2018). These figures indicate the proportion of sites that had departed from their site-specific ecological potential, rather than the proportion of the country experiencing a uniform decline in rangeland productivity. A national-scale synthesis by (Jamsranjav et al., 2018) likewise found strong spatial variation and cautioned against treating all altered rangelands as equally or irreversibly degraded.

Both grazing pressure and climate variability shape observed change. Satellite analysis for 2002–2012 attributed much of the decline in vegetation greenness to rising livestock pressure, while precipitation explained a substantial share of change in wetter areas (Hilker et al., 2014). Process-based analysis also shows that climate and grazing interact rather than operate independently, with impacts varying across Mongolia's ecological gradients (Dangal et al., 2016). Meanwhile, Mongolia's mean temperature has risen by

about 2°C over the past seven decades, increasing exposure to drought, dzud, water stress, fire, and sand and dust storms (World Bank, 2024b). Degradation is therefore often concentrated around settlements, roads, water points, and accessible seasonal pastures, while remote areas may remain lightly used; national averages can obscure these local imbalances.

The ecological consequences extend beyond vegetation cover. Heavy or poorly timed grazing can reduce perennial grasses, litter inputs, root biomass, infiltration, soil stability, forage quality, and drought recovery, while increasing bare ground and erosion risk. These effects directly weaken pastoral livelihoods by reducing available fodder and livestock productivity and by increasing vulnerability to winter disasters. Yet many Mongolian rangelands retain considerable recovery potential. The 2015 national assessment concluded that more than half of the country's rangelands could recover or move toward recovery within ten years if grazing management improved (National Agency for Meteorology and Environmental Monitoring & Ministry of Environment, Green Development and Tourism, 2015). This makes prevention and early management more feasible and less costly than attempting to rehabilitate sites that have crossed persistent ecological thresholds.

Rangeland restoration also offers a potential pathway for increasing soil organic carbon, although the magnitude and timing of these gains remain uncertain. Worldwide, experimental evidence validating long-term carbon accumulation in slow-cycling soil pools remains limited (Chang et al., 2015). Mongolia's 2026 General Methodology Guideline for Rangeland Carbon Sequestration recognizes that credible crediting requires standardized baselines, stratification, field sampling, modelling, uncertainty treatment, monitoring, reporting, and verification of soil organic carbon (Enkhtaivan & Dolgorsuren, 2026b, 2026a). Carbon potential should therefore be estimated by ecological site and management history rather than extrapolated uniformly across country's rangelands.

For carbon farming, the most defensible entry point is adaptive grazing management linked to measurable restoration outcomes. Seasonal pasture planning, adjusted stocking and grazing duration, strategic resting, protection of key water and reserve pastures, erosion control, and collective agreements among herder groups can improve vegetation and soil function while retaining mobility as a core adaptation strategy. Recent implementation experience from the FAO–WWF GEF-7 project in Mongolia's Eastern Steppe demonstrates the importance of combining soum-level land-management planning, pasture photo-monitoring, local working groups and herder participation. Through these participatory processes, consecutive pasture-resting practices were implemented across approximately 845,000 hectares between 2022 and 2024 (Erdenejargal & Bat-Erdene, 2025).

Carbon finance can help cover transition and monitoring costs, but it should complement – not replace – better pasture governance, climate-risk management, and livelihood support. Projects must account for drought-driven variability, leakage to adjoining pastures, reversal risk, shared use rights, equitable benefit distribution, and the possibility that soil-carbon change may take many years to detect reliably.

2.1.3 Highlands of Tajikistan

Tajikistan is the most mountainous nation in Central Asia, with over 90% of its territory classified as mountainous and more than half lying above 3,000 meters. Its landscape is dominated by the towering Pamir and Alay mountain ranges, with deep river valleys, notably the Vakhsh and the Panj (forming part of the Amu Darya headwaters), cutting through the terrain. The climate is sharply continental, with extreme vertical zonation: hot, dry summers in the low-lying southwest to perpetual snow and ice in the high Pamirs.

Agriculture is a vital sector for Tajikistan's economy and rural population, contributing about 22% of GDP and employing over half of the labor force. The sector is defined by severe land constraints, with less than 7% of the country's area suitable for cultivation. Intensive farming is confined to small, irrigated pockets in the Vakhsh, Gissar, and Fergana valleys. This is the primary zone for staple crops. Extensive livestock grazing (sheep, goats, and yak) on high-altitude summer pastures (jailoos) and marginal slopes.

Key agricultural outputs include:

- Cotton: A historically significant cash crop, primarily grown in the hot southwestern lowlands.
- Food Staples: Wheat, potatoes, and barley for domestic food security.
- Horticulture: A critical and growing sector, with significant production of fruits (apricots, grapes, apples, lemons) and vegetables.
- Livestock: A cornerstone of rural livelihoods, providing meat, dairy, and wool.

Tajikistan's environment is under acute stress. It faces the most severe soil erosion in Central Asia, driven by deforestation on steep slopes, overgrazing, and unsustainable agricultural practices on marginal lands. Glacial retreat, a critical water source, threatens long-term water security for irrigation and hydropower. Furthermore, soil salinization affects parts of the irrigated lowlands. The viability of water-dependent carbon-farming pathways therefore needs to account for the changing reliability and seasonality of glacier- and snowmelt-fed water supplies, competing irrigation demands, and potential downstream effects.

Tajikistan offers opportunities for carbon farming through measures that stabilize degraded slopes, restore highland pastures, and improve soil management on scarce

arable land. Agroforestry, tree planting, and other perennial systems are appropriate where water availability and broader watershed conditions support their long-term viability. Careful safeguards should be put in place to ensure that carbon farming projects do not intensify competition over Tajikistan's limited productive land, create tensions around pasture use, or generate unreliable carbon claims in steep, erosion-prone mountain landscapes.

2.1.4 Dryland agricultural landscapes of Uzbekistan

Uzbekistan is dominated by arid and semi-arid climates, with vast expanses of the Kyzylkum Desert and dry steppes. Its geography is sharply divided between the flat, low-lying desert plains of the west and the more fertile, irrigated valleys in the east, notably the Fergana Valley, fed by the Amu Darya and Syr Darya rivers.

Uzbekistan's agriculture is a vital pillar of its economy, contributing significantly to GDP and employment. It relies heavily on irrigation in the fertile valleys and river deltas, while vast drylands support livestock grazing. Key agricultural products include:

- "White Gold" – Cotton: Historically and still today, cotton is a strategic crop, occupying a large portion of the best irrigated land.
- Food Staples & Horticulture:
- Wheat: Grown for national food security, now often in rotation with cotton.
- Fruits & Vegetables: A major growth sector. Uzbekistan is a leading regional producer of tomatoes, carrots, onions, grapes, melons, apricots, cherries, and pomegranates.
- Rice: Cultivated in specific, well-watered regions.
- Livestock: An important sector, particularly cattle, sheep, and goats, often utilizing natural pastures and rangelands.
- "Green Gold" – Fruits & Nuts: There is a strong national push to expand high-value perennial orchards (e.g., almonds, pistachios, apples, stone fruits) to diversify exports and improve water efficiency.

Uzbekistan's agricultural sector is critically dependent on an extensive yet strained irrigation network fed by transboundary rivers. Widespread soil salinity, wind erosion, desertification, and large areas of marginal drylands and rangelands create both major land-management challenges and potential entry points for carbon farming. Water availability is a fundamental constraint: water-dependent interventions need to be assessed against basin- and landscape-level water balances, irrigation reliability, salinity, drought risk, competing demands, and potential downstream effects. These conditions make the suitability of land-based interventions highly location-specific.

Against this background, potential carbon-farming pathways include soil restoration, salinity management, rangeland rehabilitation, improved crop rotations and conservation agriculture, as well as agroforestry, windbreaks, and water-efficient perennial systems where hydrological conditions permit. Such practices could generate carbon benefits alongside improved land productivity, reduced erosion, and greater resilience to water scarcity, provided that they do not increase pressure on scarce water resources or compromise food-production priorities.

Table 2.1 summarizes the biophysical and environmental conditions in Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan relevant for carbon farming.

Table 2.1: Biophysical and environmental conditions in Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan at a glance.

	Kyrgyzstan	**Mongolia**	**Tajikistan**	**Uzbekistan**
Appr. area, thousand sq. km.	200	1560	143	449
Rank in the world, by area	85th	18th	94th	56th
Dominating ecosystem types	Mountain ecosystems of the Tien Shan and Pamir-Alay; high-altitude pastures, montane steppes and meadows, foothill arid steppes, irrigated valleys, and limited forest areas.	Vast dry steppe and semi-desert systems; Gobi desert landscapes in the south; mountain and forest-steppe zones in the north and west; extensive rangelands dominate the land-use system.	Highly mountainous ecosystems of the Pamir and Alay ranges; alpine and subalpine pastures, dry valleys, irrigated agricultural oases, and fragile mountain watersheds.	Arid and semi-arid drylands; deserts and semi-deserts, irrigated agricultural oases, riparian ecosystems, foothill and mountain zones, and degraded lands around the Aral Sea region
Major environmental challenges	Pasture degradation and overgrazing; soil erosion on slopes; vulnerability of mountain ecosystems; glacier retreat and water-flow changes; localized salinization and land degradation in irrigated areas.	Rangeland degradation and overgrazing; desertification; drought and dzud-related livestock losses; soil erosion; water scarcity; mining-related land disturbance.	Severe land degradation and erosion in mountain and foothill areas; overgrazing; deforestation and fuelwood pressure; glacier retreat; water-management pressures; salinization in irrigated lowlands.	Water scarcity; soil salinization and waterlogging in irrigated agriculture; desertification; degradation of rangelands and drylands; Aral Sea legacy impacts; competing pressures on land and water resources

2.1.5 Candidate carbon farming methodologies

National evidence on sustainable land-management practices, their performance, and associated carbon outcomes remains substantially underdeveloped across Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan, with available information often fragmented across institutions, inconsistent in coverage, and difficult to access. International databases and knowledge platforms, including WOCAT and FAO resources, provide useful complementary information, but coverage of the four countries is also uneven and evidence from other regions cannot always be transferred directly because of differences in climate, soils, water availability, land-use systems, and governance conditions. Table 2.2 therefore presents an indicative synthesis drawing on available national information, international databases, academic and modelling studies, and experience from other countries and regions with broadly comparable ecological and land-use conditions. It summarizes the main potential carbon-farming opportunities across key land systems, identifies their potential mitigation, adaptation, and land-restoration benefits, and provides illustrative practices that could support implementation. The list is not exhaustive, and the suitability and expected outcomes of individual practices require validation under local conditions.

Table 2.2: Examples of carbon farming practices potentially suitable for Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan. Carbon outcomes are context-dependent and require appropriate baselines, monitoring and verification where monetized.

Ecosystem / land system	**Countries**	**Carbon-farming opportunity**	**Mitigation, adaptation and land-restoration potential**	**Illustrative practices**
Highland pastures and mountain grazing systems	Kyrgyzstan Tajikistan	Improved pasture management and restoration	Can reduce soil erosion and pasture degradation, improve vegetation and soil condition, enhance water retention and watershed protection, and strengthen pastoral livelihoods. Improved management may also increase soil carbon where ecological conditions and management changes support additional sequestration.	Scientifically informed grazing calendars; adjustment of grazing intensity and duration; strategic resting of degraded areas; reseeding degraded patches with native perennial grasses; restoration of seasonal grazing areas.
Dryland rangelands and steppes	Mongolia Uzbekistan	Improved grazing management, natural regeneration and pasture restoration	Can reduce desertification and further degradation, improve pasture condition, fodder availability and livestock productivity, and strengthen resilience of pastoral systems. Improved rangeland condition may also create opportunities for additional soil-carbon gains where these can be credibly demonstrated.	Community-based grazing plans; seasonal resting; management of stocking pressure; natural regeneration; reseeding with native drought-resistant grasses and forage shrubs; integration of grazing planning with carbon monitoring.

Irrigated croplands and agricultural valleys	Kyrgyzstan Tajikistan Uzbekistan	Conservation agriculture, soil restoration and integrated water management	Can build or maintain soil organic carbon, reduce erosion, improve infiltration and soil-water retention, increase water-use efficiency, mitigate salinity and strengthen resilience of agricultural production.	Minimum/no-till; diversified rotations; winter cover crops; residue retention where appropriate; compost and other organic amendments; drip or sprinkler irrigation; integration of soil-management and irrigation measures.
Agroforestry, orchards and perennial production systems	Kyrgyzstan; Tajikistan; Uzbekistan	Agroforestry and expansion of perennial vegetation in suitable agricultural landscapes	Can increase biomass and soil-carbon storage, stabilize soils, improve microclimates, diversify production and farm income, and strengthen resilience. Water requirements and effects on local and downstream water balances need to be considered in water-constrained areas.	Alley cropping; windbreaks and shelterbelts; integration of trees and shrubs into orchards and croplands; perennial fodder systems; nitrogen-fixing trees and shrubs; drought-adapted fruit and nut species.
Forests and forest-steppe systems	Kyrgyzstan Mongolia	Forest protection, assisted regeneration, afforestation and reforestation in ecologically suitable areas	Conserves existing carbon stocks and can increase biomass carbon storage while supporting biodiversity, erosion control, watershed protection and non-timber forest-based livelihoods.	Protection of existing forests; assisted natural regeneration; community-led restoration; expansion of native tree cover where ecologically and hydrologically appropriate; silvopastoral systems combining tree cover and managed grazing.
Riparian zones, wetlands and river corridors	Kyrgyzstan Tajikistan Mongolia	Protection and restoration of riparian vegetation and wetland systems	Can protect existing carbon stocks and, in suitable settings, increase carbon storage while reducing erosion and siltation, improving water quality and retention, protecting biodiversity and strengthening landscape resilience.	Protection from excessive grazing; natural regeneration; vegetative buffers; restoration of degraded riverbanks and springs; planting locally appropriate native riparian vegetation; targeted temporary exclusion where necessary for recovery.
Degraded slopes and erosion-prone lands	Kyrgyzstan Tajikistan	Revegetation and stabilization of degraded slopes	Can reduce erosion, landslide and sedimentation risks, restore vegetation and soil function, increase biomass and potentially soil-carbon storage, and provide fodder or other livelihood benefits.	Establishment of deep-rooted perennial grasses, shrubs and trees; slope stabilization; assisted natural regeneration; drought-adapted fodder and fruit species; targeted restoration of severely eroded areas.

Marginal and saline lands	Tajikistan Uzbekistan	Rehabilitation using salt- and drought-tolerant perennial vegetation	Can stabilize degraded land, improve soil condition, establish new biomass and soil-carbon stocks, diversify productive uses and reduce pressure on more productive agricultural land. Carbon gains will depend strongly on vegetation establishment, water availability and long-term survival.	Halophytes and drought-adapted perennial grasses; fodder shrubs; perennial biomass crops where appropriate; revegetation of abandoned and saline areas; use of suitable biomass for local biochar production.

2.2 Economic, social, and political contextual foundations for carbon farming in Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan

2.2.1 Kyrgyzstan

Economic context. Kyrgyzstan's economy is heavily reliant on agriculture, particularly small-scale livestock herding and subsistence farming, with remittances from migrant workers as a critical income source. The agricultural sector is characterized by small, fragmented plots, low mechanization, and limited access to finance. For carbon farming, this presents a challenge of scale and investment: Extreme land fragmentation and low capitalization prevent investments in new equipment (e.g., for no-till) and make it difficult to achieve the scale needed for cost-effective carbon project development.

The National Development Strategy of the Kyrgyz Republic for 2018-2040 set the goal to increase efficiency of country's agricultural sector by expanding irrigation network and introducing modern technology (Government of the Kyrgyz Republic, 2018). This strategic goal is a powerful enabling tool for carbon farming, but it must be consciously steered toward climate-smart implementation to create a synergy where enhanced agricultural efficiency actively builds, rather than depletes, the nation's soil carbon stocks.

Carbon credit revenues could provide a vital cash infusion, but project transaction costs must be low to be viable. Economic benefits must be immediate and tangible. Co-benefits will play a significant role, for example, increased fodder production from perennial legumes, fuel savings from reduced tillage, improved soil fertility and water retention leading to higher yields, and diversified income from forage or honey production in agroforestry systems.

Kyrgyzstan's society is rural and community-oriented, with strong traditions of pastoralism. Land tenure is largely secure for individuals, but pasturelands are often held communally. This communal management is a double-edged sword: it can facilitate collective action for rotational grazing programs, but can also lead to the "tragedy the commons" through overgrazing. Social acceptance of new practices hinges on demonstration and local champions. The deep connection to land and livestock means practices that visibly improve animal health and pasture resilience will have strong appeal. Successful carbon farming frameworks must address critical trade-offs by design, such as the competition between retaining crop residues to build soil carbon and harvesting them for their traditional use as winter livestock fodder.

Societal context. Kyrgyzstan has a relatively active civil society, however, political instability and corruption undermine long-term policy support and risk diverting project benefits, discouraging consistent farmer participation and international investment.

Carbon farming's success will require building partnerships with local self-governance institutions (ayil okmotus) and pasture committees, navigating a decentralized but often under-resourced governance structure.

Political context. Kyrgyzstan's political landscape is characterized by volatile conditions. The country is a member of the Eurasian Economic Union – meaning its agricultural sector operates within a regulated common market with Russia, Kazakhstan, Belarus, and Armenia, which influences input costs, market access, and regulatory compliance. Environmental policy in Kyrgyzstan is influenced by international donors and programs.

The specific term "carbon farming" has yet to be formally adopted in Kyrgyzstan's national strategic lexicon – however, the foundational policy principles and objectives embedded within several high-level documents create a generally favorable environment for its practices and objectives to take root. The National Development Strategy of the Kyrgyz Republic for 2018 - 2040 identifies green economy and ecological sustainability as key pillars (Government of the Kyrgyz Republic, 2018). This high-level mandate legitimizes all initiatives aimed at sustainable land management and low-carbon development, including carbon farming. The Green Economy Development Program through 2029 identifies green agriculture as a priority and includes measures to strengthen green finance and mobilize investment in environmentally sustainable activities (Government of the Kyrgyz Republic, 2025b). The program promotes sustainable and climate finance, including ESG disclosure in the banking sector, and seeks to optimize fiscal mechanisms in support of sustainable development. It also targets the restoration of degraded land, including through improved pasture management and monitoring. The National Pasture Development Program (2024-2029) establishes a framework for sustainable pasture management and climate change adaptation (Government of the Kyrgyz Republic, 2024). Its core objectives include reversing land degradation, mitigating greenhouse gas emissions through improved pasture health, and enhancing the economic well-being of rural communities.

Furthermore, President of Kyrgyzstan Sadyr Japarov has advocated to the international community – including at the 79th session of the United Nations General Assembly (Akhmatova, 2024) and the 29th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP29) in Baku (Husainova, 2024) – for the creation of a mechanism to swap external debt for climate and sustainable development projects in less developed nations. Concurrently, he announced the establishment of a national Climate Trust Fund in Kyrgyzstan, dedicated to financing projects in ecology and sustainable mining development. These initiatives can provide additional opportunities for developing carbon farming projects in the country.

International land and climate commitments. Kyrgyzstan is a Party to the UNFCCC and the Paris Agreement. While the country made significant progress under its previous commitments, including NDC 2.0 submitted in 2021, implementation remained incomplete. Nevertheless, Kyrgyzstan raised its ambition further in NDC 3.0, prepared in 2025, setting 2035 emission reduction targets of 16% using domestic resources and up to 39% with international support (see Annex 1 for more details). It also sets out a longer-term vision of achieving carbon neutrality by 2050 (Government of the Kyrgyz Republic, 2025c). This higher level of ambition, combined with past implementation gaps, increases the importance of identifying mitigation options that are both scalable and feasible within Kyrgyzstan's institutional and ecological context.

Land-based mitigation is particularly relevant in this regard: under NDC 2.0, LULUCF accounted for 75% of reported emission reductions, while agriculture contributed a further 6% (Government of the Kyrgyz Republic, 2021). Carbon farming could therefore offer a practical way to build on the country's strongest area of mitigation performance, especially through measures such as pasture restoration and improved soil management that also support adaptation and land degradation neutrality. This alignment is reinforced by NDC 3.0 (Government of the Kyrgyz Republic, 2025c), which highlights synergies between mitigation, adaptation, and land degradation neutrality goals and notes the possible future use of Paris Agreement market mechanisms once their national applicability is clearer.

Furthermore, Kyrgyzstan has been an active participant in the UNCCD Land Degradation Neutrality Target Setting Programme. During the first phase (LDN TSP 1.0), the country integrated LDN measures into its national strategies on agriculture, natural resource management, and rural development, with implementation carried out through existing legal and programmatic frameworks. Selected as one of 18 countries for the second phase (LDN TSP 2.0), Kyrgyzstan receives targeted technical support to enhance its land degradation monitoring systems, strengthen institutional governance, and embed LDN targets into national policy. A distinctive feature of the national approach is the use of local pasture committees to collect ground-based data on rangeland conditions, which complements satellite and GIS monitoring and improves the accuracy of degradation assessments. Overall, Kyrgyzstan has progressed from LDN target setting to operational implementation, with a strong emphasis on community-based pasture governance and the integration of in situ data with remote sensing. However, key challenges persist, including insufficient funding, a shortage of qualified agronomists, mechanics and hydro technicians, weak enforcement of land-use regulations, and limited local control over land management.

Taken together, these commitments provide a relevant policy foundation for carbon farming, although implementation will depend on effective inter-agency coordination,

adequate technical capacity and sustained financing (Government of the Kyrgyz Republic, 2025a).

Relevant past and current activities. Ongoing projects, such as the FAO-supported initiative on integrated water resource management in the Syr Darya and Naryn river basins, promote water-saving technologies, agroforestry, and sustainable agricultural practices to enhance food security and climate resilience among smallholder farmers. Kyrgyzstan's carbon-farming-related activity is still mainly at the readiness and pilot-development stage, with the closest current initiatives focusing on forest and pasture restoration, climate-smart pasture management, and emerging Article 6 carbon-market cooperation rather than a mature pipeline of certified land-based carbon projects (see Annex 2 for the details).

2.2.2 Mongolia

Economic context. Mongolia's economy depends heavily on mining for exports, fiscal revenue and foreign exchange, while livestock production remains fundamental to rural employment, household livelihoods, food security and national culture. The country has a highly greenhouse-gas-intensive economy when emissions are measured relative to GDP, although its precise international ranking depends on the year, accounting boundary and treatment of land-use removals. Coal-fired electricity and heating constitute the largest source of gross emissions, while livestock, particularly enteric fermentation, accounts for most agricultural emissions. Mongolia's first Biennial Transparency Report should be used for current sectoral estimates, with energy, agriculture and land use reported separately rather than combining agricultural emissions with LULUCF removals (Government of Mongolia, 2025a; World Bank, 2024a).

The principal economic case for carbon farming lies in integrating climate finance with sustainable rangeland management. Better grazing management could restore vegetation and soil condition, improve livestock productivity and strengthen resilience to drought and dzud. Carbon finance could help compensate participating herder groups for agreed reductions in grazing pressure, seasonal pasture resting and restoration activities. It could also finance grazing plans, reserve-pasture management, improved water management, monitoring systems and measures that increase livestock productivity per animal.

Restoration measures need to be compatible with the mobility-based character of Mongolian pastoralism. For example, permanent fencing should be used cautiously. Although temporary enclosures may be appropriate in some restoration sites, extensive fencing can restrict seasonal mobility, concentrate grazing elsewhere and create conflicts over customary access to common pasture. Mongolia's highly variable climate makes mobility an important adaptation strategy. Carbon-farming interventions should

therefore support flexible, negotiated grazing arrangements rather than impose uniform paddock-based models developed for sedentary livestock systems.

Importantly, the conditions required for rangeland carbon projects to achieve commercial viability remain to be established. Changes in soil organic carbon are difficult and costly to detect in Mongolia's dry and spatially variable rangelands. As with rangeland carbon projects elsewhere, initiatives in Mongolia must address additionality, permanence, grazing displacement and transaction costs, as well as the possibility that carbon revenues may not cover monitoring and implementation expenses. Carbon finance is therefore better treated as one component of a broader package of restoration, livestock-development and resilience finance than as the sole economic justification for changing pastoral management.

Societal context. Mobile and semi-mobile pastoralism is a central element of Mongolia's cultural identity and rural economy. Pastoral livelihoods are organized through households, kinship networks, customary seasonal movements, local communities and increasingly formal herder groups and cooperatives. Many herder households also depend on pensions, wage employment, trade and urban family connections, meaning that rural livelihoods are more diverse than livestock ownership alone suggests.

Pastureland is generally state property and is used in common. Herders' access often rests on customary seasonal use, local administrative decisions and community agreements rather than exclusive, long-term possession rights. This creates a fundamental challenge for carbon projects: the right to use pasture does not necessarily establish the right to claim, sell or transfer carbon credits generated from it. Projects will need transparent agreements defining who can authorize changes in management, who owns the resulting mitigation outcomes, how mobile and neighboring users participate, and how benefits and responsibilities are distributed.

A further challenge for carbon farming is that reducing grazing pressure may require addressing the multiple factors that drive livestock numbers. Growth in livestock numbers reflects both the traditional value attached to large herds and the economic, institutional and risk-management incentives that encourage herd expansion. Herds serve as savings and insurance against dzud, market volatility, limited access to finance and insurance, and uncertainty over future livelihoods. Low productivity per animal and incentives embedded in livestock markets can further encourage households to retain more animals. Carbon-farming programs should therefore improve household security, livestock health and productivity, market access and risk management alongside any effort to manage total grazing pressure.

Full and continuing participation by herders is essential. Grazing plans must reflect traditional ecological knowledge, seasonal mobility, differences among ecological

zones and the need for emergency access to reserve pasture during drought and dzud. Benefit-sharing systems should include women, poorer households, hired herders, households with relatively few animals and customary users who may not hold formal cooperative membership. Projects offering visible livelihood benefits – such as healthier animals, improved pasture condition, more reliable water access, better veterinary services and diversified income – are more likely to retain participation than projects focused exclusively on carbon credits.

Political and institutional context. Mongolia is a competitive multiparty parliamentary democracy with a strong national identity and an established strategic commitment to green development. Mongolia's Vision 2050 provides a long-term direction for low-emission, climate-resilient and environmentally sustainable development (State Great Khural of Mongolia, 2020). Carbon farming is not yet consistently used as a formal policy category, but its underlying objectives appear in Vision 2050, national climate commitments, land-restoration policies and programs for sustainable livestock and rangeland management.

Mongolia's policy environment is broadly supportive of carbon farming, but the operational framework remains incomplete. Important gaps concern carbon rights, authority over common pasture, project approval, safeguards, benefit-sharing, avoidance of double counting and the relationship between domestic accounting and international crediting standards. The country is developing procedures and technical infrastructure for carbon-market participation, but adoption of a registry procedure should not be treated as proof that a fully operational and publicly accessible domestic carbon registry is already functioning.

Implementation also depends on institutional coordination. The central government will need to establish authorization, accounting and safeguard requirements and mobilize climate finance. Aimag and soum governments, bagh-level institutions, herder organizations and cooperatives will be central to grazing agreements, local monitoring and conflict resolution. Continuity across changes in government personnel and local leadership will be important because restoration and soil-carbon outcomes require long implementation periods.

International land and climate commitments. Mongolia is a Party to the UNFCCC, Paris Agreement, and UNCCD. Its climate commitments have become progressively more ambitious across successive NDCs (see Annex 1 for more details). Under its updated NDC submitted in 2020, Mongolia set an unconditional mitigation target of 22.7% by 2030, relative to the business-as-usual scenario, excluding LULUCF. Agriculture was included through measures concerning livestock productivity, herd composition and manure management, while forest removals were accounted for separately (Government of Mongolia, 2020).

Assessment of progress towards this target should distinguish among implemented mitigation measures, changes observed in the national inventory and temporary changes caused by economic or climatic shocks. Any associated decline in emissions should not be treated as equivalent to a planned and durable mitigation outcome. Mongolia's first Biennial Transparency Report (Government of Mongolia, 2025a) provides the appropriate basis for assessing progress and identifying remaining sectoral implementation gaps, while the NDC 2.0 Stocktake Report provides a complementary assessment of implementation progress and informs the development of the next NDC (United Nations Development Programme, 2025b). Progress towards Mongolia's mitigation target has been measurable but remains incomplete. Mongolia's first Biennial Transparency Report indicates that, in 2022, emissions excluding LULUCF were 7.6% below the corresponding business-as-usual level, representing approximately 73.3% of the reduction targeted for that year and 33.4% of the reduction required to reach the 2030 target. The 2025 NDC 2.0 Stocktake Report (United Nations Development Programme, 2025b) provides a more recent assessment, estimating that by 2024 Mongolia had achieved 39.7% of its targeted mitigation trajectory excluding LULUCF, while forest removals made a substantial additional contribution when sinks were included. Progress in agriculture remained uneven: emissions increased during 2020–2023 as livestock numbers grew, before declining in 2024 owing partly to mitigation measures but also to severe livestock losses during the 2023–2024 severe dzud, which caused major livelihood impacts.

Mongolia's NDC 3.0, submitted in 2025, further raises ambition by setting unconditional emission reduction target of 30.3% by 2035 relative to business as usual, excluding LULUCF (Government of Mongolia, 2025c). It also reports a 46.3% net reduction when forest removals are included and a conditional net reduction of up to 52.8% with international support. The NDC includes a target to restore 10% of heavily degraded rangelands in forest-steppe and steppe ecological zones and indicates Mongolia's intention to use cooperative approaches under Article 6 of the Paris Agreement where appropriate (Government of Mongolia, 2025a). Mongolia's NDC 3.0 also signals openness to cooperative approaches and market mechanisms under Article 6 of the Paris Agreement as institutional and methodological frameworks develop (Government of Mongolia, 2025c).

These commitments, together with the challenges involved in meeting them, create a potential role for land-based mitigation, including sustainable grazing, restoration of degraded rangelands, improved forest management and enhancement of soil and vegetation carbon. However, mitigation claims should be distinguished from adaptation and restoration outcomes unless associated changes in emissions or removals are quantified against an appropriate baseline and independently verified.

Under the UNCCD, Mongolia has committed to achieving Land Degradation Neutrality by 2030 providing an additional policy basis for land restoration and sustainable rangeland management. Its voluntary national targets explicitly include promoting sustainable grassland management and halting further grassland degradation, alongside targets for forest cover, agricultural productivity and the prevention of net wetland loss (National Committee on Combatting Desertification of Mongolia, 2018).

The country is actively moving from commitment to action, with its updated NDC 3.0 targeting the restoration of 10% of heavily degraded rangelands, alongside pilot projects that advance carbon finance through improved grazing management. This active pursuit of LDN targets highlights the complementary relationship between Vision 2050 and Mongolia's international commitments.

Mongolia's selection as host of the 17th session of UNCCD Conference of Parties (COP17) in 2026 and its participation in international rangeland initiatives provide opportunities to connect national restoration priorities with international finance and scientific cooperation. Hosting COP17 demonstrates political leadership and international visibility, but achievement of LDN will ultimately depend on measurable improvements in land condition, locally legitimate governance and sustained financing beyond individual pilot projects.

Relevant past and current activities. Mongolia has experience with several international mitigation and results-based finance mechanisms (see Annex 2 for more details). Under the Clean Development Mechanism, four Mongolian energy and infrastructure projects issued certified emission reductions, reportedly totalling 699,177 CERs. Public records identify international project participants and buyers including the Swedish Energy Agency/Government of Sweden, Japanese entities linked to hydropower projects, and Microsoft. Although these activities did not generate land-based credits, they helped national institutions gain experience with project registration, baselines, monitoring, third-party validation, credit issuance and international buyers.

Mongolia joined the United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD) in 2011 and launched its National REDD+ Readiness Program in 2015. It subsequently developed a National REDD+ Strategy and Action Plan and submitted a Forest Reference Level for technical assessment. These are significant readiness achievements, but Mongolia has not yet demonstrated large-scale implementation through verified REDD+ results and results-based payments. REDD+ experience nevertheless provides relevant lessons concerning forest inventories, safeguards, reference levels and national-scale accounting (United Nations Convention to Combat Desertification, n.d.-a).

Linked to Paris Agreement Article 6 implementation, Mongolia–Japan Joint Crediting Mechanism provides the country's most developed bilateral carbon-market pathway.

Mongolia was the first country to sign a JCM bilateral document with Japan, in 2013 (Ministry of Economy, Trade and Industry of Japan & Ministry of the Environment of Japan, 2013). The mechanism has primarily supported renewable-energy and low-carbon-technology projects, building experience with methodologies, project-level MRV, bilateral authorization, registries and the international transfer of mitigation outcomes. In July 2026, Mongolia completed its first international transfer of JCM mitigation outcomes, demonstrating that the bilateral authorization and transfer pathway is operational (Ministry of Economy, Trade and Industry of Japan & Ministry of the Environment of Japan, 2026).

Mongolia has also expanded Article 6 cooperation with other countries. Its climate cooperation with the Republic of Korea covers mitigation projects, MRV capacity and Article 6.2 procedures (Ministry of Environment of the Republic of Korea, 2022). Mongolia and Singapore signed an Implementation Agreement on 6 October 2025, establishing a legally binding framework for authorizing eligible mitigation activities and transferring internationally transferred mitigation outcomes (Green Earth, 2025; Ministry of Trade and Industry, Singapore, 2025). The agreement creates an operational institutional pathway for bilateral Article 6.2 cooperation, while the registration of Mongolian land-sector projects and the issuance or transfer of associated credits remain forthcoming.

Several initiatives are exploring the potential for rangeland carbon finance. The “Pastures, Conservation, Climate Action” project provides an established example of community-based rangeland carbon finance in Mongolia. Managed by the Mongolian Society for Range Management under the standard of Plan Vivo, an independent certification system for community- and smallholder-led nature-based projects operating globally. The project works with 116 nomadic households across three mountain, steppe and desert-steppe sites to restore degraded grasslands through improved grazing management. At the time of finalizing this report, Plan Vivo reported that the project had issued 162,062 Plan Vivo Certificates, some of which have been sold and retired through carbon-market intermediaries, with revenues supporting participating herder communities and associated rangeland-management and livelihood activities (Plan Vivo Foundation, n.d.).

As another example, on 10 April 2026, the Mongolia–Japan JCM Joint Committee issued a no-objection decision for the planned “Mongolian Grassland Restoration through Sustainable Grazing Practices” project, being developed by Boomitra and Mitsubishi Corporation (Boomitra Team, 2026; Joint Committee of the Joint Crediting Mechanism between Mongolia and Japan, 2026). This represents an important early-stage milestone which however does not constitute approval of a methodology, project registration, verification of mitigation outcomes or credit issuance. Progression through the JCM project cycle will require an applicable approved methodology, implementation and monitoring of improved grazing practices, credible measurement, reporting and

verification of soil-carbon outcomes, project validation and registration, and the subsequent verification and approval of any credits issued. Together, these partnerships demonstrate Mongolia's intent to monetize climate outcomes and strengthen its carbon-market readiness by building experience with project authorization, MRV, corresponding adjustments, and international credit transfers, although their direct application to rangeland or forestry carbon farming will depend on whether eligible land-sector methodologies and projects are developed.

Mongolia has established a national carbon registry and is developing operational and methodological guidance for carbon-market participation, including procedures for project approval, financial management and the measurement, reporting and verification of soil-organic-carbon outcomes. Existing international methodologies for improved agricultural land and grassland management may provide useful starting points, but they will need to be adapted and tested against Mongolia’s ecological conditions, mobile pastoral systems, data constraints and institutional arrangements. In the meantime, the country has engaged with international carbon-standard organizations to strengthen its carbon-market readiness. A 2024 cooperation agreement with Verra includes capacity building on Verified Carbon Standard requirements, registry procedures and methodology development (ref), while earlier cooperation with Gold Standard focused on Mongolia’s access to international carbon finance under Article 6 (Spannagle & Salway, 2021).

Overall, Mongolia has comparatively advanced international cooperation under Article 6, an emerging policy framework and promising grassland pilots. Nevertheless, a scalable rangeland-carbon market has not yet been established. Its development will require clear carbon rights, legitimate agreements for common pasture, conservative baselines, management of leakage and permanence risks, credible soil-carbon measurement, social and environmental safeguards, and equitable distribution of benefits. Carbon finance has the greatest potential when embedded in broader programs for sustainable pastoral livelihoods, rangeland restoration and climate resilience.

2.2.3 Tajikistan

Economic context. Tajikistan is the poorest country in the region, with an economy dependent on aluminum exports, cotton monoculture, and massive remittances. Land tenure is a mix of state-owned large farms (sovkhoz remnants) and small private (dehkan) farms. Agriculture is critical for food security but suffers from legacy systems, land degradation, and acute water management challenges. Severe land degradation and water scarcity present a clear, undeniable need for soil- and water-conserving techniques, aligning carbon goals with immediate livelihood needs. The economic space for carbon farming is constrained by extreme poverty. Farmers cannot afford risk or

forego short-term yields. Interventions must first and foremost address food security and immediate income. Practices like legume intercropping that boost soil nitrogen and provide edible pulses could be more relevant than pure cover crops. Water-saving aspects of conservation agriculture (mulch to reduce evaporation) can be a powerful economic driver. Access to microcredit for seed or simple tools is a prerequisite.

As in Kyrgyzstan and Mongolia, effective carbon farming frameworks must navigate critical socio-ecological trade-offs with deep historical and cultural dimensions. A key challenge is the competition for biomass: in Tajikistan, every stalk of crop residues is used for fodder, fuel, and construction material leaving no surplus. Consequently, initiatives promoting residue retention for carbon sequestration must first provide alternative resources. Success is contingent upon two factors: integrating the practice into local community systems and proving its tangible, short-term advantages.

Societal context. Tajikistan's society is highly rural and young, with local social life strongly shaped by mahallas — traditional neighborhood-level community structures often guided by informal leaders and respected community figures. These networks can support collective action around land restoration, pasture management, and climate-smart agriculture, but they are often embedded in a broader social context where trust tends to flow vertically through recognized authorities rather than horizontally among independent actors. For carbon farming, this means that projects are unlikely to gain traction through market incentives alone. Endorsement from local administrations, jamoat and mahalla leaders, and respected community figures will be important for building legitimacy, mobilizing participation, and resolving land-use conflicts. At the same time, effective implementation will require inclusive engagement with farmers, pasture users, women, and youth to ensure that benefits are understood, fairly distributed, and linked to locally relevant priorities such as soil fertility, water security, livestock productivity, and household income.

At the local level, district and jamoat authorities are critical for translating national policies into land-use agreements, pasture management plans, farmer participation, and monitoring. For carbon farming, these actors would need to work together across climate policy, land tenure, agricultural practice, forestry, and MRV, with the main coordination challenge being the integration of sectoral mandates that are currently spread across several institutions.

Political context. Tajikistan's governance system is highly centralized, with the state maintaining strong control over major aspects of society and the economy, including agricultural production targets.

The National Development Strategy of the Republic of Tajikistan through 2030 provides the overarching national blueprint setting strategic goals for the country focusing on

sustainable economic growth and poverty reduction (Government of the Republic of Tajikistan, 2016). The strategy also calls for expanding the productive use of marginal and salinized lands, stimulating green employment, promoting ecological entrepreneurship, and developing a market for ecosystem services. Any carbon farming initiative must align with its broad objectives, notably, food security.

Similar to its neighbors Kyrgyzstan and Mongolia, Tajikistan has not yet adopted the specific term "carbon farming" into its policy lexicon. Nevertheless, the country has established a body of high-level strategic documents whose objectives are fundamentally compatible with the goals of carbon farming. The National Climate Change Adaptation Strategy (Government of the Republic of Tajikistan, 2019) and its Action Plan 2025-2027 (Government of the Republic of Tajikistan, 2025) focus on building resilience directly addressing the vulnerabilities of the agricultural sector to climate impacts (drought, erratic precipitation, soil degradation). Carbon farming practices that also improve soil health and water retention (e.g., agroforestry, cover cropping) would be highly compatible with this strategy's goals.

The Program for the Development of Pastures for 2021-2025 is directly relevant for practices like managed grazing, pasture restoration, and silvopasture (Government of the Republic of Tajikistan, 2022). It aims to combat degradation, improve fodder production, and formalize pasture management committees – key structures for implementing community-based carbon projects.

The Environmental Code provides the general legal basis for environmental protection, natural resource management, and possibly future regulations on ecosystem services or carbon credits. Furthermore, the National Greening Program till 2040 and its action plan 2025-2027 calls for the creation of the enabling environment for greening of the country as a climate adaptation measure. An early action is planting of more than 10.9 million tree and shrub seedlings.

While these legislative frameworks are broadly favorable with respect to carbon farming, Innovation is slow and carbon farming would need to align with state priorities, such as food self-sufficiency and disaster risk reduction (e.g., reducing erosion that threatens infrastructure). Pilot projects require high-level patronage to proceed, but may then be scaled through top-down directives.

International land and climate commitments. Tajikistan is a Party to the UNFCCC, Paris Agreement, and UNCCD. Its climate commitments are shaped by high vulnerability to climate change, particularly glacier melt, water stress, soil erosion, and climate-related disasters, as well as by limited domestic capacity and reliance on international support. In its updated NDC submitted in 2021, Tajikistan committed to keeping 2030 emissions at 60–70% of 1990 levels using domestic resources, or 50–60% with international finance, technology transfer, and capacity-building support (see Annex 1

for more details). Besides the mitigation targets, Tajikistan's NDC 3.0 also expands the national adaptation priorities (Government of the Republic of Tajikistan, 2021).

Land-based mitigation is relevant to Tajikistan's commitments because agriculture, forestry, biodiversity, water resources, and disaster-risk reduction are all included within the NDC scope. However, the NDC does not provide a detailed sectoral mitigation breakdown, and available reporting does not yet allow for a clear quantitative assessment of implementation progress (NDC Partnership, n.d.). This increases the importance of identifying practical, measurable land-based interventions that can deliver both mitigation and adaptation benefits.

In this context, carbon farming focused on erosion control, pasture restoration, improved soil management, agroforestry, and water-efficient land use could make a valuable contribution, while also aligning with Tajikistan's participation in the UNCCD's Land Degradation Neutrality target-setting process. During the first phase (LDN TSP 1.0), the country initiated work on establishing a decision-support system for sustainable land management. However, the mechanisms for achieving LDN targets remain at the stage of further institutional development. Several projects support LDN implementation in Tajikistan. The World Bank funded RESILAND Tajikistan project aims to strengthen the resilience of key regional infrastructure vulnerable to land degradation, improve livelihoods of transboundary communities through more productive landscapes, and enhance the connectivity and integrity of transboundary natural resources. Additionally, an FAO supported initiative promotes the conservation and sustainable use of agrobiodiversity by assessing and maintaining local crop varieties and wild relatives, thereby contributing to food and nutritional security. Overall, Tajikistan has laid the groundwork for LDN but continues to face significant capacity, data, and financing constraints. Further institutional strengthening, investment in monitoring systems, and expansion of financial mechanisms remain essential for moving from target setting to effective on-ground restoration.

Relevant past and current activities. Domestic environmental action in Tajikistan remains largely project-based and heavily reliant on external assistance. To date, the country has accessed international climate finance primarily through grants and concessional support for adaptation, resilience, sustainable land management, and institutional capacity-building (See Annex 2 for details). Compared with countries that have participated more actively in carbon markets, Tajikistan has very limited practical experience with results-based mitigation finance and carbon crediting. Publicly available records indicate no registered CDM projects in Tajikistan, and there is no clear evidence to date of operational Article 6-based initiatives (UNEP Copenhagen Climate Centre, 2026).

2.2.4 Uzbekistan

Economic context. Uzbekistan has the largest population and economy in Central Asia. Recent economic reforms have opened up the agricultural sector, but the legacy of the state-order system for cotton and wheat remains strong. Agriculture is intensive, irrigated, and a major water consumer. The economic threat of soil salinization and water scarcity provides a powerful, concrete incentive for farmers and the state to adopt water-saving practices like mulch-based conservation agriculture, which also sequesters carbon.

For the state, carbon credits could be a new export commodity. For farmers, practices like strip-till with residue cover can lower fuel, water, and labor costs. The perennial forage integration directly addresses a national shortage of livestock fodder, creating a market incentive. The economy is sufficiently formalized to support larger-scale carbon project development.

Societal context. Uzbekistan's society is undergoing rapid change with urbanization and economic liberalization. Alongside traditional rural communities, a class of new, commercially oriented farmers, is emerging who are more likely to invest in new technologies and respond to market signals, including potential carbon credit income. Similar to Tajikistan, the mahalla system remains a powerful social organizer. The key social barrier is the deep-seated practice of clean tillage and residue removal (or burning), which are equated with good management. Changing this requires extensive, trust-based demonstration. Furthermore, water is a source of social tension, so practices perceived as saving water would have high social value. The legacy of state cotton and wheat quotas can limit crop choice and flexibility, constraining the diversification and rotation options necessary for optimal carbon farming systems. As farmers gain more autonomy from state quotas, they are more responsive to innovations that improve their bottom line and resilience.

Political context. Uzbekistan's political system is characterized by a strong, centralized executive, which under President Mirziyoyev has initiated a measured program of economic and social liberalization. There is a strong political drive for modernization, agricultural reform, and attracting foreign investment. The government has ambitious green agenda pledges and is actively seeking international partnerships for sustainable agriculture. This creates a unique window of opportunity for carbon farming. The state can use its still-powerful administrative system to promote practices if they align with national goals for water conservation and export diversification.

This enabling direction is reflected in several high-level policy documents. The updated "Uzbekistan – 2030" Strategy for 2026-2030 provides the overarching national development framework, linking sustainable economic transformation with improved

environmental conditions and setting targets for land restoration, erosion control, forest expansion and biodiversity conservation (Government of the Republic of Uzbekistan, 2026). The Strategy for the Transition to a Green Economy for 2019-2030 (Government of the Republic of Uzbekistan, 2019), supplemented by the Green Economy Transition and Green Growth Program to 2030 (Government of the Republic of Uzbekistan, 2022), provides a relevant policy basis for carbon farming by linking economic modernization with resource efficiency, reduced greenhouse-gas emissions, sustainable use of natural resources, green employment and climate resilience.

The Agricultural Development Strategy for 2020-2030 supports the modernization of Uzbekistan's agriculture sector while emphasizing sustainable resource use, environmental protection, food security, private investment, and stronger advisory services (Ministry of Agriculture of the Republic of Uzbekistan, n.d.). This creates an entry point for carbon-farming-related practices such as conservation agriculture, integrated soil fertility management, soil restoration, and water-efficient production. Given agriculture's heavy dependence on irrigation and its exposure to salinization, erosion, and land degradation, carbon farming can be framed not only as a mitigation tool, but also as a practical pathway to improve soil health, water retention, productivity, and rural climate resilience. In parallel, the Concept of Forestry Development in Uzbekistan until 2030 governs forest management, conservation, and expansion. It provides the policy and operational framework for afforestation/reforestation activities, which are a major component of the national carbon sink strategy (Government of the Republic of Uzbekistan, 2020).

Uzbekistan's land-restoration agenda is especially visible in the Aral Sea region, where large-scale afforestation and phytomelioration of the dried seabed aim to stabilize soils, reduce sand and salt storms, and restore ecological functions. The dried seabed, now a saline desert known as the Aralkum, covers millions of hectares. The national Yashil Makon (Green Space) initiative, launched under presidential leadership, has driven the planting of drought and salt tolerant vegetation, mainly black saxaul (Haloxylon ammodendron), across vast areas of the Aralkum. Current efforts focus mainly on planting drought- and salt-tolerant species such as saxaul, with protective forest plantations already established across large areas of the former seabed. This agenda could be turned into a carbon-farming opportunity, if afforestation combined with native shrub and grass restoration, nursery development, survival monitoring, soil-carbon assessment, and community-based maintenance. This would allow Aral Sea restoration to be framed not only as ecological rehabilitation, but also as a measurable landscape-carbon programme delivering mitigation, adaptation, and livelihood benefits. Beyond stabilizing the soil and reducing dust storms, these plantations contribute to climate mitigation through measurable carbon sequestration. Ongoing research and pilot projects confirm that carbon sequestration in saxaul biomass is viable, and carbon

certification schemes are being developed to generate long term income streams for maintaining and expanding these forests. The Aral Sea seabed thus holds significant potential not only for landscape restoration and disaster mitigation but also for establishing a large scale, verifiable carbon farming model that provides climate, environmental and socio-economic benefits in one of the world's most degraded regions.

International land and climate commitments. Uzbekistan is a Party to the UNFCCC and the Paris Agreement. Its climate commitments are shaped by acute vulnerability to water scarcity, desertification, rising temperatures, and the long-term impacts of the Aral Sea crisis.

Uzbekistan has progressively strengthened its mitigation ambition. NDC 2.0 set the target to 35% reduction in the GDP carbon intensity by 2030 (Republic of Uzbekistan, 2021), and implementation showed strong progress against this indicator: Uzbekistan's first Biennial Transparency Report found that by 2022, it declined by almost 43% with growing LULUCF removals playing a significant role. It should be noted, however, that these reductions reflect a decoupling of emissions growth from economic growth, rather than a reduction in absolute emission levels. NDC 3.0, submitted in 2025, raises ambition to a 50% reduction in the GDP carbon intensity by 2035 (Republic of Uzbekistan, 2025a). The NDC frames this as a step toward peaking GHG emissions as soon as possible and then reducing them, while aligning with Uzbekistan's longer-term goal of net-zero emissions by 2055. It also includes projected sectoral pathways, with LULUCF expected to remain a net sink. In this context, agriculture remains a challenge as it accounts for a significant share of emissions, linked mainly to livestock and agricultural soils. At the same time, LULUCF is becoming an increasingly important sink, supported by afforestation, cropland management, and reduced emissions from grasslands (see Annex 1 for more details). Uzbekistan's adaptation agenda is also increasingly aligned with land-based action with agriculture, water resources, ecosystems and forestry, disaster risk reduction, health and the social sphere, and strategic infrastructure identified as key adaptation priorities (Republic of Uzbekistan, 2025a).

Under the UNCCD, Uzbekistan has also joined the Land Degradation Neutrality target-setting process, while combating land degradation remains a national priority. Uzbekistan has demonstrated significant advancement within the UNCCD Land Degradation Neutrality Target Setting Program. During LDN TSP 1.0, the country established a decision-support framework for achieving LDN targets and has since continued to integrate LDN mechanisms into its strategic planning and land management systems. A particular strength is the expanding application of satellite data and geographic information systems (GIS) to monitor land resources, specifically for assessing irrigated land degradation and productivity trends in agricultural landscapes.

Uzbekistan is actively advancing multiple projects that support LDN. Notable examples include FAO- and GEF-supported initiatives on integrated natural resource management for sustainable landscapes (CACILM II), scaling up ecosystem restoration across three high value landscapes, sustainable forest and pasture management in dryland ecosystems (which includes developing an integrated LDN monitoring system), and water efficient irrigation innovations promoted by GIZ. These projects enhance land productivity, water use efficiency, biodiversity conservation, and climate resilience.

Together, Uzbekistan's commitments create a strong policy basis for carbon farming approaches that link mitigation with land restoration, water efficiency, and climate resilience. Relevant opportunities include soil restoration, agroforestry, water-efficient agriculture, rangeland rehabilitation, and afforestation in degraded dryland areas, including the Aral Sea region. Their effectiveness, however, will depend on careful design in a context of severe water stress, salinization, and competing land-use pressures.

Relevant past and current activities. Uzbekistan's NDC 3.0 (Republic of Uzbekistan, 2025a) names sustainable management of forests and pastures as one (of ten) measure which was included in the preparation of the scenarios to underpin the pledge made. Commercial bank loans, agricultural insurance, and green credit lines are foreseen as promising mechanisms to increase funding for agriculture, while carbon offsets, sustainable forestry and conservation financing are listed for the LULUCF sector.

Uzbekistan has a relatively strong climate finance and carbon-market readiness profile within the region. The country has accessed international climate finance through grants, concessional finance, technical assistance, and policy-based support for renewable energy, energy efficiency, resilience, early warning systems, and green economy reforms (See Annex 2 for more details). It has also begun to engage directly with results-based mitigation finance: in 2024, Uzbekistan received a USD 7.5 million grant from the World Bank's Transformative Carbon Asset Facility for independently verified emission reductions under the iCRAFT program (World Bank, 2024c).

Uzbekistan also has prior experience with carbon crediting under the Clean Development Mechanism (CDM), with registered projects that issued Certified Emission Reductions, although these were not land-based. More recently, the country has taken steps to strengthen its participation in international carbon markets, including through Article 6 readiness, cooperation with Japan on the Joint Crediting Mechanism, and the development of domestic frameworks for carbon trading and carbon unit management (Government of Japan & Government of the Republic of Uzbekistan, 2022; Republic of Uzbekistan, 2025c, 2025b). For carbon farming, this creates a useful institutional foundation – however, the land sector is still at an earlier stage than energy or industrial mitigation. Future opportunities will depend on whether credible methodologies, MRV systems, land tenure safeguards, and project pipelines can be developed for soil carbon, agroforestry, rangeland rehabilitation, afforestation, and land restoration in degraded

dryland areas. Uzbekistan's growing carbon-market readiness therefore provides a promising entry point, but translating it into land-based carbon finance will require careful design in light of water scarcity, salinization, and competing land-use pressures.

Despite these activities, however, NDC 3.0 highlights a significant funding gap for climate action in Uzbekistan (Republic of Uzbekistan, 2025a). For climate change mitigation, the shortfall is estimated at 28% of the USD 33.7 billion needed by 2030, while for climate adaptation efforts, the funding gap is even more pronounced, estimated at 49% of the additional USD 15.7 billion required by the same year. "Agriculture faces the most critical funding deficit for climate adaptation activities." (66% of the total investment needs in 2025-2030).

Table 2.3 summarizes carbon-market experience, institutional readiness and remaining gaps across Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan.

Table 2.3: Carbon-market experience, institutional readiness and remaining gaps across Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan.

Country	Existing experience and mechanisms	Current status and gaps
Kyrgyzstan	CDM legacy; JCM cooperation with Japan established in 2023; potential for pasture- and grassland-based voluntary carbon projects	JCM implementation procedures adopted in 2025; broader Article 6 and domestic carbon-market infrastructure remains at an early stage; no operational ETS
Mongolia	Long-standing JCM portfolio; land-based voluntary carbon-market pilots; Article 6 agreement with Singapore	First international transfer of JCM mitigation outcomes completed in 2026; national carbon registry and wider domestic framework under development; no operational ETS
Tajikistan	CDM experience concentrated in hydropower; predominantly hydropower-based electricity system	Updated NDC submitted in 2021; Article 6 and carbon-pricing capacity-building under way, but operational market infrastructure and a project pipeline remain limited; no operational ETS
Uzbekistan	JCM cooperation with Japan; World Bank iCRAFT results-based carbon finance	Article 6 and carbon-unit framework enacted in 2025; national carbon-unit registry and domestic and international trading arrangements being operationalized; no operational ETS

2.3 The case for carbon farming in Greater Central Asia

Although the countries of Greater Central Asia, including Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan, differ in geography, political economy, and social dynamics, they face a shared strategic opportunity: to mobilize climate finance as a catalyst for transforming severe land-degradation challenges into practical pathways for land restoration, climate adaptation, rural resilience, stronger livelihoods, and progress toward international commitments.

The biophysical opportunity is particularly strong because each country contains extensive landscapes where improved land management could generate both carbon and non-carbon benefits. In water-constrained landscapes, however, the suitability of carbon-farming interventions needs to be assessed against basin- and landscape-level water availability. Practices that increase perennial or woody biomass, including agroforestry, orchards, shelterbelts and afforestation, cannot be treated as generic carbon solutions: their feasibility depends on local water balance, salinity, irrigation reliability, drought exposure, and potential effects on downstream users and ecosystems. The resulting opportunity landscape is therefore highly context-specific, with different carbon-farming pathways emerging depending on ecological conditions, land-use pressures, and water constraints.

In Kyrgyzstan and Tajikistan, mountainous terrain, fragile slopes, and highland pastures create opportunities for pasture restoration, erosion control, agroforestry, improved soil management, and rehabilitation of degraded lands. These measures could stabilize soils, reduce runoff, improve fodder availability, and support livestock-based livelihoods, while also contributing to carbon sequestration. In Mongolia, the opportunity lies in the country's vast rangelands, which cover most of the national territory and are central to both rural livelihoods and national identity. Improved grazing management, grassland restoration, and measures to reduce erosion and desertification could support healthier pastures, more resilient herding systems, while also creating opportunities for increased soil-carbon storage, where local conditions and management changes support additional sequestration. In Uzbekistan, the key opportunities can be found in irrigated agricultural landscapes, marginal drylands, degraded rangelands, and the Aral Sea region. Soil restoration, salinity management, windbreaks, agroforestry, conservation agriculture, water-efficient perennial crops, and afforestation with drought- and salt-tolerant species can link improved land productivity, reduced sand and salt storms, and greater resilience to water scarcity with carbon gains. Table 2.2 summarized promising carbon farming approaches across the countries of Greater Central Asia.

International commitments further strengthen the opportunity. All four countries are Parties to the UNFCCC, the Paris Agreement, and the UNCCD, and all face major implementation challenges in meeting their climate, adaptation, and land-degradation goals. Land-based mitigation is already important in several of their climate strategies, especially through LULUCF, pasture restoration, forestry, and sustainable agriculture. Carbon farming could help close the gap between stated ambition and practical implementation by offering measurable interventions that contribute simultaneously to mitigation, adaptation, and land degradation neutrality. It is particularly attractive because many of the most relevant practices – improved grazing management,

restoration of degraded pastures, agroforestry, conservation agriculture, afforestation, and soil rehabilitation – also address urgent national development problems.

This opportunity is not automatic. Carbon farming in these countries must be designed cautiously to avoid unreliable carbon claims, land-use conflicts, exclusion of local users, excessive restrictions on pastoral mobility, or competition with food production and scarce water resources. Monitoring, reporting, and verification will be challenging in remote mountains, vast rangelands, highly variable drylands, and fragmented smallholder systems. Land tenure, carbon rights, benefit-sharing, permanence, leakage, and safeguards will need careful attention. For this reason, the strongest case for **carbon farming in Greater Central Asia** is not that it will simply generate carbon credits, but that it **can become a structured, financeable approach to facilitate the restoration of degraded land, strengthening rural livelihoods, resilience to climate change, and to help countries translate their climate and land commitments into practical action**.

A transition to sustainable land management would generate long-term benefits, but it requires upfront investment that, in the realities of Greater Central Asia, will need to combine domestic resources with international finance. At this stage, revenues from the sale of carbon units are unlikely to cover the full cost of transition, but they can provide a modest yet catalytic contribution by improving project viability, attracting co-finance, and creating incentives for capacity development, technology transfer, improved MRV systems, stronger local institutions, and wider adoption of sustainable land-management practices.

The catalytic, rather than fully compensatory, role of carbon finance becomes clearer when potential carbon revenues are translated into approximate per-hectare income and compared with the costs of adopting new land-management practices. For example, cropland and grassland soil-carbon sequestration potentials are commonly estimated at around 0.2–0.8 tC/ha/yr (Food and Agriculture Organization of the United Nations, 2022). The actual rates vary substantially by climate, soil type, baseline degradation, biomass inputs, and management practice. Using the midpoint of the estimated sequestration range after conversion to CO_2-equivalent, 1.8 tCO_2/ha/year, and applying the 2024 average removal-credit price of approximately USD 19.5/tCO_2e (Forest Trends' Ecosystem Marketplace, 2025), potential gross carbon revenue from projects fully utilizing cropland and grassland soil-carbon sequestration potential would be approximately USD 35.1/ha/year.

In Central Asian conditions, this could potentially cover part of the cost of lower-cost practices such as zero or low tillage. While the available evidence is too sparse and context-specific to draw firm conclusions on cost coverage, carbon revenue of around USD 35.1/ha/year would be modest relative to machinery-based transition costs, while

potentially more meaningful where zero-till reduces operating costs or where equipment access is shared.

The current carbon prices however are well below many research-based estimates of the carbon prices needed to mobilize land-sector mitigation at scale. The IPCC identifies meaningful soil-carbon potential around USD 20/tCO_2e for cropland and grazing-land management, while more costly restoration options may require prices closer to USD 100/tCO_2e (Intergovernmental Panel On Climate Change, 2023). Recent modelling of agricultural carbon sequestration suggests even higher incentive levels, around USD 80–120/tCO_2e by mid-century would be required to achieve net-zero emission target across AFOLU (Frank et al., 2024). Whether the world moves toward these price levels will depend largely on the severity and visibility of climate impacts, and on the political will of major economies and market actors to translate rising climate risks into stronger regulation, higher carbon prices, and more substantial demand for land-sector mitigation. If they do, the revenue potential of carbon farming could look very different from today: even moderate increases in carbon prices would substantially raise per-hectare returns, improve the viability of more costly restoration practices, and make carbon revenues a more significant component of the financing mix for sustainable land management.

Carbon sequestration rates may also be much higher than average estimates in specific locations and for specific technologies. For example, experimental evidence in Central Asia suggests that crop-residue mulching can generate high soil-carbon gains under favorable conditions. Drawing on other studies, (Lal, 2004; Table 13) reports that long-term residue mulching on Sierozem soils increased SOC by about 3.95 Mg/ha/yr in the 0–50 cm layer, or approximately 14.5 tCO_2/ha/yr. This is a very high experimental rate, almost eight times higher than the midpoint of the commonly cited sequestration range, and should therefore be interpreted as site-specific evidence under favorable conditions rather than as a generalizable average for Uzbekistan or Central Asia. However, if a particular site were able to achieve this rate, potential gross revenue from selling carbon credits would be much higher than under the midpoint assumption, reaching approximately USD 89.6/ha/year at the 2024 average voluntary carbon market price.

3 Demand side of carbon farming

3.1 Core requirements for results-based monetization of mitigation outcomes

While national and international subsidies, grants, concessional finance, and other forms of public support will remain crucial enablers of sustainable land management (SLM) in Greater Central Asia, especially in the near to medium term, additional results-based climate finance may be mobilized through **voluntary carbon markets** and the cooperative **mechanisms established under Article 6** of the Paris Agreement. These channels can reward verified mitigation outcomes, including emission reductions and, where eligible, carbon removals. However, access to such finance is conditional. Carbon units can only be issued, sold, or transferred when the underlying mitigation outcome meets a set of integrity requirements designed to ensure that the claimed **climate benefit is real, measurable, additional, durable, and socially and environmentally sound**.

In practical terms, a physical ton of carbon removal, and in some cases an avoided ton of emissions, can be monetized only if several core conditions are met:

- **Clear rights and benefit-sharing**. Land tenure, land-use rights, carbon rights, and authority to participate in carbon transactions must be sufficiently clear. This is especially important in contexts with communal pastures, state-owned land, leasehold arrangements, or customary use. Benefit-sharing arrangements must be transparent and credible so that farmers, herders, local communities, and implementing institutions understand who receives what, under which conditions, and for how long.
- **Robust quantification**. Emission reductions or removals must be estimated using an approved methodology, with transparent assumptions, conservative accounting, clearly defined system boundaries, and explicit treatment of uncertainty. For land-based projects, this usually requires careful baseline setting, stratification of land types, soil or biomass measurement protocols, and modelling or sampling procedures appropriate to the ecosystem.
- **Monitoring, reporting, and verification (MRV)**. Activities and outcomes must be monitored over time, documented in an auditable way, and independently verified. For soil carbon, rangeland restoration, agroforestry, and afforestation projects, this implies reliable data on land management, vegetation cover, soil-carbon change, grazing pressure, biomass growth, and any project-related emissions.
- **No double counting**. The same ton of CO_2e must not be credited, sold, transferred, retired, or claimed more than once. This requires clear registry systems, unique serial numbers for issued credits, transparent tracking of ownership and retirement, and

rules to prevent the same mitigation outcome from being counted by both a project buyer and the host country. For land-based projects, double-counting risks are especially important where project activities overlap with national GHG inventories, LULUCF accounting, or jurisdictional REDD+ programmes.

- **Additionality.** The mitigation outcome must go beyond business as usual for the specific land, actor, and context. It should not already be required by law, regulation, or existing policy, and it must be assessed against a credible baseline showing what would have happened without the project or carbon-finance incentive.
- **Permanence and reversal-risk management**. Carbon stored in soils, grasslands, shrubs, or trees can be lost through drought, fire, overgrazing, land conversion, pest outbreaks, or management failure. Projects therefore need to define the expected storage period and manage reversal risks through buffers, insurance mechanisms, replacement obligations, long-term monitoring, or conservative crediting rules.
- **Leakage control**. Projects must show that mitigation benefits are not simply displaced elsewhere. For example, restricting grazing in one pasture may increase grazing pressure on another; afforestation on productive land may shift crop production to other areas; residue retention may require alternative fodder sources. Such risks must be identified, minimized, monitored, and deducted where necessary.
- **Environmental and social safeguards**. Projects must avoid harm to water resources, biodiversity, food security, pastoral mobility, and local livelihoods. Participation should be based on informed consent and meaningful engagement, particularly where projects affect communal land, vulnerable groups, or traditional resource-use systems. High-integrity carbon farming should therefore deliver mitigation together with land-restoration, adaptation, and livelihood benefits, rather than carbon gains at the expense of local resilience.

These requirements are broadly consistent across leading voluntary carbon-market standards, emerging integrity frameworks, and Article 6.4 methodologies. The ICVCM Core Carbon Principles, for example, define high-quality carbon credits as those associated with real, verifiable climate impact and include requirements related to governance, emissions impact, sustainable development, and safeguards. Verra's Verified Carbon Standard sets project requirements for validation, monitoring, and verification of emission reductions and removals, while its AFOLU rules require projects to address leakage and manage reversal risks through mechanisms such as carbon buffer pools. Gold Standard similarly requires monitoring and reporting plans, independent verification, stakeholder inclusivity, safeguards, and sustainable-development provisions. Under Article 6.4, methodologies and activity standards also

address baseline setting, additionality, monitoring, leakage, authorization, removals, and reversal risks (Integrity Council for the Voluntary Carbon Market, n.d.).

For Greater Central Asia, these conditions are not merely technical requirements; they define the difference between carbon farming as a credible financing instrument and carbon farming as a risky or short-lived project label. The region's fragmented smallholder systems, communal pastures, arid and mountain ecosystems, high climate variability, and evolving carbon-market institutions make integrity requirements especially important. Results-based monetization will therefore depend not only on the biophysical potential to store carbon, but also on whether projects can establish credible baselines, reliable MRV systems, durable governance arrangements, safeguards for land users, and trusted mechanisms for sharing benefits.

These integrity requirements are not obstacles imposed by carbon markets; they are precisely the conditions that distinguish sustainable land management from extractive agriculture. A well-managed pasture that sequesters carbon also improves water infiltration, reduces erosion, and supports higher livestock carrying capacity. A soil carbon project that meets additionality and permanence rules is one that has genuinely shifted from degrading to restoring land. Thus, meeting these requirements is not a burden but a confirmation that carbon farming is delivering on its primary promise: restoring land and building financial stability for land users through healthier, more productive ecosystems.

3.2 Carbon market architecture

Carbon-market architecture consists of two related but distinct levels. The first level is the **market or transaction channel**: where credits are used, traded, or transferred. This includes voluntary carbon markets (VCMs), where companies and other non-state actors buy credits voluntarily and Article 6 mechanisms under the Paris Agreement, where countries cooperate and transfer mitigation outcomes, including ITMOs under Article 6.2 or credits under Article 6.4.

Additionally, countries may establish domestic compliance carbon markets (CCMs), where regulated entities use eligible units to meet legal obligations under an emissions trading system, offset scheme, or other regulatory framework (Table 3.1). Among the four countries considered in this report, none currently operates a fully functioning compliance carbon market comparable to an emissions trading system. Uzbekistan has recently adopted legislation that creates a basis for carbon-unit trading, MRV, and a national registry, but this remains an emerging framework rather than an established operational compliance market. In the Greater Central Asian region, Kazakhstan remains the main example of an operational compliance carbon market, with its national ETS in force since 2013.

Table 3.1: Summary of key characteristics of major channels for results-based monetization of mitigation outcomes.

Monetisation channel	Who buys carbon credits	Revenue scale	Political complexity	Time to build	Notes
Voluntary Carbon Market (VCM)	Corporates	Low	Low–medium	2–4 yrs	Fastest entry point
Article 6 transfers	Other governments	Medium	High	4–8 yrs	Sovereign-level strategy
Domestic compliance scheme	National emitters	Depends on the market design	Very high	5–10 yrs	Requires carbon pricing

The second level is the **crediting mechanism**: the system that defines how emission reductions or removals are quantified, verified, issued, tracked, and retired. Examples include Verra's Verified Carbon Standard, Gold Standard, Plan Vivo, ART TREES, domestic crediting systems, and the Article 6.4 mechanism. These mechanisms establish methodologies, baselines, additionality tests, MRV requirements, safeguards, registries, and issuance rules.

The relationship between these two levels is not necessarily one-to-one. Crediting mechanisms create and certify carbon units, while market mechanisms provide the channels through which those units are bought, sold, transferred, or used. A credit issued by an independent crediting mechanism, for example, may be sold in the voluntary carbon market, accepted for use in a compliance system if permitted by the relevant regulator, or transferred internationally under Article 6 if authorized by the host country and properly accounted for. Thus, the same type of mitigation activity may, in principle, be linked to different market channels, but it must first pass through a credible crediting mechanism before it can generate a monetizable carbon unit.

For Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan, this distinction is important because the immediate opportunity is less about creating new domestic compliance markets and more about building the institutional and technical capacity to access existing crediting and market channels. In the near to medium term, the most feasible pathway is likely to combine participation in established independent crediting mechanisms, such as Verra, Gold Standard, Plan Vivo, or relevant jurisdictional frameworks, with future use of Article 6 where host-country authorization, corresponding adjustments, and national registries become operational. This means that the key readiness challenge for the region is not only to identify land-based

mitigation potential, but to translate it into creditable activities: with clear land and carbon rights, robust baselines, credible MRV systems, safeguards, benefit-sharing arrangements, and national procedures for authorization and tracking. Without these foundations, even high biophysical sequestration potential will remain difficult to monetize; with them, carbon farming can become a practical channel for attracting climate finance into land restoration, sustainable agriculture, rangeland rehabilitation, and rural resilience.

3.3 Available carbon crediting mechanisms

A "crediting mechanism" refers to the institutional and methodological framework through which mitigation outcomes are assessed against a baseline, verified, and converted into carbon credits that can be sold or transferred. Major existing crediting mechanisms can be grouped into three categories based on who administers and governs them (World Bank, 2026):

- **Independent crediting mechanisms** are typically administered by non-governmental organizations, such as Verra and Gold Standard. These organizations set the rules and issue/certify credits that are supplied by farmers and other project developers and then bought, sold, and retired in the voluntary carbon market (VCM).
- **International crediting mechanisms** are managed by an international organization established with authority of national governments, such as UN agencies. This category includes mechanisms established under the Kyoto Protocol (including CDM) and Article 6 of the Paris Agreement.
- **Governmental crediting mechanisms** are administered by one or more national or subnational governments. Examples include California's Compliance Offset Program and Australia's Carbon Credit Unit (ACCU) Scheme. Depending on their design, credits from these mechanisms may be used for domestic compliance, voluntary purposes, or international transfers

3.3.1 Independent crediting mechanisms

Independent crediting mechanisms, such as Verra's Verified Carbon Standard and Gold Standard, form a core infrastructure of the global voluntary carbon market. They provide the rules, methodologies, registries, validation and verification procedures, and issuance systems through which mitigation activities are converted into tradable carbon credits. In this sense, they are not themselves the voluntary carbon market, but they underpin it by defining what can be credited, how emission reductions or removals are measured, how environmental integrity is assessed, and how credits are tracked, transferred, and ultimately retired by buyers.

Project-based voluntary trade of carbon

No single source reliably provides a complete picture of the global voluntary carbon market's size and dynamics, due to fragmented registry data and limited transparency in over-the-counter (OTC) transactions and pricing (Board of the International Organization of Securities Commissions, 2024). One widely used reference is a global information platform operated by the non-profit Forest Trends, which compiles data, news, and analysis on environmental finance and markets. Based on self-reported information from multiple independent crediting mechanisms together representing a significant share of voluntary carbon credit trading worldwide, the 2025 report indicates that on average about 650 carbon credit projects were registered each year from 2022 to 2024. This period followed two atypical years: 2020, when registrations exceeded 1,500 projects, and 2021, when registrations were around 350 (Forest Trends' Ecosystem Marketplace, 2025; Figure 4).

By transaction volume, Forestry and Land Use is the largest project category, accounting for 73.1 $MtCO_2e$ in 2024 or 48% of total reported transaction volume across the ten largest standards covered by the State of Voluntary Carbon Market 2025 report. Renewable Energy ranks second, representing 29% of transactions, while all other categories accounted for substantially smaller shares, including Agriculture (only 0.8% in 2024) (Forest Trends' Ecosystem Marketplace, 2025; Table 3). Forestry and Land Use was also the most frequently retired credit type in 2024. Retirements refer to credits permanently taken out of circulation and used for climate claims. About 68 $MtCO_2e$ of Forestry and Land Use credits were retired in 2024, equivalent to roughly 37% of the 182 $MtCO_2e$ retired across the ten largest standards.

Average prices for 2024 transactions were highest for Forestry and Land Use credits, at USD 9.27/tCO_2e, followed by Agriculture credits at USD 7.66/tCO_2e. Agriculture was also the only category in which average prices increased relative to 2023. By contrast, Renewable Energy credits recorded the lowest average price across all categories, at USD 2.67/tCO_2e in 2024 (Forest Trends' Ecosystem Marketplace, 2025; Table 3).

However, these category-level averages conceal very large differences across specific project types and technologies. A growing premium for carbon-removal credits is also evident: in 2024, removal credits traded at an average price 381% higher than reduction credits. Biochar illustrates this particularly clearly: although Biochar Production represented a very small share of reported transaction volume, it had an average price of over USD 160/tCO_2e — more than 25 times the total market average price. This suggests that while broad land-use or agriculture averages provide a useful benchmark, certain high-integrity removal technologies can command substantially higher prices where buyers value durability, measurability, and perceived quality.

In the voluntary carbon market, farmers can monetize carbon credits through several routes:

- **Direct sale (OTC) to an end buyer**. The farmer (or an affiliated project developer) signs a bilateral spot or offtake agreement directly with a corporate buyer, often via the buyer's procurement or sustainability team. This works best when the project has a compelling narrative, clear co-benefits, and the capacity to handle buyer due diligence and contracting.

  Examples: a food company purchasing insetting-style soil carbon credits from its supplier base; a luxury brand buying agroforestry credits with biodiversity co-benefits directly from a farmer cooperative; a tech company signing a multi-year offtake for regenerative agriculture removals.

- **Brokers and carbon trading intermediaries (OTC, but brokered).** A broker connects the farmer to potential buyers and supports price discovery, negotiation, and sometimes market intelligence. This route is common because it reduces search costs and helps align the credit characteristics with buyer requirements (vintage, standard, buffer contribution, SDG claims, ratings/assessments, etc.).

  Examples: a broker placing a tranche of VCS soil carbon credits with multiple mid-sized corporate buyers; an intermediary negotiating a portfolio sale that includes both agriculture and land-use credits; a trader arranging delivery terms and registry transfer for a buyer with specific vintage constraints.

- **Spot marketplaces or exchanges (platform-based listing and settlement).** The farmer lists issued credits (or credits available for delivery) on a marketplace that facilitates transactions and, in some cases, registry-linked settlement. This can improve liquidity and reach multiple buyers, particularly for more standardized credits, but may involve platform fees, more price competition, and stricter metadata/listing requirements.

  Examples: listing issued credits on platforms such as CBL/XPANSIV, AirCarbon Exchange, or Carbon Trade Exchange; using a marketplace storefront to sell smaller parcels of credits to a range of buyers; selling via a platform that supports "buy now" spot purchases for verified vintages.

- **Auctions and tender platforms (seller-initiated price discovery)**. Credits are sold through a competitive bidding process. This can be organized by a platform or by buyers (or buyer coalitions) running a procurement tender. It is typically best suited to larger volumes with standardized documentation and clear delivery terms.

  Examples: participating in a buyer-led tender for a defined volume of agriculture removals; selling a larger block of credits via an auction mechanism run by a

trading platform; responding to an RFP from a corporate coalition seeking credits with specified safeguards and MRV standards.

- **Forward sales and pre-issuance finance (Emission Reduction Purchase Agreements (ERPAs), offtake, carbon pre-purchase).** The farmer sells future delivery (or a share of expected issuance) to a buyer or financier, often to fund implementation and MRV. This is common where upfront costs are meaningful (baseline sampling, monitoring systems, practice changes), but buyers typically require safeguards and apply a discount for delivery and issuance risk.

  Examples: a multi-year ERPA where a buyer prepays part of the contract value to fund soil sampling and MRV; an offtake agreement tied to future vintages of agroforestry credits to finance planting and maintenance; a pre-purchase arrangement where a climate fund commits capital against expected issuance.

- **Aggregators (especially for smallholders or many small sites).** An aggregator bundles many farms into a single supply stream, manages MRV and administration, and sells credits at scale. This is often the most practical approach for dispersed land interventions and smallholder contexts where individual farms cannot efficiently meet MRV, verification, and contracting requirements alone. See Annex 5 for the review of the emerging landscape of aggregators in GCA.

  Examples: a regenerative agriculture program aggregating hundreds of small farms into one crediting project; a cooperative or input provider coordinating practice adoption and MRV, then marketing credits collectively; an aggregator combining smallholder agroforestry plots into a single verified issuance pipeline and negotiating one sale for the whole pool.

For most voluntary buyers, the dominant standards/registries are Verra's Verified Carbon Standard (VCS), American Carbon Registry (ACR), Gold Standard, and Climate Action Reserve (CAR), which together with the Clean Development Mechanism (CDM) of the Kyoto Protocol collectively account for a large share of voluntary market activity and are often treated as the main interoperability set by market infrastructure providers (see Table 3.2).

Table 3.2: VCM transaction volumes, values, and prices by project standard, 2024. Source: Forest Trends' Ecosystem Marketplace (2025). Project standards' market shares are calculated based on the estimate of the global carbon market volume of USD 535M.

Standard	**Volume ($MtCO_2e$)**	**Value (USD)**	**Market share, by value (%)**	**Price (USD)**

VCS	41.9	194.8M	36.4	$4.65
ACR	10.3	121.4M	22.7	$11.82
Gold Standard	9.8	69.5M	13.0	$7.10
CDM*	6.2	8.3M	1.6	$1.35
CAR	3.1	32.5M	6.1	$10.60

Greater Central Asian countries have so far engaged only marginally with these developments, with Mongolia standing out as the main exception. Verra's database (Verra, n.d.) provides a useful window into this pattern because the Verified Carbon Standard is the largest independent crediting mechanism and includes several AFOLU methodologies directly relevant to carbon farming. Within this database, Mongolia has 12 listed projects, 11 of which are AFOLU-based: seven Agricultural Land Management projects, specifically Sustainable Grassland Management projects, and four Afforestation/Reforestation projects. By contrast, Tajikistan has only one listed project, in the Energy Industries category, while Kyrgyzstan and Uzbekistan have no listed Verra projects.

A similar pattern is observed also for other countries from the region. Kazakhstan has three listed Verra projects with direct land-sector relevance: two sustainable agriculture projects and one restoration project focused on greening the dried Aral Sea. Russia also has three listed land-sector projects, including forest protection, restoration of burned forest through carbon-sequestration plantations, and peatland rewetting. Although Verra data captures only a fraction of VCM, they suggest that participation in the main voluntary carbon-market infrastructure remains highly uneven across Greater Central Asia and, outside Mongolia, very limited. This limited engagement stands in stark contrast to some broadly comparable countries, including India and China, which have mobilized this type of climate finance much more successfully and developed large portfolios of projects under major independent crediting mechanisms.

Project-level VCM MRV

To issue and sell credits in the voluntary carbon market, a mitigation activity must be developed and verified under an eligible carbon-credit standard (and typically use an approved methodology) and be issued on a recognized registry. A standard is a set of requirements and methodologies that specify:

- What activities are eligible,
- How baselines and additionality are defined,

- Which carbon pools/gases must be included,
- How to measure/monitor, how often, and how to handle uncertainty,
- How reporting must be formatted,
- Who can verify and under what accreditation,
- How permanence and leakage are handled, and
- What documentation is required and what happens if rules are not met.

By way of example, Table 3.4 in Annex 3 lists relevant VCS carbon-crediting quantification methodologies (MRV methodologies). This demonstrates that methodologies now exist for most major land-use activity types (e.g., forest protection and management, afforestation/ reforestation, cropland and rice systems, grasslands/ rangelands, and certain wetland/peatland restoration pathways), so producers can in principle find an established carbon-crediting MRV approach for a wide range of land-based interventions. At the same time, these methodologies are not static: they are regularly revised to reflect new science and data (especially on baselines, leakage, permanence and reversal risk), to address known sources of bias or over-crediting identified through audits and market scrutiny, to incorporate improved remote sensing and modeling capabilities, and to align with evolving integrity expectations and labels (such as ICVCM's Core Carbon Principles) as well as updated IPCC/ UNFCCC guidance and stakeholder consultation feedback.

Central Asia and Mongolia are dominated by grasslands and shrublands where carbon dynamics are strongly climate-driven, spatially heterogeneous, and often concentrated in soils rather than above-ground biomass. This creates specific MRV challenges. First, it can be difficult to separate the effect of improved land management from natural rainfall and temperature variability, creating a risk of over-crediting in unusually wet years and under-crediting during droughts. Second, changes in soil organic carbon often have a low signal-to-noise ratio at realistic sampling frequencies and project durations, making statistically robust detection difficult. Third, estimates of soil-carbon change are highly sensitive to sampling depth, bulk density corrections, and sampling design, so methodological choices can strongly influence reported outcomes. Finally, drought, fire, episodic overgrazing, and other disturbances can reverse accumulated gains, complicating permanence accounting and increasing the need for conservative baselines, buffers, and long-term monitoring.

Global soil MRV guidance explicitly flags these measurement and scaling constraints and recommends hybrid measurement–model designs with transparent uncertainty treatment (World Bank, 2021). Recent peer-reviewed critiques have also questioned whether some major soil carbon crediting approaches can robustly estimate SOC change, underscoring the reputational risk of weak MRV (Dupla et al., 2024). At the same

time, these challenges do not make land-based carbon finance infeasible; rather, they point to the need for careful system design. The region's extensive rangelands, degraded pastures, irrigated croplands, shelterbelts, and restoration areas could still support credible mitigation and removal activities if projects combine conservative baselines, stratified sampling, remote sensing, process-based modelling, independent verification, and strong uncertainty discounts. In this sense, robust MRV systems combining remote sensing, field sampling, and modelling (McConkey et al., 2019; World Bank, 2021) should be seen not only as a constraint but also as a foundation for building high-integrity carbon assets that can attract demand precisely because they are adapted to the ecological realities of dryland systems.

A reputable scientific basis already exists for estimating soil-carbon stock changes in managed agricultural systems — a key ingredient for credible soil-carbon MRV and high-integrity crediting. For example, Mathers et al. (2023) validated DayCent-CR — a credit-oriented version of a process-based biogeochemical model that simulates carbon and nitrogen dynamics in soils and managed ecosystems — for cropland soil-carbon offset reporting. Using 668 soil organic carbon stock-change measurements from 41 agricultural research sites, they showed that model-based approaches can meet defined performance criteria when they are properly calibrated and validated, and when uncertainty is explicitly quantified and conservatively deducted. This suggests that soil-carbon MRV can have a defensible scientific basis, even though the integrity of any specific crediting methodology still depends on its full design, implementation, verification, and conservative treatment of uncertainty.

In contrast, forest-based mitigation and removals often offer a more favourable starting point for MRV because changes in tree cover, canopy structure, fire scars, and above-ground biomass can be detected more directly through remote sensing than gradual changes in soil carbon. Where satellite data are combined with field plots, forest inventories, disturbance mapping, and suitable allometric models, forest carbon estimates can therefore be more spatially explicit and easier to update over time. This makes forests, shelterbelts, riparian vegetation, and afforestation or reforestation areas potentially attractive entry points for carbon-market development.

However, forest MRV is also not straightforward in Mongolia and Central Asia. Forest inventory networks are often sparse, discontinuous, or difficult to maintain, particularly in remote mountain forests, forest-steppe zones, and fragmented riparian or shelterbelt systems. Fire, pests, drought stress, and illegal or unsustainable fuelwood extraction can generate episodic emissions and reversals that must be detected quickly and incorporated into permanence accounting. Another challenge is that forest degradation is often more difficult to detect than clear-cut deforestation: gradual canopy thinning, selective harvesting, grazing pressure, pest damage, or repeated low-intensity disturbance may not produce a simple land-cover change signal, yet can substantially

affect carbon stocks. This is why forest-monitoring method development for MRV increasingly focuses not only on deforestation, but also on degradation, disturbance intensity, and biomass change. New data sources can improve this picture. For example, spaceborne lidar missions such as GEDI can provide valuable information on forest height, canopy structure, and above-ground biomass, helping to improve biomass estimation and calibration in areas where ground data are limited. Yet these tools are not a substitute for national forest inventories. To be credible for carbon-market purposes, GEDI and similar datasets need to be integrated with national plots, locally appropriate allometric equations, disturbance records, and transparent uncertainty estimates. For the region, the opportunity is therefore to build hybrid forest MRV systems that combine satellite-based monitoring, targeted field measurements, and national inventory development, allowing forest-carbon projects to become more credible, scalable, and attractive to buyers while also strengthening domestic forest management and reporting capacities.

Even perfect measurement does not guarantee credible credits or policy claims. The hardest disputes are often about:

- Baseline setting (what would have happened anyway),
- Additionality (would changes occur without carbon finance),
- Leakage (displacement of grazing/wood harvest), and
- Permanence/reversal risk (especially drought/fire in drylands).

Integrity frameworks like ICVCM CCPs elevate governance, transparency, tracking, and robust third-party validation/verification precisely because these risks persist across methodologies (Integrity Council for the Voluntary Carbon Market, 2024).

Jurisdiction-based standards

The developments in independent crediting mechanisms are not limited to project-based standards such as Verra's Verified Carbon Standard and Gold Standard. ART TREES illustrates the expansion of jurisdictional crediting approaches for land-sector mitigation. Unlike project-based mechanisms, which usually credit mitigation outcomes within a defined project boundary, ART TREES operates at the scale of an entire national or eligible subnational jurisdiction. This means that emission reductions and removals are quantified against a jurisdiction-wide forest reference level, rather than against the baseline of a single project site.

ART is the program and registry framework run by the Architecture for REDD+ Transactions, while TREES – The REDD+ Environmental Excellence Standard – is the standard, or rulebook, used to quantify, monitor, report, and verify greenhouse-gas emission reductions and removals from REDD+ activities at jurisdictional and national scale. Under TREES, countries and eligible subnational jurisdictions can generate

verified credits if they meet requirements for accounting and crediting, monitoring and independent verification, leakage and reversal-risk management, avoidance of double counting, environmental and social safeguards, and transparent issuance of serialized units on a public registry.

In practice, a government, or an eligible subnational jurisdiction authorized within a national framework, submits a REDD+ program to ART, establishes a reference level, monitors forest-sector performance, reports verified emission reductions or removals, and undergoes independent third-party validation and verification. Once approved, the results can be issued as serialized TREES credits on the ART Registry. The registry then records issuance, transfers, retirements, cancellations, and buffer-pool balances, with each credit representing one metric ton of CO_2 equivalent.

This model represents a different route to land-sector carbon finance: not farm-by-farm or project-by-project crediting, but large-scale jurisdictional accounting linked to public institutions, safeguards, and national forest or land-use strategies. It could be relevant, for example, where countries develop national or regional programs for forest restoration, saxaul restoration, reduced forest degradation, or dryland afforestation. At the same time, ART TREES is not a general soil-carbon or agricultural land-management standard. It is primarily relevant to REDD+ and forest-sector mitigation, including removals from reforestation and forest restoration. TREES 2.0 explicitly expanded beyond avoided deforestation and degradation to include crediting for forest-sector removals from reforestation and restoration.

As of March 2026, 26 national and subnational jurisdictions were engaged in ART TREES across Africa, Asia, and North and South America, but none from Greater Central Asia. If countries in the region were to pursue this route in the future, it would require careful accounting coordination between project-level and jurisdictional crediting. Where project-level activities operate within a jurisdiction also seeking ART TREES credits, the same emission reductions or removals must not be credited twice. This is usually addressed through “nesting,” whereby project baselines, monitoring, and credit issuance are aligned with the jurisdictional accounting system. Credits issued to individual projects are then deducted from, or otherwise reconciled with, the jurisdiction’s overall credited volume to avoid double issuance, double use, or double claims (Architecture for REDD+ Transactions, n.d.).

3.3.2 International crediting mechanisms

Kyoto Protocol

The Kyoto Protocol, adopted in 1997 and entering into force in 2005, introduced three international market-based mechanisms designed to increase flexibility in achieving emission-reduction commitments. *International Emissions Trading* allowed countries with quantified targets to trade parts of their assigned emission allowances with one

another. *Joint Implementation* enabled one country with a Kyoto target to invest in an emission-reduction or removal project in another country with a Kyoto target and receive emission reduction units in return. The *Clean Development Mechanism* (CDM), by contrast, linked developed and developing countries: it allowed emission-reduction projects in non-Annex I countries to generate certified emission reductions that could be used by Annex B countries toward their Kyoto commitments. Among the three, the CDM became the most prominent project-based offset mechanism and the main precedent for later international carbon-crediting approaches, including the Paris Agreement Article 6.4 mechanism.

With the end of the Kyoto Protocol's second commitment period in 2020, the CDM no longer supports new Kyoto-period compliance obligations. However, parts of the CDM infrastructure remain active: CER issuance and registry operations continue for eligible historical activities, and selected CDM activities may transition into the Paris Agreement Crediting Mechanism under Article 6.4 if they meet the agreed conditions (United Nations Framework Convention on Climate Change, n.d.-g).

Participation by countries of Greater Central Asia in CDM was uneven. **Kyrgyzstan** and **Tajikistan** had only limited CDM engagement, with identified project proposals such as landfill gas in Bishkek and Pamir hydropower not reaching sustained registered-crediting activity. **Mongolia** participated more actively, but its registered CDM portfolio was still modest: it had five registered CDM projects, (four of which issued CERs), covering renewable-energy, energy-efficiency, and household clean-energy activities. According to the World Bank's Mongolia Country Climate and Development Report, Mongolia's participation in international carbon markets, including the CDM, as well as the Japan–Mongolia JCM and voluntary schemes, is expected to deliver 6.33 million tCO_2e in reductions over 2006–2030, equivalent to an annual reduction of approximately 1% of national GHG emissions (World Bank, 2024a). **Uzbekistan** had the deepest CDM portfolio among the four, with numerous registered activities, especially N_2O reduction, landfill gas, and methane-leak reduction in gas-distribution systems (UNEP Copenhagen Climate Centre, 2025).

Paris Agreement

International carbon cooperation has gained momentum as the Article 6 framework of the Paris Agreement has moved from negotiation into implementation. Following the finalization of the Article 6 rulebook at COP29 in Baku and further decisions on Articles 6.2 and 6.4 at COP30 in Belém, countries now have a clearer basis for using cooperative approaches, crediting mechanisms, and non-market cooperation to support climate mitigation. This growing interest is also reflected in updated Nationally Determined Contributions (NDCs), in which more than 60 countries refer to Article 6 mechanisms,

including major acquiring countries such as Japan, South Korea and Switzerland, as well as developing countries across Africa, Asia and Latin America.

Article 6 provides the Paris Agreement's main framework for international cooperation on mitigation. It allows countries to cooperate in achieving their NDCs, including through the cross-border transfer of mitigation outcomes, while applying accounting rules to avoid double counting. In practice, Article 6 cooperation is organized around three main provisions. Article 6.2 covers cooperative approaches between countries, including internationally transferred mitigation outcomes (ITMOs). Article 6.4 establishes a centralized UN-supervised crediting mechanism, now known as the Paris Agreement Crediting Mechanism. Article 6.8 covers non-market approaches, such as cooperation on finance, technology, capacity building, adaptation, and broader mitigation support without the transfer of carbon credits.

Article 6.2: Cooperative approaches (country-to-country transfers of mitigation outcomes)

Article 6.2 provides a framework for countries to trade mitigation outcomes directly with each other under their own bilateral/plurilateral agreements (not a single UN-run crediting program). These transferred outcomes are commonly called ITMOs. A quantified mitigation outcome (typically expressed in tCO_2e) is transferred that the host country authorizes for international use and that the acquiring country uses toward its NDC or another authorized purpose.

The host country must subtract the transferred reduction/removal from its own NDC accounting, and the acquiring country adds it, so the same ton is not claimed by both. Double counting is prevented by (a) a rule that forces the host to adjust its own accounting when outcomes are transferred, (b) registries that track each unit/event with unique IDs, and (c) UNFCCC reporting + review that exposes inconsistencies between what host and buyer claim.

The Paris Agreement Article 6 Implementation Status Report (Institute for Global Environmental Strategies, 2025) documents the rapid expansion of government-to-government cooperation under Article 6.2. As of August 2025, it recorded 99 formalized bilateral arrangements, including MoUs and signed bilateral agreements, involving 61 Parties: 51 host Parties and 10 acquiring Parties, with some Parties playing both roles. These bilateral arrangements should be understood as enabling frameworks rather than transactions themselves: they create the legal and administrative channels through which specific mitigation activities may later be authorized, issued, transferred, reported, and accounted for as ITMOs.

Progress is also visible in the development of authorization and tracking infrastructure. According to the A6ISR, 85 countries had authorization and/or tracking arrangements under way; 13 had both in place; and 14 had submitted initial reports to the UNFCCC.

Authorization arrangements are domestic rules/processes for deciding who can generate/transfer units and for what purpose (e.g., which ministry signs an authorization, what conditions apply, how corresponding adjustments will be triggered). Tracking arrangements are systems to record units and transactions (registries or other tracking infrastructure) so transfers, use, and cancellations can be monitored. Initial reports lay out the country's approach, governance, authorization procedures, and how it will ensure accounting integrity (including corresponding adjustments).

Article 6.2 readiness in Greater Central Asia remains at an early and uneven stage (Table 3.3). Among the four focus countries, Mongolia appears to be the most advanced: both its authorization and tracking arrangements are in progress, and it has already submitted an initial report to the UNFCCC. Kyrgyzstan and Uzbekistan are still at a more preparatory stage, with authorization under consideration; Kyrgyzstan is also considering tracking arrangements, while for Uzbekistan no publicly available information on tracking is reported. Tajikistan stands out as the least documented case, with authorization and tracking not reviewed and no initial report submitted. The comparator countries show that this pattern is not unique to Greater Central Asia. Kazakhstan and China are also still largely at the "under consideration" stage, while Pakistan has both authorization and tracking in progress. India is the most advanced among the comparators, with authorization arrangements already in place and tracking in progress, although it has not yet submitted an initial report. Overall, most countries in and around the region are still building the institutional foundations needed for Article 6.2 participation, particularly the ability to authorize mitigation outcomes, track transfers, and report them transparently under UNFCCC rules.

Table 3.3: Article 6.2 readiness in Greater Central Asia and selected comparator countries: status of authorization procedures, tracking arrangements, and initial report submissions. Source: (Paris Agreement Article 6 Implementation Partnership Center, 2026).

	Authorization	**Tracking**	**Initial reports**
Kyrgyzstan	Under consideration	Under consideration	No submissions
Mongolia	In progress	In progress	Initial report
Tajikistan	Not reviewed	Not reviewed	No submissions
Uzbekistan	Under consideration	No publicly available information	No submissions

For comparison			
Kazahkstan	Under consideration	Under consideration	No submissions
China	Under consideration	No publicly available information	No submissions
India	In place	In progress	No submissions
Pakistan	In progress	In progress	No submissions

As of September 2025, the A6ISR reported 159 implemented projects/activities under Article 6.2 (Figure 3.1). The largest share was associated with Japan's Joint Crediting Mechanism, which accounted for 132 projects across 15 host countries. These were concentrated mainly in Indonesia (39), Thailand (25), and Viet Nam (20). Mongolia is included among the JCM host countries with six reported projects, while Uzbekistan is a JCM partner country and an emerging Article 6.2 readiness case, but had not yet developed a comparable registered JCM project portfolio as of September 2025.

Most of the remaining activities were linked to Switzerland as the acquiring Party, with 21 projects across nine host countries, including Ghana (11) and smaller portfolios in Senegal, Chile, the Dominican Republic, Malawi, Peru, Thailand, Uruguay, and Vanuatu. Additional activities were associated with Sweden in Ghana, Norway in Benin, the Republic of Korea in Uzbekistan, and Singapore in Ghana. These figures show that Article 6.2 implementation is still concentrated among a small number of acquiring countries, with Japan and Switzerland accounting for the overwhelming majority of reported activities.

[Figure to be included in the final edition]

Figure 3.1: Bilateral cooperation between Parties. Source: Institute for Global Environmental Strategies (2025).

Japan's large Article 6.2 footprint reflects the fact that it entered the Paris Agreement era with an already mature bilateral crediting scheme: the Joint Crediting Mechanism. Launched by Japan in 2013, the JCM was designed to promote the diffusion of Japanese low-carbon technologies in partner countries and to quantify Japan's contribution to emission reductions achieved through those projects. It was later aligned with Article 6.2, once the Paris rulebook clarified how internationally transferred mitigation outcomes should be authorized, accounted for, and reported.

Switzerland's strong engagement in Article 6.2 reflects a deliberate policy choice to meet part of its climate target through high-integrity mitigation outcomes generated abroad. Unlike Japan, whose large footprint builds on a pre-existing technology-oriented crediting scheme, Switzerland's approach is closely linked to its domestic climate policy architecture, including the compensation obligation under the Swiss CO_2 Act and the role of the KliK Foundation in acquiring ITMOs. Switzerland uses bilateral Article 6.2 agreements to create the legal and accounting basis for such transfers, including authorization and corresponding adjustments by host countries. This allows Switzerland to channel domestic funding into mitigation activities abroad, access lower-cost emission-reduction opportunities, and position itself as an early mover in operationalizing Article 6.2 cooperation.

Several factors help explain why early Article 6.2 activity remains concentrated in a small number of countries, especially Japan and Switzerland. First, not all potential acquiring countries intend to use international credits toward their climate targets. The EU, for example, has framed its 2030 target as being achieved domestically, without the use of international credits, which limits one of the largest possible sources of demand (López Hernández, 2025). Second, participation requires significant institutional readiness: countries need legal authority to authorize transfers, procedures for approval, tracking infrastructure or registry access, and reporting capacity. Many countries are still building these systems, which constrains both the supply of authorized mitigation outcomes and the demand from acquiring Parties (Institute for Global Environmental Strategies, 2025). Third, governments remain cautious because Article 6.2 carries integrity and reputational risks, particularly around double counting, weak baselines, additionality, and the credibility of corresponding adjustments. Demand and price uncertainty further slow investment, since neither governments nor private actors can easily justify building large project pipelines without confidence that credits will be purchased at viable prices (Hoch et al., 2023). Host countries also face a strategic dilemma: authorizing ITMO exports means applying corresponding adjustments, so the mitigation outcome can no

longer be counted toward the host country's own NDC. This makes governments cautious about selling reductions that may later be needed for domestic target achievement (United Nations Framework Convention on Climate Change Secretariat, 2025). Japan and Switzerland are therefore special cases. Japan entered the Paris Agreement era with the already mature JCM pipeline, while Switzerland created strong domestic demand through its climate policy architecture and the KliK Foundation's role in acquiring ITMOs. In both cases, Article 6.2 activity is supported by domestic institutional structures that many other countries do not yet have.

Although Article 6.2 implementation is expanding, AFOLU-relevant activities still represent only a small part of the reported project landscape. In the A6ISR 2025 edition, agriculture accounts for six of the 159 implemented projects/activities, while forestry and land use account for two more, giving a total of eight AFOLU-related activities. Of these, four are associated with Japan as the acquiring Party, three with Switzerland, and one with Singapore (Institute for Global Environmental Strategies, 2025; Figure 6). This suggests that, despite the strong relevance of Article 6.2 for carbon farming, soil carbon, rangeland management, and landscape restoration, early implementation remains dominated by energy, industry, buildings, and transport.

Under the Japan–Philippines JCM, a project is designed to apply alternate wetting and drying in rice paddies in Batangas and Laguna Provinces to reduce methane emissions, providing a validation-stage example of how changes in agricultural water management could generate credited mitigation outcomes (Joint Crediting Mechanism, n.d.). Singapore's nature-based procurement also points to future demand for AFOLU credits, including the Kwahu Landscape Restoration Project in Ghana (National Climate Change Secretariat & Ministry of Trade and Industry, Singapore, 2025).

Article 6.4 Crediting Mechanism (UN-supervised crediting program)

Article 6.4 of the Paris Agreement establishes the Paris Agreement Crediting Mechanism (PACM), a centralized UN-supervised crediting mechanism and the institutional successor to the Kyoto Protocol's Clean Development Mechanism (CDM). Under this mechanism, approved mitigation activities can generate Article 6.4 emission reductions (A6.4ERs), provided they are registered, monitored, verified under approved methodologies, and issued through the Article 6.4 registry infrastructure.

The mechanism is overseen by the Article 6.4 Supervisory Body, which operates under the authority and guidance of the CMA. A6.4ERs may either contribute to the host country's own mitigation efforts or, if authorized by the host Party, be transferred for use by another country or for another authorized purpose, subject to the relevant accounting rules, including corresponding adjustments where required. The CMA adopted the rules, modalities and procedures for the Article 6.4 mechanism in 2021, and designated the 12-

member Supervisory Body to supervise it (United Nations Framework Convention on Climate Change, n.d.-c).

The mechanism has moved from design toward operationalization, but it is still at an early stage. In October 2024, the Supervisory Body adopted key standards on methodologies and on activities involving removals, which provide the basis for designing, measuring and verifying emission reductions and removals under PACM. These standards are important not only for Article 6.4 itself, but also because they may influence good practice in the wider voluntary carbon market. In 2025, further operational elements were advanced, including rules for baseline setting, activity standards, registry procedures, and transition arrangements for CDM activities. The Article 6.4 mechanism registry is intended to record A6.4ERs with unique identifiers, showing where they were generated, who owns them, and how they are used (United Nations Framework Convention on Climate Change, n.d.-e).

A major milestone was the approval of the first Article 6.4 methodology. In October 2025, the Supervisory Body approved A6.4-AMM-001, "Flaring or use of landfill gas," which applies to activities that capture landfill gas from solid waste disposal sites and either flare it, use it to produce energy, or supply it to consumers. The methodology is valid from 30 October 2025 to 29 October 2030 and is based partly on earlier CDM landfill-gas methodology experience. This is significant because it marks the beginning of a functioning Article 6.4 methodology base, although the range of approved methodologies remains limited and further methodologies, including in renewable energy, energy efficiency, forestry and agriculture, are still under development or review.

Designated Operational Entities (DOEs) are central to the operational integrity of Article 6.4 because they provide the independent validation and verification required before credits can be issued. Their role is to assess whether proposed activities comply with Article 6.4 rules before registration, including methodology use, baseline setting, additionality, monitoring plans, and safeguards, and later to verify whether the claimed emission reductions or removals have actually been achieved. This makes DOEs the mechanism's quality-control layer between project developers, host-country approvals, and the issuance of A6.4ERs. The system is now becoming operational: the Supervisory Body reported that 10 Article 6.4 DOEs had been accredited, with 11 additional applicant entities undergoing initial accreditation assessments, and expects the number of approved methodologies, registered activities and issued units to grow significantly in 2026 (United Nations Framework Convention on Climate Change Article 6.4 Supervisory Body, 2026).

The transition from the CDM is an important bridge into Article 6.4. Eligible CDM activities that submitted transition requests within the applicable deadlines could proceed to the PACM only if their host Parties submitted approval by 30 June 2026 and the activities

complied with the new Article 6.4 rules. By early July 2026, 1,511 CDM project activities and programs of activities had requested transition; 450 had received host-Party approval, but only 27 had been registered as PACM activities (United Nations Framework Convention on Climate Change, n.d.-h). These figures indicate both a sizeable pipeline of potential legacy supply and a much narrower pool that has passed the key transition stages. Host Parties must consider whether activities align with their NDCs, sustainable development priorities and Article 6 accounting strategies, while concerns remain about the environmental integrity of some legacy CDM activities (Mulder & Faecks, 2025).

For Greater Central Asia, the Article 6.4 picture is still highly preliminary. The CDM legacy pipeline appears limited: **Kazakhstan** submitted three transition requests, **Uzbekistan** eight, **Kyrgyzstan** and **Mongolia** one each, and Tajikistan none (United Nations Framework Convention on Climate Change, n.d.-d). Only two of these transition requests, both from Kazakhstan, appear to fall within AFOLU-relevant categories. These numbers suggest that the region enters PACM with only a small Kyoto-era project base compared with major CDM host countries such as China and India. The CDM database also contains very few projects directly relevant to soil restoration: only two projects explicitly refer to soil restoration, one in Moldova and one in Chile, both under afforestation/reforestation methodologies (AR-ACM0001 and AR-AM0002). This confirms that the CDM provides only a narrow precedent for carbon farming and dryland soil-carbon approaches; most future relevance for Greater Central Asia will depend on new Article 6.4 methodologies, host-country readiness, and the ability to design robust MRV systems for rangelands, degraded lands, agroforestry, soil carbon, and landscape restoration.

Participation in Article 6.4 also requires more than simply having project ideas. A host country must designate a national authority (DNA) for the mechanism, since the DNA is responsible for authorizing and approving participation in Article 6.4 projects. Establishing a DNA is one of the formal requirements for participation. As of the A6ISR 2025 edition, many countries had designated Article 6.4 DNAs, but far fewer had communicated full host-Party participation requirements, revealing a gap between institutional nomination and full operational readiness.

In the Greater Central Asian context, Kazakhstan, Kyrgyzstan, Uzbekistan and Mongolia had designated national authorities for Article 6.4, while Tajikistan had not. However, none of the focus countries had yet communicated full host-Party participation requirements. This is a critical next step: designation of a national authority signals institutional entry into the mechanism, but it does not by itself make a country fully ready to authorize internationally transferable Article 6.4 credits. To reach that stage, a host country must formally communicate its Host Party Participation requirements. These requirements specify how participation in Article 6.4 contributes to the country's NDC and long-term mitigation strategy, which activity types it will allow, and how sustainable-

development benefits will be assessed. They must also clarify the treatment of corresponding adjustments: in particular, whether A6.4ERs will be authorized for international use, in which case the host country must apply a corresponding adjustment so that the same mitigation outcome is not also counted toward its own NDC.

For Greater Central Asia, this means that Article 6.4 could become relevant for carbon farming, but practical participation will depend on completing the wider institutional architecture, including host-party participation requirements, authorization procedures, MRV capacity, registry access, and clear rules on the treatment of exported mitigation outcomes in national NDC accounting.

Article 6.8: non-market approaches

Article 6.8 provides the Paris Agreement framework for international climate cooperation that does not involve the transfer of carbon units. Unlike Article 6.2 and Article 6.4, it does not generate ITMOs or A6.4ERs and does not involve the sale or transfer of mitigation outcomes between national accounts. Instead, it is intended to support voluntary cooperation through finance, technology development and transfer, capacity building, policy coordination, and joint programs that contribute to mitigation, adaptation, resilience, sustainable development and poverty eradication. In practical terms, Article 6.8 could cover cooperation on renewable-energy integration, grid interconnection, methane regulation, sustainable agriculture, water management, land restoration, climate-resilient infrastructure, or regional adaptation programs, without turning the resulting climate benefits into tradable carbon credits. The work program is coordinated through the Glasgow Committee on Non-market Approaches, and the UNFCCC has established an NMA Platform to record and exchange information on such approaches (United Nations Framework Convention on Climate Change, n.d.-a).

For Greater Central Asia, Article 6.8 may be especially relevant because many countries in the region are still at an early stage of readiness for credit-generating mechanisms under Articles 6.2 and 6.4. Non-market approaches could therefore provide a useful cooperation channel for areas where carbon-crediting is complex or not yet viable, including dryland restoration, rangeland management, climate-resilient agriculture, water-efficient irrigation, disaster-risk reduction, and regional knowledge-sharing on MRV and adaptation. The current status remains preliminary, however. The Article 6.8 architecture is still being operationalized through the 2025–2026 phase of the work program, and participation depends partly on countries designating national focal points and using the NMA Platform to record cooperation initiatives. Among the countries relevant to Greater Central Asia, **Kazakhstan**, **Kyrgyzstan**, **Turkmenistan** and **Uzbekistan** are listed as having Article 6.8 national focal points; **Tajikistan** and **Mongolia** do not appear on that list (United Nations Framework Convention on Climate Change, n.d.-i).

Other international initiatives in the context of results-based carbon finance

Beyond project-based crediting, emerging Article 6-aligned approaches such as policy crediting are expanding the scope of carbon finance from individual activities to sectoral reforms and policy-driven emission reductions. Unlike project-based mechanisms such as the CDM or PACM, policy crediting rewards verified emission reductions that result from policy reforms or sector-wide interventions, rather than from a single discrete project. The World Bank's Transformative Carbon Asset Facility (TCAF) has pioneered this approach. This included Uzbekistan's iCRAFT program, which supports energy tariff and subsidy reforms and quantifies the resulting emission reductions (World Bank, 2023). In 2024, Uzbekistan became the first country to get a World Bank payment under a policy-crediting program, receiving USD 7.5 million for independently verified reductions of 500,000 tons of CO_2. The iCRAFT structure combines results-based climate finance with potential Article 6-aligned carbon finance: some emission reductions can remain in Uzbekistan and count toward its NDC, while others may be transferred as ITMOs if Article 6 accounting and reporting requirements are met. This makes policy crediting especially relevant for countries seeking to mobilize carbon finance for systemic reforms, not only for individual mitigation projects.

3.3.3 Compliance instruments

Compliance instruments are government-established systems that create enforceable obligations to reduce emissions, pay for emissions, or surrender eligible units. They usually take the form of a carbon tax, where entities pay a levy per ton of emissions or through an energy-tax proxy; an emissions trading system (ETS, or "cap-and-trade"), where regulated entities must surrender allowances for each ton emitted; or a compliance-linked offset or crediting mechanism, where credits issued under public rules can be used to meet legal obligations, such as ETS surrender requirements, carbon-tax liabilities, or other public compliance targets. Governmental crediting mechanisms more broadly issue credits for verified emission reductions or removals under public rules, but they are directly compliance-relevant only when those credits are eligible for use against a regulated obligation, such as an ETS, carbon tax, or public-sector target.

A number of jurisdictions around the world have implemented governmental crediting mechanisms and compliance-linked offset systems, although only some explicitly cover land-based mitigation and removals. Examples include Australia's ACCU Scheme, Japan's J-Credit Scheme, China's CCER, Thailand's T-VER, France's Label Bas-Carbone, California's compliance offset program, Alberta's TIER offset system, New Zealand's ETS forestry component, and the carbon-tax offset mechanisms in South Africa and Colombia.

In Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan, compliance instruments are not yet established, let alone compliance-linked crediting for land-based mitigation and removals. **Uzbekistan** has recently taken steps to move in this direction by establishing the initial legal basis for a national carbon trading system. The law "On Limiting Greenhouse Gas Emissions", entered into force in January 2026 (Law of the Republic of Uzbekistan on Limiting Greenhouse Gas Emissions, 2025), establishes a framework for regulating greenhouse gas emissions and developing carbon-market instruments. It introduces a state system for accounting and controlling greenhouse gas emissions, provides for the establishment of national emission-reduction targets – although specific targets have not yet been set – and encourages the implementation of "green" projects aimed at reducing or absorbing emissions, including through the generation of carbon units. The law also provides for the creation of a state registry to record and verify carbon units, and introduces rules for their issuance, circulation, and trading, including possible participation in international markets. In addition, it foresees state support mechanisms for green initiatives and projects, and requires that revenues from carbon credits be directed toward environmental purposes, including circular-economy measures and waste management. The next steps would include establishing the national framework for greenhouse gas accounting, setting specific emission reduction targets for each economic sector, and implementing core operational systems which involves creating the registries for emissions and carbon units, finalizing the detailed rules for emissions reporting and verification, defining which organizations will be regulated, and setting up the contractual and fee structure for the carbon unit registry operations.

Mongolia does not yet have an operational economy-wide ETS or formal domestic offset program. Available assessments suggest that the development of such instruments is constrained by institutional fragmentation, limited policy incentives, and an incomplete regulatory framework for authorizing and governing carbon-market activities (United Nations Development Programme, 2025a; World Bank, 2024a). At the same time, carbon-market policy and regulatory development, including incentives for carbon-credit generation, have been recommended as a way to mobilize additional climate finance for NDC implementation and low-carbon, climate-resilient development (United Nations Development Programme, 2025a). A relevant emerging direction is the UNDP-supported work on Mongolia's Domestic Carbon Market (Food and Agriculture Organization of the United Nations & United Nations Development Programme, 2025), which explores a domestic crediting mechanism based on soil carbon sequestration through rangeland restoration. Under this approach, credits could potentially support Mongolia's NDC, be traded internationally under Article 6, or be purchased by domestic companies, although the framework remains under development rather than an operational compliance instrument.

Kyrgyzstan is currently at the policy exploration and readiness-building stage. A recent CAREC study explored the opportunities and challenges of introducing carbon pricing in Kyrgyzstan, including the creation of a ETS (Sabyrbekov & Sharshenova, 2024). Interviews with stakeholders as part of this research suggest that both governmental bodies and private enterprises currently exhibit limited readiness for implementing carbon pricing through an Emissions Trading System. Substantial political commitment, legislative development, capacity strengthening, and targeted research would be prerequisites for progress.

Tajikistan is widely recognized as prioritizing climate adaptation over mitigation and maintaining relatively low CO_2 emissions within the region, owing in large part to its significant hydropower capacity. Given this context, establishing a compliance carbon market instrument such as an Emissions Trading System or offset programs is not a priority.

Across Central Asia, the most advanced compliance carbon market remains Kazakhstan's national ETS. **Kazakhstan** operates the Kazakhstan Emissions Trading System (KAZ ETS), the region's flagship compliance carbon market. The ETS is active and covers major emitting sectors (power/heat, oil and gas, mining, metallurgy, chemical and manufacturing industries), making it the only fully operational ETS in Central Asia (International Carbon Action Partnership, 2026). The domestic offset framework allows credits from sectors outside the ETS, including GHG reduction or absorption activities, and land-based activities such as agriculture and forestry have been identified as potentially eligible. The cap has been described as formed "bottom-up" based on expected output and benchmarks, with a reserve for new entrants and output changes; since 2021 allowances have been allocated via benchmarking. In 2024, 8.1 $MtCO_2$ of allowances from the reserve were issued to 59 installations (International Carbon Action Partnership, 2026).

The KAZ ETS allows the use of domestic offset credits for compliance, and there is no quantitative limit on offset use. The development of a domestic offsetting standard (Qazaq Green Certificate Program) was reported in 2023, while eligibility for ETS compliance has been under consideration (International Carbon Action Partnership, 2026). OECD's country note treats ETS permit prices as Kazakhstan's explicit carbon price instrument and reports that explicit carbon prices cover a substantial share of emissions (with additional coverage through energy taxes and with fossil fuel support affecting net effective rates (Organisation for Economic Co-operation and Development, 2024), although the current price is very low (USD 1 in 2024). Current reform debates in Kazakhstan tend to focus on strengthening price discovery and market liquidity, improving allocation stringency, and clarifying how (and which) domestic credits/offsets can be used for compliance without undermining integrity. AIFC's overview underscores ongoing evaluation of carbon price levels and transaction activity, reflecting a policy

focus on market functioning as well as ambition (Astana International Financial Centre, 2025).

Among the growing number of jurisdictions that have incorporated land-based mitigation and removals into carbon-market architecture, California/USA and Australia provide particularly useful examples for Greater Central Asia because they illustrate two distinct design pathways without treating landholders as capped emitters.

California demonstrates a compliance-market model. Its cap-and-trade program, launched in 2013, covers major emitting sectors, while allowing regulated entities to use a limited quantity of offset credits from activities outside the capped sectors. The California Air Resources Board issues ARB Offset Credits for qualifying projects that reduce or sequester greenhouse gases under approved compliance offset protocols. AFOLU-relevant protocols include U.S. Forest Projects, Urban Forest Projects, Rice Cultivation Projects, and Livestock Projects (California Air Resources Board, n.d.). This program provides an example that demonstrates how land-based activities can be linked to a regulated compliance market through carefully defined protocols, third-party verification, leakage provisions, permanence rules, and reversal-risk management. The system is deliberately cautious: offset use is quantitatively limited, and current rules allow offsets to cover only 4% of an entity's compliance obligation for 2021–2025 emissions and 6% for 2026–2045 emissions. This design helps preserve the incentive for direct emissions reductions in capped sectors while still channeling compliance demand toward land-based mitigation and removals.

Australia illustrates a different, more land-sector-oriented model. The Australian Carbon Credit Unit (ACCU) Scheme, launched in 2011 as the Carbon Farming Initiative, is a project-based crediting system that encourages people and businesses to reduce emissions or store carbon, including through changes in vegetation management and other land-use practices. One ACCU represents one ton of CO_2-equivalent abatement, and ACCUs are tradable units that can provide an additional income source for project proponents. The scheme includes land-sector methods such as vegetation management, soil carbon, environmental plantings, human-induced regeneration, and savanna fire management. For sequestration projects, permanence obligations apply for either 25 or 100 years, with a discount applied where a shorter 25-year permanence period is selected. ACCUs can be sold to the Australian Government under carbon abatement contracts, to private buyers, or used by large industrial facilities under Australia's Safeguard Mechanism, which sets declining emissions baselines for major facilities.

A further lesson from Australia is that land-sector crediting can be designed to support broader land-stewardship objectives, not only carbon accounting. Several ACCU methods are relevant to biodiversity conservation, vegetation recovery, soil health, fire

management, and more resilient land-use systems, making the scheme a potential model for aligning carbon farming with adaptation, ecosystem restoration, and rural development goals. Australia has also sought to lower participation barriers for farmers and landholders by developing more practical methodologies, including soil-carbon approaches that use standardized or simplified elements to reduce monitoring costs and technical complexity. For Greater Central Asia, this is particularly relevant because carbon farming will need to work in dispersed rural landscapes where smallholders, pastoralists, and local communities may not have the capacity to engage with highly complex MRV systems.

This program has positioned Australia as an international leader in agricultural and land-based carbon markets. It has effectively created a new income stream for farmers, ranchers, and Traditional Owners by monetizing climate-friendly land management. The model demonstrates how a dedicated, government-supported scheme can mobilize large-scale action in the land sector without imposing a compulsory emissions cap on the economy. Australia's approach is a flexible, incentive-based system specifically tailored to the land sector. It combines guaranteed government demand with a developing private market to drive AFOLU mitigation, emphasizing practical project types, environmental co-benefits, and broad participation from rural and regional communities.

3.3.4 Labelled debt instruments as complementary finance for carbon farming

Green bonds and related labelled debt instruments – such as climate bonds, sustainability bonds, sustainability-linked bonds, and resilience or nature bonds – represent another market-based financing channel for carbon farming, although they differ from carbon markets based on tradable emission units. Rather than generating credits or compliance obligations, they mobilize capital from investors for eligible green projects, including sustainable land management, restoration, forestry, soil-carbon enhancement, climate-resilient agriculture, and biodiversity-related investments. For Greater Central Asia, such instruments could be particularly useful for financing the up-front costs of carbon farming – including restoration activities, MRV systems, aggregation platforms, technical assistance, and verification – before revenues from carbon credits or other ecosystem-service payments materialize. They should therefore be treated as complementary to carbon-crediting and Article 6 mechanisms, not as substitutes for them.

These instruments are already used in several Greater Central Asia countries, although not yet as dedicated carbon-farming finance mechanisms. **Kazakhstan** has the most developed green finance market in the region, with green bonds and loans used mainly for renewable-energy and other environmentally sustainable projects (Astana International Financial Centre, 2023). **Uzbekistan** has issued sovereign and bank-level

green or sustainable bonds, while **Kyrgyzstan**, **Tajikistan**, and **Mongolia** have also seen first green or sustainability bond issuances or frameworks (International Finance Corporation, 2023, 2024, 2025). These developments suggest that labelled debt instruments could become an important complementary channel for carbon farming, especially for financing up-front costs such as restoration works, soil and vegetation monitoring, irrigation efficiency, advisory services, project aggregation, and MRV systems. However, in the region they should currently be described as broader green-finance instruments with potential relevance for carbon farming, rather than as established carbon-farming finance mechanisms.

4 Enabling conditions

To access durable, demand-driven funding streams for land-based mitigation and removals, Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan will need to strengthen the enabling conditions that allow environmental outcomes to be converted into trusted units of value. These conditions differ in detail across voluntary carbon markets, Article 6.2 transfers, the Article 6.4 mechanism, and domestic compliance offset systems, but all depend on some combination of legal clarity, credible MRV, registry and tracking systems, institutional coordination, verification capacity, safeguards, and alignment with land, agricultural, and water policies. Table 4.1 summarizes "10+1" buckets of enabling conditions that governments would need to address: ten relate primarily to domestic readiness, while the final bucket concerns the international interface needed to connect national systems with the cross-border carbon-market channels.

Table 4.1: Enabling conditions for developing durable funding streams from land-based mitigation and removals across carbon-market channels. R = required; I = important; O = optional. Source: Authors' expert assessment.

Enabler	VCM (voluntary credits)	A6.2 (ITMO transfers)	A6.4 (UN mechanism)	Domestic compliance
1) Legal framework, carbon rights and land tenure (who can generate, own, transfer, and benefit from carbon units)	**R**	**R**	**R**	**R**
2) Institutional mandates & coordination (responsible authorities, roles across ministries, coordination, enforcement)	I	**R**	**R**	**R**
3) Project approval and authorization procedures (project approval, state-land access, Article 6 authorization, corresponding adjustments)	I	**R**	**R**	**R**
4) Consent, safeguards, and benefit-sharing rules (consent, participation, grievance mechanisms, revenue sharing, environmental safeguards)	**R**	**R**	**R**	**R**
5) National data foundations (land-use maps, soil data, forest inventories, pasture data, climate data, GHG inventory data)	**I**	**I-R**	**I-R**	**R**
6) National MRV guidance compatible with standards (baselines, uncertainty, leakage, permanence, reversals, consistency with national inventories)	I	**R**	**I-R**	**R**

7) Integrity and assurance infrastructure (registries, unit tracking, double-claim controls, verifier recognition, audit quality)	I	**R**	**I-R**	**R**
8) Capacity development and extension (training, advisory services, extension, demos, local aggregators, public-agency capacity)	I	I	I	I
9) Alignment with ag/land/water policy (subsidies, pasture rules, water constraints, restoration priorities, biodiversity)	I	I	I	**R**
10) Project development, finance, and demand creation (aggregation, upfront finance, guarantees, insurance, tax clarity, procurement, buyer guidance)	O-I	O-I	O-I	**I-R**
11) International interface (bilateral deal templates; UN reporting readiness)	O-I	**R**	**R**	O-I

4.1 Legal framework, carbon rights, and land tenure

A legal framework for carbon markets must answer a basic question: who has the right to generate, own, transfer, and benefit from a carbon unit created through land management? This is especially important for land-based mitigation and removals, where carbon outcomes are linked to land, trees, soils, pastures, water use, and long-term management obligations. A credible framework should therefore define carbon rights and their relationship to land tenure, forest and pasture-use rights, leases, possession rights, concession arrangements, and project contracts. It should also clarify who may act as project proponent, who must give consent, how benefits are shared with land users and communities, who carries liability if removals are reversed, and how carbon units may be transferred domestically or internationally.

Clarifying these questions is a precondition for converting land-management outcomes into bankable units of value. Without clear carbon rights, project developers and investors face uncertainty over whether a land manager, local authority, community, state agency, or private developer is legally entitled to claim the mitigation outcome. Buyers, in turn, need assurance that the transfer is valid, that the same unit is not claimed by several actors, and that long-term obligations will survive changes in land management, contracts, or public policy. For Article 6 transactions, the legal framework must go further: it must define authorization procedures, the role of the designated authority, corresponding-adjustment rules, possible limits on export, and the relationship between transferred units and the country's own NDC. For voluntary

markets, a fully developed Article 6 framework is not always required, but the same underlying questions of tenure, consent, ownership, liability, and benefit sharing remain essential.

The land-tenure dimension is particularly important because many land-based carbon projects require long time horizons, often extending over several decades. Soil-carbon projects, pasture restoration, agroforestry, afforestation, and avoided degradation all depend on sustained land-management changes and continuing monitoring. The relevant question is therefore not only whether land can be owned, but whether land users have sufficiently secure, transferable, and enforceable rights to manage the land over the period required to generate and maintain carbon benefits. Across Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan, carbon farming will need to be built on land-use, lease, possession, or pasture rights rather than simple private ownership, especially because pastures, rangelands, forests, irrigated agricultural land, and degraded drylands are frequently state-owned or governed through special-use arrangements.

Kyrgyzstan is moving toward carbon-market participation, but does not yet have a dedicated legal framework for carbon-market participation. Its NDC 3.0 indicates that the country may voluntarily participate in Paris Agreement market mechanisms and cooperative approaches as their functioning and applicability become clearer in the national context (Article 6 Implementation Partnership Center, n.d.-a). Recent agreements with private carbon-market actors also suggest growing interest in Article 6 infrastructure and project development (CCarbon, 2026).

For land-based projects, however, the underlying tenure question remains central. Kyrgyzstan has state, municipal, and private land, but pastures are a special case. The new Land Code regulates land rights, their registration and transfer, and land relations under conditions of state, municipal, and private ownership. Agricultural land from the State Fund can often be leased for relatively short periods, commonly around five years, while some categories may be allocated for longer periods, up to around 20 years, with possible extension. The 2009 Pasture Law created local Pasture Committees and restructured pasture management in ways that are highly relevant for any rangeland carbon projects and benefit-sharing at community level. Pastures are state-owned and managed through decentralized local pasture institutions and pasture-use arrangements. Cropland carbon projects may therefore be easier to structure around private or registered lease rights, while pasture-carbon projects would need to work through local pasture committees, pasture-use plans, user associations, and collective benefit-sharing mechanisms. For Kyrgyzstan, carbon-rights rules would need to clarify who has authority to change grazing regimes, enter project agreements, receive revenues, and accept long-term monitoring and permanence obligations.

Kyrgyzstan's climate governance includes a sectoral law framework for GHG accounting: the national inventory report references Law No. 71 (2007) and notes that it establishes a single, comprehensive register of emissions and removals (with maintenance procedures approved by government). A draft climate framework law has also been under discussion: public hearings were held in January 2025 on a draft law "On Climate Activities," intended to set institutional foundations and rules for mitigation/adaptation, finance, and international cooperation (Aarhus Center, 2025).

Mongolia has made visible progress in building carbon-market infrastructure particularly in rangeland and forestry contexts – although carbon farming is not yet formally recognized as a legal or policy term in Mongolia.

The 2024 Law on the Legal Status of the Unified Association of Herder Households (Law of Mongolia on the Legal Status of the Unified Association of Herder Households, n.d.) gives herder associations legal personality and a formal role in contracted pasture use, protection, and restoration, providing a potential local counterpart for rangeland carbon projects. The Land Law supplies the spatial and administrative basis for implementation through soum-level (district-level unit) land-use decisions, annual land-management plans, land-use agreements, cadastral mapping, and land databases. Together, these instruments can support the core requirements of rangeland carbon farming: defined management areas, collective grazing rules, carrying-capacity-based pasture use, local monitoring, and benefit-sharing through herder institutions.

However, private land ownership in Mongolia is limited: only Mongolian citizens may own land, and pastures, common-use land, and land for state special needs cannot be privately owned. State-owned land may be possessed for long periods — up to 60 years, with a possible one-time extension of up to 40 years — which can provide a useful basis for long-term investment. Yet Mongolia's largest land-based mitigation opportunities are likely to lie in rangelands, pastures, and forests, where private ownership is not the main legal basis. Carbon rights in these areas would therefore need to be linked to possession or use rights, herder-group arrangements, local-government authorization, and benefit-sharing contracts, which in case of Mongolia still requires further legal clarification.

The country is developing frameworks and mechanisms for Article 6 participation, including by estimating carbon potentials and exploring bilateral cooperation and voluntary cooperation opportunities (Article 6 Implementation Partnership Center, n.d.-b). A key recent step was the approval of the National Carbon Registry Procedure in June 2024, which provides a legal basis for registering, verifying, transferring, and managing carbon credits, and is designed to support interoperability with Article 6.2 and Article 6.4 (GRATA International, 2026).

Several policy and financing initiatives further support the enabling environment for carbon farming. The Billion Trees campaign is closely linked to Mongolia's afforestation,

restoration, and forest-removal objectives (Khurel, 2024), while emerging carbon-market readiness work aims to develop monitoring, reporting, and verification systems for rangeland carbon sequestration (Food and Agriculture Organization of the United Nations & United Nations Development Programme, 2025).

Tajikistan appears to be at an early stage in establishing an explicit legal framework for carbon-market participation. Its updated NDC discusses climate-policy institutions, the need to strengthen institutional and community capacity, and the importance of international support, but it does not set out a dedicated carbon-rights or carbon-crediting framework (Government of the Republic of Tajikistan, 2021). For carbon farming, this matters because land in Tajikistan remains under state ownership, while individuals and entities receive land-use rights rather than ownership. These rights may include lifelong inheritable use rights, including for dehkan farms, as well as fixed-term or lease arrangements. Short-term use may be granted for only a few years, while longer-term use or lease arrangements may extend up to around 20 years. This creates a mixed picture. Some forms of tenure may be long enough to support investment, especially lifelong inheritable use and longer-term use rights, but the legal basis for attaching carbon rights to those land-use rights would still need to be made explicit. This is particularly important for pasture and degraded-land restoration, where livestock users, primary land users, local authorities, and the state may all have overlapping interests. The Land Code and Law on Pastures defines land use rights, ownership, and lease terms. This is a critical area for due diligence. A carbon-farming framework for Tajikistan would therefore need to clarify whether carbon benefits attach to the state, primary land users, secondary users, pasture associations, livestock keepers, or project developers, and who carries liability if credited removals are not maintained. Carbon farming projects must have clear, long-term agreements with land users (individual farmers, dehkan farms, or pasture committees) to ensure the permanence and legitimacy of carbon sequestration activities.

Uzbekistan. The environmental legal framework in Uzbekistan is evolving in ways that could support carbon-farming-related activities. The Law on Environmental Protection and related sectoral laws provide the general basis for environmental management, natural-resource protection, and pollution control. The Land Code identifies preservation of the land fund, improvement of soil quality and fertility, rational land use, and special protection of agricultural land as core principles, which align closely with carbon-farming objectives. In addition, Uzbekistan recently strengthened environmental governance through new legislation on environmental expertise, environmental impact assessment and strategic environmental assessment, which entered into force in 2025 and expanded assessment requirements for relevant projects, programs, and plans (Global Green Growth Institute, 2025). This is relevant for carbon farming because larger land-restoration, forestry, irrigation, or infrastructure-linked carbon projects may need

to demonstrate environmental integrity, manage safeguards, and align with national environmental approval procedures.

Uzbekistan has recently begun to establish a formal legal basis for carbon-market participation, including rules relevant to carbon units, MRV, registry functions, and trading (Presidential Decree No. PD-110 "On Measures for Participation in the International Carbon Units Market," 2025). National legal framework provides several important entry points for carbon farming, but also requires careful due diligence on land tenure and carbon-rights arrangements. The Law "On Limiting Greenhouse Gas Emissions" sets a legal framework for emissions reduction and defines the roles of public authorities in emissions reduction, carbon-unit trading, and monitoring (Republic of Uzbekistan, 2025c; The Law of the Republic of Uzbekistan "On Limiting Greenhouse Gas Emissions" (No. O'RQ-1073) Has Been Adopted, 2025). It also provides for the regulation of ownership relations over GHG emission reductions, the establishment of state accounting procedures, a national carbon-unit registry, and an MRV system. In this sense, the law begins to define rights and procedures around carbon units as tradable assets. However, it does not, by itself, appear to fully resolve the more specific land-sector question of how carbon rights attach to agricultural leases, dehkan farms, pasture use, forest land, or state-owned degraded lands. For carbon farming, this link between carbon-unit ownership and underlying land-use rights will still need to be clarified in implementing rules, project contracts, or sector-specific regulations.

At the same time, land-sector implementation will still depend on how the emerging carbon-market framework interacts with land tenure. Land remains predominantly state-owned, but agricultural land can be granted on long-term lease. Agricultural lease terms are often considerably longer than in some neighboring systems, commonly in the range of 30–50 years and legally up to 50 years depending on land category and arrangement. This can provide a relatively strong basis for cropland, agroforestry, irrigation-efficiency, shelterbelt, and restoration projects, provided that associated carbon rights are clearly allocated. The remaining task is to specify how carbon value is distributed between the state as landowner, leaseholders, farmers, dehkan households, cooperatives, local authorities, investors, and project developers.

Overall, Uzbekistan's legal context is becoming more favorable for carbon farming, especially through the combination of land-protection principles, environmental assessment rules, and new carbon-market legislation. However, practical implementation will depend on resolving several project-level legal questions, including how long-term land-use rights are secured, how benefits are shared with farmers or local communities, and how carbon-market rules interact with forestry, agriculture, water, and land-use regulations. Persistent bureaucracy and corruption remain hurdles which can slow project implementation, increase transaction costs, and risk capturing revenues before they reach the farmer, undermining trust and participation.

Overall, carbon-market legislation and land tenure need to be treated together. Mongolia and Uzbekistan have made more visible progress in developing carbon-market infrastructure, especially through registry, MRV, and Article 6-related frameworks. Kyrgyzstan is showing growing institutional interest and early Article 6 engagement, while Tajikistan's framework appears less explicit and would require more foundational legal development. However, none of the four countries can rely on carbon-market rules alone. Because much of the land relevant for carbon farming is state-owned or governed through lease, possession, use, or pasture rights, each country will need to define how carbon rights attach to these tenure categories, who can authorize projects, how benefits are shared, and who carries liability if credited outcomes are reversed or not maintained. Where land users have only short-term or weakly protected rights, additional contractual safeguards, public authorization, and benefit-sharing rules will be needed to make land-based carbon units credible for buyers and investors.

4.2 Institutional mandates and coordination

Institutional mandates and coordination are necessary as they determine which authority is responsible for carbon-market policy, which body approves or records projects, which institution authorizes mitigation outcomes for Article 6 use, which agency maintains or connects to the registry, and how land, agriculture, forestry, water, climate, finance, and local-government institutions interact. As carbon farming cuts across climate policy, land administration, pasture management, agricultural extension, forest governance, water allocation, rural development, safeguards, and international reporting, coordination is essential to ensure that project approvals, land-use decisions, MRV requirements, benefit-sharing arrangements, and carbon-accounting rules are mutually consistent rather than fragmented across institutions.

The government's role is different across market channels. In the voluntary carbon market, the government does not usually conduct project-level MRV or issue credits directly. These functions are normally performed by the project proponent, independent validators and verifiers, and the selected carbon standard. However, the government still needs to define the public interface: whether projects require notification or approval, whether activities on state land, forests, pastures, or protected areas require special authorization, how projects should demonstrate consent from land users, and whether voluntary credits may be counted only as private claims or may also be authorized for international use. In Article 6.2 and Article 6.4, the governmental mandate becomes much stronger because mitigation outcomes interact with national accounting, corresponding adjustments, NDC implementation, and reporting under the Paris Agreement transparency framework. In domestic compliance offset systems, the state's role is strongest: it must define eligibility rules, compliance use, MRV requirements, registry procedures, enforcement mechanisms, and liability.

Among the four GCA countries, **Uzbekistan** currently has the clearest emerging institutional basis for carbon-market participation. The *Ministry of Economy and Finance* has been identified as a key authorized body for limiting greenhouse-gas emissions, conducting carbon-unit trading at national and international levels, and establishing the carbon-unit registry for domestic and international carbon markets. The law further gives the Ministry of Economy and Finance responsibilities for coordinating green-growth and emission-reduction activities across economic sectors, regulating and ensuring greenhouse-gas trading at national and international levels, coordinating state, regional and other programs in the field, monitoring the implementation of measures to reduce emission intensity, participating in the development of methodologies for quantifying emissions, removals and reductions, attracting foreign investment and climate-finance resources, and establishing international cooperation in this field. The *Ministry of Ecology, Environmental Protection and Climate Change* has a complementary climate-policy role: it implements unified state policy on climate change, coordinates and monitors state, regional and other programs related to limiting greenhouse-gas emissions, develops and monitors the National Climate Strategy for mitigation and adaptation, and establishes international cooperation in the climate field. State accounting of greenhouse-gas emissions is to be carried out by the Ministry of Economy and Finance jointly with the Ministry of Ecology, and emissions data are to be reflected in the greenhouse-gas cadaster. The Ministry of Agriculture is the key actor for integrating carbon-farming-related practices into agricultural modernization, advisory services, soil management, and farm-level adoption, while water-sector institutions and local authorities are essential for addressing irrigation efficiency, salinization, and degraded land restoration.

The *Cabinet of Ministers* retains important rule-setting functions, including defining procedures for participation in international and domestic carbon-unit markets, setting procedures for reports and verification, and determining criteria and procedures for classifying projects as “green”. *Local state authorities* approve and oversee territorial programs, participate in implementing state policy, integrate greenhouse-gas considerations into territorial plans, programs and projects, promote mitigation measures among the population, and support activities by businesses, citizens and NGOs, including through information and financial assistance. In addition, the *Uzbekistan Technical Regulation Agency under the Cabinet of Ministers* is responsible for approving standardization documents for greenhouse-gas limitation, green projects and carbon-footprint determination, while MRV systems are regulated through technical-regulation documents. Overall, Uzbekistan has a relatively strong top-down institutional basis for carbon-farming-related practices, but effective implementation will require close coordination between finance, ecology, agriculture, forestry, water, and local governance institutions. To have higher chances to receive political support, carbon farming can be framed as aligning with national goals for water conservation,

export diversification, and climate resilience. Projects would likely succeed through partnerships with reform-minded state agencies and large agribusinesses, with a trickle-down effect to smaller farmers.

Mongolia has a relatively active but still evolving institutional basis for carbon-market participation and carbon farming. The *Ministry of Environment and Climate Change* (formerly the Ministry of Environment and Tourism) is the central public authority for climate policy, UNFCCC reporting, NDC implementation and overall carbon-market coordination. The *Climate Change Research and Cooperation Centre (CCRCC),* established in 2020 as a state-owned enterprise, has taken over functions of the former Climate Change Project Implementing Unit and the Joint Crediting Mechanism Secretariat, giving it an operational role in supporting NDC implementation and bilateral or multilateral carbon-market mechanisms. The *Department of Climate Change and Policy Planning of the Ministry of Environment and Climate Change* is responsible for registering and overseeing the procedure, while CCRCC is tasked with executing the procedure, operating the registry and reporting on performance. The *National Climate Committee*, re-established in 2023 and chaired by the Deputy Prime Minister, provides a high-level coordination platform across sectors and regions and can establish subcommittees and professional councils. The *Climate Change Research and Cooperation Centre*, under the Ministry of Environment and Climate Change, plays a central role in climate reporting, NDC implementation, and coordination of international climate mechanisms and is also Mongolia's designated national authority for Article 6.4.

For forest-based carbon farming, the Forest Agency is the key sectoral body, with responsibilities related to forest policy implementation, sectoral MRV, project oversight and coordination with local authorities and project developers. For rangeland carbon farming, implementation would need to involve local governments and herder household associations, especially because recent reforms formalize pastoral household associations and pasture-use agreements with local authorities. Other institutions also play important supporting roles: the Ministry of Foreign Affairs coordinates international climate engagement; the Ministry of Finance administers international climate-finance resources; the Ministry of Economy and Development supports cross-sectoral integration of climate and sustainability into economic planning; Mongolia's General Authority for Land Administration, Geodesy and Cartography provides land classification, boundary and rights data; the Water Agency, Forest Agency, National Statistics Office and Ministry of Food, Agriculture and Light Industry hold datasets relevant to wetland, forest, socio-economic and agricultural baselines. The key challenge for Mongolia is the need to connect these mandates into a single operational pathway for carbon-farming project approval, land-rights confirmation, safeguards, MRV data access, registry entry, benefit-sharing and Article 6 authorization where credits are transferred internationally.

Kyrgyzstan has taken initial steps toward carbon-market participation, but its institutional framework remains only partially developed. The *Coordination Council on Ecology, Climate Change and the Development of "Green" Economy* was established in 2025, chaired by the Prime Minister, with the aim of creating a sustainable and effective system of public administration in the fields of environmental protection, climate change response, and the implementation of "green" economy principles (ref).

Climate and land-based mitigation sit primarily with the *Ministry of Natural Resources, Ecology and Technical Supervision*, which is also identified as the authority to provide Article 6 authorizations (a key function for crediting and international transfers). The *Climate Finance Center under the Cabinet of Ministers* plays a role in attracting and coordinating climate-related investment (Government of the Kyrgyz Republic, 2025c). This provides a potential institutional entry point for carbon-market development. However, carbon farming would require a clear assignment of roles among climate-finance institutions, the ministry responsible for natural resources and climate policy, land agencies, agricultural authorities, pasture-management bodies, local governments, and statistical and inventory institutions, including who approves projects, verifies land-use rights, provides baseline data, oversees safeguards, and ensures consistency with national GHG accounting. This is especially important because Kyrgyzstan's carbon-farming potential is closely linked to pastures and mountain landscapes, where management authority is dispersed across state ownership, local pasture institutions, users, and communities. A clear institutional mandate would be needed to determine how projects are approved, how pasture users are engaged, how MRV data are collected, and how carbon-market activities are aligned with national climate and land-management objectives.

Tajikistan appears to be at an earlier stage in defining institutional mandates for carbon-market participation. Existing climate-policy mandates are concentrated mainly in the *Committee for Environmental Protection* and *Agency for Hydrometeorology*, which is responsible for preparing National Communications under the UNFCCC and is involved in the NDC update process. The Committee also serves as the National Designated Authority to the Green Climate Fund, while the *Center for Implementation of Investment Projects* within the Committee is accredited as a GCF direct access entity. The *Ministry of Agriculture* oversees climate-smart agriculture, livestock, pasture use, and farmer-facing extension. The *State Committee for Land Management and Geodesy* plays a core role in land administration, pasture governance, land-use records, and monitoring. The *Forestry Agency* is responsible for afforestation, reforestation, forest restoration, and forest-carbon activities. Other institutions relevant to land-based mitigation include the Agency on Land Reclamation and Irrigation, the Ministry of Energy and Water Resources, and the Agency on Statistics under the President. These bodies provide an institutional basis for climate reporting, adaptation planning, and climate-finance engagement, but a

dedicated mandate for carbon-credit generation, authorization, registry tracking, safeguards, benefit sharing, and project-level carbon-farming oversight is missing.

Across all four countries, institutional coordination is likely to be one of the main determinants of whether carbon farming remains a set of isolated pilot activities or becomes a scalable funding stream. The necessary coordination is both horizontal and vertical. Horizontally, climate, finance, agriculture, land, forest, water, statistics, and local-government authorities need shared procedures and data flows. Vertically, national rules must be implementable by regional and local authorities, extension services, land users, farmers, herders, and project developers. For carbon farming, a well-designed institutional mandate should therefore do three things: create a clear national decision point for carbon-market participation; establish coordination mechanisms across the ministries and agencies that govern land-based activities; and provide predictable procedures for project approval, safeguards oversight, registry interaction, and international authorization where relevant. Without this, even technically sound projects may struggle to demonstrate legal validity, public acceptance, and accounting integrity.

4.3 Project approval and authorization procedures

Project approval and authorization procedures are the operational bridge between a carbon-market framework and actual carbon-farming projects. Project developers, farmers, herders, local authorities and buyers need to know which steps must be followed before a project can be implemented, credited, transferred or claimed. For land-based mitigation and removals, a clear approval system should specify which authority receives project applications, which documents must be submitted, which land-use rights and consents must be demonstrated, which safeguards apply, how baseline and MRV approaches are reviewed, and whether the project is eligible for voluntary credits, Article 6 transfers, the Article 6.4 mechanism, or domestic compliance use.

The government's role differs across market channels. In the voluntary carbon market, project approval by the host country is not always legally required, because projects are usually developed under private standards and validated by independent third-party bodies. However, governments increasingly have reasons to introduce at least a notification, no-objection, or approval procedure, especially for land-based projects. Such a procedure helps confirm that the project has a legitimate land basis, does not conflict with national land, forest, pasture or water policy, respects safeguards and benefit-sharing requirements, and does not create double-claiming risks. It also helps governments understand which mitigation or removal outcomes are being generated on their territory, even when credits are sold for voluntary corporate claims rather than transferred under Article 6.

For Article 6.2 and Article 6.4, approval and authorization procedures are no longer optional. Under Article 6.2, the government must decide whether a mitigation outcome may be authorized for international transfer as an ITMO, whether a corresponding adjustment will be applied, and whether the activity is consistent with the country's NDC strategy. This requires procedures for assessing eligibility, additionality, sustainable-development contribution, safeguards, avoidance of double counting, and risks of overselling mitigation outcomes that the country may need for its own NDC. Under Article 6.4, the role of the designated national authority is also central: the UNFCCC states that a DNA is the organization granted responsibility by a Party to authorize and approve participation in Article 6.4 projects, and establishment of a DNA is a participation requirement (United Nations Framework Convention on Climate Change, n.d.-b). In domestic compliance offset systems, the state's role is strongest because the government defines which activities are eligible, how offsets can be used for compliance, which MRV and verification procedures apply, and how non-compliance or reversals are handled.

Across the four countries, formal procedures for approving and authorizing carbon-market projects are still emerging and, in most cases, have not yet been translated into operational pathways for land-based activities. **Mongolia** is moving toward more explicit project approval and authorization procedures, particularly through its national carbon-registry work and Article 6 cooperation. The National Carbon Registry Procedure reportedly provides a legal basis for registering carbon-credit projects and transactions and for supporting Article 6 implementation (GRATA International, 2026). The SCALA program has developed operational and methodological guidelines to support rangeland carbon sequestration under Mongolia's emerging carbon-market framework addressing the procedural and technical basis for rangeland carbon projects, including project registration, approval, financial management, and carbon-sequestration methodology (Enkhtaivan & Dolgorsuren, 2026a, 2026b). In addition, Mongolia's cooperation with Singapore includes a dedicated Article 6 process architecture, with an implementation agreement, application process, eligibility list, forms, and project register (Government of Singapore, 2026). For carbon farming, however, these procedures will need to be adapted to the specific governance of forests, rangelands, and herder-managed landscapes. Approval pathways should therefore involve not only the central climate authority and registry operator, but also the Forest Agency, land-administration authorities, local governments, and herder associations where pasture-use agreements and communal rangeland management are involved.

In **Uzbekistan**, the Law "On Limiting Greenhouse Gas Emissions" creates a promising legal entry point for carbon-market participation. The next step will be to translate this general framework into sector-specific approval procedures for land-based activities, including soil restoration, agroforestry, shelterbelts, rangeland rehabilitation,

afforestation, and restoration of degraded lands. These procedures would need to clarify how projects are recognized as eligible carbon-generating or "green" activities, how land-use and lease rights are verified, how sectoral authorities are involved, and when credits may be authorized for international transfer.

Kyrgyzstan has signaled interest in Article 6 participation, but project approval and authorization procedures for carbon-market activities still appear to be at an early stage. For carbon farming, Kyrgyzstan would need to define a clear pathway for project submission, land and pasture-rights verification, local approval, safeguards review, data access, registry entry, and, where relevant, Article 6 authorization. **Tajikistan** would first need to develop the basic legal and institutional framework for carbon-market participation. This would include assigning a competent authority, establishing project approval procedures, clarifying the treatment of carbon rights on state-owned and user-held land, defining safeguards and benefit-sharing requirements, and setting rules for any future authorization of credits for international use.

In all four countries, approval and authorization procedures should avoid becoming purely administrative checklists. For carbon farming, they are a mechanism for ensuring that projects are legally valid, environmentally credible, socially acceptable and consistent with national climate accounting. A practical procedure would include at least four decision points: initial project notification or no-objection; confirmation of land rights, consent and safeguards; review of MRV and registry compatibility; and, where credits are exported or used toward another country's target, formal Article 6 authorization and corresponding-adjustment treatment. Without such procedures, carbon-farming projects may still emerge, especially through voluntary standards, but they will face greater risks of contested rights, weak buyer confidence, double claiming, and poor integration with national climate and land policy.

International experience shows that host countries can benefit from establishing structured project approval and authorization systems because such systems turn carbon-market participation into a predictable public procedure rather than a sequence of ad hoc decisions. **Rwanda**, for example, has developed a detailed Manual of Procedures that covers pre-authorization, Article 6.4 approval, VCM non-objection letters, ITMO authorization and transfer, registry management, corresponding adjustments, and integration with UNFCCC reporting (Government of Rwanda, 2024). This provides a useful early example of how host-country procedures can turn Article 6 readiness into real authorization practice. Its structured process allowed the government to authorize mitigation outcomes generated by projects certified under independent standards, including VCS and Gold Standard, for "other international mitigation purposes" under Article 6. In its 2024 Initial Report, Rwanda states that it had issued unilateral Letters of Authorization to several such activities, while also negotiating that a share of the credited mitigation outcomes would be allocated toward Rwanda's

own NDC (Government of Rwanda, 2024). Rwanda therefore was able to create a host-country authorization layer through which credits generated under Verra and Gold Standard standards could be internationally used in a way that is linked to corresponding adjustments and national accounting. This makes Rwanda one of the early operational examples of a host country moving from Article 6 preparedness to actual authorization practice.

Ghana provides a similar lesson: its Carbon Market Office maintains public documents, forms, authorization statements, reports and templates, while the technical expert review of Ghana's Article 6 initial report describes a defined process in which applications are submitted to the Carbon Market Office, assessed against authorization criteria, and considered by a carbon-market committee (Ghana Carbon Markets Office, n.d.). **Thailand**'s experience also shows the value of clear national rules: its Article 6 framework links eligibility criteria, authorization and approval procedures, corresponding-adjustment mechanisms, and a national carbon-credit registry, and implementation lessons highlight that clear procedures help facilitate private-sector engagement (Article 6 Implementation Partnership Center, n.d.-c). **Cambodia** provides a further example of procedural clarity: its Article 6 Operations Manual designates the Ministry of Environment as the national authority empowered to issue letters of no objection, letters of authorization and positive examinations, and uses a positive list of eligible project types (Ministry of Environment, Kingdom of Cambodia, 2024).

For Mongolia, Kyrgyzstan, Tajikistan, and Uzbekistan, these examples point to several concrete design lessons. First, the host country should define separate but connected pathways for non-authorized VCM credits, authorized Article 6.2 outcomes, Article 6.4 activities, and possible domestic units. Second, the system should provide standardized forms, eligibility criteria, review timelines, and decision points, rather than relying on case-by-case negotiations. Third, approval should not be limited to climate authorities: for carbon farming, the procedure must require confirmation of land rights, safeguards, benefit-sharing arrangements, and consistency with forest, pasture, agriculture, water, and local-government rules. Fourth, authorization for international transfer should be treated as a strategic public decision, with checks against NDC needs, overselling risks, corresponding-adjustment capacity, and registry readiness. In this sense, the most relevant lesson from leading host-country examples is that approval and authorization procedures should become a predictable public service: transparent enough for project developers and buyers, but conservative enough to protect national climate accounting and land-sector integrity.

4.4 Consent, safeguards, and benefit-sharing rules

Consent, safeguards, and benefit-sharing rules are essential for carbon farming because land-based projects affect people's rights, livelihoods, land-use choices, and long-term

access to natural resources. Unlike many energy-sector crediting activities, carbon farming is often implemented on agricultural land, pastures, forests, degraded lands, or communal-use landscapes where formal ownership, customary use, lease rights, and local livelihoods may overlap. A government framework should therefore define who must consent to a project, how consent is documented, what social and environmental safeguards apply, how grievances are handled, and how revenues and responsibilities are shared among farmers, herders, communities, land users, project developers, local authorities, and the state where relevant.

At this stage, the four focal countries still need to translate general land, environmental, forest, pasture, and local-governance provisions into concrete carbon-project rules that account for overlapping land-use rights, the interests of affected farmers, herders and communities, consent and grievance procedures, benefit-sharing arrangements, and long-term responsibilities for maintaining credited carbon outcomes.

International experience offers potentially useful models. **Kenya** provides one of the clearest examples of formalizing benefit-sharing in carbon-market regulation. Its 2024 Carbon Markets Regulations require community carbon projects to include annual social contributions in a Community Development Agreement; for land-based projects, public summaries of the regulation report a 40% contribution of earnings to community development, while the regulation links benefit management to community-level governance arrangements. This approach is relevant for the GCA countries because it shows how a government can move benefit sharing from a vague principle into a contractual and regulatory requirement, although the exact percentage would need to be adapted carefully to national conditions and project economics (Ernst & Young, 2024).

Ghana offers a different lesson: safeguards and benefit sharing can be embedded in a broader carbon-market framework rather than treated as a separate social add-on. Ghana's Carbon Market Framework covers both Article 6.2 mitigation activities and voluntary carbon-market projects, and sets out national procedures for authorization, corresponding adjustments, tracking, and reporting. For the focal countries, the useful model is not only Ghana's institutional architecture, but the idea that social, environmental, and sustainable-development requirements should be checked as part of the project approval and authorization process, before credits are internationally transferred or counted (Ministry of Environment, Science, Technology and Innovation, Ghana, 2022).

Rwanda is also useful here because its Article 6 Manual of Procedures integrates activity development, authorization, ITMO transfer, registry management, corresponding adjustments, and reporting in one procedural system. This matters for safeguards because it creates clear decision points at which the host country can review whether an

activity is consistent with national policy and sustainable-development priorities before authorizing international use of mitigation outcomes. Rwanda's Initial Report also shows that the country used authorization practice to secure contributions to its own NDC interests, illustrating how host countries can use authorization not only to enable credit exports but also to protect national benefits (Government of Rwanda, 2024).

Cambodia provides another useful model through its Article 6 Operations Manual (Ministry of Environment, Kingdom of Cambodia, 2024). The manual designates the Ministry of Environment as the national authority for the GHG emission-reduction mechanism, empowers it to issue letters of no objection and authorization, and uses a positive list of eligible activity types. A host-country case-study summary notes that Cambodia reserves sovereign rights to mitigation outcomes generated in the country, clarifies when rights are conferred to activity participants, and reserves a share of mitigation outcomes for domestic NDC use. For GCA countries, this is useful because it shows how authorization rules can clarify not only which projects are eligible, but also how benefits and mitigation outcomes are divided between project participants and the host country.

For Mongolia, Kyrgyzstan, Tajikistan, and Uzbekistan, the practical lesson is that consent, safeguards, and benefit sharing should be built into project approval from the start. A credible system would require proof of land-user consent, a benefit-sharing plan, a grievance mechanism, safeguards screening, identification of affected users, and rules on how carbon revenues and liabilities are distributed over time. This is especially important for pastures, rangelands, forests, and degraded drylands, where carbon value may be generated through collective management changes rather than by a single private landowner. Done well, these rules would not only reduce social risk; they would also increase buyer confidence by showing that carbon units are backed by legitimate land access, durable local participation, and a fair distribution of value.

4.5 National data foundations

National data foundations are another core government enabler for carbon farming as projects depend on public data systems to establish credible baselines, prove land eligibility, define project boundaries, assess leakage and permanence risks, and avoid double counting with national climate targets. Governments therefore need to make reliable national datasets available and usable. These include land-use and land-cover maps, cadastral and land-rights information, pasture and forest inventories, soil maps, agricultural statistics, climate and hydrological data, protected-area boundaries, degradation assessments, fire and disturbance records, and national greenhouse-gas inventory data. For land-based mitigation and removals, the quality of these data foundations is especially important. Soil carbon, rangeland restoration, agroforestry, afforestation, shelterbelts and forest management all depend on spatially specific

information. Without national data foundations, project MRV becomes more expensive, more uncertain, and harder for buyers and verifiers to trust.

Across the four focal countries, existing data systems are stronger at the level of national reporting, but much less developed for investment-grade carbon farming. All four countries have experience preparing national greenhouse-gas inventories under the UNFCCC. However, for the land-based categories most relevant to carbon farming — including agricultural soils, croplands, grasslands, forest land, land-use change, and biomass removals — the available inventory evidence points to continued reliance on lower-tier methods, default parameters, and relatively aggregated activity data. This is most evident in **Kyrgyzstan**, **Tajikistan**, and **Uzbekistan**, where Tier 1 methods dominate, while **Mongolia** shows a somewhat more advanced but still mixed picture, combining Tier 1 and Tier 2 approaches in parts of the land and forest inventory (Agency for Hydrometeorology of the Committee for Environmental Protection under the Government of the Republic of Tajikistan, 2022; Agency of Hydrometeorological Service of the Republic of Uzbekistan, 2024; Ministry of Environment and Tourism of Mongolia, 2023; Ministry of Natural Resources, Ecology and Technical Supervision of the Kyrgyz Republic, 2024).

Mongolia also has an important advantage in forest data. Its national forest inventory, conducted between 2014 and 2017 and published with FAO support, provides a more structured basis for forest planning and reporting (Food and Agriculture Organization of the United Nations, 2025). This is relevant for forest carbon, afforestation and improved forest management, because field plots and national forest datasets can help calibrate remote sensing and biomass estimates. However, rangeland and soil-carbon data remain more difficult. Mongolia's large grassland systems are spatially heterogeneous and strongly affected by climate variability, grazing pressure, drought and fire. For carbon farming, the data challenge is therefore to connect forest inventories, pasture data, land administration records, climate data and local management information into project-level baselines.

Uzbekistan's recent transparency framework creates another important starting point. Its BTR shows that the country has a functioning national inventory process and identifies the move toward Tier 2 methods as part of its inventory improvement agenda (Agency of Hydrometeorological Service of the Republic of Uzbekistan, 2024). For carbon farming, the relevant data foundations would include agricultural land leases, irrigation and water-use data, salinity and degradation maps, shelterbelt and afforestation records, forest and ecosystem data, and statistics on crop and land-management practices. Because many potential activities are water-constrained, national data on irrigation, groundwater, salinization and drought risk will be as important as carbon data narrowly defined.

Kyrgyzstan's data foundations are closely linked to mountain pastures, agricultural land and national inventory systems. The country has official inventory processes and institutional arrangements for collecting data from ministries, agencies, state institutions and enterprises, but its reliance on Tier 1 methods shows that more detailed activity data and country-specific parameters are still needed for carbon-market use (Ministry of Natural Resources, Ecology and Technical Supervision of the Kyrgyz Republic, 2024). For pasture-based carbon farming, the most important data gaps are likely to concern pasture condition, grazing intensity, seasonal use, degradation trends, soil organic carbon, and the spatial boundaries of pasture-use rights and local management units.

Tajikistan faces a similar but more foundational challenge. Its national reporting system provides a basis for climate data collection, but the predominance of Tier 1 methods means that the data are not yet sufficient for robust project-level crediting (Agency for Hydrometeorology of the Committee for Environmental Protection under the Government of the Republic of Tajikistan, 2022). Carbon farming would require more detailed and spatially explicit data on dehkan farms, pasture-use arrangements, degraded lands, irrigation and land reclamation systems, forest resources, soil conditions, erosion, and climate risks. Without these data, projects may be possible as pilots, but they would face high transaction costs and credibility challenges if scaled.

For the four countries, the practical government task is to turn existing public data into usable carbon-market infrastructure. This means improving land-use and land-cover maps, digitizing and clarifying land-rights records, strengthening soil and biomass sampling networks, upgrading forest and pasture inventories, linking climate and water datasets to land-management planning, and making non-sensitive datasets accessible to project developers and verifiers. It also means defining which national datasets should be treated as authoritative for project boundaries, baseline setting, leakage assessment, safeguards screening and registry entry. In this sense, national data foundations are not just a technical support function. They are part of the credibility infrastructure that determines whether carbon-farming outcomes can be measured, verified, trusted and converted into durable units of value.

International experience shows that national data foundations can become a practical accelerator for land-based carbon markets when governments invest in datasets that project developers, verifiers, and registries can rely on. **Australia** provides one of the clearest examples: its Full Carbon Accounting Model (FullCAM) is a government-supported land-sector carbon accounting tool used to model greenhouse-gas emissions and removals from the land sector, and specific Australian carbon-credit methods rely on FullCAM data to estimate eligible reforestation outcomes. This illustrates how a public modelling and data infrastructure can reduce uncertainty for project developers and create consistency between project crediting and national land-sector accounting

(Australian Government Department of Climate Change, Energy, the Environment and Water, n.d.).

Costa Rica offers a useful forest-sector example. Its national land-use and ecosystem monitoring system, SIMOCUTE, was put into operation to maintain consistency in land-use change information across government agencies, and Costa Rica's REDD+ monitoring has used stratified sampling and bias-corrected area estimates to strengthen forest reference levels. This shows the value of having a nationally recognized land-monitoring system that can support both UNFCCC reporting and carbon-market-relevant baselines (Ministry of Environment and Energy of Costa Rica, 2025).

Kenya is relevant for soil-carbon and agricultural land because recent work has focused specifically on the economics and measurement challenges of soil organic carbon in cropland and carbon-market contexts. The broader lesson is that governments do not need to provide all project-level measurements themselves, but they can support carbon farming by investing in soil datasets, agricultural statistics, county-level extension systems, and research partnerships that make soil-carbon estimates more credible and less costly (Wehinger & Lutta, 2024).

For Mongolia, Kyrgyzstan, Tajikistan, and Uzbekistan, these examples suggest three concrete lessons. First, public datasets should be treated as part of carbon-market infrastructure, not only as inputs for national reporting. Second, governments should identify authoritative datasets for project boundaries, land-use history, forest and pasture condition, soil properties, water constraints, and protected-area overlaps. Third, project-level MRV should be designed to connect back to national inventory systems, so that voluntary or Article 6 credits do not become disconnected from national climate accounting.

4.6 National MRV guidance

Measurement, Reporting, and Verification (MRV) is a process of quantifying GHG emission reductions and/or removals resulting from a mitigation activity over a defined period, relative to a baseline, reporting them in a specified framework, and having them verified by an accredited third party so results can be credibly recognized. MRV is crucial for GHG inventory compilation and for demonstrating progress towards Nationally Determined Contributions (NDCs) under the Paris Agreement, as well as for carbon crediting and results-based payments (World Bank, 2025).

Beyond providing national data foundations, governments also need to define how project-level carbon-farming MRV should interact with national reporting and carbon-market rules. This does not mean that governments must replace the methodologies of Verra, Gold Standard, Article 6.4, or other crediting systems. Rather, national MRV guidance should provide the public "interface layer" between project methodologies and the country's own inventory, NDC accounting, land-use policy, and registry or

authorization procedures. For carbon farming, such guidance should clarify minimum expectations for baselines, uncertainty treatment, leakage assessment, permanence, reversal reporting, use of national datasets, and consistency with national greenhouse-gas inventories. This is particularly important in land-based systems, where soil carbon, rangelands, forests, shelterbelts, degraded lands, and afforestation projects are highly sensitive to climate variability, disturbance, land-use history, and management assumptions. The same issue is already implicit in the distinction between national inventory MRV and project-level VCM MRV in the previous text: project proponents and independent verifiers may conduct the technical MRV, but the government still needs to define how project claims fit within national datasets, accounting rules, and double-counting controls.

A modern MRV systems for land-based emission reductions and/or removals rely on integrated architectures combining remote sensing, field inventories, ecosystem/biogeochemical modeling, data governance, and independent auditing. These systems have matured rapidly over the last decade, driven by (i) the Paris Agreement's Enhanced Transparency Framework (ETF) for national reporting, (ii) results-based finance for forests (e.g., REDD+), and (iii) the growth - and scrutiny - of voluntary carbon markets (VCM).

Under the Paris Agreement, countries communicate Nationally Determined Contributions (NDCs on a five-year cycle), while progress and inventory information are reported more frequently through the Enhanced Transparency Framework via Biennial Transparency Reports (BTRs), which are submitted every two years (with the first BTR due by 31 December 2024, subject to flexibilities for those entitled to use them). In parallel, National Communications remain part of UNFCCC reporting and are commonly prepared on an approximately four-year rhythm; because BTRs are biennial, these two reporting cycles naturally overlap about every four years, and countries may streamline preparation by aligning content, reusing the same underlying inventory/MRV datasets, and (where guidance allows and timelines coincide) packaging submissions in a coordinated way rather than treating them as entirely separate reporting exercises.

At national scale, a land-sector MRV is expected to align with IPCC guidance for estimating emissions/removals from Agriculture, Forestry and Other Land Use (AFOLU). The 2006 IPCC Guidelines and subsequent refinements provide standardized methods, uncertainty handling, and tiered approaches (Tier 1–3) for biomass and soil carbon stock changes (Intergovernmental Panel on Climate Change, n.d.-a, n.d.-b). Countries often apply it using different tiers depending on data availability and capacity.

Countries with limited data systems tend to use Tier 1 for most categories meaning they apply IPCC default emission factors for broad activity data (often relying on national statistics and generic land-use maps). **Kyrgyzstan**'s National Inventory Report for 1990–

2020 (published 2024) used Tier 1 approach "for almost all categories of emissions and removals" (Ministry of Natural Resources, Ecology and Technical Supervision of the Kyrgyz Republic, 2024; page 20). **Tajikistan**'s Fourth National Communication on Climate Change clarified that Tier 2 method was used to estimate emissions from the Waste sector, while "Other emissions were estimated using the Tier 1 method with default estimation parameters from the 2006 IPCC Guidelines and country data." (Agency for Hydrometeorology of the Committee for Environmental Protection under the Government of the Republic of Tajikistan, 2022; page 52). **Mongolia**'s National Inventory Report (2023) indicates that agricultural emissions are estimated predominantly using Tier 1 methods, whereas estimates for the forest land apply a combination of Tier 1 and Tier 2 approaches (Ministry of Environment and Tourism of Mongolia, 2023; page 24). **Uzbekistan**'s First Biennial Transparency Report similarly states that "IPCC Tier 1 methodologies were mainly used" in preparing the 1990–2022 inventory, and further clarifies that Tier 1 methodologies were applied to estimate GHG emissions in most key categories because of limited detailed activity data and a lack of reliable national emission factors (Agency of Hydrometeorological Service of the Republic of Uzbekistan, 2024). The report identifies transition to Tier 2 methods as part of the Inventory Improvement Plan, with priority categories including fuel combustion, natural gas, and enteric fermentation.

Tier 1 relies on generic IPCC defaults, which can bias estimates where local conditions differ from global averages. Tier 2 uses country- or region-specific emission factors and stock-change parameters, reducing uncertainty and systematic error. Tier 3 uses repeated measurements and/or validated, data-rich models (often combined with detailed activity data such as permanent plots and high-frequency remote sensing) to further improve attribution and responsiveness to management and disturbance, especially in highly variable systems. Hence, Tier 2 and Tier 3 generally require progressively stronger measurement and monitoring systems within MRV, while Tier 1 can be implemented largely with default factors and basic activity data.

Countries are encouraged to prioritize higher tiers for key categories (those contributing most to national totals or trends). If forests or grasslands dominate the land-sector balance, Tier 2 can materially change the inventory and improve targeting. Tiers 2 and 3 provide outputs that are more actionable for national policy: e.g., distinguishing carbon dynamics among major forest types, rangeland strata, or management regimes - useful for designing programs and tracking whether they are working. In Greater Central Asia, high-leverage Tier 2 and Tier 3 improvements often come from forest biomass parameters (species/eco-zone allometry, wood density, biomass expansion factors) and stratified soil/rangeland parameters where global defaults can carry high uncertainty in semi-arid, heterogeneous landscapes (Verchot et al., 2006).

For national inventories and NDC reporting, moving beyond Tier 1 is mainly an institutional (not just technical) choice: Tier 2 and Tier 3 methods must be transparently documented, embedded in domestic QA/QC [1], and then examined through the UNFCCC's Enhanced Transparency Framework via technical expert review, which checks consistency with the agreed reporting guidance (including relevant IPCC inventory guidance) and identifies improvements and capacity needs rather than issuing a formal approval (United Nations Framework Convention on Climate Change, n.d.-f). Countries are motivated to invest in Tier 2 (country- or region-specific parameters) and Tier 3 (repeated measurements and/or validated models with richer activity data) because higher-tier methods are designed to be more accurate when adequate data exist, and because stronger evidence and clearer documentation tend to reduce review findings, support more credible trend interpretation, and improve readiness for results-based finance and market mechanisms. In addition, the transparency system includes multilateral peer consideration, and in practice expectations from peers with more advanced inventory systems - as well as from funders, buyers, and international partners - can create informal pressure to improve methods and institutionalize stronger monitoring over time.

In practice, in project-level VCM MRV, the government is usually not the direct implementer of monitoring, reporting, and verification. These functions are normally carried out by the project proponent, checked by an independent validator/verifier, and assessed against the methodology of the relevant carbon standard. But the government plays an important role as it provides or validates national datasets, and prevents double counting with national climate targets or other market channels.

For this reason, one useful government function is to develop national MRV guidance that is compatible with, but does not duplicate or replace, the methodologies used by voluntary carbon standards or Article 6 mechanisms. Such guidance can define minimum expectations for how carbon-farming projects should establish baselines, use national datasets, treat uncertainty, assess leakage, manage permanence risks, and report reversals. This is especially important for land-based activities because soil carbon, rangelands, forests, shelterbelts, and degraded drylands are strongly affected by climate variability, disturbance, and land-use history. National guidance can help ensure that project baselines are not constructed in isolation from national inventories, land-use maps, forest and pasture data, or NDC accounting assumptions. It can also

[1] QA/QC in GHG MRV is the set of practical checks and procedures that make your estimates reproducible, internally consistent, and defensible. Quality control (QC) is the routine, hands-on checking done while compiling estimates; quality assurance (QA) is the more independent, higher-level review of the whole system and whether QC is working. In land-based MRV specifically, QC often focuses on things like land-use classification accuracy assessment, plot data validation, allometry/wood density parameter checks, and ensuring carbon pool accounting is consistent across maps, inventories, and models.

specify when projects should apply conservative deductions, buffer contributions, reversal monitoring, or restrictions on crediting in areas with high fire, drought, overgrazing, or water-stress risks.

Such guidance would be valuable even in the VCM, where project-level MRV is conducted under private standards. Governments do not need to prescribe every measurement method, but they can clarify which national datasets are authoritative, how project boundaries should be checked against land and registry records, how leakage should be assessed in pastoral and agricultural systems, and how voluntary credits should be reported so they do not conflict with national climate accounting. For Article 6.2 and Article 6.4, the need is stronger: national MRV guidance should define how project-level estimates are reconciled with the national GHG inventory, how authorized mitigation outcomes are tracked, and how reversals or underperformance are reflected in reporting and corresponding adjustments. In this sense, national MRV guidance is not a substitute for project methodologies; it is the public layer that makes project-level MRV nationally consistent, conservative, and credible for buyers, reviewers, and partner countries.

4.7 Integrity and assurance infrastructure

Integrity and assurance infrastructure is the part of the carbon-farming system that makes carbon units traceable, auditable, and trustworthy. It includes registries or tracking systems, unit labelling, rules against double counting and double claiming, validation and verification arrangements, conflict-of-interest controls, and procedures for dealing with reversals, errors, or non-compliance. For land-based carbon farming, this infrastructure is especially important because outcomes may be uncertain, spatially dispersed, vulnerable to drought, fire, pests, or overgrazing, and dependent on long-term land-management commitments. Even when projects are certified under voluntary standards, governments need to know which projects operate in their territory, which units have been issued, whether they have been authorized for international transfer, and whether they are also being counted toward the national NDC.

In the voluntary carbon market, much of the assurance function is provided by private standards and accredited validators and verifiers. However, this does not remove the need for a public integrity layer. Governments should be able to record projects, confirm land eligibility, track whether credits are authorized or non-authorized, prevent the same mitigation outcome from being claimed by multiple actors, and ensure that voluntary claims do not conflict with national inventory and NDC accounting. For Article 6.2 and Article 6.4, this becomes a formal requirement: mitigation outcomes must be authorized, tracked, reported, and, where applicable, subject to corresponding adjustments. For domestic compliance offsets, integrity and assurance infrastructure is

even more central because the state itself determines whether units can be used for compliance.

Across the four focal countries, this area is still to be developed. International experience shows that integrity systems work best when the registry, authorization process, and verification requirements are connected from the beginning. **Rwanda**'s Article 6 procedures link authorization, registry management, corresponding adjustments, and UNFCCC reporting in one procedural framework. **Ghana**'s Carbon Market Office provides an operational model with forms, templates, authorization procedures, and tracking arrangements. **Australia**'s carbon-crediting system shows how a domestic compliance-grade framework can combine government-approved methods, registry infrastructure, independent auditing, and reversal-management rules. For Mongolia, Kyrgyzstan, Tajikistan, and Uzbekistan, the key lesson is that integrity should not be treated as a final administrative step after credits are generated. It needs to be built into the system from project registration onward, so that every unit has a clear origin, ownership history, authorization status, verification record, and accounting treatment.

4.8 Capacity development and extension

Capacity development and extension are essential for moving carbon farming from legal possibility to practical implementation. Even where carbon-market rules, MRV guidance, registries, and approval procedures exist, projects will not scale unless farmers, herders, local authorities, advisors, project developers, and public agencies understand how carbon farming works and what responsibilities it creates. Capacity development should cover both carbon-market literacy and practical land-management support.

For governments, the role is not to train every project participant directly, but to build the enabling system. This may include developing extension materials, training local advisors, supporting demonstration sites, creating technical manuals, building capacity in public agencies, helping local aggregators work with smallholders and herders, and ensuring that communities understand contracts, benefit sharing, monitoring obligations, reversal risks, and long crediting periods. In the four focal countries, this remains to be a major bottleneck.

International experience shows that capacity development is not a peripheral activity but part of the core implementation infrastructure. **Australia**'s Carbon Farming Outreach Program is a useful model: it supports farmers and land managers, including First Nations land managers, to make informed decisions on managing emissions and storing carbon, and funds training and advice rather than assuming that land managers can navigate carbon markets on their own. The program provides a practical example of how government can use outreach grants, trusted advisors, and sector-specific guidance to lower the entry barrier for land managers (Australian Government Department of Climate Change, Energy, the Environment and Water, 2026). **Kenya**'s Agricultural Carbon Project

offers another relevant lesson for smallholder and community-based systems. Implemented by Vi Agroforestry with support from the World Bank BioCarbon Fund, the project worked with around 30,000 smallholder farmers and combined sustainable agricultural land management, farmer groups, advisory support, farm-enterprise development, and carbon-credit generation. Its design shows that carbon farming in fragmented land systems needs aggregation, trusted local intermediaries, farmer organizations, and continuous advisory support, not only a methodology and a buyer (Vi Agroforestry, n.d.).

For Mongolia, Kyrgyzstan, Tajikistan, and Uzbekistan, the practical lesson is that capacity development should be built into carbon-farming readiness from the beginning. Governments can help by training public officials who will approve and monitor projects, creating advisory networks for farmers and herders, supporting pilot projects in representative landscapes, developing model contracts and benefit-sharing templates, and strengthening local institutions that can aggregate many small land users into investable projects. Without this layer, carbon farming is likely to remain limited to isolated donor or developer-led pilots; with it, countries have a better chance of turning carbon-market rules into durable land-management practice.

International experience also shows that leading host countries often learn by testing procedures in real projects before scaling them into a full national system. **Ghana** is a useful example. Its Article 6 framework did not emerge only from abstract policy design; it was shaped partly by the practical needs of pilot transactions with the Swiss KliK Foundation. A West African readiness assessment notes that Ghana's progress in establishing an Article 6 framework was driven by "the needs arising from pilot transactions with the Swiss KliK Foundation," and identifies Ghana's National Clean Energy Access Program as an Article 6 pilot (Hunzai & Krämer, 2021). In other words, pilots helped Ghana identify which institutional decisions, private-sector engagement channels, accounting arrangements, and authorization procedures were needed in practice.

Thailand provides a similar lesson. Its first Article 6.2 pilot, the Bangkok e-bus program, authorized up to 500,000 tCO2e for Switzerland's NDC use over 2022–2030, generated concrete lessons on inter-ministerial coordination, sustainable-development co-benefits, NDC overselling risk, corresponding-adjustment methods, and the need for clear national rules to facilitate private-sector engagement.

For Mongolia, Kyrgyzstan, Tajikistan, and Uzbekistan, the equivalent would be to establish carbon-farming testing sites in representative landscapes – for example, degraded rangelands, irrigated croplands, shelterbelts, forest-steppe areas, or afforestation sites – not only to test land-management practices, but also to test the full governance chain: land-rights confirmation, consent, benefit sharing, MRV design,

verifier interaction, registry entry, and buyer engagement. Such sites can help governments learn what works under local ecological and institutional conditions before inviting larger-scale investment. Such developments have already begun in Mongolia and, to a lesser extent, in Uzbekistan. Mongolia has a small but growing set of pilot initiatives that can serve this function. The clearest example in Mongolia is the ADB-supported Grassland Carbon Restoration Project, which tests grassland restoration, improved grazing, soil-carbon quantification, MRV and benefit sharing (Asian Development Bank, 2025). For Uzbekistan, Kyrgyzstan, and Tajikistan, similar testing sites could be an important next step, particularly in pasture and degraded-land systems where carbon-farming potential depends on collective management, local consent, and credible MRV under highly variable climatic conditions.

Russia's "carbon polygons" program provides a useful example of testing sites as scientific and capacity-building infrastructure. Launched by the Ministry of Science and Higher Education, the program created a network of representative field sites where universities and research institutions test methods for measuring greenhouse-gas fluxes and ecosystem carbon balances using ground measurements, remote sensing, modelling, and long-term monitoring (Ministry of Science and Higher Education of the Russian Federation, n.d.). The sites are intended to improve MRV methods, generate local evidence on carbon dynamics, and train specialists. For Mongolia, Kyrgyzstan, Tajikistan, and Uzbekistan, the relevant lesson is that carbon-farming testing sites do not need to start as market projects; they can first serve as controlled landscapes for testing MRV protocols, sampling designs, uncertainty treatment, and institutional roles before scaling crediting activities.

One example is the HSE University-operated carbon polygon Pokrovsky (HSE University, n.d.), which serves as a testing ground for developing and validating technologies to enhance soil organic carbon sequestration using cover crops, particularly on abandoned agricultural lands. In addition, the site is actively accumulating data on ecosystem GHG fluxes using eddy covariance systems and is used to build capacity in the development of dynamic digital twins of agricultural ecosystems and AI-based remote land monitoring using satellite and UAV data – data collected by unmanned aerial vehicles (usually drones) flying over farms, grasslands, or restoration sites.

4.9 Alignment with agricultural, land, water, and other relevant policies

Carbon farming can become a durable tool for sustainable land management only if it is aligned with the wider policy systems that shape land-use decisions. Land managers respond not only to carbon prices, but also to agricultural subsidies, pasture regulations, water allocation rules, forest laws, land-restoration programs, biodiversity objectives, rural development priorities, and food-security concerns. If these policies pull in different directions, carbon projects may generate weak incentives, face

implementation barriers, or even create unintended harm. For example, a project that rewards vegetation restoration on degraded rangelands may fail if pasture-use rules still encourage short-term grazing pressure. An agroforestry or shelterbelt project may be difficult to implement if land-lease rules, irrigation plans, or farm-support schemes do not recognize tree-based land management. A soil-carbon project may be undermined if agricultural policies continue to reward practices that increase erosion, salinization, or overuse of water.

For governments, policy alignment means making sure that carbon farming is not treated as a stand-alone carbon-market activity, but as part of land, agriculture, pasture, forest, water, and rural-development governance. This requires checking whether carbon-farming activities are compatible with existing land-use classifications, lease conditions, pasture-management plans, forest restoration targets, irrigation rules, biodiversity safeguards, and national adaptation priorities. It also requires identifying where current policies may need adjustment. In dryland and semi-arid systems, water policy is especially important: carbon projects that increase tree cover, change cropping systems, or restore degraded land must be assessed against water availability, salinity risks, drought exposure, and competing water demands. Similarly, pasture-based projects must be aligned with grazing rights, seasonal mobility, livestock policies, and the institutions that regulate communal or state-owned rangelands.

In the four focal countries, this alignment is likely to be one of the most important practical challenges. **Mongolia**'s carbon-farming potential is closely tied to rangelands, forest-steppe landscapes, afforestation, and improved forest management, which means that carbon-market rules would need to be linked with pasture governance, herder institutions, forest policy, land administration, and local-government responsibilities. **Kyrgyzstan**'s opportunities are also strongly connected to mountain pastures and degraded grazing lands, making alignment with pasture-use rules, livestock policy, local pasture committees, land administration, and rural livelihoods essential**. Tajikistan**'s potential land-based activities would need to be reconciled with state land ownership, dehkan farm arrangements, pasture-use systems, irrigation and land-reclamation policies, erosion control, and water-energy-agriculture trade-offs. In **Uzbekistan**, carbon farming would need particularly close alignment with agricultural land leases, irrigation and drainage systems, salinization management, shelterbelt and afforestation programs, degraded-land restoration, and water-efficiency priorities.

International experience shows how this alignment can work. **Costa Rica** provides a useful example. Its long-standing forest policy framework links carbon and ecosystem-service payments with forest conservation, reforestation, watershed protection, biodiversity objectives, and rural land-use incentives. This alignment helped make forest-based carbon finance part of a broader national land-management strategy, rather than a stand-alone crediting activity. For the GCA countries, the lesson is that

carbon farming should be connected to existing policy priorities such as pasture rehabilitation, soil restoration, shelterbelt development, afforestation, erosion control, water efficiency, and rural livelihoods. Projects that reinforce these priorities are more likely to be politically durable, easier to implement, and more attractive to buyers seeking credible co-benefits.

For Mongolia, Kyrgyzstan, Tajikistan, and Uzbekistan, the practical task is therefore to screen carbon-farming options against existing policy incentives and constraints before projects are scaled. Governments should identify which activities are already supported by national land, agriculture, pasture, forest, water, or restoration strategies, which activities face regulatory barriers, and which incentives may need to be revised. This would help avoid projects that look attractive from a carbon perspective but are difficult to implement under existing land-use or water-management rules. It would also help prioritize activities with strong co-benefits, such as rangeland rehabilitation, soil restoration, agroforestry, shelterbelts, forest restoration, erosion control, and improved water-use efficiency. In this sense, policy alignment is not a secondary condition. It is what determines whether carbon farming can become a durable land-management strategy rather than a set of isolated carbon-credit projects.

4.10 Project development, finance, and demand creation

Project development, finance, and demand creation are the final link between carbon-farming readiness and actual investment. Projects will not scale unless land managers and developers can turn eligible activities into bankable projects and connect them to reliable sources of demand. This is especially important for carbon farming because many costs arise before credits are issued: feasibility studies, land-user engagement, baseline preparation, soil or biomass sampling, remote-sensing analysis, validation, registration, implementation of new practices, monitoring, and verification. Farmers, herders, forest users, and local communities are often not in a position to carry these upfront costs or wait several years for uncertain carbon revenues.

Governments therefore have an important enabling role, even where credits are issued under voluntary standards or sold to private buyers. They can reduce transaction costs by supporting project aggregation, model contracts, standard benefit-sharing templates, approved advisory services, pilot projects, and public data access. Aggregation is particularly important in Mongolia, Kyrgyzstan, Tajikistan, and Uzbekistan because many potential carbon-farming activities are likely to involve dispersed land users, small farms, herder groups, pasture users, or local restoration sites. Without aggregation, individual projects may be too small to cover certification, MRV, legal, and transaction costs. Public support can help create intermediaries that bundle many land users into larger projects while preserving transparent benefit-sharing and safeguards.

Finance is another critical bottleneck. Carbon revenues are typically performance-based and arrive only after monitoring and verification, while land managers need resources at the beginning to change practices. Governments can help bridge this gap through concessional finance, guarantees, revolving funds, grant support for feasibility studies, risk-sharing instruments, insurance or buffer arrangements, and tax clarity for carbon revenues. This does not mean that governments must finance carbon-farming projects directly. Rather, they can make projects investable by reducing uncertainty around land rights, approval procedures, MRV expectations, revenue treatment, and long-term liability. Development banks, climate funds, private investors, aggregators, and buyers are more likely to engage where these conditions are clear.

Demand creation is equally important. Voluntary demand may come from international corporates, traders, funds, or buyers seeking high-integrity credits with strong co-benefits. Article 6 demand may come from countries seeking ITMOs for NDC-related use. Domestic demand may come from public procurement, state-owned enterprises, regulated emitters, or future compliance schemes. Governments can support demand by clarifying which types of credits may be used for which claims, whether voluntary credits are authorized or non-authorized, how domestic buyers should avoid misleading claims, and whether public institutions can purchase or support credits from national land-restoration priorities. For domestic compliance offsets, demand creation becomes a direct government function, because the state defines the obligation that creates demand for eligible units.

For the four focal countries, project development and demand creation remain at an early stage. Mongolia has emerging carbon-market infrastructure and Article 6 cooperation, but land-based project pipelines still need to be built around forests, rangelands, herder-managed landscapes, and afforestation opportunities. Uzbekistan has a more explicit emerging legal basis and could potentially connect carbon farming to afforestation, shelterbelts, degraded-land restoration, agricultural soils, and water-efficient land management, but project pipelines, finance models, and buyer channels still need to be developed. Kyrgyzstan has interest in Article 6 and climate-finance cooperation, but carbon-farming projects will require aggregation models for pasture users, farmers, and mountain communities. Tajikistan would first need more foundational legal, institutional, and MRV arrangements before a credible project pipeline could emerge at scale.

Crucially, financial stability for farmers, herders, and local communities should not be equated solely with carbon credit revenues. The most durable economic benefits of carbon farming come from improved land condition: higher forage productivity, reduced need for fertilizers and irrigation, better drought resistance, and lower livestock mortality. Carbon payments act as a transitional and complementary income stream that can help cover upfront costs and reward early adopters, but the longterm financial

case rests on healthier soils, more resilient pastures, and more productive landscapes. Government policies and project designs should therefore emphasize this combined economic logic: carbon finance catalyzes restoration, and restoration delivers sustained financial and ecological returns.

International experience suggests several useful models. **Australia** shows how government can support land-sector carbon markets through approved methods, public data infrastructure, outreach programs, and a domestic crediting system that creates a clearer route from land-management practice to recognized units. **Kenya**'s smallholder agricultural carbon experience shows the importance of aggregators, farmer groups, advisory services, and upfront support when working with many small land managers. **Rwanda** and **Ghana** show how structured authorization procedures and carbon-market offices can make projects more attractive to buyers by clarifying how activities are submitted, reviewed, authorized, tracked, and reported. These examples suggest that project finance and demand creation should not be left entirely to the market. Governments can actively shape the conditions under which carbon-farming projects become credible, investable, and attractive to buyers.

For Mongolia, Kyrgyzstan, Tajikistan, and Uzbekistan, the practical priority is to move from general potential to project pipelines. This means identifying priority activity types, preparing pilot projects in representative landscapes, supporting aggregation models, clarifying finance and tax treatment, engaging potential buyers, and linking carbon farming to national land-restoration, agriculture, pasture, forest, water, and rural-development priorities. Without this project-development layer, carbon farming may remain a latent opportunity. With it, land-based mitigation and removals can begin to generate durable, demand-driven funding streams while supporting broader sustainable land-management goals.

4.11 International interface

The international interface is the "+1" element in the carbon-farming readiness framework: it builds on domestic legal, institutional, MRV, registry, safeguards, and project-development systems, but connects them to external demand and Paris Agreement accounting. For voluntary carbon markets, the international interface may involve recognition of international standards, guidance on whether credits can be marketed with or without host-country authorization, and clarity on claims by foreign buyers. For Article 6.2, it becomes much more formal: the government must be able to authorize mitigation outcomes, decide whether corresponding adjustments will be applied, track transfers, report them under the Enhanced Transparency Framework, and ensure that exports do not undermine its own NDC. For Article 6.4, countries also need the institutional capacity to interact with the UN mechanism, including the designation

of a national authority, activity approvals, sustainable-development requirements, and reporting links.

For carbon farming, this interface is particularly important because land-based mitigation and removals may be attractive to international buyers but also valuable for domestic climate and land-restoration goals. A host country therefore needs rules on which types of land-based units may be exported, which should be retained for domestic NDC use, whether certain activities require a share of mitigation outcomes for the host country, and how long-term risks such as reversals, fire, drought, or project underperformance will be handled after international transfer. Without this interface, carbon-farming projects may still be certified under voluntary standards, but they will face uncertainty over claims, authorization status, double counting, and eligibility for buyers seeking Article 6-aligned units.

Among the four focal countries, **Mongolia** currently has the most visible operational international interface. It has signed an Article 6 implementation agreement with Singapore, and the Singapore-Mongolia cooperation platform includes an application process, eligibility list, forms, and project register (Government of Singapore, 2026). This gives Mongolia a concrete procedural model for receiving applications, screening eligible activities, and moving projects toward internationally transferable mitigation outcomes. Mongolia has also been advancing registry and Article 6 readiness, which creates a basis for linking domestic project development with external buyers and partner-country requirements.

Uzbekistan has also begun to build a formal international interface. Presidential Decree PD-110 establishes an institutional, legal, and operational framework for participation in international carbon-unit markets, especially under Article 6, and refers to carbon credits including ITMOs (Presidential Decree No. PD-110 “On Measures for Participation in the International Carbon Units Market,” 2025). Uzbekistan is also actively developing Article 6 and JCM readiness, with recent policy dialogue involving government institutions, development partners, and technical experts. This suggests that Uzbekistan is moving from general readiness toward a more structured international carbon-market architecture, although land-based project pathways and export rules will still need to be specified in operational detail. **Kyrgyzstan** has signaled interest in Article 6 participation and carbon-market cooperation, but its international interface appears less operationalized. The key next steps would be to define the national authorization process, establish templates for bilateral cooperation, clarify how corresponding adjustments would be applied, and decide which mitigation outcomes could be exported without compromising the country’s NDC. **Tajikistan** appears to be at an earlier stage still: before developing a full international interface, it would need to establish the domestic legal and institutional basis for carbon-credit generation, project approval, registry tracking, safeguards, and authorization.

International experience shows that host countries benefit when the international interface is designed as a structured public system rather than negotiated case by case. **Rwanda**'s Article 6 Manual of Procedures provides a strong example because it covers approval of Article 6.2 and Article 6.4 activities, authorization of participants, VCM activities with corresponding adjustments, ITMO authorization, registry management, corresponding adjustments, and UNFCCC reporting (Government of Rwanda, 2024). **Ghana** offers another practical model: its Carbon Market Office provides public documents, authorization statements, reports, and templates, and Ghana's Article 6 framework links a carbon-market office and registry with NDC accounting and corresponding adjustments (Ghana Carbon Markets Office, n.d.).

For Mongolia, Kyrgyzstan, Tajikistan, and Uzbekistan, the practical lesson is that international engagement should not start only when a buyer appears. Governments can prepare in advance by developing authorization templates, bilateral cooperation models, eligibility lists for activity types, rules for authorized and non-authorized credits, reporting procedures, and guidance on corresponding adjustments. This would make carbon-farming projects easier to present to international buyers while protecting national interests. In particular, countries should avoid exporting land-based mitigation outcomes without a clear view of their own NDC needs, inventory treatment, reversal risks, and long-term land-policy priorities. A strong international interface should therefore help mobilize external demand, but on terms that preserve national accounting integrity and support sustainable land management.

5. Key take-away messages and policy recommendations

The following takeaways and policy recommendations translate the report's analysis into an actionable agenda for governments, international donors, development partners, and potential private-sector actors. They reflect the central finding that carbon farming in Greater Central Asia is a set of context-specific pathways in which carbon finance can help mobilize additional investment for land restoration, climate mitigation, rural livelihoods, and resilience. The four countries possess substantial potential in rangelands, drylands, mountain pastures, irrigated agricultural systems, and degraded landscapes, but this potential can only be realized if carbon outcomes are made credible, measurable, socially legitimate, and financially viable. Therefore, this report's 20 recommendations across five strategic action areas, S-C-A-L-E, focus on how to move from biophysical potential and existing sustainable land-management experience toward investable, high-integrity carbon farming pathways that support climate mitigation, adaptation, land degradation neutrality, and rural livelihoods (Figure 5.1).

S. Strengthen the evidence base for carbon farming

1. Enhance collection and sharing of relevant data

Credible carbon farming requires transparent, accessible, and spatially explicit data on soil organic carbon, vegetation cover, pasture condition, salinity, erosion, land-use history, and degradation status. Relevant data are often dispersed across government agencies, research institutions, and other organizations, collected using different methods, or not readily accessible. Greater data sharing, common standards, and interoperable data systems can help overcome institutional silos, make better use of existing information, and reveal where important data gaps remain.

2. Strengthen national carbon and land-degradation reference information

Consistent national reference data and information can provide an important foundation for carbon accounting across different financing and monetization channels. They can support project developers and crediting programs in establishing project- or methodology-specific baselines in voluntary carbon markets, while also strengthening the data basis for mitigation accounting, authorization, and the application of relevant methodologies under Paris Agreement Article 6 mechanisms. They can additionally support national tracking of land degradation and restoration outcomes and help improve consistency across projects and programs. Remaining data gaps can be addressed through a combination of field sampling, remote sensing, ecological site classification, and long-term monitoring, with carbon estimates kept conservative until locally validated evidence becomes available.

3. Develop fit-for-purpose MRV capacity and systems for drylands

Robust national measurement, reporting and verification capacity is needed both to meet countries' domestic and international climate-reporting obligations and to enable participation in carbon markets and results-based finance. National systems need to support greenhouse-gas inventories, tracking of progress towards NDCs, land-degradation and restoration monitoring. Participation in Paris Agreement Article 6 mechanisms additionally requires appropriate national institutional arrangements and capacity for authorization, accounting, tracking, and reporting, as applicable to the mechanism concerned.

For Greater Central Asia, the challenge is to ensure that the data, monitoring infrastructure and technical capacity underpinning these different functions are appropriate for arid and semi-arid ecosystems, mobile pastoralism, highly variable rainfall, sparse vegetation, and slow soil-carbon change. Investment in remote sensing, field measurements, modelling, local reporting, long-term monitoring and appropriate treatment of uncertainty can strengthen national reporting while also enabling project developers to meet international crediting requirements. Particular attention is needed to detecting and quantifying potential reversals caused by drought, fire, changes in land management, or other disturbances, so that credited carbon outcomes can be accounted for in accordance with the permanence provisions of the applicable standard or mechanism. National land-condition and LDN monitoring can provide complementary information on ecosystem change and potential reversal risks, but does not replace carbon-specific monitoring and accounting.

Wherever possible, common data and monitoring infrastructure can serve multiple purposes, including carbon accounting, tracking progress towards land degradation neutrality, informing pasture and watershed management, guiding public investment and climate adaptation planning, and providing credible evidence for donors, project developers and buyers. Such investment can also generate the locally validated evidence needed to inform the further development and refinement of voluntary carbon-market methodologies and standards, helping ensure that they better reflect the dynamics of Central Asian drylands.

4. Invest in testing sites

Governments and development partners can fill gata gaps and strengthen practical know-how by establishing carbon farming testing sites across representative ecosystem types, including mountain pastures, dryland rangelands, irrigated croplands, saline soils, agroforestry systems, degraded slopes, and restoration areas such as the Aral Sea region. These sites can function as practical learning laboratories where land-management practices, MRV methods, cost structures, farmer and herder incentives, and benefit-sharing models are tested before wider scaling. This is especially important in Greater Central Asia, where carbon outcomes are highly context-specific and shaped

by climate variability, soil conditions, water availability, grazing pressure, and local governance arrangements.

5. **Establish a regional carbon farming learning platform**

A Greater Central Asia carbon farming learning platform could facilitate sharing methodologies, MRV experience, testing sites' and pilot outcomes, governance models, and buyer engagement tactics among countries. It could additionally promote regional training, standardised data practices, scientific peer review, and coordination with donors. These efforts would minimise duplication and enhance the region's reputation as a credible provider of dryland, rangeland, and restoration-focused climate solutions.

C. Create country-specific carbon farming pathways and enabling frameworks

6. **Develop differentiated national pathways rather than one regional blueprint**

Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan share dryland and land degradation challenges, but their ecological conditions, development needs, and carbon farming opportunities differ substantially. This points to differentiated national priorities: rangeland carbon and herder-based governance in Mongolia; mountain pastures, forests, and watershed restoration in Kyrgyzstan; erosion control and mountain landscape restoration in Tajikistan; and irrigated soil restoration, salinity management, agroforestry, and Aral Sea landscape rehabilitation in Uzbekistan.

7. **Align carbon finance with land-management priorities while safeguarding additionality**

Carbon farming can provide an important mechanism for attracting investment into sustainable land management across Greater Central Asia by helping to finance transition costs and reward land users. However, carbon-finance opportunities need to be assessed within broader land-management priorities rather than be used to determine them. Consistent with the LDN response hierarchy Avoid → Reduce → Reverse, avoiding degradation may remain preferable to reducing or reversing degradation even where prevention generates fewer monetizable carbon outcomes. Carbon revenues can play a particularly important role where land-management interventions generate demonstrably additional mitigation outcomes, taking into account existing legal obligations, relevant policies and commitments, prevailing practices, and the extent to which the intervention would occur without carbon finance. This means that carbon finance is most appropriately directed toward activities that would not otherwise take place, or that increase the scale, speed, or ambition of restoration beyond what would occur in its absence. In this way, carbon monetization can complement national priorities for avoiding, reducing, and reversing land degradation while maintaining the environmental integrity required for credible carbon-market participation.

8. Sequence carbon farming action according to readiness and potential

National carbon farming strategies are best developed as portfolios rather than as single-pathway programs. Activities could be assessed against a common set of criteria, including mitigation potential, measurement feasibility, baseline availability, land-tenure clarity, institutional capacity, implementation cost, reversal risk, water availability, basin-level water impacts, salinity risks, safeguard requirements and expected livelihood benefits. Activities scoring relatively well across these dimensions – such as shelterbelts, afforestation on clearly delineated land, selected forestry measures and some conservation-agriculture practices – may provide practical early entry points where interventions are ecologically and hydrologically appropriate and easier to delineate, monitor, verify, and integrate into existing institutions.

Other activities, including pasture restoration and broader landscape restoration, may offer larger long-term land, climate, and livelihood value, but can have lower carbon gains per hectare and higher transaction costs. They require stronger governance, longer baselines, more sophisticated MRV, and more cautious carbon accounting. Sequencing action in this way can help countries generate early experience and credible results while building the readiness needed for more complex, higher-potential pathways.

9. Establish clear legal and institutional frameworks for carbon farming

Scaling carbon farming requires clarity over land tenure and use rights, rights to carbon benefits, institutional responsibilities, project approval and authorization procedures, and safeguards for participating land users and communities. Countries need to identify and address gaps or ambiguities in existing frameworks, particularly where land is state-owned, communally managed, or subject to overlapping rights. Clear rules are needed on who can enter carbon agreements, claim and receive carbon revenues, and, where relevant, authorize the transfer of mitigation outcomes under Paris Agreement Article 6. Transparent procedures and clearly assigned institutional responsibilities can reduce uncertainty for land users, project developers, and investors while protecting environmental integrity and the rights and interests of farmers, herders, and local communities.

10. Promote ecosystem-specific management approaches

Carbon farming practices are more likely to succeed when they are adapted to ecological variability. Governments and scientific partners can support ecological site descriptions, state-and-transition models, and landscape classification systems that distinguish between land types, degradation states, and recovery pathways. These tools are particularly relevant for rangelands, mountain pastures, and other heterogeneous landscapes, where they can guide site-specific restoration, grazing management, and decisions on where natural regeneration is still possible and where active intervention is needed.

A. Advance financial opportunities, reduce the entry barriers, and ensure inclusivity and fair benefit sharing

11. Develop differentiated financing pathways

National approaches to using carbon farming to support sustainable land management and land restoration need differentiated financing pathways that match activities and their expected outcomes to the most appropriate sources of finance. Carbon markets may be suitable for activities that generate credible additional and measurable mitigation outcomes, while other interventions may rely more heavily on results-based climate finance, adaptation finance, land-restoration funds, public investment, or donor grants. Blended approaches may be particularly important where carbon revenues can contribute to, but cannot fully finance, priority land-management interventions. This differentiated approach can help avoid unrealistic carbon expectations, direct carbon-market finance toward activities with credible carbon outcomes, and ensure that important restoration and resilience benefits are not undervalued simply because they are difficult to monetize as carbon credits.

12. Make benefit sharing a core design requirement

Farmers, herders, and local communities need to be direct beneficiaries of carbon farming. Benefit-sharing rules must clearly specify the distribution of revenues, services, equipment, training, infrastructure, and risk-reduction benefits. This is particularly crucial when carbon projects operate on communal pastures, state land, or landscapes shared by multiple groups.

13. Create aggregation mechanisms for small-scale farmers and herders

Carbon farming initiatives often require sufficient scale to make monitoring, verification, project development, and market participation economically viable, yet many land users in the region operate on small, fragmented, or collectively managed land. In every country, an assessment is needed to identify suitable institutions and organizational models for aggregation, considering institutional mandates, administrative capacity, local legitimacy, inclusiveness, accountability, efficiency, and potential conflicts of interest. Where appropriate, this assessment could be undertaken or facilitated by an independent or neutral entity. Existing cooperatives, pasture user groups, farmer associations, municipalities, NGOs, or private developers may provide useful foundations, but their suitability cannot be assumed, particularly where there are risks of exclusion or elite capture. Existing arrangements may need to be strengthened, reformed, or complemented by new models. Clear safeguards are also needed to protect smallholders and herders from unfair contracts, opaque revenue sharing, and exclusion from decision-making.

14. De-risk adoption and lower entry barriers for poor land users

Many poor and risk-exposed farmers and herders cannot afford upfront investments or wait for delayed returns, even when carbon farming could improve the landscapes they manage. Public finance, concessional loans, grants, guarantees, and results-based payments can help cover early costs, including restoration works, equipment, soil testing, project validation, and transition periods.

Risk-sharing mechanisms can also help manage uncertainties beyond land users' control, including drought, fire, and other events that may reduce carbon gains or cause reversals. Depending on the financing or crediting framework, risk-management arrangements may include insurance, guarantees, reserve funds, pooled carbon buffers, or other mechanisms that allocate permanence and performance risks without placing disproportionate liabilities on vulnerable land users. Without adequate financial support and risk-sharing arrangements, carbon farming risks remaining inaccessible to vulnerable land users or exposing them to liabilities they are poorly placed to bear.

L. Link carbon farming with land, water, and development agendas to unlock synergies

15. Integrate carbon measurement into existing SLM and restoration programs to assess carbon outcomes and financing opportunities

There are many initiatives in the region that are already restoring land, improving vegetation cover, reducing erosion, strengthening water management, or supporting LDN implementation. Many SLM practices generate carbon-related co-benefits, but not all can easily support credible carbon claims, as soil-carbon changes in drylands are slow, spatially variable, and climate-sensitive. A viable approach to carbon farming will distinguish between practices suitable for near-term crediting, practices suitable for results-based public finance, and practices that should remain primarily adaptation or land-restoration interventions.

In addition to launching new carbon-focused initiatives, governments and donors can build on this existing project base by incorporating carbon indicators, MRV components, carbon accounting, and methodological alignment into SLM, watershed restoration, agroforestry, pasture management, and LDN programs. This can help document carbon outcomes more systematically and identify where additional mitigation may be eligible for monetization. However, adding carbon measurement and accounting to existing programs does not in itself establish additionality or eligibility for carbon credits; any monetized outcomes still need to meet the baseline, additionality, and other requirements of the applicable financing or crediting mechanism. This approach can strengthen carbon-related outcomes while preserving the broader land, water, livelihood, and resilience objectives of existing programs.

16. Link soil carbon management with water security

In irrigated systems, particularly where water scarcity is a binding constraint, carbon farming is most compelling when it improves both soil carbon and water performance. Practices that build soil organic matter, improve soil structure, increase water-holding capacity, reduce evaporation, limit erosion, and enhance irrigation efficiency can make water use more productive while strengthening drought resilience. This positions carbon farming not only as a mitigation measure, but also as an adaptation and water-security strategy, especially in Uzbekistan, Tajikistan, and Kyrgyzstan, where irrigation, water scarcity, and land degradation are closely linked.

17. Align carbon farming with national policy priorities

Carbon farming is most likely to gain traction when it is embedded in existing national priorities such as sustainable pasture and forest management in Kyrgyzstan; rangeland resilience, pasture governance, and herder livelihoods in Mongolia; erosion control, watershed management, and landscape restoration in Tajikistan; and water-use efficiency, salinity management, land rehabilitation, and agricultural modernization in Uzbekistan. Alignment with national strategies on climate change, land degradation neutrality, agriculture, water management, biodiversity, and rural development can strengthen political ownership, improve institutional coherence, and attract public and donor support. Water-dependent interventions need landscape- or basin-scale assessment because local gains can increase consumptive water use or create downstream costs.

18. Support fragile restoration landscapes as strategic priorities with cautious, evidence-based carbon removal expectations

Restoration efforts in fragile landscapes, including degraded drylands, saline areas, mountain watersheds, and the dried Aral seabed, can deliver major benefits for land stabilization, dust suppression, public health, ecological recovery, and climate resilience. In the Aral Sea region in particular, restoration has clear strategic value beyond carbon, while its carbon potential remains uncertain because of harsh environmental conditions, variable vegetation survival rates, slow carbon accumulation, and permanence risks. These landscapes are therefore best treated as long-term restoration priorities, with their carbon potential assessed cautiously through locally validated evidence, conservative accounting, and relevant international experience.

E. Enhance capacity to address the specific challenges of carbon farming in arid and semi-arid landscapes

19. Account for the full complexity of carbon farming and land restoration in arid and semi-arid landscapes

Carbon farming in arid and semi-arid landscapes can deliver important long-term benefits for land recovery, soil health, vegetation, livelihoods, and resilience, but

translating these benefits into credible carbon outcomes is often technically and institutionally complex. High climate variability, sparse vegetation, slow and uneven soil-carbon change, disturbance risks, and heterogeneous land-use systems can make carbon gains difficult to attribute, measure, and verify with confidence. These challenges are particularly pronounced in pasture systems, where mobile grazing, communal land use, and collective governance add further complexity. In highly variable drylands, maintaining functioning land and preventing further degradation may in some cases deliver greater long-term value than interventions aimed primarily at maximizing carbon removals. Carbon expectations therefore need to remain realistic, with wider market participation informed by locally validated evidence, sufficiently long monitoring periods, fit-for-purpose MRV, and conservative accounting.

20. Strengthen collective and landscape-level governance

Many carbon farming outcomes depend on coordinated management across multiple land users rather than on individual land-management decisions alone. This is particularly important for common pastures, but also applies to shared forests, watersheds, restoration landscapes, irrigation systems, and other areas where ecological processes and management decisions extend across individual holdings or administrative boundaries. Appropriate governance arrangements can support coordination over resource use, restoration responsibilities, monitoring, and the distribution of costs and benefits. In pastoral systems, this requires particular attention to grazing pressure, seasonal mobility, pasture access, and collective stewardship, supported – where appropriate – by pasture user groups, herder cooperatives, pasture committees, and local grazing agreements. Carbon finance needs to reinforce collective stewardship rather than create incentives that undermine sustainable resource management, with transparent rules for participation, responsibilities, monitoring, and benefit sharing.

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To conclude, carbon farming in Greater Central Asia is best pursued as a strategic pathway to promote nature-based solutions, land restoration, climate resilience, sustainable rural development, and food and water security, with carbon finance serving as a complementary mechanism to accelerate and sustain these outcomes. To become operational, these pathways need to be embedded in an enabling policy and legal environment, including clear land-tenure arrangements, carbon rights, project authorization procedures, safeguards, and institutional responsibilities. This is essential for attracting responsible investment while protecting environmental integrity and the interests of farmers, herders, and local communities.

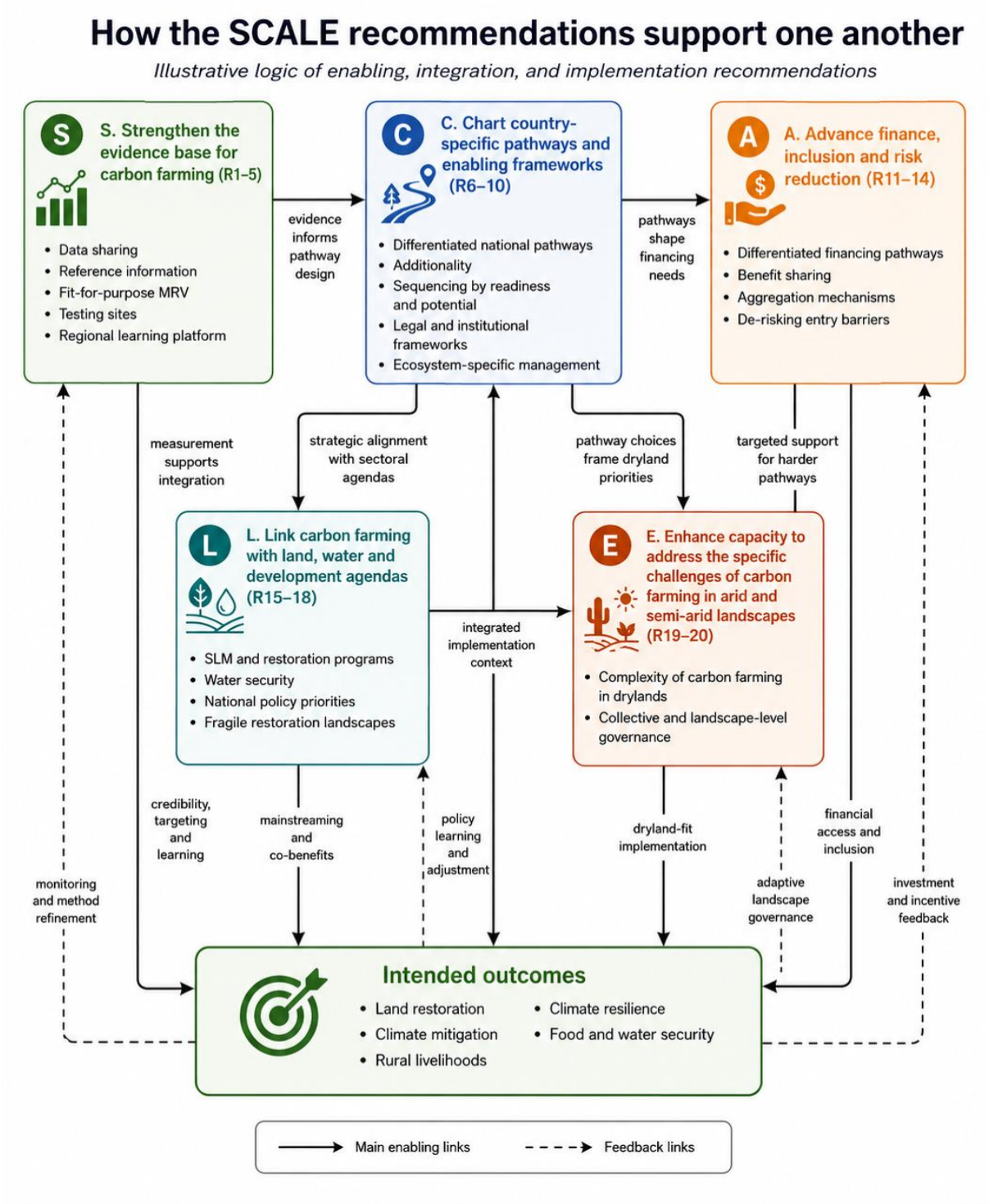

Figure 5.1: An illustrative logic of the SCALE recommendations. Source: Authors' elaboration.

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Annexes

Annex 1: UNFCCC participation and reporting status by country

Kyrgyzstan acceded the UNFCCC in 2000, but as a Non-Annex I Party, the country is not bound by emission reduction targets; instead it is obligated to develop and report on national climate actions. Furthermore, Kyrgyzstan signed the Paris Agreement in 2016 and ratified it in 2019. Kyrgyzstan's climate commitments under the Paris Agreement have evolved across three NDC rounds, gradually increasing ambition while remaining framed relative to a business-as-usual (BAU) baseline. In its initial INDC submitted in 2015 (Government of the Kyrgyz Republic, 2015), Kyrgyzstan pledged to reduce greenhouse gas emissions by 11.49–13.75% below BAU by 2030 on an unconditional basis, and by 29.00–30.89% conditional on international support. In its updated NDC submitted in 2021 (Government of the Kyrgyz Republic, 2021), Kyrgyzstan refined and front-loaded its targets, committing unconditionally to emission reductions of 16.63% by 2025 and 15.97% by 2030 below BAU, and conditionally to deeper cuts of 36.61% by 2025 and 43.62% by 2030 with international finance and technology support. Under NDC 2.0, 64% of targeted mitigation measures were partially or fully implemented, with steady progress across key sectors. Notably, Land Use, Land-Use Change and Forestry (LULUCF) accounted for nearly 75% of total GHG emission reductions achieved, while agriculture contributed a further 6%. These reductions were driven largely by the expansion of forest plantations and the growth of organic farming, and were achieved predominantly through measures included in the unconditional portfolio (Government of the Kyrgyz Republic, 2021).

NDC 3.0, prepared in 2025, further adjusts the timeline and ambition, setting unconditional reduction targets of 18% by 2030 and 16% by 2035 below projected emissions, alongside conditional targets of 30% by 2030 and 39% by 2035, and introducing a longer-term aspiration to achieve carbon neutrality by 2050 (Government of the Kyrgyz Republic, 2021). Speaking of ways to achieve their 2035 targets, the report clarifies: "It may engage in market mechanisms and co-operative approaches envisaged under the Paris Agreement when there is more clarity on how these mechanisms and approaches may work and deliver in the national context of Kyrgyzstan." (Government of the Kyrgyz Republic, 2021). Furthermore, Kyrgyzstan's NDC3.0 highlights that the program's priorities ensure synergies between mitigation and adaptation, as well as with the country's LDN goals (Government of the Kyrgyz Republic, 2021).

Mongolia signed the UNFCCC in 1992 and ratified it in 1993, but as a Non-Annex I Party, the country is not bound by emission reduction targets; instead it is obligated to develop and report on national climate actions. Furthermore, Mongolia signed and ratified the Paris Agreement in 2016. Mongolia's climate commitments under the Paris Agreement

have evolved across three NDC rounds, with targets largely framed against business-as-usual (BAU) projections and showing increasing ambition and sectoral coverage. In its 2015 INDC, Mongolia committed to policies and measures expected to reduce national GHG emissions by 14% by 2030, excluding LULUCF; agricultural emission reductions were not quantified due to insufficient background data (Ministry of Environment, Green Development and Tourism of Mongolia, 2015).

In its updated NDC (Government of Mongolia, 2020), approved in 2019 and submitted in 2020, the country raised its unconditional mitigation target to 22.7% by 2030, again excluding LULUCF, with a conditional increase to 27.2% contingent on additional measures (such as carbon capture and storage and waste-to-energy technologies) and international support. Agriculture was explicitly included as a non-energy sector, with planned reductions of approximately 31.3% of the total unconditional mitigation package – through measures to regulate or reduce livestock numbers and improve manure management. Forest removals were treated separately, increasing the total mitigation potential to 44.9% by 2030 (Government of Mongolia, 2020). Mongolia's NDC 2.0 implementation delivered measurable but insufficient progress. By 2024, the country had achieved 39.7% of the targeted 2024 reduction trajectory (excluding LULUCF). Including forest removals, total mitigation reached 47.2% of the target that included forest sinks. Forest removals delivered most significant contributions, alongside the energy sector, while agriculture showed mixed results: emissions exceeded baseline levels during 2020–2023 due to rising livestock numbers, before falling in 2024 partly because of mitigation measures but also substantial livestock losses from dzud. Overall, the NDC 3.0 stocktake concludes that Mongolia made progress under NDC 2.0 but remains not fully on track to meet its 2030 mitigation and adaptation goals (United Nations Development Programme, 2025). Mongolia's NDC 3.0, submitted in 2025, further strengthens ambition and extends the time horizon, setting unconditional reductions (again, excluding LULUCF) of 23.0% by 2030 and 30.3% by 2035 below BAU, alongside higher conditional targets and substantially larger net reductions when forest removals are included (Government of Mongolia, 2025). The NDC 3.0 also signals Mongolia's openness to engaging in cooperative approaches and market mechanisms under Article 6 of the Paris Agreement, as relevant institutional and methodological frameworks are developed. In parallel, Mongolia emphasizes the importance of aligning mitigation efforts with adaptation priorities and sustainable land management objectives, highlighting synergies with rangeland restoration, forest management, and broader national development goals.

Tajikistan ratified the UNFCCC in 1998 and, like Kyrgyzstan and Mongolia, is a Non-Annex I Party, meaning it is not subject to binding emission-reduction commitments under the Convention but is required to prepare and report national climate actions. Tajikistan signed the Paris Agreement on 22 April 2016 and ratified it on 20 March 2017.

Tajikistan is one of the world's most vulnerable countries to the impacts of climate change, particularly glacier melt and water-related disasters. This vulnerability strongly shapes both the ambition and focus of its climate commitments, although these remain constrained by limited fiscal space, institutional capacity, technical resources, and dependence on international support. Tajikistan's climate commitments have evolved from a relatively broad INDC to a more ambitious updated NDC. Unlike Kyrgyzstan and Mongolia, Tajikistan's NDC targets are not framed against a BAU projection but against 1990 emissions levels. In its 2015 INDC, Tajikistan committed to keep 2030 GHG emissions at 80–90% of 1990 levels unconditionally, or 65–75% with international support with measures covering energy, transport, agriculture, forestry, water resources management, and disaster-risk reduction (Government of the Republic of Tajikistan, 2015). In its updated 2021 NDC, Tajikistan set the unconditional target to 60–70% of 1990 levels by 2030, while the conditional target to 50–60%, subject to significant international finance, technology transfer, and capacity-building support. The updated NDC also expanded adaptation priorities across five strategic sectors and 27 lines of action (Government of the Republic of Tajikistan, 2021). Agriculture, forestry, biodiversity, energy, industry, construction, transport, and infrastructure are included in the updated NDC scope, making land-based mitigation relevant to the country's climate commitments. However, the NDC does not provide the same detailed sectoral mitigation breakdown as, for example, Mongolia's updated NDC, and available public reporting does not yet allow a clear assessment of how much of the NDC 2.0 mitigation target has been achieved in quantitative terms (NDC Partnership, n.d.).

Uzbekistan, like other countries in the region, ratified the UNFCCC (in 1993) and as a Non-Annex I Party is not subject to binding emission-reduction commitments under the Convention but is required to prepare and report national climate actions. Uzbekistan signed the Paris Agreement in 2017 and ratified it in 2018. Uzbekistan's climate commitments are heavily shaped by its high vulnerability to water scarcity, desertification, and temperature increases, which threaten its agricultural sector and water security. Uzbekistan's climate commitments under the Paris Agreement have evolved from an emissions-intensity target focused on limiting growth to a more ambitious green-transition agenda.

Uzbekistan's NDCs differ from many other countries in the region in that they do not set separate unconditional and conditional mitigation targets. In its first NDC, submitted in 2018, Uzbekistan committed to reducing its GHG emissions-to-GDP ratio by 10% by 2030, relative to 2010 levels (Republic of Uzbekistan, 2017). In its updated NDC 2.0, submitted in 2021, the country raised this commitment substantially, targeting a 35% reduction in GHG emissions intensity by 2030 (Republic of Uzbekistan, 2021). Unlike absolute emissions-reduction targets, Uzbekistan's NDC 2.0 does not require total GHG emissions to fall by 2030; rather, reducing the carbon intensity of GDP implies

decoupling emissions growth from economic growth. Implementation of NDC 2.0 shows strong progress against the main intensity indicator. Uzbekistan's first Biennial Transparency Report (BTR) reports that, by 2022, GDP carbon intensity had fallen by 40.6% relative to 2010 excluding LULUCF, and by 42.9% including LULUCF removals. This means Uzbekistan had already exceeded the 35% NDC 2.0 intensity-reduction benchmark, with the BTR assessing achievement of the main indicator at 116%. However, the NDC 3.0 cautions that this should not be interpreted as final achievement of the 2030 target, since the reduced intensity level must be maintained through 2030.

Sectorally, Uzbekistan's mitigation progress is driven mainly by energy efficiency, renewable energy expansion, industrial modernization, waste management, and growing LULUCF removals. In agriculture, emissions remain a challenge: NDC 3.0 states that the sector accounted for 17% of total GHG emissions, with emissions increasing 1.5 times between 2010 and 2022, mainly due to livestock and agricultural soils. At the same time, the NDC identifies mitigation measures such as improved cattle breeding and diets, and more efficient fertilizer application to increase soil fertility. LULUCF plays an increasingly important sink role: net absorption in the sector increased sharply between 2010 and 2022, driven by lower emissions from grasslands and greater removals from forest land and cropland, linked in part to afforestation policy.

Uzbekistan's NDC 3.0, submitted in 2025, further raises ambition by setting a new target to reduce GHG emissions intensity per unit of GDP by 50% by 2035 compared with 2010 levels (Republic of Uzbekistan, 2025). The NDC frames this as a step toward peaking GHG emissions as soon as possible and then reducing them, while aligning with Uzbekistan's longer-term goal of net-zero emissions by 2055. It also includes projected sectoral pathways, with LULUCF expected to remain a net sink. For adaptation, NDC 3.0 is also more developed than earlier submissions. Rather than relying on the older adaptation planning framework, Uzbekistan's adaptation agenda is now reflected in its ongoing National Adaptation Plan process and in NDC 3.0. The NDC identifies agriculture, water resources, ecosystems and forestry, disaster risk reduction, healthcare and the social sphere, and strategic infrastructure as key adaptation priorities, while noting that detailed adaptation goals, measures and actions will be submitted in a supplementary document. This creates a strong policy entry point for carbon-farming-related practices that deliver both mitigation and resilience benefits, including soil restoration, afforestation, agroforestry, water-saving agriculture, and land rehabilitation in the Aral Sea region.

Annex 2: Major relevant activities by country

Table A2.1: Relevant GEF-Funded (LDN, SLM, Land Restoration, Dryland Management, LULUCF, Cross-Cutting) projects in Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan. Sources: GEF Projects Database, GEF Agencies Websites, and National Ministries/Departments Websites and Reports (March 2026).

#	Country	Project Title	GEF ID	GEF Period	Status	GEF Grant (approx.)	Implementing Agency	Carbon Farming / Land Restoration Linkage
1	**Kyrgyzstan**	Integrated Community-based Management of High Value Mountain Ecosystems in Southern Kyrgyzstan for Multiple Benefits	10692	GEF-7	Approved / Active	USD 2.64M (Co-fin: USD 20.3M)	UNDP	Restores degraded lands in Pamir-Alai mountain ecosystems; maintains ecosystem services (carbon sinks, soil protection); integrates sustainable pastoralism and rangeland management. Land Degradation focal area.
2	**Kyrgyzstan**	CACILM-2: Integrated Natural Resources Management in Drought-prone and Salt-affected Agricultural Production Landscapes in Central Asia and Turkey	9238	GEF-6	Completed (c. 2024)	~USD 18.4M (regional) (KGZ share ~USD 2M)	FAO	Introduced no-till farming, soil carbon-conserving practices, and sustainable land management to combat salinization and desertification across Kyrgyzstan, Tajikistan, Uzbekistan, Kazakhstan, Turkey. Directly links to soil organic carbon and land restoration objectives.
3	**Kyrgyzstan**	Central Asia Water and Land Nexus (CAWLN) – Kyrgyzstan component	Regional (CAWLN)	GEF-8	Active (launched Nov 2025)	USD 26M (regional) (KGZ share TBD)	FAO	Ecosystem restoration of Syr Darya basin; reduces deforestation; builds agricultural resilience; sustainable water-land-biodiversity management supporting NDC commitments including land degradation neutrality (LDN). Carbon sequestration via restored grasslands and riparian forests is a co-benefit.
4	**Kyrgyzstan**	Addressing Tenure Governance and Gender Equality in Land Rights to Strengthen Land Degradation Neutrality (LDN) Initiatives – Kyrgyzstan	GEF-8 (PIF stage)	GEF-8	Active (2025–2028)	TBD (FAO-led)	FAO / International Land Coalition	Promotes agroforestry and sustainable land management practices tied to secure land tenure; underpins LDN targets which include soil organic carbon maintenance as a metric under SDG 15.3.1. Directly enables conditions for carbon farming at field level.
5	**Mongolia**	Promoting Dryland Sustainable Landscapes and Biodiversity Conservation in the Eastern	10249	GEF-7	Approved / Active	USD 5.35M (Co-fin: USD 50.9M)	FAO + WWF-US	Reverses dryland degradation in temperate grasslands through integrated landscape and value chain approach; promotes sustainable rangeland management and halts grassland degradation

#	Country	Project Title	GEF ID	GEF Period	Status	GEF Grant (approx.)	Implementing Agency	Carbon Farming / Land Restoration Linkage
		Steppe of Mongolia						– a key NDC mitigation pathway for Mongolia. Direct carbon sequestration via improved grazing practices and ecosystem restoration. Part of GEF-7 Dryland Sustainable Landscapes (DSL) Impact Program.
6	**Mongolia**	Managing Peatlands in Mongolia and Enhancing the Resilience of Pastoral Ecosystems and Livelihoods of Nomadic Herders	10545	GEF-7	Active (Jan 2023–Dec 2027)	USD 3.76M (Co-fin: USD 20.5M)	UNEP	Core carbon farming / sequestration project: reduces GHG emissions from degraded peatlands; restores peatland carbon stocks; introduces sustainable peatland and rangeland management for nomadic herders. Directly supports Mongolia's LDN target of 'no net loss of wetlands by 2030' and NDC LULUCF framework. High carbon relevance: drained peatlands are major carbon sources.
7	**Mongolia**	Sustainable Forest Management in Mongolia's Forest Landscape	4744	GEF-5	Completed	USD 3.59M (Co-fin: USD 19.8M)	FAO	Secured ecosystem services including biological diversity, reduced forest degradation, and carbon storage; enhanced resilience to climate change. Established forest carbon monitoring and SFM governance frameworks – foundational for subsequent carbon-linked projects.
8	**Mongolia**	Rehabilitating and Conserving Mountain Landscapes in Khangai Region for Improved Ecosystem Services and Community Livelihoods	11114	GEF-8	Approved (2023)	Details on thegef.org/projects/11114	UNDP	Rehabilitates degraded lands and promotes community-based natural resource management in Khangai mountain landscapes; reduces land degradation and biodiversity loss; improves ecosystem services (including carbon sequestration in mountain forests and grasslands).
9	**Tajikistan**	Tajikistan Ecosystem Restoration and Resilient Agriculture (TERRA)	11398	GEF-8	Approved (2025)	USD 8.02M (Co-fin: USD 12.0M)	IFAD	Applies integrated landscape management (ILM) approaches for restoration of degraded grassland ecosystems in the Lower Panj river sub-basin; contributes to Land Degradation Neutrality; multiple environmental benefits including biodiversity, climate change mitigation (carbon via grassland restoration), and socioeconomic resilience. Multi-focal area: Biodiversity, Climate Change, Land Degradation.
10	**Tajikistan**	CACILM-2: Integrated Natural Resources Management in Drought-prone and Salt-affected Agricultural	9238	GEF-6	Completed (c. 2024)	Regional (see #2); TJK share ~USD 2M	FAO	See Kyrgyzstan entry (#2). In Tajikistan: piloted intercropping of cotton/legumes and maize/legumes; promoted soil carbon retention through conservation agriculture. Directly links to carbon farming principles

#	Country	Project Title	GEF ID	GEF Period	Status	GEF Grant (approx.)	Implementing Agency	Carbon Farming / Land Restoration Linkage
		Production Landscapes in Central Asia and Turkey (Tajikistan component)						(building soil organic carbon, reducing tillage emissions).
11	**Tajikistan**	Central Asia Water and Land Nexus (CAWLN) – Tajikistan component	Regional (CAWLN)	GEF-8	Active (launched Nov 2025)	USD 26M (regional) (TJK share TBD)	FAO	See Kyrgyzstan entry (#3). In Tajikistan: focuses on Amu Darya and Panj river basin ecosystems; deforestation reduction; sustainable mountain agroecosystem management supporting carbon sequestration and LDN.
12	**Tajikistan**	Conservation and Sustainable Use of Pamir Alai and Tian Shan Ecosystems for Snow Leopard Protection and Sustainable Community Livelihoods	6949	GEF-6	Completed	USD 4.18M (Co-fin: USD 19.6M)	UNDP	Protected mountain ecosystems with SLM integration; maintained carbon-rich forest and grassland habitats; reduced pressure on natural vegetation through alternative livelihood support. Relevant to land restoration and avoided emissions from ecosystem degradation.
13	**Uzbekistan**	Food Systems, Land Use and Restoration (FOLUR) Impact Program – Uzbekistan Country Project	10576	GEF-7	Active	~USD 4-7M (national) (Co-fin: significant)	FAO / IUCN / ICARDA	Part of the USD 345M global FOLUR IP. Shifts land use from degradation to sustainability; targets 1 million tCO2 sequestered; restores 50,000 ha of degraded ecosystems; promotes agro-ecological approaches and conservation of agrobiodiversity; reduces deforestation. Strong carbon farming linkage through integrated landscape and value chain management. Executing agency: Ministry of Agriculture of Uzbekistan.
14	**Uzbekistan**	Sustainable Forest and Rangelands Management in the Dryland Ecosystems of Uzbekistan	GEF-7 (FAO)	GEF-7	Active	Details via thegef.org	FAO	Targets Bukhara and Navoi regions where pasture productivity declined 42% since 2000; aims to restore 13,000 ha of degraded land; improve land management on 225,000 ha; updates national pasture law; introduces SLM techniques to spot and curtail degradation. Direct land restoration and carbon sequestration relevance. Supported Soil Doctors Programme and RECSOIL soil organic carbon initiative (2024).
15	**Uzbekistan**	Integrated Conservation Management and Restoration of High-Value Landscapes in Uzbekistan (EcoLand)	GEF-8 (ERIP)	GEF-8	Active (launched Nov 2025)	TBD	UNDP / IUCN	Part of GEF-8 Global Ecosystem Restoration Integrated Programme (ERIP); addresses drivers of ecosystem degradation through SLM, biodiversity conservation, and climate mitigation; improves management of 1.3M ha of forests, dry steppe

#	Country	Project Title	GEF ID	GEF Period	Status	GEF Grant (approx.)	Implementing Agency	Carbon Farming / Land Restoration Linkage
								rangelands, and agricultural land; pilots innovative biodiversity financing mechanisms; integrates carbon mitigation as a formal component.
16	**Uzbekistan**	Central Asia Water and Land Nexus (CAWLN) – Uzbekistan (4 sub-projects)	Regional (CAWLN)	GEF-8	Active (launched Nov 2025)	USD 18.4M total CAWLN; UZB: ~USD 16.44M (4 projects)	FAO	Four national projects: (1) integrated water resources management in Amu Darya/Zarafshan/Panj basins (USD 5.84M); (2) water resources management in Syr Darya/Naryn basins (USD 5M); (3) ecosystem services and biodiversity through integrated land-water management (USD 5.6M — includes degraded land restoration, agro-ecology, agrobiodiversity); (4) regional land degradation reduction in vulnerable ecosystems (USD 2M — desertification reversal, SLM introduction). Combined carbon sequestration co-benefits across all four.
17	**Uzbekistan**	CACILM-2 (Uzbekistan component)	9238	GEF-6	Completed (c. 2024)	Regional (see #2); UZB share ~USD 3M	FAO	See entries #2 and #10. In Uzbekistan: Bukhara and Kashkadarya pilot regions; no-till farming on saline/arid lands; promoted soil organic carbon via conservation agriculture. Farmgate-level carbon farming linkage; foundation for current RECSOIL/CAWLN work.

Table A2.2: A Comparative Table of Internationally Funded Large-Scale Projects (excluding GEF) in Kyrgyzstan, Mongolia, Tajikistan, Uzbekistan. Thematic areas covered: carbon sequestration, sustainable land management, rangeland, forest, and peatland restoration, and climate-smart agriculture.

#	Country	Project Title	Funder(s)	Period	Status	Budget (approx.)	Implementing Agency	Thematic Scope	Carbon Farming / Sustainable Agriculture / Land Restoration Description
1	**Kyrgyzstan**	**GCF FP116: Carbon Sequestration through Climate Investment in Forests and Rangelands (CS-FOR)**	Green Climate Fund (GCF)	2022–2030	Active	USD 50M total (GCF: USD 30M grant + USD 15M RKDF co-loan + USD 5M GoK co-finance)	FAO (Accredited Entity); SAEPF & ARIS (executing)	Carbon sequestration; Land restoration	The most direct 'carbon farming' project for Kyrgyzstan. Reduces GHG emissions from rangeland and forest degradation; expected to cut 7.6% of national emissions. Three pillars: institutional NRM governance; integrated rangeland and forestry planning with carbon-storing practices (reduced overgrazing, assisted regeneration, agroforestry); and climate-sensitive value chains partly financed via Russian-Kyrgyz Development Fund (RKDF) credit lines. 40% of agricultural land seriously degraded; 42% of rangelands degraded. GCF Board Decision B.24/09 (December 2019); implementation started October 2022.
2	**Kyrgyzstan**	**World Bank RESILAND CA+: Kyrgyz Republic Resilient Landscape Restoration Project (P177407)**	World Bank (IDA) + PROGREEN Trust Fund + Korea-World Bank Partnership Facility (KWPF)	2024–2029	Active (Board approved Feb 2024)	USD 52.4M (USD 45M IDA + USD 5M PROGREEN + USD 2.4M KWPF)	Ministry of Emergency Situations (Kyrgyz Republic); CAREC (regional component)	Land restoration; Sustainable agriculture; Carbon co-benefits	Part of the regional USD 256M RESILAND CA+ umbrella program. Increases areas under sustainable landscape management in Osh, Jalal-Abad, Issyk-Kul, and Naryn regions. Key activities: agroforestry, shelterbelts, afforestation, pasture management, and nature-based solutions for mudflow/landslide mitigation. Carbon co-benefits from forest restoration and improved pasture SOC. Includes glacier/mudflow monitoring ICT system and the 'One Village – One Product' (OVOP+1) livelihood approach. CAREC implements regional exchange platform with Tajikistan and Uzbekistan.
3	**Kyrgyzstan**	**IFAD Access to Markets Project (ATMP)**	IFAD	2016–2024 (completed)	Completed	USD 31.2M (IFAD financing)	IFAD; Agricultural Projects Implementation Unit (APIU); Community Development and Investment Agency (ARIS)	Sustainable agriculture; Rangeland management	Raised incomes in pastoralist communities; improved smallholder livestock integration into meat, milk, honey, and wool value chains. Pasture user unions mobilised community-level groups for transparent resource access. Promoted sustainable rangeland practices, reducing overgrazing pressure and supporting pasture-carbon stock maintenance. A successor programme (~USD 31M under IFAD13) is under design for 2025 onwards per IFAD COSOP 2025–2030.
4	**Mongolia**	**ADB Aimags and Soums Green Regional Development Investment Program (ASDIP) — ADB Project #49430**	ADB + Green Climate Fund (GCF) + European Investment Bank (EIB) + European Union (EU)	2023–2033 (Tranche 1 signed Jan 2024)	Active	USD 735M total program; Tranche 1: USD 270M (ADB USD 93M + GCF/EIB USD 138.6M loan/grant + GoM/private sector)	ADB (lead); Ministry of Economy and Development (Mongolia); MoFALI, MCUD, MoF (co-executing)	Carbon farming; Sustainable agriculture; Land restoration	The largest investment in the table and the most explicitly 'carbon farming' programme at scale. Component 2 (Livestock and Rangeland Management) implements 'climate-resilient, high-carbon sequestration, and sustainable rangeland management' in Mongolia's western aimags (Bayan-Ulgii, Uvs, Khovd). Component 3 establishes the Green and Inclusive Regional Agribusiness Fund (GIRAF) providing climate-smart finance for low-carbon livestock value chains. Promotes transformational shift from overgrazing (livestock tripled in 30 years, exceeding carrying capacity 3×) to sustainable herding with verified carbon outcomes. Complements with low-carbon urban infrastructure and renewable energy. ADB approved USD 448M program March 2023; Framework Financing Agreement signed February 2023.
5	**Mongolia**	**ADB Grassland Carbon Restoratio**	ADB	2025–2027 (pilot phase	Active	Pilot scale (budget TBD; ADB	ADB; Ministry of Food, Agriculture	Carbon farming (carbon credits);	The most directly 'carbon farming' project in the entire table. Generates certified carbon credits from improved livestock grazing and grassland management to mobilise international carbon finance for rangeland

#	Country	Project Title	Funder(s)	Period	Status	Budget (approx.)	Implementing Agency	Thematic Scope	Carbon Farming / Sustainable Agriculture / Land Restoration Description
		n Project (Pilot)		; December 2025 launch)		technical assistance grant)	and Light Industry (MoFALI); Ministry of Environment and Climate Change; Ministry of Economy and Development	Rangeland restoration	restoration. Tests standardised MRV methodologies for measuring soil organic carbon in grassland ecosystems; builds a monitoring, reporting, and verification (MRV) system aligned with international carbon crediting standards. Explores private sector participation and benefit-sharing mechanisms with traditional herder communities. Designed to scale nationally and enhance Mongolia's readiness for Article 6 Paris Agreement carbon markets. Announced by ADB Country Director Shannon Cowlin, December 19, 2025.
6	**Mongolia**	**EBRD / Khan Bank: USD 20M Agribusiness Lending (Youth in Business Programme)**	EBRD	2025	Disbursed 2025	USD 20M (€16.8M) loan to Khan Bank	EBRD; Khan Bank (financial intermediary)	Sustainable agriculture; Agribusiness	Part of EBRD's USD 218M total Mongolia portfolio in 2025. The Khan Bank USD 20M loan under the Youth in Business programme channels on-lending to agribusiness SMEs, supporting climate-smart agricultural practices and sustainable food value chains. Complements ASDIP's rangeland management objectives by providing private-sector finance for low-carbon agribusiness enterprises. Reference: EBRD 2025 Central Asia and Mongolia investment results (published January 2026).
7	**Tajikistan**	**GCF/IFAD/FAO Community-Based Agriculture Support Programme Plus (CASP+)**	Green Climate Fund (GCF) + IFAD + FAO	2024–2031 (7-year project; GCF Board B.39, July 2024)	Active	USD 79.69M total (GCF: USD 30M grant + USD 9M loan; IFAD + FAO co-finance)	IFAD + FAO (Accredited Entities); Ministry of Finance; Ministry of Agriculture; Committee on Environmental Protection (executing)	Carbon / Sustainable agriculture / Land restoration	Largest single climate-agriculture project for Tajikistan. Contributes to low-emission sustainable development pathways; reduces GHG emissions and introduces climate-resilient agriculture (livestock, dairy, meat, horticulture value chains). Agroforestry is a key instrument: the predecessor GCF project under WFP established 200 ha of agroforestry across 11 districts (2023-24). CASP+ integrates climate planning at district, village, and community level. Strengthens CEP (NDA to GCF) institutional capacity. Expected to directly benefit 650,000 individuals (51.5% women) and indirectly benefit 2.268 million people. Builds on prior IFAD CASP (USD 38.9M, 2018–2024) and Livestock and Pasture Development Projects I & II.
8	**Tajikistan**	**World Bank RESILAND CA+: Tajikistan Resilient Landscape Restoration Project (P171524)**	World Bank (IDA grant)	2022–2028 (effective Nov 2022)	Active	USD 45M (IDA grant)	Ministry of Finance; line agencies; CAREC (regional component)	Land restoration; Sustainable agriculture; Carbon co-benefits	Addresses land degradation and soil erosion threatening rural livelihoods in Sughd, Khatlon, and GBAO regions. Targets 16,000+ rural residents. Key activities: integrated pasture and forest management, biodiversity conservation, transboundary protected area development. 613 common interest groups formed; 250 business plans submitted for livelihood-based anti-degradation activities (greenhouse construction, irrigation rehabilitation, equipment). Geobotanical surveys and remote-pasture infrastructure for sustainable livestock management. Carbon co-benefits via forest and pasture carbon sinks. Regional exchange platform with Kyrgyzstan and Uzbekistan via CAREC.
9	**Tajikistan**	**World Bank Climate Adaptation and Mitigation Program for the Aral Sea Basin (CAMP4ASB)**	World Bank (PROGREEN + bilateral trust funds)	Completed (benefited Tajikistan & Uzbekistan)	Completed	USD 45M (regional; Tajikistan/Uzbekistan national shares)	World Bank; national ministries (TJK and UZB)	Climate-smart agriculture; Land restoration	Implemented 310 micro-projects on climate-smart agriculture, directly benefiting 50,000+ people in Tajikistan and Uzbekistan. Strengthened regional cooperation and empowered communities in the Aral Sea Basin region. Provides the institutional learning baseline and community-level experience now being scaled under RESILAND CA+ in both countries. Reference: World Bank Central Asia Environment Program brief (2025).
10	**Uzbekistan**	**World Bank RESILAND CA+: Uzbekista**	World Bank (IDA) + PROGREEN	2022–2029 (launched Apr	Active	USD 153M IDA Credit + USD 8M	Forest Agency, Ministry of Ecology (MEEPCC);	Land restoration; Agroforestry; Carbon co-benefits	Largest single land restoration investment in the table for Uzbekistan, and the largest in the RESILAND CA+ program. Expands forested areas and restores degraded forests and lands across six provinces (Samarkand,

#	Country	Project Title	Funder(s)	Period	Status	Budget (approx.)	Implementing Agency	Thematic Scope	Carbon Farming / Sustainable Agriculture / Land Restoration Description
		n Resilient Landscapes Restoration Project (P174135)	Trust Fund	2025 at Samarkand Climate Forum)		PROGREEN = USD 161M total	CAREC (regional component)		Surkhandarya, Syrdarya, Jizzakh, Namangan, Kashkadarya). Activities: agroforestry, plantations, fruit trees, silvopastoral systems, nature-based tourism, protected areas. Includes Uzbekistan's first National Forest Inventory and a digital ICT platform for the Forest Agency. Carbon sequestration via afforestation is an explicit output. Uzbekistan has already restored 500,000 ha of Aralkum, achieving a Bonn Challenge milestone a decade early. Launched at Samarkand International Climate Forum, April 2025.
11	**Uzbekistan**	**EBRD Sovereign Loan: Modernisation of 110 Irrigation Pumping Stations**	EBRD	2025 (signed 2025; multi-year implementation)	Active	USD 250M (€240M sovereign loan)	EBRD; Ministry of Water Resources / Uzsuvtamino t	Climate-smart agriculture; CO_2 emission reduction	Modernises 110 irrigation pumping stations across 10 regions of Uzbekistan, replacing inefficient Soviet-era equipment with energy-efficient pumps. Reduces electricity consumption by 251,000 MWh/year and cuts CO_2-equivalent emissions by over 117,000 tonnes per year — the most quantified GHG reduction outcome for agriculture-adjacent infrastructure in the table. Supports climate-resilient water management for agricultural production across Uzbekistan's primary farming regions. Directly reduces the carbon intensity of irrigated agriculture.
12	**Uzbekistan**	**World Bank Agriculture Modernization Project (P158372)**	World Bank (IDA)	2019–2026	Active	USD 200M (IDA Credit)	Ministry of Agriculture; International Strategic Center for Agri-Food Development (ISCAD)	Sustainable agriculture	Enhances productivity-supporting agricultural services and promotes market-led, high-value horticulture value chains. While primarily an agricultural commercialisation project, its structural reforms — reducing cotton monoculture dependence, diversifying to horticulture and mixed cropping — directly improve soil organic carbon management and reduce GHG emissions per unit of agricultural output. Includes National Center of Excellence for Agriculture Research (with in-vitro plant lab, 2M plants/yr capacity) and ICT extension services platform. 362 procurement packages, USD 145.2M under implementation.
13	**Uzbekistan**	**World Bank Climate Adaptation and Mitigation Program for the Aral Sea Basin (CAMP4ASB) — Uzbekistan component**	World Bank (PROGREEN + bilateral trust funds)	Completed	Completed	See entry #9; UZB national share	World Bank; Ministry of Ecology (UZB)	Climate-smart agriculture; Land restoration	See entry #9 (Tajikistan). In Uzbekistan, CAMP4ASB co-financed climate-smart agriculture micro-projects and community resilience investments in the Aral Sea Basin region, benefiting over 50,000 people jointly with Tajikistan. Provided institutional and community foundations for the current RESILAND Uzbekistan project.

Annex 3: Illustrative statistics illustrating the role of AFOLU activities in VCMs

Table A3.1: Number of project registrations by independent crediting organizations, Source: (Forest Trends' Ecosystem Marketplace, 2025, Table S1; based on input from ACR, ART, BioCarbon, CAR, CDM, Cercarbono, Global Carbon Council, Gold Standard, Plan Vivo, and VCS registries).

	Agriculture	Forestry and Land Use	Total AFOLU	Total	AFOLU share
2020	23	236	259	1537	16.9%
2021	6	89	95	348	27.3%
2022	22	108	130	619	21.0%
2023	27	130	157	694	22.6%
2024	26	114	140	616	22.7%

Table A3.2: Volume of credit issuances (MtCO2e) by independent crediting organizations, Source: (Forest Trends' Ecosystem Marketplace, 2025, Table S2; based on input from ACR, ART, BioCarbon, CAR, CDM, Cercarbono, Global Carbon Council, Gold Standard, Plan Vivo, and VCS registries).

	Agriculture, MtCO2e	Forestry and Land Use, MtCO2e	Total AFOLU, MtCO2e	Total, MtCO2e	AFOLU share
2020	1,1	75,9	77	278,8	27,6%
2021	4	140	144	423,1	34,0%
2022	9	146,5	155,5	501,3	31.0%
2023	6,6	124	130,6	390	33,5%
2024	3,2	86,7	89,9	311,5	28,9%

Table A3.3: Verra's AFOLU-based projects in Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan, and several neighboring countries. Source: (Verra, n.d.).

Country	Project
Mongolia	Dornod Sustainable Grassland Management Project: https://registry.verra.org/app/projectDetail/VCS/5746
Mongolia	Selenge Sustainable Grassland Management Project: https://registry.verra.org/app/projectDetail/VCS/5747
Mongolia	Sukhbaatar Sustainable Grassland Management Project: https://registry.verra.org/app/projectDetail/VCS/5748

Mongolia	Afforestation Project In Mongolia: https://registry.verra.org/app/projectDetail/VCS/5713
Mongolia	Mongolia Afforestation Project (Phase II): https://registry.verra.org/app/projectDetail/VCS/5699
Mongolia	Sustainable Grassland Management Project In Sukhbaatar Province: https://registry.verra.org/app/projectDetail/VCS/5639
Mongolia	Sustainable Grassland Management Project In Tov Province: https://registry.verra.org/app/projectDetail/VCS/5640
Mongolia	Sustainable Grassland Management Project In Dornod Province: https://registry.verra.org/app/projectDetail/VCS/5526
Mongolia	Boreal Carbon - Project Gamma I: https://registry.verra.org/app/projectDetail/VCS/5446
Mongolia	Mongolia Afforestation Project (Phase I): https://registry.verra.org/app/projectDetail/VCS/5193
Kazakhstan	Sustainable Regenerative Agriculture Project With Ecologically Oriented And Organic Integration: https://registry.verra.org/app/projectDetail/VCS/5701
Kazakhstan	Ecoharvest Sustainable Agriculture Project: https://registry.verra.org/app/projectDetail/VCS/5700
Kazakhstan	Greening Of The Dried Aral Sea: https://registry.verra.org/app/projectDetail/VCS/5628
Russia	Protection Of High Conservation Value Forests By Terneyles Group: https://registry.verra.org/app/projectDetail/VCS/1544
Russia	Restoration Of Burned-Out Forests Through The Carbon-Sequestration Plantation In Forest-Steppe Zone: https://registry.verra.org/app/projectDetail/VCS/5127
Russia	Rewetting Of The Paltinskoye Peatland For Climate Resilience In Perm Krai: https://registry.verra.org/app/projectDetail/VCS/5437

Table A3.4: VCS methodologies for different types of land-based emission reduction and removal. Source: (Verra, n.d.)

Land type	Methodology code	Status (active/ inactive)	Name	Description
Cropland	VM0042	Active	Improved Agricultural Land Management (IALM)	Covers cropland soil carbon removals and emissions reductions from improved agricultural land management practices (e.g., reduced tillage, improved fertilizer application, residue/biomass and water management, cover crops and cropping practices; the methodology also allows certain grazing-related practices, so it spans cropland and some mixed crop–livestock systems) https://verra.org/methodologies/vm0042-improved-agricultural-land-management-v2-2/
Cropland	VM0051	Active	Improved Management in Rice Production Systems	Applies to flooded rice systems and credits methane reductions from improved water and crop management practices; Verra notes it replaces the CDM rice water management methodology AMS-III.AU that Verra inactivated https://verra.org/methodologies/improved-management-in-rice-production-systems/
Cropland	VM0017	Inactive as of 31 March 2023	Adoption of Sustainable Agricultural Land Management	It quantified emission reductions and removals from sustainable land management practices that enhance aboveground/belowground/soil carbon stocks in agricultural areas, and Verra notes overlap with newer ALM methodologies (especially VM0042) https://verra.org/methodologies/vm0017-adoption-of-sustainable-agricultural-land-management-v1-0/
Cropland	VM0022	Inactive as of 1 July 2024	N2O emissions reductions in agricultural crops through nitrogen fertilizer rate reduction	Was focused on N fertilizer rate reduction in cropping systems (originally limited to the United States) and Verra explicitly points users to VM0042 for nitrogen management going forward https://verra.org/methodologies/vm0022-quantifying-n2o-emissions-

				reductions-in-agricultural-crops-through-nitrogen-fertilizer-rate-reduction-v1-1/
Cropland	VM0021	Inactive as of 10 March 2022	Soil Carbon Quantification Methodology:	Designed as a modular soil carbon methodology for agricultural land management (including changes to agricultural practices), but Verra inactivated it due to baseline approach issues and overlap with newer ALM methodologies https://verra.org/methodologies/vm0021-soil-carbon-quantification-methodology-v1-0/
Forest land	VM0048	Active	Reducing Emissions from Deforestation and Forest Degradation (REDD+), v1.0	Verra's newer consolidated REDD+ framework, designed to use up-to-date science/data/technology and to be applied together with modules for specific activity types (e.g., avoiding unplanned deforestation via module VMD0055) https://verra.org/methodologies/vm0048-reducing-emissions-from-deforestation-and-forest-degradation-v1-0/
Forest land	VM0010 VM0003 VM0012 VM0035 VM0045	Active	Improved forest management (IFM) methodologies (multiple)	These cover activities like converting logged forest to protected forest (VM0010), extending rotation age, reducing impact logging, etc. https://verra.org/methodologies/vm0010-methodology-for-improved-forest-management-conversion-from-logged-to-protected-forest-v1-4/
Forest land	VM0047	Active	Afforestation, Reforestation, and Revegetation (ARR), v1.1	Applies to afforestation/ reforestation/ revegetation that increases vegetative cover or enhances forest carbon stocks; it includes an area-based approach using remote sensing + plots and a census-based approach suited to dispersed plantings (including agroforestry/shelterbelts and even urban forestry, which can overlap with "settlements") https://verra.org/methodologies/vm0047-afforestation-reforestation-and-revegetation-v1-1/

Forest land	VM0006 VM0007 VM0015	In transition from active to inactive	Avoiding unplanned deforestation/degradation (AUDD)	Several older AUDD methodologies are still listed as active, but Verra has been transitioning toward VM0048 https://verra.org/program-methodology/vcs-program-standard/vcs-program-methodologies-active/
Forest land	VM0009 VM0037	Inactive	RED++	ICVCM has noted that Verra excluded several older REDD+ methodologies from ICVCM assessment; credits under those older methodologies therefore would not be eligible for the CCP label https://icvcm.org/integrity-council-approves-three-redd-methodologies/
Grasslands / rangelands	VM0032	Active, being updated	Methodology for the Adoption of Sustainable Grasslands through Adjustment of Fire and Grazing, v1.0	Quantifies reductions/removals from adjusting grazing intensity and prescribed fire frequency, with accounting pathways that can include soil carbon sequestration and reduced methane emissions from altered fire regimes/grazing https://verra.org/methodologies/vm0032-methodology-for-the-adoption-of-sustainable-grasslands-through-adjustment-of-fire-and-grazing-v1-0/ Verra has an ongoing major revision process – v2.0 is under consultation as of Dec 2025–Jan 2026 https://verra.org/consultation-major-revision-to-sustainable-grasslands-methodology/
Grasslands/ rangelands	VM0026	Being inactivated	Sustainable Grassland Management (SGM)	Provides procedures for emission reductions/ removals from sustainable grassland management in semi-arid regions (e.g., grazing rotation, limiting grazing on degraded pastures, restoration of severely degraded lands) https://verra.org/methodologies/vm0026-methodology-for-sustainable-grassland-management-sgm-v1-0/
Wetlands	VM0033	Active	Tidal Wetland and Seagrass Restoration, v2.1	Quantifies net GHG reductions/removals from restoring tidal wetlands (blue carbon), focused on rebuilding healthy wetland ecosystems and associated biomass/soil carbon benefits https://verra.org/methodologies/vm003

				3-methodology-for-tidal-wetland-and-seagrass-restoration-v2-1/
Wetlands	VM0036	Active	Rewetting Drained Temperate Peatlands, v1.0	Quantifies reduced net emissions from rewetting drained peatlands in temperate regions, accounting for peatland emissions and selected non-peat carbon pools; it uses vegetation composition and water table depth as proxies (the "GEST" approach) https://verra.org/methodologies/vm0036-methodology-for-rewetting-drained-temperate-peatlands-v1-0/

Annex 4: Decision-Making Considerations for a Small Firm in Uzbekistan Seeking Voluntary Carbon Market Access

By way of example, consider a small farm in Uzbekistan (common in the country) that wants to adopt reduced tillage to generate carbon credits for sale in the voluntary carbon market. In practice, the choice of a feasible crediting pathway hinges on three factors: (1) which carbon-credit standards offer an applicable cropland soil-carbon methodology with global (or at least non-country-restricted) eligibility; (2) whether the farm can realistically meet the associated MRV and monitoring requirements (often the binding constraint at small scale); and (3) which route to market is workable in practice – most commonly participation in an aggregator program rather than developing and verifying a standalone project. The main voluntary-market standards that directly fit reduced tillage include

- Verra VCS: VM0042 Improved Agricultural Land Management explicitly includes reduced tillage among eligible improved agricultural land management practices, and it is designed for AFOLU projects generating both reductions and removals https://verra.org/methodologies/vm0042-improved-agricultural-land-management-v2-2/
- Gold Standard: its Soil Organic Carbon Framework Methodology is a soil carbon framework with activity modules, including a module specifically for increasing soil carbon through improved tillage practices; the framework is meant to be applicable across a broad range of agricultural systems and offers measurement / literature / default-factor approaches depending on data availability https://globalgoals.goldstandard.org/402-luf-agr-fm-soil-organic-carbon-framework-methodolgy

For a farm to decide between VCS and Gold Standard for reduced tillage, the following criteria should be applied:

- The standard the likely buyers will accept, and that the farmer's developer/ aggregator can actually register and verify. In practice, many large buyers and intermediaries are set up to procure from Verra VCS or Gold Standard.
- MRV burden and "fit" to the data reality. Both routes, Verra VCS or Gold Standard, ultimately require credible monitoring and transparent reporting; VM0042 is explicit about SOC measurement techniques and provides substantial methodological detail (including lab methods and requirements for SOC measurement). Gold Standard's SOC framework is explicitly designed to accommodate different quantification approaches (direct measurement, peer-reviewed literature, or default-factor approaches) and is paired with activity modules and model guidelines.

- Scale and transaction costs: for a single farm, the deciding factor is often whether it can join an aggregator program that already operates under one of these standards, because verification and sampling costs are hard to carry alone.
- Integrity/marketability considerations: VM0042 v2.2 is flagged by Verra as eligible for ICVCM CCP labeling subject to conditions, which can matter for some buyers.

Burden comparison will be informed by the following considerations:

1) Eligibility and additionality burden
    - Baseline/practice history: how many years back does one need records to show "new practice"?
    - What can disqualifies a project (already no-till, already cover cropping, etc.)?
    - Leakage/permanence requirements (how long must practice continue; what happens if it stops)?
2. Data and recordkeeping burden
    - What farm data are mandatory? Tillage operations (type, depth, frequency); residue handling; fertilizer rates and timing; yields/crop types; irrigation/water management (if relevant).
    - Format and frequency: annual reporting? seasonal? per field?
3. Measurement and sampling burden (usually the biggest cost)
    - Soil sampling requirement: required depth(s), bulk density, stratification rules; minimum number of plots/cores per stratum; re-sampling interval (e.g., every X years)
    - Lab methods and QA: accredited labs required? chain-of-custody rules?
    - Who pays for sampling and lab work?
4. Modeling burden (if models are used)
    - Is modeling allowed/required?
    - Which models are acceptable and who runs them?
    - Calibration/validation requirements (do you need paired measurements to validate the model locally)?
    - How do they handle uncertainty and conservativeness (discounting/buffers)?
5. Verification and audit burden
    - Frequency of third-party verification (every issuance cycle vs multi-year)
    - Audit evidence required (field visits, photos, logs, invoices)
    - Who pays VVB costs?
6. Time to first issuance and cashflow burden
    - Can one issue annually, or only after multi-year monitoring?

- Upfront costs before any credits are issued
- Any minimum credit volume thresholds that make small farms impractical unless aggregated

7. Transaction costs and fees
    - Registry fees, methodology fees (if any), admin fees
    - Aggregator/developer share
    - Required tools/software subscriptions
8. Risk and liability burden
    - Reversal/non-performance risk: are there buffers or clawbacks?
    - What if yields fall or practices change?
    - Long-term contract obligations on the land (important for leased land)

Small farms typically access carbon crediting through aggregators or project developers who operationalize standard methodologies into implementable monitoring and reporting programs; standards primarily provide the rulebooks and issuance infrastructure rather than hands-on project development support.

Annex 5: Emerging landscape of aggregator-like services across Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan

There are potential "aggregator-like" players in Greater Central Asia, but the landscape is still thin compared with Europe and North America, and many efforts are partnerships between an international developer and a local implementing body.

Mongolia:

- Boomitra (soil carbon project developer): has publicly announced partnerships in Mongolia aimed at launching regenerative agriculture/soil carbon projects and enabling access to carbon finance (Boomitra Team, 2024).
- Plan Vivo pathway via MSRM (Mongolia): Plan Vivo describes a community-driven rangeland project in Mongolia managed/ administered by MSRM (Mongolian Society for Rangeland Management), which functions in practice like an aggregator/implementer for herder groups (Plan Vivo Foundation, n.d.).
- Mongolia's domestic rangeland carbon scheme (emerging): UNDP materials on Mongolia's domestic carbon market concept describe an operational cycle where herder federations and project developers can submit rangeland carbon sequestration projects for evaluation and potential issuance - this is not "VCM aggregation" per se, but it is a country-based aggregation channel that could later link to international markets depending on rules (Enkhtaivan & Dolgorsuren, 2024).

Kyrgyzstan:

- Rabobank Acorn (agroforestry aggregation model): Acorn describes work in Kyrgyzstan supporting smallholders' transition to agroforestry and turning measured removals into carbon units certified under Plan Vivo - again, effectively an aggregation model for small farms (Acorn B.V., n.d.).
- FAO programs (enabling rather than selling credits): FAO is running soil/forest/pasture carbon-related initiatives in Kyrgyzstan, which can build the monitoring and institutional base that future aggregation programs often need, even if they are not directly "VCM sales channels" themselves (Food and Agriculture Organization of the United Nations, 2025)

Uzbekistan / wider region:

- Regional "pipeline builders" exist, but many are still in readiness/training mode rather than operating large, established farm-credit aggregation at scale. Examples include FAO's RECSOIL initiative launch in Uzbekistan (soil carbon-focused), which is more of an enabling mechanism than a VCM aggregator (Food and Agriculture Organization of the United Nations, 2024).

Annex 6: Authorization and tracking arrangements under Article 6.2

Authorization arrangements matter most for sellers (host-side) as without host authorization, the mitigation outcome cannot be transferred as an ITMO for Article 6 purposes, and it cannot be used toward another country's NDC with corresponding adjustment. For a project developer/supplier, this is the "can I legally generate and export Article 6 units, and under what conditions?" gate. They also matter for buyers as buyers need to know the host will authorize the unit for the intended use (NDC use, compliance, other authorized purpose), because that determines whether the unit is usable and whether corresponding adjustment will be applied.

Tracking arrangements matter strongly for both buyers and sellers. Sellers need a way to have units issued/recorded and then transferred out (serials/identifiers, accounts, "first transfer" recorded). Buyers need confidence that what they acquire is uniquely identified, transferable into their systems, and cannot be double-sold or double-used. In practice, tracking is what makes delivery possible: even if a contract exists, you need the registry/IT infrastructure to execute the transfer and document it.

Initial report to the UNFCCC matters most for buyers (and for buyer-country credibility). The initial report is a transparency signal that the Party has disclosed how it will run Article 6.2 (governance, authorization, corresponding adjustments, tracking). For an acquiring Party, it reduces political/reputational risk and increases confidence that the units will be internationally recognized. For a buyer that needs "Paris-aligned" units, it is often used as a due diligence checkpoint. Initial report still matters for sellers, but indirectly: If the host country has submitted an initial report (or is clearly on track to), it lowers the risk that the host's units will later be questioned for lack of transparency or weak accounting, which can affect price and demand.

Annex 7: Saudi Arabia's Regional Voluntary Carbon Market

Saudi Arabia's Regional Voluntary Carbon Market Company (RVCMC), backed by the Public Investment Fund and Saudi Tadawul Group, launched a voluntary carbon market exchange platform on 12 November 2024 on the sidelines of COP29 in Baku (Regional Voluntary Carbon Market Company, 2024). The exchange is intended to provide institutional market infrastructure for trading carbon credits and to help channel finance toward high-quality climate projects, with 23 Saudi and international companies participating on the first day of trading. Public descriptions of the platform note that it initially supports auction and block-trade functionality, with plans to expand into spot market features over time (Al-Barakati, 2024).

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