DPGs FOR CLIMATE ACTION COLLECTION

Framework Compliance Summary

VERIFIED DIGITAL PUBLIC GOOD

National Carbon Credit Registry

Open-source software · United Nations Development Programme (Digital For Planet)

github.com/undp/carbon-registry

An open-source toolkit that lets any country set up a sovereign carbon registry, tracking the full carbon-credit lifecycle (project registration, authorization, verification, issuance, transfer and retirement) with every transaction recorded immutably on a ledger, meaning records cannot be altered or deleted once written, and public data exposed for transparency — the digital infrastructure Article 6.2 of the Paris Agreement presupposes.

At a glance

CLIMATE OBJECTIVES Mitigation · Climate finance & Carbon Markets · Cross-cutting	**SECTORS** Cross-sector	**DEPLOYMENT** National	**COUNTRIES ACTIVE** 3 live; 6+ in progress
OWNER UNDP (Digital For Planet); developed under the Digital For Climate (D4C) collaboration	**TYPE** Open-source software	**DATA EXTRACTION** REST API · AEF (XLSX/CSV) · registry-to-registry sync	**YEAR LISTED** 2026

CLIMATE DPG FRAMEWORK · COMPLIANCE STATUS All four layers met

L1	**DPG Standard**	Verified & listed on the Registry (10 Feb 2026)	✓ **VERIFIED**
L2	**Climate Alignment**	Climate-relevant by design (Article 6, MRV)	✓ **MET**
L3	**Infrastructural Approach**	Interoperability L3 · Adoption readiness L4	✓ **MET**
L4	**Measuring Outcomes**	Full KPI table; real-time ledger + AEF reporting	✓ **MET**

✦ **Admitted to the Climate Action Collection**

LAYER 1 DPG Standard

The National Carbon Credit Registry is a verified digital public good, listed on the DPG Registry (AGPL-3.0), having met all nine indicators of the DPG Standard. Layer 1 is a precondition for entry to the DPGs for Climate Action Collection.

LAYER 2 Climate Relevance

Climate-relevant problem addressed

Article 6.2 of the Paris Agreement requires every participating country to "have, or have access to, a registry" for tracking internationally transferred mitigation outcomes (ITMOs) (Decision 2/CMA.3, para 29) and to submit annual information in an agreed electronic format. Many developing countries lack this digital infrastructure. Without a national registry they cannot authorize ITMOs, apply corresponding adjustments, or prevent double counting and double claiming of emission reductions — which blocks their access to Article 6 carbon finance and undermines the integrity of their NDCs. The National Carbon Credit Registry addresses this gap: it is an open-source toolkit that lets any country set up a sovereign registry tracking the full carbon credit lifecycle — project registration, authorization, verification, issuance and serialization, transfer, and retirement — with every transaction recorded immutably on a ledger and public data exposed for transparency.

Theory of contribution

NCCR converts Paris Agreement rules into executable national processes: by giving governments the registry infrastructure Article 6.2 presupposes, it lets countries serialize credits, track first transfers, apply corresponding adjustments and report through the Agreed Electronic Format, unlocking results-based climate finance. Immutable ledger records and public transparency reduce double-counting risk and raise buyer confidence. It does not itself reduce emissions; it enables mitigation by making national carbon markets trustworthy, financeable and accountable.

Frameworks it aligns with

- IPCC methodological guidance
- Paris Agreement (NDC tracking / implementation)
- Carbon Markets & Internationally Transferred Mitigation Outcomes (Article 6).
- UNFCCC decisions & guidelines
- Paris Agreement (National inventory systems / transparency frameworks)

How alignment is achieved

NCCR directly operationalises UNFCCC Decisions 2/CMA.3 and 6/CMA.4: credits are serialized as ITMOs in the unique-identifier format of 6/CMA.4 para 17; cooperative approaches and Initial Reports are modelled per 2/CMA.3 and gate project authorization; first transfers are tracked at credit-block level to support corresponding adjustments and prevent double counting; and the system auto-generates Agreed Electronic Format reports (Actions, Holdings, Annual Information) for annual UNFCCC submission.

Supported Decisions or Actions

The registry supports decisions across all three categories. For **policy and planning**, Designated National Authorities use it to create Article 6.2 cooperative approaches, authorize projects against their NDC strategy, compute corresponding adjustments, and generate UNFCCC-ready reports — while ministries and climate funds (e.g. the Sri Lanka Climate Fund) oversee national credit balances. For **investment and finance**, project developers register carbon projects and transfer serialized credits, and buyers access transparent transaction records that inform climate-finance decisions. At the **operational** level, independent validation and verification bodies submit the certification reports that gate credit issuance. All roles operate under enforced permissions with full audit trails.

LAYER 3 Infrastructural Approach

Modular design

A service-oriented TypeScript/NestJS system where each service (national API, analytics API, ledger replicator, async-operations handler, data importer) is independently deployable and selected by configuration. All services are stateless and share a domain library of ~50 encapsulated modules. Integration points are decoupled behind swappable interfaces: the ledger runs on a PostgreSQL event-sourced implementation (or Amazon QLDB, now discontinued); storage on local disk or S3; geolocation on Mapbox, OpenStreetMap or offline lookup. Versioned REST APIs with auto-generated OpenAPI/Swagger; a documented customization framework lets countries localize without forking core logic.

Data processing

INGESTION Web forms across the full project lifecycle; authenticated REST APIs for system-to-system submission (MRV systems, machine accounts); CSV/JSON reference data; scheduled importers pulling from the UNDP ITMO Platform and the UNFCCC CDM DOE list, with the run frequency configured by each deployment.

VALIDATION A global pipeline enforces ~100 typed DTO schemas on every request; domain state machines gate transitions (authorization requires an approved project, active cooperative approach and submitted Initial Report); role-based access, rate limits and audit logs guard integrity before ledger commit.

DISSEMINATION Analytics dashboards (~70 native statistics), public transparency counters and map views; AEF reports (XLSX/CSV), PDF certificates and authorization letters; downstream access via documented REST APIs and registry-to-registry sync.

Integrations & Adapters

Designed as national infrastructure other climate systems plug into. Ships a REST client for the Climate Action Data Trust (mapped to the CAD Trust v2 data model from release v2.1.0), so national data aggregates into the global metadata layer that prevents double counting across registries. An optional synchronization service connects to the UNDP ITMO Cooperation Platform, and a generic

registry-to-registry client syncs to any peer endpoint. All functionality is exposed through versioned REST APIs with OpenAPI/Swagger and machine-account auth; AEF outputs (6/CMA.4 Annex) are directly consumable by Article 6 and national-inventory workflows.

Maturity scales

Interoperability Level 3 / 5 — Standardized
Adheres to domain standards (ITMO serial format per 6/CMA.4, AEF per Annex, CAD Trust data-model alignment); versioned OpenAPI/Swagger REST APIs; registry-to-registry and CADT sync with documented field mappings.

Interoperability Evidence CAD Trust data-model alignment mapping (documention/cadtrust_alignment.md) and UNDP ITMO Platform connectivity with field mappings (README "External Connectivity"): https://github.com/undp/carbon-registry

Auto-generated OpenAPI/Swagger documentation served by each API service (national and analytics APIs).
AEF report generation per Decision 6/CMA.4 Annex, with XLSX/CSV templates maintained in the repository.
ITMO serial number format per Decision 6/CMA.4 para 17, documented with worked examples in the README.

Adoption readiness Level 4 / 5 — Orchestrated / Cloud-Optimized

Scalability, Performance & reliability The two request-serving services are stateless and horizontally scalable (or serverless, scaling to zero when idle). Writes and reads are separated: an immutable ledger is the source of truth, replicated asynchronously into an operational PostgreSQL read store. Async work runs through a FIFO queue with retry. Reliability is monitored via a public open-source status page; QA includes 189 green end-to-end tests across the Article 6 lifecycle plus CI/CD on merge. The dual-database design also supports disaster recovery — the operational store can be rebuilt from the ledger.

Computing & energy intensity Deliberately lightweight: documented minimum 4 GB RAM, 4 CPU cores, 20 GB storage per service, no GPU. A full national deployment runs as five containers on a single modest server via docker-compose, realistic for on-premises government hosting. Crucially, the ledger is an append-only database (PostgreSQL event tables or QLDB), NOT a proof-of-work blockchain — immutability without energy-intensive consensus mining. Serverless option scales to zero when idle.

LAYER 4 Measuring Climate Outcomes

Measurable outcomes it facilitates

- Improved MRV systems (coverage, timeliness, completeness)
- Increased transparency in emissions or adaptation reporting
- Carbon market participation, registry, or Article 6 readiness strengthened
- NDC tracking, implementation, or update processes improved

- Climate finance access, readiness, or mobilisation supported
- Climate data infrastructure, interoperability, or accessibility improved

Reach in numbers

3 live national registries (Namibia, Côte d'Ivoire, Nepal) · 6+ adoptions in progress (Sri Lanka, Nigeria, Zimbabwe, Mongolia, Cambodia, Chile, Philippines, plus scoping in Ukraine, Peru, Rwanda) · full Article 6 credit lifecycle tracked in real time per deployment.

Key performance & impact indicators

Category	Indicator Name	Definition / Unit of Measurement	Data Source	Baseline (if available)	Most Recent Value	Reporting Frequency / Evidence Link
Climate Finance & Carbon Markets	ITMOs issued, transferred and retired	tCO2e (serialized credit blocks)	Registry ledger / analytics dashboard	0 at national deployment	Tracked in real time per deployment	Real-time dashboard; annual AEF reports — demo.carbreg.org /
Mitigation	Projects registered and authorized under Article 6 cooperative approaches	Count of projects, by sector and status	Registry analytics API	0 at deployment	Per-deployment	Real-time
Climate Monitoring / Observation	AEF reports (Actions, Holdings, Annual Information) generated for UNFCCC submission	Reports per Party per year	Registry AEF reporting module	N/A	Per-deployment	Annual (15 April UNFCCC submission cycle)

Deployment countries · 3 live

Namibia, Côte d'Ivoire, Nepal. In progress: Sri Lanka, Nigeria, Zimbabwe, Mongolia, Cambodia, Chile, Philippines; scoping in Ukraine, Peru, Rwanda.

Adopting Organizations

UNDP (Digital For Planet) is custodian and maintainer. National deployment at the Sri Lanka Climate Fund (Ministry of Environment) and Namibia's Ministry of Environment, Forestry & Tourism. Developed under the Digital For Climate (D4C) collaboration, whose advisory board comprises EBRD, UNDP, the UNFCCC secretariat, IETA, the European Space Agency and the World Bank Group.

Evidence & Additional Resources · 12 sources

Live registries, a public demo, source code, status monitoring and DPG certification documenting real-world uptake.

Evidence Sources

Live demo with full Article 6 lifecycle: https://www.demo.carbreg.org/
DPG Registry entry: https://app.digitalpublicgoods.net/a/10403
Technical documentation, architecture and Article 6 compliance mapping: https://github.com/undp/carbon-registry
Help/documentation site: https://nationalcarbonregistrydemo.tawk.help/
UNDP ITMO cooperation platform: https://carboncooperation.undp.org/

Evidence of Adoption

- DPG Registry listing (certified Digital Public Good): https://app.digitalpublicgoods.net/a/10403
- Project site: https://carbreg.org
- Public demo instance: https://www.demo.carbreg.org/
- Source code (AGPL-3.0): https://github.com/undp/carbon-registry
- UNDP ITMO Voluntary Bilateral Cooperation Platform (integrated): https://carboncooperation.undp.org/
- Public status/uptime page: https://status.carbreg.org/
- Community of practice: https://www.sparkblue.org/group/keeping-track-digital-public-goods-paris-agreement
- Namibia national registry (government-hosted, live since COP28): https://registry.nsa.org.na
- Côte d'Ivoire national carbon registry: live since Q1 2025 (Registre carbone Côte d'Ivoire)

Independent validation

The product owner has identified the following types of external validation applicable to this solution:

- **Independent evaluation** — external assessment of the solution's technical design, climate alignment, or impact claims by an entity not involved in its development

The information above reflects the self-reported responses provided by the product owner as part of a structured compliance submission against the Framework for Identifying Digital Public Goods for Climate Action.