carrot foundation

WHITE PAPER

Digital Public Infrastructure for **Global Climate Finance**

Shared rails designed to make environmental and social outcomes verifiable and bankable at scale: The Carrot Network.

Case: Low-carbon circular economy

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<2% of organic waste is biologically treated in the Global South

>20% of methane comes from waste

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Shaping the economy we need

Solving the world's hardest problems — among them climate change, the stewardship of natural resources, and human development — will depend on building more sustainable economic systems, and on new kinds of technology to enable them. A sustainable economy is one that values **public goods**, not only private ones. The difficulty is that the markets such an economy requires barely exist: the outcomes that matter most — a stable climate, clean air and water, recovered materials, restored land, healthy and productive communities — benefit everyone, yet are paid for by almost no one. Public rules and private markets each carry part of the load, but neither, on its own, reliably directs capital toward the results society needs collectively.

The scale of what fails to flow makes this concrete. Under the UN climate process, the Baku-to-Belém roadmap puts the external finance the Global South will need for climate action at about **US$1.3 trillion a year by 2035**. In 2023, the total that arrived from abroad was about **US$196 billion** — roughly **15 percent** of what will be needed. And the gap is widest exactly where a market should be: private capital is expected to supply about half of the target, yet cross-border private climate finance came to only some **US$42 billion** — it would need to grow roughly **fifteenfold** (Climate Policy Initiative, 2025).

THE FINANCE GAP

US$1.3T	needed annually by 2035
US$42B	cross-border private finance in 2023
15×	growth needed in private flows

A shortfall of that size is not a market malfunctioning at the margin, waiting for a correction; it is a market that has **never been formed**. And it persists because market formation is, above all, a **coordination problem** — one that neither companies nor governments, acting alone, are positioned to solve. No single company can build a market whose value accrues to everyone; every competitor that benefits without contributing would ride free on the investment. No single government can build one either: the problems cross borders, and consensus among many governments is slow to form. What market formation requires is a way for those ready to act — buyers, builders, funders, and public bodies alike — to coordinate at the level of the system, without waiting for unanimity at either the individual or the intergovernmental level.

Forming markets is different work from fixing them, and coordination at that level takes three things at once. It takes a **new kind of financing system** — one that points development at clear, verifiable outcomes, environmental and social alike, directing capital to results rather than promises so that value reaches the people who produce them. It takes a **new technology layer** that makes those outcomes trustworthy — measured, independently verified, uniquely recorded, and transparently settled — and that turns the tools it builds into shared public goods rather than private bottlenecks. And it takes a **new kind of organization** to steward that layer — one bound to a clearly stated purpose it cannot quietly abandon, governed transparently, and open to the participation of the people it serves.

That layer is **digital public infrastructure (DPI)**. In the form this paper describes, it sits outside government, yet works in partnership with it — and with the private sector, philanthropy, finance, technology, and science — to establish trust between parties who would not otherwise cooperate, so that capital can flow to results. Its stewardship is coordinated by a **foundation whose purpose is fixed in its deed and cannot be redirected toward private gain**. Its development is progressively opened to the people who use it: its contributors, its builders, and its participants.

The Carrot Network is digital public infrastructure for the resource-efficient, low-carbon circular economy — the shared rails for an economy that is low-pollution, regenerative, and inclusive. Its purpose is environmental *and* social at once: using capital more efficiently to improve circularity, cut natural-resource extraction, reduce pollution, and tackle climate change, while creating **green jobs**, income, and local opportunity for the people who do the work. The methodologies, the public registry, and the verification code that make up these rails are **digital public goods** — open, auditable, and available to anyone building on them. Carrot proves the model today in waste, recycling, and methane. Because the pattern is general and the need is far broader than waste, the same rails are built to extend to other environmental domains — water, nature, and biodiversity among them.

And because those open tools make outcomes **measurable, verifiable, and bankable**, they open a path markets have struggled to build: buyers can commit to results before those results exist, and de-risk the investment needed to produce them. Coordinated, that

demand becomes a new kind of climate and development finance — one that pays for outcomes, not promises.

What "digital public infrastructure" means

Digital Public Infrastructure (DPI) is the term used across the University College London (UCL) Institute for Innovation and Public Purpose, the United Nations Development Programme, the World Bank, and the G20 for digital systems that work as shared, society-wide rails rather than as proprietary platforms. These bodies share a *family* of definitions rather than one canonical text, but they converge on a few traits: DPI is **foundational** (other services are built on top of it), **interoperable** (it works through open standards, not a single vendor's stack), **inclusive** (designed for broad access), and **publicly accountable** (governed in the open). The reference cases are the foundational layers of identity, payments, and data exchange — India's Aadhaar and UPI, Brazil's Pix, Estonia's X-Road, the open-source MOSIP. The World Bank frames the pattern as a stack of three trust functions — **trusted identity, trusted data exchange, and trusted settlement** — that, once public, other services can build on.

Closely related is the idea of **digital public goods** — the term the UN and the Digital Public Goods Alliance use for open-source software, open standards, open data, and open content that are freely reusable and adaptable. The relationship is simple: the infrastructure is the rail, and digital public goods are the open parts it is made of. DPI is *most* powerful when its core components are themselves digital public goods: non-rivalrous (one participant's use does not diminish another's) and non-excludable (open licenses and open standards let others build on the rails without permission — and, if ever needed, carry them forward independently). The Carrot Network is built to this standard: its core components are **digital public goods** — shared, inspectable resources that any operator, verifier, methodology author, or application developer can build on.

What none of these definitions require is a particular *owner*. As the UNDP and the UCL IIPP both put it, DPI is a multi-stakeholder endeavor that can be built by governments, by the private sector, by philanthropies, or by several together. The Carrot Network applies that idea to a domain the foundational cases have not reached: **outcomes-based funding for environmental and social advancement**. It builds its identity layer, methodology rules, evidence pipeline, public registry, and reward distribution as shared market rails — usable by many independent participants, and governed for the mission rather than for private gain. It begins with waste reduction via recovery, reuse, and recycling — a first domain chosen for leverage. Diverting organic waste from landfills cuts **methane**, the fastest and largest brake available on near-term warming, and the waste sector is one that can deliver it at a cost-saving at the system level (UNEP, *Global Methane Status Report*, 2025). It also opens the wider **circular economy**: an estimated two-thirds of global emissions are tied to how resources are extracted, used and discarded, and circular-economy interventions are judged capable of delivering roughly 85% of the additional emissions reductions needed beyond current national pledges to hold warming below 2°C (*Circularity Gap Report*, 2021). The transition they open is estimated at up to 76 $GtCO_2e$ of avoided emissions through 2050 (WBCSD, *Global Circularity Protocol*).

What makes infrastructure "public"

If ownership does not decide what counts as public, what does? A rigorous recent answer comes from Mazzucato, Eaves and Vasconcellos (UCL IIPP, *Digital Public Infrastructure and Public Value: What is "public" about DPI?*, 2024). Their central finding is the one the Carrot Network is built on:

> The "publicness" of digital infrastructure is not determined by who builds it or who owns it — but by how it is governed: whether it is created and governed for the common good.

They show that defining DPI by its *technical attributes* (open standards, reusable components) or by its *functions* (the essential capabilities it provides) is necessary but, in their words, "broadly silent on governance." Infrastructure earns its "public" label only when explicit public values are locked in and enforced. They set out five governance principles — drawn from Mazzucato's "common good" framework — against which any candidate DPI can be measured:

- **Purpose and directionality** — the infrastructure has an explicit mission, and that mission shapes what it does.

- **Co-creation and participation** — the people who use it help shape it.
- **Collective learning and knowledge-sharing** — methods and evidence are open enough for others to learn from.
- **Access for all and reward-sharing** — value reaches participants broadly, not only the operator.
- **Transparency and accountability** — rules, decisions, and finances can be inspected.

These describe governance and outcomes, not origins. The same authors accept that shared infrastructure "can be provided both by public and private organisations, or even co-developed" — *provided that*, however it is built, a publicly accountable mechanism guarantees access and reward-sharing over time. That proviso is why the network's core components are released as digital public goods: open methodologies, an open registry, and open verification code are how "access for all" and "collective learning" stop being promises and become properties anyone can check. **It is also the standard the Carrot Network is built to meet — and the next section answers it head-on.**

How the Carrot Network meets the public-governance test

The Carrot Network is stewarded by the **Carrot Foundation** (registered as "Carrot Fndn"), a Swiss foundation under Article 80 *et seq.* of the Swiss Civil Code, registered in Zug (UID CHE-152.448.302), constituted in October 2023 and supervised by Switzerland's Federal Supervisory Authority for Foundations (ESA). A Swiss foundation's statutory purpose (*Zweck*) cannot be altered by its own board; it is externally supervised and audited. That legal form is what lets the Foundation act as a **steward, not an owner** — it can evolve how the network operates, but it cannot redirect the network away from the purpose it exists to serve. This is the new kind of organization the opening of this paper called for: purpose stated and locked, governance transparent and externally supervised. It also answers the coordination problem at its root: a market whose value accrues to everyone can only be formed by an actor that does not need to capture that value — and a purpose-locked, non-profit steward is that actor by construction.

Measured against the five governance principles:

- **Purpose and directionality.** The Foundation's purpose — to build a low-carbon, inclusive circular economy — is recorded in its Deed and in the Swiss commercial register, and is binding under Swiss law. It is enforceable, not aspirational.
- **Co-creation and participation.** Participants across environmental-work and social-development ecosystems are direct counterparties to the network and help shape how it develops. Over time, responsibility for different aspects of the network is designed to be **managed in a distributed, decentralized way** rather than concentrated in a single operator; the network is centralized today to secure foundational quality and strong early leadership — a choice addressed openly in *Building DPI responsibly*, below — and participation broadens as it matures. *(This is a distributed-benefit and -management design, not a grant of control rights to individual stakeholders.)*
- **Collective learning and knowledge-sharing.** The verification code that executes each methodology is **open source under LGPL-3.0** and publicly inspectable; methodology frameworks are versioned and documented; the dMRV (digital Measurement, Reporting and Verification) evidence pipeline lets accredited verifiers, methodology authors, and application developers work over shared, documented rules rather than private spreadsheets.
- **Access for all and reward-sharing.** The network is open to participants across the value-adding ecosystem, and value flows to the people who do the environmental work, in proportion to verified contribution — not concentrating at the operator. Under transparent, published fees, 100% of proceeds fund the ecosystem and the network that serves it — at least 80% of every credit sale is distributed to ecosystem participants, and the remainder sustains the public rails (see *How the network is funded*, below) — and reward shares are tuned by impact type — for circular-economy outcomes, by material, territory, and role — to direct effort to where recovery is hardest. The tuning steers effort; it is contingent on a credit being issued and sold. *(A buyer owns the credit, fully on retirement; participants are rewarded for their contribution but never own the credit itself.)*
- **Transparency and accountability.** Beyond the federal supervision described above, the underlying record is immutable: there is a durable history of every transaction and every update to every data point, and the **key outputs — credit issuance, transfer, and retirement — are recorded on a public registry that anyone can audit**. Not every part of the platform is publicly recorded, and some operational data is **permissioned to auditors and verifiers** rather than open to all — a deliberate balance between public auditability and the privacy

of the people and businesses whose work is recorded, with personal and operational data encrypted and handled under applicable data-protection law and GDPR-aligned practices (see *Building DPI responsibly*, below).

How the network is funded — and how it de-risks participation

The environmental and social outcomes the network pursues are public goods, made financeable in the form of credits. The network runs on crediting systems and is supported by the sale of credits — verified environmental outcomes that a buyer pays for, described fully in *The environmental extension*, below. Credit integrity depends on who sets the rules, who issues credits, and who profits — and on keeping those roles honest. Carrot is built to hold them apart. It is a **purpose-locked, non-profit steward**. It has no shareholders, and its fees do not function as a dividend that grows with issuance. The rules that decide what qualifies are **open-source and auditable**; verification is executed by deterministic software and reviewed by **independent validation and verification bodies (VVBs)**, not by Carrot itself; and every credit's record is public. Carrot is built as open infrastructure that established standards and registries can build on and interoperate with, earning credibility through demonstrated results and independent recognition rather than self-declaration. The aim is not to add another standard to a crowded field; it is to supply the layer the field has lacked — shared, open rails for identity, verification, recording, and settlement.

Proceeds from each credit sale are distributed to the participants recorded along the value-creation chain, in proportion to verified contribution, under the published Rewards Distribution Policy. Distribution uses a traceable digital currency (USDC), chosen because it settles across borders at low cost, reaches participants directly, and leaves an end-to-end auditable trail from sale to recipient. What is not distributed to participants is organized into **purpose-bound pools**, so it is always visible what each unit of value is *for* — the network's economics are governed, not discretionary by default:

- **Treasury — the Foundation's operations.** Funds the Foundation's management, administration, legal, compliance, governance, and board. It is fed by published fees on work the Foundation performs — a **registry fee (1%, where Carrot is the registry of record)**, a **rewards-distribution / settlement fee (2.5%)**, and **dMRV / integrity charges (currently 16.5%, varying by scenario)**. Together these are the network's share — 20% where Carrot is the registry of record — so 100% of every credit sale funds the mission — at least 80% reaching the ecosystem directly, the remainder sustaining the public rails — a split reviewable in the Rewards Distribution Policy rather than asserted as a headline rate. Because the Treasury is funded by published fees on a non-profit steward — not a dividend that grows with issuance — funding the network never competes with protecting its integrity.
- **Community Pool — ecosystem growth.** Funds network onboarding, expansion, and use globally. It is fed by three of the network's incentive mechanisms: the discount applied while an important stakeholder — in recycling supply chains, the waste generator — is not yet identified, which drives full digitization to the source; the self-policing mechanism, which withholds rewards from bad actors; and unclaimed rewards. Value that would otherwise sit idle is recycled into growing the open network — and this pool is designed to move toward open governance so other ecosystem actors can help direct it.
- **Impact Pool — local development.** Where the waste generator is a large business, a portion of the rewards it would receive is directed here instead, funding socio-environmental and circular-economy projects **at the country level**. This keeps a participation incentive in place and a baseline flow of rewards to service providers across the ecosystem, while ensuring credit buyers are not financing rewards to large corporations — routing that value to local engagement and development.

Two of these pools turn the network's own integrity mechanics into fuel for the public good. The **source-tracing incentive** — a discount along the service-provider chain when the generator is not identified — makes full digitization to the source economically advantageous, and the value it frees flows to ecosystem growth rather than to any private party. The **self-policing mechanism** ties rewards to honest data: because rewards flow along each underlying unit's chain of custody, a record flagged for bad or fraudulent data is disqualified, withholding rewards from *everyone* on that chain — so if, for example, a hauler and a recycler submitted false data to inflate rewards, the waste generators behind them would stop being rewarded too — putting the continuation of the contracted service itself at risk. The same would occur in any project that does not meet its agreed milestones, ensuring that everyone in the chain collaborates and works toward the agreed goal. Honest data is the

condition of being rewarded at all, and the withheld value funds the ecosystem. The Foundation can also suspend or remove bad actors.

Seen from the supply side, these same mechanics **de-risk participation.** A recycler, a cooperative, or a municipality deciding whether to invest in collection, sorting, or measurement faces a predictable rule set, not a discretionary one: rewards are tied to verified outcomes rather than to a volatile headline price set by an operator; the fee schedule is published in the Rewards Distribution Policy, and changes to it pass through governance rather than operator discretion; and value reaches every verified role in the chain through the same transaction, rather than concentrating with a single buyer or intermediary. Rewards distributed under predictable, published rules, against verified outcomes, are what let a small operator treat environmental work as investable rather than a gamble. That is the financing system named at the outset, seen from its supply side — and the precondition for the demand-side commitments described in *Shaping markets*, below.

Working with the state — and what the foundation guarantees

The DPI literature generally assumes a *state* stands behind the infrastructure, guaranteeing access and reward-sharing. The Carrot Network has no state behind it — so it has to be clear about what provides those guarantees, and about how it works alongside the public sector rather than against it.

Some things only a government can do: it can make participation compulsory across a whole market, it carries an electoral mandate, and it can act as a backstop of last resort. **The Carrot Foundation claims none of these,** because it is an *opt-in, additive* market layer, not a gatekeeper to any essential service. What a purpose-locked foundation *can* guarantee are exactly the things a voluntary market needs in order to be trusted — or that a regulator can choose to endorse or reject at any time:

- **No private capture, locked in.** The purpose is fixed in the Deed and cannot be redirected toward private gain by ordinary decision — only through the external supervisory process Swiss law prescribes for altering a foundation's purpose.
- **External accountability.** Federal supervision and audit sit above the Foundation's own management.
- **Continuity that does not depend on the steward.** Because the verification code is open source and the public credit registry and open methodologies are not locked inside Carrot, the rails can outlive the institution that stewards them today. If the Foundation failed or lost its way, the network's public assets would remain auditable — and could be taken up and continued by others.

Far from competing with government, the infrastructure is built to *lighten its load*. It can lower public costs — waste handling and enforcement, the public-health burden of unmanaged pollution, the remediation of contaminated land and water — freeing municipal budgets while supporting local productivity and green jobs. It also brings technology, financing, and verified data to bear at a system level, across jurisdictions, value chains, and borders — beyond the remit of any single government. In that sense it is a **facilitator** for the public sector and a **safeguard** for the market it underpins: it supplies the verification, traceability, and settlement that market needs to be trusted, while the state keeps its mandate, its regulatory authority, and its role as ultimate backstop. The result is a clear division of labor — **public purpose anchored in a purpose-locked foundation and open infrastructure; public authority retained and exercised by the state.**

A new pathway: private capital, public destination

One question remains from the previous section: can infrastructure with no state behind it be counted on in the same way? Most DPI to date has been state-initiated — UPI under a central-bank mandate, X-Road by the Estonian state, MOSIP as a multilateral open-source collaboration. State leadership built the reference cases, and it brings strengths no foundation can replicate: scale, mandate, and democratic legitimacy. But it also carries risks the DPI experience has made familiar. Priorities and funding can shift with administrations and budget cycles, exposing infrastructure to political reversal or under-investment; commitments to openness can be hard to sustain across political transitions; a system funded as one line in a national budget competes with every other need that budget carries; and infrastructure bound to a single state does not easily serve people and markets beyond its borders.

None of this argues against public leadership — it argues that what makes infrastructure dependable is not who owns it, but whether its purpose, funding, and governance can hold steady across political time. The DPI literature reaches the same conclusion from the

other direction: it does not require a state *origin* — only public *governance*. Co-Develop treats who builds DPI as an open design choice so long as public accountability holds; the UCL IIPP paper accepts privately-managed DPI provided access and reward-sharing are guaranteed. The lesson is that **operation can be non-governmental as long as something guarantees the public destination.**

The Carrot Network applies that pattern to a domain where cross-border coordination has been slow — environmental markets — using **private capital as the trigger** and a purpose-locked foundation as the guarantor of the **public destination**:

- **The trigger is private.** Solidos Brasil LTDA, the development company (the "Lab"), raised early capital under conventional instruments to develop the open rails, the methodology standard, and the dMRV pipeline.
- **The transfer is structural.** Under an intellectual-property assignment agreement signed on 22 December 2023, Solidos Brasil LTDA assigned the Carrot Network intellectual property — the code, the methodologies, the registries, and the associated domains and content — to the Carrot Foundation, which now holds it in stewardship under Swiss foundation law. Solidos Brasil was the first company to build the network's technology; it continues that work for the Foundation today alongside a growing set of independent builders — among them **EcoCircle**, **Eloverde**, and the **Mare Foundation** — as open infrastructure designed for many builders.
- **The destination is public.** Governed under Art. 80 ZGB, the Foundation is the purpose-bound steward of the rails.

The Swiss-foundation-as-steward form is well established for public-interest assets — it is the structure philanthropy has long used for mission-locked institutions, including the Geneva-based product-development partnerships built for global health — the **Medicines for Malaria Venture**, a Swiss foundation since 1999, and the **Drugs for Neglected Diseases initiative**, constituted like the Carrot Foundation under Article 80 *et seq.* of the Swiss Civil Code — assets stewarded for a mission rather than for owners. The Carrot Network applies that stewardship pattern to environmental markets — with the rails themselves released as digital public goods.

The environmental extension

Environmental markets need one design element that identity and payments infrastructure did not: a **crediting instrument** to internalize externalities.

Using identity or payments infrastructure has immediate value to the user, so adoption is self-motivating. Environmental work — reuse, recycling, composting, anaerobic digestion, super-pollutant reduction (e.g., methane, nitrous oxide, ground-level ozone, black carbon, and fluorinated gases), carbon dioxide removal, reforestation, water and nature restoration, renewable energy production, among others — is different: it produces value (the public good) for third parties (the city, the atmosphere, future generations), and the people doing the work are not automatically rewarded by those who benefit. Without a mechanism to channel buyers' and obligated parties' willingness-to-pay back to the people producing the outcome, the rails have no fuel.

Carrot's credits — the Recycling Credit and the Carbon Credit, recorded on a public, auditable registry — are that mechanism. Both are live today: credits have been issued, sold, and retired, and the proceeds distributed to the participants recorded along each underlying unit's chain of custody. They are, in effect, an **outcomes-based (results-based) financing instrument**: a buyer's payment is released against a verified environmental result, not a promise or an estimate, and the value it releases is distributed to the people who produced that result. This is the financing model the development-finance institutions have themselves formalized. The World Bank's *Carbon Crediting: A Results-Based Approach to Mobilizing Additional Climate Financing* (2025) frames crediting as results-based finance — funding released only once outcomes are achieved, measured, and independently certified — with its **SCALE** trust fund as the Bank's platform for results-based climate finance, and the IFC's *Unlocking Social and Environmental Impact: Outcome-Based Finance* (2025) makes the case for outcome-based instruments as the pathway for impact capital in emerging markets. Carrot's crediting mechanism applies that model on open public rails: **the network operates as a public registry for the circular economy — an open, digital MRV and crediting infrastructure** on which established standards, registries, and buyer coalitions can build. The credits are market instruments running *on top of* public-purpose rails, with rules and value flows visible and inspectable. The DPI pattern absorbs this extension

cleanly: **the rail stays public; the credit is the market-forming layer that makes the rail economically viable for the people doing the environmental work.**

INTEGRITY IS UPSTREAM

Recording a credit on a public registry confers durability and auditability — not integrity. Integrity comes from the methodology and independent verification upstream of the registry.

Carrot is the shared infrastructure that operators, methodology authors, accredited verifiers, and buyers all build on; it does not run environmental projects on the ground and is not the verifier. That separation is what lets the network serve as shared rails for every stakeholder — and, because all of them build on the same open infrastructure, what makes it scalable and interoperable.

Shaping markets, not only recording them

Public rails and a credit instrument make a market *possible*. What makes it *work* is the ability to shape demand and de-risk supply so that capital moves before the outcome exists. This is where public infrastructure does more than record transactions — it can help *transform* a market, shaping it toward a directed outcome rather than merely clearing individual transactions.

That reframing has a rigorous grounding, and it turns on a distinction worth making plainly. The conventional view treats a market as a natural default that occasionally **fails** — through externalities like pollution, or missing public goods — leaving the public role to **correct** the failure and then step back. Mazzucato's *Governing the Economics of the Common Good: from correcting market failures to shaping collective goals* (2024) rejects that premise: markets are not givens to be patched but *"outcomes of governance structures"* — made, and therefore able to be **shaped**, by the actors who govern them. The task is not to *fix* a market after it fails, but to **form and shape** one, steering it toward a collectively-chosen direction.

For the environmental economy the distinction is decisive — it is the diagnosis this paper opened with. The hundreds of billions that should flow to verified environmental and social outcomes, and do not, mark a market to **form**, not a failure to correct. Nor will today's channels form it on their own: cross-border private climate finance travels overwhelmingly as project debt to utility-scale energy in a handful of large markets, **and it does not reach the distributed environmental work** — the small producers, cooperatives, and municipal chains — where circular-economy outcomes are actually made. Part of what keeps that work out of reach is the cost of entry: conventional crediting programs and registries carry upfront accreditation and registration fees that price out small and midsize operators — few composting facilities or recycling centers can afford accreditation with a registry, much less carry that cost with no assurance that credit sales will ever pay it back. As a digitally-native registry, Carrot sharply lowers that cost of participation — expanding access, and with it a pool of credit supply today's markets have yet to reach. Carrot is infrastructure for that formation: a rail governed for a fixed public purpose, built to give a market its direction rather than only to record what happens within one.

The mechanism that does this on the demand side is **coordinated advance demand** — buyer's clubs, demand coalitions and alliances (the pattern used for vaccines and now carbon dioxide removal), and, in its most formalized form, the Advance Market Commitment (AMC). It is also the coordination device the opening of this paper called for: a way for willing buyers to act together, at the level of a system, without waiting for unanimity. An AMC is a commitment, made *before* the supply exists, to purchase a defined volume of a **verified outcome** at a defined price. That forward commitment is what makes the supply financeable: it turns "we hope someone buys this" into "this volume is already sold," which is the demand certainty that lets a supplier — and its financiers — invest. The AMC enters to give a market that needs formation its first firm demand. The pattern has a track record:

- **Health.** The canonical case is the pneumococcal AMC: in 2009, five governments and the **Bill & Melinda Gates Foundation** committed **US$1.5 billion** through **Gavi, the Vaccine Alliance**, to guarantee demand for pneumococcal vaccines before manufacturers had built the supply. It worked — over a billion doses have since been supplied to lower-income countries, and the final tender drove the price to US$2 a dose. The same logic, at emergency speed, underpinned the **COVID-19 advance purchase agreements**, which committed roughly **US$18 billion** to vaccines that did not yet exist.
- **Carbon removal.** Frontier Climate — the buyer coalition built by Stripe — has used advance commitments (prepurchases plus pay-on-delivery offtake agreements) to pull early carbon removal off

the lab bench. Its buyer commitment has grown to **US$1.8 billion** (June 2026), with roughly **US$694 million already contracted** to carbon-removal suppliers — and **71% of founders said it influenced their decision to start a carbon-removal company** (Ransohoff, *How to Start an Advance Market Commitment*, 2024). Ransohoff explicitly lists **greenhouse-gas removal, including methane and nitrous oxide,** among the next domains suited to an AMC.

- **At coalition scale.** The **Symbiosis Coalition** (Google, Meta, Microsoft, and Salesforce) has announced its intention to contract up to **20 million tonnes of nature-based carbon-removal credits by 2030** through a shared, quality-first process — a live example of buyers coordinating advance demand. Renaissance Philanthropy's *Commitments Playbook* (2024) describes how such coalitions are assembled: anchor commitments, a public call to action, and time-bound deadlines that convert pledges into coordinated demand.

An advance commitment, though, is only as credible as the verification and settlement behind it. To commit to buy "a verified outcome" before it exists, a buyer needs to trust that the outcome can be **independently verified**, **uniquely recorded** so it cannot be double-counted or double-sold, and **settled transparently**. Those are the three trust functions — identity, data exchange, settlement — that public digital infrastructure provides, and the digital public goods the Carrot Network releases: open methodologies, an open public registry, and open verification code. In development-finance terms, this is what makes an outcome **bankable**: when many buyers commit in advance to purchase future output, that certainty of demand lets capital treat small, dispersed environmental producers as investable — the market-building logic development-finance institutions already apply to blended finance (the International Finance Corporation has made this case in emerging-market circular-economy finance).

THE MARKET-FORMATION PATHWAY

digital public goods → verifiable, uniquely-recorded outcomes → outcomes that buyers can commit to in advance → de-risked, bankable investment → a market that pays for results.

The Carrot Network provides the public infrastructure on which such commitments can be coordinated, tracked, and scaled. It does not itself run a market commitment or act as buyer; it makes the pattern possible and credible for the coalitions, funders, and obligated parties who do. The rails are deliberately agnostic to why a buyer pays: whether demand comes from a voluntary coalition, an obligated party under regulation, or a public program paying for results, the verification, unique recording, and settlement are the same. No voluntary market closes a gap of the scale this paper opened with on its own; what it proves is the trust infrastructure every demand channel needs in order to reach the distributed work where outcomes are made. Used this way, the infrastructure supports a shift in climate and environmental finance **from promises to verified outcomes** — built on public rails.

Carrot in the global DPI conversation

Environmental markets are now an explicit frontier for DPI — and Carrot is an operating contribution to it, not a claim on empty ground:

- The **ITS Rio / Ronaldo Lemos report *Digital Public Infrastructure for Climate*** (2025), prepared for the COP30 Presidency, frames "Climate DPI" as an operating system for climate action and proposes a modular "ClimateStack" whose layers explicitly include **carbon markets and the settlement of credits and climate finance** — the market-facing functions, not only data. The Carrot Network is an early-stage, operating implementation of that finance-and-registry function, focused first on waste and methane, and shows how those settlement and market layers can be built as public goods rather than as a proprietary exchange. With the right partners and capital, the same rails can serve nature and climate DPI more broadly — they are domain-agnostic by design.
- The **UNDP's "Nature ID"** work proposes DPI for nature and climate as an interoperability layer for environmental data, carbon-market traceability, and biodiversity credits — naming real-world anchors such as Brazil's Cadastro Ambiental Rural.
- The institutions defining DPI — **UCL IIPP**, the **Co-Develop Fund** (Rockefeller Foundation, Bill & Melinda Gates Foundation, Omidyar Network, Nilekani Philanthropies), the **UNDP**, and the **World Bank** — have concentrated on identity, payments, and data exchange. Carrot's contribution is to show that the same design pattern, the same governance standard, and the same market-shaping potential extend to environmental claims — from waste and methane today toward water, nature, and biodiversity. Carrot itself does not trade materials or run services on the ground; it makes the value of the

verified public good tangible and channels it to the ecosystem that produced it.

Building DPI responsibly: the risks we design against

DPI is not automatically benign, and a credible public-infrastructure project should say so in concrete terms. The UN's *Universal DPI Safeguards Framework* (UNDP and the UN Office for Digital and Emerging Technologies, 2024) and a substantial independent literature document real harms from real systems — exclusion, surveillance, and capture. The hardest lesson from large-scale deployments is precise: **when access to an essential service is gated behind a digital rail, failures of that rail fall hardest on the most vulnerable — and "voluntary" systems tend to drift toward de facto mandatory as essential value concentrates on the rail.** As a non-state builder, the Carrot Network is itself a subject of the Universal DPI Safeguards life cycle, and we accept that standard.

How the network is designed against each failure mode — stated honestly, including where a guardrail is still maturing:

- **Exclusion / the drift to de facto mandatory.** Carrot rewards people for environmental contributions at a system level; it does not stand between anyone and their food, identity, benefits, or livelihood, so the welfare-gating failure mode does not arise in the same form. The subtler risk is Carrot's own: as demand concentrates on the rail, a participant who is not registered could lose access to the *rewarded* market for their contribution. The network is an additive market layer: participation is opt-in, and participants can and do transact off-rail — private buyers and municipally-run channels exist, though they remain small, local, and hard to scale — and no buyer is required to source only through Carrot.
- **Surveillance and data risk.** A registry that records identified workers' contributions is itself a potential surveillance surface, so the scope of public transparency matters. Public-registry transparency is **scoped to credit records** — issuance, transfer, retirement — while operational and personal data is **permissioned to auditors and verifiers**, not open to all, and is handled under a data-minimisation, encryption, and retention posture and applicable privacy law (LGPD/GDPR), as set out in the published Privacy Policy.
- **Capture.** Carrot is **deliberately centralized today**, under a focused development team, to ensure foundational quality, a clear vision, and strong early leadership. This is a feature of the early phase, not the end state: participation expands to more stakeholders over time, and **guardrails are added as the network grows, aligned to the Foundation's stated purpose.** The structural protections that hold throughout are the purpose-lock (the mission cannot be unilaterally changed), external federal supervision, and open interfaces and open code so others can build on the rails — and, if necessary, carry them forward independently.
- **Registry integrity.** Recording a credit on a public registry confers durability and auditability — not integrity. Carbon and environmental markets have seen weak credits passed off as verified; Carrot enforces integrity upstream, in the **methodology and independent third-party verification**. For example, each unit of material (a MassID) can carry at most one carbon credit and one recycling credit, which prevents double-counting, and co-benefits are never priced into the carbon credit. Methodologies published on Carrot confront offset and greenwashing risk directly, and credit buyers who overstate their claims can be suspended.

We offer these as commitments we can be held to, through named mechanisms rather than assurances of good character — open code anyone can audit, a public registry anyone can inspect, federal foundation supervision, and a published Rewards Distribution Policy and Terms & Conditions. Integrity in this domain has to be demonstrated through mechanism — compliance, traceability, transparency — not declared.

Learn more

The market this paper opened with is not waiting to be corrected; it is waiting to be formed — and no single company or government can form it alone. Forming it takes the three things named at the outset, and the Carrot Network is where they can exist together at scale: a financing system that directs capital to verified outcomes and distributes value to the people who produce them; a technology layer, built from digital public goods, that makes those outcomes trustworthy; and a purpose-locked steward, externally supervised, that holds the rails to their stated purpose. Each is inspectable today. The work of formation itself is shared by design — it belongs to the buyers, builders, funders, and public bodies these rails were built for. The notes that follow describe where each can begin.

For philanthropic funders and catalytic investors — The Carrot Foundation is structured to receive philanthropic and catalytic capital in support of the public-purpose rail: methodology development, the dMRV pipeline, and network governance. It can also fund the Foundation's own early-stage capacity — the administrative and development costs of standing up a public-purpose institution before the network's published fees can carry them. The same rails let a funder or buyer coalition direct outcomes-based advance commitments to verified environmental **and social** results — cleaner material streams and lower emissions, plus green jobs, inclusion, and local development — de-risking the producers who deliver them. Philanthropy, used this way, is **market-forming capital**: it moves before a market can pay for itself, and it leaves behind open rails that others build on. Funders who want to examine the rails, the Rewards Distribution Policy, or the public registry directly — or to explore what an anchor commitment could help form — are invited to start that conversation with the Foundation. For support, contact fund.impact@carrot.eco.

For ecosystem participants and integrators — The Carrot Network is open to the people and businesses who produce verified environmental outcomes — in today's circular-economy chains: waste generators, processors, and recyclers — and to the integrators who connect them to shared rails. Reward is tied to verified outcomes under a published, rules-based schedule that participants can plan and invest against. For onboarding support participants can contact onboard@carrot.eco; for accreditation of project developers and recyclers, operations@carrot.eco; and for network integrators, integration@carrot.eco.

For buyers and demand coalitions — A credit on the network is an outcomes-based instrument: payment is released against an independently verified result, uniquely recorded so it cannot be double-counted or double-sold, and settled transparently — visible from purchase to the people who produced the outcome. The same rails let coalitions coordinate advance commitments to outcomes that do not yet exist, with the verification and settlement already in place. For support, contact registry@carrot.eco.

For governments and public agencies — The infrastructure is built to lighten the public sector's load, not replace it: lower waste-handling and enforcement costs, reduced public-health and remediation burdens, freed municipal budgets, and support for local green jobs and productivity — with the verified data, traceability, and settlement a market needs, while the state keeps its mandate, regulatory authority, and backstop role. It can also enable new market-based policy: under **extended producer responsibility (EPR)**, for example, producers can meet obligations by funding verified waste-reduction outcomes directly — compliance demonstrated through results rather than through documentation alone. For support, contact gov.support@carrot.eco.

For researchers and policy actors — Methodology frameworks, verification code, and the public credit registry are publicly inspectable digital public goods. For research and methodology development, contact science@carrot.eco.

For general questions — contact@carrot.eco.

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External resources

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