TERRASOS

WORKING PAPER

BIOCREDITS AND HABITAT BANKS: RETHINKING THE DEVELOPMENT AND MAINTENANCE OF ECOLOGICAL INFRASTRUCTURE

Authors: Mariana Sarmiento, Charles Bedford

BIOCREDITS AND HABITAT BANKS: RETHINKING THE DEVELOPMENT AND MAINTENANCE OF ECOLOGICAL INFRASTRUCTURE

- *Biodiversity credits under an ecological infrastructure framework have the potential to accelerate funding for biodiversity conservation while benefiting local communities and biodiversity custodians.*
- *To make voluntary biodiversity credits (biocredits) work for nature and its custodians, we need to step out of the carbon credit framing for both technical, social and practical reasons.*
- *An infrastructure framework for Biocredits provides a way to accountably, traceably, transparently fund the restoration of natural landscapes and to benefit the people who have maintained the nature that we all need to survive.*

Authors:

Mariana Sarmiento
Chief Executive Officer of Terrasos, biodiversity custodian, Colombia

Charles Bedford
Professor, Hong Kong University of Science and Technology, and Chief Impact Officer, Carbon Growth Partners

SUMMARY

The notion of nature as critical infrastructure that must be restored and maintained has historically been confined more to theory and academia than put into practice. However, recently, many governments, non governmental organizations (NGOs) and the private sector have created new financial mechanisms that are beginning to ensure the appropriate investment in our natural infrastructure. The Kunming-Montreal Global Biodiversity Framework indicates that $600-800 billion per year will be needed by 2030 to close the biodiversity funding gap. This sum of money can only be generated by valuing nature properly and creating markets that will mobilise private, public and institutional capital.

Biodiversity credits or units are a new type of asset that should be developed to finance the restoration and maintenance of our ecological infrastructure. The term "biodiversity credits" or "biocredits" is used generically to signify an intangible asset created through the voluntary or compliance-driven restoration and management of land for at least 30 years.

We do not distinguish between the funding source for the biocredit tool, rather focus on the parallels and learnings from grey, or built, infrastructure.

Biocredits are in use already in a number of jurisdictions: in the US they come in the form of compliance obligations created by the Endangered Species Act and the Clean Water Act, in Colombia through regulatory requirements for infrastructure developers to restore a multiple of the habitat that is destroyed by the project, and there are a variety of nascent voluntary bio-crediting systems in place, both aligned with and completely separate from regulatory compensation structures. Biocredits differ from carbon credits in that they represent long-term ecological and management outcomes. Biocredits are forward-looking, focusing on delivering, maintaining, and repairing ecological infrastructure and creating the institutional and social fabric that can sustain it. They also reflect the need to embed the externality of nature into the development process.

The idea of nature as infrastructure can be traced back to the 1800s or before.[1] To combat nature loss, it is essential to shift the conversation to a long-term infrastructure type market framework, where desirable ecological infrastructure is repaired, built and maintained. This is in contrast to the carbon market which has been designed to create incentives for reducing emissions, and therefore for obsolescence, as the energy transition progresses toward 2050.

With this in mind, this working paper describes the multiple ways in which the private sector interacts in infrastructure markets in an effort to shed light into how to increase financial flows and to utilize biodiversity credits or units and other market mechanisms to support ecological infrastructure. We draw parallels between the built infrastructure finance and maintenance systems and the restoration and management of natural infrastructure and conclude with some recommendations for adoption of infrastructure standards and practices for nature.

1 Nelson SH, Bigger P. Infrastructural nature. Prog Hum Geogr. 2022 Feb;46(1):86-107. doi: 10.1177/0309132521993916. Epub 2021 Feb 25. PMID: 35115736; PMCID: PMC8801626.
See also https://www.eco-business.com/opinion/nature-as-infrastructure/ commentary by Erik Berglof chief economist from the Asia Infrastructure Development Bank.

CONTEXT: BUILT INFRASTRUCTURE

Spending on infrastructure globally is approaching $2.5 trillion per year[2] and spans various sectors, such as transportation, energy, water, and telecommunications, and involves various technologies like smart grids, smart contracts, and digital infrastructure. Risk management and design for permanent maintenance is also essential for long-term natural infrastructure projects. In architecture, form follows function; likewise infrastructure financing is designed to deliver funding at the same pace as the development, maintenance and reconstruction of the facilities requires.

Infrastructure markets today involve significant investments from both public entities and private investors, with different business models accommodating each. Private capital typically enters the infrastructure markets through concession models, public private partnerships, and other private initiatives. Concession models involve private sector financing, construction, and operation of infrastructure projects for a specific period, with ownership and control of the asset eventually transferred to the public sector.

Concession agreements can be used for traditional infrastructure such as toll roads, bridges, public facilities, airports, hospitals, and water treatment plants. For natural infrastructure, private actors have developed and operated projects, such as ecosystem restoration projects like habitat banks in the US and Colombia, or efforts like the creation and management of Indonesia's Komodo National Park, or contracting systems where concessionaires run commercial operations in national parks. Public-private partnerships (PPP) and private initiatives involve public and private sectors sharing responsibilities and risks in designing, financing, building, and operating infrastructure projects where pay for success components are included that are similar to what is seen with biocredit projects.

Payment and pricing possibilities vary depending on the type of infrastructure and business model involved. Pricing in the infrastructure market is typically unitized, with standards and rules of thumb to help ensure quality, encourage best practices, manage costs and ensure fairness.

2 McKinsey & Co. Bridging global infrastructure gaps https://www.mckinsey.com/~/media/mckinsey/business%20functions/operations/our%20insights/bridging%20global%20infrastructure%20gaps/bridging-global-infrastructure-gaps-in-brief.pdf

CONTEXT: NATURAL INFRASTRUCTURE

The purpose of biocredits is delivering, maintaining and repairing ecological infrastructure. Although the instrument is relatively new as a tool, the notion of nature as infrastructure can be traced back to the 1800s or before[3]. Public funding for the protection of nature has generally followed the infrastructure model, through public investment in national parks and public lands predominantly.

However, this limited public investment has failed to protect the diversity of life on earth—because of the limited extent of public lands, conflicting uses on public lands, and lack of funding for management and restoration, climate change, and general population and development growth needs. With this in mind, adding private investment mechanisms to infrastructure funding models can assist in the protection of nature alongside the public mandate.

Maintaining natural infrastructure, just like maintaining a highway or a municipal facility, is fundamentally a cost based exercise. The use of biocredits to combat nature loss is more appropriately aligned with infrastructure frameworks, and has less of an analogue in carbon markets. Carbon is a negative externality, so using speculative markets to drive higher pricing is critical to deterring emissions. Natural infrastructure is a positive requirement for life on earth, so requires more long term planning and cost based pricing.

The comparison of biocredits to carbon credits is not particularly useful given that their only similarity is that they are both relatively new types of assets.

1. **Source:** Carbon credits can be generated from a multitude of sources. All biodiversity credits come from nature.

2. **Term:** Carbon credits represent annual outcomes. Biocredits must represent long-term ecological outcomes, commitment, and management.

3. **Temporal aspect:** Biocredits are forward looking; they are about delivering, maintaining and repairing ecological infrastructure and creating social fabric that can sustain that infrastructure. Carbon credits are retrospective; a reward for having kept carbon in the ground or preventing its emission into the air.

4. **Purpose:** Carbon credits reflect our need to re-balance atmospheric chemistry. They are fundamentally about pricing pollution, something negative. Biodiversity credits maintain the natural infrastructure that supports us all. They fund nature, something we must have to survive.

5. **Pricing:** Carbon markets have been around for 30 years and are beginning to mature, with compliance markets, taxes, cap and trade schemes and voluntary markets all converging on what will ultimately be a global price for carbon. Biocredits, in the compliance context at least, predate the carbon market (eg, US habitat banking model), and have long established that nature has a highly variable price, depending on the context, geography, and activities required to protect and restore it.

3 Carse, A. (2012). Nature as infrastructure: Making and managing the Panama Canal watershed. Social Studies of Science, 42(4), 539-563. https://doi.org/10.1177/0306312712440166

LESSONS FROM THE BUILT ENVIRONMENT

Given this more useful paradigm, what lessons can we draw for natural infrastructure funding from traditional infrastructure?

1. **Diverse Sectors or Services:** Infrastructure markets span various sectors--transportation, energy, water, and telecommunications. Different types of infrastructure provide different types of services. Similarly, different types of ecosystems provide different types of services – some provide better services as carbon sinks, others for water quality and quantity regulation, and others for biodiversity. The costs of maintaining and providing those services are similarly quantifiable whether natural or built infrastructure.

2. **Long Lifecycle:** Infrastructure projects often have long lifecycles, with planning, construction, and maintenance phases lasting for decades. In the case of biodiversity, the goal is to maintain it in perpetuity.

3. **Regulatory Framework:** Infrastructure development is subject to extensive regulations, requiring adherence to standards and compliance with environmental, safety, and other regulations. Similarly, biocredit projects must operate within complementary national regulations, adherence to standards, audits, etc.

4. **Technology Integration:** Infrastructure development increasingly incorporates advanced technologies like smart grids, smart contracts, project finance, DMRV and digital infrastructure to enhance efficiency, transparency and sustainability. In like fashion, biocredit projects use smart contracts, blockchain, bioacoustic monitoring, and remote sensing to assure outcomes are maintained.

5. **Risk Management:** Involves managing various risks, including political, financial, climatic, and operational risks, due to the long-term nature of projects. Both nature and, say, transport and energy infrastructure need this function.

Investment in biodiversity conservation has traditionally been limited to public or philanthropic funding, which so far has proven to be insufficient to the challenge and scale of the biodiversity crisis. In the case of traditional infrastructure, national governments, along with multilateral lending organizations, and now private investors, have developed multiple types of arrangements from which we can draw on for use in funding natural infrastructure. Infrastructure markets today involve significant investments from both public entities, such as governments, and private investors, that different business models. Designing for and accomodating diverse funding sources is a success story in the infrastructure market and can be adopted more widely for nature.

INFRASTRUCTURE FUNDING MODELS AND OPPORTUNITIES

Private capital to finance the built environment comes in many forms including concession models, public private partnerships, and private initiatives. When looking at each of these closely it is clear that these models can equally apply for natural infrastructure and unlock the amount of finance that is required to maintain the natural asset base.

Below we describe some specific models of private capital financing for traditional infrastructure and highlight a few areas where they also have financed natural infrastructure:

Typology	Private initiatives - Build-Operate-Transfer (BOT)	Private initiatives - Build-Transfer-Operate (BTO)	Public-Private Partnership (PPP):	Concession Agreements
Description	BOT involves private sector financing, construction, and operation of an infrastructure project for a specific period. After this period, the ownership and control are transferred to the public sector.	The BTO model involves private sector construction and ownership of an infrastructure project, with subsequent transfer to the public sector. However, the private sector may or may not continue to operate the project after transfer.	PPP is a collaborative arrangement where the public and private sectors share responsibilities and risks in designing, financing, building, and operating infrastructure projects. This model can take various forms, such as Build-Operate-Transfer (BOT) and Design-Build-Finance-Operate (DBFO).	Private entities are granted a concession by the government to operate and profit from an infrastructure project for a specified period. The concessionaire may be responsible for financing, construction, and operation.
Traditional infrastructure example	Toll roads, bridges, and public facilities.	Public buildings, transportation systems.	Airports, hospitals, water treatment plants.	Concession to operate a port, airport, or a specific service.
Nature infrastructure example	Ecosystem restoration project is developed by private actor and operated by private actor. The project can or cannot be transfered.	Often used by US NGO's to secure critical lands more quickly than government can move, then transfers lands to a government land management agency.	Komodo National Park is a cooperative example of a private company and an NGO planning and managing a national park under contract with the Govt of Indonesia.	Setting up and maintaining physical infrastructure in US national parks, funded through a revenue stream related to users of nature tourism.
Who Pays for Natural Infrastructure	Users of the nature infrastructure project	Initially charitable dollars, usually repaid by government appropriations on subsequent transfer.	Combination of govt funds, user/visitor fees, charitable funds, and revenues from commercial activities	Facility or nature can be financed through a bond to be repaid by concession revenues.
Payment and pricing possibilities	Transfer ocurrs when full payment has been delivered by public or private entity			Private actor pays "licencing" fee to government.

PRICING

Pricing in the infrastructure market can vary widely depending on the type of infrastructure and the business model involved. Prices and costs are typically unitized. For example, in linear infrastructure such as roads, rails or transmission lines, units are price per kilometer or meter. No two infrastructure projects are the same or cost the same, though there are standards and best practices that help set costs for bidder and buyer. As with biodiversity projects, no two ecosystems are the same, though the common denominator for all is cost per area (hectares, acres or square meters).

Hence, pricing depends on factors such as the nature of the infrastructure, prices of land, the regulatory environment, risk allocation, and the goals of the public and private stakeholders involved. It's essential to strike a balance that ensures fair returns for the private sector while providing affordable and reliable services for the public or private actors involved, which includes communities and landowners. This means that the price should at least cover the cost of developing the infrastructure and maintaining it.

Type / Description		
User Fees or Tariffs	**Availability Payments:**	**Concession Payments**
Users of the infrastructure pay fees or tariffs based on their usage. This model is common in utilities such as water, electricity, and toll roads. The fees may be fixed, variable, or a combination of both.	Payments are made based on the availability and performance of the infrastructure, rather than direct user fees. The government or funding entity makes payments to the private sector operator, typically in fixed amounts, to ensure the infrastructure is available for public use.	In concession agreements, private entities often make concession payments to the government in exchange for the right to operate and profit from an infrastructure project. These payments may be fixed, periodic, or based on a percentage of revenue.

Type / Description		
Lease Payments	**Capacity or Output-Based Payments**	**Incentive-Based Pricing**
In lease and operate models, private entities pay lease payments to the government for the right to use and operate infrastructure assets. The lease terms and payment structure are typically outlined in the lease agreement.	Payments are tied to the capacity provided or the output generated by the infrastructure. This model is often used in energy projects, where payments are based on the amount of electricity generated or delivered.	Pricing structures may include incentives or penalties based on the performance of the infrastructure. This encourages private operators to meet or exceed specified performance standards.

CONCLUSION

Nature and the built environment are two sides of the same coin. Both deliver services for people, and both need strategy, vision and long-term management in order to continue doing so. Yet natural infrastructure has been chronically underfunded, suffering because the world has not adequately priced the services she provides, nor built in the cost of her restoration into the industries and built-infrastructure that use her for free.

This reality is changing with the increasing awareness of the inter-connectedness of human well-being, economic productivity and the natural world. The models for permitting and financing grey infrastructure are increasingly being used to finance our natural infrastructure. It is a mistake to equate the carbon market's pricing mechanisms that are designed to deter emissions with the cost based management of natural infrastructure which is designed to maintain the biosphere, forever. Biocredits provide a way to accountably, traceably, transparently fund the restoration of natural landscapes and to benefit the people who have maintained the nature that we all need to survive.

HOW HABITAT BANKING WORKS

Habitat banking companies or organizations (they can be private, public, or non-profit) **anticipate** environmental compensation requirements that countries require of project developers. They then **identify** strategic locations and **structure and invest** in large scale conservation and restoration projects that have a minimum duration of minimum 30 years. Each site and associated project is constituted in a habitat bank that delivers environmental, social and financial returns. Landowners, habitat developers and third parties participate as investors. The payments are only made by infrastructure companies when the results from conservation and restoration are met.

The basic assumptions of the habitat bank business model:

1. **Revenue Source:** Habitat banks generate revenue through the sale of biodiversity credits or units that are mandated through national or regional laws requiring like for like compensation for destruction of natural habitat.

2. **Payment Scheme:** Payments for these units are made through a pay-for-results scheme, where the infrastructure company pays based on the achievement of contractual execution milestones.

3. **Revenue Collection:** Revenue is collected within the first 5-15 years of each habitat bank's operation, then paid out overtime in accordance with the financial plan.

4. **Activities:** The habitat bank implements both environmental restoration and conservation.

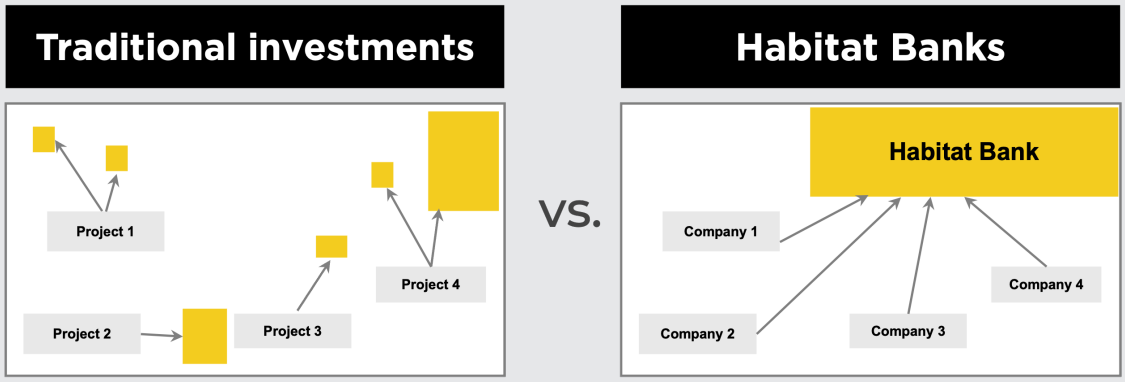
5. **Cost and Expense Structure:** Costs and expenses include the execution of tasks, obtaining land tenure, labor and the purchase of supplies related to restoration and conservation, along with the costs of structuring and managing the business model.

6. **Land Use Rights:** The right to use the land that makes up the habitat bank is typically obtained through a partial usufruct contract, which grants land use rights without transferring ownership and compensates at a rate equal to or higher than the opportunity cost of the alternative use of that land, or through fee title transfer.

7. **Duration:** Habitat banks typically have a lifespan of 30 years to permanence, depending on the legislation.

8. **Sinking fund:** To ensure the availability of resources to support operations throughout the project's life, this fund allocates part of the revenue from the first fifteen years to ensure the project can operate at least until year 30. This fund ends up looking like a pension fund for nature where habitat banks exist.

9. **Third party verification and registry:** To ensure transparency government or a third party will manage registry where all habitat banks documentation and all the transactions are recorded. No credits are released for sale unless a third party (government or qualified third party) has verified outcome completion.



- High transactions costs
- Uncertain implementation costs
- Reduced impact
- Mismatched timing between projects and duties
- Non permanence of investments and impacts

- Early investment
- Performance based payments
- Secured land
- Reduced transactions costs
- Economies of scale
- Reduce financial risk and uncertainty for companies

Habitat banks operate under a performance-based payment approach which mitigates risks for both companies and governments. Market mechanisms allow for a profit, which incentivizes private landowner participation through long term pledges of their land in exchange for payments, and private capital investment in exchange for a competitive return.

They are 'positively disruptive alternative for environmental offset implementation as an alternative to traditional low quality, dispersed, short-term interventions done directly by project developers. They are an innovative form of biodiversity conservation as projects expend capital for acquisition and restoration in the first years but retain funds in a 30-year sinking fund that pays for management for nature during that term and is segregated into a special trust attached to the land.

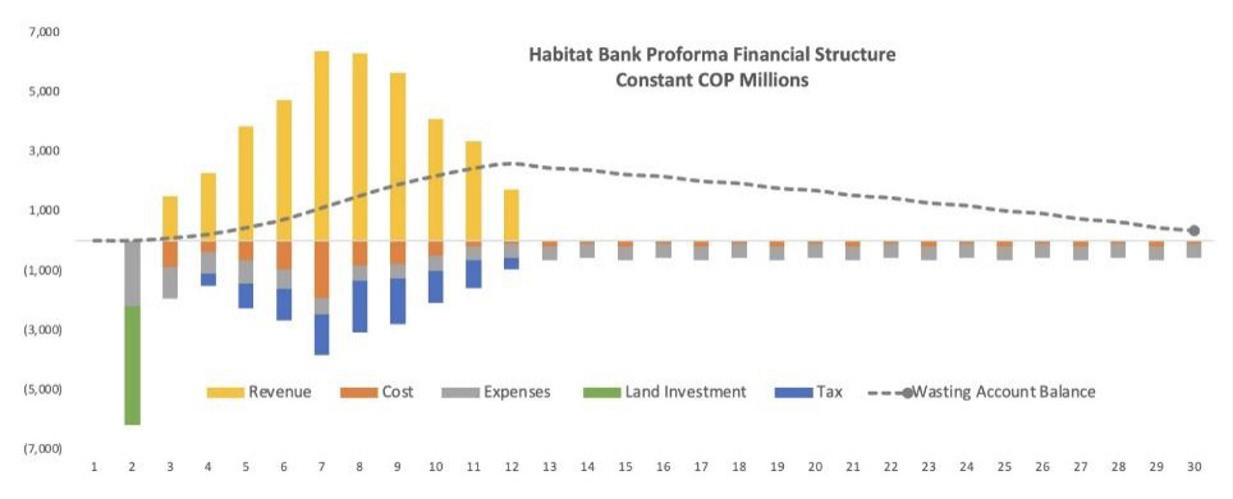


Figure 1 Sample Cash Flows of a 30-year habitat bank

The habitat banking model stands apart from traditional government-run compensation schemes due to its performance-based payments, where funds are disbursed from an independent trust upon the habitat bank operator achieving statutory milestones.


TERRASOS
Follow us on our social media:
terrasos_co
Terrasos
@TerrasosCO
Terrasos Oficial
Terrasos Colombia