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Review Article

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Climate Finance for the Global South: Carbon Credits and Debt Swaps

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Abstract

This paper examines how nature-based carbon credits and debt-for-nature swaps can jointly support climate mitigation, biodiversity conservation, and economic resilience in the Global South. Agriculture is a major contributor to greenhouse gas emissions and soil degradation, disproportionately affecting smallholder farmers in low-income countries. What mechanisms can enhance the income models of smallholder farmers to facilitate their transition to sustainable agricultural practices that improve soil health and contribute to climate change mitigation? Nature-based carbon credits offer a promising solution by monetizing carbon stored in soils, trees, and pastures. When verified and traded, these credits can provide farmers with additional income while helping companies meet net-zero targets. However, the voluntary carbon market remains fragmented and largely inaccessible to smallholders. Debt-for-nature swaps complement this approach at the macroeconomic level by allowing countries to reduce sovereign debt in exchange for environmental commitments. When combined, these instruments can unlock greater impact by aligning fiscal relief with climate action and facilitating financial flows from the Global North to the Global South. The paper highlights the G20's strategic role in scaling these solutions. It recommends establishing a global knowledge centre to standardize debt-for-nature swaps, promote high-integrity carbon credit frameworks, and support jurisdictional and commodity-wide approaches. The G20, in collaboration with the IMF, World Bank, NGOs, and the private sector, can help mobilize the financial and technical resources needed to expand access to carbon markets and support sustainable development.

Keywords: Nature-Based Carbon Credits, Debt-For-Nature Swaps, Voluntary Carbon Markets, Climate Finance, Smallholder Farmers, G20 Policy Coordination

1. Introduction

Unprecedented economic growth has strained Earth's ecosystems, breaching planetary boundaries [1]. Natural resources are depleting, emissions are rising, and the climate crisis now threatens both environmental stability and human well-being.

These impacts are unevenly distributed [2]. While the Global North has historically driven much of the environmental degradation, the Global South bears the brunt of its consequences. Low-income countries, with minimal contributions to global emissions, face severe climate impacts, such as extreme weather, water scarcity, and biodiversity loss [3]. These challenges are compounded by limited resources for adaptation and development.

Addressing this imbalance requires global cooperation and responsibility. Wealthier nations must acknowledge their role and support inclusive solutions - through climate agreements, sustainable development, technology transfer, and fair trade. The G20, representing major economies, plays a crucial role in shaping this agenda.

To combat poverty and build a sustainable, green economy, we must balance progress with environmental responsibility. Economic growth and sustainability are not mutually exclusive - strategic investments in green technologies, renewable energy, and sustainable practices can drive development while minimizing ecological harm. Reducing poverty calls for targeted efforts that foster inclusive growth, especially in sectors that empower and uplift marginalized communities.

One sector where these issues converge is food and agriculture. This paper explores how to make that sector more sustainable

[1]An earlier version of this paper was published as a Policy Brief by the Global Solutions Initiative: https://www.global-solutions-initiative.org/publication/nature-basedcarbon-credits-and-debt-for-nature-swaps-as-part-of-a-climate-agenda-for-the-global-south/

while strengthening the resilience of vulnerable farmers in low-income countries. We look at the opportunities for broadening the revenue model for farmers by rewarding them with carbon credits for ecosystem services they provide, thereby providing them with the means to make their farming practices more sustainable.

We conclude that the G20, national governments, and businesses have a crucial role in establishing and scaling carbon markets, ensuring they are accessible to smallholder farmers. The paper also concludes that debt-for-nature swaps can enhance the macroeconomic stability of low-income countries, indirectly supporting smallholders. A final conclusion is that integrating nature-based carbon solutions with debt-for-nature swaps could unlock greater impact than either approach alone.

The remainder of this paper is structured as follows. Section 2 briefly examines the ecological footprint of food production. Section 3 explores how food systems can become part of the solution by transitioning to regenerative agriculture. Section 4 discusses how nature-based carbon credits can support this transition, particularly in the Global South, where the potential for carbon sequestration is significant. Section 5 introduces debt-for-nature swaps as a tool to improve both the financial and ecological resilience of low-income countries. Section 6 explores how combining these two instruments can amplify their impact. Section 7 discusses the policy implications, with a particular focus on the G20's role in enabling these solutions, and concludes the paper.

2. The Environmental Footprint of Food and Agriculture

In 2023, globally almost 54 billion tons of CO_2 equivalents (CO_2e, GHG or carbon) was emitted into the atmosphere as a consequence of human activities (In this paper we use the terms carbon and GHG interchangeably to refer to carbon dioxide equivalents [4]. CO_2e is a metric measure used to compare the emissions from various GHGs, such as methane, nitrous oxide and CO_2, on the basis of their global-warming potential). About one-third of all GHG emissions come from food and agriculture [5]. Just as human activity has driven climate change, feeding a growing global population has taken a toll on the planet's soils. Intensive agriculture has depleted up to 70% of the natural carbon content in cultivated soils (Quote by Dr. Rattan Lal in the New York Times in May 2016: "A lot of soil carbon has been lost. Some estimates are as high as 50% to 70% loss of the original carbon stock in the soil) [6]. Yet soil is the foundation of our food system - responsible for producing 95% of the food we eat [7]. A single teaspoon of healthy soil can contain more microorganisms than the global human population [8]. This complex and dynamic resource plays a critical role in carbon storage, while also supporting crop productivity, nutritional quality, and rural livelihoods.

Rising temperatures, coupled with increasing occurrences of droughts and floods, are accelerating soil degradation and erosion. Globally, an estimated 24 to 36 billion tons of topsoil are lost each year [9]. This degradation leads to soils depleted of essential carbon, reduced nutrient availability, and declining water quality - factors that severely undermine agricultural productivity. As a result, food security is threatened for approximately 3.2 billion people, particularly in Africa and South Asia [10]. Additionally, elevated temperatures contribute to rising food and headline inflation worldwide [11]. For low-income households, which already allocate a large share of their income to food, increasing prices pose a significant risk.

Agriculture's ecological footprint extends beyond land degradation. It is the largest consumer of freshwater, accounting for 70% of global withdrawals, and is a major contributor to water pollution through nutrient runoff and agrochemical discharge [12,13]. According to Poore and Nemecek, agriculture is responsible for 78% of global ocean and freshwater eutrophication [14]. Furthermore, agriculture occupies roughly half of the world's habitable land, a transformation that has driven widespread deforestation, habitat loss, and biodiversity decline.

There are approximately 570 million farmers worldwide, with smallholders accounting for 84% of this population [15]. These farmers typically cultivate small plots of land and engage in diverse agricultural practices, making a significant contribution to global food production. Ricciardi et al. estimate that smallholders produce 30%-34% of the world's food supply while operating on just 24% of global cropland [16]. Samberg et al. further highlight their importance, noting that smallholder farms generate 41% of total global calorie production and 53% of calories destined for human consumption [17].

Smallholder agriculture plays a particularly vital role in developing countries, where it serves as a primary source of income and sustenance for millions. Supporting innovation in regenerative and environmentally sustainable farming practices is essential for this group. Such approaches can enhance livelihoods, create employment opportunities, and reduce poverty - without intensifying environmental degradation. The following section explores how carbon sinks - including soils, pastures, and trees - can be leveraged to absorb atmospheric carbon and support this transition.

3. Agriculture as a Carbon Sink

To understand how nature-based carbon credits can contribute to restoring carbon balance in the global food system, it is useful to begin with the global carbon cycle. In 2023, nearly 54 billion tons of CO_2-equivalent were emitted globally. Approximately 60% of these emissions remain in the atmosphere, while the remaining 40% can be absorbed by natural carbon sinks - soils, trees, and oceans. Soils alone store an estimated 2,400 billion tons of carbon in the top two meters - three times more than the atmosphere [18]. This sequestration is driven by photosynthesis, through which plants absorb atmospheric CO_2 and convert it into soil organic matter.

While emission reduction at the farm level is essential, carbon removal is equally critical. As long as greenhouse gases remain in the atmosphere, global temperatures will continue to rise, regardless of mitigation efforts. Therefore, both emission reduction

and removal must be pursued in parallel.

Although agriculture is a major emitter, it also holds a unique capacity to draw carbon back from the atmosphere. However, intensive farming - particularly monocropping - has depleted soil carbon stocks. Studies estimate that agricultural soils have lost 30% to 75% of their original organic carbon due to conventional practices [19]. This highlights the vast potential for soil restoration and carbon sequestration across nearly all cultivated land.

If managed properly, degraded soils could reabsorb between 80 and 100 billion metric tons of carbon by 2100 (Based on information provided by Dr. Rattan Lal to the Institute for Agriculture and Trade Policy in 2000) [20]. The IPCC Special Report on Climate Change and Land (2019) estimates that grassland and cropland soils could sequester between 0.38 and 2.5 gigatons of CO2e annually, with other studies suggesting even higher figures - up to 4.4 gigatons per year [21-23]. Based on the midpoint of the IPCC range (1.44 gigatons/year), soils could deliver over 60% of the sequestration needed under the 2018 IPCC scenario.

This potential can be unlocked through regenerative agriculture, which restores biodiversity and soil health. Healthy soils absorb more carbon, which can be quantified and converted into certified carbon credits. Sequestration capacity varies by soil type, climate, vegetation, and land management. Effective practices include conservation tillage, cover cropping, crop rotation, organic amendments, and restoration of degraded lands.

The Global South holds particular promise due to its vast agricultural areas and potential for improved land management. Challenges such as deforestation and desertification not only release carbon but also reduce productivity. Sustainable practices like agroforestry, managed grazing, and organic soil amendments (e.g., compost, manure, biochar) can enhance soil fertility and carbon storage, offering both climate and livelihood benefits.

Implementing regenerative practices also addresses the second major challenge: the food transition. By 2050, the global population is projected to reach nearly 10 billion [24]. This places a dual burden on the food and agriculture sector: to at least double food production while reducing greenhouse gas emissions by up to 75% [23-26].

One strategy is to shift diets in high-income countries toward more plant-based consumption [27]. Another is to fundamentally transform food production systems. Transitioning from conventional to regenerative agriculture can reduce and remove emissions, restore biodiversity, enhance water resilience, and reduce chemical inputs.

4. Paying the Transition with Carbon Credits

Unlocking the potential of nature-based carbon credits is particularly relevant for smallholder farmers, many of whom earn below subsistence levels. A core issue in the global food system is the failure to internalize the environmental costs of production into food prices. As a result, farmers who adopt sustainable practices are not adequately compensated for the ecosystem services they provide. These services, including biodiversity preservation and pest control, benefit society at large, yet their costs are borne by farmers who cannot pass them on through the supply chain due to limited consumer awareness and willingness to pay.

To address this imbalance, new business models are needed that reward farmers for delivering ecosystem services. Without such mechanisms, smallholders - especially in the Global South - risk being excluded from the transition to sustainable agriculture, either due to financial constraints or consolidation favoring larger farms.

Carbon stored in soils and trees can be quantified, certified, and sold as carbon credits. For example, one additional tonne of carbon stored per hectare can be converted into a tradable credit. This offers a promising income stream through verifiable carbon markets.

At the moment, few markets exist in which these services, like soil health, pollination, pest control, flood control, water management and air purification, can be priced, and those that do are restricted to specific, largely developed world locations. However, pending the wider emergence of such markets, ecosystem services can be priced as co-benefits that are part of nature-based carbon credits. That is why these credits have a higher price than other lower quality credits based on, for instance, avoided emissions due to the installation of solar panels [28].

While carbon credits are not an end in themselves, they provide a practical way to value ecosystem services. Currently, the voluntary carbon market is the most developed mechanism for pricing such services. There are few markets that assign value to ecosystem services. Where such markets do exist, they are typically limited to specific regions, primarily in high-income countries (See for example, UK biodiversity net gain markets, Australian water rights trading, US nutrient credit markets). In the absence of broader market mechanisms, these services can be partially valued as co-benefits within nature-based carbon credits. Nature-based carbon credits, which include co-benefits like pollination, pest control and flood regulation, typically command higher prices than credits based solely on avoided emissions, such as those from renewable energy projects [29].

Nature-based carbon credit mechanisms enable financial flows from downstream supply chain actors and non-food sectors to farmers, supporting sustainable agriculture. Companies in the Global North are increasingly willing to purchase these credits to fulfil their net-zero emission pledges, often guided by Science Based Targets and the Paris Agreement. To meet interim goals, they invest in emissions reductions and offset residual emissions through voluntary carbon markets. Nature-based credits serve this purpose and can facilitate substantial transfers to the Global South.

While several successful agroforestry initiatives exist, soil carbon sequestration remains underutilized in carbon credit markets.

When applied, it is mostly in the U.S., where large-scale farms can absorb the high costs of data-intensive monitoring. Smallholders, however, face significant barriers due to tech- and data intensive design of these soil sequestration projects.

Nature-based carbon credits are in short supply, despite rising demand. The Taskforce on Scaling Voluntary Carbon Markets projected in 2021 that demand could grow 15-fold by 2030 (up to 2 GtCO2/year) and 100-fold by 2050 (up to 13 GtCO2/year), creating a $50 billion market in 2030 [29]. Meeting this demand requires scaling supply through the inclusion of more nature-based credits and a shift from the existing individual or 'bundled' projects to jurisdictional solutions.

However, demand alone is insufficient. The risks can be high and transitioning to carbon farming requires knowledge, upfront investment, and robust systems for monitoring, verification, and certification [30]. Intermediaries are needed to connect farmers to buyers and manage credit transactions. To include smallholders, project developers must take the lead by absorbing financial risks and aggregating land among hundreds of smallholders to achieve sufficient economies of scale. This is crucial, as the upfront costs of soil sampling and project registration, the opportunity cost of changing practices, potential near-term yield reductions, and the market price of nature-based carbon credits pose financial risks that smallholders cannot bear individually [31]. Project developers will also have to ensure permanence of carbon storage despite land ownership changes. Without such support, smallholders remain excluded from the benefits of soil carbon markets.

Voluntary carbon markets (VCMs) have faced criticism in recent years due to issues such as poor transparency, double counting, and non-additionality (Examples are a BBC Panorama documentary titled 'Big Brands' Green Claims Uncovered' broadcasted in 2024 and a newspaper article by Dvorak in the Wall Street Journal in 2023) [32]. These shortcomings undermine trust and the effectiveness of carbon markets in supporting climate action. This paper argues that VCMs can only contribute meaningfully to climate mitigation and biodiversity conservation if carbon credits meet high-integrity standards. This includes ensuring credits are used for residual emissions - those that remain after a company has reduced its own emissions - and that they represent real, additional climate benefits. Moreover, carbon projects must be developed in consultation with local and Indigenous communities to ensure legitimacy and long-term impact.

Despite criticism over low-quality and non-additional projects, high-integrity VCMs remain a vital tool in climate mitigation. When transparent and liquid, they can accelerate climate action by directing finance to the most efficient sources of carbon abatement or removal. For example, farmers offering nature-based carbon credits can access a broader pool of buyers, reducing dependence on a few corporations or governments.

VCMs also enable much-needed investment in agriculture from non-food companies and individuals. Agriculture is typically a low-margin sector with limited capacity to absorb or pass on additional costs. Thirdly, voluntary carbon markets empower farmers to directly monetize the ecosystem services they provide. In conventional supply chains, value is often captured by large multinational corporations, while farmers - who typically have limited market power - are increasingly marginalized. To prevent a similar imbalance in emerging markets for ecosystem services, it is essential to design inclusive mechanisms that ensure farmers retain a fair share of the value they generate.

To build trust and ensure environmental integrity, the Integrity Council for the Voluntary Carbon Market (ICVCM; the successor to the TSVCM) has introduced the Ten Core Carbon Principles [33]. Among these principles, carbon-crediting programs must ensure transparency and integrity. This includes using registries to track credits, requiring independent third-party validation and verification, and ensuring that emission reductions are additional - meaning they wouldn't happen without carbon finance. Reductions must also be permanent, with safeguards against reversal, and must not be double counted. Double counting refers to a situation where a single GHG emission reduction or removal is counted more than once for the purpose of meeting climate mitigation targets.

Companies in the Global North with net-zero commitments increasingly rely on nature-based carbon credits to offset emissions they cannot feasibly eliminate. Since net zero does not mean absolute zero, offsets are often necessary. Given that the greatest potential for nature-based solutions lies in the Global South, this creates an opportunity for large-scale benefit transfers - if credits are sourced from low- and middle-income countries.

Governments in the Global North may also use such credits to meet climate targets. Beyond carbon markets, these governments can support sustainability in low-income countries through mechanisms like debt-for-nature swaps, which link debt relief to environmental protection.

5. Debt-For-Nature Swaps: Part of the Solution

Countries rich in natural resources and biodiversity often face disproportionately high levels of sovereign debt. Paradoxically, these same countries are among the most vulnerable to the impacts of climate change and biodiversity loss. According to the International Monetary Fund (IMF), 34 of the 59 low- and middle-income countries facing climate threats at or above the median level are also at high risk of experiencing a fiscal crisis within the next two years. Only five countries are considered at low risk, while 20 fall into the medium-risk category [34].

One policy instrument that addresses both debt sustainability and environmental protection is the debt-for-nature swap. This financing mechanism allows a portion of a country's debt to be forgiven in exchange for commitments to achieve specific environmental objectives. Debt-for-nature swaps provide fiscal relief to countries struggling with high debt service obligations and limited refinancing options. By restructuring debt, these agreements reduce the overall debt burden and lower interest

costs. Additionally, improved debt metrics can lead to upgrades in sovereign credit ratings, thereby reducing future borrowing costs. In return, the debtor country agrees to allocate the financial savings toward domestic climate or biodiversity-related initiatives.

The concept of debt-for-nature swaps emerged during the debt crisis of the 1980s. The first such agreements were implemented in 1987 in Bolivia and Costa Rica, facilitated by the World Wildlife Fund and Conservation International, respectively [35]. These early transactions were modest in scale. In Costa Rica's case, the agreement involved loan restructuring, debt forgiveness, and a reduction in public debt, resulting in $5.4 million in savings on interest and repayments. In exchange, Costa Rica committed these funds to a Natural Resources Conservation Fund, which supported a range of conservation efforts, including land acquisition for protected areas, forest restoration, and the promotion of sustainable agriculture. A year later, Costa Rica entered into a second, more substantial swap valued at US$33 million.

Since its inception, the debt-for-nature swap mechanism has been implemented in numerous countries across the Global South. According to an inventory by the African Development Bank, approximately 145 such swaps had been executed by 2021 [36]. The most recent example cited in the survey occurred in Belize, involving a transaction valued at over $550 million. This 2021 debt-for-nature swap enabled Belize to refinance a significant portion of its sovereign debt under more favorable terms [37]. The resulting interest savings were allocated by the Belizean government to support nature conservation initiatives.

The swap was orchestrated by the U.S.-based environmental organization The Nature Conservancy, which provided low-interest financing to facilitate the repurchase of $553 million in commercial debt at a substantial 45% discount. To fund the transaction, The Nature Conservancy issued "blue bonds" - debt instruments dedicated to marine conservation - through a Swiss investment bank. These bonds were backed by the U.S. government, which conferred an investment-grade credit rating, thereby enhancing their attractiveness to investors.

After 2021, the number of debt-for-nature swaps grew steadily. In 2023, Ecuador concluded the largest debt-for-nature swap to date, worth over $1.6 billion [38,39]. In May 2023, amid Ecuador's political crisis, its government bonds dropped sharply in value. A Swiss bank bought $1.6 billion in bonds for just $644 million - nearly a 60% discount. This debt was replaced with a $656 million 'Galapagos Bond', insured by the US Development Finance Corporation, saving about $1 billion in repayments over 17 years. In return, Ecuador committed to spend $18 million annually for 20 years on conservation in the Galápagos Islands.

Debt-for-nature swaps can be an effective instrument when the need for climate and biodiversity investments contributes to the unsustainability of sovereign debt [40]. However, they are not a substitute for comprehensive debt restructuring, as swaps alone are typically insufficient to restore a country's solvency in cases of severe debt distress. For a swap to have a meaningful impact, it must significantly reduce the overall debt burden and generate additional fiscal space for the debtor country, including for environmental and climate-related expenditures [41]. Consequently, some scholars argue that debt-for-nature swaps are most appropriate in situations where debt levels are high but still deemed sustainable [42].

Even under such conditions, these transactions can entail substantial transaction costs due to their structural complexity. They often involve multiple stakeholders and protracted negotiations. Typically, a non-governmental organization (NGO) raises capital from investors for clearly defined sustainability projects in developing countries facing sovereign debt challenges. A service provider is then engaged to establish a special purpose vehicle (SPV), which channels funds to approved projects. The SPV also extends a loan to the debtor country, enabling it to repurchase downgraded debt from commercial and private creditors at a discount. In effect, creditors exchange the original debt - subject to a haircut - for a new, lower-interest loan. The proceeds from this transaction are ultimately used to repay the investors.

In cases where a country's debt position is unsustainable and access to capital markets is lost, priority must be given to comprehensive debt restructuring. In such scenarios, environmental and climate objectives become secondary. Addressing debt and sustainability separately may be more efficient, for instance by providing concessional loans earmarked for ecological investments, rather than attempting to combine both goals within a single financial instrument.

To make a substantial contribution to conservation and climate mitigation and adaptation, debt-for-nature swaps must scale significantly in both number and size. Bloomberg estimates that the potential market for such swaps could exceed $800 billion [43]. The G20, given its global influence and financial capacity, is well-positioned to play a catalytic role in facilitating this upscaling.

Recent years have seen various international efforts aimed at coordinating debt relief for low-income countries. Notably, during the COVID-19 pandemic, temporary and substantial relief measures were implemented. However, these interventions have not prevented the emergence of a debt crisis across the Global South - exacerbated by rising interest rates and intensifying geopolitical tensions. In response, the G20 introduced the Common Framework, a coordinated approach to sovereign debt restructuring. Despite its intentions, the framework has faced criticism for its limited effectiveness, particularly its failure to include all creditor classes in negotiations and its lack of integration with development and climate objectives.

According to the Debt Relief for a Green and Inclusive Recovery Project, urgent reforms to the Common Framework are needed to align debt relief with sustainability goals [44]. One promising avenue is the incorporation of high-integrity, nature-based carbon credits into debt-for-nature swap structures. This approach could

enhance the environmental impact of swaps while providing a credible mechanism for financing climate and biodiversity initiatives.

6. Nature-Based Credits in Debt-For-Nature Swaps

Nature-based carbon credits can enhance the effectiveness of debt-for-nature swaps by serving as alternative forms of payment for interest or principal, thereby aligning financial obligations with environmental goals. By using carbon credits to cover interest payments, countries can reduce the capital required for debt servicing, improving debt sustainability while incentivizing ecosystem protection and restoration. This mechanism expands fiscal space for ecological investments and strengthens the link between financial relief and climate action.

Debt-for-nature swaps typically fund projects that build climate and biodiversity resilience. In addition to these core initiatives, debtor countries may implement separate projects - such as reforestation, habitat restoration, biodiversity conservation, and sustainable land management - that generate carbon credits. Establishing a robust carbon credit mechanism involves:

i. Assessing sequestration potential of eligible projects.
ii. Developing standardized methodologies for credit measurement.
iii. Creating a registry to track and trade credits.
iv. Valuing credits financially, either via market pricing or negotiated agreements.
v. Allocating credits for debt servicing and converting them to cash equivalents through the voluntary carbon market.

To prevent double counting, carbon credits used for interest or redemption payments must be retired upon transfer. Accordingly, the recipient - whether a country or organization - must not resell the credits but instead permanently remove them from circulation. These retired credits can contribute to the recipient's Paris-aligned net-zero pathway.

A rigorous monitoring, reporting, and verification (MRV) system is essential to ensure the continued carbon sequestration of supported ecosystems. This may include satellite monitoring, field assessments, and third-party verification. By integrating nature-based credits into debt-for-nature swaps, countries can fulfil financial obligations while demonstrating environmental commitment - aligning economic incentives with conservation outcomes.

Nature-based carbon credits can also serve as collateral in debt-for-nature swaps, offering assurance to creditors. This requires establishing a trust or escrow account to hold the credits, as well as creating legal agreements among debtor countries, creditors, and stakeholders that define the use as collateral and release conditions of the credits. Such arrangements provide measurable assets that reinforce environmental commitments and help unlock financing for sustainable development.

Beyond nature-based credits, those generated from renewable energy and energy efficiency projects may also be eligible. These interventions can yield co-benefits, such as reduced fossil fuel imports. However, as Chamon et al. emphasize, only credits that meet the additionality criterion - i.e., those that would not have been feasible without the debt-for-climate swap - should be included [34]. A notable example is the 2005-2007 debt-for-wind-power swap between Spain and Uruguay under the now defunct Clean Development Mechanism (CDM), which is not part of the voluntary carbon market) [45]. This earned Spain certified emission reduction credits (CERs).

7. Policy Implications and Conclusions

The G20 comprises 19 countries and two regional bodies, collectively representing approximately 85% of global GDP, over 75% of international trade, and around two-thirds of the world's population. Given its broad representation and economic influence, the G20 is well-positioned to lead efforts in scaling financial instruments that simultaneously strengthen the fiscal resilience and environmental sustainability of low-income countries.

This paper has explored two such instruments: nature-based carbon solutions and debt-for-nature swaps. These mechanisms can operate independently or in tandem. Carbon credits offer a pathway for individual farmers to adopt sustainable practices and diversify income, while debt-for-nature swaps address macroeconomic challenges by easing sovereign debt burdens. Together, they shape the enabling environment for smallholders in the Global South, making both instruments relevant for inclusive and sustainable development.

Low-income countries are disproportionately affected by the climate crisis, despite contributing minimally to its causes. With limited borrowing capacity, additional public debt is not a viable solution. Nature-based carbon solutions can support sustainable agriculture and generate tradable carbon credits, offering farmers a new revenue stream. Successful agroforestry projects already demonstrate the potential of such credits in the Global South. However, these initiatives are often fragmented, operating as stand-alone efforts with limited scalability. Soil-based carbon credit schemes, in particular, remain largely inaccessible to smallholders due to high costs and technological barriers - challenges that could be mitigated through large-scale, coordinated efforts.

To expand the supply of nature-based carbon solutions, the G20 could spearhead a coalition of governments, NGOs, and private sector actors to develop common standards and transition from isolated or bundled projects to jurisdictional, regional, or commodity-wide approaches. The current voluntary carbon market is fragmented, with diverse standards, registries, verification protocols, and certification bodies. This lack of harmonization hampers scalability and credibility.

Building on the work of the Integrity Council for the Voluntary Carbon Market, the G20 could promote global cooperation and standardization. Achieving this requires scale - more and larger

projects involving smallholders - and strategic collaboration. NGOs could partner with major food processing companies that have a vested interest in securing high-integrity nature-based credits, thereby aligning environmental goals with commercial incentives.

Collaboration among the G20, national governments, NGOs, researchers, and farming communities is essential to unlock the full potential of nature-based solutions and debt-for-nature swaps. Strategic investments in research, education, and agricultural extension services are critical to support the adoption of sustainable practices by smallholder farmers in the Global South. Complementary policies and incentives that promote sustainable land management can further enhance the region's contribution to global soil carbon sequestration.

However, the scale of investment required in the Global South far exceeds the capacity of multilateral lending and development institutions. As Olabisi et al. note, the stakes are particularly high in South Asia (excluding China) and Africa, which are projected to account for the majority of global population growth in the coming decades [46]. This demographic trend will intensify the need for climate mitigation and adaptation financing.

Xie et al. analysed climate finance flows from multilateral development banks to 143 emerging and developing economies between 2015 and 2020 (They study the climate finance allocation practices of eight multilateral development banks: Asian Development Bank, African Development Bank, Asian Infrastructure Investment Bank, European Bank for Reconstruction and Development, European Investment Bank, Inter-American Development Bank Group, Islamic Development Bank and the World Bank Group) [47]. Their findings reveal a strong bias toward mitigation, with only 8% of climate finance directed to countries with both high vulnerability and low emissions. To address this imbalance, the G20 should encourage greater private sector participation in climate and nature financing, particularly for adaptation projects in the most vulnerable low-income countries.

Investing in climate and nature solutions in the Global South often yields higher returns per dollar than comparable investments in the Global North. Developed country governments can use regulatory tools - such as carbon pricing, tax incentives, cap-and-trade systems, and subsidies - to incentivize private sector investment in emerging markets. A precedent exists in the European Union's Emissions Trading Scheme, which allowed companies to use Certified Emission Reduction (CER) credits from the UN's Clean Development Mechanism (CDM) to meet part of their compliance obligations. Similar mechanisms could be applied to support investments not only in sustainable food systems but also in the energy transition.

Take the energy transition as an example. Accelerating global decarbonization requires investment not only in domestic infrastructure but also in regions like Africa, where abundant solar resources and available land make green hydrogen production particularly cost-effective. As Olabisi argues, focusing solely on solar panel deployment in high-income countries is suboptimal, as tropical installations can yield up to 40% more energy [48].

A similar logic applies to greening food production. Rather than prioritizing afforestation in wealthy nations, it is often more effective to strengthen natural carbon sinks in the Global South. In many low-income countries, deforestation is driven by the need for fuel or pastureland. Yet, at reasonable carbon prices, preserving forests can generate more value per hectare than fuelwood or livestock.

To unlock this potential, the voluntary carbon market must be further developed, and high-integrity nature-based credits should be integrated into regulated carbon markets. The G20 can play a pivotal role by establishing clear criteria for linking voluntary and compliance markets. This would provide a pathway for scaling up credible, nature-based climate solutions while ensuring environmental integrity and market transparency.

To enable developing and emerging economies to invest in sustainability, it is essential to maintain a low cost of capital. Only under such conditions can these countries access capital markets at affordable rates to finance climate and nature-related investments. A sustainable debt position is a prerequisite for this access. When debt levels become unsustainable, debt-for-nature swaps can serve as a valuable tool to restore fiscal space. While the potential of this instrument is significant, its impact remains limited due to underutilization. Realizing its full potential will require coordinated action from high-income countries.

The G20 can play a central role by partnering with institutions such as the World Bank, the IMF, academic experts, and NGOs to scale up debt-for-nature swaps. One concrete step would be the establishment of a global knowledge centre dedicated to these instruments. This centre could develop a standardized framework based on best practices for structuring effective and equitable swaps. Several key considerations should guide this framework:

i. Minimizing transaction costs: A significant portion of funds currently flows to intermediaries - often financial institutions - rather than to climate and nature investments. Simplifying, standardizing, and de-risking transactions can help ensure that more capital reaches on-the-ground projects.
ii. Maximizing debt relief: The framework should prioritize the repurchase of debt at the lowest possible price, particularly targeting debt that is difficult to refinance due to maturity, currency denomination, or high interest rates.
iii. Ensuring environmental integrity: Robust monitoring and verification mechanisms must be in place to track the delivery of climate and nature outcomes. These systems can build on existing standards such as those developed by Verra (VCS) or the Gold Standard.

In addition, nature-based carbon credits can be integrated into debt-for-nature swaps as a means of covering interest or principal

payments. The G20 could lead the development of a mechanism to incorporate high-integrity nature-based credits into these transactions. This approach could draw inspiration from the Clean Development Mechanism (CDM) under the Kyoto Protocol, which allowed developed countries to invest in emission reduction projects in developing countries in exchange for Certified Emission Reduction (CER) credits.

Although the CDM has been phased out under the Paris Agreement, its foundational principles - such as transparency, environmental integrity, and support for global emissions reductions - remain relevant. A new mechanism aligned with the Paris Agreement could be developed to support debt-for-nature swaps, with a strong emphasis on:

- Supporting countries' Nationally Determined Contributions (NDCs);
- Prioritizing nature-based solutions that protect, restore, and sustainably manage ecosystems;
- Ensuring the active participation of local and Indigenous communities, whose knowledge, consent, and equitable benefit-sharing are essential for project legitimacy and success.

By advancing such a mechanism, the G20 can help unlock large-scale private and public investment in climate and nature, while supporting debt sustainability and inclusive development in the Global South.

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