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BIOECONOMY

WORKING GROUP DOCUMENT

CNI Brazilian National Confederation of Industry

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TABLE OF CONTENTS

FOREWORD BY THE WORKING GROUP CHAIR 9

FOREWORD BY THE WORKING GROUP CO-CHAIRS 10

EXECUTIVE SUMMARY 12

WHY BIOECONOMY? 14

A. PRIORITY 1 - ALIGNING CLIMATE, NATURE, ECOSYSTEMS, AND HUMAN RIGHTS **23**

A.1 Enabling Action 1.1 24

A.2 Enabling Action 1.2 32

B. PRIORITY 2 - MOBILIZING FINANCE AND TECHNOLOGY **37**

B.1 Enabling action 2.1 39

B.2 Enabling action 2.2 46

C. PRIVATE SECTOR CASES **51**

C.1 BASF - Pragati project 53

C.2 Dengo - Credits for Life 55

C.3 Givaudan - Sustainable Hyaluronic Acid 58

C.4 Morphosis - Terrasos' PPP Model for Ecosystem Resilience 61

C.5 Natura - SAF Dendê 64

C.6 Sanctu - The Amazon regenerative platform 67

ANNEXES 69

ANNEX A – ACRONYMS 70

ANNEX B – G20 HIGH-LEVEL PRINCIPLES ON BIOECONOMY 72

ANNEX C – COMPOSITION AND MEETING SCHEDULE 73

ANNEX D – PARTNERS 76

DISCLAIMER AND ACKNOWLEDGEMENTS 77

FOREWORD BY THE WORKING GROUP CHAIR

JOÃO PAULO FERREIRA

CEO, NATURA

As Chair of the Bioeconomy Working Group, I am honored to witness our community shaping a bold and unified vision: one where the bioeconomy stands at the center of solutions to climate change, biodiversity loss, ecosystem use, and human rights challenges.

Over the past five months, our Working Group has brought together more than 30 institutions and mobilized 50+ private-sector cases that prove the bioeconomy is not only actionable, but also scalable, replicable, and transformative. The outcomes of this collective effort are reflected in this report, alongside the SB COP Bioeconomy Booklet, which showcases tangible business-led solutions from across the globe.

Together, we have built a shared private-sector vision and identified two priorities to elevate the bioeconomy at COP as a climate solution:

- First, recognizing the bioeconomy as a bridge linking climate, biodiversity, ecosystem stewardship, and human rights, through greater alignment and shared standards.
- Second, securing a lasting place for the bioeconomy in global climate negotiations, making it a strategic pillar of the COP agenda by mobilizing finance and technology at scale.

Looking ahead, our collective ambition is clear: to secure the enduring recognition and importance of the bioeconomy in the COP process. This Working Group has shown what is possible when business leads with purpose and unity. Now is the time to translate ambition into action and place the bioeconomy at the heart of a just, regenerative future.

João Paulo Ferreira

Chair of the SB COP Bioeconomy Working Group
CEO, Natura

FOREWORD BY THE WORKING GROUP CO-CHAIRS

ETHEL LAURSEN

PRESIDENT LATIN AMERICA, NOVONESIS

This paper charts a path toward a future where the bioeconomy becomes a driving force for sustainable development, fostering innovation and creating jobs. By leveraging renewable biological resources, such as biosolutions (microorganisms, enzymes, yeast and proteins), we can address critical global challenges — including climate, energy diversification and food security. I'm honored to have shared relevant and meaningful insights with esteemed colleagues.

ISABELLA TONACO

CSO, SYMRISE

This paper sets a course for bioeconomy to drive innovative action. It calls on leading industries to move fast and differently, showcasing scalable business cases. Diverse value chains, natural and synthetic, and an ecosystem view of climate, nature, and society, can accelerate regeneration. I commend this report to governments and partners. As co-chair, I feel honored to endorse and advance its recommendations.

MARCELO MELCHIOR

CEO, NESTLÉ BRAZIL

Together with our partners and suppliers, we are committed to unlocking the vast potential of bioeconomy in Brazil. As we approach COP 30, we believe that collaborative efforts can drive sustainable practices, enhance biodiversity, and create resilient communities. The future of bioeconomy is bright, and together we can make a significant impact.

PRISCILA CAMARA

SENIOR VP SOUTH AMERICA BASF

This document reflects our collective ambition and commitment to unlock the potential of Bioeconomy, scaling and accelerating innovative and concrete solutions. As co-chair of the workgroup, I am honored to contribute to this journey. We hope that SBCOP and COP30 will set a legacy for the future, spotlighting initiatives which integrate economic, environmental and social improvements and demonstrating our commitment to a sustainable future for the people and the planet.

SANJIV PURI

CHAIRMAN & MANAGING DIRECTOR, ITC LIMITED

Bioeconomy is a vital pillar of climate action, linking nature, land and community. Standardizing global frameworks, mobilizing finance, de-risking investments and tech acceleration can scale up solutions to reduce emissions, regenerate ecosystems and support inclusive growth. Our own experience at ITC with meaningful interventions in regenerative agriculture, farm forestry and water stewardship has been immensely encouraging and demonstrates that what is good for the planet is also good for the economy. Focus on new innovative solutions as well as adaptation initiatives to secure livelihoods can shape the next paradigm of bioeconomic transformation.

EXECUTIVE SUMMARY

The bioeconomy represents a transformative pathway to realign economic development with climate goals, ecosystem regeneration, and positive social impact. This document positions the bioeconomy as an innovative, multidimensional transition, moving from fossil-based to bio-based materials, new bioproducts and biosolutions, from linear to circular value chains, and from extractive to regenerative land use models that restore ecosystems and support inclusive prosperity. As COP30 approaches, the global community has a unique opportunity to make this vision tangible by placing the bioeconomy at the heart of climate implementation strategies.

For that, this document outlines two key priorities from the private sector that should be elevated and prioritized at COP30: firstly, fostering greater convergence across the Rio Conventions, on climate change, biodiversity, and desertification, and integrating human rights as framed by the International Covenant on Civil and Political Rights (ICCPR) and secondly, recognizing the bioeconomy as a strategic pillar of the COP30 climate solutions agenda, while boosting countries' economic green growth, job creation, energy-self-sufficiency and circular economy. To illustrate the potential and effectiveness of these priorities, this document references multiple business cases and provides an in-depth analysis of six compelling examples from diverse sectors and regions.

To unlock this potential, each priority is accompanied by practical enabling actions with defined KPIs, demonstrating how to implement these transformative pathways at scale. This working group outlines enabling actions promoting integrated planning across climate, biodiversity, land, ocean ecosystems, and human rights agendas; standardizing data, metrics, and reporting across sectors; mobilizing climate finance; and advancing technological incentives particularly in the Global South. Across all areas, the private sector is ready to act, not only as an investor and innovator, but as a partner in implementation. This document brings

forward concrete proposals from the business community, with the aim of supporting the COP30 Presidency in embedding the bioeconomy into the next chapter of global climate action. We invite stakeholders from all sectors to join us in this critical effort to drive transformative change.

The realization of COP30 in the Amazon represents a historic opportunity to embed the bioeconomy at the heart of the global climate agenda, as a concrete path to regenerative prosperity for nature-rich countries. This unique window, coupled with Brazil's leadership as the G20 president in 2024 and the ongoing review of NDCs and NBSAPs, underscores the urgency and strategic timing of this working group's actions.

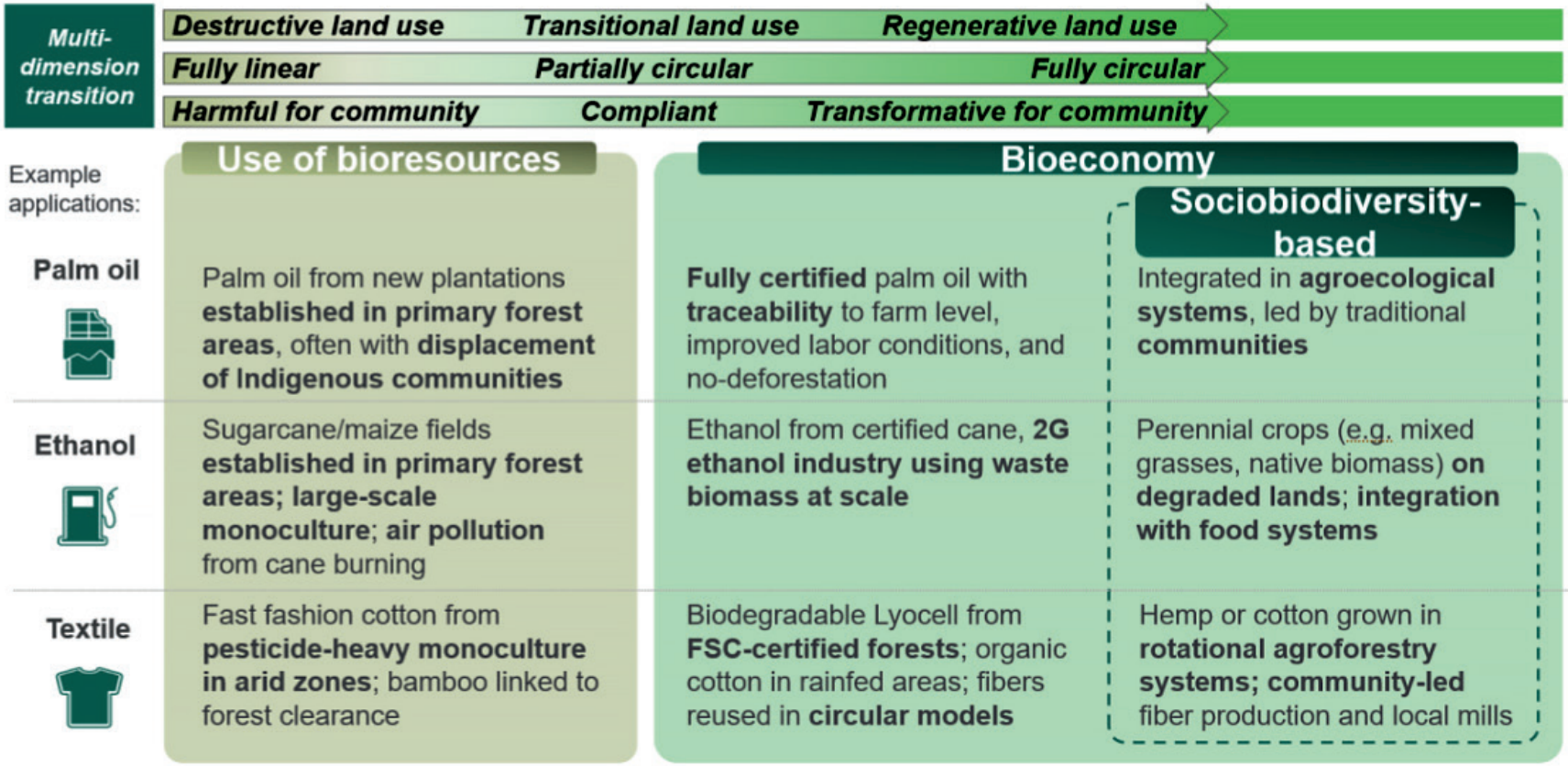
WHY BIOECONOMY?

Efforts to define the bioeconomy have intensified over the past two decades, yet no universally accepted definition has emerged. Institutions such as the Organization for Economic Co-operation and Development (OECD), Food and Agriculture Organization of the United Nations (FAO), European Commission, and the G20 have proposed distinct and evolving interpretations, reflecting its multidimensional character[1,2], such as the G20 High-Level Principles on Bioeconomy[3]. While some emphasize biotechnology, biosolutions and the use of renewable biological resources, others highlight sustainability, circularity, and socioeconomic transformation.

This plurality of perspectives has helped broaden the concept but also introduced ambiguity around its scope, with early movements toward a common taxonomy beginning to emerge (e.g., World Bioeconomy Association)[4]. Based on those definitions, the Sustainable Business COP30 Bioeconomy Working Group has advanced a shared vision of the **bioeconomy as a model that enables bio-based solutions, and the replacement of fossil-based materials, while ensuring sustainable ecosystem use, fostering circularity, and creating positive social impact. It is conceived as a pathway, a multidimensional transition to regenerative land use, to circular production systems, and to community-centered value creation**.

1 OECD. The Bioeconomy to 2030: Designing a Policy Agenda. OECD Publishing, 2009. Available at: https://www.oecd.org/futures/long-termtechnologicalsocietalchallenges/42837897.pdf. Accessed on: 10 Jun. 2025.
2. NATUREFINANCE; FGV EAESP. The Sustainable Global Bioeconomy. May. 2024. Available at: https://www.naturefinance.net/wp-content/uploads/2024/05/ENG-TheGlobalBioeconomy_FINAL.pdf Accessed on: 18 Jun. 2025.
3. Referenced in Annex 2.
4. WORLD BIOECONOMY ASSOCIATION (WBA). Concept Note: Towards a Common Language for the Global Bioeconomy – Promoting Convergence in Bioeconomy Terminology Across Continents. 2025. Available at: https://bioeconomyassociation.org. Accessed on: 26 Sep. 2025.

FIGURE 1 - BIOECONOMY AS A MULTI-DIMENSIONAL TRANSITION



Sources: Adapted from The Nature Conservancy. *Bioeconomy of sociobiodiversity in the state of Pará*. 2021. Available at: https://www.nature.org/en-us/about-us/where-we-work/latin-america/brazil/stories-in-brazil/para-bioeconomy/. Accessed on: 30 Jun. 2025. BCG Analysis.

The bioeconomy thus serves as a bridge between environmental sustainability and socioeconomic development, offering integrated and holistic solutions to complex, systemic challenges that cannot be addressed in isolation[5]. An important strand of bioeconomy is the socio-bioeconomy, also called the bioeconomy of sociobiodiversity, which the Brazilian government defines as a development model that integrates nature conservation, the generation of economic benefits, and respect for Indigenous peoples, traditional communities, and family farmers[6]. This socio-bioeconomy stands out as a powerful catalyst for social impact, combining biodiversity conservation, carbon mitigation, and community resilience.

Economically, bioeconomy activities significantly enhance value creation. For example, in the Amazon region, bioeconomy activities achieve profitability up to nine times greater per area compared to traditional livestock farming[7].

Environmentally, bioeconomy strategies effectively mitigate emissions, when applied in a sustainable manner. Borregaard Advanced Lignin, for instance, uses wood debris to produce advanced biochemicals that replace petroleum in construction, batteries, pharmaceuticals, foodstuffs, cosmetics, and biofuels. In the case, this approach achieves a 70% reduction in CO_2 emissions compared to fossil-based alternatives.[8] In addition, Novonesis is scaling enzyme technologies capable of capturing carbon dioxide, thereby improving industrial efficiency and driving deeper emission reductions in hard-to-abate sectors.[9]

Furthermore, from a social impact perspective, bioeconomy initiatives significantly enhance community livelihoods, while also generating employment and income opportunities throughout their entire value chain. Symrise's Bridging the Gap program in Madagascar empowers vanilla-farming communities by managing 5,000 hectares under regenerative

5 5FAO. The Bioeconomy Toolbox. 2021. Available at: https://www.fao.org/documents/card/en/c/CB7438EN/. Accessed on: 30 Apr. 2025.

6. CNBIO. Consulta Pública do Plano Nacional de Desenvolvimento da Bioeconomia – Sociobioeconomia. 2025. Available at: https://ns-dtp-prd-df.s3-df-govcloud.dataprev.gov.br/gcc-decidim/gcc-decidim/k91g3yzj83e8r8fajq2jf26ql6m6. Accessed on: 15 Aug. 2025.

7. THE NATURE CONSERVANCY; INTER-AMERICAN DEVELOPMENT BANK (IDB). Bioeconomia da Restauração da Amazônia. 2024. Available at: https://aliancaamazonia.org.br/wp-content/uploads/2024/11/Bioeconomia_Restauracao_Alianca.pdf. Accessed on: 15 Jun. 2025.; BCG analysis.

8. Modahl, Ingunn Saur; Brekke, Andreas; Valente, Clara. Environmental assessment of chemical products from a Norwegian biorefinery. 2022. Available at: https://norsus.no/en/publikasjon/environmental-assessment-of-chemical-products-from-a-norwegian-biorefinery/?v=1.Accessed on: 8 Sep. 2025. Available in the Bioeconomy WG Case Booklet.

9. Novonesis. Biosolutions for carbon capture. Available at: https://www.novonesis.com/en/biosolutions/bioenergy/carbon-capture Accessed on: 8 Sep. 2025. Available in the Bioeconomy WG Case Booklet.

agriculture, ensuring deforestation-free and fully traceable vanilla. The initiative seeks to raise household incomes by 20% for 5,000 farmers, while reaching over 25,000 children and youth with improved understanding of child rights. By strengthening livelihoods, it reduces the pressures that drive deforestation.[10]

The transformative potential of the bioeconomy lies in its multifaceted nature, encompassing activities from foundational resource utilization to cutting-edge scientific breakthroughs. This spectrum can be broadly categorized into distinct, yet interconnected, typologies, each representing different levels of value aggregation, innovation, and scale. These typologies, grounded in sustainability, are not linear evolutionary stages but complementary fronts that must be articulated to generate scale:

- **Natural-intensive bioeconomy**: this typology represents a transition pathway from traditional intensive models toward regenerative and diversified practices. While often based on the use of biological resources in a more traditional manner with lower technological intensity, it remains fundamentally important for the subsistence and economies of many regions, particularly in the Global South. It includes sustainable agriculture, forestry, aquaculture and fisheries. The focus here is on optimizing natural resource use, enhancing the resilience of production systems, and generating local value, often with a strong social and community component. **Example**: Natura's SAF dendê program expands sustainable palm agroforestry in the Amazon with smallholder families and partners, supporting soil restoration, carbon removals, and biodiversity. The initiative increases farmer income by 40%, removes up to 6 tCO_2e/ha/year, and promotes diversified agroforestry systems that improve livelihoods, biodiversity, and soil regeneration.[11]
- **Advanced bioeconomy**: the application of biotechnology and scientific knowledge to transform biomass into higher value-added products. This includes the production of biochemicals, bio-based plastics, second-generation biofuels, advanced bio-based materials and advanced food products. It is characterized by increasing investment in

10. SYMRISE. The farmers in focus. Available at: https://www.symriomics.com.br/ Accessed on: 8 Sep. 2025. Available in the Bioeconomy WG Case Booklet.
11. NATURA & CO. Relatório Integrado 2024. 2024. Available at: https://www.naturaeco.com/relatorio-integrado 2024. Accessed on: 30 Sep. 2025. Available in the Bioeconomy WG Case Booklet.

research and development, aiming for greater process efficiency and the replacement of fossil-based inputs with renewable alternatives. This segment also contributes to economic resilience by diversifying rural economies and increasing value addition at origin. Example: Bio-based plastics from sugarcane ethanol reduce reliance on fossil feedstocks. Braskem's I'm greenTM bio-based polyethylene, for example, saves approximately five tons of CO_2 per ton of plastic produced compared to its fossil counterpart. Best practices of sugarcane farming in Brazil have also helped restore degraded land and preserve biodiversity with a range of sustainable practices that involve crop rotation and green corridors.[12]

- **High-tech bioeconomy**: cutting-edge science, such as synthetic biology, genetic engineering, and bioinformatics, to develop revolutionary products and processes. This includes biopharmaceuticals, advanced therapies, biomaterials with unique properties, personalized solutions, and biology-driven agricultural innovations to secure global food systems. This segment is intensive on research and development (R&D) and represents the frontier of bioeconomic innovation, with high potential for global impact. Critically, the high-tech bioeconomy also accelerates climate solutions by enhancing crop resilience to stress, reducing reliance on chemical inputs, and enabling nature-positive industrial transitions. **Example**: Givaudan Active Beauty has reinvented hyaluronic acid production through precision fermentation and strain engineering, delivering the same effectiveness and reducing CO_2 emissions per kilogram of hyaluronic acid by 92%.[13,14]

The global bioeconomy already represents a substantial and growing share of economic activity. Current estimates place its aggregate annual output between $ 4 to 5 trillion, spanning agriculture, aquaculture, forestry, food, biofuels, biochemicals, bio-based plastics, and pharmaceuticals.[15] This figure captures only the portion of the economy already integrating renewable and sustainable biological inputs. However, the broader market potential

12. Braskem. Sustainability beyond carbon savings: the role of bio-based plastics in a net zero circular economy. 2025. Available at: https://www.braskem.com.br/imgreen/details-news/sustainability-beyond-carbon-savings-the-role-of-bio-based-plastics-in-a-net-zero-circular-economy. Accessed on: 30 Sep. 2025. Available in the Bioeconomy WG Case Booklet.
13. Givaudan Active Beauty. Givaudan Active Beauty unveils PrimalHyal™ 50 Life. 10 Jan. 2024. Available at: https://www.givaudan.com/media/trade-media/2024/givaudan-active-beauty-unveils-primalhyal-50-life Accessed on: 8 Sep. 2025. Available in the Bioeconomy WG Case Booklet.
14. NATUREFINANCE; WORLD BIOECONOMY FORUM. Financing a Sustainable Global Bioeconomy. Sep. 2024. Available at: https://naturefinance.net/publication/financing-a-sustainable-global-bioeconomy/. Accessed on: 9 Jun. 2025.
15. WEF. What is the bioeconomy and how can it drive sustainable development? 2024 Available at: https://www.weforum.org/stories/2024/07/bioeconomy-sustainable-development/ Accessed on: 10 Jun. 2025.

FIGURE 2 - 2 - STRATEGIC SPECTRUM OF THE BIOECONOMY

	Nature Intensive Bioeconomy	Advanced Bioeconomy	High-Tech Bioeconomy
Products	Large quantity of goods - **in the main unprocessed nature products** for established markets	**Advanced bioproducts** (biofuels, biochemicals, biomaterials etc.)	**High-tech biotech and biomanufactured products** (e.g., enhanced crops, nanomaterials, custom organisms)
Stage and level of investments	At a mature stage, heavily invested and tied to sectors like agriculture, forestry, and fisheries	Growing stage, driven by tech innovation and both public/private investment for returns and environmental value	Rapidly evolving, heavily funded R&D focus with innovation at its core
Location	Found across continents, benefiting from established value chains and production advantages	Centered in tech-advanced countries with access to capital and enabling policy environments	Led by regions with strong research ecosystems, IP protections, and skilled talent pools
Policy and regulative context	Focused on land use and sustainability; land tenure is a key issue	Policies support renewable energy and sustainable agriculture/forestry	Focused on regulating emerging technologies and IP rights
Competi-tiveness	Already competitive, with strong potential thanks to existing infrastructure and sustainability advancements	Becoming more competitive due to focus on efficiency, sustainability, and added value. Plays a key role in decarbonization and global challenges	Extremely competitive due to innovation and leadership; poised for strong growth in high-performance and sustainable products

Source: NatureFinance; World Bioeconomy Forum. *Financing a Sustainable Global Bioeconomy.* September 2024. Available at: https://www.naturefinance.net/resources-tools/global-bioeconomy-g20-stocktake/. Accessed on: 15 May 2025.

could be considerably larger. If we consider sectors such as chemicals, pharmaceuticals, plastics, textiles, and other materials that are still heavily dependent on fossil fuels and other finite resources, a progressive transition, while limited by resource availability, to bio-based inputs could capture significant untapped potential.

In this context, more than 60 countries have adopted or are formulating national bioeconomy strategies, and multilateral efforts.[16] Investment interest is also growing, with increasing attention from climate finance institutions and private capital.

Despite its immense potential and growing recognition, the global bioeconomy faces significant bottlenecks that impede its full scale and impact. These challenges are multifaceted, ranging from market fragmentation and value-chain complexities that limit efficiency and equitable value capture for producers, to critical infrastructure gaps, particularly in processing, logistics, and innovation ecosystems within emerging markets. Furthermore, technological disparities and insufficient knowledge transfer slow the development of higher-value bio-industries in many regions. Volatile demand, the absence of long-term offtake agreements, and a lack of harmonized sustainability standards create considerable uncertainty for investors. Access to finance and risk transfer solutions remains constrained by high perceived risks and a scarcity of tailored instruments for early-stage ventures. Finally, regulatory fragmentation across ministries and jurisdictions complicates coordinated action, hindering the development of cohesive strategies.

Unlocking the full potential of the bioeconomy requires addressing both the supply and demand sides through coordinated, systemic interventions.

On the supply side, efforts must focus on strengthening the foundations of sustainable bio-based production. This includes investing in biological resource development and bio-based innovation; enhancing infrastructure for processing, logistics, and storage; and supporting producers, rural, traditional, and Indigenous communities in managing ecosystems and accessing higher-value markets. Strengthening regional R&D hubs, expanding technical capacity, and enabling small and mid-sized enterprises to integrate into bioeconomic value chains are also critical to foster inclusive

16. FAO. Global Bioeconomy Monitoring Toolkits and Dashboards. Available at: https://www.fao.org/bioeconomy/toolbox. Accessed on: 3 May 2025.

innovation. Good practices in land-use-change management, along with the promotion of side streams from one sector as raw materials for another, will enhance resource utilization and circularity. Facilitating long-term offtake agreements with reliable buyers will further reinforce investment certainty. Moreover, fostering viable finance mechanisms is essential to unlock the growth of bio-based SMEs and startups, together with strengthening rural producers more broadly, supporting their transition toward sustainable and regenerative models, supported by the engagement of certification bodies and NGOs to strengthen local supply chains.

On the demand side, action must prioritize the creation of stable, scalable markets for bio-based products and services. This involves developing blended finance instruments and risk transfer mechanisms to de-risk investments and transition from conventional approaches to bioeconomy-based ones, aligning sustainability standards to increase market confidence, and ensuring consistent policy parameters through procurement frameworks, clear public procurement policies, incentives, and long-term offtake mechanisms. Establishing shared data systems and interoperable metrics will be essential to enhance traceability, credibility, and cross-border recognition, while addressing regulatory and certification gaps to facilitate market access and consumer trust, particularly in international markets. These policies should target diverse uses for biomass in order to build resilient supply chains, while carefully balancing use across applications.

The bioeconomy's multifaceted contributions make it a pertinent vehicle for addressing converging global challenges, from climate and biodiversity to land use and social inequality. This report sets forth the structural levers and enabling conditions required to realize the bioeconomy's potential as a global driver of a low-carbon, just, biodiversity-positive, and resilient future.[17]

17. SDG Knowledge Hub. Brazil Shares Priorities for COP 30. IISD, March 12, 2025. Available at: https://sdg.iisd.org/news/brazil-shares-priorities-for-cop-30. . Accessed on: 26 May 2025.

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A. ALIGNING CLIMATE, NATURE, ECOSYSTEMS, AND HUMAN RIGHTS

A. ALIGNING CLIMATE, NATURE, ECOSYSTEMS, AND HUMAN RIGHTS

Priority 1: Foster convergence across the three Rio Conventions (UNFCCC, CBD and UNCCD) and International Covenant on Civil and Political Rights (ICCPR)

Simplify regulatory processes, align implementation frameworks, and enable the private sector to scale bioeconomy projects that benefit climate, biodiversity, land restoration, and human rights

Enabling Action 1.1

Promote integrated planning across climate, nature, land and human rights agendas by aligning NDCs, NBSAPs, NAPs, and BHR NAPs, and standardizing data, metrics, and reporting across sectors — advancing the COP28 Joint Statement on Climate, Nature and People, and driving coherent implementation of the Paris Agreement and the Kunming-Montreal Global Biodiversity Framework.

Implementation Approaches

1 – Alignment of policy instruments at the national, sub-national, and supra-national levels across ministries, governance structures

- Launch a joint planning track under the COP process to coordinate the design and update of national instruments, including NDCs, NBSAPs, NAPs, and BHRNAPs, ensuring mutual reinforcement and policy coherence. Encourage active participation of the private sector to contribute expertise, resources, and technical support to enhance the quality, ambition, and effectiveness of NDCs by providing specialized knowledge and practical solutions.
- Encourage countries to adopt shared progress indicators and synchronized update cycles for these instruments, improving synergies between climate, biodiversity, adaptation, and human rights goals.
- Recommend the formation of inter-ministerial coordination bodies with inclusive, multi-stakeholder advisory panels to oversee integrated planning and implementation at the national level.
- Promote knowledge-sharing on integrated governance models, showcasing examples where governments have effectively aligned their national strategies across ministries and policy domains.

- Acknowledge the central role of subnational governments as key implementers and policy innovators in the bioeconomy. Encourage the development of state-level regulatory frameworks and financial instruments. Promote intergovernmental collaboration platforms to scale territorial implementation of bio-based solutions.

2 – Harmonization of data and reporting frameworks across sectors

- Endorse and support the integration of leading climate accounting, and disclosure standards, such as the *Greenhouse gas protocol (GHG P), the Taskforce on Nature-related Financial Disclosures (TNFD), the Taskforce on Climate-related Financial Disclosures (TCFD), noting that this framework has now been consolidated under the International Sustainability Standards Board (ISSB)*[18], *as well as the Taskforce on Inequality and Social-related Financial Disclosures (TISFD)*, into national and corporate disclosure systems.
- Encourage governments and institutions to include the bioeconomy as a priority sector within their existing green taxonomies, or to create new ones where necessary, based on a harmonized definition. Standardized indicators and reporting guidelines should link climate, biodiversity, and social impact metrics, reducing duplication and increasing data quality. Prioritize clear and harmonized regulatory and certification frameworks, especially for bio-based products, to enhance international market access and strengthen consumer trust.
- Promote the development of "one-stop" digital portals or linked registries where countries and companies can report on aligned sustainability metrics, enabling clearer oversight and easier comparison of outcomes.
- Advocate for capacity-building and technical support, particularly in developing countries, to strengthen statistical and institutional infrastructure for integrated data collection and impact reporting.

Relevant KPIs

TABLE 1 - BIOECONOMY POLICIES RELEVANT KPIS

Type	KPI	Baseline
Policies	Countries with bioeconomy strategies[19]	64 (2024)
Policies	Number of countries with national plans (NDCs, NBSAPs and NAPs) that mention bioeconomy	• NDCs: 8 countries (2024) • NBSAPs: 6 countries (2024) • NAPs: 2 countries (2024)

18. IFRS Foundation. "ISSB and TCFD." IFRS Sustainability — Standards and Frameworks webpage, 2025. Available at: https://www.ifrs.org/sustainability/tcfd/. Accessed on: 25 Aug. 2025.
19. FAO. Bioeconomy Strategies Dashboard: Sustainable and Circular Bioeconomy for Agrifood Systems Transformation. FAO, launched March 2024. Available at:

Background and Context

The three Rio Conventions, the UN Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), and the Convention to Combat Desertification (UNCCD), all emerged from the 1992 Earth Summit in Rio de Janeiro, embodying a global resolve to address climate change, biodiversity loss and land degradation in parallel[20]. Each convention is a legally binding treaty with its own institutional framework: a Conference of the Parties (COP) as the decision-making body, supported by a dedicated secretariat and periodic national reporting. Over the past three decades, these treaties have guided pivotal agreements and targets in their respective domains.

The UNFCCC led to the 2015 Paris Agreement, which aims to hold global temperature rise "well below 2°C" above pre-industrial levels. Under the CBD, Parties recently adopted the Kunming–Montreal Global Biodiversity Framework (2022) to halt and reverse nature loss by 2030[21]. Notably, the CBD explicitly includes marine and coastal biodiversity within its mandate, addressing ocean conservation as integral to global biodiversity goals. Similarly, the UNCCD promotes Land Degradation Neutrality targets, as reflected in SDG 15.3, striving for a land degradation-neutral world by 2030[22]. Despite distinct mandates, all three "sister" Conventions share sustainable development objectives at their core and increasingly recognize the need for coordinated action.

Complementing these frameworks, global ocean governance is guided primarily by the United Nations Convention on the Law of the Sea (UNCLOS), which serves as the foundational legal framework for marine resources management. Recently, the concept of a sustainable blue economy, promoting ocean health, sustainable fisheries, aquaculture, and coastal resilience, has emerged prominently in global policy discussions, intersecting significantly with the objectives of the Rio Conventions.

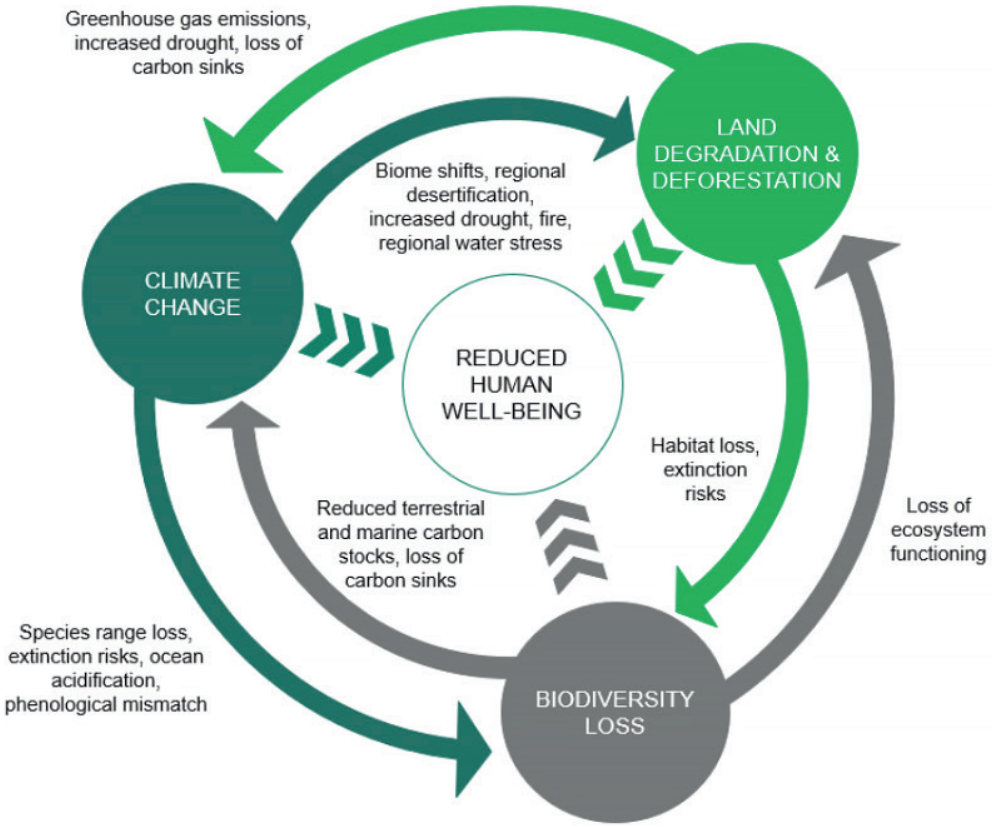
20. UNFCCC –The Rio Conventions: The interconnected challenges of climate change, desertification and biodiversity loss. UNFCCC. Available at: https://unfccc.int/process-and-meetings/the-rio-conventions. Accessed on: 25 Jul. 2025.
21. UNEP – Kunming–Montreal Global Biodiversity Framework. Available at: https://www.unep.org/un-biodiversity-conference-kunming-montreal-2022. Accessed on: 10 May 2025.
22. WBCSD –. Business Declaration on Land Degradation Neutrality. Available at: https://www.wbcsd.org/resources/business-declaration-on-land-degradation-neutrality/#:~:text=of%20the%20Parties%20took%20place,importance%20of%20land%20degradation%20neutrality. Accessed on: 3 Jun. 2025.

In parallel, human rights have emerged as a vital dimension of these environmental agendas. In 2021, the UN Human Rights Council formally recognized the right to a clean, healthy, and sustainable environment as a universal human right[23], a position reaffirmed with greater institutional weight in 2022 by the UN General Assembly through Resolution 76/300[24]. Further reinforcing this recognition, General Comment No. 36 of the ICCPR's Human Rights Committee affirms that environmental degradation, climate change, and unsustainable development constitute some of the most serious threats to the right to life, and that States must respect and ensure this right through concrete environmental protections, informed by international environmental law.[25]

Many countries' National Action Plans on Business and Human Rights likewise integrate environmental sustainability commitments, reflecting a broad consensus that efforts to combat climate change and ecological decline must also uphold the rights and livelihoods of affected communities, as mentioned in the second High Level Principle on Bioeconomy from G20 which states "Be inclusive and equitable, uphold the rights of all persons, including Indigenous Peoples and members of local communities, promote gender equality and the participation of all stakeholders".[26] This includes ensuring stable, decent jobs and sustainable income opportunities, which are critical to enabling communities to actively participate in, and benefit from, environmental protection and climate resilience efforts.

23. OHCHR – Resolution 48/13: The human right to a clean, healthy and sustainable environment. Available at: https://www.ohchr.org/en/documents/resolutions/ahrcres4813-human-right-clean-healthy-and-sustainable-environment. Accessed on: 10 Jun. 2025.
24. UNGA. Resolution 76/300 – The human right to a clean, healthy and sustainable environment. Available at: *https://url.us.m.mimecastprotect.com/s/SSTC1w95xsqlm2N2sLfDhVLdna* Accessed on: 26 Jun. 2025.
25. UN HUMAN RIGHTS COMMITTEE. General Comment No. 36 – Article 6: Right to life. Available at: https://url.us.m.mimecastprotect.com/s/90QHC9r2nRt2DKLELCGHvhqqz7K. Accessed on: 18 Jun. 2025
26. OECD. OECD Guidelines for Multinational Enterprises on Responsible Business Conduct. Available at: https://mneguidelines.oecd.org. Accessed on: 10 jun. 2025.

FIGURE 3 - INTERACTIONS BETWEEN BIODIVERSITY, CLIMATE CHANGE AND LAND USE



Source: Adapted from UNEP. *Making Peace With Nature: A scientific blueprint to tackle the climate, biodiversity and pollution emergencies*. 2021. Available at: https://www.unep.org/resources/making-peace-nature Accessed on: 30 Jun. 2025.

Climate change, ecosystem degradation, land use and human rights are closely interlinked challenges that cannot be effectively addressed in silos. Environmental impacts tend to cascade across these domains: for example, the loss of healthy forests and soils not only harms biodiversity but also diminishes carbon sinks and community resilience[27]. Similarly, oceans absorb around 93% of global warming heat and capture nearly 30% of anthropogenic carbon emissions, underscoring their critical role in climate regulation and biodiversity protection.[28] Conversely, climate extremes accelerate habitat loss and land degradation, creating feedback loops. Acknowledging this, the Rio Conventions

27. UNFCCC – The Rio Conventions: The interconnected challenges of climate change, desertification and biodiversity loss. UNFCCC. Available at: https://unfccc.int/process-and-meetings/the-rio-conventions. Accessed on: 25 Jul. 2025.
28. IPCC. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report (AR5) of the IPCC. IPCC, Geneva, Switzerland, 2014. Available at: https://www.ipcc.ch/report/ar5/syr/. Accessed on: 24 Jul. 2025.

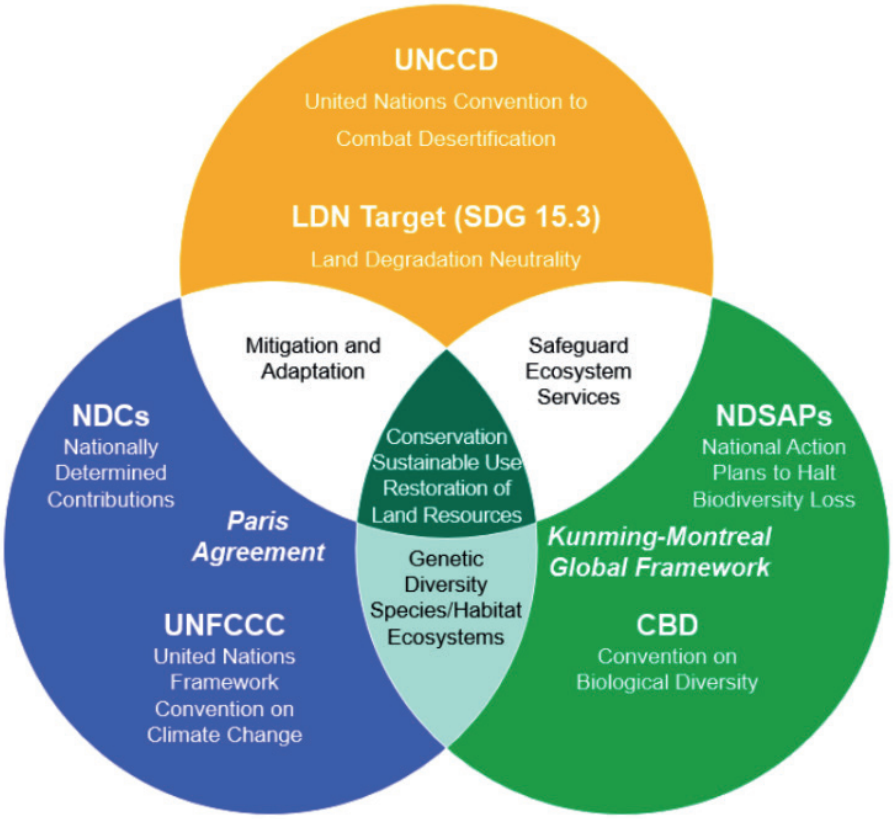
and their Parties have emphasized cross-cutting solutions and bio-based approaches that yield co-benefits for all three goals. Protecting and restoring ecosystems (from forests to coral reefs) is now seen as integral to climate mitigation and adaptation, biodiversity conservation and sustainable land use alike.

Indeed, bioeconomy-focused solutions often demonstrate how progress in one domain can bolster all others. For example, Africa's Great Green Wall initiative, an 8,000 km mosaic of reforestation and sustainable land use across the Sahel, illustrates the power of integrated action. By 2030, this project aims to restore 100 million hectares of degraded land, sequester 250 million tons of carbon (mitigating climate change) and create 10 million rural jobs[29]. In doing so it also provides habitat for countless species and improves regional food and water security.

At COP28, the presidencies of the Rio Conventions jointly affirmed that tackling climate change, biodiversity loss, and land degradation in an integrated way is the only viable path to achieving the goals of both the Paris Agreement and the Kunming-Montreal Global Biodiversity Framework[30]. The Joint Statement on Climate, Nature and People, endorsed by 18 countries at COP28, underscored that nature must be at the center of climate action, declaring "there is no path to fully achieve the near- and long-term goals of the Paris Agreement or the 2030 targets of the Global Biodiversity Framework without urgently addressing climate change, biodiversity loss and land degradation together in a coherent, synergetic and holistic manner"[31].

29. UNEP – The Great Green Wall Initiative. Available at: https://www.unep.org/explore-topics/forests/what-we-do/great-green-wall. Accessed on: 8 Jun. 2025.
30. NDC PARTNERSHIP. Joint Statement on Climate, Nature and People – COP28. Available at: https://ndcpartnership.org. Accessed on: 10 Jun. 2025.
31. CBD - Biodiversity and Climate Change (Non paper on item 25 – Working Group II, version 3). COP 16 Non paper, October 26 2024. Available at: https://www.cbd.int/doc/c/f1c4/abb4/119585269e2bf66a5a59e8a9/cop16-wg2-nonpaper-item25-climatechange-v3-en.pdf. Accessed on: 25 Jul. 2025.

FIGURE 4 - UNCCD GLOBAL LAND OUTLOOK



Source: Adapted from UNCCD. *Global Land Outlook – 2nd Edition*. 2022. Available at: https://www.unccd.int/resources/global-land-outlook/global-land-outlook-2nd-edition. Accessed on: 28 Jun. 2025. BCG Analysis.

Currently, however, data and reporting frameworks remain siloed across these domains in both public and private sectors. Governments submit separate climate and biodiversity reports, for instance, countries are preparing new NDCs by 2025 in response to the Paris Agreement's Global Stocktake, while simultaneously finalizing revised NBSAPs by 2024 for the biodiversity framework. As shown in Table 1, baseline data illustrate this fragmentation: in 2024, 64 countries had bioeconomy strategies, while only 8 NDCs, 6 NBSAPs, and 2 NAPs explicitly referenced bioeconomy.[32]

Similarly, businesses face a patchwork of disclosure standards for environmental and social performance. Over 5,800 companies have now set Paris-aligned climate targets, and some 1,400 firms called for biodiversity

32. FAO. Bioeconomy Strategies Dashboard: Sustainable and Circular Bioeconomy for Agrifood Systems Transformation. FAO, launched March 2024. Available at: https://tableau.apps.fao.org/views/Bioeconomystrategiesdashboard/Home? Accessed on: 24 Jul. 2025

action at COP15, momentum that has supported the emergence of frameworks such as the Taskforce on Nature-related Financial Disclosures and regulatory initiatives like the EU sustainability reporting directive.[33] While these frameworks represent meaningful steps toward greater accountability and transparency, the broader ecosystem of varying metrics and standards still presents challenges. This highlights the ongoing need for more harmonized, interoperable data systems that can track climate and nature progress comprehensively across sectors. The current state reflects similar fragmentation in public policy, posing coordination challenges for businesses seeking to disclose, invest, and comply effectively across jurisdictions.

However, despite growing private sector interest in bioeconomy and bio-based solutions, several public sector bottlenecks continue to hinder implementation at scale:

- Limited inter-ministerial coordination makes it difficult to align climate, biodiversity, land use and human rights frameworks into a unified implementation pathway.
- Limited integrated eligibility criteria within major climate finance instruments (e.g., Green Climate Fund, Global Environment Facility, Adaptation Fund) leaves many bioeconomy initiatives ineligible or underfunded.
- Disjointed national reporting systems (climate, biodiversity, land) make it harder for businesses to align their disclosures with global frameworks (e.g., International Sustainability Standards Board - ISSB, Taskforce on Nature-related Financial Disclosures - TNFD). Gaps in public geospatial and sectoral data (on biomass potential, land degradation, risk zones) increase uncertainty and limit pipeline development for investable projects.

Addressing these gaps, through policy enablers, better data systems, and integrated planning, is critical to enabling scalable private sector action. An example of successful international coordination is the G20 Initiative on Bioeconomy (GIB), which, in September 2024, achieved consensus among member countries of the High Level Principles on Bioeconomy.[34]

33. CDP. 1.5 °C still the goal: businesses disclosing climate transition plans jumps nearly 50%. Available at: https://www.cdp.net/en/press-releases/15c-still-the-goal-businesses-disclosing-climate-transition-plans-jumps-nearly-50?utm_source=chatgpt.com. Accessed on: 26 Sep. 2025.
34. Secretaria de Comunicação Social (Secom). G20 chega a consenso e estabelece princípios de alto nível sobre bioeconomia. Webpage, 2024. Available at: https://www.gov.br/secom/pt-br/assuntos/noticias/2024/09/g20-chega-a-consenso-e-estabelece-principios-de-alto-nivel-sobre bioeconomia. Accessed on: 25 Aug. 2025.

Building on that momentum, the G20's Bioeconomy Finance Hub for Africa is now being developed, a pan-African platform aimed at translating those principles into action by unlocking and scaling public and private finance for nature-positive, inclusive bioeconomy development across the continent.[35]

Advancing convergence between the commitments of the Rio Conventions, human rights frameworks and sustainable blue economy strategies, is directly aligned with the priorities set by COP Presidency for COP30, which aims to center nature, climate, and people in a unified implementation agenda. With countries due to submit updated NDCs and biodiversity plans in 2025, and the first Global Stocktake feeding into COP30 discussions, now is the time to translate convergence from narrative to actionable outcomes.

Enabling Action 1.2

Promote integrated planning across climate, nature, land and human rights agendas by aligning NDCs, NBSAPs, NAPs, and BHR NAPs, and standardizing data, metrics, and reporting across sectors — advancing the COP28 Joint Statement on Climate, Nature and People, and driving coherent implementation of the Paris Agreement and the Kunming-Montreal Global Biodiversity Framework.

Implementation Approaches

- Include language in the COP30 cover decision or presidency declaration welcoming the G20 Bioeconomy Principles as a voluntary reference framework for integrated implementation of climate, biodiversity, and land goals.
- Invite Parties to consider the G20 Principles when designing or updating key national instruments, such NDCs, NBSAPs, NAPs, BHR NAPs, and national bioeconomy roadmaps, to ensure cross-cutting alignment and coherence.
- Encourage use of the Principles as a foundation for inter-ministerial coordination within governments, improving alignment between environment, agriculture, economy, and innovation portfolios.

35. ANCA *From Concept to Implementation: Advancing the Bioeconomy Finance Hub under the G20 Framework* [Webinar]. 11 Aug. 2025.Available at: https://www.dffe.gov.za/sites/default/files/docs/g20ecswg/webinar1bioeconomyinitiative_finance.pdf Accessed on: 8 Sep. 2025

- Promote the Principles as a common baseline for public–private dialogue, donor coordination, and blended finance design, enhancing consistency across stakeholder frameworks and reducing transaction friction in project development.
- Task technical bodies (e.g., UNFCCC SBSTA, the TEC, or the Joint Liaison Group of the Rio Conventions) with identifying linkages between the Principles and existing implementation frameworks, creating an evidence base for Parties to adapt them at national level.

Background and Context

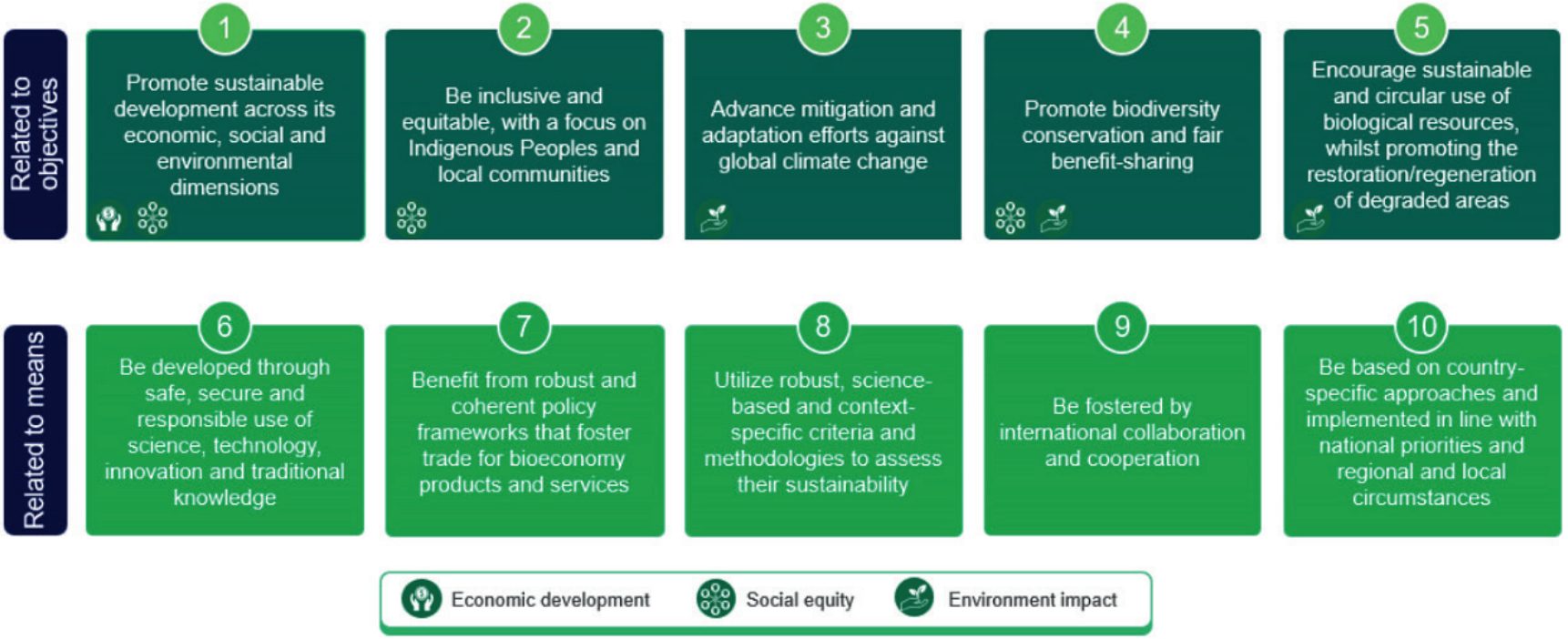
Despite the increasing relevance of bioeconomy in global policy, no common operational framework exists to guide coherent implementation across climate, biodiversity, and land agendas. The G20 High-Level Principles on Bioeconomy were endorsed in 2024 as a voluntary framework highlighting the bioeconomy's potential to drive sustainable development across economic, social, and environmental dimensions.[36]

This G20 initiative articulates ten broad Principles that collectively promote inclusive economic growth, environmental sustainability, and social impact, effectively serving as a unifying platform aligning climate action, biodiversity conservation, and development. The Principles call for integrated approaches such as advancing climate change mitigation and adaptation in line with the Paris Agreement, conserving biodiversity with fair and equitable benefit-sharing (consistent with the new Kunming–Montreal Global Biodiversity Framework), and restoring degraded lands through circular and regenerative use of biological resources. This is particularly relevant for biodiversity-rich countries in the Global South, where the bioeconomy holds untapped potential for value creation and climate resilience.

Equally, they emphasize poverty eradication, food security, and the rights of Indigenous Peoples and local communities, explicitly bridging environmental goals with social inclusion and human well-being. In essence, the G20's Bioeconomy Principles provide a comprehensive blueprint for simultaneously advancing the objectives of all three Rio Conventions (UNFCCC, CBD, UNCCD) while upholding the broader sustainable development and social justice commitments of the global community.

36. G20. G20 High-Level Principles on Bioeconomy. 2024. Available at: https://www.g20.org/content/dam/gtwenty/gtwenty_new/documents/G20-Bioeconomy-Principles-2024.pdf. Accessed on: 10 Jun. 2025.

FIGURE 5 – SUMMARY OF G20 BIOECONOMY PRINCIPLES



Source: Adapted from G20 Initiative on Bioeconomy. G20 High-Level Principles on Bioeconomy. 2024. Available at: https://www.g20.org/en/tracks/sherpa-track/bioeconomy-initiative. Accessed on: 30 June 2025. BCG Analysis.

Incorporating the G20 Bioeconomy Principles into COP30's outcomes would build on the growing momentum for convergence across international environmental agreements. It would align with recent declarations such as the COP27 Sharm El Sheikh Implementation Plan and the COP28 Joint Statement on Climate, Nature and People, both of which emphasized the need for coherent, integrated action across climate, biodiversity, and land agendas. Endorsing the Bioeconomy Principles would provide a concrete and voluntary framework to guide this alignment in practice. It would also reinforce the social and rights-based dimensions of environmental action, reflecting the global recognition that a clean, healthy, and sustainable environment is a universal human right. Moreover, it would help sustain the visibility and relevance of the bioeconomy in future UN processes, reinforcing its integration into agendas such as COP31 and beyond, and ensuring that current momentum is not lost.

SUSTAINABLE
BUSINESS
COP30

B. MOBILIZING FINANCE AND TECHNOLOGY

B. MOBILIZING FINANCE AND TECHNOLOGY

Priority 2: Position the bioeconomy as a strategic pillar within the solutions agenda of the climate COPs

Integrate bioeconomy into finance and innovation pathways, ensuring it is embedded across implementation tracks and recognized as a driver of climate and biodiversity goals

Fragmented governance and scant coordination between the climate and biodiversity arenas have kept the bioeconomy from realizing its systemic promise on the UN stage. Public sector bottlenecks, including the absence of common definitions, exclusion from climate finance eligibility, and siloed institutional governance, have likewise hindered its inclusion in the formal UNFCCC implementation tracks.

Against this backdrop, the staging of COP30 in the Amazon offers a pivotal opportunity to cement the bioeconomy within the official climate solutions agenda. Hosting the UN climate summit in Belém, in the heart of the world's largest rainforest, is more than symbolic. It spotlights the Amazon's dual role as a vital carbon sink and a cradle of biodiversity, illustrating why climate and land-use solutions must go hand in hand. The Amazon has long epitomized the challenge of reconciling economic growth with forest conservation, and advances in the bioeconomy now offer "new hope" for resolving this tension through sustainable development. Moreover, by drawing global attention to terrestrial ecosystems, COP30 can also highlight parallel opportunities in marine and coastal environments, emphasizing integrated terrestrial and marine solutions for global climate and biodiversity goals.

In this context, to ensure this opportunity translates into durable outcomes, there is opportunity to embed the bioeconomy in COP30's official outcomes, from implementation mechanisms to eligibility in climate finance instruments and recognition in adaptation and mitigation pathways.

ENABLING ACTION 2.1

Mobilize climate finance (e.g., nature credits, blended finance) to scale bioeconomy solutions as part of climate and biodiversity strategies.

Implementation Approaches

- Encourage climate finance stakeholders, including Green Climate Fund (GCF), Global Environment Facility (GEF), Multilateral Development Banks, and bilateral funders, to adopt harmonized guidelines for bioeconomy investment, including de-risking strategies, pipeline development, and inclusive financial structuring. This should include attention to enabling trade policies, such as sustainable product standards and preferential access, which improve market viability for bio-based goods.
- Encourage GCF and GEF to formally recognize integrated bioeconomy solutions within their funding strategies, and to prioritize projects that link climate, nature, and local development goals.
- Support the development of shared approaches to risk pricing, based on real-world project data, regional benchmarks, and AI-enabled analytics, to help reduce overestimated risk premiums that deter investment in early-stage or bio-based bioeconomy ventures.
- Expand access to guarantees and insurance instruments for both large and small actors, covering community-led high-impact projects as well as advanced bio-based initiatives. This could involve simplified regional facilities or pooled risk-sharing mechanisms, alongside leveraging existing risk transfer solutions and designing new instruments to address strategic, financial, operational, geopolitical, feasibility, and reputational risks, in order to mobilize stronger private sector engagement.
- Champion more catalytic use of concessional capital within blended finance vehicles by encouraging public and philanthropic actors to provide first-loss tranches at sufficient scale to shift investor return expectations and crowd in private capital.
- Highlight the importance of project preparation and investment matchmaking, especially for bio-based and locally rooted initiatives, by strengthening platforms that connect communities, anchor firms, interested companies, research, technological development and innovation centers, and finance providers.

- Support SMEs and mid-cap companies in strengthening their sustainability frameworks, project viability, and financial structuring, through advisory services and targeted initiatives, thereby enhancing their access to financing instruments.
- Promote convergence around interoperable climate, biodiversity, and social impact metrics to ensure that multi-benefit bioeconomy projects are visible, measurable, and investable across global finance systems and ensuring that bioeconomy financing supports fair and inclusive growth. This should extend to the development and adoption of standardized methodologies for bioeconomy-based carbon credits in response to growing voluntary market demand, with institutions such as the World Bank, GCF, GEF, and other leading stakeholders ensuring alignment with the latest international carbon accounting principles.

Relevant KPIs

TABLE 2 - BIOECONOMY FINANCE RELEVANT KPIS

Type	KPI	Baseline
Finance	Total finance flows to nature-based solutions[37] [38]	$ 200 billion a year (2023)
Finance	Biodiversity offsets and credits[37]	$ 11,7 million (2023)

Background and Context

Although global financial flows remain misaligned with nature, with nearly $ 7 trillion annually invested in environmentally harmful activities, recognition of the bioeconomy is growing.[39] Mainstream nature finance is now flowing at scale, as demonstrated by recent analyses and case studies of the sustainable debt market. For example in 2024, bonds with proceeds dedicated to nature-related projects made up about 16.5% of the total $1.1 trillion in sustainable bond issuances.[40] With initiatives such as ICMA's "Sustainable Bonds for Nature: A Practitioners Guide," this positive

37. UNEP - State of Finance for Nature 2023: The Big Nature Turnaround – Repurposing $7 Trillion to Combat Nature Loss. United Nations Environment Program, December 2023. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/44278/state_finance_nature_2023.pdf Accessed on: 24 Jul. 2025.
38. Nature-based solutions as actions inspired by nature that provide environmental, social, and economic benefits, in line with the definition outlined in UNEA Resolution No. 5.
39. UNEP - State of Finance for Nature 2023: The Big Nature Turnaround – Repurposing $7 Trillion to Combat Nature Loss. United Nations Environment Program, December 2023. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/44278/state_finance_nature_2023.pdf Accessed on: 24 Jul. 2025.
40. Environmental Finance. Sustainable Bonds Insight 2025. January 2025. Available at: https://www.environmental-finance.com Accessed on: 1 Oct. 2025.

momentum is expected to continue.[41] As evidenced by the data presented in Table 2, total finance flows to nature-based solutions were estimated at $ 200 billion annually in 2023, while biodiversity offsets and credits reached $ 11.7 million the same year.

Nevertheless, significant defining challenges persist:

- **Capital is available but not flowing where needed**: In principle, there is ample global capital for climate and nature (over $114 trillion in assets under management[42]), and global climate finance flows have nearly doubled since 2019. However, the necessary funds are not reaching the bioeconomy and other nature-positive solutions at scale. As Climate Policy Initiative (CPI) observes, "*the necessary funds are available, but need to be reallocated to uses consistent with global climate goals.*" For instance, in regions like the Amazon biome in Brazil, financial opportunities often have minimum investment thresholds suited to conventional projects but significantly above the average size of bioeconomy initiatives, thereby hindering their execution.
- **High-impact projects are perceived as high-risk**: Bioeconomy initiatives (from regenerative agriculture to novel biomaterials) can deliver outsized climate and biodiversity benefits, but investors often deem them too risky. Challenges like unfamiliar business models, information asymmetry, and lack of historical data lead financiers to overestimate risk and demand prohibitive returns[43]. Many bioeconomy projects also involve long time horizons and uncertain revenue streams, further elevating perceived risk. As a result, private capital skews toward "safe" mature technologies and markets, leaving a financing gap for early-stage and community-based bio-projects.

There is already a broad set of tools available to mobilize finance in the bioeconomy, including existing sustainable finance instruments that, if tailored to bioeconomy-related needs and deployed coherently, can be effectively leveraged.[42]

41. International Capital Market Association (ICMA). Sustainable Bonds for Nature: A Practitioner's Guide. June 2025. Original available at: https://www.icmagroup.org/sustainable-bonds-for-nature-practitioners-guide. Accessed on: 30 Sep. 2025.
42. CPI Global Landscape of Climate Finance 2023. November 2023. Available at: https://www.climatepolicyinitiative.org/wp-content/uploads/2023/11/Global-Landscape-of-Climate-Finance-2023.pdf Accessed on: 3 Jun. 2025.
43. NATUREFINANCE; WORLD BIOECONOMY FORUM. Financing a Sustainable Global Bioeconomy. Sep. 2024. Available at: https://naturefinance.net/publication/financing-a-sustainable-globalbioeconomy/.Accessed on: 10 Jun. 2025.

Key financing mechanisms to leverage:

- **Policy levers**: deforestation-free procurement mandates, minimum bio-based content requirements, public procurement policies, supportive trade policies (e.g., preferential tariffs for sustainable products or recognition of certifications)[44] tax incentives, and elimination of perverse subsidies are examples of measures that can send strong market signals.
- **Regulatory clarity and standards**: clear definitions of what qualifies as "green" or "nature-positive" investment enable alignment with sustainable finance frameworks and unlock eligibility across markets.
- **Concessional capital layers**: blended finance vehicles, with public or philanthropic first-loss layers, can shift risk-return dynamics to attract commercial investors.
- **Risk transfer mechanisms**: such as public guarantees, political risk coverage, nature insurance, catastrophe bonds, can lower the risk profile of bioeconomy ventures and attract private capital. Recognizing bioeconomy activities as sources of high-quality biodiversity and carbon credits can further enhance their appeal to investors.

These mechanisms are deployed in financial instruments already in use:

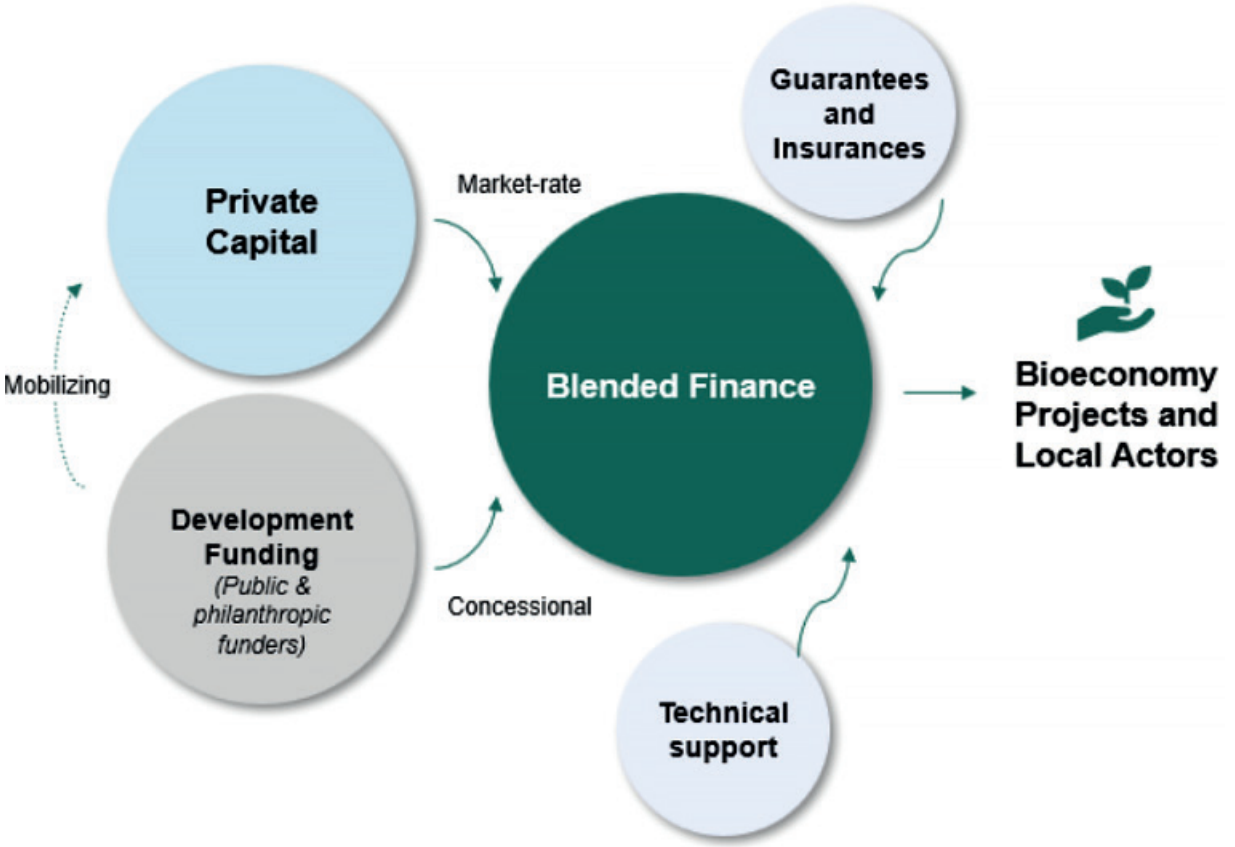
Instruments	Description	Mechanics	Examples
Sustainable Debt Instruments	Debt securities and loans explicitly linked to sustainability or climate goals (e.g. Sustainability-linked Bonds, Green and Blue Bonds, Debt-for-Nature Swaps, Biodiversity credit-linked bonds)	Companies or governments issue debt instruments dedicated to sustainable initiatives, and link loan conditions to sustainability performance	**Sustainability-Linked Loan (SLL) for Suzano's biomass gasification plant**: $2.9 million with loan terms contingent on GHG emission intensity reduction and women's leadership representation. The project uses syngas from biomass, enables up to 97% GHG reduction, exports 180 MW of clean energy, and spurred ~10,000 jobs, training, and regional development.[45]

44. Souza, Mayra. The Bioeconomy Revolution: How Trade Fuels the Green Transition. Global Trade and Customs Journal, Vol. 20, Issue 5, 2025. Available at: http://dx.doi.org/10.54648/GTCJ2025061 Accessed on: 25 Aug. 2025.
45. World Bank Group (IFC). Growing Livelihoods in Brazil: IFC's Sustainably-Managed Forestry Partnership with Suzano S.A. Brief Report. 15 Apr. 2025. Available at: https://www.worldbank.org/en/results/2025/04/15/growing-livelihoods-in-brazil-ifc-s-sustainably-managed-forestry-partnership-with-suzano-s-a?utm_source=chatgpt.com Accessed on: 8 Sep. 2025.

Tradable Certificate Schemes & Payments for Ecosystem Services (PES)	Mechanisms representing measurable sustainability outcomes. Includes: - Tradable certificates (e.g., carbon or biodiversity credits) which can be bought/ sold in markets. - PES, not necessarily tradable, involving direct payments to landowners/ communities for ecosystem stewardship.	- Tradable certificates: Conservation/positive initiatives generate credits that are certified and traded on open markets. - PES: Service users (e.g., utilities, companies, governments) compensate providers for maintaining ecosystem services (clean water, forest cover, biodiversity). Payments can be direct (cash) or indirect (technical support).	**Dengo Chocolates Credits for Life**: Partnership integrating 347 cacao farmers (2,815 ha) offering additional income stream through traceable credits via regenerative "cabruca" systems [46] **Terrasos' PPP Model for Ecosystem Resilience**: Created by Morphosis Solutions, Terrasos, IDB Lab, IFC, and Colombia's Ministry of Environment. Infrastructure companies finance biodiversity habitat banks under a national compliance framework. The model restored >6,000 ha, with >3,000 ha enrolled in the registry, and has disbursed private capital with no public funding. Biodiversity units are sold to offset buyers, with SPVs (Special Purpose Vehicles) generating service income and dividends.[47]
Sustainable Investment Funds	Funds investing exclusively in sustainable companies/projects (e.g. Conservation trust fund, Environmental funds)	Investors pool capital in sustainable portfolios, selecting companies/projects based on sustainability performance	**Moringa Agroforestry Fund** - €84 million fund of patient equity and quasi-equity to scalable agroforestry ventures that integrate tree cultivation with agriculture.[48] **SWEN CP Blue Ocean Fund** – €170 million venture capital fund launched in 2021, targeting start-ups that provide solutions to restore ocean health and protect biodiversity, focusing on areas such as sustainable aquaculture, plastic waste reduction, and ocean data.[49]
Blended Finance	Combines public or concessional capital with private sector investment	Public sector de-risk projects (e.g., first-loss guarantees), incentivizing private investment at scale into climate-focused initiatives	**Tropical Forest Forever Facility (TFFF)** – Initiative in construction that incentivizes the conservation and expansion of tropical forests by making annual payments to Tropical Forest Countries.[50] **Amazônia Viva Financing Mechanism** – Created by Natura, VERT, FUNBIO, and invested by IFC, this mechanism has disbursed BRL 12.9 million to 15 cooperatives, providing working capital to agro-extractive producers. It combines Agribusiness Receivables Certificate (CRA) at market return, structured in senior and mezzanine tranches, with an Enabling Condition Facility (ECF) that is philanthropic and provides non-reimbursable, grant-style structural support. [51]

46. Verra (VCS Program). Credit for earth— VCS Project ID 5318. Verified Carbon Standard (VCS) registry entry. Available at: https://registry.verra.org/app/projectDetail/VCS/5318 Accessed on: 8 Sep. 2025. Available in the Bioeconomy WG Case Booklet.
47. Partnerships for Forests (P4F). Unlocking Nature's Value in Colombia: Innovating Market Mechanisms to Protect Biodiversity. Case study. March 2024. Available at: https://partnershipsforforests.com/wp-content/uploads/2024/04/Unlocking-Natures-value-in-Colombia.pdf Accessed on: 8 Sep. 2025. Available in the Bioeconomy WG Case Booklet.
48. LAVCA. Moringa Closes €84m on Agroforestry Fund. December 12, 2015. Available at: https://www.lavca.org/moringa-closes-e84m-on-agroforestry-fund/. Accessed on: 10 Jun. 2025.
49. SWEN Capital Partners. SWEN Capital Partners' Blue Ocean closes at €170 m. 16 mar. 2023. Available at: https://www.swen-cp.fr/en/blog/2023/03/16/swen-capital-partners-blue-ocean-closes-at-e170m/?utm_source=chatgpt.com Accessed on: 8 Sep. 2025. Available in the Bioeconomy WG Case Booklet.
50. Tropical Forest Forever Facility (TFFF). Concept Note 3.0 – FINAL. PDF report, Aug. 2025. Available at: https://tfff.earth/wp-content/uploads/2025/08/TFFF-Concept-Note-3.0-202508-FINAL.pdf. Accessed on: 25 Aug. 2025.
51. International Finance Corporation (IFC). IFC invests in the Amazônia Viva Financing Mechanism created by Natura to strengthen the socio-biodiversity economy in the Amazon. Press release. 24 Oct. 2024. Available at: https://www.ifc.org/pt/pressroom/2024/ifc-investe-no-mecanismo-financeiro-criado-pela-natura-para-fortalecer-a-sociobioeconomia-na-amaz-nia Accessed on: 8 Sep. 2025. Available in the Bioeconomy WG Case Booklet.

FIGURE 6 - TYPICAL BLENDED FINANCE MECHANICS AND STRUCTURE



Source: The Rockefeller Foundation, World Economic Forum, BCG analysis.

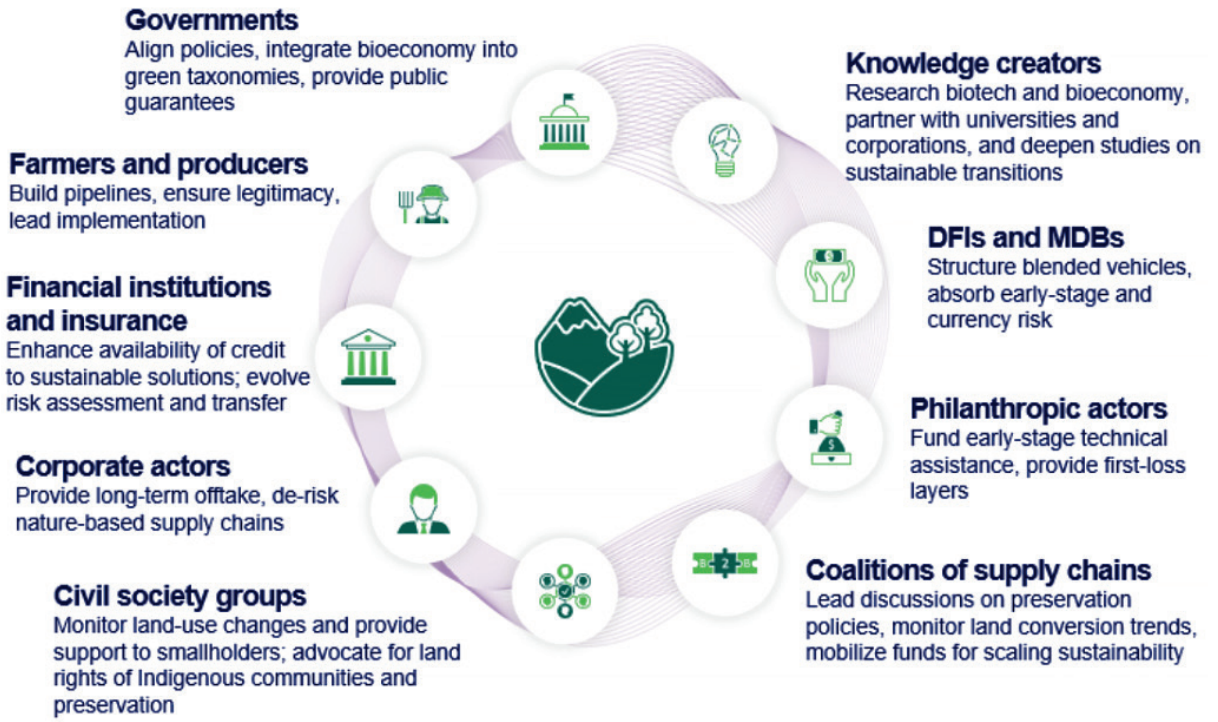
To achieve impact at scale, financial tools must be designed to address real scalability barriers. The following principles guide how financial mechanisms can be turned into outcomes:

- Price risk correctly, based on data and experience: Too often, financiers apply a high-risk premium to bioeconomy projects simply because they are unfamiliar or lack historical data. This *mispricing* of risk can doom otherwise viable projects. Effective mechanisms must improve risk assessment so that perceived risks align with actual risks. For example, better collection of performance data from pilot projects can reduce information asymmetry. Initiatives like the Taskforce on Nature-related Financial Disclosures (TNFD) and improved risk analytics will help lenders and investors quantify risks. Advanced data systems and AI tools can further support this by identifying risk patterns, forecasting project performance, and informing pricing models, helping to make credit decisions more evidence-based and less subjective.

- Make guarantees and insurance accessible to early-stage and nature-based ventures: If we want private capital in high-impact, early-stage projects, risk-sharing instruments must be within reach of those projects. This means designing guarantee and insurance facilities that are user-friendly for smaller actors (e.g. local cooperatives, start-ups, community projects). Application processes should be streamlined, and eligibility criteria should recognize the realities of nature-based enterprises (which may lack large balance sheets or collateral).
- Blend finance meaningfully, with concessional layers deep enough to matter: Blended finance works only if the concessional piece truly shifts the economics of a project. A token 1% first-loss tranche will not sway a commercial investor in a high-risk venture. Effective design requires sufficient concessionality to bridge the viability gap.
- Support project pipelines with technical assistance and matchmaking: A recurring bottleneck is the lack of bankable projects in the bioeconomy. Early technical support (e.g., feasibility studies, business planning, metrics validation) helps projects become investment ready. Blended funds can include technical assistance facilities, while incubators, accelerators, and matchmaking platforms can connect developers with investors and partners.
- Establish interoperable metrics to value multiple outcomes. Current financial systems often overlook the combined carbon, biodiversity, and livelihood benefits of bioeconomy projects, and siloed accounting can even penalize them. Interoperable frameworks are needed to recognize and reward these multi-impact contributions.

Finally, it is also crucial that a systemic challenge like financing the global bioeconomy involves collective action and mutually reinforcing roles. Below is a structured overview of the key stakeholders and the roles each should embrace jointly to unlock finance for the bioeconomy at scale:

FIGURE 7 - STAKEHOLDERS INVOLVED IN BIOECONOMY PROJECTS



Source: Adapted from World Economic Forum. *The Cerrado: Production and Protection.* 2022. Available at: https://www.weforum.org/reports/the-cerrado-production-and-protection. Accessed on: 30 Jun. 2025. BCG Analysis.

ENABLING ACTION 2.2

Promote technological incentives in the Global South to accelerate the substitution of fossil-based solutions with bio-based alternatives and the development of new bio-based solutions.

Implementation Approaches

- Position the bioeconomy as a formal technology priority under the UNFCCC Technology Mechanism, by encouraging the Technology Executive Committee (TEC) to issue policy guidance on enabling environments for bio-based innovation, including fiscal incentives and regulatory support for biomaterials, biotechnology, and bio-based industrial technologies.
- Invite developing countries to integrate bioeconomy priorities into their Technology Needs Assessments (TNAs)[52] that identify technologies for mitigation and adaptation, and align them with national innovation

52. National, country-driven processes under the UNFCCC tech mechanism.

strategies to unlock eligibility for international climate finance and technical support.

- Develop technical guidance under the TEC and the Climate Technology Centre and Network (CTCN) on how bio-based solutions contribute to both mitigation and adaptation, including templates and evaluation frameworks.
- Encourage regional innovation hubs in the Global South (e.g. Amazonia, Southeast Asia, Sahel, coastal Africa, and small island states) to partner with CTCN and multilateral agencies to accelerate technology transfer and scale domestic manufacturing capacity for bio-based industries, including ocean-derived products.
- Promote South–South cooperation by facilitating trilateral partnerships (e.g. Brazil–India–Kenya) in areas such as biomanufacturing, bio-based product development, and local SME acceleration.
- Support the creation of bioeconomy-focused incubators and accelerators in the Global South, co-funded by climate finance mechanisms and national research institutions, to boost entrepreneurship in sustainable bioproducts and processing technologies.

Relevant KPIs

TABLE 3 - BIOECONOMY TECHNOLOGY RELEVANT KPIS

Type	KPI	Baseline
Technology	New bioeconomy patent publications (annual)[53]	• Emerging Market and Developing Countries (EMDC) excluding China: 7.976 (2023) • China: 110.819 (2023) • World: 223.470 (2023)

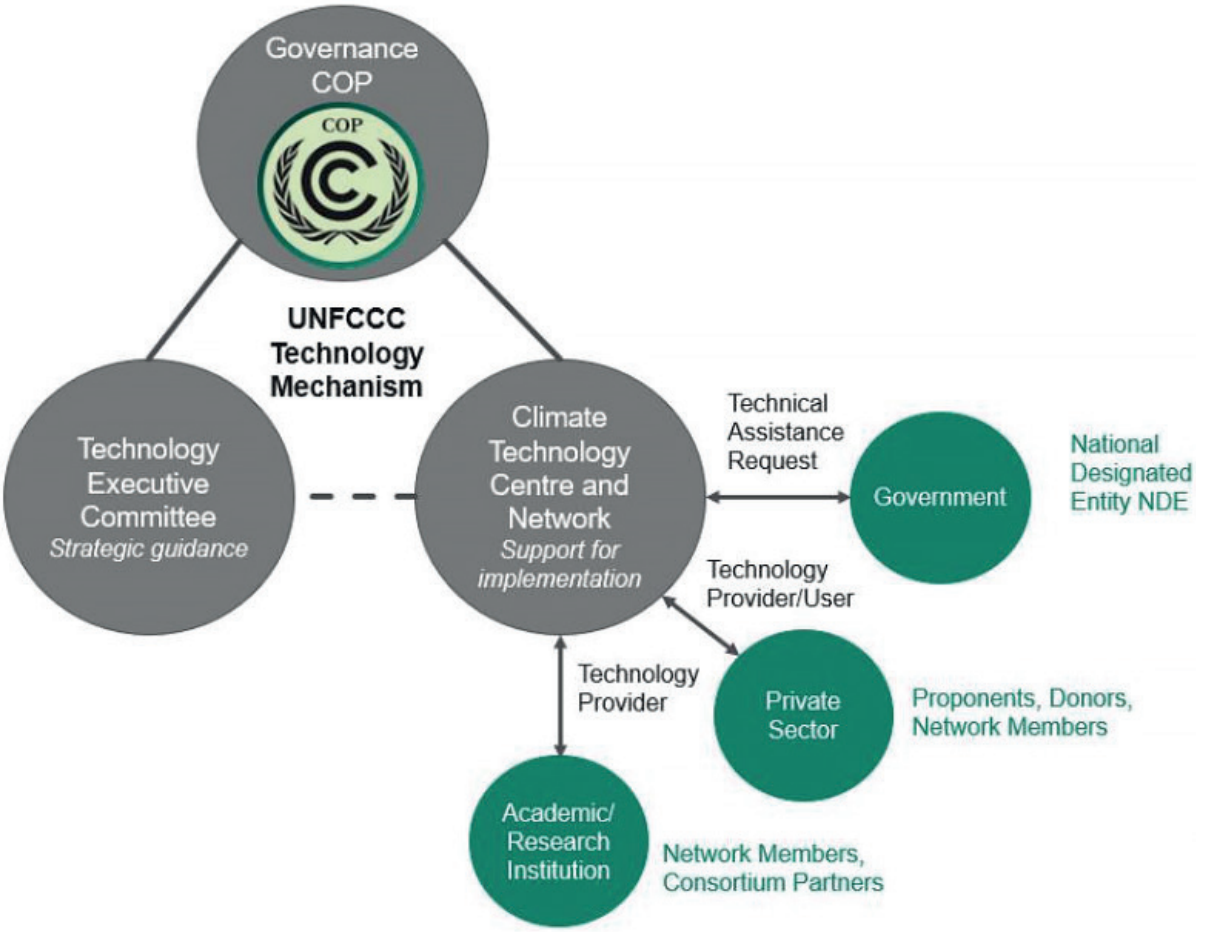
Background and Context

Global climate frameworks have established mechanisms to support technology transfer to developing countries, but these tools remain underutilized for scaling bio-based alternatives. The UNFCCC Technology Mechanism, through its Technology Executive Committee (TEC) and Climate

53. WIPO. World Intellectual Property Indicators 2024 (including data covering 2020–2023). Indicator 17: Patent filings by selected countries and technology categories (fields 11, 14, 15, 24). Published in 2024. Available at: https://www3.wipo.int/ipstats/ips search/... (configured for countries from Afghanistan through Zimbabwe) Accessed on: 24 Jul. 2025.

Technology Centre and Network (CTCN), was designed to help the Global South access and deploy low-carbon and climate-resilient technologies. It offers policy guidance, technical cooperation, and knowledge platforms. Likewise, major climate finance instruments like the GCF and GEF were created to mobilize capital for innovation in emerging economies.

FIGURE 8 - UNFCCC TECHNOLOGY MECHANISM



Source: Adapted from CTCN. *UNFCCC Technology Mechanism*. 2020. Available at: https://www.ctc-n.org/technology-mechanism. Accessed on: 21 Jun. 2025.

In theory, this institutional architecture could support bioeconomy innovation. And indeed, a few initiatives already show potential. The GCF-approved $ 600 million Amazon Bioeconomy Fund, managed by the Inter-American Development Bank (IDB), is catalyzing sustainable bio-businesses across six countries[54]. The GEF-funded Amazon Sustainable

54. Green Climate Fund (GCF). Amazon Bioeconomy Fund. Available at: https://www.greenclimate.fund/project/fp173. Accessed on: 18 Jun. 2025. Available in the Bioeconomy WG Case Booklet.

Landscapes Program explicitly supports forest-based value chains and bioproducts.[55] In South Asia, early-stage investments are being made to convert agricultural residues into bio-based fibers and materials. Yet these examples remain the exception, not the rule.[56] Substantial near-term opportunities also exist by rapidly scaling mature and proven technologies such as regenerative agriculture, water recycling and conservation technologies, and biological pest management methods. These approaches typically require lower barriers to entry, have established technical knowhow, and can offer immediate climate resilience and sustainability benefits in developing regions.

Today, bio-based innovation in the Global South is still largely absent from the strategic focus of most COP-linked technology and finance mechanisms. Support tends to be fragmented under broader forestry or adaptation programs.[57] Funding rarely reaches higher-tech applications such as bio-based chemicals or advanced biomaterials, and when it does, it is often via pilot projects with limited scale-up potential.[58] The lack of dedicated financing instruments (e.g. credit guarantees for early-stage bio-ventures, concessional capital for scale-up) severely limits investment in these areas.

This gap is compounded by a structural asymmetry in global bioeconomy value chains. While the Global South supplies the bulk of biodiversity and raw biomass, value-added innovation remains concentrated in the Global North. As indicated in Table 3, the amount of annual bioeconomy patent publications in the Global South, excluding China, represents less than 5% of the world's total. Countries in Latin America, Africa, and Southeast Asia are largely locked into low-value extraction, exporting commodities while importing processed bioproducts and bio-based technologies. Meanwhile, high-value segments like industrial biomanufacturing, enzyme engineering, or bio-based packaging materials are dominated by OECD countries.[59]

55. Global Environment Facility (GEF). Amazon Sustainable Landscapes Program. Available at: https://www.thegef.org/programs/amazon-sustainable-landscapes-program. Accessed on: 26 Jun. 2025.
56. FAO. The Bioeconomy and the Global South. In: Global Bioeconomy Summit Report 2020. Available at: https://www.fao.org/publications. Accessed on: 18 Jun. 2025.
57. IDB Harnessing the Bioeconomy Climate Nexus for Sustainable Development. Discussion Paper, Inter American Development Bank, June 2025. Available at: https://publications.iadb.org/publications/english/document/Harnessing-the-Bioeconomy-Climate-Nexus-for-Sustainable-Development.pdf. Accessed on: 20 Jul. 2025.
58. NatureFinance; World Bioeconomy Forum. Financing a Sustainable Global Bioeconomy. September 12, 2024. Available at: https://www.climatepolicyinitiative.org/publication/financing-a-sustainable-global-bioeconomy/. Accessed on: 10 Jun. 2025.
59. FAO. The Bioeconomy and the Global South – Opportunities and Challenges. In: The Bioeconomy and the Global Bioeconomy: Ten Years of Knowledge, Collaboration and Progress. Global Bioeconomy Summit, 2020. Available at: https://www.fao.org/publications. Accessed on: 10 Jun. 2025.

Yet the Global South holds a unique strategic asset: its biodiversity, the raw material for the next generation of bio-innovation. For instance, Brazil exemplifies this potential: the country has the greatest biodiversity on the planet, accounting for around 24% of global biodiversity across different classes of living organisms.[60] With the right incentives, technology access, and capacity-building, these regions could leapfrog into leadership positions across multiple segments of the bioeconomy. As highlighted in the ICC study, two key recommendations to drive the bioeconomy in Brazil are to strengthen its scientific base and to consolidate its innovation ecosystem.

COP30 provides a pivotal opportunity to shift this dynamic. By formally integrating bio-based innovation into the scope of the UNFCCC Technology Mechanism and aligning climate finance tools to support mid- and high-tech bioeconomy ventures, COP30 can help rewire global value chains for fairness and resilience. This includes promoting South-South cooperation in biotechnology, investing in regional bioeconomy innovation hubs, and expanding technical assistance programs under TEC/CTCN to include bio-based manufacturing, bio-input development, and advanced processing infrastructure.

60. ICC Brasil. O Potencial do Brasil na Bioeconomia do Conhecimento: Resumo Executivo. PDF report, Ago. 2025. Available at: https://www.iccbrasil.org/wp-content/uploads/2025/08/ICC_Bioeconomia-do-Conhecimento_Agosto-2025_Resumo-Executivo.pdf. Accessed on: 25 Aug. 2025.

C. PRIVATE SECTOR CASES

C. PRIVATE SECTOR CASES

The cases presented in this Chapter are also featured in the Bioeconomy WG Case Booklet. For additional details and more information, please refer to the full version available in the booklet.

All cases demonstrate alignment with the ten G20 High-Level Principles in Annex B. For illustrative purposes, the following table highlights the principles most prominently reflected in each case.

TABLE 4- MAIN G20 HIGH-LEVEL PRINCIPLES ILLUSTRATED BY CASE

Case	High-Level Principles
1: BASF - Pragati project	1,2,5
2: Dengo - Credits for Life	1,5,8
3: Givaudan - Sustainable Hyaluronic Acid	3,5,6
4: Morphosis - Terrasos' PPP Model for Ecosystem Resilience	3,4,7
5: Natura - SAF Dendê	1,2,4
6: Sanctu - The Amazon regenerative platform	1,7,10

C. 1 BASF - Pragati project

Stakeholders involved

- BASF (Private Company): Partner
- Arkema (Private Company): Partner
- Jayant Agro-organics (Private Company): Partner
- Solidaridad Network (NGO): Partner: trains farmers and engages communities
- Smallholder Farmers (Local/Traditional Communities): Cultivate castor and apply sustainable agricultural practices

Initiative Description and Objectives

The Pragati Project, launched by BASF and its partners, is the world's first sustainable castor bean program. The initiative is based in India, specifically on Gujarat, where most of the world's castor supply originates.

The goal of the project is to enable sustainable castor crop cultivation by:

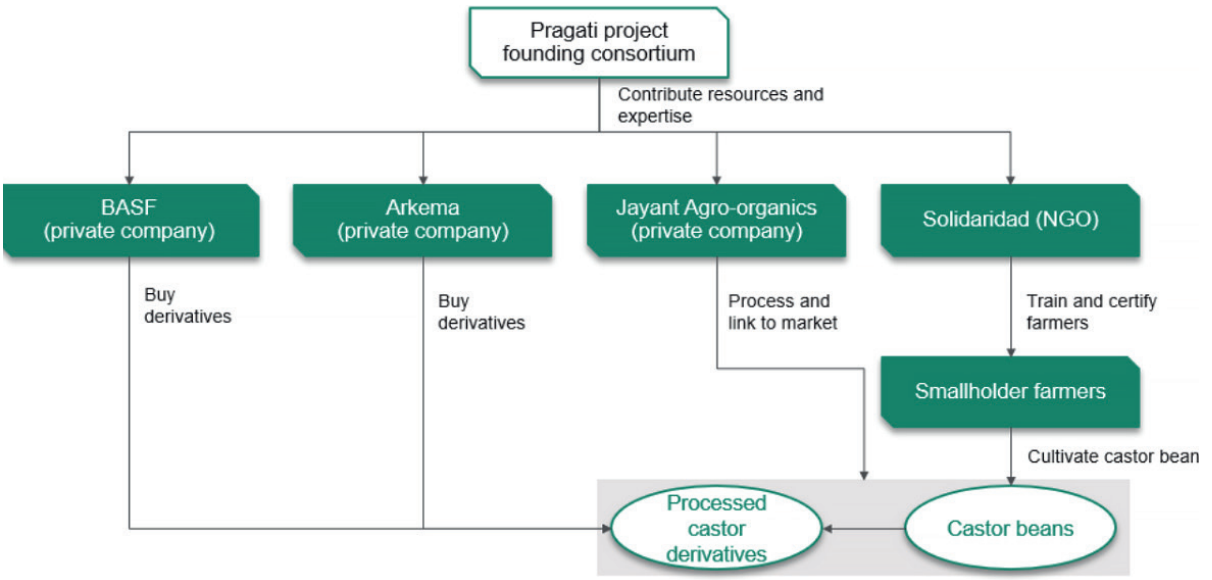
- Using good agricultural practices to increase yield and farmer income
- Efficiently using water resources and maintaining soil fertility
- Driving adoption of good waste management practices
- Enabling better health and safety practices and respecting human rights

The project is being implemented in phases. It began with a pilot in 2016, reaching village-level consolidation by 2019, and is now in its third phase (2023–2026), with an expanded focus on supporting and increasing women's participation in castor farming. In 2025, more than 1,100 women from 17 project villages enrolled in the program and received training on agricultural practices to enhance productivity and adopt sustainable, regenerative agriculture in a safe manner. All of them also took part in the program's digital and financial literacy module, resulting in improved financial and household decision-making.

The SuCCESS (Sustainable Castor Caring for Environmental & Social Standards) code was developed to support the principles of Pragati and make it possible for producers to certify their crops as sustainable and bring them to the global market as responsibly sourced products. The SuCCESS Code adopts 11 principles of accountability by supporting smallholders in

the field to ensure monitoring and compliance with 41 mandatory and 35 non-mandatory control points.

FIGURE 9 - CASE 1 BLUEPRINT - PRAGATI PROJECT



Source: SB COP Bioeconomy Working Group

Results

- The program has trained more than 10,000 farmers, with over 8,000 audited and SuCCESS certified; expanded sustainable practices to 9,000 hectares and delivered about 100,000 tons of certified castor seeds since the beginning of the project.
- In year 8, certified farmers achieved 57% higher yields compared to regional averages, and in the demo pilots, water consumption has reduced by approximately 33% relative to local averages.
- Communities have benefited from over 100 medical camps reaching more than 8,300 people as well as from the distribution of 8,200 personal protective equipment kits and 5,500 crop protection boxes.

Key Takeaways

Pragati stands out as a pioneering project in sustainable castor farming in India, delivering measurable environmental, social, and economic benefits. Its success is rooted in strong partnership governance, innovative frameworks, and deep local engagement, making it a replicable model for responsible sourcing and sustainability.

C. 2 Dengo - Credits for Life

Stakeholders involved

- Dengo (Private Company): Coordinates implementation and market access
- ReSeed PBC (Private Company): Provides digital MRV tools and blockchain registry
- Ecam (NGO): Leads community engagement and mobilization
- Impact Not a Bank (Financial Institution): Facilitates financial structuring and payments
- FoodChainID (Private Company): Ensures traceability and certification services
- World Bank (International Organization): Provides outcome-bond financing
- Santa Cruz State University (Academia): Supplies research and technical expertise.
- Global Forest Bond (NGO): Links to biodiversity and conservation markets
- KPMG (Private Company): Provides third-party assurance, audits, and compliance
- Public Sector (Local Government): Regulatory compliance and policy alignment
- Smallholder Cocoa Producers (Families, SMEs): Core beneficiaries

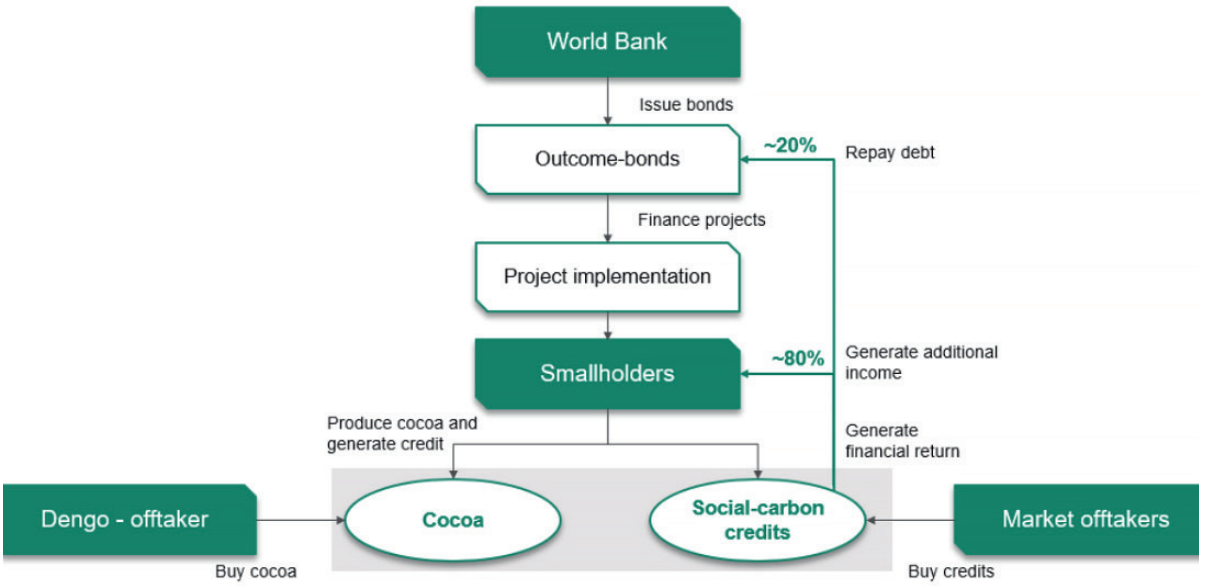
Initiative Description and Objectives

The Dengo Credits for Life project creates a new source of income for cabruca cocoa producers in Bahia, Brazil, by using the Social Carbon Protocol for Family Farming (PCSAF) to certify avoided deforestation and carbon sequestration.

Credits are issued through World Bank outcome-bond financing, which covers about two years of producer mobilization, diagnostics, and data collection (2023–2025), followed by one year of validation, MRV, and audits (2024–2025), leading to certification and first payments. Once verified under Verra methodologies (VM0048 and VM0047), the credits are registered on ReSeed's blockchain platform and Verra's registry, and sold in the voluntary carbon and biodiversity markets. The resulting revenues are then split: 80% flows directly back to farmers through payments and technical assistance, while the remaining 20% share repays the upfront

outcome-bond financing, ensuring financial sustainability and scalability of the model.

FIGURE 10 - CASE 2 BLUEPRINT - CREDIT FOR EARTH



Source: SB COP Bioeconomy Working group

Results

- Project has been deployed in 2,815 hectares (1,566.88 ha cabruca and 939.60 ha native forest), engaging 99 families and 347 participants across 104 properties.
- Over 1 million tCO_2 have been conserved to date, with R$ 2.2 million distributed in 2025 to producers through payments and technical assistance.
- Baseline biodiversity indicators have been established, and family livelihoods are being monitored with the goal of achieving a 20% rise in average household income among participants.

Key Takeaways

The initiative faces challenges such as exposure to climate risks like droughts and storms, land tenure disputes, low farmer engagement, and regulatory shifts. Technical hurdles in measuring and verifying carbon stocks also add complexity and cost, particularly in smallholder contexts where data must be standardized across many properties.

These barriers are being addressed through capacity building, digital MRV that lowers costs, and independent audits that ensure credibility. Alignment with Brazil's Forest Code, the ABC+ Plan[61], and the National Policy for Payment for Environmental Services provides regulatory certainty, while outcome-bond financing secures upfront capital. By combining verified methodologies with participatory processes and blockchain transparency, the model is designed to scale to 3,000 producers and 75,000 hectares in Bahia and can be replicated across other agroforestry systems, linking climate finance directly to rural livelihoods.

61. National program that promotes climate-smart farming practices, such as recovering degraded pastures, integrated crop-livestock-forestry systems, and agroforestry, to enhance resilience in the agriculture sector.

C. 3 Givaudan - Sustainable Hyaluronic Acid

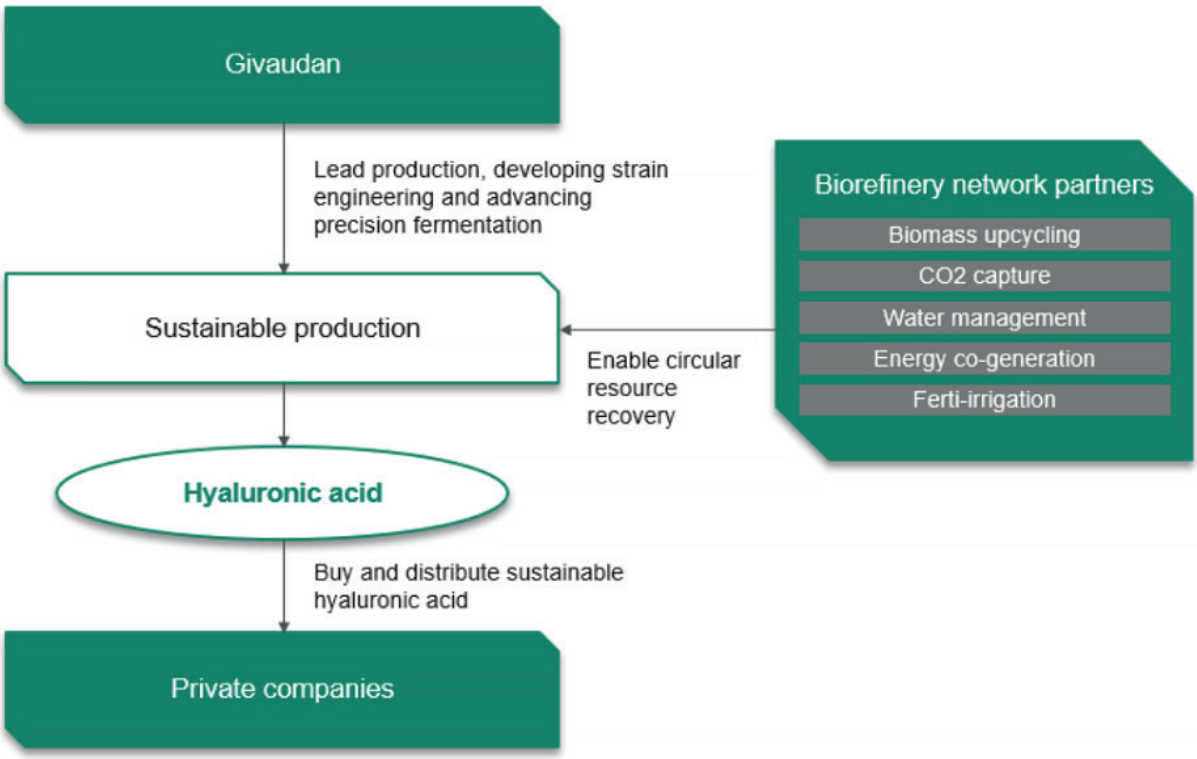
Stakeholders involved

- Givaudan (Private Company): Leads production, strain engineering, and precision fermentation
- Biorefinery Network Partners: Enable circular resource recovery
- Large Corporations: Act as offtakers and distributors in global beauty markets
- Small and Medium Enterprises (SMEs): Formulate products with the ingredient
- Regulatory Authorities: Ensure compliance and market acceptance.

Initiative Description and Objectives

Hyaluronic acid production at the Pomacle biorefinery was already highly sustainable thanks to its circular setup, which integrates agricultural biomass upcycling (from beetroot and wheat), CO_2 capture, energy co-generation through biomethane and biomass, ferti-irrigation partnerships, and advanced water management. Yet Givaudan Active Beauty chose to go further, reinventing the process itself by moving beyond traditional bacterial fermentation toward a breakthrough model based on engineered microbial strains and precision fermentation. Between 2020 and 2024, the initiative advanced through four phases, strain engineering, industrial scale-up, full production, and commercialization, culminating in the global launch of PrimalHyal™ 50 Life. All sustainability gains were validated through ISO 14040 and 14044 – aligned Life Cycle Assessments, confirming drastic reductions in emissions, energy use, and water consumption.

FIGURE 11 - CASE 3 BLUEPRINT - SUSTAINABLE HYALURONIC ACID PRODUCTION INTEGRATED INTO THE BIOREFINERY



Source: Givaudan

RESULTS

- The new process decreases CO_2 emissions by 92%, cutting per-kilogram emissions from 80 kg CO_2e to just 6.4 kg CO_2e. Environmental performance shows a 95% reduction in water acidification and eutrophication, a 90% cut in non-renewable energy consumption, and a 75% decrease in water usage.
- PrimalHyal™ 50 Life is commercially available worldwide, combining lower environmental footprint with stronger cost competitiveness, as yields were improved while energy and resource consumption were significantly reduced.

Key Takeaways

The main challenges involved regulatory alignment for biotech-derived cosmetic ingredients, ensuring industrial scalability of fermentation at competitive costs, and bridging market acceptance of a novel production process.

Givaudan overcame these barriers through rigorous ISO-aligned life cycle assessments, competitive pricing strategies, and industrial-scale fermentation capacity. The approach offers strong potential for replication across other high-demand biopolymers in personal care and beyond, positioning biotechnology as a transformative enabler of the bioeconomy.

C. 4 Morphosis - Terrasos' PPP Model for Ecosystem Resilience

Stakeholders involved

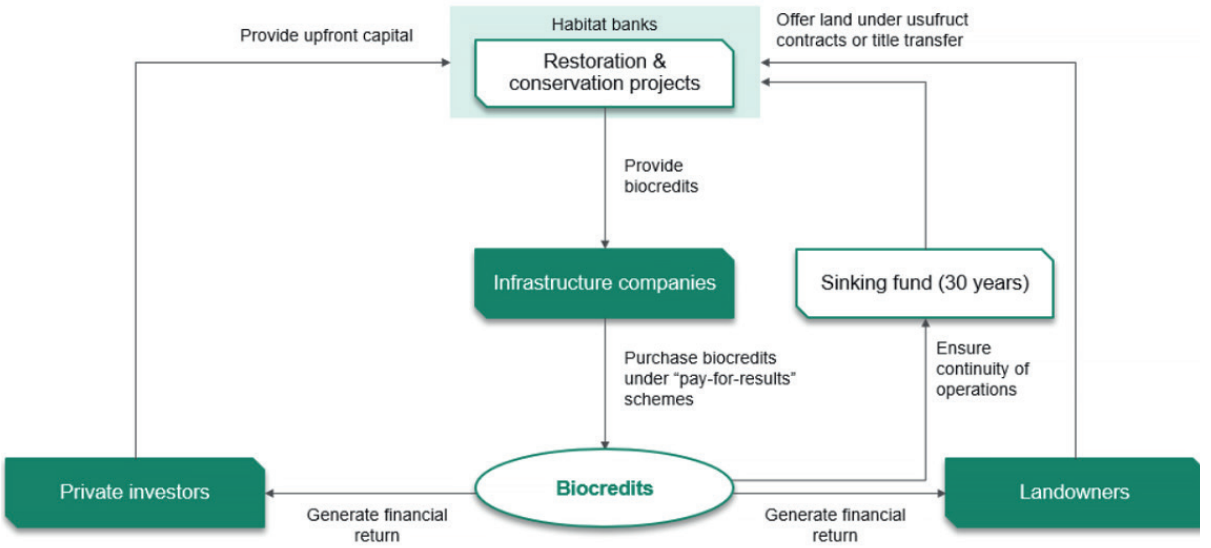
- Morphosis Solutions (Private company): Provides structuring and global financial transition expertise
- Terrasos (Private company): Project owner and developer, habitat bank operator, risk-bearing asset manager
- Land Degradation Neutrality Fund managed by Mirova: Provides project finance
- Partnerships 4 Forest (UK gov program): Provides derisking grant capital
- IDB Lab (International organization): Early-stage investor
- Colombian Ministry of Environment (Government): Provides national compliance framework for biodiversity offsets
- Private Landowners: Contribute land via 30-year usufruct or title transfer agreements

Initiative Description and Objectives

Terrasos has pioneered a public–private partnership (PPP) model to finance ecosystem resilience entirely through private capital, anchored in Colombia's national watershed impact and biodiversity offset regulations. At its core are habitat banks, long-term ecological infrastructure projects where landowners commit land for 30 years in exchange for compensation through biodiversity credits or units issued under the Terrasos Biodiversity Unit framework (TEBU), which guarantees rigorous monitoring, reporting, and benefit-sharing.

Private sector demand comes primarily from compliance buyers. In fact, under Colombian law, project developers in sectors such as infrastructure, energy, and extractive industries (mining, oil, gas) are legally required to offset impacts in watersheds and biodiversity on a like-for-like basis. Instead of fragmented, low-quality offsets, they can purchase credits from habitat banks that guarantee measurable, long-term ecological outcomes at scale. For investors, the model provides an asset class with risk-adjusted returns, where revenues are generated through credit sales over 15–20 years and safeguarded by a 30-year sinking fund.

FIGURE 12 - CASE 4 BLUEPRINT – TERRASOS' PPP MODEL



Source: SB COP Bioeconomy Working group

Results

- The model has restored more than 2,000 hectares and enrolled over 3,000 hectares in Colombia's national biodiversity registry.

- Terrasos has mobilized more than US$ 7 million in biodiversity credit sales, while the TEBU protocol, upgraded to version 4.0 in 2025, has set a market benchmark for integrity, monitoring, and benefit-sharing.

- Landowners who commit their land for 30 years receive sustained payments that equal or exceed the opportunity cost of alternative uses.

- Early evidence confirms measurable adaptation outcomes, including a 0.4°C surface temperature reduction in restored areas, improved erosion control, and reduced flood risk.

Key Takeaways

Terrasos' model shows that adaptation can be financed entirely through private capital when biodiversity is treated as ecological infrastructure. Along the way, the initiative faced several barriers, including shifting regulations, volatile credit demand, risks of delayed restoration outcomes, and balance sheet pressures from high upfront investment. These challenges were addressed through a vertically integrated enterprise

approach, where Terrasos assumed full project risk during early years and de-risked long-term operations through biodiversity credits and a 30-year sinking fund.

This performance-based PPP model, anchored in compliance frameworks yet attractive to voluntary buyers, proves that private investment can deliver both reliable returns and measurable adaptation outcomes. Its design makes it replicable in other jurisdictions where biodiversity offset regulations are emerging, creating strong potential for scaling across sectors and geographies.

C. 5 Natura - SAF Dendê

Stakeholders involved

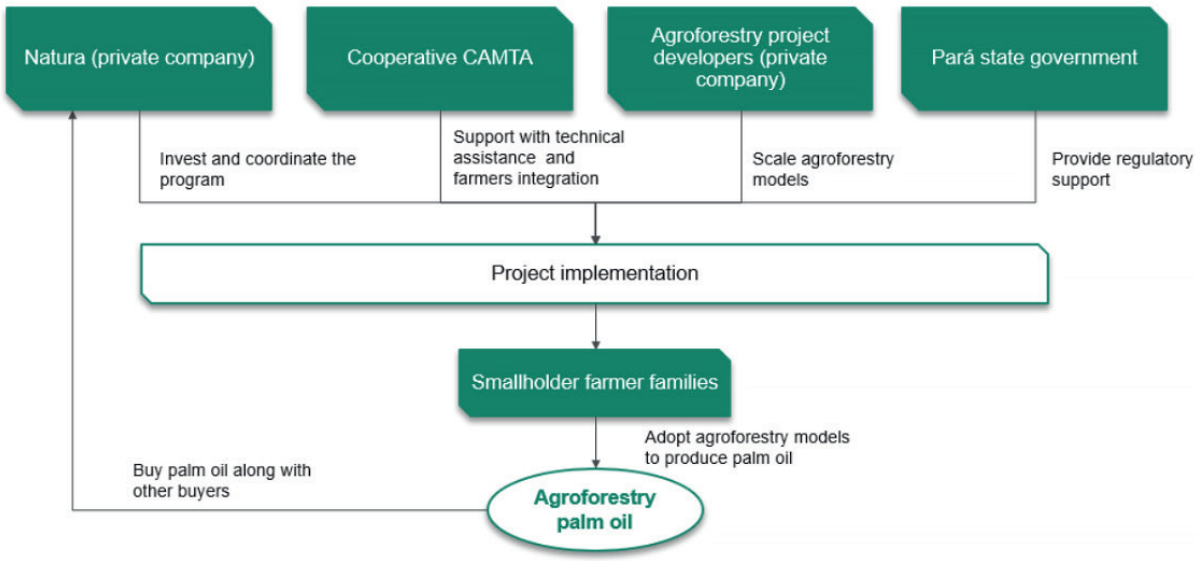
- Natura (Private Company): Leads investment and program coordination
- Agroforestry Project Developers (Private Companies): Implement agroforestry models
- Smallholder Farmer Families: Adopt agroforestry systems
- Cooperativa Agrícola Mista de Tomé-Açu (CAMTA): Facilitates producers engagement
- Pará State Government (Brazil): Provide regulatory support and alignment with policies
- NGO Technical Partner: Supports with technical assistance

Initiative Description and Objectives

The SAF Dendê program, led by Natura, promotes the expansion of sustainable palm oil sourcing through agroforestry systems in Pará, Brazil. After 13 years of technical and economic feasibility research, the model integrates palm with native and high-value crops like cocoa, aiming to regenerate soils, diversify farmer income, and supply the cosmetics industry with ethical trade, low-carbon palm oil.

SAF Dendê is being scaled across Tomé-Açu and surrounding regions by building strategic partnerships with cooperatives, private companies, and international partners to secure long-term market access, while working with government actors to resolve land tenure regularization issues and align supportive policies. Financing combines Natura's capital with concessional loans, guarantees, and carbon revenues to reduce risks for farmers and attract institutional investors. Monitoring integrates digital tools for traceability with cooperative and community-based oversight, ensuring compliance with Roundtable on Sustainable Palm Oil (RSPO) and Union for Ethical BioTrade (UEBT) standards.

FIGURE 13 - CASE 5 BLUEPRINT - SAF DENDÊ



Source: SB COP Bioeconomy Working group

RESULTS

- 650 hectares of palm agroforestry are already planted, with 300 hectares mapped for the 2025/26 cycle and a cooperative commitment to expand toward 2,000 hectares.
- Smallholder families participating in pilots are earning on average 40% more gross income compared to monoculture systems.
- Agroforestry systems are modeled to remove up to 6 tons of CO_2e per hectare per year, validated under IPCC guidelines and Natura's field-based estimates.

Key Takeaways

The project has faced bottlenecks linked to unclear land tenure, high upfront costs, limited availability of skilled labor, and weak initial market demand for certified sustainable palm oil. Policy delays and environmental insecurity have also posed risks, creating uncertainty for farmers and investors and slowing early adoption. These barriers highlight the need for stronger governance, farmer capacity building, and enabling regulation to unlock wider participation.

Despite these challenges, with structured blended finance, carbon revenue streams, and cooperative partnerships, the model can be replicated across the Amazon and adapted to other tropical geographies. If adopted by more companies, it has the capacity to transform palm supply chains into a regenerative, climate-smart and socially inclusive system.

C. 6 Sanctu - The Amazon regenerative platform

Stakeholders involved

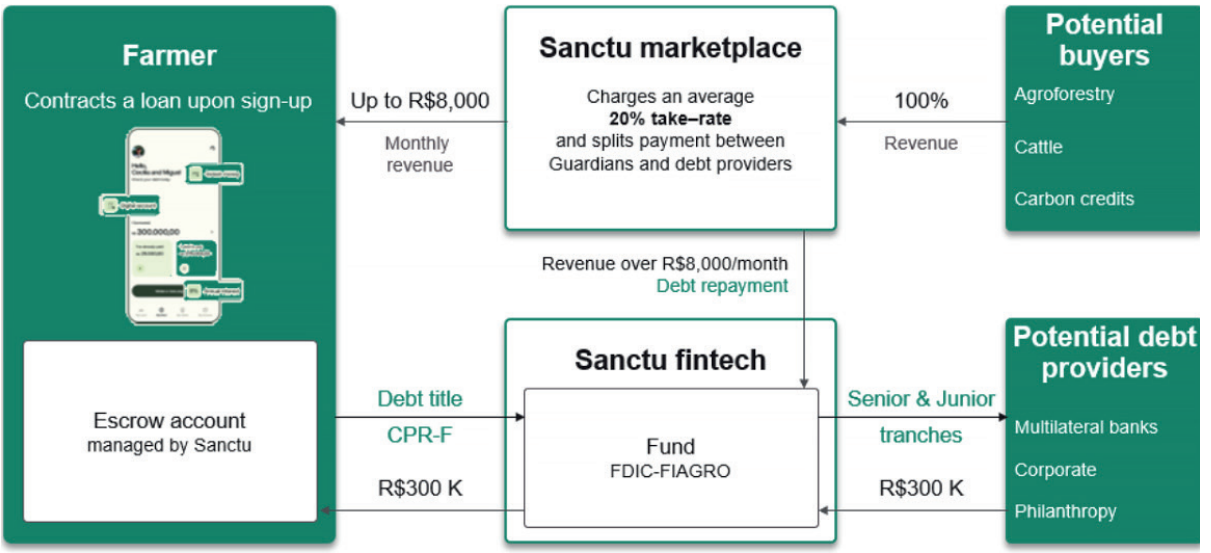
- Sanctu (Private Company): Develops the project and operates the platform
- Corporate Buyers: Purchase sustainable agroforestry products (such as cacao, açaí, and cattle) and high-integrity carbon credits
- Projeto Saúde e Alegria, IDESAM, others (NGOs): Engage with communities
- BNDES, Climate Funds, Multilateral Banks, Philanthropy (Financial Institutions): Provide blended finance and debt capital to enable farmer loans

Initiative Description and Objectives

Sanctu's Amazon Regeneration Platform is a large-scale initiative to restore degraded Amazon land while raising smallholder incomes through a platform model. Instead of owning land, Sanctu signs 40-year contracts with farmers who adopt regenerative agroforestry, sustainable cattle ranching, and forest restoration. The company provides financing, tailored investment plans, technical assistance, and secures corporate buyers for products and carbon credits. It charges an average 20% take-rate on sales, splitting payments between farmers and debt providers.

Financially, the program is structured to deliver a 30% IRR per farm, supported by blended finance vehicles and guaranteed offtake agreements that reduce market risk. Environmentally, it projects significant carbon capture, underpinned by AI-driven project design, advanced geospatial monitoring, and rigorous certification to ensure permanence and credibility. Implementation began in 2023 with pilot families and advanced in 2025 with the first investment plans, technical assistance, and product sales.

FIGURE 14 - CASE 6 BLUEPRINT - AMAZON REGENERATIVE PLATFORM



Source: Sanctu

Results

- 1000 hectares of degraded pasture have already been converted into productive, biodiverse forest and agroforestry systems.
- The first 10 families have already committed to 40-year contracts under the platform, tripling their baseline monthly income, with high satisfaction reflected in an NPS above 85, pointing toward the ambition of increasing income.

Key Takeaways

The main challenges have been climate risks, price volatility, dependence on buyers, regulatory uncertainty, and keeping farmers engaged over the long term.

These have been mitigated by income-stabilizing loan structures, diversification across multiple value chains, and long-term contracts that secure permanence and trust. This combination shows strong potential for replication in other tropical regions, positioning the model as a scalable blueprint for bioeconomy-driven rural development.

ANNEXES

ANNEX A – ACRONYMS

AI	Artificial Intelligence
BHR	Business and Human Rights
CBD	Convention on Biological Diversity
COP	Conference of the Parties
COP15	15th Conference of the Parties to the CBD (Convention on Biological Diversity, 2022, Kunming-Montreal Framework)
COP27	27th Conference of the Parties to the UNFCCC (2022, Sharm el-Sheikh)
COP28	28th Conference of the Parties to the UNFCCC (2023, Dubai)
COP30	30th Conference of the Parties to the UNFCCC (2025, Belém, Brazil)
COP31	31st Conference of the Parties to the UNFCCC (future, 2026)
CPI	Climate Policy Initiative
CTCN	Climate Technology Centre and Network (under the UNFCCC Technology Mechanism)
FAO	Food and Agriculture Organization of the United Nations
GCF	Green Climate Fund
GEF	Global Environment Facility
GIB	G20 Initiative on Bioeconomy
ICC	nternational Chamber of Commerce
ICCPR	International Covenant on Civil and Political Rights
ICMA	International Capital Market Association
IDB	Inter-American Development Bank
IEA	International Energy Agency
ISSB	International Sustainability Standards Board
OECD	Organization for Economic Co-operation and Development
RSPO	Roundtable on Sustainable Palm Oil
SBSTA	Subsidiary Body for Scientific and Technological Advice (UNFCCC)

SDG	Sustainable Development Goal
SME	Small and Medium-sized Enterprises
TA	Technical Assistance
TCFD	Task Force on Climate-related Financial Disclosures
TEC	Technology Executive Committee (under the UNFCCC Technology Mechanism)
TISFD	Taskforce on Inequality and Social-related Financial Disclosures
TNA	Technology Needs Assessments
TNFD	Taskforce on Nature-related Financial Disclosures
UEBT	Union for Ethical BioTrade
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change

ANNEX B – G20 HIGH-LEVEL PRINCIPLES ON BIOECONOMY - G20 INITIATIVE ON BIOECONOMY (GIB)

1. Integrate and promote sustainable development across its economic, social and environmental dimensions, contribute to eradicating hunger and poverty and improving health and well-being, whilst ensuring global food security and nutrition.

2. Be inclusive and equitable, uphold the rights of all persons, including Indigenous Peoples and members of local communities, promote gender equality and the participation of all stakeholders.

3. Advance mitigation and adaptation efforts against global climate change, in line with applicable multilateral climate agreements.

4. Contribute to the conservation of biodiversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, subject to national laws and in line with applicable international agreements and instruments.

5. Advance sustainable consumption and production patterns and the efficient and circular use of biological resources, whilst promoting the restoration and regeneration of degraded areas and ecosystems.

6. Be developed through safe, secure and responsible use of science, technology, innovation and traditional knowledge, with potential benefits, risks and impacts assessed scientifically.

7. Benefit from robust and coherent policy frameworks that foster trade for bioeconomy products and services, market conditions, sustainable business models, decent jobs, local value creation and private sector and civil society participation.

8. Utilize transparent, comparable, measurable, inclusive, science-based and context-specific criteria and methodologies to assess their sustainability throughout the value chains.

9. Be fostered by international collaboration and cooperation that addresses global challenges, leverages complementary strengths, innovation and entrepreneurship and promotes financing, capacity building and sharing of best practices.

10. Be based on country-specific approaches and implemented in line with national priorities and regional and local circumstances.

ANNEX C – COMPOSITION AND MEETING SCHEDULE

Distribution of Members by country

Brazil	12
Germany	4
Colombia	2
India	2
Latvia	1
Argentina	1
France	1
Kenya	1
Netherlands	1
Peru	1
Switzerland	1
USA	1
South Africa	1

Distribution of Members by gender

Male: 15	Female: 14

Task Force Chair

Name	Organization	Position	Country
João Paulo Ferreira	Natura	CEO	Brazil

Task Force Deputy Chairs

Name	Organization	Position	Country
Angela Pinhati	Natura	CSO	Brazil
Paulo Dallari	Natura	Government Affairs Director	Brazil

Task Force Co-Chairs

Name	Organization	Position	Country
Priscila Camara	BASF	Senior Vice President South America BASF	Brazil
Marcelo Melchior	Nestlé	CEO Nestlé Brazil	Brazil
Isabella Tonaco	Symrise	CSO	Germany
Ethel Laursen	Novonesis	President Latin America	Brazil
Sanjiv Puri	ITC Limited	Chairman and Managing Director	India

Task Force PMO

Name	Organization	Position	Country
Bernardo Passerino Szvarça	GSS	PMO	Brazil
Priscila Drozdek de Alcântara	GSS	PMO	Brazil
Cecília Michelis	GSS	PMO	Brazil

Task Force CNI Focal Point

Name	Organization	Position	Country
Julia Moreira Pupe	CNI	Industry and Policy Specialist	Brazil

Task Force Members

Name	Organization	Position	Country
Augusto Bauer	Aje	CEO	Peru
Argentino Oliveira Neto	Braskem	Director of Sustainable Development and Marketing	Netherlands
Dorothy Maseke	FSD Africa	Council Member	Kenya
Lucia Lisboa	Givaudan	VP Fragrances LATAM	Germany
Hallvard Bremnes	Givaudan	Global Head of Sustainability	Germany
Alex Pryor	Guayaki yerba mate	CEO	Argentina
Ligia Stocche	IDB	Chief of Staff	Brazil
Mayra Souza	IFF	Global Director	Brazil
Marcelo Furtado	Itaúsa	Head of Sustainability	Brazil
Sabīna Alta	Laflora	Development Director	Latvia
Patrick Sabatier	L'Oreal	Chief Corporate Affairs & Engagement Officer - Brazill	France
Rodrigo Suarez	Marsh	Climate and Sustainability Leader in Latin America and the Caribbean	Colombia
Thiago Picolo	re.green	CEO	Brazil
Henrique Dantas	Sanctu	COO	Brazil
Andre Lammerding	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)	Director Cluster Biosphere	Germany
Mariana Sarmiento	Terrasos	CEO	Colombia
Pauline Lowe	Zurich	Director Group Public Affairs	Switzerland

Mr. Tarun Sawhney	Triveni Engineering	Vice-Chairman & MD, Triveni Engineering	India
Jukka Kantola	World Bioeconomy Association	Chair	USA
Madeleine Ronquest	FirstRand Group	Group Head Environmental, Nature & Climate Risk	South Africa
Juliana Salles Almeida	IDB	Principal Specialist at the IDB Presidency	Brazil

Task force Meetings Schedule

Data	Format
22/05/2025	Online
01/07/2025	Online
21/07/2025	Online
12/08/2025	Online
15/08/2025	Online

ANNEX D – PARTNERS

Knowledge Partner

BCG

Network Partners

ICC

NATURE FINANCE

UEBT SOURCING WITH RESPECT

WORLD ECONOMIC FORUM

IFC

DISCLAIMER AND ACKNOWLEDGEMENTS

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CNI Brazilian National Confederation of Industry