

Mapping finance solutions and instruments across the three bioeconomy types





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This contribution by Nature Finance and the Sustainable Finance Coalition<sup>1</sup> aims to support the G20 Initiative on the Bioeconomy (GIB) by outlining a selection of traditional and innovative finance solutions and instruments<sup>2</sup> that can be used to grow the bioeconomy, particularly with clear prioritisation, financial planning, and alignment with development and climate-nature goals as the key starting point for selecting and leveraging financing. Though not exhaustive and open to additions from GIB members, this mapping presents financial solutions and instruments that can be leveraged to bridge funding gaps, reduce risks, and attract private investments in the bioeconomy.

The bioeconomy is a rapidly evolving economic paradigm that is globally recognised as a key driver for sustainable development. It reduces dependence on fossil resources, promotes the use of biomass alternatives and a circular approach across a range of sectors, and promotes biodiversity conservation. It presents a set of viable economic opportunities for a just transition.

The **Global Bioeconomy Stocktake**<sup>3</sup> identified over 60 countries and regions with bioeconomy or bioscience-related strategies. In order to gain a shared understanding among the G20, the above 3 bioeconomy types were outlined, not to suggest a hierarchy but rather to emphasize the diversity and range of the bioeconomy. A country, and even a single industry value chain, can have examples from each type of the bioeconomy, meaning that not only is overlap possible but part of economic development and diversification.



<sup>&</sup>lt;sup>1</sup> This technical contribution draws from existing analytical work conducted by NatureFinance and the Sustainable Finance Coalition. It is intended to inform and support the discussions of the G20 Bioeconomy Initiative on the Bioeconomy and does not represent a formal position or recommendation.

<sup>&</sup>lt;sup>2</sup> The solutions and instruments included have been identified based on relevance to different bioeconomy models and do not represent an official position or exhaustive list. Their applicability may vary across G20 member contexts.

<sup>&</sup>lt;sup>3</sup> https://www.naturefinance.net/wp-content/uploads/2024/05/ENG-TheGlobalBioeconomy\_FINAL.pdf

Explanation	<b>Nature Intensive</b> <b>Bioeconomy</b> The Nature Intensive Bioeconomy refers to an economic system that utilizes biological resources, processes, and principles to produce goods and services. It encompasses various sectors including agriculture, forestry, fisheries, food and bioenergy. The goal of the bioeconomy is to create sustainable economic growth, while reducing environmental impact and dependency on fossil fuels.	Advanced Bioeconomy represents an evolution from traditional bioeconomy represents an evolution from traditional bioeconomic practices, focusing on the use of innovative technologies and advanced biological processes to create value-added products. It aims to address environmental and economic challenges by providing sustainable alternatives to fossil-based products and enhancing the efficiency and sustainability of production processes.	Hi-Tech Bioeconomy The High-Tech Bioeconomy refers to the segment of the bioeconomy focused on producing high-value, specialized, and often technologically sophisticated bioproducts. These products are characterized by their advanced functionalities, innovation, and higher market value compared to traditional bio-based or commodity goods.
Volumes	High, established volumes	Growing volumes as technology and market demand drive increased production.	Production in the <b>high-tech bioeconomy focuses on</b> <b>quality, precision, and specialized applications</b> , often resulting in lower but more valuable outputs.
Products including consumer preferences and cultural norms	Large quantity of goods – <b>in the main unprocessed nature</b> <b>products</b> for established markets, although growing context and impact-based differentiation	<b>Advanced bioproducts</b> (biofuels, biochemicals. biomaterials etc.) using other techniques than biotechnology and biomanufacturing	High-Tech Bioeconomy products, driven by biotechnology and biomanufacturing, include enhanced crops with superior nutrition and climate adaptability, high-performance bioplastics, bio-based nanomaterials, and custom organisms for industrial use.
Stage and level of investments	At a mature stage, with significant investments already made and is closely linked to traditional industries such as agriculture, forestry, and fisheries, although specific projects like forest restoration and socio-bioeconomy initiatives may still face considerable financing challenges.	At an evolving stage, characterized by continuous innovation and the development of new technologies. Investments are increasing as both public and private sectors recognize the potential for returns and environmental benefits.	At a dynamic evolving stage, attracting investments in R&D. The focus is on innovation, with funding from both public and private sectors to support cutting-edge biotechnology and biomanufacturing projects.
Location and associated comparative advantages	The bioeconomy has a prevalence across continents, benefiting from consolidated industrial value chains that provide comparative advantages in production and distribution.	Primarily driven by, located and benefiting more technologically advanced countries characterized by a greater access to technology, investment capital, and regulatory frameworks that support sustainable innovation.	Predominantly driven by technologically advanced regions with strong research infrastructure. These regions benefit from robust IPRs (intellectual property rights), a skilled workforce, and a supportive regulatory environment that fosters innovation and commercialization.
Policy and regulative context	Government policies on land use, sustainable practices, notably land tenure challenges	Policies on renewable energy, sustainable agriculture and forestry	Regulations on new technologies, Intellectual Property protection
Competitiveness now and into the future	Currently competitive and is expected to maintain or enhance its competitiveness in the future due to its established infrastructure and continued advancements in biotechnology and sustainable practices.	Poised to become increasingly competitive due to its focus on sustainability, resource efficiency, and the development of added-value products. Expected to play a critical role in transitioning to a low-carbon economy and addressing global challenges such as climate change and resource scarcity.	Highly competitive due to its focus on innovation and technological leadership. Expected to grow significantly as demand for specialized, sustainable, and high-performance bioproducts increases.

## Leveraging finance solutions and instruments to grow the bioeconomy

Many countries' green transition strategies, associated financing and donor support (e.g. **Just Energy Transition Partnerships and Country Platforms**) have focused primarily on transition from fossil fuels to renewable energy, with less attention on the potential of nature-based solutions as a broader set of economic, sectoral and industry-wide transformative opportunities to transition. The bioeconomy has largely been treated as a siloed. Largely as a science and technology focused area in developed countries and as nature-intensive and/or social focus (socio-bioeconomy) in nature-rich countries. It offers a broad menu of industries and approaches that can sustainably harness nature to support mitigation, adaptation, resilience and sustainable development. Existing country strategies and development finance efforts that touch on parts of the bioeconomy, such as supporting mangrove forest conservation and restoration, blue economy aquaculture and seaweed mariculture, circular production of urban waste, nature credits, biotechnology such as gene editing to eradicate pests, and regenerative agriculture interventions, would benefit from being integrated under a larger, strategic bioeconomy umbrella.

Further to this, many countries seeking financing to grow and scale their bioeconomy are doing so in a broader context of mounting debt crisis and increasingly severe climate and nature crises. This creates an opportunity to start looking at investments in the bioeconomy and nature more broadly as not only a physical shock absorber, but also as a fiscal shock absorber. NatureFinance recently released a report titled **"Nature as a Shock Absorber"**, which explores how Sustainability-Linked Sovereign Financing can offer a pathway towards aligning public financial management with sustainability goals for countries to unlock vital investments in nature, support improved sovereign credit ratings, and drive climate and equity outcomes.

By looking at bioeconomy finance as part of a broader adaptation and resilience agenda, countries can then identify the positive financial transmission channels that these investments have on improved sovereign creditworthiness, and structure instruments accordingly. One way in which to do this, is by using a financial materiality assessment framework (FIMA), namely assessing different parts of the economy that are dependent on nature and currently generating important financial flows, and thereby assess the most vulnerable sectors, and where if investments are made in resilience and adaptation, can thereby generate the best economic productivity and co-benefits (carbon credits, biodiversity uplift, local jobs, etc...). In doing this, one can then make the case to ratings agencies and the IMF that these kinds of investments should result in an improved credit rating and debt analysis score, because these countries are taking proactive steps to shore up key parts of the bioeconomy that are at threat and have the potential to deliver significant economic benefits if protected.

The practical application of this kind of analysis is that it can help countries identify which key performance indicators related to adaptation and resilience are most likely to strengthen economic fundamentals and result in a potential credit uplift, particularly for bio-based sectors of the economy such as agro-processing, regenerative agriculture, alternative fuels, etc.

The purpose of this short brief is to summarise the range of finance solutions and instruments which can be deployed by a range of actors to grow the bioeconomy in this context. The list has been scoped collaboratively from resources from both organisations and is not exhaustive. The list is being presented to the GIB members for input and discussion to facilitate knowledge exchange and solution-oriented thinking to growing the bioeconomy.<sup>1</sup>

<sup>&</sup>lt;sup>1</sup> The following knowledge product has been compiled by members of Nature Finance and the Sustainable Finance Coalition. The two organisations wish to acknowledge the following people for their inputs and guidance. Monique Atouguia, Luana Maia, Arend Kulenkampff, Mariam Umarji, Kyra Lunderstedt, Justin Smith and Candice Stevens. You can learn more about the work of both organisations from their websites: https://www.naturefinance.net/

Payment for Ecosystem Service	Sustainability- linked bonds	Green and Blue Bonds	Debt-for-Nature Swaps	Conservation Outcome Bonds	Biodiversity credit-linked bonds
Conservation Trust Funds	Environmental Funds Outcome, Impact, Species, ESG	Conservation Fees	Sovereign & Multilateral Grants	Grants and Subsidies e.g., GEF, UN-REDD	<b>Biodiversity</b> Offsets public and private
Carbon Markets & Biodiversity Credits	Blended Finance	Nature In Bioeco			
Venture Capital and Private Equity/Debt	Corporate Investment & Strategic	Advanced	و مرد مولوم مرد المرد	IP &	Public-Private Partnerships PPPs
Green and Climate Bonds	Partnerships	Bioeconomy	Bioeconomy	Licensing-Based Financing	Stock Market, IPOs and
Blended Finance	Green Public Procurement Governments purchasing bio-based products				Licensing Agreements
Government Innovation Grants and Tax Incentives	and services throughout the public sector supply chain to stimulate demand, mainstream the bioeconomy and set new norms	Bankable Projects Investor Meet and Match	R&D Grants from Multilateral & Na Agencies (e.g., Horizon Europ DARPA BioTech Offic	e, ce)	Technology Transfer & Licensing Agreements

#### **Nature-Intensive Bioeconomy**

Relies on natural ecosystems, biodiversity, and traditional biological resources (e.g., forestry, agriculture, fisheries).

Payment for EcosystemSustaiServices (PES): IncentivesDebt infor landowners to preserveto natuecosystems.perform

Sustainability-linked bonds: Debt instruments linked to nature targets and key performance indicators

**Debt-for-Nature Swaps:** Converting national debt into conservation funding. **Conservation Outcome Bonds:** Performance-based bonds that deliver bonus payments upon verification of conservation targets or outcomes. These incentivize measurable nature-positive results and align financing with ecological performance.

Green & Blue Bonds:

sustainable land and

**Environmental Funds** 

environmental impact, including outcomes-based,

species-specific, and

Grants and Subsidies:

funding for sustainable

(e.g., GEF, UN-REDD).

land use and conservation

Government and international

ESG-aligned funds.

returns alongside

(Outcome, Impact, Species,

**ESG):** Investment vehicles

designed to deliver financial

marine projects.

Debt instruments funding

**Biodiversity credit-linked bonds:** Structured bonds that embed long-term off-take agreements for biodiversity credits, creating predictable revenue streams and attracting private capital into conservation activities.

**Conservation Trust Funds:** Legally established funds that provide long-term, sustainable financing for protected areas and biodiversity programs, using endowment, sinking, or revolving models.

Sovereign & Multilateral Grants: Support from institutions like the Global Environment Facility (GEF) and UN-REDD.

in ecosystem services.

Biodiversity Offsets (public

Conservation Fees: Revenue

instruments derived from user

fees - such as tourism or park entry - structured to fund the

ongoing management and

maintenance of protected areas and biodiversity

conservation efforts.

and private): Compensatory conservation mechanisms that aim to achieve No Net Loss or Net Gain of biodiversity by offsetting residual environmental impacts from development. Designed in line with the mitigation hierarchy, these offsets are measurable, enforceable, and governed by legal and institutional frameworks to ensure long-term ecological integrity and compliance **Blended Finance:** Combining public and private funds to de-risk investments

Carbon Markets & Biodiversity Credits: Monetizing carbon sequestration and biodiversity protection efforts.

Insurance products (co-existence, climate change): Financial risk-transfer mechanisms that absorb shocks from environmental events (e.g., drought, human- wildlife conflict, storm damage). These solutions promote resilience by protecting vulnerable communities and incentivizing investment in naturebased solutions. They are most effective when supported by government buy-in, data systems, reinsurance arrangements, and local engagement



#### **Advanced bioeconomy**

Utilizes industrial biotechnologies and bio-based innovations (e.g., biofuels, biomaterials, bio-based chemicals).

Venture Capital and Private Equity/Debt: Investment in emerging bio-based startups (e.g., synthetic biology, sustainable packaging). **Green and Climate Bonds:** Funding for bio-based infrastructure and industrial-scale bioeconomy projects. Blended Finance: Combining public and private capital to de-risk investments in bio-based industries.

Corporate Investment & Strategic Partnerships: Large firms investing in bio-based R&D and commercialisation. Government Innovation Grants and Tax Incentives: Support for commercializing bio-based solutions. Green Public Procurement:

Governments purchasing bio-based products and services throughout the public sector supply chain to stimulate demand, mainstream the bioeconomy and set new norms.

**Bankable Projects (Investor Meet and Match):** Viable nature-positive business models aligned with investment criteria, designed to attract public or private capital. These projects are supported through matchmaking platforms that connect impact-oriented investors with scalable green or biodiversity-focused enterprises, enabling replication, risk reduction, and measurable environmental and social outcomes.



#### High-tech Bioeconomy

Integrates cutting-edge technologies like synthetic biology, precision fermentation, and artificial intelligence in bioengineering.

**IP & Licensing-Based Financing:** Monetizing patents and proprietary biotech processes.

Technology Transfer & Licensing Agreements: Collaboration between research institutions and industry for commercial applications. Public-Private Partnerships (PPPs): Joint funding for bioeconomy infrastructure and research hubs. **R&D Grants from Multilateral & National Agencies:** Public-private funding for breakthrough biotech research (e.g., Horizon Europe, DARPA BioTech Office).

**Stock Market, IPOs and Licensing Agreements:** Monetizing biotech patents and proprietary bio-based technologies and raising capital through public listings for bio-tech firms.

### Accelerator Bioeconomy Financing Instruments

	Nature Intensive	မ်ကြေး Advanced ခြော Bioeconomy	្នំដ្រឹះ Hi-Tech ្លាក្ដុំ Bioeconomy
Sustainable Development Goal (SDG)-Linked Bonds Bonds specifically designed to fund projects that contribute directly to achieving the UN SDGs, particularly those related to climate actions.	Fund reforestation projects and sustainable agriculture initiatives to meet UN SDGs on climate action and life on land	Invest in large-scale biorefineries that convert agricultural waste into biofuels, biochemical and biomaterials contributing to clean energy goals.	Support the development of bioplastics and advanced bioenergy systems, achieving SDGs related to industry innovation and climate action.
<b>Green and blue bonds expansion</b> Enhanced versions of green bonds (focused on environmental projects) and blue bonds (focused on ocean and water-related projects) with stricter sustainability criteria and impact reporting.	Issue bonds to finance the restoration of wetlands and marine ecosystems with strict sustainability criteria.	Use green bonds to support bioeconomy projects that harness agricultural and forest biomass, ensuring rigorous impact reporting.	Fund high-tech projects like ocean-based carbon capture and storage systems with blue bonds, ensuring high sustainability standards.
Blockchain-enabled carbon and biodiversity credits Utilizing blockchain technology to create transparent, secure, and traceable carbon and biodiversity credit trading systems.	Implement blockchain for transparent carbon credits in reforestation and biodiversity conservation projects.	Use blockchain to trade carbon credits from bioproducts that sequester carbon during production.	Ensure transparent trading of carbon and biodiversity credits for projects like bioplastics and advanced ecosystem restoration technologies.
<b>Environmental impact bonds</b> Pay-for-success bonds where returns are linked to the achievement of specific environmental outcomes, such as carbon reduction, water purification, or biodiversity restoration	Link returns to outcomes such as increased forest cover or improved water quality from conservation projects.	Tie bond returns to successful bioproducts that reduce greenhouse gas emissions and enhance soil health.	Link returns to measurable reductions in pollution or increases in renewable energy production from high-tech bioeconomy projects.
<b>Nature-Based Solutions (NBS) funds</b> Investment funds dedicated to projects that use nature-based solutions to address environmental challenges, such as reforestation, wetland restoration, and sustainable agriculture.	Fund projects like reforestation, wetland restoration, and sustainable agriculture that use natural processes.	Invest in bio-based solutions that improve soil health and increase crop yields using natural inputs.	Support high-tech solutions that leverage natural processes, such as advanced algae-based biofuels and bioremediation technologies.
<b>Circular economy financing platforms</b> Digital platforms that facilitate investments in circular economy projects, enabling recycling, reuse, and resource efficiency initiatives.	Finance projects focused on composting and organic waste recycling to improve soil health and reduce landfill use.	Support the recycling of bioproducts and the reuse of agricultural residues in bio-based manufacturing processes.	Invest in technologies that enable the recycling and repurposing of bioplastic materials, reducing waste and resource consumption.
Impact-linked finance Financing mechanisms where the cost of capital is linked to the social and environmental impacts of the funded projects, with better impacts leading to more favorable financing terms.	Provide financing with favorable terms for projects that demonstrate significant positive environmental impacts, like biodiversity restoration.	Offer better financing rates for bioproducts that achieve substantial environmental benefits, such as reducing carbon footprints.	Link financing terms to the environmental performance of high-tech bioeconomy projects, like advanced bioenergy systems and bioplastics.
Regenerative agriculture investment trusts (RAITs) Trusts that pool investor capital to purchase and manage farmland using regenerative agriculture practices.	Pool capital to purchase and manage farmland using regenerative practices that restore soil health and biodiversity.	Invest in farms that use bio-based inputs and sustainable practices to enhance productivity and environmental health.	Fund high-tech agricultural projects that integrate precision farming technologies with regenerative practices for improved sustainability.
<b>Bioeconomy insurance products</b> Specialized insurance products that protect bioeconomy investments against specific risks such as crop failure, pest infestations, and extreme weather events.	Provide insurance against risks like crop failure or pest infestations for projects using nature-based solutions.	Offer specialized insurance for bioproduct investments, covering risks related to production and market fluctuations.	Develop insurance products for high-tech bioeconomy projects, protecting against risks like technological failures or extreme weather events.
<b>Climate adaptation funds</b> Funds specifically targeted at financing projects that enhance the resilience of ecosystems and communities to climate change impacts.	Finance projects that build resilience in ecosystems and communities to climate impacts, such as mangrove restoration.	Support bio-based solutions that enhance climate resilience, like drought-resistant crops and soil health improvement.	Invest in advanced technologies that help communities and ecosystems adapt to climate change, such as precision climate-smart agriculture.
<b>Bioeconomy crowdfunding platforms</b> Platforms that enable small-scale investors to fund bioeconomy projects, democratizing investment and increasing public engagement in sustainable initiatives.	Enable small-scale investors to support community-led conservation and sustainable agriculture projects.	Democratize investment in bioproduct startups that use bio-based processes to create sustainable materials.	Crowdfund innovative high-tech bioeconomy projects, allowing the public to participate in the growth of sustainable industries like bioplastics and advanced biofuels

The Sustainable Finance Coalition uses a 3-part Finance Model as an efficient, systematic way to help organisations find the right finance solution, customise the solution to their context, and scale it up across a landscape or seascape. Each Part of the Finance Model has three Components and a set of user-friendly tools seen below. The Finance Solution Inventory is one such tool, which assists in Scoping available opportunities and has been used to contribute to this report.

#### 1. FIND

## Identifying the right finance solution for the right place with the right people.

#### 2. DESIGN

Take an identified finance solution from an idea to implementation with clear impact parameters.

#### **3. MOBILISE**

Harnesses the power of collective action to mobilise money and expertise to take finance solutions to scale.



## Financing a Sustainable Global Bioeconomy



## **The Finance Solution Inventory**





