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BRICS IN TRANSITION:

National Strategies, Global Leadership, and the Future of Nature-based Solutions and Bioeconomy Cooperation

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BRICS IN TRANSITION: National Pathways, Global Leadership, and the Future of Nature-based Solutions and Bioeconomy Cooperation¹

Executive Summary

In its expanded configuration the BRICS grouping includes nature rich countries, policy innovators and global champions of Nature-based Solutions (NbS) and the bioeconomy, and increasingly assertive climate and nature finance actors. This report examines how eight selected BRICS countries — Brazil, China, Egypt, Ethiopia, India, Indonesia, South Africa, and the United Arab Emirates (UAE) — are pursuing NbS and the bioeconomy in advancing climate and biodiversity protection goals while addressing development priorities.

It argues that BRICS countries are already developing the building blocks of a nature-positive transition, but cooperation is fragmented, under-financed, weakly standardized, and poorly connected to implementation institutions. It also argues that cooperation can play a greater role

in scaling up innovation and expanding NbS and the bioeconomy across these countries and beyond, particularly in the Global South. Advancing BRICS countries cooperation on NbS and the bioeconomy forward requires, moreover, strategically leveraging existing BRICS working groups, harmonizing standards and methodologies, establishing pool financing mechanisms and pilot projects, and accelerating knowledge exchange — enabling BRICS countries to collectively strengthen global leadership on nature and climate while advancing inclusive, resilient development pathways suited to their diverse ecological and economic contexts.

The eight BRICS nations examined here possess significant natural capital — from the tropical forest basins of the Amazon and Borneo-Mekong-Southeast Asia to African and Eurasian forests and coastal mangroves — positioning them uniquely to lead in ecosystem restoration, sustainable land management, and ecological innovation. Each country's

approach reflects its distinct ecological and developmental context: Brazil leverages its biodiversity-rich biomes (the Amazon Rainforest included) through integrated climate and bioeconomy policies; China embeds NbS within its “Ecological Civilization” framework; Ethiopia has developed a bioeconomy strategy and both Egypt and Ethiopia pursue ecosystem-based adaptation under arid conditions; India balances afforestation with rural livelihoods; Indonesia prioritizes peatland and mangrove protection; South Africa links ecosystem restoration to employment and just transition; and the UAE deploys technological innovation to overcome desert constraints.

Internationally, these countries increasingly shape global agendas. Globally, Brazil’s recent G20 and COP30 presidencies advanced shared principles on the bioeconomy and mobilized significant finance for tropical forest conservation with support from multiple BRICS partners. China increasingly integrates environmental standards into its Belt and Road investments and forest-related commodity trade while sharing its pioneer experience on ecological restoration and expanding climate smart agricultural cooperation across Africa. India promotes South-South partnerships in climate-resilient agriculture and champions, alongside Brazil, global initiatives on biofuels. Both Indonesia and the UAE lead global initiatives on “blue carbon”. Regionally, Indonesia leads regional efforts on peatland management. South Africa champions circular and blue economy approaches within African frameworks. Egypt and Ethiopia engage actively in pan-African climate smart agriculture and afforestation initiatives, while the UAE advances desert-adapted agricultural technologies across Central Asia and the Middle East.

Compared to clean energy transition agendas, NbS and bioeconomy policy landscape remains less politically salient and institutionally developed across most of the selected BRICS countries. Yet the report also documents genuine momentum: growing national ambition, policy innovation, and — in several cases — significant international leadership through initiatives championed within BRICS and beyond. Crucially, it situates this momentum within real implementation constraints: financing and data gaps, governance fragmentation, land-use conflicts, unequal distribution of benefits, and persistent tensions between short-term economic growth and long-term ecological restoration. The result is a landscape of promise and constraint — where ambition is real, but the conditions for delivery remain uneven.

Moving from national to international landscapes, the report identifies concrete cooperation tracks across a series of thematic areas, notably: forestry and ecosystem restoration, low-carbon and climate-adapted food systems, the blue economy, the circular economy, and NbS for adaptation and resilience. These thematic opportunities, however, rest on a set of cross-cutting foundations that remain underdeveloped and that require strengthened and coordinated action, namely: integrating nature’s value into economic decision-making; expanding nature finance within the New Development Bank (NDB) and BRICS national development finance institutions; and establishing dedicated mechanisms for knowledge and policy exchange on NbS and the bioeconomy across BRICS countries.

To build on existing national policy ambition and innovation, as well as on ongoing international cooperation and leadership efforts by these BRICS countries, the report recommends a set of immediate and medium- and longer-term actions, as follows:

Immediate Actions

- ***Establish a BRICS NbS and Bioeconomy Knowledge and Policy Platform*** - Establish a policy and knowledge exchange platform functioning as an action-oriented repository and evidence-based accelerator of NbS and bioeconomy efforts across BRICS. A dedicated working group on Measurement, Reporting, and Verification (MRV) and safeguards should be established as a foundational workstream, drawing on existing international methodologies.
- ***Launch a NDB Nature Finance Window*** - Launch a dedicated nature finance window within the New Development Bank (NDB), comprising: thematic funding schemes, including a BRICS Tropical Forests and Landscape Fund; a pilot pipeline of 5-8 bankable NbS and bioeconomy projects for co-financing with BRICS national development banks; and a strategic nature finance dialogue to harmonize appraisal criteria, safeguard standards, and blended finance structures.
- ***Anchor and Sustain a BRICS Forest Momentum Agenda*** - Encourage all BRICS countries and NDB members to join Brazil and Indonesia as sovereign investors in the Tropical Forests Forever Facility (TFFF), and develop a BRICS Forest Roadmap sustaining momentum from COP30 in Belém through to COP32 in Ethiopia, embedding zero-deforestation commitments within the Climate Convention process, across the United Nations System, and beyond.

Medium- and Longer-Term Actions

- ***On Forests:*** Establish a BRICS Alliance for Sustainable Forestry and Landscape, a permanent cooperation mechanism covering sustainable forest management, landscape restoration, zero-deforestation supply chains, and forest-based bioeconomy value chains, serving as the BRICS contribution to global climate and biodiversity frameworks.
- ***On Adaptation:*** Develop a three-track agenda revolving around a Climate-Adapted Food Systems Initiative (CAFS) providing a plurilateral science-policy platform for joint agricultural research and South-South technical cooperation; a BRICS National Action Plan Implementation Fund supporting ecosystem-based cross-border disaster risk reduction projects; and a BRICS Adaptation Action Plan anchored in the BRICS Disaster Risk Reduction Working Group and explicitly linked to NbS methodologies.
- ***On Circular Bioeconomy:*** Create a BRICS Circular Bioeconomy Innovation Platform (CBIP) to accelerate the development and deployment of circular bioeconomy technologies, including waste biorefineries, agricultural residue valorization, bio-based materials, and sustainable packaging.
- ***On Marine and the Blue Economy:*** Launch a BRICS Blue Bioeconomy Partnership (BBP) anchored in the existing BRICS Ocean and Polar Science and Technology Working Group, focusing on sustainable fisheries, marine biotechnology, blue carbon accounting, and mangrove and coastal ecosystem restoration.

- ***Cross-Cutting Strategic Dialogues:*** Invest in three sets of strategic dialogues (i) on common biodiversity and nature finance standards, building on existing international initiatives (such as the G20 Initiative on Bioeconomy, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), and the International Advisory Panel on Biodiversity Credits (IAPB); (ii) on harmonized trade and certification protocols, towards a BRICS Protocol on Ethical Biodiversity Products Trade; and (iii) on nature finance coordination between NDB and BRICS national development finance institutions, towards common appraisal frameworks and a shared pipeline of nature-positive investments.

Main Takeaways

- BRICS countries are already major laboratories for NbS and the bioeconomy, but cooperation remains fragmented and below its potential.
- The biggest opportunity is not creating new rhetoric or policy documents, but connecting existing institutions, finance, standards, policy knowledge, and technical capacity.
- Forests, ecosystem restoration, low-carbon and climate-resilient food systems, blue economy, circular economy, and NbS for adaptation and resilience are the most actionable cooperation tracks.
- The NDB and BRICS working groups could become genuine implementation vehicles if mandates, pipelines, and standards are specified.
- Cooperation must address trade-offs such as land competition, food security, Indigenous and local community rights, greenwashing, carbon-market integrity, and biodiversity safeguards.

Introduction

The synergy between Nature-based Solutions (NbS) and the bioeconomy is central to a comprehensive climate response, providing a pathway to reduce emissions, protect biodiversity, and promote sustainable livelihoods. For the purposes of this report, NbS are defined as actions to protect, sustainably manage, and restore natural or modified ecosystems that address climate challenges while providing benefits for human well-being and biodiversity.² Complementing this, the bioeconomy refers to economic activities derived from the transition to a sustainable, circular model of production that utilizes biological resources, innovative biotechnologies, and ecological processes to create food, energy and materials. The bioeconomy's key pillars include environmental sustainability (biodiversity conservation, climate action), economic development (innovation, green jobs), and social inclusion (equity, food security), aiming for a regenerative, low-carbon future³ — or, as some in the scientific community argue, *a low-fossil carbon* future (see [Glossary](#)).

BRICS countries possess significant natural capital — from the Amazon to African and Eurasian Forests — giving them unique advantages in promoting NbS and the bioeconomy. However, they face a dual challenge: to implement large-scale ecosystem protection and the sustainable use of biological resources, while meeting urgent development needs that often lead to deforestation, land degradation, and biodiversity loss.

In this context, advancing greater synergies across the three Rio Conventions (climate, biodiversity, and desertification)⁴ has emerged as an essential enabling condition for aligning policies, finance, and implementation for NbS at scale. BRICS countries have diverse land use-related development models and decarbonization — or rather defossilization (see [Glossary](#)) — paths: for instance, Brazil's advanced biofuels and agroforestry coupled with

innovations in forest restoration and regenerative agriculture, China's investment in what it calls "Ecological Civilization" — with translations ranging from ecological restoration to biopharmaceuticals —, as well as Ethiopia and India's community-led ecological restoration programs, all reflecting the differences in the ecological, economic, and policy environments of each country. These practical experiences not only highlight the pivotal role of BRICS countries in strengthening the global commitment to nature and climate but also showcase the complex socio-economic trade-offs faced by Global South countries in balancing ecological considerations with human development.

This report focuses on a subgroup of BRICS members — Brazil, China, Egypt, Ethiopia, India, Indonesia, South Africa, and the United Arab Emirates (UAE).⁵ These members were selected on the basis of their significant natural capital, active national NbS and bioeconomy policy frameworks, visible international cooperation or leadership, and near-term cooperation potential. The report does not therefore claim to represent all BRICS members equally; rather, it examines a purposive sample of members where cooperation potential is most visible. By concentrating on this subset of eight BRICS members, this report is better positioned to identify cross-cutting challenges, transferable policy lessons, and concrete entry points for international cooperation — whether intra-BRICS or with third-country partners — in support of a just, inclusive and nature-positive transition.

The report is thematically organized to cover key aspects of NbS and the bioeconomy across the eight selected BRICS countries. It features a comprehensive mapping of domestic policy tools and flagship projects, followed by an assessment of their international cooperation initiatives on both NbS and the bioeconomy. The results inform synthesized policy recommendations aimed at leveraging collective BRICS strengths to overcome shared barriers and strengthen global leadership on nature and climate.

Glossary

Term	Definition
Nature-based Solutions (NbS)	Actions that protect, sustainably manage, or restore ecosystems to address societal challenges while providing benefits for people and nature. ⁶
Bioeconomy and Sociobioeconomy	The bioeconomy is a rapidly growing economic model that relies on renewable biological resources from land and sea to produce food, materials, energy, and services. As a broad category, the bioeconomy can be clustered into three types: Nature Intensive Bioeconomy, Advanced Bioeconomy, and Hi-Tech Bioeconomy. In some countries and regions, particularly in Latin America, the term sociobioeconomy is also used to refer to an approach that integrates environmental sustainability with social inclusion, equitable development, and community well-being. ⁷
Circular economy	An economic system designed to minimize waste and keep materials, products, and resources in use for as long as possible. ⁸
Nature Value, Natural Capital, Nature Assets, Nature Wealth, and Nature Markets	Natural capital, natural assets, nature wealth, and nature markets are interconnected concepts that reflect efforts by different institutions and countries to recognize and value nature in economic decision-making. Natural capital is the stock of ecosystems and natural resources that provide goods and services to society. Natural assets refer to the tangible components of nature that form part of this stock. Nature wealth highlights the broader social and economic value derived from these resources and the services they support. Nature markets are mechanisms through which nature-related outcomes are priced, financed, or traded, often through credits, rights, or other market instruments. ⁹
Biodiversity, Ecosystems, and Ecosystem Services (BEES)	A collective term referring to biodiversity, the ecosystems it supports, and the services those ecosystems provide to people. ¹⁰
Ecosystem-based Adaptation (EbA)	The use of biodiversity and ecosystem services to help people adapt to the effects of climate change. ¹¹

continuation

Term	Definition
Payment for Ecosystem Services (PES)	A mechanism through which beneficiaries of ecosystem services compensate those who manage land or resources to maintain or enhance those services.
Biodiversity or Nature Credits	Units that represent measurable actions or outcomes that support biodiversity conservation or nature restoration. Both terms are currently used: the Kunming–Montreal Global Biodiversity Framework and the International Advisory Panel on Biodiversity Credits (IAPB) refer to biodiversity credits, while Nature Credits is the term found in policy documents from institutions like the European Commission and numerous environmental organizations. ¹²
Climate-Smart Agriculture (CSA)	An approach to agriculture that seeks to increase productivity, strengthen resilience to climate change, and reduce emissions where possible. ¹³
Blue Carbon and Blue Economy	Blue Carbon is the carbon captured and stored by coastal and marine ecosystems such as mangroves, seagrasses, and salt marshes. ¹⁴ The Blue Economy, meanwhile, broadly refers to sustainable economic activities associated with the ocean, seas, and coastal regions.
Decarbonization and Defossilization	Decarbonization is the process of reducing greenhouse gas emissions and decreasing dependence on fossil fuels in energy and production systems. Increasingly, scientists and policymakers are using the term “defossilization”, recognizing that achieving net zero means eliminating fossil fuels, not carbon. ¹⁵
Land use, land-use change and forestry (LULUCF) and Agriculture, Forestry, and Other Land Use (AFOLU)	International climate policy works with two land-related categories defined by the Intergovernmental Panel on Climate Change (IPCC) in the context of emissions accounting: LULUCF and AFOLU. LULUCF refers to the sector that covers greenhouse gas emissions and removals from land use, changes in land use, and forestry activities. AFOLU, in turn, is the category covering emissions and removals from farming, forests, and land use. Approximately a quarter of global annual GHG emissions come from the AFOLU sector, with agricultural production contributing to N ₂ O and CH ₄ emissions and land use, land-use change, and forestry contributing with CO ₂ emissions. ¹⁶
Just Transition	A transition to a low-carbon and sustainable economy that is fair, inclusive, and supportive of workers and affected communities. ¹⁷

1. National NbS and Bioeconomy Landscapes within BRICS



Brazil

Brazil is home to the world's richest biodiversity, accounting for an estimated 15–20% of all known species,¹⁸ and ranks among the world's megadiverse countries. The Brazilian Amazon plays a central role in this ecological prominence, as around 60% of the Amazon rainforest — a biome that contains roughly 10% of global biodiversity — lies within Brazil's territory.¹⁹ Besides the Amazon rainforest, Brazil is also home to other biodiversity-rich biomes, such as the Atlantic Rainforest, the Pampas (a highly biodiverse temperate grassland), the Cerrado (a highly biodiverse savanna), the Caatinga (a highly biodiverse seasonal dry forest), and the Pantanal (a highly biodiverse tropical wetland). This exceptional natural endowment positions Brazil as a leader in advancing NbS to climate change. The country is uniquely placed to innovate, test, and scale such solutions at national and regional levels, including through cooperation with neighbouring South American countries and sharing models that could be adapted to other regions.

Meanwhile, Brazil is among the world's largest greenhouse gas (GHG) emitters, ranking sixth globally and accounting for approximately 3.1% of global emissions in 2023.²⁰ Unlike most major emitters, whose emissions are dominated by the

energy, transport, and industry sectors, Brazil's emissions profile is largely shaped by land-use change, which is driven by deforestation and fire-related degradation alongside agriculture. Together, these sources (known in climate negotiations as AFOLU - Agriculture, Forestry, and Other Land Use, see [Glossary](#)), account for roughly three-quarters of national emissions,²¹ highlighting the central role of land-based and nature-focused strategies in Brazil's climate responses.

Overall strategic planning and legislative framework: Brazil's approach to NbS and the bioeconomy is grounded in an increasingly integrated strategic and legislative framework²² that places land-based and nature-focused approaches at the core of climate and development policy. The country's updated Nationally Determined Contribution (NDC)²³, submitted to the UNFCCC in 2024, and the National Biodiversity Strategy and Action Plan (NBSAP)²⁴ provide the primary policy anchors for climate mitigation, adaptation, and biodiversity objectives, with a strong emphasis on land use, forests, and agriculture. These are complemented by the 2025 Climate Plan²⁵ and the 2023 Ecological Transformation Plan²⁶ and Pact,²⁷ which together function as investment- and implementation-oriented frameworks to support the delivery of Brazil's climate and biodiversity commitments. Operational instruments such as the National Plan for Native Vegetation Recovery (PLANAVEG)²⁸ translate these strategic objectives into concrete land-based actions, setting targets to restore at least 12 million hectares of native vegetation by 2030 in support of Brazil's NDC and broader biodiversity goals.²⁹ Brazil is also currently developing its National NbS Strategy (ENSBN) to guide implementation at the subnational level, particularly across Brazilian cities.³⁰

Bioeconomy-specific policies: In 2024, the federal government launched the National Bioeconomy Strategy,³¹ which sets strategic guidelines for the development of bio-based value chains grounded in innovation, sustainability, and social inclusion. It also provides the framework for the National Bioeconomy Development Plan (PNDBio),³² currently under development, including a dedicated sociobioeconomy axis.³³ On the production side, the biofuels sector is structured around both Fuel of the Future Law and Programme, and the RenovaBio, which links certified emissions reductions from ethanol and biodiesel to tradable decarbonization credits (CBIO),³⁴ providing a stable market signal for low-carbon fuels. Agroforestry systems and integrated crop-livestock-forestry (ICLF)³⁵ models are increasingly embedded in both restoration and productive landscapes, supported by rural credit, rural technical assistance, and low-carbon agriculture programmes, while regenerative agriculture practices (such as no-tillage, crop rotation, and the use of bioinputs) are expanding within mainstream agribusinesses. Support for low-carbon, regenerative, and forest-compatible agriculture remains, nonetheless, small compared to investment in and subsidies to traditional agribusiness.

Demand-side instruments, particularly public procurement embedded in national programmes, play a market-shaping role in Brazil's bioeconomy agenda. Mechanisms such as the Food Acquisition Programme (PAA)³⁶ and the National School Feeding Programme (PNAE)³⁷ use public purchasing power to strengthen local supply, support food security, and foster productive inclusion of family farmers, agroforestry systems, and sociobiodiversity value chains. These demand-side tools are complemented by income-support mechanisms, such as Sociobio Mais,³⁸ which stabilize markets for forest-based products and support livelihoods linked to standing forests. Together,

these approaches are complemented by economic instruments that link environmental compliance to incentives, including the National Policy on Payment for Environmental Services (PNPSA),³⁹ Environmental Reserve Quotas (CRA)⁴⁰ under the Forest Code, and public forest concessions managed by the Brazilian Forest Service (SFB), which support restoration and sustainable forest use while fostering local value chains.

Financial and market mechanisms:

Brazil's bioeconomy and NbS agenda is supported by an expanding set of financial and market-oriented instruments designed to mobilize public, private, and blended finance. The Brazilian Development Bank (BNDES) plays a central role by providing long-term credit, concessional financing, and project structuring for forest-based value chains, restoration, sustainable agriculture, and bioeconomy initiatives. This includes programmes such as the Ministry of Environment-led, BNDES-managed Climate Fund⁴¹ as well as NbS-focused and/or forest-specific funding schemes such as BNDES Forests⁴² and the BNDES-led Amazon Fund,⁴³ which includes a range of targeted initiatives to support national and subnational anti-deforestation and law-enforcement activities as well as alternative socio-economic development. An example is the project "Forests and Communities: Amazon Alive"⁴⁴ which promotes the bioeconomy and improves market access for local communities. These efforts are increasingly complemented by the Brazil Climate and Ecological Transformation Investment Platform (BIP),⁴⁵ which serves as the country's official platform to aggregate and scale bankable projects aligned with climate and nature priorities, including NbS and the bioeconomy. In parallel, innovation-oriented mechanisms such as the Nature Investment Lab (NIL)⁴⁶ support the development of new economic instruments and project pipelines, including emerging biodiversity credit and Payment for Ecosystem Services (PES, see [Glossary](#)).

Implementation under Constraints: Limits, Trade-offs, and Tensions

NbS and the bioeconomy are gaining momentum in Brazil as promising climate and development pathways, particularly in critical ecosystems such as the Amazon. Yet, Brazil's level of ambition and implementation remain constrained by several gaps. The first is a financing gap: scaling these approaches requires both impact-oriented public finance and sustainable private capital, while large restoration projects also depend on long-term financing.⁴⁷ A second set of constraints relates to regulation and governance. These include persistent forest governance and land-tenure problems, logistical bottlenecks, weak transportation and digital connectivity, energy instability, and territorial risks linked to insecurity and illicit economies in forest regions.⁴⁸

Scaling NbS and the bioeconomy also requires managing land-, food-, and agriculture-related tensions. These include the trade-offs between biofuel production and food security, competition for land, the inclusion of small agricultural producers in new bioeconomy supply chains through technical assistance, credit, and market access,⁴⁹ and the need to prevent greenwashing and extractivist dynamics by ensuring local participation, ownership, and fair benefit-sharing.⁵⁰

A Closer Look into Brazil's Flagship NbS & Bioeconomy Initiatives: Protecting, Restoring and Valuing Forests and Nature

Brazil has consolidated a portfolio of flagship national initiatives that place nature, forests, and sustainable land use at the centre of its development strategy. These include large-scale conservation efforts such as the **Amazon Protected Areas Program (ARPA)**,⁵¹ the world's largest tropical forest conservation initiative; robust deforestation control policies under the Action Plan for the Prevention and Control of Deforestation in the Amazon and other biomes (**PPCDam**⁵², **PPCerrado**⁵³, among others); and an expanding restoration architecture anchored in both public programs such as **PLANAVEG**⁵⁴, **Floresta+**,⁵⁵ **Restaura Amazônia**, and multistakeholder initiatives such as **Restaura Cerrado** and the

Reverte Cerrado Program.⁵⁶ A central enabling pillar of this system is the **Rural Environmental Registry (CAR)**,⁵⁷ which provides a nationwide georeferenced database of land use in private properties and underpins environmental compliance, forest restoration, and eligibility for PES schemes under the **National PES Policy**.⁵⁸ Together, CAR-based conditionality and PES instruments, like the **Forest Code-related Environmental Reserve Quotas (CRA)**, integrate NbS into Brazil's rural policy and financing landscape. These initiatives are complemented by bioeconomy and sociobiodiversity policies promoting agroforestry, forest-based value chains, and regenerative agriculture, alongside innovative financial instruments such as the **Amazon Fund**,⁵⁹ **EcolInvest**,⁶⁰ **Nature Investment Lab (NIL)**, and the **Brazil Investment Platform (BIP)**, supported by strong regulatory frameworks, notably the **Forest Code**.⁶¹



China

China's practice of NbS and the bioeconomy is deeply rooted in the *National Ecological Civilization Framework*. As a guiding political concept, ecological civilization enhances environmental sustainability as the core element of national development.⁶² As the world's largest GHG emitter and a leader in renewable energy investment, China is under significant pressure to decarbonize its economy while ensuring the energy and food security of its large population. China's diverse geographical environment — covering vast forests, grasslands, wetlands, and farmland — provides an essential natural asset base for climate mitigation and adaptation. However, decades of rapid industrialization have also led to severe ecological degradation, making ecological restoration and sustainable management an urgent national priority. China's bioeconomy has long been based on agriculture and traditional biological products, but it is now rapidly expanding into advanced fields such as bioenergy, biopharmaceuticals, and biomaterials. Its driving force stems from domestic strategic needs, including reducing dependence on imported raw materials, addressing agricultural and forestry waste, and cultivating new green growth industries. This dual positioning, focusing on natural capital restoration and promoting bioeconomic innovation, makes China an active practitioner of large-scale NbS implementation and innovation.

China promotes NbS and the bioeconomy through a top-down, target-driven national planning system, complemented by regulatory constraints and strong financial incentives.

Overall strategic planning and legislative framework: The Master Plan for National Key Ecosystem Protection and Restoration Major Projects (2021-2035)⁶³

and the Outline of the Construction of a Beautiful China (2013-2035)⁶⁴ have established a high-level vision and integrated the goals of NbS into a broader environmental and climate target system. The 1+N Carbon Peak and Carbon Neutral Policy Framework,⁶⁵ of 2025, clearly lists ecosystem carbon sinks and the bioeconomy as key components. At the legal level, the Revised Forest Law (2019)⁶⁶ and the Revised Grassland Law (2021)⁶⁷ focus on ecological protection and restoration, while the Yangtze River Protection Law⁶⁸ and the Yellow River Protection Law⁶⁹ promote comprehensive watershed management as a practical form of large-scale NbS implementation. The new Ecological and Environmental Code emphasizes safeguarding ecosystems, including forests and grasslands, and the Code's three pillars, "Pollution Prevention and Control", "Ecological Conservation", and "Green and Low-Carbon Development" — codify ecosystem-based governance approaches.⁷⁰

Bioeconomy-specific industrial and innovation policies: The 14th Five-Year Plan for Bioeconomy Development (2021-2025)⁷¹ is the blueprint for bioeconomy policy, aiming to promote breakthrough progress in bioagriculture, biomanufacturing, and bioenergy. The plan prioritizes the development of biomass plastics and chemical substitutes, while promoting the sustainable use of biological resources. In the field of bioenergy, policies support the utilization of agricultural and forestry waste materials, promote biogas production (especially in rural areas, such as parts of Sichuan province, under the Rural Revitalization Strategy),⁷² and encourage biomass co-heat and power production. The catalogue of strategic emerging industries also integrates advanced biotechnology, enabling enterprises in this field to access priority financing channels and research and development (R&D) support.

Financial and market mechanisms: Public finance is the primary driver of the development and implementation of NbS and the bioeconomy. The central government has allocated USD 30 billion annually to local governments through ecological compensation transfers for conservation and restoration.⁷³ It is also actively piloting PES as a market-based mechanism. One of the notable initiatives is the national emission trading system (ETS) launched in 2021, the world's largest carbon market, which was complemented in 2024 by the relaunch of the certified emissions reduction scheme (CCERs) — a voluntary carbon market that already includes afforestation and mangrove creation as eligible project types, thereby creating financial value for NbS carbon sequestration.⁷⁴ Additionally, the pilot mechanism for realizing the value of ecological products is being tested nationwide, aiming to monetize ecosystem services such as water purification and air quality improvement through payment, certification, and ecotourism initiatives⁷⁵.

Implementation under Constraints: Limits, Trade-offs, and Tensions

China's ambition in NbS and the bioeconomy, as well as the scale of existing initiatives, is constrained by policy, market, and project-level challenges. At the policy and governance level, fragmented policy systems and centralized decision-making can limit implementation and scaling. Weak accounting standards and the absence of standardized biodiversity valuation methods also make it difficult to assess biodiversity outcomes and carbon-credit integrity.⁷⁶ Greater engagement with major international initiatives, such as the International Advisory Panel on Biodiversity Credits (IAPB) and the G20 Initiative on Bioeconomy, could help strengthen standards and coordination.

At the project level, large ecological engineering and afforestation schemes, such as the Three-North Shelter Forest Program, face limits in terms of carbon sequestration and biodiversity protection.⁷⁷ Other carbon-sequestration projects have also suffered from low profitability, quality concerns, and in some cases credibility challenges.⁷⁸ These constraints suggest that China's leadership in this field should be assessed with greater nuance.

China also faces important trade-offs in expanding NbS and the bioeconomy. Nature-based approaches can complement climate action, but they cannot replace deep cuts in fossil-fuel use. At the same time, China must balance reducing agricultural emissions with maintaining food security, which remains a national priority.

A Closer Look into China's Flagship NbS & Bioeconomy Initiatives: Large-scale policy experimentation in urban and rural areas

China's flagship initiatives in NbS and the bioeconomy are largely driven by top-down policy. A cornerstone program is the **Grain for Green Programme**,⁷⁹ one of the world's largest ecosystem service compensation programs, promoting the conversion of farmland back to forest and grassland. Since 1999, millions of hectares of inefficient farmland have been transformed into forests and grasslands, generating significant soil conservation, water regulation, and carbon sequestration. The **Ecological Protection Red Line Policy**⁸⁰ complements it and legally protects more than 25% of China's land area — including forests, wetlands, and grasslands — forming a vast network of natural carbon sinks.

In the field of the bioeconomy, China leads the development of bioenergy and biofuels on an industrial scale, supported by the **Renewable Energy Law**⁸¹ and the ethanol blending target of E10 (10% ethanol blended with gasoline).⁸² China has established a massive biomass power generation supply chain system and has become a major producer of biodiesel and fuel ethanol. Most of the raw materials are agricultural residues. In addition, China takes the lead in implementing the **Sponge City Plan**,⁸³ an urban NbS program designed to improve rainwater management, flood control, and groundwater replenishment across Chinese cities. Implemented in more than 30 pilot cities, the program uses measures such as natural drainage systems, water-permeable paving, and artificial wetlands, directly integrating ecological functions into urban infrastructure and resilience planning.



Egypt

Egypt's engagement with NbS and the bioeconomy is shaped by its arid environment, severe water scarcity, and dense population concentrated along the Nile and Delta coasts. In the face of severe climate threats, including sea-level rise, desertification, and extreme high temperatures, Egypt's strategy prioritizes ecosystem-based adaptation (EbA, see **Glossary**) approaches to protect food security, coastal cities, and freshwater resources. Its bioeconomic potential is closely related to agricultural by-products, wastewater reuse, and saline agriculture, aiming to maximize resource efficiency under conditions of limited land and water availability. Therefore, NbS and the

bioeconomy are not only environmental add-ons but also strategic tools to enhance national resilience, reduce import dependence, and achieve sustainable development within clear ecological constraints.

Egypt adopts a centralized, project-driven approach, leveraging international cooperation, climate finance, and large-scale national projects to scale NbS and circular bioeconomy (see **Glossary**) practices.

Overall national strategy: The National Climate Change Strategy 2050⁸⁴ and the National Strategy for Adaptation⁸⁵ explicitly promote ecosystem conservation and restoration. The 2030 Sustainable Development Strategy (Egypt Vision 2030)⁸⁶ integrates NbS into its environmental and economic pillars, while the National

Bio-based Economy Strategy (launched in 2021)⁸⁷ aims to formalize the role of biological resources, waste resources, and biotechnology innovation.

Bioeconomy and circular economy:

Key areas include bioenergy generation from agricultural residues, supported by the New National Renewable Energy Strategy,⁸⁸ such as the rice straw biogas project.⁸⁹ The Decent Life (Hayah Karima) rural development initiative promotes biogas devices and composting systems at the community level.⁹⁰ Through the National Research Center and the City of Scientific Research and Technological Applications (SRTA-City), Egypt is advancing research on biosaline agriculture and microalgae cultivation for biological products.^{91,92}

Financial and implementation

mechanisms: NbS implementation builds on bilateral partnerships and international climate finance, specifically through the Green Climate Fund (GCF)⁹³ and the Adaptation Fund (AF).⁹⁴ The Ministry of Environment coordinates these efforts with the Ministry of Agriculture and the New and Renewable Energy Administration (NREA). Meanwhile, the Sovereign Fund of Egypt (TSFE)⁹⁵ seeks to attract private investment into greenfield projects. Participation in carbon markets, especially through voluntary blue carbon (see [Glossary](#)) credits linked to mangrove projects, is being explored as a potential revenue stream.⁹⁶

Implementation under Constraints: Limits, Trade-offs, and Tensions

Egypt's NbS and bioeconomy agendas are marked by a clear gap between ambition and implementation. NbS for adaptation remain relatively new in the Egyptian context, especially in built-environment applications and coastal zones,⁹⁷ and implementation rates are still low relative to the country's stated potential. This is reinforced by severe water scarcity, which limits the scalability of NbS such as watershed restoration, wetland conservation, mangrove rehabilitation, dune stabilization, and urban green infrastructure.⁹⁸

The bioeconomy faces similar constraints. Ambitions around waste valorization and circularity are weakened by poor waste-data systems, limited recycling standards, and weak incentives for private investment in circular projects. These challenges are compounded by structural tensions, such as tight fiscal space and the continued prioritization of fossil gas security,⁹⁹ which leaves limited political and financial room for scaling NbS and bioeconomy initiatives.

A Closer Look into Egypt's Flagship NbS & Bioeconomy Initiatives: Strengthening Ecosystem-based Adaptation and Circular Bioeconomy

Egypt's flagship initiatives focus on addressing extreme drought, land degradation, and population pressures. The **National Afforestation Initiative**¹⁰⁰ aims to plant 100 million trees by 2030, mainly using treated wastewater to combat desertification, reduce sandstorms, and establish urban green belts. A pioneering

bioeconomy example is the **biogas plant in Beni Suef**, which converts agricultural residues such as rice straw (a major source of seasonal air pollution) into biogas, organic compost, and raw materials, addressing environmental and public health problems while producing energy and fertilizer. These efforts are central to the **National Climate Change Strategy 2050**, which positions NbS and the circular bioeconomy as a key instrument for climate adaptation and sustainable development.



Ethiopia

Ethiopia's approach to NbS and the bioeconomy is intrinsically linked to its national development vision, environmental vulnerability, and agricultural-based economy. As a country highly vulnerable to climate change, especially drought, land degradation, and deforestation, Ethiopia regards ecosystem restoration and sustainable land management as top priorities for ensuring food security, water management, and rural livelihoods. Its economy is largely biologically based, with agriculture accounting for nearly 40% of GDP and supporting the livelihoods of more than 80% of the population. Therefore, the bioeconomy naturally extends to agricultural processing, sustainable forestry, and bioenergy, which are seen as pathways for value addition, energy access, and import substitution. Based on the Climate Resilient Green Economy (CRGE)¹⁰¹ Strategy, Ethiopia has integrated NbS and the bioeconomy into its national framework for low-carbon and climate resilient growth, positioning itself as an ambitious leader in landscape restoration.

Ethiopia's policy implementation is characterized by large-scale national mobilization campaigns, supported by community structures and international partnerships.

National overall strategies and plans:

The CRGE Strategy from 2011 is the cornerstone of Ethiopia's approach, with forestry, agriculture, and renewable energy as priority areas. This is implemented through and complemented with more recent sectoral plans and green economy action plans. In the Agriculture and Forestry sector, key policy documents include the National Forest Sector Development Program (NFSDP),¹⁰² led by Ethiopia's Ministry of Environment, Forest and Climate Change (MEFCC), the National Agroforestry Development Strategy (2026–2035),¹⁰³ launched in 2025, under the leadership of the Ministry of Agriculture (MoA), and other food security-related policy documents such as the National Nutrition Sensitive Agriculture Strategy.¹⁰⁴ Another relevant national policy framework, which relates to both the energy transition and NbS, is the National Clean Cooking Roadmap (2024 to 2034),¹⁰⁵ which centres on moving away

from traditional biomass through a multi-fuel approach that incorporates electricity, ethanol, and LPG, alongside improved stoves. While serving national electrification goals, the Roadmap also aims at conserving nature and forests, with modern cook stoves at the center. Although the CRGE continues to be an important — and the first ever Ethiopian climate strategy — additional national and sectoral policies are now in place, creating a robust policy and program ecosystem in the country for NbS, having also informed Ethiopia's NDC 3.0.¹⁰⁶ These include the Ethiopian National Carbon Market Strategy (2025–35),¹⁰⁷ Ethiopia's Long-Term Low Emission Development Strategy (LT-LEDS) (2020–50),¹⁰⁸ Ethiopia's National REDD+ Strategy (2018–2030),¹⁰⁹ among others. The National Adaptation Plan (NAP)¹¹⁰ and the Ten-Year Development Plan (2021–2030)¹¹¹ further mainstream EbA approaches and the sustainable use of biological resources for climate adaptation.

Bioeconomy and bioenergy development:

In 2024, Ethiopia launched its national Bioeconomy Strategy (2025–30), which has innovation and technology at its core and focuses on leveraging the country's renewable biological resources for sustainable solutions in pharmaceuticals, energy, waste management, as well as agriculture and food production.¹¹² Ethiopia currently has a range of Climate Smart Agriculture (CSA, see [Glossary](#)) initiatives in place, including thematic programmes and projects to foster the adoption of CSA practices and technologies for integrated soil fertility management, small-scale irrigation, agroforestry, crop diversification, improved livestock feed and feeding practices, among others, across the country.¹¹³ Together these initiatives indicate an effort to turn CSA into a central component of Ethiopia's food security, climate mitigation, and adaptation, as well as of its “agri transformation” agenda.¹¹⁴ Ongoing policy efforts equally focus on biofuels and biomass to ensure energy

security. The National Biofuel Development and Utilization Strategy¹¹⁵ promotes the production of ethanol from sugarcane and biodiesel from non-edible oils such as castor. Importantly, so far bioethanol utilization in Ethiopia has not been widely implemented on a large scale, despite the country's available potential coming from sugarcane plantations and agricultural waste. In 2024, Ethiopia published a revised version of the 2007 biofuels strategy, aiming to boost commercial and industrial production and viability, a challenge still to be confronted in the coming years.¹¹⁶ Meanwhile, the Biomass Energy Strategy¹¹⁷ aims to improve the efficiency of traditional biomass use (for example, through improved cooking stoves) and to promote biogas extraction from agricultural and livestock waste.¹¹⁸ The value addition of key sectors such as coffee, oilseed, and leather is also a core component of Ethiopia's bioeconomy strategy.

Financial and governance mechanisms:

Implementation draws on a combination of public financing, international climate finance (mainly support from the GCF and the World Bank), and other international cooperation assistance. On the public front, the CRGE Facility¹¹⁹ has worked since 2013 as a central climate finance pool under the Ministry of Finance to mobilize resources, while the 2024 Green Legacy and Degraded Landscape Restoration Special Fund¹²⁰ provides a dedicated and stable funding source for restoring degraded landscapes under the Green Legacy Initiative, requiring the Federal Government to allocate 0.5 to 1.0 percent of the annual budget for this aim. Moreover, the Ethiopian Environment and Forest Research Institute (EEFRI)¹²¹ provides important technical support for a range of NbS initiatives. A distinctive feature of Ethiopia's approach is the strong role of the state in mobilizing action through regional and local administrations, often involving extensive public participation. However, limited access to long-term private investment and advanced bio-innovation funds remains a constraint.

Implementation under Constraints: Limits, Trade-offs, and Tensions

Ethiopia's ambitious NbS agenda is constrained by a gap between urgent resilience needs and limited institutional and financial capacity. Despite a broad set of climate targets and documents (including on low-carbon agriculture, reforestation, and restoration), NbS interventions remain fragmented across sectoral silos, lacking a more coherent governance framework for integrating them into climate adaptation and disaster-risk planning.¹²²

Implementation is also limited by weak data and technical capacity. Ethiopia's varied ecosystems — including wetlands, drylands, and highland watersheds — require context-specific solutions, but progress is slowed by poor coordination, limited skills, and weak collaboration across government, non-governmental organizations, humanitarian actors, and the private sector.¹²³

These challenges are compounded by macroeconomic and security shocks that reduce fiscal space for NbS. Since 2020, overlapping crises — including external crises like the COVID-19 pandemic, wider global and regional instability, and internal crises related to armed conflict, drought, and political instability — have shifted priorities towards immediate humanitarian needs and made long-term NbS financing harder to sustain.¹²⁴

A Closer Look into Ethiopia's Flagship NbS & Bioeconomy Initiatives: Linking Land Restoration, Clean Energy Access, and Sustainable Agriculture

Ethiopia's flagship initiative is its **Green Legacy Initiative**,¹²⁵ a national tree-planting campaign aimed at planting 25 billion seedlings by 2025. This large-scale mobilization effort has involved millions of citizens to achieve soil conservation, climate adaptation, and food security through landscape restoration. In the bioeconomy domain, the **National Biogas Programme**¹²⁶ has supported the construction of hundreds of thousands of small biogas ponds to convert livestock

manure into clean cooking fuel and organic fertilizers, thereby improving family health, reducing deforestation, and increasing agricultural productivity. These initiatives form core pillars of the **CRGE** Strategy, directly linking ecological restoration with energy access and sustainable agriculture. Besides its contribution to land regeneration, to the protection of critical ecosystems, and to the expansion of indigenous trees, the CRGE also addresses socio-economic needs, improving livelihoods through eco-tourism, agro-forestry products, and job creation, and strengthening community participation and mobilization.



India

India's participation in NbS and the bioeconomy is shaped by its extreme vulnerability to climate impacts, the high dependence of a large rural population on natural resources, and the dual goal of rapid economic development and decarbonization. India's updated NDC 3.0, announced in March 2026, includes plans to build carbon sinks of 3.5 to 4 billion tonnes of CO₂ equivalent by 2035 by expanding forest and tree coverage. India's previous NDC, submitted to the UNFCCC in 2022, had a less ambitious target of 2.5 to 3 billion tonnes of CO₂ equivalent.¹²⁷

Meanwhile, more than 700 million people in India are directly dependent on agriculture and forestry for their livelihoods, while threats such as heat waves, monsoon anomalies, and land degradation are increasing, prompting India's climate strategy to prioritize adaptation measures, ecosystem resilience, and livelihood synergies.

India's bioeconomy has always been rooted in agriculture, forestry, and livestock, and is now strategically turning to advanced fields such as biofuels, biomanufacturing, and high-value-added pharmaceutical and agricultural biological products to address challenges such as energy security, waste management, and rural income growth. From Himalayan forests to coastal mangroves, India's rich biodiversity provides a valuable natural asset base for NbS, but these ecosystems are under significant pressure. Therefore, India adopts a pragmatic and mission-oriented strategy, reflected in the Lifestyle for Environment (LiFE) National Strategy,¹²⁸ to achieve practical ecological and socio-economic benefits through ecological restoration, sustainable management, and biological innovation.

India also adopts a multi-scale policy framework that combines the mission of the central government with state-level implementation, complemented by fiscal incentives and community governance models.

Overall national mission and strategy:

The National Action Plan on Climate Change (NAPCC)¹²⁹ and its eight national missions constitute the central framework, among which the Green India Mission (GIM)¹³⁰ and the National Mission for Sustainable Agriculture¹³¹ are directly related to NbS and the bioeconomy. The recently launched National Bioenergy Programme¹³² and the National Mission on Strategic Knowledge for Climate Change¹³³ guide relevant research and deployment. India's updated NDC¹³⁴ clearly emphasizes EbA measures and the LiFE movement, while the National Biodiversity Action Plan integrates conservation and sustainable use. Moreover, in 2024 India announced its BioE3 Policy (Biotechnology for Economy, Environment, and Employment), aimed at establishing India as a global bio-manufacturing hub and R&D center in biotechnology.¹³⁵

Bioeconomy-oriented policies and incentive mechanisms:

The National Biofuel Policy¹³⁶ (2018) and its subsequent revisions promote the development of bioenergy and biofuels, mandating ethanol blending in gasoline with the target of 20% (E20) achieved ahead of time in 2025.¹³⁷ It also encourages the production of advanced biofuels using non-grain raw materials. The Galvanizing Organic Bio-Agro Resources Dhan (GOBAR-DHAN)¹³⁸ scheme supports the construction of distributed biogas plants using agricultural and livestock waste. For high-value bioproducts, the Biotechnology Industry Research Assistance Council (BIRAC) funds innovation in industrial biotechnology and biomanufacturing. The Sustainable Alternative Towards Affordable Transportation (SATAT)¹³⁹ initiative encourages enterprises to invest in compressed biogas plants.

Meanwhile, the acceleration towards the E20 target has sparked significant debate regarding its implications for food security. Experts and India's own Ministry of Finance-led Economic Survey caution that high administered prices for maize-based ethanol have incentivized farmers to shift land away from pulses and oilseeds, potentially increasing dependence on edible oil imports and exposing domestic food prices to volatility.¹⁴⁰

Financial and fiscal mechanisms:

NbS implementation relies heavily on the central government's budgetary allocations to the states through the Union Budget and Finance Commission. Market-linked

incentives are significant, such as the differential pricing mechanism of ethanol purchased by oil marketing companies, which supports the growth of the biofuel industry. The Perform, Achieve, and Trade (PAT)¹⁴¹ scheme indirectly promotes biomass-based industrial heating through its focus on energy efficiency. The Green Credit Programme (GCP),¹⁴² which encourages plantation activities in exchange for Green Credits, was piloted in 2023, while a PES model is gradually emerging. India is actively developing its domestic carbon market, which is expected to eventually integrate high-integrity forestry and agricultural carbon credits, creating new financing streams for NbS.

Implementation under Constraints: Limits, Trade-offs, and Tensions

India's NbS and bioeconomy agendas are shaped by a tension between rapid scale-up ambitions and limited project readiness, coordination, and local implementation capacity. NbS investment in India is constrained by low awareness, financing gaps, fragmented governance, weak institutional capacity, and limited technical expertise, especially at the local level.¹⁴³

The bioeconomy also remains unevenly distributed across the country. Official government data shows that Maharashtra, Karnataka, Telangana, Gujarat, and Andhra Pradesh account for a very large share of India's bioeconomy value, due to their role as innovation ecosystems and biotechnology industrial hubs, underscoring spatial inequality and a need for additional policies to address and further regionalize and democratize biomanufacturing and innovation.¹⁴⁴

There are also important land-use and governance tensions. In India, bioeconomy and NbS expansion can create pressure at the interface of land rights, food production, as well as forest and biodiversity protection. This includes, for instance, forest loss and conflicts over land allocation for biofuels and related projects.¹⁴⁵

Finally, NbS markets face integrity risks. Reports and commentary on India warn that projects can be mislabeled as NbS when they rely on simplistic tree-planting or plantation models, while carbon- and nature-integrity safeguards remain underdeveloped, increasing the risk of greenwashing¹⁴⁶ and overexploitation of biological resources.

A Closer Look into India's Flagship NbS & Bioeconomy Initiatives: Integrating Biodiversity Protection and Rural Livelihoods

India's flagship efforts are defined by their scale and integration with rural livelihoods. The **Green India Mission (GIM)** is part of its national climate change action plan, which aims to improve the coverage and quality of 10 million hectares of forest, enhancing ecosystem services such as biodiversity conservation, water recharge, and carbon sequestration. In terms of the bioeconomy domain, the **National Policy**

on Biofuels and its subsequent revisions have supported the world's most ambitious ethanol blending program, targeting 20% ethanol blending with gasoline (E20) by 2025-26, mainly using sugarcane and grains, to support farmers' income and energy security. Additionally, the **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)**¹⁴⁷ plays an important role as a large-scale rural employment and security program, funding millions of water conservation, afforestation, and land-restoration projects that directly link ecological restoration with livelihood generation.



Indonesia

Indonesia's approach to NbS and the bioeconomy is fundamentally shaped by the geography of its archipelago, its globally important but threatened ecosystems, and its dependence on natural resource-based commodity exports. As a country at the forefront of climate vulnerability — facing sea level rise, storm intensification, and monsoon changes — Indonesia regards the protection and restoration of its vast forests, peatlands, and mangroves as a key infrastructure for national adaptation, disaster risk reduction, and long-term economic recovery and growth. Its economy has been driven by the exploitation of biological resources, particularly palm oil, timber, and fisheries, making the transition to a sustainable and circular bioeconomy a strategic necessity for maintaining export competitiveness, ensuring food security, and achieving its climate commitments. Based on the Low Carbon Development Initiative (LCDI),¹⁴⁸ launched in 2017, and the Forest and Other

Land Use (FOLU) Net Sink 2030 target,¹⁴⁹ Indonesia has integrated ecological balance and bioeconomy objectives into a comprehensive vision of green growth, positioning itself as a global leader in managing tropical landscapes to achieve both carbon emissions reduction and development results.

Indonesia's policy implementation is characterized by a mix of high-level regulatory orders, specialized recovery agencies such as peatland and mangrove restoration agencies, market-based interventions, and evolving community-based governance models. Recent analysis emphasizes that this transformation must adopt a socio-bioeconomic approach, ensuring that biodiversity conservation is inextricably linked to social equity, Indigenous rights, and the protection of vulnerable groups to prevent greenwashing and ensure local sovereignty.¹⁵⁰

Overarching national strategies and plans:

The National Medium-Term Development Plan (RPJMN) 2020-2024¹⁵¹ is the central policy framework, requiring low-carbon development and environmental carrying capacity as prerequisites for spatial planning. The FOLU Net Sink 2030 Operational Plan¹⁵² provides a detailed roadmap to make the forestry and land-use sectors into a net carbon sink. Indonesia is progressively implementing NbS to meet its enhanced NDC targets, aiming for a 31.89% to 43.20% emission reduction by 2030.¹⁵³ The National Action Plan for Greenhouse Gas Reduction (RAN-GRK),¹⁵⁴ signed into law in 2011, and its provincial equivalent plans have strengthened these goals by setting specific emission reduction targets for various industries.

Bioeconomy development and market transformation:

Policy efforts actively drive demand through the B30 mandate,¹⁵⁵ the world's highest biodiesel blending requirement, which mandates 30% blending of palm oil-based biodiesel, aimed at strengthening energy security and the sustainable use of palm oil production. The B30 mandate serves as the basis for the Indonesian Sustainable Palm Oil (ISPO)¹⁵⁶ certification, a mandatory standard for improving sustainable practices in the palm oil sector. It is worth noting, however, that the palm oil sector is historically a major deforestation driver in Indonesia, highlighting the existing challenges of expanding the biofuel industry, and moving forward with defossilization in the energy sector, while avoiding negative

impacts and trade-offs on forest, nature, and efforts to reduce emissions from the land-use and forestry sector.¹⁵⁷ Beyond biofuels, the National Waste-to-Energy Program¹⁵⁸ encourages the conversion of agricultural and urban waste into biogas, while the Social Forestry Program¹⁵⁹ grants local communities the rights to legally manage millions of hectares of forest land to promote community-based agroforestry and value chains for non-timber forest products.

Financial and governance mechanisms:

Implementation relies heavily on international climate finance, through the Environmental Fund Management Agency (BPD LH),¹⁶⁰ which provides a channel for Norway's REDD+ payments¹⁶¹ and the national budget. In May 2025, Indonesia launched the Climate Resilience Fund (CRF) "DINFRA"¹⁶² in collaboration with the United Nations-REDD Programme and the United Nations Environment Programme (UNEP), to bridge the multi-billion-dollar financing gap by mobilizing public and private investment into NbS projects, such as reforestation and mangrove restoration, with a target to reduce 128 million tonnes of CO₂ by 2030. An important new mechanism is the Carbon Economic Value Regulation,¹⁶³ which establishes a legal framework for carbon pricing, trading, and taxation, enabling revenue generation from carbon credits in forests and peatlands. Governance involves complex coordination between the Ministry of Environment and Forestry, the peatland restoration agency, and local governments.

Implementation under Constraints: Limits, Trade-offs, and Tensions

Despite its high biophysical potential, Indonesia's NbS and bioeconomy sector faces significant limits and tensions. A first limit is NbS standardization, alignment, and coordination deficits. Given Indonesia's rich biodiversity and pressing ecological and socioeconomic challenges, addressing the lack of standardization and promoting greater economic and policy alignment, including at the regional level, are central to reducing ambiguity, facilitating collaboration, and creating incentives and an enabling environment for both NbS and bioeconomy investments.¹⁶⁴

Beyond policy and governance, the expansion of NbS and bioeconomy initiatives is also shaped by acute tensions, starting with the fundamental contradiction between biofuel expansion and forest conservation. Continued expansion of oil palm plantations in forested areas, including those planned around the Merauke Food Estate for bioethanol, poses serious risks to the country's remaining rainforest.¹⁶⁵ Indonesia also has to manage tensions related to emerging trade and diplomatic disputes with international consumer markets over deforestation-risk commodity trade. The new European Union Deforestation Regulation, for instance, creates barriers for Indonesia's commodity exports and access to European markets. Crucially, beyond the trade barriers, Indonesia's responses to emerging global anti-deforestation legislation are also creating diplomatic tensions that complicate both the country's international climate standing and its domestic bioeconomy market development.¹⁶⁶

A Closer Look into Indonesia's Flagship NbS & Bioeconomy Initiatives: Protecting and Restoring Critical Ecosystems while Expanding Biofuels

Indonesia's flagship NbS initiative is the **National Peatland Restoration Agency (BRG)**,¹⁶⁷ which aims to restore 2.6 million hectares of degraded peatland (critical carbon sinks) through re-moistening, revegetation, and livelihood restoration, thereby reducing the risk of devastating fires. In the bioeconomy

domain, the **B30 mandate** remains an important pillar, aiming to reduce fossil fuel imports, manage palm oil stocks, and lower emissions, while navigating the complex associated sustainability challenges it faces. In addition, the **Social Forestry Project**¹⁶⁸ plays a transformative role by granting local communities the rights to manage millions of hectares of state-owned forests and promotes community-based agroforestry systems as a sustainable model for forestry and bioeconomy development.



South Africa

South Africa's approach to NbS and the bioeconomy is defined by its aim to achieve a just transition while addressing the triple challenges of poverty, inequality, and unemployment alongside climate change and ecological degradation. As the African continent's most industrialized economy, South Africa has long relied on coal and mineral mining, resulting in severe biodiversity loss, water shortages, and land degradation, with disproportionate impacts on vulnerable rural communities. South Africa's significant natural capital — including globally recognized biodiversity hotspots, vast pastures, and long coastlines — provides an important foundation for climate adaptation, carbon sequestration, and sustainable economic diversification. The bioeconomy is seen as a strategic lever for this transformation, focusing on high-value sectors such as Indigenous plants for biotrade, sustainable forestry, and waste-to-resource innovation, which can create green jobs and stimulate rural development. Therefore, NbS and the bioeconomy are not only environmental strategies but also an integral part of the strategy for reshaping a more inclusive, resilient, and post-mining economic future.

Based on its commitment to a low-carbon, climate-resilient economy, South Africa's policy framework promotes the development of NbS and the bioeconomy through national strategies, targeted plans, and innovative financing mechanisms.

National overall strategies and plans:

South Africa's key national strategies include the National Climate Change Adaptation Strategy (NCCAS),¹⁶⁹ launched in 2019, and the draft National Biodiversity Economy Strategy (NBES),¹⁷⁰ both of which

clearly link biodiversity conservation and economic opportunities. The National Development Plan 2030¹⁷¹ and the Just Energy Transition Investment Plan 2023-2027 (JET IP)¹⁷² recognize the role of ecosystems and sustainable biomass in building climate resilience and job creation. The National Waste Management Strategy also promotes a circular bioeconomy by encouraging the value addition of organic waste.¹⁷³

Bioeconomy-focused policies and sectoral support:

The Bioeconomy Strategy¹⁷⁴ (2013), launched by the Department of Science and Innovation, serves as the key policy blueprint, targeting innovation in biopharmaceuticals, bioprocessing, and sustainable biomass-based biofuels. The Forestry Sector Master Plan¹⁷⁵ aims to expand commercial forestry and develop downstream wood-based biomaterials. It also supports indigenous biotrade (such as Rooibos trees, honeybush, and medicinal plants) through partnerships with traditional ecological knowledge (TEK) holders and fair-trade certifications, thereby aligning biodiversity conservation with community-based economic development¹⁷⁶.

Financial and market-based mechanisms:

Funding is provided through budget allocations for environmental projects from the National Treasury¹⁷⁷ and the Green Fund,¹⁷⁸ now managed under the Development Bank of Southern Africa. The carbon tax, including compensation for activities such as afforestation and avoided deforestation, creates potential revenue for NbS. Pilot PES programs are being explored, including water conservation schemes.¹⁷⁹ The Just Transition Framework¹⁸⁰ also prioritizes climate financing for nature-based livelihoods and green employment in rural areas.

Implementation under Constraints: Limits, Trade-offs, and Tensions

South Africa's NbS and bioeconomy implementation is shaped by strong resilience potential, but underfunded and fragmented delivery systems. Despite a number of pilot projects and initiatives, finance to address South Africa's restoration and NbS needs remains far below requirements. The country also lacks targeted business cases and revenue streams, and more long-term funding schemes for NbS maintenance and monitoring, beyond the existing short-term project-related finance. Meanwhile, implementation is further limited by policy, institutional, and technical barriers, including policy and governance fragmentation, and institutional capacity constraints.¹⁸¹

The expansion of NbS and the bioeconomy in South Africa is also currently constrained by more structural challenges, including the country's high exposure to climate risks like agricultural drought and urban flooding, as well as structural land governance rights and tenure fragmentation that constrain large-scale NbS deployment.¹⁸² Moreover, South Africa's stark spatial inequalities are also important constraints to urban NbS, limiting the development of green infrastructure in historically socially and economically marginalized neighborhoods.¹⁸³

A Closer Look into South Africa's Flagship NbS & Bioeconomy Initiatives: Linking Adaptation, Conservation, and Equitable Economic Development

South Africa's flagship NbS initiatives emphasize job creation and ecosystem restoration in the context of water scarcity. The **Working for Water (WfW)**¹⁸⁴ program, as part of the Expanded Public Works Program,¹⁸⁵ is a globally recognized national action plan aimed at removing water-intensive invasive plants, restoring river flows and biodiversity, and creating tens of thousands of employment opportunities. The harvested biomass is increasingly used in bioeconomy enterprises, including firewood, wood,

and biomaterials. Meanwhile, the **ReLISA Project (Restoring Landscapes in South Africa)** is a five-year multi-partner initiative (including the German government, UN agencies, and conservation organizations) using NbS to address environmental, social, and economic challenges at the landscape level. The Initiative, launched in 2024, has mobilized 25 thousand euros to promote large-scale restoration in 11 sites across South Africa's three critical biomes (savannah, grasslands, and thicket).¹⁸⁶ Additionally, in the field of the bioeconomy, the draft **Biodiversity Economy Strategy**¹⁸⁷ promotes the sustainable and high-value utilization of local species, such as Rooibos and honeybush, creating export markets and supporting rural livelihoods. This approach directly links conservation with equitable economic development.



United Arab Emirates (UAE)

The UAE's approach to NbS and the bioeconomy is shaped by its extreme drought, limited arable land, and a strategic shift from a hydrocarbon-based economy to a more diversified, innovation-driven green economy. In the face of rising temperatures, water scarcity, and coastal erosion, the UAE leverages NbS as targeted interventions for urban cooling, air purification, and marine ecosystem restoration. Its bioeconomy is strategically advanced, focusing on high-value industries, such as biofuels derived from halophytic (salt-resistant) plants, algae bioproducts, and aquaculture, which align with national priorities in food security, waste value-added, and post-oil economic resilience. Against this background, NbS and the bioeconomy are part of the UAE's vision of sustainable urbanization, climate adaptation, and global leadership in the emerging green economy.

The UAE adopts a top-down, state-led model, relying heavily on public investment, ambitious national strategies, and international research partnerships to overcome its severe ecological constraints.

Overall national strategies and visions:

The UAE Net Zero by 2050¹⁸⁸ strategic initiative and the National Climate Change Plan 2017–2050¹⁸⁹ provide a high-level framework for ecosystem protection and green growth. The UAE Centennial 2071¹⁹⁰ and Vision 2021¹⁹¹ further embed sustainable development and knowledge

innovation as national pillars, while the National Food Security Strategy 2051¹⁹² promotes bioeconomic innovation in agriculture and aquaculture.

Bioeconomy innovation and technology

pilots: The UAE is a global leader in piloting novel bioeconomic models adapted to desert environments. The Sustainable Bioenergy Research Consortium (SBRC),¹⁹³ led by Khalifa University, pioneers the Seawater Energy and Agriculture System (SEAS),¹⁹⁴ which uses seawater to farm fish and halophytic plants for biofuel and animal feed. The UAE's National Policy on Biofuels,¹⁹⁵ launched in 2024, encourages waste-to-energy solutions and advanced biofuels. Major state-owned enterprises, such as Mubadala, invest in biofuel and chemical production,¹⁹⁶ while entities such as Silal drive high-tech, water-efficient agricultural biotechnology.¹⁹⁷

Financial and governance mechanisms:

NbS implementation is driven by sovereign wealth fund investments and direct government spending. Entities such as the Abu Dhabi Environment Agency (EAD)¹⁹⁸ and the Ministry of Climate Change and Environment (MOCCAE)¹⁹⁹ lead the implementation of policies. Additionally, the UAE actively creates markets through green procurement policies and public-private partnerships (PPPs). Its role as a global financial hub further provides international capital for enterprise expansion, while domestic research funding from the UAE Research Program for Rain Enhancement Science²⁰⁰ and other sources support cutting-edge bioinnovation both inside the UAE and in partner countries.

Implementation under Constraints: Limits, Trade-offs, and Tensions

Compared to more ecologically endowed BRICS members, the UAE has a more limited range of NbS pathways available due to the biophysical constraints of its arid desert conditions, further exacerbated by climate change, including water scarcity, extreme desert climate, limited arable land, and soil salinity.

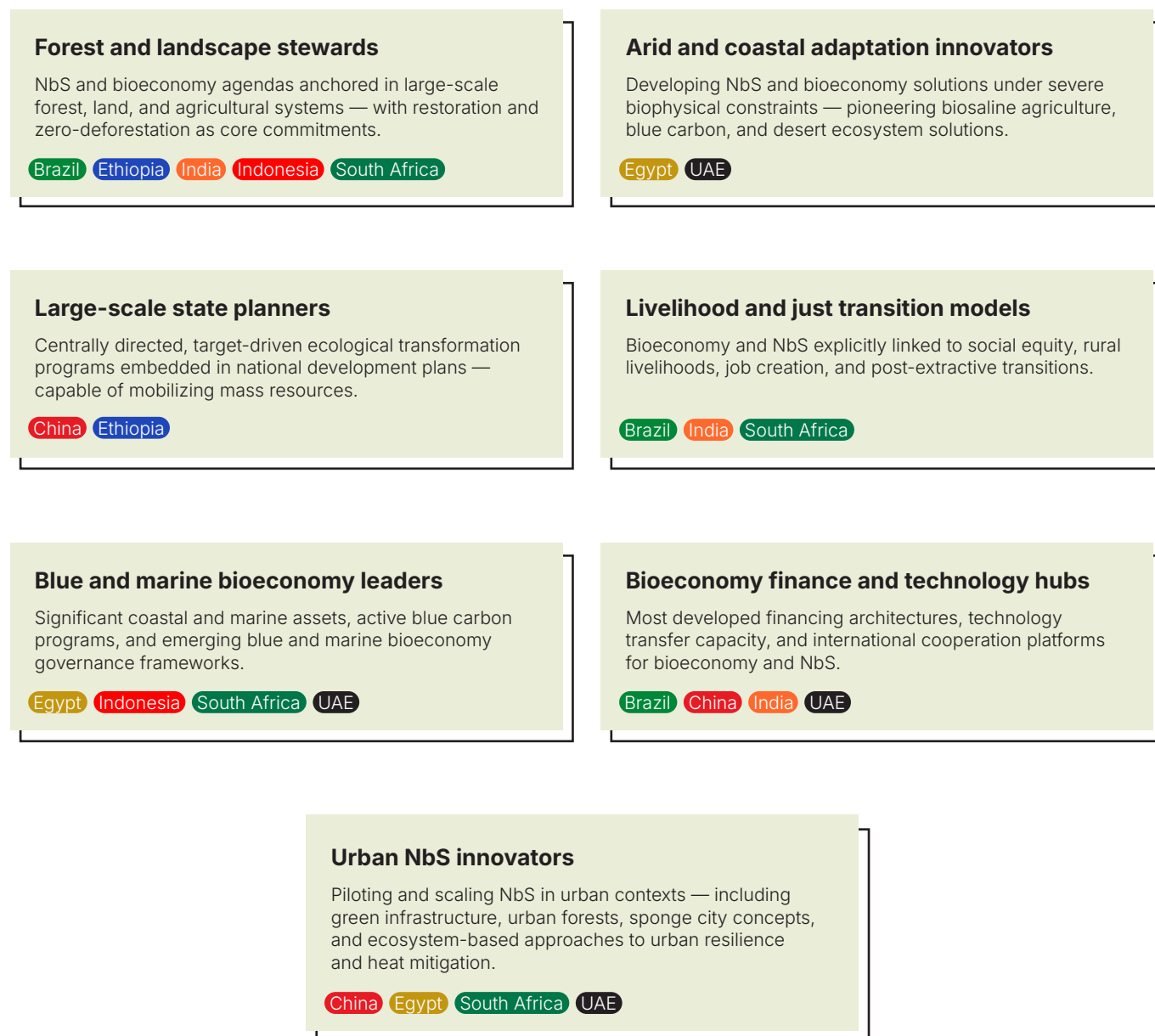
The area where the UAE has shown greater ambition and potential, namely nature-restoration especially in mangroves and blue carbon, remains largely dominated by highly visible but small flagship projects, with limited opportunities for larger scale interventions, due to high project costs and long carbon verification timelines.²⁰¹ To move beyond pilot projects, the UAE needs both a stronger mobilization of both public and private capital, through innovative financing instruments and models, as well as an effort to systematically embed NbS into sectoral frameworks (climate, water, agriculture, biodiversity, and urban planning).

Finally, the impacts of fossil-fuel lock-in, including the industrial footprint on fragile local ecosystems and the country's willingness to maintain its role as a major hydrocarbon exporter, is also a major structural limit on the scale and credibility of the UAE's nature investments. Moving implementation forward and giving it the required scale requires breaking with the policy and economic inertia and forging long-term, sustained multi-stakeholder technical and financial partnerships to scale up the transition.²⁰²

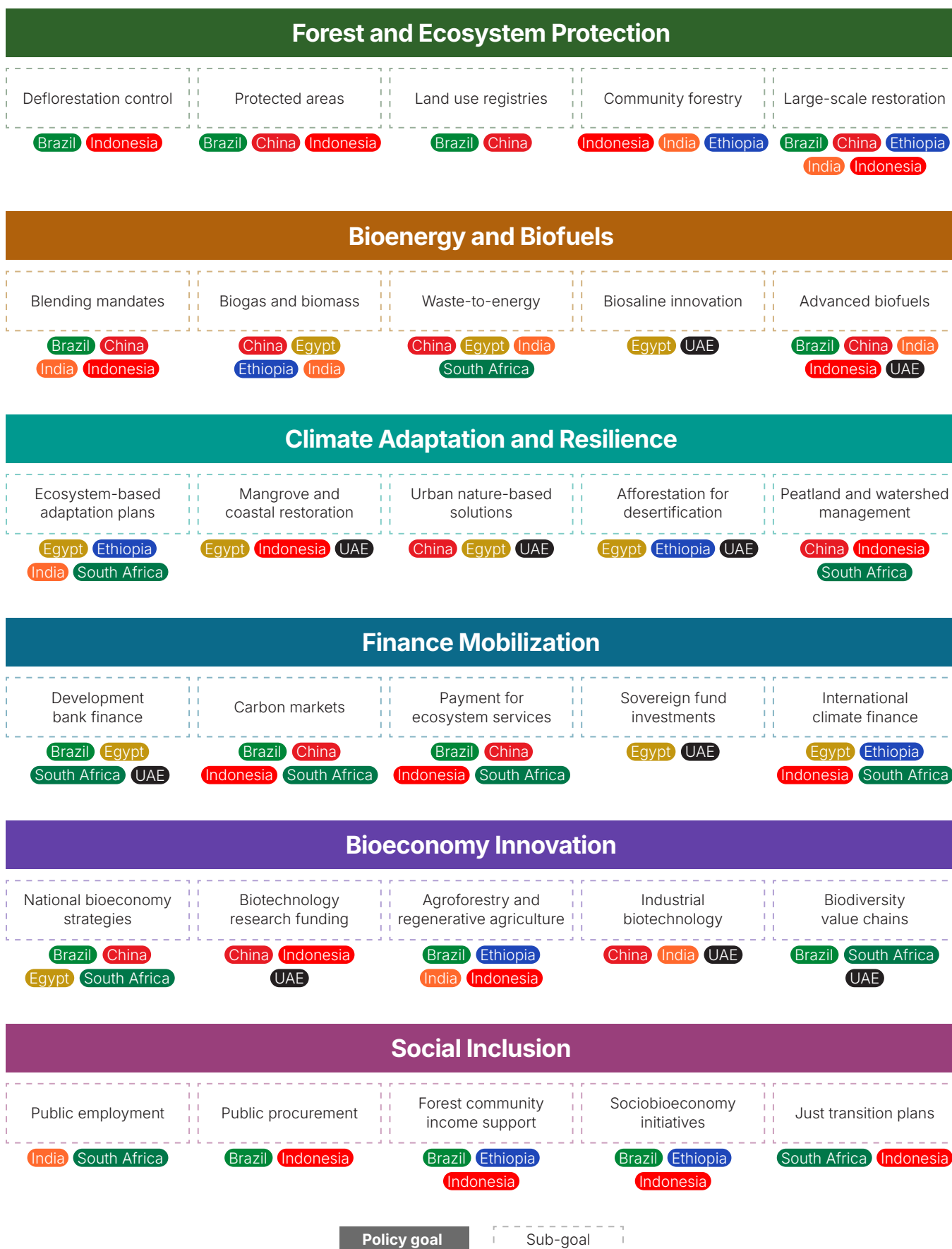
A Closer Look into The UAE Flagship NbS & Bioeconomy Initiatives: Scaling Technology for Climate Adaptation and for the Fishery Industry

The flagship initiatives of the UAE are characterized by technological innovation to mainly address extreme drought conditions. The main NbS initiative is the **National Mangrove Planting Initiative**,²⁰³ which aims to plant 100 million mangroves by 2030 for coastal protection, carbon sequestration, and habitat creation, supported by innovative

irrigation using treated wastewater. In the bioeconomy domain, the landmark project is the **Seawater Energy and Agricultural System (SEAS)** developed by the **Sustainable Bioenergy Research Consortium**. This closed-loop system uses seawater to farm fish and shrimp, further using nutrient-rich wastewater to fertilize halophytic plants, such as salt horn grass, which are harvested for biofuels and animal feed, creating a comprehensive production model for food, water, and energy suitable for desert environments.

Figure 1. Ambition and Innovation in BRICS Ecological Transition: A Typology

Note: These archetypes capture prominent roles and are non-exclusive — countries may appear in more than one archetype, reflecting the multi-dimensional nature of their NbS and bioeconomy strategies.

Figure 2. BRICS Ecological Transition: Policy Instruments and Goals.

2. International and South-South Cooperation Landscapes across BRICS

After mapping the national landscapes, this section examines existing international cooperation initiatives related to NbS and the bioeconomy in which the eight selected BRICS countries participate or lead. This includes multilateral, bilateral, and regional initiatives with other BRICS countries and beyond.



Brazil

Brazil's international engagement on NbS and the bioeconomy is increasingly characterized by agenda-setting, normative leadership, and the mobilization of international finance, moving beyond traditional project-based cooperation. Building on its natural capital and domestic policies on forests, land use, and the bioeconomy, Brazil has increasingly positioned itself as a global leader in the field.

During its 2024 G20 Presidency, Brazil led the adoption of the G20 High-Level Principles on Bioeconomy,²⁰⁴ establishing a shared framework to align the bioeconomy with biodiversity conservation, climate mitigation, and inclusive growth, and strengthened South-South cooperation among emerging economies.

Brazil's COP30 Presidency in 2025, the first UN climate conference held in the Amazon, further consolidated this agenda. By elevating forests, land-based solutions, and the bioeconomy in the climate agenda,

Brazil emphasized that nature and forests are not only carbon sinks but also drivers of sustainable development, innovation, and international cooperation. Key outcomes included the Call to Action on Integrated Fire Management and Wildfire Resilience,²⁰⁵ launched during the Belém Climate Summit (the Leaders' Summit) and the launch of the Tropical Forests Forever Facility (TFFF),²⁰⁶ an innovative international forest finance mechanism designed to mobilize long-term, performance-based funding for tropical forest conservation. The TFFF also focuses on prioritizing predictable finance and benefit-sharing with Indigenous Peoples and local communities.

By the end of the conference, the TFFF had mobilized over US\$ 6.7 billion in its initial phase, with 66 countries endorsing the initiative,²⁰⁷ including BRICS members such as China, Ethiopia, Indonesia, and the UAE. The conference also marked the launch of other thematic initiatives, including the Belém Declaration on Hunger, Poverty, and People-Centered Climate Action,²⁰⁸ to strengthen social protection, support smallholder producers, and ensure sustainable livelihood alternatives for forest-dependent communities, the Resilient Agriculture Investment for Net-Zero Land Degradation (RAIZ) program, launched with the Food and Agriculture Organization of the United Nations (FAO), and the Open Planetary Intelligence Network (OPIN), a collaborative initiative designed by Brazil and India to leverage Digital Public Infrastructure (DPI) for sustainable development and climate implementation in the Global South.²⁰⁹

Building on its 2024 G20 Presidency and the G20 High-Level Principles on Bioeconomy,²¹⁰ Brazil has played a convening and agenda-setting role in advancing the Global Bioeconomy Challenge,²¹¹ launched under the COP30 Action Agenda²¹² in partnership with FAO, the Inter-American Development Bank (IDB), the United Nations Conference

on Trade and Development (UNCTAD), the World Resources Institute (WRI), and NatureFinance. The initiative aims to translate high-level bioeconomy principles into implementation, addressing key enablers such as financing, metrics, markets, and socio-bioeconomy integration to support the adoption of bioeconomy solutions for local communities within climate and nature commitments.

Furthermore, regional cooperation among Amazonian countries has increasingly advanced the bioeconomy and NbS in the Amazon basin. Through the Amazon Cooperation Treaty Organization (ACTO),²¹³ which brings together Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela, Brazil has supported the development of shared regional frameworks connecting forest conservation, sustainable land use, and inclusive growth. Key regional initiatives include the IDB-sponsored Pan-Amazon Bioeconomy Network,²¹⁴ which promotes policy alignment, innovation, knowledge exchange, and financing for forest-based value chains, and technical cooperation with FAO²¹⁵ to support sustainable Amazonian agrifood systems. These efforts are complemented by multilateral financing initiatives, such as the IDB's Amazonia Forever Programme,²¹⁶ which scales investment in the bioeconomy, forest protection, and climate resilience.

Beyond the region, Brazil is also expanding technical cooperation with other BRICS countries on deforestation-related matters, including satellite-based monitoring to reduce deforestation (with India and China) and on deforestation-free supply chains (with China), as further discussed below.²¹⁷



China

China's international cooperation on NbS and the bioeconomy is informed by the Green Development Guide for the Belt and Road Initiative,²¹⁸ which promotes environmental standards for overseas investment in forestry, agriculture, and renewable energy. China is a significant contributor to the United Nations Decade on Ecosystem Restoration (2021-2030)²¹⁹ and large-scale international projects, such as the "Great Green Wall" initiative to combat desertification in Africa.²²⁰ China has signed the China-EU Agreement on Forest Law Enforcement, Governance, and Trade (FLEGT),²²¹ aimed at eliminating illegal logging across supply chains, and cooperates with Brazil through the China-Brazil Earth Resources Satellite (CBERS)²²² project, providing high-resolution data to monitor the Amazon rainforest degradation and reforestation.²²³ In recent years, Chinese and Brazilian stakeholders (including subnational governments, major businesses,²²⁴ and civil society experts)²²⁵ have also expanded cooperation on deforestation-free beef and soy supply chains.²²⁶ Furthermore, the 2024 launch of the China-World Bank Group Global Center for Ecological Systems and Transitions (CWGC)²²⁷ marks a shift towards structured global policy transfer, acting as both a policy center and a knowledge hub for scaling ecological approaches.²²⁸ China's flagship projects of South-South cooperation include the 24 Agricultural Technology Demonstration Centers (ATDCs) across Africa,²²⁹ focusing on integrated management of drought-resistant crops, water, and soil. A notable example is the Ethiopia-China Joint Agroforestry Project in the Oromia region,²³⁰ which combines fruit tree cultivation with grain production to enhance food security and carbon sequestration. Other examples include the Biogas, Biomass, and Solar Trilateral Cooperation²³¹ project, which brings together Ethiopia and China under the framework of South-South collaboration facilitated by UNDP.



Egypt

Egypt has undertaken national and international cooperation in NbS and the bioeconomy through regional diplomacy and leadership in Pan-African climate initiatives. At the regional level, Egypt has cooperated with countries such as Kenya, Mauritania, South Africa, and Morocco in the African Green Hydrogen Energy Alliance,²³² formulating policy frameworks and pilot projects to link renewable energy with sustainable biomass for green fuel production. Beyond regional alliances, Egypt cooperates with European partners, such as the Netherlands, on specialized bioeconomic initiatives including organic waste valorization to transform agricultural residues into high-value products.²³³

In 2024, Egypt joined the UNEP Mediterranean Action Plan's Blue Economy Project²³⁴ to rehabilitate the seabed and promote sustainable aquaculture. Furthermore, Egypt has partnered with the UAE to launch digital capacity-building schemes designed to train Egyptian and other African experts in modern water management and sustainable agriculture.²³⁵ Another example is the Egyptian Red Sea Initiative (ERSI),²³⁶ led by the Government of Egypt, UNDP, and the Global Fund for Coral Reefs (GFCR),²³⁷ launched at COP27 to conserve Egypt's globally significant Red Sea coral reef ecosystems. Complementing these marine efforts, Egypt has prioritized the restoration of coastal blue carbon sinks through a national project to rehabilitate and expand mangrove forests along the Red Sea and Gulf of Aqaba for shoreline protection and biodiversity conservation.²³⁸



Ethiopia

Ethiopia's global participation in NbS and the bioeconomy is carried out through its multilateral participation and collaboration with more than 30 African countries through its leadership in the African Forest Landscape Restoration Initiative (AFR100).²³⁹ Ethiopia shares its technical expertise and the Green Legacy Initiative model to support the restoration of 100 million hectares across Africa. It is also a partner of the World Bank's Sustainable Land Management Project II,²⁴⁰ which combines farmer-managed natural regeneration (FMNR) with solar-powered irrigation. Bilateral projects include the two South-South cooperation projects with China on agroforestry and bioenergy (mentioned above) and Ethiopia-Israel Drip Irrigation and Apiculture Development Project²⁴¹ in Tigray and Amhara, supporting Ethiopia's agricultural sector through technological advancements tailored for arid and semi-arid landscapes. In 2025, Ethiopia held the Second Africa Climate Summit (ACS2) in Addis Ababa, placing NbS and the bioeconomy high among the Summit's priorities.²⁴²



India

India promotes international and South-South cooperation in NbS and the bioeconomy through multilateral platforms, bilateral agreements, and technical assistance programs. The International Solar Alliance (ISA), co-founded with France, implements initiatives such as the Scaling Solar Applications for Agricultural Use (SSAAU)²⁴³ and the solar pump scheme²⁴⁴ to directly support climate-smart agriculture and sustainable land management in African and Small Island Developing States (SIDS).²⁴⁵ In addition,

India provides targeted support through the India-United Nations Development Partnership Fund²⁴⁶ to fund demand-driven projects, such as climate-resilient agriculture in Zimbabwe,²⁴⁷ transferring India's expertise in soil health management, drip irrigation, and seed development. Bilaterally, India has undertaken knowledge exchanges with BRICS partners. India-Brazil cooperation, for instance, includes a MoU on Cooperation in Bioenergy and Biofuels with Brazil,²⁴⁸ which has facilitated joint research and policy dialogue on sugarcane and other biomass for ethanol production, and a partnership to launch Brazil's first entirely home-built satellite (Amazonia-1) to monitor land use change in the Amazon²⁴⁹. Both countries are also leading global biofuels initiatives, including the Global Biofuels Alliance, launched in 2023.²⁵⁰



Indonesia

Indonesia's global participation in NbS and the bioeconomy is carried out through the ASEAN Center for Biodiversity's Peatland Management Strategy,²⁵¹ focusing on protected area management and ecosystem restoration. Another multilateral initiative is its role in the ASEAN Agreement on Transboundary Haze Pollution,²⁵² cooperating with neighbouring countries such as Malaysia and Singapore on peatland restoration and fire prevention projects to address regional air pollution problems. Within BRICS, Indonesia is collaborating with Brazil on renewable energy development, particularly ethanol-based biofuels,²⁵³ and with China and the UAE on "blue carbon" and mangrove-related matters. Indonesia and the UAE launched in 2024 an international research center on mangroves, the Mohamed

bin Zayed-Joko Widodo International Mangrove Research Center, headquartered in Bali. Both countries also co-lead the Mangrove Alliance for Climate.²⁵⁴ In 2025, China's Hainan International Blue Carbon Research Center (HiBC) and Indonesia's Research Center for Oceanography under the National Research and Innovation Agency (BRIN), signed a research cooperation agreement to advance joint efforts on the role played by coastal and marine ecosystems on carbon mitigation.²⁵⁵ Beyond BRICS, Indonesia also co-hosts the Global Mangrove Watch partnership²⁵⁶ with the US and Australia, using satellite monitoring to protect mangroves. Bilaterally, Indonesia has co-developed the Indonesia-Norway Integrity Council for Voluntary Carbon Markets (ICVCM)²⁵⁷ pilot project to verify carbon credits from peatlands.



South Africa

South Africa's global participation in NbS and the bioeconomy includes leading the African Circular Economy Alliance (ACEA)²⁵⁸ and participating in the Global Partnership for Forest and Landscape Restoration (GPFLR).²⁵⁹ Bilateral initiatives include the South Africa-Norway Oceans for Development Programme,²⁶⁰ focusing on integrated management and sustainable aquaculture of abalone and seaweed in coastal areas. Regionally, South Africa has a series of South-South cooperation initiatives on blue carbon, including the Great Blue Wall (alongside Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, and Tanzania) to increase marine protected areas in the South Western Indian Ocean and conserve and restore critical blue ecosystems while sequestering 100 million tonnes

of CO₂ and creating 1 million jobs in the blue economy (see [Glossary](#)) by 2030.²⁶¹ Another concrete example is the partnership with Namibia and Angola under the Benguela Convention,²⁶² a legally binding intergovernmental body for ocean governance that establishes a framework for the long-term conservation and sustainable management of the Benguela Current Large Marine Ecosystem (BCLME)²⁶³ to ensure ecosystem health and socio-economic benefits. Within BRICS, South Africa has championed eco-tourism and the creation of green jobs as central pillars of decarbonization and biodiversity protection.²⁶⁴ It has also signed an Agreement on Strengthening Cooperation in the Oceans Economy with China, which covers areas including aquaculture and fish product processing, marine environment conservation and management, research and technology transfer, and skills development.²⁶⁵



United Arab Emirates (UAE)

The UAE's international cooperation in NbS and the bioeconomy is led by the Mohammed bin Zayed Species Conservation Fund,²⁶⁶ which has supported over 2,500 NbS projects worldwide, including the protection of the habitat of the Arabian leopard by restoring the vegetation base that sustains it.²⁶⁷ A major multilateral platform that the UAE leads and funds is the Abu Dhabi-based International Center for Biosaline Agriculture (ICBA),²⁶⁸ a global research center promoting salt-

and drought-resistant crop varieties, sustainable aquaculture, and water-saving agricultural technologies across Central Asia and the Middle East.²⁶⁹ Furthermore, the UAE has established a trilateral cooperation framework with France and India to execute joint projects in energy, climate change mitigation, and biodiversity protection, with a specific focus on the Indian Ocean region.²⁷⁰

Within BRICS, the UAE-China joint innovation center for sustainable agriculture and water safety²⁷¹ is a key initiative that focuses on testing and commercializing desert-adapted agricultural technologies, including artificial rainfall research and closed-loop saline agricultural systems. Bilateral cooperation with India is promoted through the India-UAE Green hydrogen-related agreements,²⁷² including collaborative research and investment in renewable energy and sustainable biomass resources to produce green hydrogen and its derivatives. Mangroves are also an important area of shared interest between the UAE and other BRICS countries, notably Indonesia, through the Mangrove Alliance for Climate, co-led by both countries, and the Mohamed bin Zayed-Joko Widodo International Mangrove Research Center, headquartered in Bali, to which the UAE initially pledged USD 10 million.²⁷³ The UAE also leads South-South cooperation through the UAE-Pacific Partnership Fund,²⁷⁴ which provides funds for renewable energy and food security projects such as solar desalination and hydroponic farms in Pacific Small Island

Developing States (PSIDS).

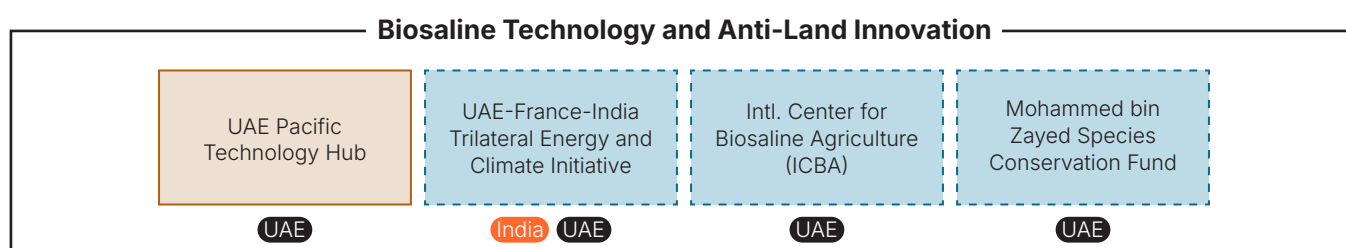
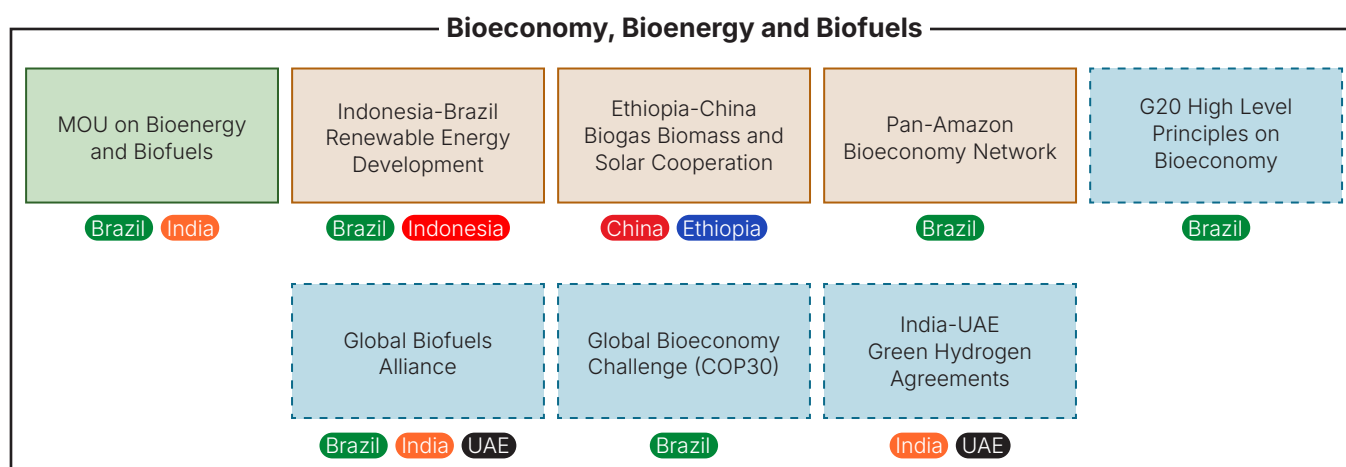
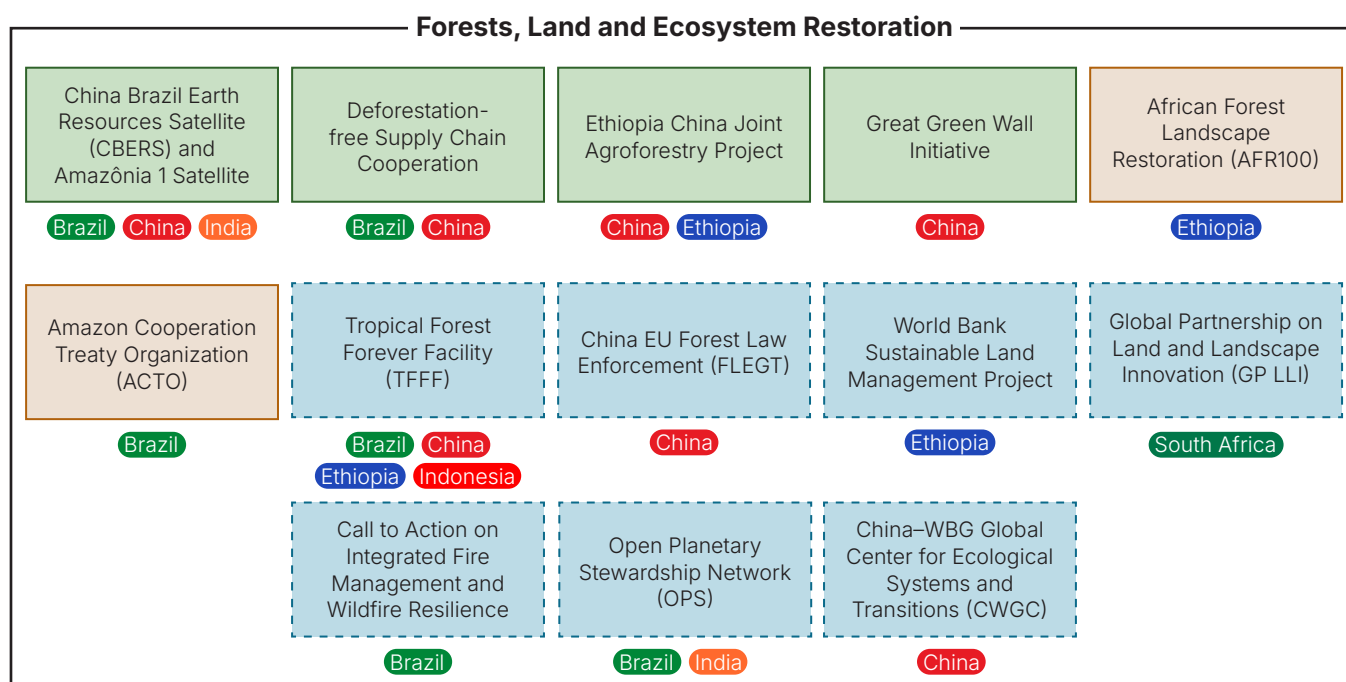
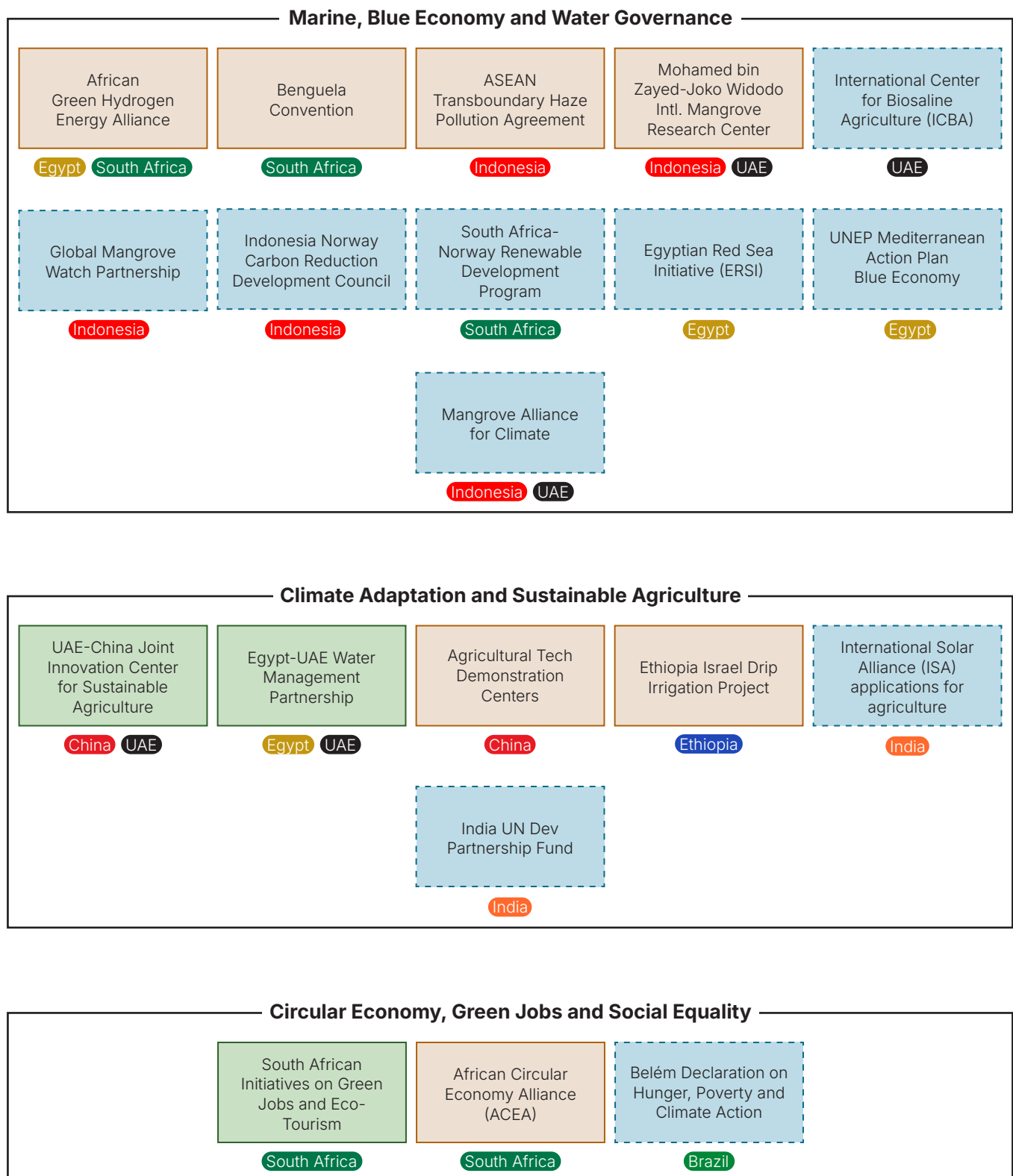


Figure 3. BRICS Global Leadership and Cooperation Landscape*continuation*

3. Fostering NbS and bioeconomy cooperation within BRICS and beyond

The mapping of national and international landscapes of NbS and the bioeconomy across the eight selected BRICS countries highlights the growing role these countries play as providers of NbS and bioeconomic innovations for climate mitigation and adaptation, sustainable development, and inclusive growth.

Although comparatively less politically salient and institutionally developed than efforts towards clean energy-related initiatives,²⁷⁵ there is experimentation and innovation on the ground across a range of thematic clusters, including ecosystem protection and restoration, bioenergy and biofuels, marine and blue economy, climate adaptation, low-carbon nature-positive agriculture, circular economy, and beyond.

The mapping shows growing ambition, translated into policy and regulatory innovation, but also implementation constraints, including incipient NbS and bioeconomy frameworks, policy and institutional fragmentation, and financing gaps. A cross-cutting insight from the cases examined here is that implementation gaps are often not technical first, but institutional first. Many countries already have strategies, but delivery is held back by fragmented governance, weak coordination, and limited accountability. Finance is also a

recurring bottleneck. Even where NbS or bioeconomy projects are viable, scaling is limited by high upfront costs, slow returns, and insufficient dedicated funding. This is reinforced by weak measurement and valuation. The lack of data, accounting methods, and standardized taxonomies makes it harder to prove benefits and attract investment. Finally, land and resource competition matters. NbS and bioeconomy projects compete with agriculture, urbanization, industry, and infrastructure, which creates trade-offs that need explicit management.

In highlighting what is being tested on the ground within and across countries, the report also underscores the potential for expanding BRICS cooperation, particularly through the exchange of expertise, joint research, technical innovation, and coordinated financing mechanisms. Intra-BRICS cooperation can help countries address some of these issues and scale up existing initiatives in key sectors. It must also provide a space for countries to discuss ways to manage major tensions and trade-offs related to this agenda, such as land competition, food security, Indigenous and local community rights, greenwashing, carbon-market integrity, and biodiversity safeguards.

In this context, existing BRICS platforms, such as the Ocean and Polar Science and Technology Working Group, the Disaster Risk Reduction Working Group, and the BRICS-led New Development Bank (NDB), provide important institutional channels for sustained dialogue and structured collaboration.

Below we detail some entry points for BRICS cooperation on NbS and the bioeconomy in the years ahead.

1. Forest and Land Management

To strengthen sustainable forestry and landscape management, BRICS should establish a BRICS Alliance for Sustainable Forestry and Landscape. This alliance would provide a space for exchange on forest laws and on key initiatives such as sustainable forest management and ecological restoration, besides supporting the harmonization of forest carbon credit certification and nature credit standards across the group. An important function of the alliance would be to oversee joint research projects on climate-adaptive afforestation and high-integrity monitoring of forest carbon reserves using shared satellite data from platforms such as the China-Brazil Earth Resources Satellite (CBERS). Meanwhile, BRICS countries should also build on the momentum around forest finance generated by COP30, and join Brazil and Indonesia as contributors to the Tropical Forests Forever Facility (TFFF). They should also jointly design and establish a BRICS Tropical Forests and Landscape Fund, as a specialized financing scheme within the BRICS-led NDB, which would carry out cooperative financing, provide grants and preferential loans for community forest enterprises, and focus on the production of non-wood forest products (such as Brazil nuts and medicinal plants) and sustainable wood value chains. Additionally, the alliance should develop a BRICS Forest Roadmap, along the efforts championed by Brazil's COP30 Presidency to produce a global Roadmap to halt and reverse deforestation and forest degradation by 2030,²⁷⁶ and a BRICS Protocol on Ethical Biodiversity Products Trade to ensure equitable sharing of benefits with Indigenous and local communities.

2. Sustainable Agriculture and Food Security

BRICS should launch a Climate-Adapted Food System Initiative (CAFS) to establish a network of joint agricultural research stations within the BRICS agricultural ecological zones, focusing on the development of low-carbon, drought-resistant, heat-resistant, and salt-resistant crop varieties, complemented by open-source knowledge sharing. CAFS should also fund the production and distribution of affordable small-scale precision agricultural technologies tailored to small farmers, such as soil moisture sensors and drone-based monitoring. To address food waste, CAFS should also support pilot projects to develop an integrated cold-chain infrastructure and biotransformation centers to convert agricultural residues into animal feed, compost, and bioenergy. A core component of the initiative would be a BRICS farmer-to-farmer knowledge exchange program, which promotes direct technical assistance and peer learning in regenerative practices. This program can build on existing South-South and triangular development cooperation²⁷⁷ (SSC and TDC, respectively) schemes, in partnership with UN agencies such as the FAO.

3. Marine and Aquatic Bioeconomy

BRICS countries should establish a BRICS Blue Bioeconomic Partnership (BBP) that is based on the existing BRICS Ocean and Polar Science and Technology Working Group.²⁷⁸ The BBP would develop a 10-year strategic research and investment plan for a sustainable marine economy focusing on a joint marine protected area network, coral reef and mangrove restoration projects, and the sharing of monitoring protocols. Such partnerships should promote innovation in sustainable aquaculture and algae biotechnology

through a co-funded network of research ships and laboratories. To facilitate trade, the BBP should promote common standards for seafood hygiene and phytosanitary measures, invest in modernizing and greening key port infrastructure, and position BRICS countries as leaders in low-carbon trade and marine biorefining.

4. Circular Bioeconomy and Waste Valorization

BRICS should establish a Circular Bioeconomic Innovation Platform (CBIP), which would act as a synergized accelerator, providing funds for pilot biorefineries in special economic zones that use waste streams from sources such as sugarcane slag, rice husks, and foreign invasive plant biomass to produce bio-based chemicals, materials, and energy. CBIP should maintain a publicly accessible technical library of best practices for anaerobic digestion, gasification, and enzyme conversion. The platform should also promote policy coordination, formulate recycling standards for bio-based products in BRICS countries, and advocate for the elimination of international trade barriers to certified recycled bioproducts.

5. Climate Adaptation and Resilience

A dedicated BRICS Adaptation Action Plan should be developed based on the BRICS Disaster Risk Reduction Working Group.²⁷⁹ This plan would ensure the systemic integration of NbS into each country's National Adaptation Plan (NAP) and establish a BRICS National Action Plan Implementation Fund to support ecosystem-based cross-border demonstration projects for disaster reduction, such as the restoration of flooded wetlands in river basins or the stabilization of coastal sand dunes.

Flagship projects could include a network of real-world laboratories, where researchers, policymakers, and local communities jointly test and promote adaptation solutions, such as agroforestry for soil moisture retention or urban green infrastructure for reducing heat. The plan should also include a joint capacity-building project on NbS implementation for local government officials, and dedicated financing mechanisms to support local-level NbS deployment — potentially channelled through or co-designed with the NDB — to support subnational NbS projects across BRICS member states.

6. Valuing Nature

BRICS countries should broaden their dialogue on the integration of nature's value in economic decision-making, building on existing national and international discussions related to nature finance as well as to "natural capital," "nature assets," and/or "nature wealth" (see [Glossary](#)).²⁸⁰ This dialogue should draw on member countries' previous engagement with major international initiatives, including at the G20 and the International Advisory Panel on Biodiversity Credits (IAPB). It should equally support national, regional, and cross-regional efforts to develop a shared language, frameworks, and standards for Biodiversity, Ecosystems, and Ecosystem Services (BEES) to promote nature-positive investment alternatives, enhance innovative financing mechanisms for forests and other critical ecosystems, and foster sustainable bioeconomy trade. Additionally, BRICS countries should encourage the NDB and BRICS national development finance institutions to mainstream nature finance in their operations and promote the convergence of biodiversity finance reporting.²⁸¹

7. Knowledge Production, Peer Learning and Policy Exchange

Considering the mismatch between growing interest and policy experimentation on NbS and the bioeconomy, and existing mechanisms for knowledge and policy exchange within BRICS, countries should explore ways to strengthen data generation, dissemination, policy learning,

and experimentation. This could include the development of specific knowledge and policy exchange mechanisms such as a BRICS NbS & Bioeconomy Accelerator that serves as an action-oriented research and policy initiatives repository and an Annual BRICS “State of Nature-based Solutions & Bioeconomy” Report to give visibility to national and international cooperation initiatives with and across BRICS countries.

Policy Recommendations

To build on existing national policy ambition and innovation, as well as on ongoing international cooperation and leadership efforts by these BRICS countries, the report recommends a set of immediate and medium- and longer-term actions, as follows:

Immediate Actions

1. Establish a BRICS NbS and Bioeconomy Knowledge and Policy Platform

Establish a policy and knowledge exchange platform that functions as both an action-oriented repository of research and policy initiatives and an evidence-based accelerator of NbS and bioeconomy efforts across BRICS countries. The platform should be designed around shared innovation clusters, with a particular focus on facilitating policy knowledge and technology transfer. A dedicated working group on Measurement, Reporting, and Verification (MRV) and safeguards for NbS and bioeconomy initiatives should be established as a foundational workstream of the platform, drawing on methodologies under development at the IAPB and the Taskforce on Nature-related Financial Disclosures (TNFD).

2. Launch a NDB Nature Finance Window

Launch a dedicated nature finance window within the New Development Bank (NDB), comprising:

- Thematic funding schemes, including a BRICS Tropical Forests and Landscape Fund;
- A pilot pipeline of 5–8 bankable NbS and bioeconomy projects for co-financing between the NDB and BRICS national development banks, spanning forest and ecosystem restoration, waste biorefineries, biofuels, urban resilience, and blue economy interventions;
- A strategic nature finance dialogue between the NDB and BRICS national development finance institutions, to harmonize appraisal criteria, safeguard standards, and blended finance structures.

3. Anchor and sustain a BRICS Forest Momentum Agenda

Two complementary actions should be launched in tandem to capitalize on the momentum generated at COP30 in Belém:

- Encourage all BRICS countries and NDB members to join Brazil and Indonesia as sovereign investors in the Tropical Forests Forever Facility (TFFF);
- Develop a BRICS Forest Roadmap that sustains momentum from COP30 through to COP32 in Ethiopia, embedding zero-deforestation commitments within the UNFCCC process and providing a BRICS-specific architecture to support national implementation.

Medium- and Longer-Term Actions

The medium- and longer-term recommendations are organized across four thematic action areas and one cross-cutting governance track.

4. On Forests: BRICS Alliance for Sustainable Forestry and Landscape

Building on the immediate Forest Roadmap, establish a BRICS Alliance for Sustainable Forestry and Landscape as a permanent cooperation mechanism covering sustainable forest management, landscape restoration, zero-deforestation supply chains, and forest-based bioeconomy value chains. The Alliance should provide an institutional home for the BRICS Forest Roadmap and serve as the BRICS contribution to global climate and biodiversity frameworks.

5. On Adaptation: A Three-Track Agenda

Three mutually reinforcing initiatives should be advanced in parallel:

- Climate-Adapted Food Systems Initiative (CAFS): a network of joint agricultural research stations within BRICS agricultural ecological zones, acting as a plurilateral science-policy platform and supporting pilot South-South and Triangular Cooperation technical cooperation projects;
- BRICS National Action Plan Implementation Fund: a dedicated fund to support on-the-ground implementation of ecosystem-based, cross-border demonstration projects for disaster risk reduction, operationalizing the existing BRICS Disaster Risk Reduction Working Group;
- BRICS Adaptation Action Plan: a formal plan anchored in the BRICS Disaster Risk Reduction Working Group that links ecosystem-based adaptation explicitly to NbS methodologies.

6. On Circular Bioeconomy: BRICS Circular Bioeconomy Innovation Platform (CBIP)

Establish a BRICS Circular Bioeconomy Innovation Platform (CBIP) to accelerate the development and deployment of circular bioeconomy technologies — including waste biorefineries, agricultural residue valorization, bio-based materials, and sustainable packaging.

7. On Marine and the Blue Economy: BRICS Blue Bioeconomy Partnership (BBP)

Establish a BRICS Blue Bioeconomy Partnership (BBP), anchored in the existing BRICS Ocean and Polar Science and Technology Working Group. The BBP should focus on sustainable fisheries, marine biotechnology, blue carbon accounting, and mangrove and coastal ecosystem restoration — areas where multiple BRICS members have complementary assets, existing bilateral and regional cooperation, and global leadership.

8. Cross-Cutting Strategic Dialogues

Three strategic dialogues should be advanced as a cross-cutting track running alongside and enabling the thematic action areas above:

- Common biodiversity and nature finance standards and methodologies: drawing on existing international initiatives such as the G20 Initiative on Bioeconomy, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), and the International Advisory Panel on Biodiversity Credits (IAPB);
- Harmonized trade and certification protocols, including a BRICS Protocol on Ethical Biodiversity Products Trade;
- Nature finance: promoting longer-term dialogue and coordination between the NDB and BRICS national development finance institutions, towards common appraisal frameworks, co-financing structures, and a shared pipeline of nature-positive investments.

Endnotes

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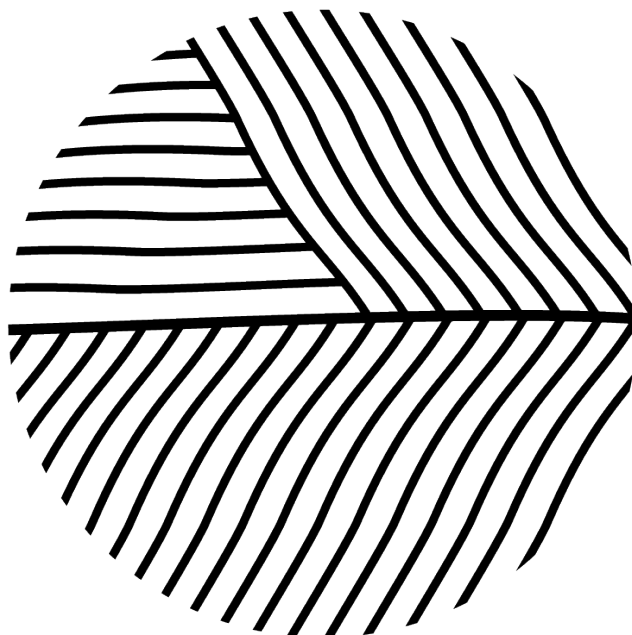
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