

Fostering Bio-Partnerships: A 5-P Alliance for Environmentally and Socially Responsible Bio-Businesses

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Abstract

Despite the repeated calls from the Convention on Biological Diversity (CBD) since 1993 on the conservation, sustainable, and equitable use of biodiversity, the pace of endangerment and extinction of biodiversity and the associated culture has increased. Though a major contributor to this situation is the business sector, only about 5% of them recognise their role and impacts on biodiversity and the rights of local and Indigenous communities. According to 2022 Customer Data Platform Data, 70% of member companies did not assess their biodiversity impact. Promoting sustainable biodiversity use and meeting people's needs requires cross-sectoral partnerships, regular monitoring, and sector-specific risk assessments. Existing global initiatives like the Taskforce on Nature-related Financial Disclosures (TNFD) and the India Business and Biodiversity Initiative (IBBI) are limited in their reach, ignoring small and medium businesses. To address these gaps and to achieve the Kunming-Montreal Global Biodiversity Framework (KM-GBF) 2030 Targets 9, 15, and 19 and the Nagoya Protocol provisions, the authors propose a "Business & Biodiversity 5-P Platform." The 5-P model involves five interconnected groups: producers (local communities that utilise their traditional knowledge and innovations), partners (community institutions and NGOs), promoters (advocates of the bio-economy), policymakers (government officials), and politicians (leaders providing vision). This approach ensures a sustainable supply of bioresources, benefiting businesses and society by fostering long-term viability and harmony with nature.

Keywords: Biodiversity, Business sector, Sustainable use, Benefit-sharing, 5-P Platform, Bio-Partnerships

1. Introduction

Target 13 of the Kunming-Montreal Global Biodiversity Framework (KM-GBF) seeks to facilitate a significant increase in the benefits shared from the use of biodiversity by 2030 through legally complied mechanisms and strategically organised partnership pathways for access to genetic resources and associated traditional knowledge (CBD/COP/Dec/15/4). As a follow-up to this and by recognising the need for responsible biodiversity-business partnerships, Target 15 of the KM-GBF encourages the business sector and biodiversity management actors to perform their roles effectively by calling for a cross-sectoral approach, regular monitoring, assessment, and disclosure of sector-specific business risks and impacts on biodiversity.

In the current and predicted scenario of a widening economic divide and increasing ecological destruction, socially and environmentally responsible businesses become the front-line sector in operationalising the sustainable use and benefit-sharing frameworks of the Convention on Biodiversity and creating green transition plans and bio-economy (UNEP, 2020). The World Economic Forum (WEF) estimates that nature-dependent businesses, such as those in construction, agriculture, and food and beverages, generate approximately \$44 trillion in economic value annually (WEF 2020). As part of the KM-GBF implementation commitments, the governments of developed countries and growing economies like Brazil, China, and India earmarked new funding and incentives to mobilise the business sector towards green-transition plans, bio-economy innovations, and strategies.

Since industrialisation, businesses that depend on nature have promoted unsustainable consumption of supply source services, leading to the loss of biodiversity and ecosystem degradation (Bishop et al. 2010). Implementers of economic development interventions often fail to foresee environmental consequences and compromise legal, environmental, and social responsibilities. As an example, India, one of the 12 mega biodiversity countries in the world, has seen 45 million hectares of forests being denuded to various extents, and even some of the National Parks and Protected Areas of the country are considered to be endangered (IUCN 1990, Swaminathan 2010). The scenario continues in many biodiversity-rich but economically disadvantaged tropical countries, most evidently in the food and agriculture sectors.

The commercial production of plantation crops like coffee, tea, cocoa, rubber, teak, and oil palm by clearing natural forests and adopting unscientific land uses stands out as the primary driver for the extinction and endangerment of several tropical forest-dwelling species as well as quite a

lot of traditionally conserved plant genetic resources (Gibbs et al. 2010; Kissinger et al. 2014). Nearly 90% of the world's demand for palm oil is met by two biodiversity-rich tropical countries, Indonesia and Malaysia. This industry is rapidly expanding in other countries, including India (where palm oil's current annual consumption is about 10 million metric tonnes), West and Central Africa, Latin America, and Papua New Guinea. Similarly, the seafood industry, the world's last major hunter-gatherer food system and aquaculture market, is growing unsustainably much faster than the agriculture sector (Trevor A. Branch et al. 2008; Bourillon and Allison 2014).

Following the food and agriculture sector, the pharmaceutical industry, including nutraceuticals, cosmetics, biotech, and traditional medicine (TRM), emerged as a major exploitative biodiversity-dependent sector (Young (1999)). The pharmaceutical industry significantly depends on and influences numerous forms of biodiversity, ecosystems, and genetic resources, ranging from forests, deserts, wetlands, and seas to vascular plants, ferns, seaweeds, algae, fungi, microbial life, and many forms of ecosystem services, including water, soil, and mineral products (Bhujun et al. 2017; Afzal and Yasmeen 2023). Over the past 10-15 years, a wider supply of medicinally or nutritionally important biodiversity by the corporate pharma sector worldwide has been reported. For example, out of the 1,562 drugs approved by the USFDA between 1981 and 2014, 320 were derived from plants and natural products, 141 were herbal mixtures, 64 were pure natural products, and 61 were synthetic drugs that have origins in the pharmacophores of natural products (Newman and Cragg, 2016).

The growing demand for herbal health products fuels the continued exploration and exploitation of natural compounds for drug discovery, aided by advancements in molecular biology and digital technologies that provide unprecedented opportunities to uncover novel active molecules from the biological world. Chaachouay and Zidane (2024), in their extensive review of the global literature on plant-derived natural products for drug development, concluded that developing drugs using plant-based pharmaceutical technology offers an efficient, cost-effective, and safe alternative to conventional procedures that use animal cell cultures or microbial fermentation. Notwithstanding, the critical importance of the role of the business sector in promoting the sustainable use of biodiversity and benefit-sharing, only about 5% of businesses understand how they impact biodiversity and nature or recognise and influence the rights and roles of local and Indigenous communities who safeguard biodiversity and add value to genetic resources (WBA Nature Benchmark Report 2022). The Customer Data Platform Data of 2022 reveals that 70% of the member companies failed to assess the impact of their business on biodiversity (TNFD 2023).

The World Economic Forum outlines five action steps for the business sector to address this shortcoming and engage in biodiversity conservation and sustainable use as a lead partner in the implementation of the KM-GBF. Among these five-pronged action steps, the advocacy for "don't do it alone" stands out for its strong conviction that isolated efforts are ineffective. While there are global joint initiatives for biodiversity and business collaboration in general at the global level, there are few notable industry-specific "do-it-together" coalitions known at either the global, national, or sub-national level. For instance, initiatives like the Taskforce on Nature-related Financial Disclosures (TNFD) and the India Business and Biodiversity Initiative (IBBI) aim to help companies and financial institutions incorporate nature into their decisions, but their reach extends only to a few transnational corporations or big companies.

Recognising the TNFD's and IBBI's limited reach and drawing on our experience and partnerships with diverse communities of a socio-economic system in India's poverty-climate-biodiversity hotspots, we propose creating and nurturing a 5-P Biodiversity and Business Partnership ecosystem to achieve the KM-GBF 2030 Goals and the provisions of the Nagoya Protocol on Access and Benefit Sharing (ABS) (*IBBI Working Groups - CII-ITC-CESD, 2023*). This proactive alliance is suggested to integrate and harness the power of five critically important communities in the socio-economic and political system in the manner of natural ecosystem communities. Such a systemic approach will foster the CBD strategy of whole-of-government and whole-of-society involvement in implementing the NBSAPs, the ABS commitments, and supporting partner countries to eliminate the fear of bio-piracy.

We elaborate on the description, rationale, structure, and member entity's role in the partnership and discuss the operational plan for this ecosystem of communities by taking India's Pharma business as an example in the following sections.

2. Understanding the 5-P Biodiversity-Business Partnerships

Five communities that have a high and critical stake in defining, managing, and shaping a biodiversity-business management paradigm are: '*Producers*' comprising farmers, fishermen, individual manufacturers, workers, healers, artisans, miners, Indigenous People, and others at one end, and companies and enterprises on the other end that engage in making consumable products out of cultivated or wild biodiversity by utilising their traditional knowledge and innovations. '*Partners*' dominated at different levels, ranging from local community institutions, NGOs, bio-trading partners, conservation organisations, and research collaborators who are the

primary associates of producers in the value chain. '*Promoters*' comprise individuals, institutions, citizen groups, journalists, religious leaders, and celebrities who advocate and push for policies, principles, and practices for bio-economy and sustainable development agenda. '*Policymakers*' are mainly those government department officials who are responsible for protecting and enhancing nature-human-social systems, the economy, biodiversity, and the environment. Finally, and importantly, '*Politicians*,' including the ministers and other leaders of ruling and opposition parties in a democracy, or those heads in autocracies who provide guidance and vision, ensure policies and programmes needed for sustainable and equitable use of biodiversity for resilient development.

The 5-P bio-business partnership can be nurtured through a concerted long-term effort benefiting every partner in a mutually reinforcing manner, akin to a *food web* in a natural ecosystem. In both the natural and social ecosystems, the base 'Producer' community creates consumable products for themselves from biodiversity, ecosystem services, and others by harnessing resources and skills. The 'Partner' groups that are analogous to organisms engage in symbiotic relationships with the producers in different ways, such as mutualism, where partners benefit mutually from the collaboration, or commensalism, where one partner benefits while the other is neither helped nor harmed, or parasitism, where one benefits at the expense of the other. The third group, 'Promoters,' are similar to facilitator species like the Pollinators and Seed distributors in the ecosystem that create beneficial conditions for the overall food web and sometimes contribute to creating enabling conditions for symbiotic collaborations between species indirectly. The next two groups at the apex, the 'Policymakers' and 'Politicians,' are similar to keystone species and ecosystem engineers in Nature and have the power to provide leadership, control, connect, change the system, and bring progress.

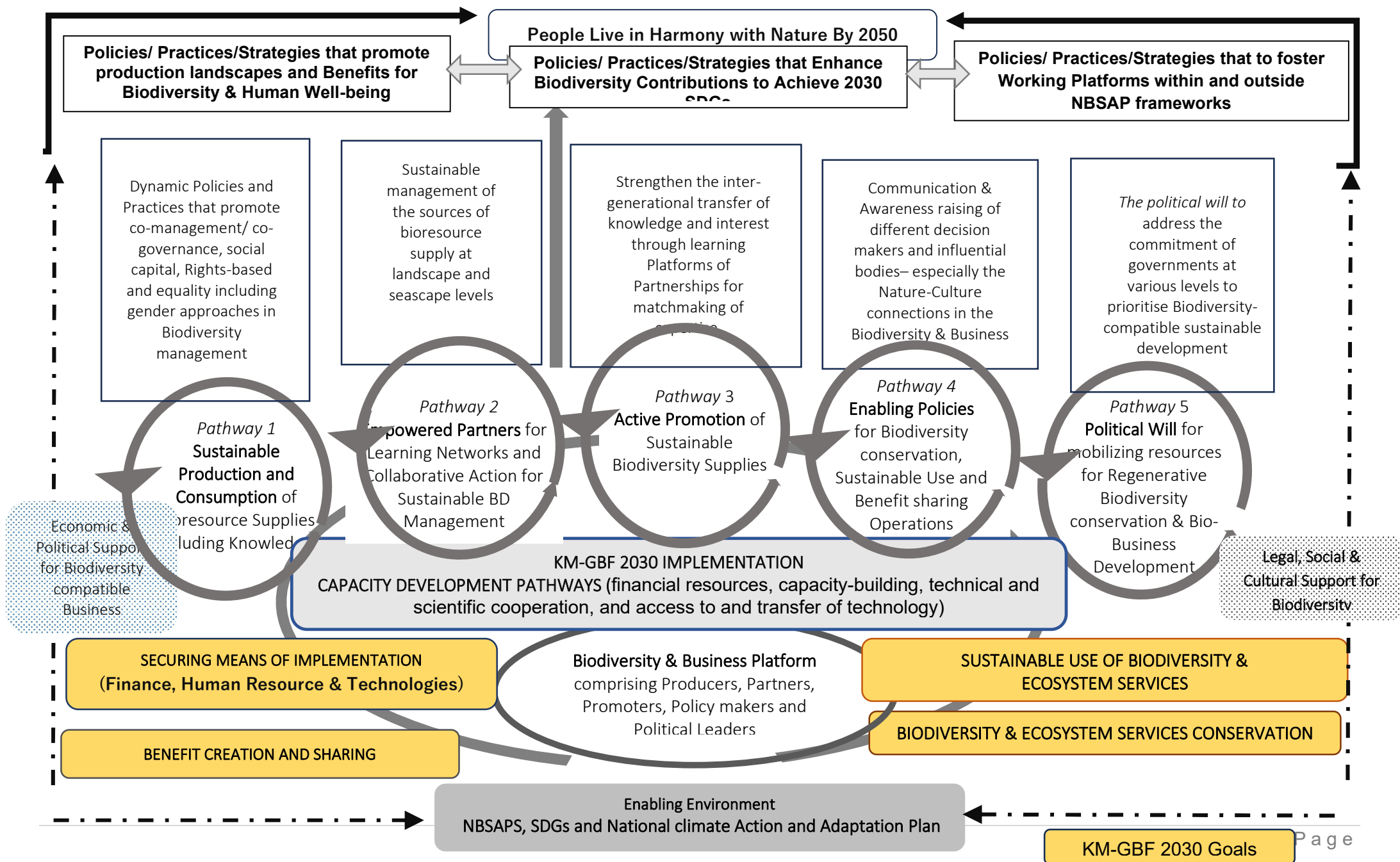
These five interrelated groups significantly impact the operational ecosystem's structure, function, and health and collectively lead to the system's sustainability and regenerative capability. In a natural ecosystem, nature performs this job in a balanced and collective manner, benefiting all the actors and ensuring regenerative growth for the system, whereas in the human social system, it is imbalanced, benefiting only a few who exploit the individual benefits and ultimately degenerative growth of the system.

A vast network of multi-stakeholders operates at global to national levels for conservation and sustainable use of biodiversity, to name a few, CBD, IUCN, ACTO, CMS, National Park Service, The Nature Conservancy, The Tropical Forest Alliance (TFA), ASEAN Centre for Biodiversity (ACB), and

South Asia Cooperative Environment Programme (SACEP), with the principles and promises to tackle the issues related to free, informed, fair and equitable benefit sharing. The World Economic Forum, global initiatives like the Taskforce on Nature-related Financial Disclosures (TNFD), and the national initiative of the India Business and Biodiversity Initiative (IBBI) are two major examples that specifically target business and biodiversity reciprocity. However, most of these institutional networks operate at the international, regional, and national levels, often disconnected from ground-level realities. This disconnect frequently results in failures in biodiversity management and sustainable business value-chain development operations. This issue is particularly evident in large federal countries like India, despite national-level legally binding commitments to the sustainable use of biodiversity and the fair and equitable sharing of benefits derived from it (MEA, 2005). To address this problem, coordinated actions at the sub-national level involving state and local governments or ecological-zone-specific efforts are needed. Such an effort would also broaden the customer base and enhance biodiversity-business reciprocal actions.

The perspectives of and solutions from key actors in this partnership can be streamlined into five major action pathways. *Pathway 1 is **Sustainable Production and Consumption*** of bioresource supplies, including knowledge, skills, and innovations; *Pathway 2 is **Empowered Partners*** for learning networks and collaborative action in Sustainable Biodiversity Management; *Pathway 3 is **Active Promotion*** of Sustainable Biodiversity Supplies for building up a bio-business economy and green development; *Pathway 4 **Enabling Policies*** for biodiversity conservation, sustainable use, and fair and equitable benefit-sharing operations; and *Pathway 5 **Political Will*** for mobilizing resources (financial, capacities, and science, and technologies) for regenerative and sustainable biodiversity conservation and bio-business development. These pathways can be integrated as a major strategy to achieve the desired outcomes that deal with business and biodiversity reciprocity concerns and contributions. See Figure 1 for an illustration of how these relationship pathways connect and function within a bio-business partnership and produce results.

Fig. The 5-P Biodiversity-Business Partnership Framework for implementing the sustainable Bio-trade policies and practices



3. Operating the 5-P Platform for Responsible Pharma Business

The pharmaceutical and traditional medicine sector businesses in India are intensively gearing up to tap the emerging opportunity to produce novel plant-made pharmaceuticals (PMPs), phytopharmaceutical drugs (PPDs), and herbal therapeutics. According to the Ministry of Ayush, India's export of medicinal plant-derived extracts rose from \$364 million in 2015-16 to \$401.68 million in 2016-17, \$456.12 million in 2017-18, and \$628.25 million during 2022-23. The primary objective of the 5-P platform concerned with the Pharma sector is to strengthen the joint management of the source of phytochemical raw drugs in trade and help develop a sustainable value chain for genetic resource use. With an active 5-P approach, the sustainability of the supply source of bioresources can be ensured, and it alone can only help companies protect the long-term viability of their businesses and secure a social license to operate in the market.

(a) The Production Sector commitments

A significant obstacle to establishing an environmentally and socially responsive pharma sector with equitable benefits to nature and people lies in the current patterns of thinking, behaviour, and action, especially on the part of the major players within the system. The Indian pharma sector, with around 10,500 companies, dominates the global generic medicine and vaccine markets, meeting over 60% of the demand for DPT, BCC, and Measles vaccines (Ganguly, 2024). As the patents on many drugs on the market expire by 2030, Indian companies are poised for further growth by tapping the emerging opportunity for new drug production. To meet the growing export demand and enhance the quality branding of this commodity, the Government of India has implemented several measures. As per the Ministries of Commerce and Ayush, these include establishing the Pharmaceutical Export Promotion Council, offering financial incentives for exporters to participate in trade fairs, organising international business meets and conferences, and taking specialised actions for the medicinal plant sector. Further, the "Voluntary Certification Scheme for Medicinal Plants Produce" (VCSMPP), along with quality labels such as the Ayush Mark and Premium Mark, has been introduced to help the industry establish quality standards through Good Agricultural Practices (GAPs) and Good Field Collection Practices (GFCPs). In India, the Central Drugs Standard Control Organization (CDSCO) has enhanced monitoring through amended regulations in 2023 to assess the authenticity of extracts processed from natural products and herbals.

The Pharma industry needs to balance both the profit and people dimensions, nurturing human and herbal health and supporting environmental sustainability. Achieving long-term sustainability for the pharmaceutical industry as well as for nature and people requires the systemic perspective of One Health. The One Health approach recognises the interconnectedness of human, animal, and environmental health, specifically biodiversity, climate, and land-water systems, emphasising the need for a holistic perspective (Campbell, 2024). Though the One Health approach has to be the norm within the Pharma production and consumption sector, their understanding of the intricate nexus between the components of this system is limited or not reflected in their action. See Figure 2, which depicts the linkages within the health system pentagon (human health, animal health, land and water system health, climate system health, and biodiversity) and the priority sciences that need to be harnessed for promoting sustainable production and consumption behaviours and practices.

(b) The Partner Sector commitments

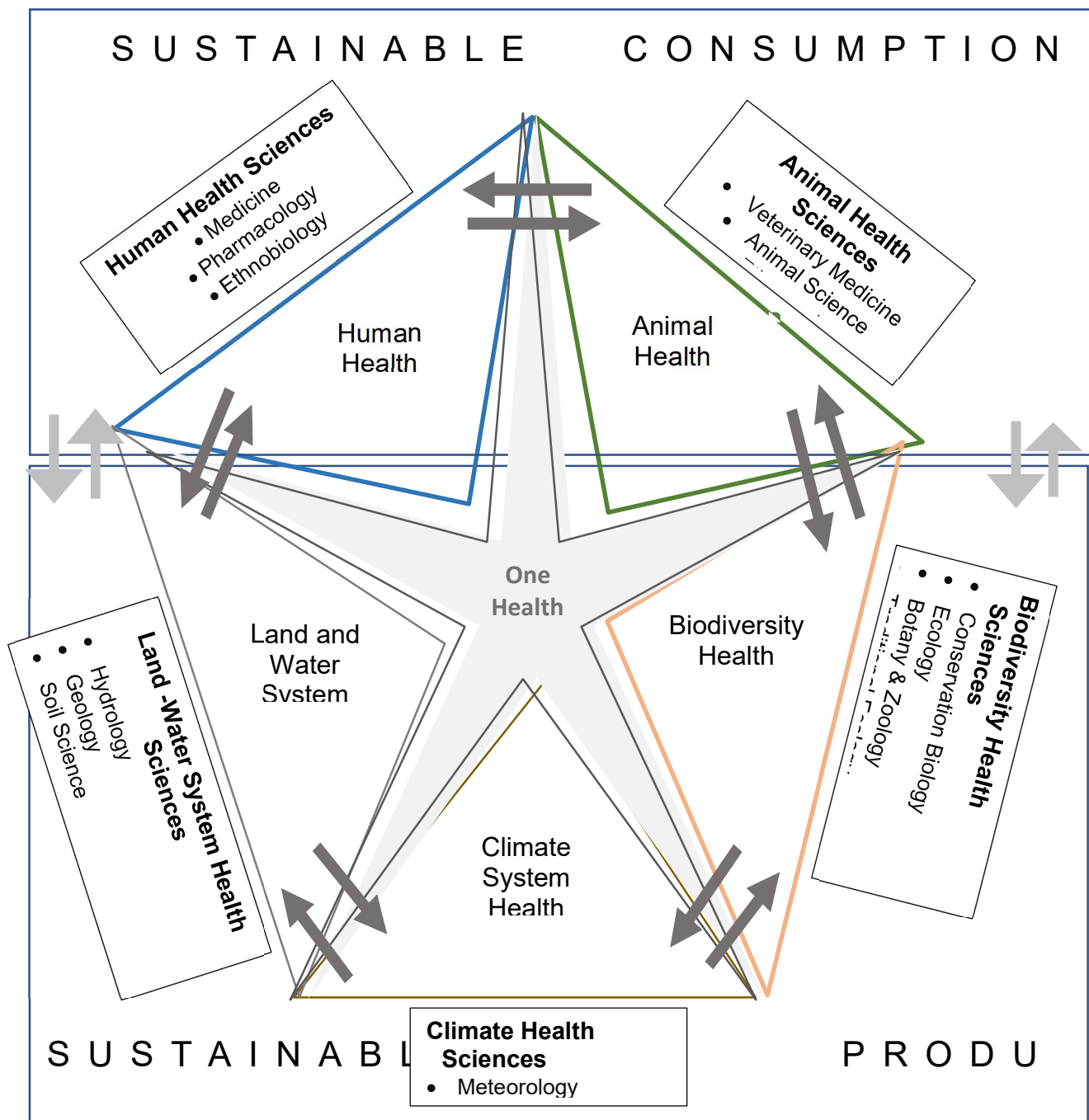
Among the partner organisations, science and technology institutions stand out considering their competitive advantage in business development. India is emerging as a global scientific powerhouse, as evidenced by its significant research output, ranking third globally in quantity and 13th in quality of science publications as of 2014, despite India's spending on research and development be just 0.64% of the GDP and private sector involvement not balanced (*Nature* **628**, 473 (2024)). India is now the world's third-largest pharmaceutical supplier, renowned for its affordable medicines and generic drugs (*India More Than Ready to Take Steps to Become Science Powerhouse: Nature*, n.d.). According to the Nature Index 2014, India is among the top ten leading countries in chemistry as measured by weighted fractional count (WFC). There is also a steady increase in the establishment of universities and the number of prestigious institutions such as the Indian Institutes of Technology (IITs) and Indian Institutes of Science Education and Research (IISERs). However, India's engagement in life sciences is comparatively less than that of other Asian nations such as China, Singapore, Taiwan, and South Korea.

On one side, over 80% of the known global biodiversity remains under-explored or unexplored for its bioactive molecules, and on the other side, addressing concerns about overexploitation of wild sources of medicinal plants and drug quality improvement, the need for public-private-producer knowledge partnerships in pharma research and development remains a significant challenge. The demand for value-added extracts of medicinal plants is also increasing in the global market, particularly in Europe, alongside collaborative efforts. Chaachouay and Zidane (2024), emphasise the importance of collaboration among researchers from fields such as

ethnobotany, botany, taxonomy, pharmacognosy, pharmaceuticals, medicinal chemistry, organic chemistry, molecular biology, microbiology, pharmacology, and plant ecology to make the discovery of new chemical components in medicinal plants more efficient and cost-effective.

However, a multidisciplinary collaboration among academics alone cannot achieve total system sustainability and social equity improvement in this field. To ensure a sustainable supply of medicinal plants, drug quality, and efficacy improvement of phytopharmaceutical drugs (PPDs), and herbal therapeutics, cross-sectoral collaboration between academics, the private and public pharmaceutical and health industries, traditional herbal healers, and knowledge holders from the local communities becomes crucial.

Fig. 2. One Health: The Biodiversity & Business Pentagon



(c) Promoters and public outreach commitments

For the Pharma Business, the major promoters are the communicators, influencers, or media that help spread ideas, innovations, and best practices in green health promotion or access and benefit sharing related to the conservation and sustainable use of medicinal plant genetic resources. They interact closely with producers, partner groups, politicians, and policymakers to ensure the widespread adoption of policies, regulations, and practices supporting innovation and collaboration. They enhance the spread and success of certain products or processes, like birds, winds, or water dispersing seeds or helping with timely pollination or breeding.

Knowledge, including traditional knowledge and innovations from indigenous and local communities, as well as the scientific and product/process understanding of researchers and managers, is a critical component of the pharmaceutical industry value chain (Ramy et al., 2020). The value of a genetic resource to an industry is derived from the knowledge possessed by individuals or societies. The positive correlation between traditional knowledge of the medicinal properties of genetic resources and the efficiency of drug discoveries in modern laboratories is well-established (Ahtiainen & Pouta, 2011; Taubman & Leistner, 2008).

The legally binding Convention on Biological Diversity (CBD) enabled the Nagoya Protocol on Access to Genetic Resources, and the Fair and Equitable Sharing of Benefits (ABS) came into force ten years ago. This protocol addresses crucial issues related to managing knowledge associated with the conservation and sustainable use of biodiversity. To operationalize the Nagoya Protocol, the contracting Parties need to develop a professional Knowledge Management System. Such a system can facilitate organizational learning and archive the wealth of knowledge embedded across multiple stakeholders. Currently, in India, there are attempts to pool knowledge resources across states under the People's Biodiversity Register tool provision in Biodiversity (Amendment) Act 2023 (Mohan, 2023). However, efforts to use this knowledge to create new insights, drive innovations, and influence research, development, and policy interventions are limited. A systemic approach is required to define, capture, analyse, and communicate knowledge resources across geographies for diverse purposes using various media.

Formalising both popular communication systems and scientific peer-reviewed publications is necessary to ensure transparency in plans, decisions, instructions, and the use and benefits of bioresources. This should, however, be supported by a bottom-up feedback mechanism. Concerted action from every stakeholder is required to develop and adopt a communication plan that effectively communicates India's core competencies, achievements, and

innovations in R&D methods, and builds replicable models in integrated bioresource use for different stakeholder groups at national and international levels.

India has the potential to transform into a one-stop Knowledge Centre for Pharma, Traditional Medicine, and integrated health development. A clearinghouse mechanism specifically for the medicinal plant use and development sector must be developed, utilising the services of universities and national research organisations. This clearinghouse mechanism should have a formal, professional knowledge communication system as its foundation to build and retain a strong customer base. Customers in the pharma, cosmetics, and traditional medicine sectors include key stakeholders in sustainable bioresource utilisation and health and wellness. To expand further, it is crucial to (i) retain critical stakeholder groups such as taxpayers, donors, scientists, practitioners, policymakers, students, teachers, farmers, NGOs, and individuals interested in green growth, and (ii) attract new customers, especially from the private sector globally. An appropriate body with strong leadership and effective communication capabilities is required to manage the KMS related to the Pharma industry on a pan-India level.

(d) Policymaking System and Good Governance commitments

Within the legally binding Corporate Social Responsibility (CSR) regime, some Indian companies find enhanced opportunities for cooperation and partnerships across diverse stakeholders to implement the 2030 sustainable development agenda, green development protocols, and biodiversity framework (Singh & Rahman, 2021). Poverty researchers and poverty reduction experts are just beginning to understand the dynamics between ecosystems and human behaviour, and there are few efforts to achieve "win-win" solutions, such as bioprospecting, ecotourism, integrated conservation and development projects, and payments for ecosystem services (Barrett et al. 2011). To sustain and up-scale such a win-win scenario, the need for functional cross-sectoral stakeholder groups becomes very critical as does the need to realise the KM-GBF targets.

In the global pharma industry, India, one of the 17 mega biodiversity countries, is an active player with a current market value of \$65 billion, projected to reach \$130 billion by 2030, according to records from the Ministry of Commerce, India, thanks to the policies and programmes of the governments of India. With this growth trajectory, the Commerce Ministry wants to place India as the global medical and wellness tourism hub by 2030. According to Ayush records, India's herbal pharmaceutical sector has expanded by 18.5% growth, with over 8100 plant-based drug manufacturing units in 2022. The National Medicinal Plant Board's data shows, that 78% of the 7500-8000 plants of recorded medicinal uses in

Traditional Medicine (TRM), including Ayurveda, Siddha, Unani, and Homeopathy, are met from the wild, of which 242 species were traded over 100 metric tonne per year in 2014. Production and consumption persist, yet efforts to sustain the sourcing and supply of raw materials from the wild remain minimal on the part of the industry.

Where does the pharma get the medicinal plant raw materials? Historically, all habitats housed plants of medicinal importance to humans, and many such species were conserved in human settlements, particularly in rural landscapes, encompassing diverse ecosystems such as culturally protected forest patches, mountains, wetlands, and legally protected areas. However, conservation planning and governance often exclude these community-protected areas. (Srivathsa et al. 2023), in their article Prioritizing India's Landscapes for Biodiversity, Ecosystem Services and Human Well-being | Nature Sustainability, highlight the importance of considering both protected and non-protected areas in conservation efforts within India. Their study found that, despite protected areas covering about 5% of the land, 85% of top-priority sites for conservation were outside these zones. This underscores the need for a landscape-level approach that integrates human-use landscapes and ecosystems critical for ecosystem services.

The WBA Nature Benchmark Report of 2022 reveals that 97% of the 389 companies analysed globally are yet to commit to a nature-positive trajectory by 2030, and less than 13% of them have a clear commitment to respect Indigenous People's roles and rights over protecting and enhancing biodiversity. In India, some estimates show that in 2016, over 1000 medicinal plant species were threatened across different ecosystems, mainly due to the industry's over-exploitation of wild sources (Gowthami et al. 2021, FRLHT ENVIS 2016a).

Exceptions are reported in India, where a few pharmaceutical companies conduct their businesses with a heightened sense of social responsibility. As per the India corporate social responsibility (CSR) reports, through such initiatives, companies like Aurobindo, Cipla, Divi's Laboratories Ltd, Lupin Ltd, Mankind Pharma, and Dr Reddy's Laboratories actively support local communities in securing health, education, disaster responsiveness, sustained water availability, and more (<https://thecsrjournal.in/pharmaceutical-pharma-companies-india-csr-corporate-social-responsibility/>). Despite such efforts towards social upliftment and attempts to transition the source of raw material supply from wild to cultivated spaces by the pharma and herbal industries in India, the literature available is insufficient to demonstrate how many of these industries have analysed their impact on the availability and ensured sustainable supply of medicinal plant diversity or such raw materials sourced from the wild.

(e) Political Offices and Political Will

The role and responsibilities of political offices and their leadership are pivotal in the conservation and sustainable use of biodiversity, with political will being crucial in driving forward initiatives that support biodiversity conservation. Within ten years of the Convention on Biological Diversity (CBD) coming into force, thanks to the political leadership, the Government of India enacted the necessary legal framework in 2002 and subsequently established a three-tier implementation structure to achieve the objectives of biodiversity conservation, sustainable use, and sharing of benefits arising from such use with the providers of genetic resources and associated traditional knowledge. This three-tiered implementation body comprises the national-level National Biodiversity Authority, state-level biodiversity boards, and local-level biodiversity management committees. According to the National Biodiversity Authority's website, as of January 2024, there are 277,688 Biodiversity Management Committees working in coordination with 28 State Biodiversity Boards and 8 Union Territories in India.

The National Biodiversity Strategy and Action Plan and targets, along with the indicators developed every five years in compliance with CBD provisions, including the Nagoya Protocol (2010-2014), are major tools to set the programmes of action and monitoring mechanisms. At the national level, India has initiated several programmes to enhance biodiversity conservation, ecosystem services, and sustainable livelihoods. Key initiatives include:

- **National Mission for Biodiversity and Human Well-Being (NMBHWP):** Aimed at enhancing biodiversity conservation and ecosystem services.
- **Green India Mission (GIM):** Part of the National Action Plan on Climate Change (NAPCC), focusing on increasing forest and tree cover, restoring ecosystems, and enhancing biodiversity.
- **Biodiversity Finance Initiative (BIOFIN):** In partnership with the United Nations Development Programme (UNDP), aiming to identify and mobilize financial resources for biodiversity conservation.
- **National Adaptation Fund for Climate Change (NAFCC):** Supports adaptation projects that integrate biodiversity conservation to enhance ecosystem resilience.

Despite these efforts, progress has been sluggish in enacting programmes that promote the other two goals: sustainable use and benefit sharing with the providers of knowledge, generally local community men and women. A major reason is the slow progress in the operationalization of the Nagoya Protocol (2014), which sets guidelines for utilizing genetic resources for a broad spectrum of users, ranging from academics and other non-commercial

researchers to commercial companies. There is inadequate awareness among users of the procedures for compliance with access and benefit sharing.

Political leaders must effectively engage all critical stakeholders to overcome these challenges. This requires political offices to:

- **Promote Capacity Development:** Implement appropriate training programs for local communities, researchers, and businesses on the requirements and benefits of the Nagoya Protocol.
- **Enhance Awareness Campaigns:** Educate the public and stakeholders about the importance of genetic resource conservation and equitable benefit-sharing.
- **Facilitate Partnerships:** Create avenues for collaboration between local communities, knowledge providers, government agencies, the private sector, and non-governmental organizations to promote efforts in biodiversity conservation and benefit-sharing.
- **Ensure Transparency:** Monitor compliance with the Nagoya Protocol through reporting requirements and audits, and provide publicly accessible information on the process.

The significance of the People's Biodiversity Register, an instrument advocated in the Biodiversity Act, cannot be overstated. With the National Green Tribunal orders in August 2019 and March 2020, the pace of forming Biodiversity Management Committees (BMCs) and preparing the Biodiversity Registers has improved. However, this progress will yield results at the outcome level only when BMCs become active in their localities and engage effectively in the conservation and sustainable management of biodiversity. Currently, only less than ten to twenty per cent of these BMCs are active in the country. Respective local governments and offices must take proactive steps to ensure the activation and engagement of the BMCs.

4. A Case Study on Bio-Partnership: MSSRF's Community Agrobiodiversity Centre

MSSRF's **Community Agro-biodiversity Centre** (CAbC) was started in 1997 in the Wayanad district of Kerala. The Centre's activities centre on the conservation and sustainable management of AGRO-BIODIVERSITY in strong partnership with local communities, mainly tribe communities like *Kurichiya*, *Kuruma*, *Paniya* and *Kattunaikka*. The activities fall into three Operational Areas - **Conservation** (Agrobiodiversity Conservation and Enhancement); **Education** (Agrobiodiversity Education, Communication & Training) and **Livelihoods** (Agrobiodiversity based sustainable Livelihoods and Food Security) with notable results.

The CABc now emerged as a model Centre for mainstreaming biodiversity conservation in tribal/rural agricultural development. The Centre is working with over 20,000 households across Wayanad, Idukki and Ernakulam districts covering about 25,000 ha of land, with field-level interventions in Livelihood Development, Food and Nutrition and Conservation programmes focusing on education and awareness programmes.

The Centre has formed and nurtured two Community Institutions, viz., Wayanad Tribal Development Committee; and SEED Care- a Traditional Rice Farmers Forum. The team works with 89 women Self Help Group, and 7 Farmers Clubs, apart from several local Self Government Institutions.

The Centre has perfected four streams of sustainable agricultural and rural development methods: *conservation*, *cultivation*, *consumption*, and *commerce*, and is developing the additional resources to serve as a Resource Centre.

CABc's over 25 years of efforts in the Wayanad District of Kerala helped to promote sustainable management of many "Farmers' varieties" and traditional germplasm in PGRs like Rice, Roots and Tubers and Beans. The research and extension programmes on Farmers' varieties have resulted in:

- Legal recognition of Farmers' Varieties (For the first time in India, community-conserved farmers' varieties of rice got legal recognition through the protection of Plant Varieties and Farmers Rights Act 2001).
- On-farm conservation of Farmers' Varieties (Wayanad became the first district in the state to have the largest number of traditional rice varieties in cultivation).
- A Lead Botanical Garden for Rare Endemic Threatened (RET) in Kerala. The Centre became a conservatory for RET plant species found in the Western Ghats (Since 2010, nearly 100,000 seedlings of 160 RET species have been multiplied and distributed to those who are interested in growing such species).
- *Plant Genome Saviour Award* to a grass-root institution promoted by MSSRF and represented by the tribal communities of Wayanad that are being nurtured by the Centre.
- GIAHS status for Kuttanad Below -Sea level Farming. (The Centre in association with the state agricultural department of Kerala helped the Kuttanad region of the state

get the global recognition of FAO promoted GIAHS status for the Below -Sea level Farming).

- The Centre's work in the promotion of family farming, integrated tribal development, RET plant conservation, and nurturing 'child scientists' getting widely recognized in the state.

In conclusion, the local community and other stakeholder partnerships under the CAbC umbrella helped the Wayanad district emerge as a model for community agrobiodiversity management. Key impacts of this effort include the recovery of 300+ RET plants and eco-restoration strategies by involving integrated conservation methods, which have included addressing the ecosystem connectivity challenges faced by many local governments within a fragmented production landscape of mountains in the Malabar region. The 4 C Approach (Conservation-Cultivation-Consumption-Commerce) for the sustainable value chain development of millet, and Neglected and Underutilised Species, and wild food becomes pivotal. Efforts in capacity-building for PRIs, SHGs, NGOs, and the Biodiversity Management Committees became a model for mainstreaming biodiversity.

5. Conclusion and Recommendations

Unlocking the potential of responsible biodiversity-based businesses becomes crucial for achieving sustainable development goals, especially for a growing economy like India. It, however, demands creating active, inclusive, and gender-responsive partnership avenues at subnational, national, and international stages. Such avenues act as the engines that drive the adoption of biodiversity conservation and sustainable use practices and ensure equitable benefit-sharing through Access and Benefit-Sharing (ABS) mechanisms. Promoting collaboration within specific sectors allows for targeted solutions that address the unique challenges and opportunities confronted by each industry. This is where the 5-P approach becomes relevant to reach out to every key actor in the conservation and utilisation of biodiversity, including the smallholder farming and indigenous people communities and the medium, small, and micro-enterprises.

In India, the appropriate body to formulate and nurture the 5-P partnership discussed is the National Biodiversity Authority (NBA) through the State Biodiversity Boards and the Biodiversity Management Committees and in close collaboration with business firms by utilising their provisions such as Corporate Social Responsibility (CSR) and Corporate Environmental Responsibility (CER). Transparent information sharing, capacity-building

initiatives, robust conflict resolution mechanisms, and rigorous monitoring and evaluation processes are the cornerstones of such partnerships.

By emphasizing the Indian Pharma business and biodiversity management context, we recommend the following five-pronged action plan to propel responsible biodiversity-based businesses and ensure the flourishing of Access and Benefit-Sharing (ABS) mechanisms.

1. **Foster Multidisciplinary and Cross-Sectoral Collaboration:** Collaborative efforts between academics, private and public pharmaceutical and health industries, traditional herbal healers, farmers, local communities, and local leaders are crucial for ensuring a sustainable supply of medicinal plants and improving drug quality. Public-private-producer knowledge partnerships should be strengthened to address overexploitation and enhance research and development.
2. **Embracing the One Health Paradigm:** The pharmaceutical industry stands to gain significant advantages by wholeheartedly adopting the One Health approach. This philosophy emphasizes cross-sectoral collaboration, recognizing the intricate web that connects human, animal, and environmental health. By embracing this approach, the industry can cultivate a holistic perspective, fostering an integrated scientific approach that draws upon the strengths of various academic disciplines. This collaborative spirit can pave the way for the development of more comprehensive and effective medications, diagnostics, and preventative measures.
3. **Building Bridges for Sustainable Solutions:** Ensure a sustainable supply of high-quality medicinal plants by creating a symphony of collaboration across diverse stakeholders. Academics, private and public pharmaceutical and health industries, traditional herbal healers, farmers, local communities, and local leaders must all come together in a collaborative effort. Strengthening public-private-producer knowledge partnerships will be key to addressing overexploitation and propelling research and development efforts. This collaborative spirit can not only secure a sustainable future for medicinal plants but also unlock breakthroughs in drug quality and efficacy.
4. **Develop a Professional Knowledge Management System (KMS):**
To truly unlock the potential of biodiversity conservation and sustainable use, a robust professional Knowledge Management System (KMS) is essential. This system should act as a central hub, facilitating the pooling of diverse knowledge resources. By fostering this collaborative knowledge exchange, we can generate new insights, propel innovations, and ultimately influence research, development, and policy interventions. Formalizing communication systems within the KMS is crucial, ensuring

transparency and fostering trust. Peer-reviewed publications and robust feedback mechanisms will be the cornerstones of this system, guaranteeing the quality and reliability of the knowledge shared.

5. **Responsible Management Through Stakeholder Engagement:** Effective stakeholder engagement lies at the heart of responsible biodiversity management. Governments must prioritize capacity building and awareness campaigns to empower stakeholders. Political offices must promote capacity development, enhance awareness campaigns, facilitate partnerships, and ensure transparency in compliance with the Nagoya Protocol. The People's Biodiversity Register should be actively used to engage local communities in biodiversity conservation and sustainable management. Efforts should be made to increase awareness among users of the procedures for compliance with access and benefit sharing.

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