

Sustainable Economic Development of India and the Role of Biodiversity

Policy Challenges and Opportunities

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Abstract

With inclusion of environmental concerns, major shifts in development narratives have taken place in recent years. Biodiversity denotes variability within species (genetic diversity), between species (species diversity) and between ecosystems (ecosystem diversity). India, one of the 17 mega-diverse countries, is rich in its biodiversity and its associated traditional knowledge.

However, due to lack of awareness about the benefits and knowledge of its preservation method, this unique asset is in steady decline. While economic activities constitute the priority of the country, economic sectors leading to growth i.e. agriculture, fisheries, forestry, health, nutrition, water supply, energy, trade, industry, transport and tourism rely on biodiversity and impact biodiversity.

Thus, in order to sustain economic growth, it is important to preserve biodiversity through integrating actions related to conservation and promoting the sustainable use of biodiversity in cross-sectoral policies.

Moreover, it is important to develop multi-sectoral policy frames and strategies for preservation. This Paper reviews how biodiversity is treated in different cross-sectoral policies, challenges in mainstreaming biodiversity, and the probable economic opportunities.

Background

The paradigm of development has changed quite significantly in recent years. The origin of this change dates back to the 1970s, when a major revision in development thinking took place. This challenged the conventional definition of economic development. This revision was based on the belief that without the upliftment of poor, development cannot occur. This novel thought was culminated on October 1987 when the Brundtland Commission first coined the word 'Sustainable Development' (Daly 1990).

This report defines sustainable development as the development that meets the needs of the present generation without compromising the needs of the future generations (Imperatives 2016, Kates *et al.* 2005). It encompasses the following two key concepts:

- Concept of 'needs', particularly the essential needs of the world's poor, to which overriding priority should be given (Kates *et al.* 2005) and
- Idea of limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs. (Imperatives 2016)

Sustainable development's present approach emphasises catering to the poor, encouraging cultural sensitivity and advocating wholesome participation from society as it ensures equity, making development inclusive (Barbier 1987). Moreover, it is realised that sustainable development can only be achieved through the due recognition of the environment.¹

Sustainable Economic Development

The basic premise of sustainable economic development is that many environmental problems occur due to lack of development (Shafik 1994). Impoverished communities, often lacking choice, choose immediate economic benefits instead of long term sustainable ways (Duraiappah 1998). The primary concern of sustainable development is thus to ensure that poor people have the choice of sustainable and secure livelihood (Jalal 1990). In this regard, the overall objective of sustainable development is not in conflict with economic development.

It is meant to improve the human quality of life and encourage welfare for present and future generations (Bartelmus 2013). The latest initiative towards the achievement of sustainable development took place on September 2015, when the United Nations General Assembly formally adopted the 'universal, integrated and transformative' 2030 Agenda for Sustainable Development, a set of 17 Sustainable Development Goals (SDGs)². The goals are to be implemented and achieved in every country from the year 2016 to 2030.

With almost a decade of rapid economic growth, India has become one of the world's fastest developing countries (Gupta *et al.* 2016). It is traditionally believed that the major problems of the country (i.e. poverty, social exclusion and environmental degradation) can be resolved through this development (Jalal 1990). Unfortunately, the economic growth rate still works as the sole indicator of progress in India.

It is believed that such growth will initially result in environmental degradation and social

exclusion but the trend will be reversed over time (Stern 2004). This has been the case for most of the developing countries and has been proved by Nobel laureate Simon Kuznets.³ The Environment Kuznets Curve is a hypothesised relationship between various indicators of environmental degradation and income per capita, depicted through an inverted U-shaped relation (Stern 2004).

Biodiversity for Economic Growth

While environmental concerns feature in development discourses, biodiversity is a rather less used and even lesser understood term (Rands *et al.* 2010). Biodiversity is the variety of genes, species and ecosystems on earth, and the processes that maintain this diversity (Rands *et al.* 2010).

It is the living species, ecosystems and natural processes that constitute nature. Biodiversity is not only about the number of species, but also about the variability of plants and animals in ecosystems, the processes by which they are supported, and the functions that they deliver (Lindenmayer *et al.* 2006).

The Convention of Biodiversity (CBD) defines biodiversity as “the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. This includes diversity within species, between species, and of ecosystems” (MoEF 2014). Biodiversity is the natural capital and ecological infrastructure foundation on which economic growth, social development and human wellbeing is cultivated (Hirsch and Secretariat of the Convention on Biological Diversity 2010).

Biodiversity is integral to economic growth and poverty reduction (UNEP 2010). According to a

report about 40 percent of the world’s economy is contingent on biodiversity.⁴ More than 80 per cent of the world’s poor directly or indirectly rely on biodiversity for their survival (Hirsch and Secretariat of the Convention on Biological Diversity 2010).

Therefore, the impoverished are most adversely impacted by biodiversity destruction. Overexploitation of biological resources makes it harder for locals to have access to resources because they become scarcer, making these resources more expensive (Duraiappah 1998). Biodiversity provides many economic benefits and environmental services, essential for growth, to the local people. But in the absence of knowledge of true economic value of these services, natural resources are often overexploited, leaving the poor local communities vulnerable (Rands *et al.* 2010).

In 2010, Pavan Sukhdev pioneered the concept of bestowing monetary value on biodiversity in his report ‘The Economics of Ecosystems and Biodiversity (TEEB)’, nonetheless, the idea is still at initial phase and not empirically proven.⁵ It is important to realise that biodiversity not only increases agricultural productivity and ecosystem protection but also provides many environmental services. These include: climate and biogeochemical cycles regulation, hydrological functions, soil protection, crop pollination, and pest control and ecosystem resilience measures (Rands *et al.* 2010). These services are both important ecologically and economically.

Moreover, many sectors of the economy, such as the pharmaceutical, biotechnology, personal care, botanical and food and beverage industries are heavily dependent on biodiversity.

Role of Biodiversity on Woman Empowerment

Biodiversity plays an integral role in women empowerment and has the potential to improve their lives (Pillai and Ganga 2010). Currently, 60-80 per cent of farmers in developing countries are women (FAO 2011). Statistics show that women have more agricultural knowledge than that of men in their communities (Shiva 1988). Therefore, conserving biodiversity will allow women to continue to be relevant and have a more respectable standing in their society because of the important knowledge they harbour.

It has also been found that they have more knowledge about agricultural pursuits and biodiversity in their local communities compared to men (Shiva 1988; Pillai and Ganga 2010). Therefore, gender-differentiated data collection can foster community sustainability.⁶ Furthermore, it is essential to ensure that women have access to this data so that they can contribute at the same level to the society as that of men. Unfortunately, despite the plethora of literature on biodiversity and women empowerment, no significant societal change has occurred yet.

Economic growth and development involve changes in the physical ecosystem. Certainly, biological resources need to be exploited for such progress. However, development tends to undermine the importance of ecosystems and the implications of species diversity reduction. Species, once extinct, are not renewable. The loss of plant and animal species can greatly limit the options of present as well as future generations.

The objective of this Paper is to facilitate the process of incorporating biodiversity considerations into national policies and strategies and practices of key public and private actors, which impact or rely on biodiversity in

order to ensure sustainable conservation and use of biodiversity, locally and globally.

In this endeavour, the Paper deliberates how biodiversity is presently managed in India, how the subject of biodiversity is treated in different national sector policies, and how policies and other challenges impact the efficient management of biodiversity. It concludes with a few key recommendations.

Management of Biodiversity

Biodiversity in India

India is one of the largest 'mega-diverse' countries. India hosts 7-8 per cent of the world's recorded biodiversity and 4 of the 34 of the globally identified biodiversity hotspots (Himalaya, Indo-Burma, Western Ghats and Sri Lanka, Sundaland) in the world (MoEF 2014). So far, over 91,200 species of animals and 45,500 species of plants have been documented in the ten biogeographic regions of the country (MoEF 2009). India also has a variety of wetland ecosystems ranging from high altitude cold deserts to hot and humid areas in coastal zones containing diverse flora and fauna.

Additionally, about 4,445 km² of the country is under mangroves (MoEF 2009). India also possesses rich marine diversity. It is third largest fish producing country in the world (MoEF 2009). The vast coastline of India stretches 7,517 km in total⁷ and comprises of a wide range of habitats (like estuaries, lagoons, mangroves, backwaters, salt marshes, rocky coasts, stretches and coral reefs). They are all characterised by rich and unique biodiversity components. Forests, covering 23.39 per cent of the geographical area of the country (of which 75 per cent occurs in the north-eastern states), are crucial ecosystems for India.

Due to lack of awareness for the value of biodiversity and inadequate forest protection planning, this rich biodiversity is in continuous decline. As per the International Union for Conservation of Nature (IUCN) Red List version 2010.4, 94 species of mammals, 78 species of

birds, 66 species of amphibians, 30 species of reptiles, 122 species of fish, 113 species of invertebrates and 255 species of plants in India are listed as ‘Critically Endangered’, ‘Endangered’ or ‘Vulnerable.’

Box 1: Hazards to Coral Reef

The mainland coast of India has two reef areas; the Gulf of Kutch, in the northwest, and the Gulf of Mannar, in the southeast. Human activities, such as coral mining, extraction of lime, fish, shells, sea fans, seaweed, sea cucumbers, lobsters and sea horses, industrial run off, pesticide and oil pollution sedimentations, have also contributed to their destruction. Unfortunately, these human activities are increasing due to overpopulation, unemployment and law and regulation failure.

Even though The Gulf of Kutch is declared as a national park and the Gulf of Mannar as biosphere reserve, protection is inadequate. Recommendations for zoning education and science and recreational activities have been made, but the management plan is still under development and is very weak (World Bank).

Source: www.fao.org

Historic Evolution of Policies

India became the signatory member of the UN Convention of Biological Diversity in 1992. It then went on to become a party in 1994 through ratification of the Treaty. In accordance with Article 6 of the CBD, India developed the National Policy and Macro-level Action Strategy on Biodiversity (NPMAS) in 1999; Kalpavriksh, Non-government Organisation (NGO) and an environmental action group; and the Department of Biotechnology of Government of India were crucial to the development of the NPMAS. This plan served as a macro-level assessment to fill in gaps and provide policy statements and strategies for the conservation of biodiversity.

However, Ministry of Environment, Forest and Climate Change (MoEFCC), erstwhile MoEF (Ministry of Environment and Forests) felt the need for more specific legislations. Thus, through the support of United Nations Development Programme/Global Environment Facility, the

implementation of the National Biodiversity Strategy and Action Plan (NBSAP) project took place from 2000 to 2004. NBSAP yielded micro-level action plans through integration of cross-cutting issues and livelihood security concerns.

Some of the major programmes that contributed to its implementation include: Protected Areas (PA) network and its steady growth over the years, consolidation of Biosphere Reserves (BRs), establishment of more species-specific reserves, growth in designated Ramsar sites, augmentation of *ex situ* efforts through the establishment of the network of Lead Gardens and initiatives in the conservation of genetic resources, etc.

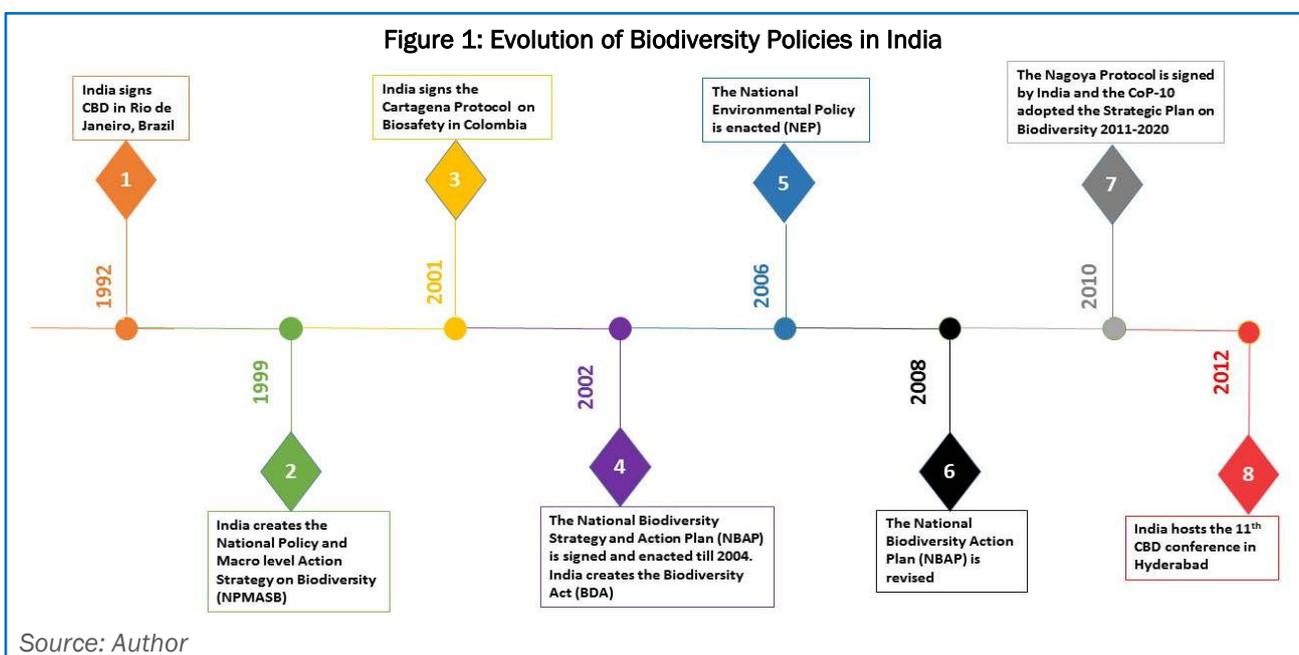
Nonetheless, this plan was not considered thorough as it did not cover all aspects of biodiversity nor provide any authority for the implementation of the strategies.

Hence in 2002, the MoEFCC carried out more in depth provisions under the CBD and created the National Biodiversity Authority (NBA), State Biodiversity Board (SBB), and the Biodiversity Management Committees (BMC) to protect local communities' knowledge on biodiversity and conserve and develop areas of biodiversity. These bodies were responsible for implementing the Biodiversity Act of 2002 that aimed to sustain ecosystems and provide information on biodiversity. Government officials, NGOs and academicians, who conducted thorough research enacted these decentralised provisions.

After the Biodiversity act of 2002, the National Environmental Policy (NEP) of 2006 was enacted to create legislation for general environmental concerns. The policy was initiated as per articles 48A and 51A of the Indian Constitution that mandates India's commitment to a clean environment. The NEP was created to fill in gaps and build on already existing environmental knowledge and legislation. This would allow India to improve sustainability and conservation of all aspects of the environment.

Although this policy was not a direct reform for biodiversity, it included a section for it. On account of the protocols carried out in this section, a meeting was called to take a second look at the NBSAP and make it coherent with the NEP. It did so by creating a more direct relationship between humans and nature. This came to be known as the National Biodiversity Action Plan of 2008. It serves as the latest foundation for biodiversity policies. It is roughly aligned with the five strategic goals and 20 Aichi Biodiversity Targets of the CBD. India, specifically, has created 12 cross-sectoral National Biodiversity Targets's (NBT's) for this policy.

Ministries and governmental departments that are related to biodiversity prepared the NBT's. The National Biodiversity Action Plan 2008 defines targets, activities and associated agencies for achieving the goals. These are drawn from the main principle in the NEP: human beings are at the centre of concerns of sustainable development and they are entitled to a healthy and productive life in harmony with nature.



Functioning of Biodiversity Board

National Biodiversity Authority (NBA), the national level authority, works with both the State Biodiversity Boards (SBB's) at the provincial level and Biodiversity Management Committees (BMC's) at the local level to implement biodiversity strategies and conservation practices.

The NBA is a statutory and autonomous body that performs facilitative, regulatory and advisory functions for the Government of India. It focusses on issues of conservation and sustainable use of biological resources and fair and equitable sharing of these biological resource benefits. NBA is in charge of maintaining the Indian Biodiversity Information System (IBIS) and giving approval to individuals and entities that want to use biological resources or biodiversity knowledge. The headquarters of NBA are in Chennai and Tamil Nadu, and has the overarching authority in implementing the BDA. As of 2015, there are 29 SBBs and 37,769 BMCs.

The SBBs provide advice and technical support for state governments on how to use and equally share biodiversity and its benefits. They also grant approvals and other requests for commercial use of bio-resources. They share close relationship with the state governments and are responsible for implementing state biodiversity policies.

Local populations in urban and rural areas set up BMCs as autonomous bodies. They are responsible for the promotion of conservation, sustainable use and documentation of biological diversity (including preservation of habitats), conservation of land races, folk varieties and cultivars, domesticated stocks and breeds of animals and micro-organisms and

documentation of knowledge relating to biological diversity. Since BMCs are at the ground-level, they do most of the work and report to the NBA via their respective SBBs.

BMCs consist of a Chairperson and six appointed officials of which one-third are women. The six members of the council appoint the Chairperson for the *Panchayat* or Municipality. BMCs, in consultation with the local villagers are responsible for creating and updating People's Biodiversity Register (PBRs), a database comprised of information on availability and knowledge of local biological resources, medical knowledge of resources etc.).

The database is maintained and validated by the BMC's and prepared through consultative processes with research universities, surveys, governmental departments, NGOs, academicians and *panchayats*. The PBRs are accessible to the general public but foreign entities and NRIs need approval from the NBA to access its knowledge.

BMCs are aided by researchers, scientists, and students to document information. Thereafter, the information is compiled in an electronic database, IBIS. This information is created to manage natural resources in a decentralised system and create a means of equitable benefit sharing for commercial uses. However, because most information lies in oral, written and folk tales, it is not documented.

BMC's collect money for their funds by levying fees from foreigners who wish to access their database and by some funding provided by the SBBs and NBA.

However, all three levels are ultimately under the jurisdiction and funding of the Ministry of Environment, Forest, and Climate Change (MoEFCC). The funds are managed primarily by the SBBs and used for the conservation of biodiversity and the betterment of the community.

The Management Committees also prepare an annual financial report, which is audited in consultation with the Accountant General of the State. Grants and loans are issued from the NBA and SBB as well. Funds are kept in a bank and accessible to the local authority.

Box 2: Indian Biodiversity Awards

The Indian Biodiversity Awards recognise excellence in biodiversity governance and conservation across India. It is organised and funded by the MoEFCC and United Nations Development Programme (UNDP) India. In 2016, the Dudhai BMC in Uttarkhand received an Indian Biodiversity Award for banning illegal sand mining and rehabilitating river ecosystems. The runner up for the award was the Niitii Hong BMC in Arunachal Pradesh for fighting against deforestation, monitoring consumption of forest produce by tribes and villagers, and reducing soil erosion and water pollution that was being caused by waste dumping in the local villages.

Source: UNDP, 2016

Biodiversity and Growth

Cross-sectoral Policy Review

The objectives of the Convention of Biological Diversity (CBD) cannot be met unless biodiversity is integrated into all sectors. Mainstreaming conservation and ensuring sustainability of biological resources are the principle challenges for developing countries today. India continues to have limited synergy between its laws for land, forests, water, air and biodiversity. Often, each sector also has multiple policies for the same objectives. Therefore, in order to avoid confusion with policy actions and increase policy efficiency, these policies should be

linked up into a single and comprehensive legislation.

Policies Linkages for Legislation

Agricultural Policies

The National Agricultural Policy was created in 2000, initiated by the Indian Ministry of Agriculture and made public by the NDA Government. However, it is no longer existent. The National Policy for Farmers (NPF) of 2007 is independent of the NAP but places a lot of importance on biodiversity and was initiated by the Ministry of Agriculture as well.

Table 1: Agricultural Policies and Legal Provisions

Sector	Policies	Year	Legal Provisions
Agriculture	National Agricultural Policy	2000	No more valid
	National Policy for Farmers (NPF)	2007	Section 3.1, subsection ii: Protection and improvement of biodiversity for the betterment of major farms.

Sector	Policies	Year	Legal Provisions
			Section 4.6 bio-resources; subsection 4.6.2 (i): Documentation of traditional knowledge in biodiversity registers by local communities and involvement of women in this process.
			Subsection 4.6.2 (vi): Literacy movement for genetic and legal frameworks in agro-biodiversity in the Northeast, Western and Eastern Ghats and arid to semi-arid zones.
			Section 4.6.2 (viii): Promotion of literacy and awareness in tribal/rural families, so that they can understand the Biodiversity Act and their rights.
			4.6.2 (x): Conservation of Coastal biodiversity.
			Section 4.7: Animal Genetic Resources; subsection 4.7.1: Rewards and other incentives from the Biodiversity Fund to those who conserve breeds under the BDA.
			Section 4.7.3: Prohibition of the exportation of biological materials (including animals) by the Biological Diversity Act.
			Section 8.2: Mega Biodiversity Areas: Incentives and assistance to encourage local communities to conserve mega biodiversity in Western and Eastern Ghats, eastern Himalayan areas and the northeast and tribal areas.

Forest Policies

The National Forest Policy of 1988, revised in 1894 and 1952, barely mentions biodiversity. This is surprising because forests are the key source of

biodiversity. The Indian Forest Act of 1927 is nearly a century old and based on the Indian Forest Act of 1878, which was implemented under British Rule.

Table 2: Forestry Policies and Legal Provisions

Sector	Policies	Year	Legal Provisions
Forestry	National Forest Policy	1988	Section 2: objectives of the policy and conservation of India's natural heritage (that harbours significant amounts of biodiversity).
			3.3: Biodiversity must be conserved in national parks and sanctuaries, biosphere reserves and other protected areas.
	The Indian Forest Act	1927	Does not mention biodiversity.

Wildlife Protection Policies

The Indian Forest Act delineates how sanctuaries, national parks and other biosphere reserves

should be protected under national and state governments.

Table 3: Wildlife Policies and Legal Provisions

Sector	Policies	Year	Legal Provisions
Wildlife	India Wildlife Protect Act	1972	<p>Section 8, Chapter II: Duties of the Wildlife Advisory Board: the Board must advise state governments on areas that must be declared sanctuaries, national parks or closed off areas.</p>
			<p>Section 18: Declaration of Sanctuary: State government declares any area that is not a reserve forest or water sanctuary as a reserved land area if there are adequate amounts of wildlife (ecological, fauna, floral, geomorphological, natural, zoological) in order to promote and protect wildlife.</p> <p>Section 19-25: Discusses the rights of the collector who has ultimate jurisdiction within the limits of the sanctuary.</p> <p>Section 26A: Declaration of area as sanctuary: state government has jurisdiction over what constitutes a sanctuary and when the sanctuary can be disposed of.</p> <p>Section 27: Outlines that only certain people are allowed in the reserves (public servants, officials, given permission) and the circumstances in which a person is granted permission to enter the reserves.</p> <p>Section 28: Outlines what grants permission for entering.</p> <p>Section 29-31: Prohibits destruction, entering with weapons and causing fires.</p> <p>Section 32: Ban on injurious substances within sanctuary limits.</p> <p>Section 33: Chief Wildlife Warden is main authority for controlling, managing, and maintaining sanctuaries through regulation and responsibility.</p>
			<p>Section 35: Declaration of National Parks: State government declares any area that is not a reserve forest or water sanctuary as a reserved land area if there is adequate amount of wildlife (ecological, fauna, floral, geomorphological, natural, zoological) in order to promote and protect wildlife.</p> <p>This Section has the same provisions as those for sanctuaries. It also outlines that boundaries of National Parks cannot be changed unless state government grants permission. No grazing or livestock is allowed inside the park.</p>
			<p>Section 37: Declaration of Closed Area: State government declares any area that's supposed to be closed. No hunting or wild animals are permitted in these areas.</p>
			<p>Central Government Involvement in National Parks, Sanctuaries and Closed Areas.</p> <p>Central government has the same rights and power as state government and can take over if they are not satisfied with how state governments are approaching these policies.</p>
			<p>Chapter IVA: Central Zoo Authority and Recognition of Zoos</p> <p>Section 38A: central government is the main authority in creating a chairperson and a committee in charge of creating zoos and taking care of its functioning.</p>

Mineral Policies

The National Mineral Policy was first enacted in 1993 and then revised in 2008 by consulting The Planning Commission of the Government of India. The new version focusses more on private mining and sustainable development for local mining populations. The Mines and Mineral

(Development and Regulation) Act of 1957 has been amended several times from 1972 to 2016 and is the only regulatory legislation for the mining sector. Both policies have been revised by the MoEFCC and FIMI. They mention that the central and state governments have jurisdiction over the policies.

Table 4: Mining Policies and Legal Provisions

Sector	Policies	Year	Legal Provisions
Mining	National Mineral Policy (NMP)	2008	Section 2.3: Mandates that a framework for biodiversity and its sustainable development be enacted. This ensures that mining activities meet sustainable measures for restoration and preserve ecological balance. The section also outlines the importance of preserving forests. This is in line with the National Rehabilitation and Resettlement Biodiversity Policy.
	The Mines and Mineral Development and Rural Act (MMDR)	1957	Biodiversity not mentioned.

Marine Fisheries Policy

India has a long history with implementing and revising fishery policies, starting with the Deep Sea Fishing Policy that was created due to fishermen concerns and protests, in 1977. The Deep Sea Fishing policies of 1991 were instated, with the 1994 policy being enacted by the

Ministry of Agriculture. This was followed by a revised version in 2002. Later, the Comprehensive Marine Fishery Policy was created in 2004, but it is not a replacement for the deep fishing policies. Currently, the National Policy on Marine Fisheries is being drafted and discussed.

Table 5: Marine Fisheries Policies and Legal Provisions

Sector	Policies	Year	Legal Provisions
Marine Fisheries	National Policy on Marine Fisheries (Draft)	2016	Section 1 of the Preamble states that overexploitation of fishes will lead to the loss of biodiversity in the future.
			Section 7: Mainstreams biodiversity conservation in the production process. The policy urges the preparation of specific species and area management plans in order to protect endangered and threatened species and conserve 'Ecologically and Biologically Sensitive Areas' (EBSAs) and 'Vulnerable Marine Ecosystems' (VMEs). Concerning the

Sector	Policies	Year	Legal Provisions
			marine environment, the policy seeks to restrict pollution that is caused by poor treatment of land, plastics (especially, micro-plastic particles) and ghost fishing. Although the policy does not speak of biodiversity, it discusses the preservation of minimum stock. This is crucial for keeping the system resilient.
	Comprehensive Marine Fishing Policy	2004	Section 10.2.2: Acknowledges the rich marine biodiversity in India, though it does not specify how to preserve it.

National Land Use Policies

In India, there are three Ministries responsible for the conservation and management of land resources: The Ministry of Rural Development, the Ministry of Agriculture, and the Ministry of Environment and Forests. The National Commission on Agriculture in 1976 first suggested drafting a land use policy. In 1984 The

National Land Use Board drew up a draft outline for a National Land Use policy, which was adopted by the National Land Use and Conservation Board (successor to the National Land Use Board) in 1986 (Swindale 1994), neither of which is now functional. The current draft is derived from the National Land Use Policy of 1988.

Table 6: Land Use Policies and Legal Provisions

Sector	Policies	Year	Legal Provisions
Land Use	National Land Utilisation Policy (Draft)	2013	The Preamble: Overexploitation of land disrupts eco systems that impact global and domestic biodiversity. The draft outlines India's richness in biodiversity and mentions that it is one of the 12 mega-biodiversity countries in the world. Thus, protective measures need to be taken. Chapter three of the draft entitled 'Current Land Use Planning and Utilisation Trends' mentions that coastal environments are crucial to India's economy because they harbour rich biodiversity (mangroves, coral reefs, sea grasses, salt marshes sand dunes). It also discusses the policies implemented in order to conserve biodiversity (NEP 2006, NBSAP, etc.).
			Chapter 9: Natural resource areas include biodiversity that need protection because they are 'eco sensitive zones'. This means that they are environmentally sensitive and require land to be used appropriately.

Water Policies

The National Water Policy of 2012 is a revision from the 2002 version, neither of which mentions

biodiversity. The Ministry of Water Resources manages the National Water Framework Bill of 2016.

Table 7: Water Policies and Legal Provisions

Sector	Policies	Year	Legal Provisions
Water	National Water Policy	2012	Biodiversity not mentioned
	National Water Framework Bill (Draft)	2016	Section 18f: Biodiversity and ecosystems should be protected.

Tourism Policies

In 1982, the Indian Government introduced National Tourism Policy, which got revised in 1997. In 2002, the New Tourism Policy was introduced. Subsequently, using the existing

framework of National Tourism Policy 2002, the Ministry of Tourism drafted the New Tourism Policy 2015 and it is still being discussed.

Table 8: Tourism Policies and Legal Provisions

Sector	Policies	Year	Legal Provisions
Tourism	New Tourism Policy	2002	Tourism Policy of 2002 acknowledges the richness of biodiversity and promotes ecotourism in certain specific locations, such as the Himalayas, North-Eastern states, Western Ghats, Jharkhand, Andaman & Nicobar Islands, and the Lakshadweep Islands. It also speaks of community involvement through awareness, education and training of local communities as guides and interpreters.

Policy Reforms

Challenges & Implementation

Every policy sector has its own motivations for protecting biodiversity. Therefore, the importance of biodiversity and the measures to protect it differ from each sector. There are many policy challenges that thwart India’s goals of sustainable development and ecosystem balance. These challenges can broadly be divided into two sections: policy reforms and policy implementation.

Policy Reforms

While many policies talk about biodiversity and its importance, they fail to mention any specific actions for its preservation. For example, the

National Forest Policy of 1988 mentions creating national parks to protect biodiversity but does not expand on this idea. It does not specify the identification and selection process, financing, or monitoring of these parks. Same patterns can be seen in marine policies.

Moreover, while the National Policy for Farmers of 2007 presents many initiatives to be taken to preserve biodiversity, it only focuses on increasing production. Therefore, it does not promote the holistic idea of biodiversity preservation. As these policies do not delineate any punishments or incentives, the preservation of biodiversity is more theoretical than realistic.

Many key sectors do not mention biodiversity at all in their policies (like some of the mining policies and the land utilisation policies). Overall, without the basic definition of biodiversity in these policies, it becomes very difficult to assess what is considered biodiversity and how to conserve it. Therefore, any mention of measures taken to do so can be greatly varied.

Furthermore, it becomes difficult to actually implement any actions for these efforts without mentioning proper measures for biodiversity conservation.

Many of these policies are antiquated as well. The Indian Forest Policy of 1927 was implemented almost a century ago. The Indian Fishery Act of 1897 is even older. Similarly, the Mines and Mineral (Development and Regulation) Act of 1957 is about 50 years old now and is the only Act regulating mining activities. These policies do not address the protection of biodiversity because they were implemented before biodiversity was mainstreamed.

For many of the sections, there is more than one policy instated to carry out similar objectives. Therefore, this creates a lack of convergence. Moreover, lack of uniformity in treating biodiversity in these policies, especially absence of it in key policies, can take away from biodiversity's importance and recognition. For example, the National Forest Policy of 1988 mentions biodiversity while the Indian Forest Act of 1927 does not.

Moreover, these policies cater to different departments. This generates competition between departments. For example, land utilisation policies cater to four different Ministries but are

handled by the Department of Natural Resources. This creates conflict with other Ministries (for example, the Ministry of Urban Development) that use this policy too but do not have the same authority as the Department of Natural Resources.

Implementation Policies

The second set of challenges focus on weak institutional structure, lack of knowledge and awareness concerning biodiversity.

While decentralisation is a useful tool to ensure sustainable and equitable community representation, it can also create problems for the management of a complicated subject, such as biodiversity. India's biodiversity is decentralised and handled by three different levels: the central, state and local levels. Locals are responsible for creating and updating the PBRs.

Even though they are most actively engaged with biodiversity, the local levels have very little knowledge or capacity to effectively manage it. State biodiversity board policies and the Biodiversity Act of 2002 mandate that states provide biodiversity training and education to local communities.

Nevertheless, this is more of a theoretical statement because there is no discussion of how to achieve this within the policies. The selection process of NGOs that contribute to these PBRs is also arbitrary and non-transparent. In addition, the data collected at the local level is self-verified. Thus, this data is not reliable because it has not been verified externally and thus can be biased or inaccurate. Also, once this information is computerised, it is difficult for local communities to access it and correct it.

BMCs are funded by SBBs and other entities. These other entities must be foreign bodies that wish to access PBR information and must pay for the information. Hence, domestic parties do not generate any income for these local levels. This is problematic because biodiversity knowledge is more prevalent domestically than internationally, therefore, foreign entities will not be as interested in obtaining PBR information as domestic parties are.

As a result, local levels lose out on significant amounts of money that they could be earning from domestic stakeholders.

Furthermore, every state has different management programmes for their BMCs. Because of this, there is no uniformity in the data collection, preservation and monitoring of the resources. Discrepancies, such as these between states illustrate the fact that biodiversity knowledge is not being gathered at the same pace or same way.

While there is only limited information from some parts of the country, it is difficult to have a holistic assessment of biodiversity across the nation. Additionally, not having the same way of creating BMCs and PBRs makes it difficult to have an unbiased biodiversity sample from each state. Lastly, no effort has yet been undertaken to protect the legal rights of the PBR information gatherer.

Sustainable Development Opportunities

Job Creation

India has many challenges that can actually be addressed through biodiversity, creating a virtuous cycle.

All 29 states in India have national parks and 24 of them have more than one. These state mandated national parks are providing refuge for endangered wildlife and other species. They are open to both national and international tourists. This is not only a revenue generator for the government but also an important livelihood source for many locals.

These businesses promote economic growth for the whole community by creating income opportunities within and around the park. (for example, the locals who are employed at Panna National Park Hotel and resorts in Madhya Pradesh).

This is also the case for coastal areas and wetlands where governments can earn revenue by training locals about sustainable tourism and raising their awareness about biodiversity preservation. Public Private Partnerships (PPPs) are also stimulated to build tourist infrastructures, such as stores, restaurants, and tour guide agencies. These venues ensure job opportunities for the overpopulated and highly impoverished communities of India.

Box 3: Adult Basic Education and Training Programme of South Africa

The Adult Basic Education and Training Programme of South Africa created the Tourism, Hospitality and Sport Education and Training Authority (Abet-Theta) programme to train locals to work in national parks. The programme was launched at Kruger National Park. The skills taught in this programme are rare in South Africa and are getting a lot of promotion from the national government. The programme projected to employ 712,000 people directly and 870,000 indirectly in 2015. In 2016, Kruger National Park alone employed 2200 workers.

Source: <http://www.krugerpark.co.za/> 2015 and <http://ewn.co.za/> 2016

Woman Empowerment

Women across the nation, from Tamil Nadu to the Himalayas, have been participating in biodiversity conservation. Their efforts include educating villagers and planting gardens. They have also taken initiatives to teach fellow local women about the medicinal benefits of plants, to conserve and properly harvest vital crops, and protect trees from illegal felling. These measures

have proved to be beneficial for the health, environment and economy.

In addition, they have given women a sense of identity by allowing them to make a change in their communities and getting recognised for more than their domestic roles in society. These efforts need to be encouraged through training institutions that can ameliorate these women's capacities and networks by providing technical and knowledge-based assistance.

Box 4: Scientific Conservation Training of Medicinal Plants

Women from three different villages in Kerala – Panangofe, Pampuchathamana, and Bharathnoor have formed an organisation that provides scientific conservation training of medicinal plants. Training includes learning how to collect, maintain, conserve and encourage the use of medicinal plants. These women have committed themselves to spread awareness and train other village women around them. The area is very committed to conserving the plant diversity in their local communities, as well.

Source: *Indian Botanist*, 2015

Fisheries

From fishery hotspots in the Himalaya to vacation hotspots in Goa, fisheries provide employment for about 14 million people in India. Besides, many people depend on fish not only for their livelihood but also for their source of protein. Many other businesses in the food and tourism industries rely partially on fisheries as well.

Hence, India cannot afford to have important fish species go extinct. This would allow industries to continue to generate revenue and employment and keep a significant amount of the Indian population fed. The government can provide funding and education in order to teach locals sustainable ways of fishing and how to avoid overfishing. This will continue to stimulate 5 percent of India's agricultural Gross Domestic Product (GDP).

Box 5: Conservation and Sustainable Utilisation of Resources Practices

Vellapatti is a small fishing village in the southern part of Gulf of Mannar in Tamil Nadu, India. The people of this village solely depend on the coral reef ecosystem around the Vaan and Koswari islands for their livelihood. Community facilities (i.e., fishing grounds, fishing methods, species composition, market structures and the socio-economic conditions of the fisherfolk) have been assessed. The problems in resource utilisation have been addressed and suggestions have been given for conservation and sustainable utilisation of resources. These practices promote the conservation and importance of marine biodiversity given the fact that these locals depend so heavily on the reef's biological resources and take initiatives to conserve them.

Source: Suganthi Devadason Marine Research Institute: Tuticorin (India); SDMRI Research Publication [Sdmri Res. Publ.], vol. 2, pp. 79-84; 2002

Payment for Environment Services

Payment for Environment Services (PES) is one of many different tools that can complement and stimulate an enabling policy environment for sustainable economic development. Currently, the role of PES programmes in supporting sustainable development is quite limited. PES denotes payments to farmers or landowners who have agreed to take certain actions to manage their land or watersheds to provide an ecological service. PES can be used to protect biodiversity through area based or product based schemes.

Land uses that protect species, ecosystems or genetic diversity create positive externality and hence should be rewarded. Global market for PES is still at the nascent stage. The payment mechanism can be conservation grants, concessions, licence fee and incentives. As the payments provide incentives to land owners and managers, PES is a market-based mechanism, similar to subsidies and taxes, to encourage the conservation of natural resources.

Box 6: Environmental Services Scheme

A Payment for Environmental Services scheme in the Yakpugang community forest in Mongar has been operationalised with support from the non-profit, international development organisation, SNV. The scheme focusses on protection and enhancement of the Yakpugang community forest, which forms a catchment area and serves as the main source of water for Mongar township. The PES scheme is between the Yakpugang community forest management group (as service providers) and the municipal authority of Mongar town (as service recipients). The Agreement lists six specific activities concerning protection of natural resources, especially biodiversity. The community forest management group is to receive Nu52,000 annually (1US\$=67 Nu) for undertaking activities to conserve the drinking water source of Mongar township. This has contributed significantly to the development of the region as the Yakpugang community forest on its own hardly brought any direct cash benefit to the local communities.

Source: [info.undp.org](https://info.undp.org/docs/pdc/Documents/BTN/Benefit-Sharing%20PES%20Report%20draft%20Jul%2008082012.pdf), 2012 (<https://info.undp.org/docs/pdc/Documents/BTN/Benefit-Sharing%20PES%20Report%20draft%20Jul%2008082012.pdf>)

Agroforestry

Agroforestry is a sustainable land use system that combines food crops with tree crops and livestock on the same land in order to increase or maintain yields and preserve soil quality and ecosystems, conserving biodiversity. Agroforestry encourages environmental sustainability and economic growth by reducing pressure on forests, recycling nutrients, protecting ecosystems, increasing crop yields and increasing farm income.

In 2014, India was the first country to adopt an agroforestry policy-the National Agroforestry

Policy 2014. The policy aims to coordinate, converge and synergise the different components of agroforestry. Moreover, it hopes to optimise agricultural sustainability and productivity and thwart climate change.

However, the agroforestry has been declining significantly over the past few decades even though farmers rely on its practices to cultivate healthy soil and crops. This decline is occurring because of 'adverse policies, weak markets and a dearth of institutional finance'.

Box 7: Empowering Rural Communities

Aranya Agricultural Alternatives, a 25 year old NGO, aims to bring 'permaculture' to communities in order to empower rural communities, manage natural resources, and sustain livelihoods. Permaculture aims to provide alternative and natural agricultural practices instead of the use of chemicals. It provides training and capacity building activities in order to conserve agricultural land that in turn conserves biodiversity from destructive practices. These practices include regenerating farmland by growing soil, stopping soil erosion, harvesting and protecting horticultural species, legumes, crops and trees. The organisation has worked with 12 villages and covered 138.5 acre of farmland in the State of Telangana (India). They are also actively engaged in the formation of Biodiversity Management Committees and training locals in registering documents related to biodiversity.

Source: permacultureindia.org

Revenue through Tourism

Biodiversity-based tourist destinations in India, such as the beaches of Goa and the 166 national parks in India are integral in generating tourist revenue (which is approximately US\$20bn).

Moreover, these destinations give India international recognition because many foreigners come to see the exotic wildlife.

Many vacation spots (for example, Goa and Mumbai) generate tourist revenue in hotels and

resorts around the area as well (for example, in 2016, Goa attracted 2927125 foreign and domestic tourists and booked 3358 hotels).

As a result, state governments across the nation can intervene by providing funds and policies to preserve and maintain these locations. In turn, the Indian economy can benefit from the revenue that is generated and create an impressive global image.

Box 8: Model Tourist Village

An ecotourism village in Indonesia, Bukit Lawang, rehabilitated the decline of orangutans in the 1970s. Since this occurrence, tourism, (both nationally and internationally), has increased drastically. Presently, the village is one of the most popular tourist destinations in the country and has catalysed initiatives to preserve surrounding forests and ecosystems. It has generated tourism-related enterprises around it as well such as restaurants and hotels.

Source: Thompson, I. and Christophersen, T., eds. (2008).

Conclusion

Biodiversity is getting eroded at a very alarming rate. While there are myriad of reasons, human activities are the principle reason for biodiversity loss. Development, because of its lack of concern for nature and its associated importance, has led to uncertainty of a sustainable future. Clearing land for agriculture, introducing invasive alien species, constructing infrastructure without specific knowledge, and overexploiting resources have all contributed to the cause. Lately, climate change and global warming are also posing as threats to the ecosystem. This is creating a vicious cycle of environmental degradation.

The need of the hour is to develop a catalogue of recorded species. Over 200 years of various surveys and research have resulted in a lot of information. But it is unorganised. Thus, it needs to be digitised and made easily accessible while protecting intellectual property rights.

Human resource development activities need to be created for those who interact mostly with biodiversity (for example, wide variety of users, data generators, data managers and different policymakers). Many emerging areas can help in preventing biodiversity erosion. But they need to be done sustainably.

Way Forward

COP-10 was held in Nagoya, Japan in October 2010 to review the progress made in biodiversity conservation targets and discuss the establishment of clearer rules for access to and benefit-sharing of genetic resources. In Nagoya, an updated Strategic Plan for Biodiversity, including the Aichi Biodiversity Targets, for the period of 2011-2020 was adopted for 192 signatory countries. This has been a considerable success concerning the embedment of biodiversity in international policy discourses. Change is stimulated through progressive thinking.

Unfortunately, the attitude towards biodiversity and its role on poverty alleviation and the preservation of ecosystems still remains less appreciated. Furthermore, there is an endemic belief that activities to preserve biodiversity will thwart industrial development. This belief is generated from the lack of understanding and knowledge.

Consequently, unless the Indian population, (including policymakers), understands the importance of biodiversity in society and takes initiative to conserve and encourage biodiversity growth, sustainable economic development goals will remain unattained. The values of social inclusiveness and ecological sustainability will be properly prioritised only when economic growth ceases to be a proxy for development or progress.

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¹ <https://books.google.co.in/books?hl=en&lr=&id=4UL5AQAAQBAJ&oi=fnd&pg=PP1&dq=sustainable+development+and+the+environment&ots=G-rc3iyeQ2&sig=cHObrVW5sNqhXtmcliZMs67UpI4#v=onepage&q=sustainable%20development%20and%20the%20environment&f=false>

² <http://www.un.org/sustainabledevelopment/sustainable-development-goals/>

³ However, there have been many critics to this theory, for example, Ansuategi, Barbier, & Perrings, 1998; Arrow et al., 1995; Copeland and Taylor 2004, Arrow et al. 1995, Dasgupta et al. 2002; (Stern 2004) Ekins, 1997; Pearson 1995 Stern, 1998; Stern et al., 1996

⁴ <http://darwin.bio.uci.edu/sustain/bio65/lec06/bio-leaf.htm>

⁵ <http://ec.europa.eu/environment/nature/biodiversity/economics/>

⁶ https://www.cbd.int/gender/doc/fs_gender_long.pdf

⁷ 5,423 km belong to Peninsular India and 2,094 km to the Andaman, Nicobar and Lakshadweep Islands, and an EEZ of 2.02 million km²