Asian Journal of Conservation Biology, July 2021. Vol. 10 No. 1, pp. 40-45 AJCB: FP0153/64918
ISSN 2278-7666 ©TCRP Foundation 2021 https://doi.org/10.53562/ajcb.AIRJ9111

Review Article

Insights in Biodiversity Management and Conservation in India: Structure and Role of Multi-tier Legal System

Gaurav Singh[1*] and Garima Dukariya[2]

[1]*Madhya Pradesh State Biodiversity Board, Bhopal - 462011, India*
[2]*School of Biotechnology, Devi Ahilya University, Indore - 452001, India*

(Received: October 10, 2020; Revised: February 04, 2021; Accepted: March 16, 2021)

ABSTRACT

India, a mega varied nation with merely 2.5% of the earth's total land region, shelters approx. seven to eight % of entire documented species, comprises of 45,000 floral species and 97,000 species of animals. Although, India can exhibit a notable variety of life diversity but there is barely any possibility for sense of security. The biodiversity experiences a variety of threats like overexploitation of natural resources, climate change, land use changes in natural habitats and spread of invasive species. Number of actions comprising facilitating strategy and official framework, have been put in place to mainstream environment, together with biodiversity. To attain the goals of Convention on Biodiversity, Indian government proclaimed the 'Biological Diversity Act' in 2002. The NBA founded under this act operates controlling, advisory and facilitative roles on matters of conservation, balanced usage of biological resources and fair and equitable sharing of benefits of use. The NBA operates through SBBs at the state level and BMCs at the regional level to execute biodiversity policies via development of People's Biodiversity Registers. All these efforts will help in moving forward in the direction of attaining objectives for biodiversity protection and human development. This review summarized the structure of multi-tier system of National Biodiversity Authority with focus on Biodiversity Management Committee and their roles in conservation.

Key words: Biodiversity, National Biodiversity Authority, Biodiversity Management Committee, Conservation, State Biodiversity Board, People's Biodiversity Register.

INTRODUCTION

The word bio means life and diversity means variability, so the variation between all living creatures found on earth from entire sources containing marine, terrestrial and water ecosystem is known as biodiversity (Agarwal & Singh, 2018). Thus, the simplest definition of biodiversity is the variation of life at all levels of biological organisation (Antonelli et al. 2018). The term biodiversity generally includes Genetic diversity, Species and Ecosystem diversity (Chandrakar, 2012).

Biodiversity performs an essential part in working of the ecosystems on which the human race depends for fresh water and food, health, restoration and shelter from natural calamities. Furthermore, its damage influences cultural and divine ideals that are essential to human welfare. Recent progression in environmental degradation and damage of biodiversity can considerably lessen the capability of ecosystems to supply these crucial amenities (www.cbd.int).

India is one of the largest biodiversity nations of the globe and amongst the 198 signatory countries to the Convention on Biological Diversity (CBD) at Rio de Janeiro in 1992 (Meenakumari and Rana, 2017). Due to the immense range of physical and environmental situations, it nurtures diverse ecological community varying from grasslands, wetlands, the tropical rain forests, coasts and high alpine cold deserts. India has a total of three primary biological areas namely, Eurasian, Afro-tropical and Indo-Malayan and ten bio-geographic zones together with 26 biotic regions (Rodgers & Panwar, 1990).

Although India constitutes only 2.5% of the earth's land area but has recorded around 8% of the total biodiversity present in world which includes millions of species and subspecies (Bawa et al. 2021; Venkataraman, 2006; Myers et al. 2000). Statistically, it is the next most populated nation in the globe and its inhabitants primarily rely upon biological resources for their sustenance.

Although, India can exhibit a remarkable variety of biodiversity but there is barely any possibility for sense of security. With the fast growth of industry, urbanization and agriculture, increasing human population and extensive developmental plans such as highways, mining and dams resulting in degradation, fragmentation, over exploitation and habitat destruction of biological resources (Agnihotri et al. 2020). Coupled with these factors, unauthorized trade of high value wildlife products and unsustainable use of resources have seriously threatened many species of flora and fauna. Due to debut and encouragement of few crop varieties with 'high yield', the agro-biodiversity has also suffered critically. Even if, India has abundant practice of conserving nature and bio-resources but still minor efforts have been made to secure the traditional knowledge on biodiversity received by a huge number of local communities. Thus, it requires a combined attempt in the direction of education, scientific investigation and policy support for conservation of the biodiversity while providing economic and ecological security (Venkataraman, 2009).

At the national level, biodiversity conservation demand efforts from various Ministries/Departments at

**Corresponding Author's E-mail: singhgauravbiotech@gmail.com*

the Central and State Government levels thereby reprising the necessity for establishing of biodiversity affairs in development planning processes (www.nbaindia.org). The present study summarizes the biodiversity profile of India, conservation acts and various official and legal structures established to execute the biological diversity act in India with special focus on Biodiversity Management Committee and its role in conservation of biodiversity.

Biodiversity Profile of India

It is predicted that India represents around 11% of the world's flora and has approximately 45,000 species of plants (Mudgal and Hajra, 1997; Balasubramanian, 2017). At the national level, various organizations along with the Botanical Survey of India (BSI) have been involved in organized indexing and documentation of plant diversity (www.bsi.gov.in). The faunal resources are equally or more diverse in India with a total estimation of approx. 97,000 animal species (www.zsi.gov.in). Various floral and faunal biodiversity found in India are mentioned in table 1.

Among invertebrates, soil fauna (Annelida) and parasitic forms which are particularly found in India only, display an excessive intensity of endemism. Entomofauna of approximately 35%, freshwater sponges and molluscs are also endemic to the Indian region. While in vertebrates, maximum degree of endemism is observed in Amphibians, at species level and thereafter by reptiles, birds, mammals and fishes. Fishery plays an essential role in India, for the progress of local communities at social and economic level. Over and above six million fish farmers and fishermen in India rely upon aquaculture and fisheries for their occupation. India is a recognized hub of agro-biodiversity as it nurtures a number of varieties of crop plants such as wheat, soybean, millets, maize, rice etc (Venkatraman, 2009; Venkatraman et al., 2020)..

Table 1. Estimated number of biodiversity reported from India

Taxonomic Name	Species Number		In India percentage (%) of Species
	Species in World	Species in India	
Animals and Protista			
Protista	36,400	3535	9.68
Insects	10,53,578	65,222	6.19
Molluscs	84,978	5205	6.12
Fishes	34,362	3364	9.78
Amphibians	7667	407	5.30
Reptiles	10,450	584	5.58
Birds	10,357	1340	12.93
Mammals	5853	427	7.29
Plants			
Gymnosperms	1021	81	7.93
Angiosperms	2,68,600	18,532	6.90
Bryophytes	16,236	2,754	16.96
Pteridophytes	12,000	1,293	10.76
Others			
Virus and Bacteria	11,813	1,196	10.12
Algae	40,000	7,396	18.49
Fungi	98,998	15,223	15.38
Lichen	17,000	2,528	14.87

Source: Botanical Survey of India (BSI), Zoological Survey of India (ZSI), Venkataraman et al., 2020.

Overview of Biological Diversity (BD) Act, 2002

The Convention on Biological Diversity (CBD) in 1992 at the Rio de Janeiro during the Earth Summit, is the highly remarkable regulation related to protection of biological diversity. The main objectives of this internationally binding agreement, which was signed by India and other 198 nations, were: conservation of biological diversity, sustainable consumption of its constituents and fair and equitable sharing of profits deriving due to exploitation of genetic resources (Tandon & Dutta, 2017; Onial et al. 2018; Dar, 2020).

To accomplish the goals of this historic convention, Government of India (GoI) proclaimed the 'Biological Diversity (BD) Act' in 2002 (Bhutani and Kohli, 2017). The Act on the basis of CBD principles (as per the Act No. 18, 2003) approved a multi-tier structure for management of resources, in pact with the democratic norms (Figure 1). The first tier is the National Biodiversity

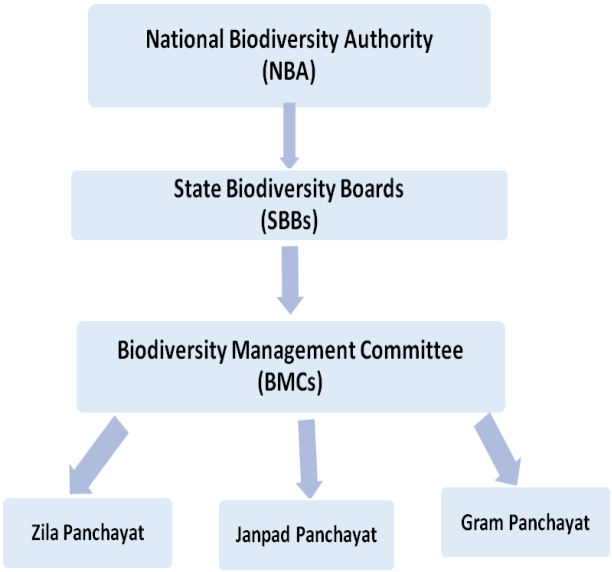

Figure 1. Structure of National Biodiversity Authority (NBA).

Authority operating at National level, thereafter comes the State Biodiversity Boards (SBBs) in second tier, that are established at State level and the third tier is the Biodiversity Management Committees (BMCs) established at Local level (Village/ Taluk/ District/ Municipal Council/ Municipal Corporation) (Bawa et al. 2021). India has efficiently constituted an operational NBA and SBBs within a decade of its enactment across the Union Republic, but the core of the drawback can be found to the local Biodiversity Management Committee. The BMCs are yet to display any efficient and constructive effect on the system of governance mainly because of the loss of resources, awareness and guidance. India has State Biodiversity Boards (SBBs) established in entire 28 states till July, 2015, and the Indian BD Act recommends a multi-tier system of regulating and dealing biological or genetic resources. Many years ago, India has provided 'the established right to grant access' in the Biological Diversity (BD) Act, 2002, by the Biodiversity Management Committee (BMC), indicating native and local communities (Ghosh, 2017).

National Biodiversity Authority (NBA)

The Central Government of India (GoI) in 2003 established the National Biodiversity Authority (NBA) to enforce India's BD Act (2002) (Prajeesh, 2017). The NBA is a legal organization and it executes regulatory, beneficial and consultative functions for the GoI on affairs relating to protection and management of biological resources, their sustainable use and lawful and rightful sharing of profits originating due to the use of bio-resources.

NBA also advises the government of states in choosing the regions of biodiversity importance, which should be reported as heritage sites under Sub-Section (1) of Section 37 of BD Act, 2002 and actions for managing such heritage sites. The NBA deals with the applications by giving approval or else for undertaking any action stated in Sections 3,4 and 6 of the BD Act, 2002.

The headquarters of NBA is in Chennai, Tamil Nadu, India and provides its mandate by an organization that consists of the Secretariat, Authority, SBBs, Expert Committees and BMCs. From the time when its established, NBA has reinforced formation of SBBs in 28 States, Union Territories and assisted creation of nearly 2,69,433 BMCs (http://nbaindia.org/content/20/35/1/bmc.html).

State Biodiversity Boards (SBBs)

The establishment of State Biodiversity Boards (SBBs) has been done under the Section 22 of the BD Act, 2002. Accordingly, SBBs have been formed in each of the 28 States of India.

The major functions of SBBs are as following:

1. It advises the Government of states, based on the instructions released by the Central Government, on affairs involving in biodiversity conservation, balanced consumption of its constituents and rightful distribution of profits occurring due to the use of biological resources.
2. SBBs also control by giving consents or else applications for profitable employment or bio utilization and bio-survey of any biological resource by any Indian.
3. It also performs few additional roles which are essential to convey the conditions or requirements of this Act or recommended by the State authorities (www.nbaindia.org).

Biodiversity Management Committees (BMCs)

The establishment of Biodiversity Management Committees was done according to the Biological Diversity (BD) Act in each local organization, whether Municipalities or Panchayats all over the country (Gadgil et al. 2006).

At local level, in agreement with requirements of Section 41 of the BD Act, Biodiversity Management Committees (BMCs) are formed which are accountable for helping protection, balanced consumption and recording of biodiversity together with maintenance of habitats, conservation of land races, conventional varieties and cultivars, breeds of animals and domesticated stocks and microbes as well as registering of information associating to biological diversity (Section 41 (1) of Biological Diversity Act, 2002).

The BMCs are statutory bodies at local level. The BMC comprises of a Chairperson and six individuals chosen by regional bodies, in which 1/3 should be females (Kumari et al. 2019) and not less than 18% SC/ST (Rule 22, section (2) of Biological Diversity guidelines, 2004). These individuals must be chosen between the agriculturists, collectors and dealers of Non-Timber Forest Produce (NTFP), herbalists, academicians, delegates of user associations, fisher-folk, community workers and any such individual/representative of union, which is trusted by the local body that they can considerably aid to the instructions of the BMC. All mentioned earlier should be in the voters list and inhabitants of the said regional body parameters. The current status of the BMCs constructed in each state of India is demonstrated in Figure 2.

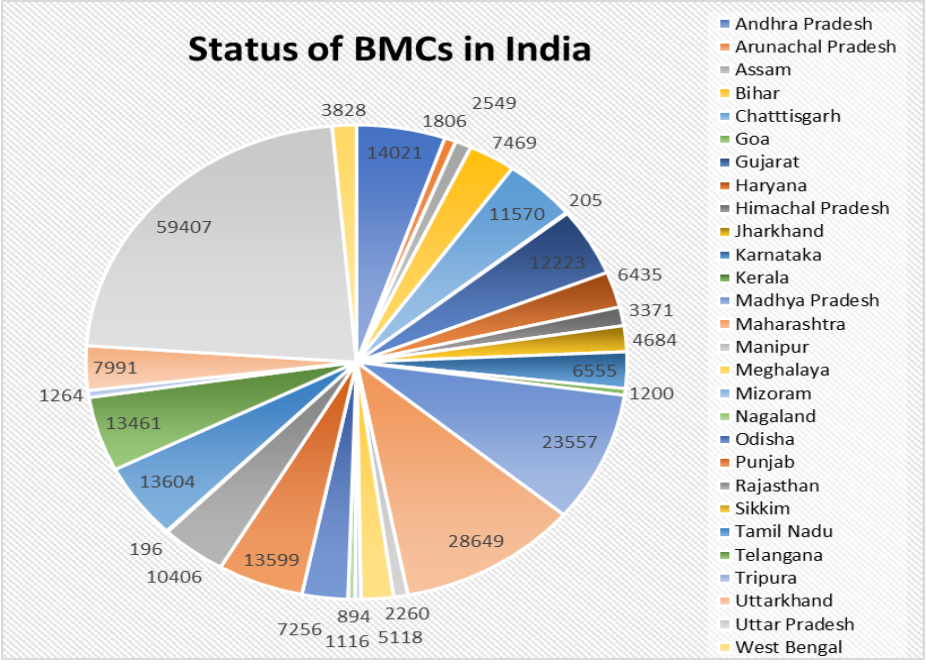

Figure 2. Current Status of Number of Biodiversity Management Committees in Indian States as on 04/01/2021. (http://nbaindia.org/content/20/35/1/bmc)

BMC shall meet at least once in 3 months and organize in one year at least 4 meetings. The meetings of the BMC should be presided by the Chairperson, and with any such representative chosen by the members arrive during his/her absence. Summaries/records of the BMC meetings will be surrendered to the district nodal or local body officer. Action strategy should be formulated by each and every BMC with emphasis on: measures to be considered for the protection of bio-resources, guidance needs for the employees of BMC, archive of potential items as Geographical Indicators (G.I.) for consideration of registration and set up a micro plan for balanced employment of local biodiversity which includes therapeutic plants and related Traditional Knowledge (TK) (Thupalli, 2013).

BMCs performs the following major functions:

1. People's Biodiversity Register (PBR) is formulated, maintained and validated by BMC in discussion with the local individuals. It also maintains a Register that provides statistics about the facts of biological resources and conventional knowledge existing within the authority of BMC.

It provides suggestions on any problem mentioned to it by the State Biodiversity Board/Authority for giving approval, in addition it also uphold the data about the local practitioners and vaids exploiting the biological resources of that local area (http://nbaindia.org/link/304/1/1/home).

Roles of BMCs

The major roles and responsibilities of BMCs are mentioned as follows:

1) Planning and formulation of the PBR and protection of Traditional Knowledge which are recorded and documented in PBR.
2) Eco-restoration of the biodiversity found in that local area.
3) Protection and balanced employment of biological resources found in that local area.
4) Provides accurate assessment to the SBB and NBA in the affair of local biodiversity issues, Traditional Knowledge (TK) and Intellectual Property Rights (IPR).
5) Biodiversity Heritage Sites (BHSs) containing fauna/ microbes, heritage trees, holy groves and consecrated water resources are also managed by BMCs.
6) Supervision and management of access to the bio-resources and allied TK for research and commercial objectives.
7) The usufructs occurring due to economic employment of bio-resources are shared by BMCs.
8) Protection of conventional breeds/ varieties of economically essential animals and floras.
9) Creating awareness for biodiversity education and protection.
10) Balanced use and benefit distribution of bioresources.

The SBBs shall prepare Technical Support Group (TSGs) to guide BMCs in their activities. The Technical support groups formed at the suitable stage (Regional/ State/ District) should help BMCs in the matter of benefit sharing, organization of sacred groves, heritage sites, water resources and collection of charges. Furthermore, it aids BMC for authentication and verification of PBRs by recording local titles/ names of plants, animals and TK allied with them (Thupalli, 2013).

Preparation of People's Biodiversity Register (PBRs)

This pioneering agenda aims to verify and record the information of existence of species, propagation exercises, natural and balanced harvests and protection, along with commercial employments of bio-resources that exists with India's local communities (Singh & Kushwaha, 2008).

It is mandated and responsibility of BMCs to prepare PBRs supporting the Biological Diversity (BD) Act, 2002. It is a record that includes availability of and complete information on biological resource (plants and animals) of that local region, their therapeutic or any such utilization and additional TK related to them. The present PBR construction approach which has been developed by the NBA is being advised for extensive official use. This explains and offers a group of lay outs with indexes and variety of facts/data requires to be supplied by BMCs through the assistance of scholars, knowledgeable individuals, investigators and be verified with the assistance of TSG/SBB as needed by BMC. The BMC preserved these data/facts in the protected custody. PBR is an official document for intents of determining Access and Benefit Sharing (ABS) requirements under the biodiversity law.

People's Biodiversity Register must be stored in secure supervision and sharing of data and information with strangers should be in accordance through relevant procedures and vigilant thought of the worth of the bio-resource. The BMC requires to maintain a record providing report about the particulars of TK granted and approach to biodiversity resources, benefits derived, fee levied and the means of their distribution. This register is maintained by any such individual authorized by chairman of BMC or the chairman itself.

Among various goals of the PBR, it is anticipated to: 1) keep a record, audit as well as give facts for balanced administration of biological resources; 2) verify rights of local communities and individuals on knowledge of biodiversity resources utilization; 3) favour biodiversity-friendly claims of development; 4) maintain and encourage the progress of the rational natural facts and knowledge of local population and of the conventional "slow" sciences of Unani medicine and Ayurveda in regulation with the aims of the CBD. This approach is particularly required for protecting the advantages of the native individuals of our country, who have performed a crucial responsibility in conservation of the India's biodiversity (Singh & Kushwaha, 2008).

'People's Biodiversity Registers (PBR)' will be prepared with a relative different logical and systematic action. But it is highly relevant to our country which is abundant in biodiversity and indeed convenient in the present age of fast industrial advancement (Gadgil et al. 2006).

CONCLUSION

To keep itself in equilibrium, nourishing and growing state, the natural ecosystem depends on a variety of

living beings. To make sure this, we should safeguard and support the biodiversity. This is necessary that we assemble and distribute fundamental awareness that can encourage individual, industries and authorities that assist them to exist in co-ordination with the environment. India proved itself as a leading country in establishing legal and institutional system for protecting biological diversity and conventional knowledge but the rate of implementing NBA activities requires to accelerate for improved results.

The BMCs still have to produce an efficient as well as affirmative influence on the governance system. BMC constituted so far have mostly remained on paper due to absence of basic funding, guidance and their non-functionality at the local level. It is essential for NBA and SBBs to ensure skill building and capability of BMCs so that along with generation of their own funds, they are also able to perform their roles and responsibilities to accomplish the larger purpose for which they are constituted.

India being a mega diverse nation, contains an immense capability for the employment of biological sources from primary bionetworks along with various agro-climatic zones. Such bio resources can give notable financial benefit to the BMCs when economically exploited by the national/international corporations and also offer sustainable livelihood options for the providers of bio resources. The local community's wisdom and ideals are now being accredited as beneficial for biodiversity protection and management. Education as well as public awareness related to PBR and biodiversity conservation importance should be created at local level by all BMCs.

Conflict of Interest

The authors confirm that they have no conflict of interest.

Acknowledgments

Authors acknowledge the library facilities of the Madhya Pradesh State Biodiversity Board (MPSBB), Bhopal.

REFERENCES

Agarwal, A., and Singh, J. 2018. "Biodiversity Conservation in India: A Review". *G-Journal of Environmental Science and Technology*, *6*(1), 1-4.

Agnihotri, N., Dassani, S., and T. K, S. 2020. Present Status and Conservation Strategies of Biodiversity in India. *International Research Journal on Advanced Science Hub, 2*, 251-255.

Antonelli, A., Kissling, W. D., Flantua, S. G., Bermúdez, M. A., Mulch, A., Muellner-Riehl, A. N., Kreft, H., Linder, H. P., Badgley, C., Fjeldså, J. and Fritz, S. A., 2018. Geological and climatic influences on mountain biodiversity. *Nature Geoscience, 11*(10), 718-725.

Balasubramanian, A. 2017. Biodiversity profile of India. *Technical report*, DOI: 10.13140/RG. 2.2. 10664.57601.

Bawa, K. S., Sengupta, A., Chavan, V., Chellam, R., Ganesan, R., Krishnaswamy, J., Mathur, V. B., Nawn, N., Olsson, S. B., Pandit, N. and Quader, S., 2021. Securing biodiversity, securing our future: A national Mission on biodiversity and human well-being for India. *Biological Conservation, 253*, 108867.

Bhutani, S., and Kohli, K. 2017. Biodiversity and the Processes of Law. In Bioresources and Bioprocess in Biotechnology, *Springer*, Singapore, 49 -71.

Chandrakar, A. K. 2012. "Biodiversity conservation in India, Technical Report" DOI:10.13140/ RG.2.1.1490.3208.

Dar, M. A. 2020. Biodiversity conservation in Jammu and Kashmir state: legal framework and concerns. In Biodiversity of the Himalaya: Jammu and Kashmir State. *Springer*, Singapore, 1077-1095.

Gadgil, M. 2006. Methodology Manual for People's Biodiversity Register. National Workshop on People's Biodiversity Register 22-23 June 2006. National Biodiversity Authority, Chennai.

Ghosh, A. K. 2017. "Biodiversity, Access and Benefit Sharing in India: A Critical Analysis". In *Biodiversity for Sustainable Development* (pp. 79-86). Springer, Cham.

Kumari, R., Banerjee, A., Kumar, R., Kumar, A., Saikia, P., and Khan, M. L. 2019. Deforestation in India: consequences and sustainable solutions. Forest degradation around the world, 1-18.

Meenakumari, B., and Rana, R. S. 2017. Implementing the Biological Diversity Act in India: Focus on ABS and Agro-biodiversity. *Indian Journal of Plant Genetic Resources, 30*(1), 25-30.

Mudgal, V. and P. K. Hajra. 1997. Floristic Diversity and Conservation Strategies in India. Vol. 1: Cryptogams and Gymnosperms. Botanical Survey of India, Calcutta.

Myers, N., Mittermeier, R. A., Mittermeier, C. G., Da Fonseca, G. A., and Kent, J. 2000. "Biodiversity hotspots for conservation priorities". *Nature*, *403*(6772), 853-858.

Onial, M., Jasmine, B., Singh, Y., Pande, A., Ramesh, C., Sivakumar, K., and Mathur, V. B. 2018. Updating India's National Biodiversity Action Plan: the process and way forward. *Current Science, 115*(3), 422.

Prajeesh, P. (2017). India lays the cornerstone of biodiversity access and benefit sharing system. Current Science, 112(1), 24.

Rodgers, W. A. and H. S. Panwar. 1990. Planning a Protected Area Network in India. Vol. 1 & 2. Wildlife Institute of India, Dehra Dun.

Singh, J. S., and Kushwaha, S. P. S. 2008. "Forest biodiversity and its conservation in India". *International Forestry Review*, *10*(2), 292-304.

Tandon, M., and Dutta, R. 2017. Biodiversity Management Committees. POLICYPAPER: Policy Paper Series. https://thelifeindia.org.in/upload/files/BMC.

Thupalli, R. 2013. Biodiversity Management Committee Constitution Tool Kit – India. National Biodiversity Authority Government of India.

Venkataraman, K. 2006. Biodiversity legislations in likeminded mega diversity countries. pp.79-92. In: D.D. Verma, S. Arora & R.K. Rai (eds.) Perspectives in Biodiversity. Ministry of Environment and Forests, Govt. of India, New Delhi.

Venkataraman, K. 2009. "India's Biodiversity Act 2002 and its role in conservation". *Tropical Ecology*, *50*(1), 23.

Biological Diversity Act, 2002 (India), Section 41 (1)

Biological Diversity Rules, 2004, Rule 22 (2)

https://www.cbd.int/doc/

http://nbaindia.org/content/20/35/1/bmc.html

http://nbaindia.org/link/304/1/1/home.html

www.bsi.gov.in

www.zsi.gov.in