iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** X **Month of publication:** October 2022

DOI: https://doi.org/10.22214/ijraset.2022.47132

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue X Oct 2022- Available at www.ijraset.com

A Study on Ecological Relevance with Specific Reference to Biodiversity and Conservation

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Abstract: ***Biodiversity is a comprehensive umbrella term for the extent of nature's variety or variation within the natural system. It is often understood in terms of the wide variety of plants, animals and microorganisms, the genes they contain and the ecosystem they form. United Nations Biodiversity Conference (COP15) agree on a new set of goals that will guide global actions to protect and restore nature through 2030. Goal:15 of the 17 goals set by UNEP, constitutes the basic structure for this research paper. This secondary research study, focuses on Ecological Relevance with Specific Reference to Biodiversity with reference to state of Kerala over a period of 10 years (2005-2015). The major changes and challenges throughout the period alongside the measures taken by the government to preserve and conserve the environment is explored with a deep insight into articles, books, websites and research journals. A thorough secondary research was done on the topic. Through analytical insights, suggestions and recommendations to create awareness about the significance of biodiversity and its conservation.***
Keywords: Biodiversity, UNEP, UNDP, Conservation, Threats, KSBB

I. INTRODUCTION

Biodiversity is the multitude of living things that make up life on Earth. It encompasses the 8 million or so species on the planet—from plants and animals to fungi and bacteria—and the ecosystems that house them, such as oceans, forests, mountain environments and coral reefs.

Kerala is home to a variety of species and wildlife alike. The biodiversity-rich Kerala is home to a large number of wildlife species. Kerala's tiger population has soared 40% in the last four years - from 136 tigers in 2014 to 190 in 2018. This shows the care and conservation that the state offers on to its Biodiversity.

The aim of the research is to analyse the changes, challenges faced and conservation methods adopted by the government over a specific period of 10 years from 2005 – 2015.

KERALA BIODIVERSITY: AN OVERVIEW

Kerala is the southernmost state in the western Indian subcontinent. Kerala's 38,863 sq. km, or 1.2% of India's overall geographic area, is a fairly small portion of the country. About 68% of the entire region is cultivated with crops, 28% is in forests, and 3% is cultivable waste. Less than 0.5% of the land is uncultivated and barren, and barely 0.0001% is designated as pasture or grazing area. Population growth over the last decade has been 4.86%, as opposed to 17.64% for the rest of the nation. The below Table 1.1 shows the topographical overview of state of Kerala

Geographical Area	38,863 sq. km
Population (2011 census) • Urban • Rural • Tribal	33.41 million 15.94 million (47.70%) 17.47 million (52.30%) 00.48 million (1.45%)
Average Population Density	860 per sq. km
Livestock Population (As per 18th livestock census)	3.59 million
No of districts • Hill districts • Tribal districts	14 10 9

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Climate	Southwest Monsoons (June – September) North east Monsoons (October – November) Winter (December – February) Summer (March – May)
Length of Arabian coast line	590 km
Rivers of Kerala • Longest River • Longest Lake	44 (41 west flowing and 3 east flowing) Periyar Vembanadu
State Symbols • State Animal • State Bird • State Flower • State Tree • State Fish	 Elephas Maximus (Indian Elephant) Great Hornbill (Vezhambal) Cassia fistula (Kanikonna) Cocos nucifera (Coconut Tree) Etroplus suratensis

Fauna Statistics:

Fauna refers to the creatures unique to a certain area, period, or habitat.

The below Table 1.2 shows the fauna statistics of Kerala with respect to India and the World

Fauna	Kerala	India	World
Fishes	196 (2)	2439 (1)	31000 (1)
Amphibians	117 (2)	277 (4)	6184 (3)
Reptiles	159 (2)	408 (3)	8734 (5)
Birds	484 (8)	1179 (7)	9782 (6)
Mammals	145 (2)	410 (3)	5416 (9)

Plant Diversity in Kerala:

The below table 1.3 shows the plant diversity in Kerala with respect to India and how much percent it constitutes to the entirety of flora species in India.

Category	Kerala	India	% to Indian Flora
Flowering Plants	4500	17500	25.71
Gymnosperms	4	64	6.25
Pteridophytes	236	1100	21.45
Bryophytes	350	2850	12.28
Lichens	520	2000	26.00
Algae	325	6500	5.00
Fungi	4800	14500	33.10

II. PAST

From 2005-2015

The State of Kerala introduced a number of programmes and regulations in support of biodiversity and ecosystem protection between 2005 and 2015. The 13th Five-Year Plan for Kerala should have a strong emphasis on sustainable development, which includes "ensuring clean air, water, soil, and food; a house to live in; employment security; basic health protection; social and cultural security; and energy security for its 33.41 million inhabitants." In order to achieve sustainable development in all of its dimensions, the UN Rio+20 outcome document "The Future We Want" recognised the importance of mainstreaming sustainable development at all levels, integrating economic, social, and environmental aspects, and recognising their interrelationships.

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The 11th and 12th Five Year Plans, which had total outlays of 1055 crore and 3189 crores (with over 200% increase in the current plan period), respectively, addressed biodiversity under the topic of ecology and environment under the section of science, technology, and environment

Year	Work done by KSSB
2005	• KSSB Established • Biodiversity Act 2002 and Rules 2004 translated to regional languages
2008	• Kerala Biological Diversity Rules formed • Kerala Biodiversity Strategies and Action Plan formulated
2009	• Rare endangered and threatened species notified as per section 38 of Biological Diversity Act 2002 • Kerala Government Environment Policy
2010	• Kerala State Organic Farming Policy, Strategy and Action plan
2011	• Kerala GOVT order for constituting BMC in all Panchayats/Municipalities/Corporations • Kerala GOVT order for fund utilization for PBR preparation in Panchayats/Municipalities/Corporations
2012	• Kerala State Biodiversity fund constituted. • Kerala GOVT order to prepare PBR in Gram panchayat by implementing a Panchayat Plan • KSSB participates in CBD COP11 at Hyderabad. • Kerala constitutes BMC in all LSG's.
2013	• Kerala Govt order for access to PBR. • Kerala Govt order authorising BMC to function as environmental watch group. • Kerala Govt order for PBR fund revision: Panchayats – Rs. 1,25,000/- Municipalities – Rs. 2,50,000/- Corporations – Rs. 5,00,000/-
2014	• KSSB participates in CBD COP12 at South Korea
2015	• First set of applications for accessing biological resources from Kerala received. • Guidelines for operationalization of BMC in regional languages. • Kerala Govt order for reconstituting BMC.

Threats to Biodiversity in Kerala

There are many challenges to the biodiversity in Western Ghats, especially in Kerala, of which some of the major challenges are discussed below.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
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A. Poaching

The state contains a plethora of wildlife, making it an excellent location for wildlife poaching and the manufacture of wildlife items. While some species are targeted for their skins or because of religious or traditional beliefs, others are poached for their flesh.

B. Mining

The flourishing riparian species are represented by Kerala's biodiversity hotspots. Mining threatens the landscape's stability by causing landslides, reducing the water table, and affecting the riparian ecology, which occupies a relatively small habitat gap in this state's biodiversity hotspot.

C. Plantation

Over than 70000 hectors of forest resources are transformed into forest plantations, primarily made up of teak and eucalyptus, in the wooded zone of the Highlands in order to satisfy the State's needs for timber and pulpwood.

D. Tourism and Pilgrimage

The biggest challenges with Kerala's biodiversity hotspot are massive tourism and pilgrimage. 13 million people and about enter the forests. It triggers "severe" changes in the "biodiversity hotspot," which results in habitat loss.

E. Forest Fires

One of the most significant challenges to and problems for Kerala's Forest Department and Forestry is forest fires. Communities who graze livestock frequently burn the land to provide new growth for the cattle, they should be given proper enforcement and awareness programs/training for criminal activities including Ganja production, poaching, tree cutting, and NTFP collection.

F. Encroachments

One of the places of the nation that is most desperate for new land is the state of Kerala. This problem may have begun as early as the 1950s as a consequence of government policies like "Grow More Food," "Arable Land," etc. The State Government has a policy that all encroachments made after January 1, 1977 will be eliminated.

Measures taken for Conservation of Biodiversity

These are some of the strategies taken by the Government of Kerala for the conservation of Biodiversity. The below mentioned strategies are part of an elaborate strategic plan by the government for the conservation of biodiversity and ecosystem.

1) *Strategy 1:* Maintain the topographic features of the state to reduce the loss of biodiversity
2) *Strategy 2:* Documentation of biodiversity and its traditional use.
3) *Strategy 3:* Conservation of biodiversity-rich areas outside the PA (Protected Areas)
4) *Strategy 4:* Built up a strong database on the forest biodiversity of the state.
5) *Strategy 5:* Conservation of ecosystem, species and gene pool.
6) *Strategy 6:* Prevention of habitat fragmentation.
7) *Strategy 7:* Mitigation of human wildlife conflicts
8) *Strategy 8:* Establish a model for sustainable utilization of resources for livelihood
9) *Strategy 9:* Prevention of over-exploitation and encroachment
10) *Strategy 10:* Ensure sustained availability of raw materials for indigenous food and medicines.

III. PRESENT

2015- PRESENT

Various efforts, both institutional and legislative, have been initiated or given fresh life during the past few years. While many other innovative concepts have been developed, a few of efforts have advanced from the conceptual to the practical stage. The key achievements include:

1) Enhancing the board's institutional structure.
2) Strengthening Biodiversity Management Committee (BMC).
3) Documentation of biodiversity.
4) Implementing Access and Benefit Sharing into Practice.

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5) Research into biodiversity.
6) Increasing the awareness of biodiversity

By establishing the Kerala Biodiversity Fund, a non-lapsable corpus fund for biodiversity conservation, and empowering biodiversity management committees (BMC) as environmental watch groups, the foundation for strengthening the institutional structure of the board was laid. This means that the BMC of each panchayat is now in charge of providing the primary level of environmental protection.

Measures For Conservation Of Biodiversity

Below are some of the measures taken by the Govt of Kerala for conservation of biodiversity.

1) *Biodiversity Management Committee (BMC):* The 13th Five-Year Plan sought to improve the BMC through fostering policy support and capacity development for the local management of natural resources.
2) *People's Biodiversity Register (PBR):* The Kerala State Biodiversity Board and technical support organisations helped to produce the comprehensive biodiversity report known as the PBR (TSG). A total of 75 PBRs have been prepared for 2019–20.
3) *Haritha Keralam Mission:* The Haritha Keralam Mission is a key initiative for environmental protection. The Haritha Keralam initiative attempts to remove solid waste and clean up Kerala's waterways. This initiative has a "hardware" component in the infrastructure of science and technology and a "software" component in its aim to change people's attitudes about litter and waste disposal, particularly in youngsters.

The Haritha Keralam Mission has three sub- missions

- Sanitation and waste management
- Water conservation
- Agricultural development.

The key focus areas of the Haritha Keralam Mission are:

- To develop strategies for different tiers of coordination of local government and other department plans to deal with the main concerns in each district.
- To guarantee that local governments receive technical, effective, and efficient guidance in order to acquire functional technological facilities.
- To take the lead in organising initiatives that guarantee public engagement and social inclusion in order to create "Haritha Keralam."

4) *Air Quality Monitoring:* At 34 sites across the State, the Kerala State Pollution Control Board keeps an eye on the state's ambient air quality. The National Ambient Air Quality Monitoring Program includes 28 of these sites (NAMP).
5) *Water Quality Monitoring:* 128 operational water quality monitoring stations are part of the National Water Quality Monitoring Programme (NWMP). There are 115 locations where the State Water Quality Monitoring Program (SWMP) is active, including 23 stations, 23 rivers, and four lakes.
6) *Ban on Single-Use Plastic:* Single-use plastic was outlawed beginning January 1, 2020. The. State Government placed rigorous limitations on the use and sale of plastic bags smaller than 50 microns in accordance with the Plastic Waste Management Rules in order to facilitate collection and recycling of such plastic (2016).

The spread of plantation crops and the use of forestlands for non-foresting activities have been governed by legislation. Programs for eradicating invasive species and regenerating natural and damaged forests would contribute to the preservation of the variety of forest. Programs to preserve mangroves and holy forests would contribute somewhat to the preservation of the region's biodiversity.

IV. FUTURE

The Govt of Kerala has built many schemes to be implemented on the state for the conservation and safeguard of Biodiversity and ecosystem. Some of them are in association with United Nations Development Programme (UNDP). Some of the main schemes are discussed below.

A. *10 - Year Programme*

1) Kerala will launch a 10-year programme in the upcoming years with the goal of safeguarding and using biological resources sustainably for the benefit of communities.
2) This action plan will be executed through Biodiversity Management Committees (BMCs) established by local bodies in liaison with the United Nations Development Programme (UNDP).
3) Athirappilly Grama Panchayat has carried out the pilot project.

4) The Kerala State Biodiversity Board will ensure that people are more educated of the laws regulating biodiversity conservation (KSBB).

B. Rebuild Kerala Initiative

1) As part of the Rebuild Kerala Initiative, the Kerala government has purchased 51 Hectors of privately owned land in an effort to preserve the mangrove forests. .
2) They will be acquired by being part of the Ecologically Fragile Land (EFL).

C. Eco-restoration Policy 2021

1) The goal of this policy is to eliminate the presence of any plant or animal species that endangers the ecological stability of our natural areas.
2) Additionally, it proposed looking into which species are most suited for each ecosystem and promoting those species.

D. IHRL – UNDP Project

The Ministry of Environment, Forest and Climate Change, the Government of Kerala, the United Nations Development Programme (UNDP), and the Global Environment Facility are partners on the India High Range Mountain Landscape (IHRL) Project. The project's goal is to provide a practical framework for governing diverse uses in order to preserve biodiversity in the Western Ghats' mountainous regions. The project aims to:

1) Effective governance framework for multiple - use mountain landscape
2) Secure the ecological integrity of the Munnar landscape
3) Enhance community-based sustainable resource use and management capabilities.

V. ANALYSIS

The Kerala State Biodiversity Board (KSBB), an autonomous division of State of Kerala, focuses mainly on conservation of biodiversity and preserving the flora and fauna lives. KSSB follows the guild lines put forward by United Nations Environment Programme (UNEP). The Sustainable Development Goals (SDG) set out by UNEP are important to KSSB. All 17 SDGs ultimately depend on robust ecosystems and biodiversity, even though the key biodiversity Goals (SDGs 14 and 15) seek to protect and sustainably use the marine and terrestrial environments, respectively. KSSB and the Kerala government have partnered with UNDP to create a multi-use management framework that is successful in preserving biodiversity in the Western Ghats' mountainous terrain. In order to protect the biodiversity and endangered wildlife, KSSB encourages afforestation /reforestation and urges the Government to put up and implement strict laws against destroying the rich biodiversity that Kerala harbours.

VI. FINDINGS

A. Deforestation

Deforestation is one of the major reasons for destruction of biodiversity and eco-system all across the world and Kerala is no different. This is one of the major reasons for the destruction of natural habitat of various wildlife and plants.

B. Inadequate Emphasis On Biodiversity In Educational Curriculum

It is critically necessary to give adequate attention into incorporating biodiversity-related topics within the curriculum to the degree necessary. It is important to tackle this problem in order to guarantee that biodiversity protection is included into both the individual and societal lifestyle of people. The students have a big impact on their families. Children today are also the nation's future citizens. Supervision is therefore very important in this area.

C. Lack Of Awareness On Biodiversity Related Issues

Biodiversity-related concerns have not yet received enough public attention. They have no idea how crucial biodiversity preservation is. Most people who have access to natural resources and participate in the decision-making processes associated with their utilisation and management do not fully understand the significance of biodiversity for the social, economic, ecological, and cultural well-being of the present and future generations.

VII. RECOMMENDATIONS

A. Reforestation And Afforestation Programmes

Reforestation and afforestation programmes are implemented in tropical areas to stop land deterioration and absorb carbon. As a result, more people are aware of the need of preserving biodiversity, supporting tree-planting campaigns, and engaging in climate-smart agriculture.

B. In-Situ & Ex-Situ Conservation

1) In-situ Conservation

a) Maintaining species in their native environment. The ecology is preserved and kept in good condition. Apart from this, in-situ conservation offers a variety of other benefits.

b) It is practical and affordable.

c) Large number of flora and fauna is conserved simultaneously

d) The organisms can successfully evolve and adapt to changes since they are in their native ecology.

e) In-situ conservation sites should be properly protected and strict laws should be implemented to prevent unwanted human intervention onto these sites.

2) Ex-situ Conservation

a) This includes maintaining and raising endangered species in zoos, botanical gardens, and other man-made environments.

b) Ex-situ sites should provide more natural habitat for harbouring species that are at the verge of extinction.

c) These locations ought to contribute to the development of a climate that is favourable to the survival of threatened species.

C. Introduce Biodiversity And Conservation As Integral Part Of Curriculum

1) Promote the integration of biodiversity education and its conservation into school and college curriculum.

2) The identification of biodiversity-related themes for inclusion in college and high school curriculum.

3) Creating books and other educational resources that place a strong focus on biodiversity.

D. Create Awareness About The Significance Of Biodiversity And Its Conservation

1) Raise awareness among all facets of society, including politicians, administrators, planners, journalists, academics, judges, businesspeople, industrialists, farmers, and students.

2) Arrange biodiversity seminars and workshops for various professional groups, including the media, the judicial system, the medical field, engineers, business owners, managers, and traders.

VIII. CONCLUSION

Communities are still living unsustainable lifestyles and are well behind the curve despite advancements in critical environmental sectors including clean water, sanitation, clean energy, forest management, and garbage. Since people consume the majority of biodiversity, we must maintain and safeguard biodiversity in order to safeguard the planet.

This study is specific to the state of Kerala but the methods used by the governments can be implemented across the states irrespective of topography. Most of the methods followed by the government of Kerala is adhering to the guidelines call forth by UNEP and hence can be implemented across different states irrespective of the difference in biodiversity of the area of concern. KSSB is working as per the guidelines of UNEP in putting forward new rules and regulations to conserve and preserve the biodiversity of the state.

Conservation of biodiversity is not an obligation but a responsibility that the people alongside the government, across the board should take seriously.

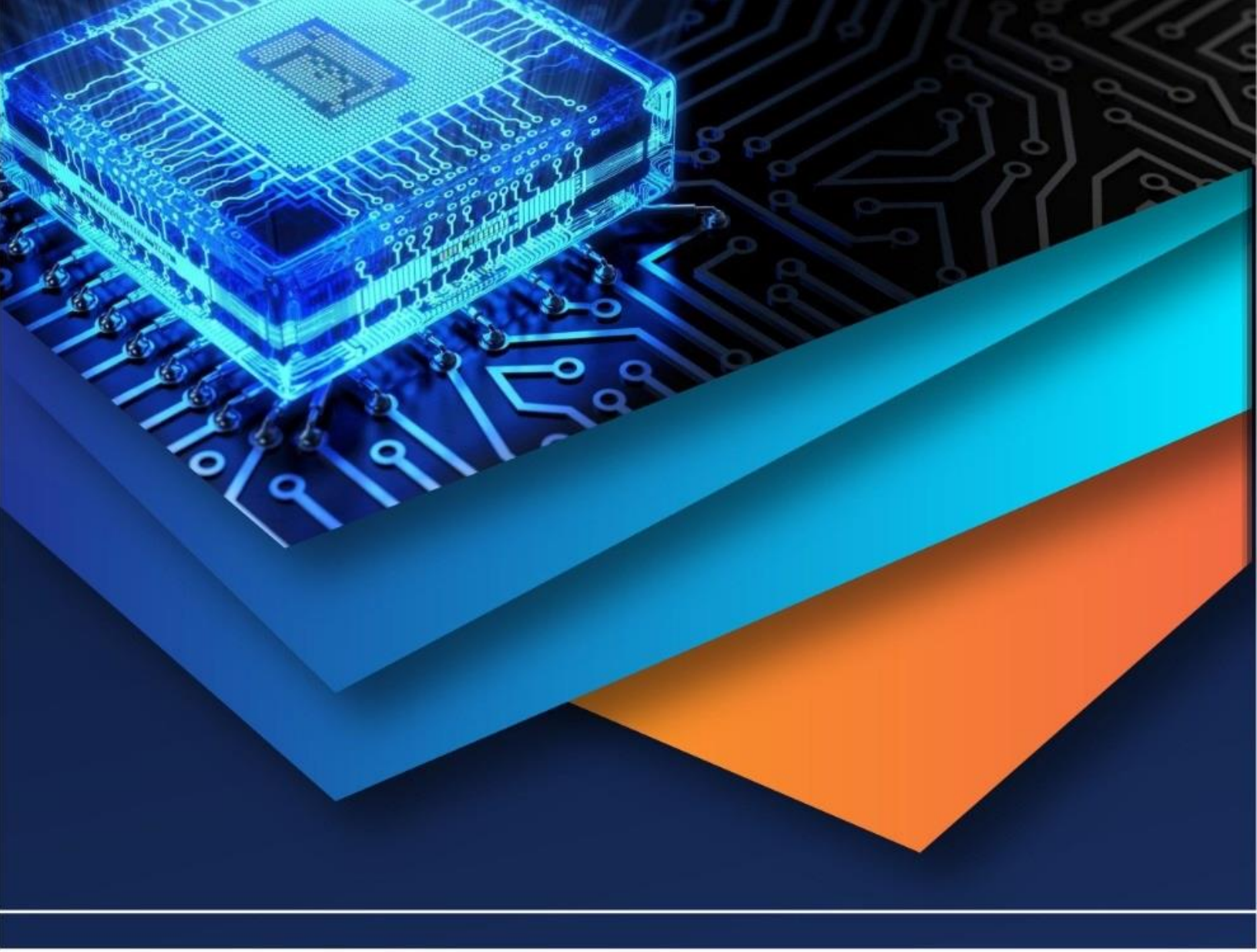
Climate change, ocean acidification, and other anthropogenic environmental effects have made it impossible to sustainably exploit Earth's biological variety as a result of human population increase and rising per capita consumption. This secondary research study purports to further research avenues on relevance of sustainable goals across states of India, Industry impact on biodiversity and ecological balance, Review of Vanishing ecological resources and sustainable goals, Impact of advances in technology on Biodiversity etc., on multifocal approaches.

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