FUTURE TECHNOLOGIES AND TRADITIONAL KNOWLEDGE IN INDIA'S BIODIVERSITY CONSERVATION LANDSCAPE

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Keywords

Abstract

Biodiversity is essential for ecosystem stability, human life, and sustainable development. India is known as one of the world's richest biodiversity hotspots, faces major threats such as pollution, habitat destruction, climate change, and invasive species. This chapter highlights the importance of innovative, integrated, and technology-driven approaches combining tools like eDNA, AI, remote sensing, and CRISPR with TEK for effective conservation. Case studies from India and global examples show the benefits of blending scientific methods with community-based practices. Emerging technologies such as genomics, synthetic biology, drones, and predictive models help monitor species, assess environmental changes, and plan habitat restoration. The study also reviews India's biodiversity policies, including the NBAP, PBRs, and legal innovations like biodiversity credits. Strengthening institutional capacity, ensuring ethical safeguards, and promoting science-policy-community collaboration are essential for future biodiversity governance. A holistic, inclusive, and adaptive strategy is key to reversing biodiversity loss in India.

1. Introduction

Biodiversity plays a vital role in ecosystem it refers to the variety of life on Earth, including genes, species and ecosystem. It providing essential natural services such as food, water, medicine, clean water. These living resources support a wide range of ecological, economic, social, cultural, educational, scientific, and aesthetic needs (Balasubramanian, 2017). India, being one of the 17 megadiverse countries in the world, is home to many unique ecosystems such as wetlands, grasslands, tropical forests, coastal zones, and cold deserts (Dar *et al*., 2022). According to the Ministry of Environment, Forest and Climate Change, around 7.6% of the world's recorded species are found in India. The National Biodiversity Authority (NBA, 2021) states that India has documented over 91,000 animal species and 45,500 plant species, showcasing the country's rich ecological heritage. Biodiversity is essential for maintaining the healthy structure and function of ecosystems. It supports critical natural processes like seed dispersal, pollination, nutrient cycling, pest control and climate regulation. Ecosystems with a

greater variety of species are more resilient and better able to recover from stress caused by disease, drought, or human activities. In a biodiverse country like India, these ecosystem services are crucial for sustaining agriculture, fisheries, and freshwater systems, which directly impact food security and rural livelihoods (Singh & Dash, 2022). The loss of biodiversity not only disrupts these services but also weakens food chains, making ecosystems more vulnerable to environmental changes. Therefore, conserving biodiversity is key to ensuring ecosystem stability and supporting sustainable development in India.
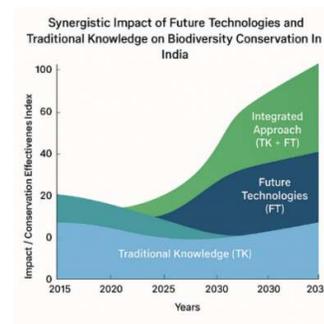

Fig 01: Synergistic impact of future technologies