ISBN: 978-81-991070-0-7

Viksit Bharat @ 2047

Innovation, Inclusion and Sustainable Development

Editors:

Mr. Gourav Kamboj, Dr. Mili,

Ms. Manju Bala, Dr. Tripti Sharma

Bhumi Publishing, India

First Edition: September 2025

Viksit Bharat @ 2047: Innovation, Inclusion and Sustainable Development

(ISBN: 978-81-991070-0-7)

DOI: https://doi.org/10.5281/zenodo.17056182

Editors

Mr. Gourav Kamboj

Dr. Mili

Ms. Manju Bala

Dr. Tripti Sharma

Bhumi Publishing

September 2025

Title: Viksit Bharat @ 2047: Innovation, Inclusion and Sustainable Development

Editors: Mr. Gourav Kamboj, Dr. Mili, Ms. Manju Bala, Dr. Tripti Sharma

First Edition: September 2025

ISBN: 978-81-991070-0-7

DOI: https://doi.org/10.5281/zenodo.17056182

Published by Bhumi Publishing,

a publishing unit of Bhumi Gramin Vikas Sanstha

Bhumi Publishing

Nigave Khalasa, Tal – Karveer, Dist – Kolhapur, Maharashtra, INDIA 416 207

E-mail: bhumipublishing@gmail.com

PREFACE

As we approach the centenary of India's independence in 2047, our nation stands at a critical juncture. The journey so far has been marked by remarkable progress, yet we are acutely aware of the challenges that lie ahead. The vision of a Viksit Bharat, or a Developed India, is not merely an aspiration but a necessity for ensuring a prosperous, equitable, and sustainable future for all its citizens.

The theme of this edited volume, "Viksit Bharat @ 2047: Innovation, Inclusion, and Sustainable Development," encapsulates the essence of our collective endeavor to shape the future of our nation. Through a series of insightful chapters contributed by leading scholars, policymakers, and practitioners, this book explores the multifaceted dimensions of India's development trajectory. The chapters in this volume offer advanced understanding of the complex interplay between innovation, inclusion, and sustainability in the Indian context. They provide valuable insights into the policy frameworks, institutional mechanisms, and grassroots initiatives that can help India achieve its development goals.

As editors, we believe that this book will contribute to a deeper understanding of the challenges and opportunities that lie ahead for India. We hope that it will inspire policymakers, researchers, and practitioners to work together towards building a more prosperous, equitable, and sustainable future for all Indians.

We would like to express our gratitude to the contributors for their insightful chapters and to the publishers for their support in bringing this volume to fruition.

ACKNOWLEDGEMENT

We would like to express our heartfelt gratitude to the contributors, reviewers, publishers, research assistants, and our respective institutions for their invaluable support in bringing this edited book publication, "Viksit Bharat @ 2047: Innovation, Inclusion, and Sustainable Development," to fruition. The esteemed authors have shared their expertise and insights through their chapters, and we appreciate their commitment to this project. The reviewers have provided constructive feedback that has significantly enhanced the quality of this publication. The publishing team has offered guidance and support throughout the publication process, and the research assistants have assisted with various aspects of the book. We are also grateful for the support provided by our institutions, which has enabled us to dedicate time and resources to this project. Their collective efforts have made this publication possible, and we are thankful for their contributions.

- Editors

TABLE OF CONTENT

ENTREPRENEURSHIP AND INNOVATION AS PILLARS OF VIKSIT BHARAT: ROADMAP TO 2047

Priya[1] and Nishita[2]

[1]Amity School of Buisness (ASB) Amity University Patna, Bihar

[2]Amity Institute of Clinical Psychology (AICP) Amity University, Patna, Bihar

Corresponding author E-mail: mishrapriya646@gmail.com, nishitanishita71@gmail.com

Abstract:

Globally, startups are acknowledged as catalysts for social change, economic expansion, and innovation. Entrepreneurship and innovation are emphasised as key pillars of national development in India's vision of Viksit Bharat @ 2047, which marks the country's centenary of independence. This chapter offers a thorough examination of the necessary elements for creating a strong startup ecosystem in India, using insights from top international innovation hotspots like Singapore, Silicon Valley, and Tel Aviv, Israel. Key drivers of entrepreneurial growth are analysed, including government policies, financial accessibility, incubation infrastructure, education and skill reforms, and technological adoption. Successful innovation-led business models are demonstrated by real-world case studies, such as BYJU's, Zerodha, Ather Energy, DeHaat, Tesla, Canva, and Stripe. Particular attention is given to inclusivity, emphasising rural innovators and women entrepreneurs, as well as sustainable practices that support the Sustainable Development Goals (SDGs) of the UN. The chapter concludes with a thorough road map that includes short-, medium-, and long-term strategies to make India a globally competitive, innovation-driven nation by 2047. Both academic rigour and practical applicability are supported by the inclusion of tables, visual descriptions, and APA-referenced sources.

Keywords: Startups, Entrepreneurship, Innovation, Viksit Bharat @ 2047, Ecosystem, Policy, Inclusivity, Sustainable Development, Global Lessons.

1. Introduction:

In the global economy of the twenty-first century, entrepreneurship has become one of the most revolutionary forces, impacting not only how companies function but also how economies, societies, and technological environments are shaped. Startups are essential to accelerating economic growth in today's interconnected world because of their innovation-driven strategy, agility, scalability, and high growth potential. They also promote social inclusion, technological advancement, and global competitiveness (Isenberg, 2011). Startups, as opposed to established businesses, are not bound by legacy systems; they make use of contemporary technologies, quickly adjust to the demands of the market, and frequently completely reshape entire sectors, from banking and education to healthcare, mobility, and agriculture.

The Viksit Bharat @ 2047 vision for India is more than just a long-term development objective; it is a strategic framework for making the country developed, independent, and competitive in the world by the time of its centenary. In order to foster innovation, encourage risk-taking, promote inclusivity, and balance economic growth with sustainability, it is imperative that a vibrant entrepreneurial ecosystem be established. The goal is not just to increase the number of startups by 2047, but also to position India as a global centre of entrepreneurship and innovation that can create solutions that affect both the country and the world.

Current Landscape of Startups in India

In terms of encouraging entrepreneurship, India has already achieved impressive results. In 2024, the nation will have over 100,000 registered startups, including over 111 unicorns, working in a range of industries, including clean energy, mobility, healthcare, fintech, edtech, agritech, and SaaS-based solutions (Invest India, 2024). All together, these startups make a substantial contribution to GDP growth, innovation output, and job creation. India is one of the most promising places in the world for innovation because of its demographic dividend, which includes a young, skilled, and technologically savvy workforce with a median age of about 28 years.

Several factors have contributed to this rapid entrepreneurial growth**:**

1. **Digital Penetration:** With more than 900 million internet users in India, startups can use digital services, e-commerce platforms, and mobile apps to reach large markets.
2. **Policy Support**: Programs like Digital India, Atal Innovation Mission, Startup India, and Fund of Funds for Startups (FFS) offer tax breaks, streamlined rules, and access to capital and coaching.
3. **Technological Access**: As cloud computing, AI, IoT, and fintech solutions become more widely used, entrepreneurs are able to create scalable and advanced technological solutions.

The expansion of angel networks, crowdfunding platforms, private equity (PE), and venture capital (VC) guarantees that promising ideas receive financial support, and government initiatives lower entry barriers for early-stage businesses.

Notwithstanding these developments, difficulties still exist. Significant barriers include lack of funding, particularly for rural and early-stage startups, infrastructure constraints, regional differences, a lack of expertise in emerging technologies, and gender imbalances in entrepreneurship. For India's startup ecosystem to be inclusive, sustainable, and globally competitive, these issues must be resolved.

Startups as Catalysts for Social and Economic Transformation

In India, startups are more than just business ventures; they are forces behind employment, social change, and technological advancement. For instance, by giving farmers access to digital marketplaces, agricultural inputs, and real-time pricing information, agritech

startups with a rural focus are dramatically increasing farmer incomes. Small farmers can more effectively integrate with supply chains, cut waste, and boost profitability with the help of businesses like DeHaat and Ninjacart.

By providing high-quality educational content to students who previously had limited access to qualified teachers and resources, edtech businesses like BYJU's, Vedantu, and Unacademy are revolutionising learning outcomes in Tier-2 and Tier-3 cities. Fintech companies like Zerodha and Paytm are also democratising financial services by making digital payment methods, insurance, and investment accessible to previously marginalised groups. These examples show how startups can address issues of inequality, regional disparity, and access to basic services while also fostering social inclusion and economic growth.

Learning from Global Best Practices

As India charts its roadmap to 2047, understanding global best practices is essential. Innovation hubs such as Silicon Valley in the USA, Tel Aviv in Israel, and Singapore offer valuable insights:

- **Silicon Valley:** Highlights the importance of a culture that tolerates failure, encourages experimentation, and fosters strong university-industry collaboration. Access to venture capital and mentorship networks accelerates innovation.
- **Tel Aviv:** Demonstrates how government-funded research and military-linked technological development can be commercialized into globally competitive deep-tech startups.
- **Singapore:** Provides an example of strategic policy interventions, intellectual property protection, and international collaborations, making the country highly attractive to global investors and entrepreneurs.

While these models offer guidance, India must adapt global strategies to its socio-economic realities, focusing on both urban and rural innovation, supporting grassroots entrepreneurship alongside deep-tech ventures, and ensuring sustainable development.

Strategic Focus Areas for India's Startup Ecosystem

To fully harness the potential of startups by 2047, India must prioritize:

1. **Inclusivity:** Promoting women entrepreneurs, marginalized communities, and rural innovators to ensure equitable access to opportunities. Programs like WE Hub (Telangana) and Stree Shakti (Central Government) provide mentorship, funding, and networking opportunities to women-led startups.
2. **Sustainability:** Encouraging startups that contribute to the UN Sustainable Development Goals (SDGs)—such as clean energy, healthcare, and waste management—aligns business growth with environmental and social responsibility.

3. **Skill Development:** Equipping the workforce with technical, managerial, and entrepreneurial skills through education reforms, vocational training, and digital literacy initiatives is essential to support high-growth startups.
4. **Global Integration:** Facilitating cross-border collaborations, technology transfer, and international market access enhances India's global competitiveness and encourages knowledge exchange.

Roadmap Towards Viksit Bharat @ 2047

India's journey towards a globally competitive startup ecosystem requires a long-term, phased approach**:**

- **Short-term (2025–2030):** Expand incubation centers, simplify regulatory frameworks, and strengthen entrepreneurship education programs at schools and universities.
- **Medium-term (2030–2040):** Scale funding mechanisms, build international partnerships, and promote inclusive entrepreneurship for women, rural innovators, and marginalized groups.
- **Long-term (2040–2047):** Establish India as a global hub for innovation, support deep-tech ventures in AI, biotechnology, and clean energy, and ensure that sustainability principles guide all entrepreneurial activity.

2. Global Lessons for a Vibrant Startup Ecosystem

Successful ecosystems that methodically support startups have been established in nations like the US, Israel, and Singapore. These countries show how entrepreneurship can flourish in environments that are conducive to innovation, policy support, financial accessibility, and cultural attitudes. These examples offer India important insights into regulatory frameworks, investment structures, ecosystem design, and cultural elements that promote innovation and risk-taking. By examining these international models, India can modify and apply tactics that are appropriate for its socioeconomic and demographic circumstances, opening the door for a startup ecosystem that is competitive worldwide by 2047.

2.1 Silicon Valley, USA

One of the most established and well-known startup ecosystems in the world is Silicon Valley. Innovation, an entrepreneurial culture, and a wide-ranging network of technology companies, investors, and research institutions are its main drivers. Lessons can be learnt from the region's success in creating an environment that encourages quick experimentation, taking risks, and growing high-growth businesses.

Key Elements of Silicon Valley:

1. **University-Industry Collaboration:**
    - Universities such as Stanford University and UC Berkeley act as both talent pipelines and innovation incubators.

- These institutions facilitate research commercialization, provide mentorship to startups, and foster entrepreneurial thinking among students.
- Many of the region's unicorns, including Google, Intel, and Cisco, originated from university-linked research projects (Kenney & Zysman, 2016).

2. **Venture Capital Access:**
   - Silicon Valley boasts the highest concentration of venture capital firms globally, creating abundant funding opportunities for early-stage, high-risk startups.
   - This financial ecosystem encourages innovation by allowing entrepreneurs to experiment with disruptive ideas without immediate concern for profitability.
   - Examples include funding rounds for companies like Tesla, Airbnb, and Stripe**,** which benefited from early-stage VC investments to scale globally.
3. **Culture of Risk-Taking and Innovation:**
   - Failure is perceived as a learning opportunity rather than a stigma.
   - This cultural attitude fosters experimentation, enabling startups to pursue high-risk, high-reward ventures.
   - Entrepreneurs are encouraged to pivot, iterate, and refine their business models until they achieve product-market fit.
4. **Clustered Ecosystem:**
   - The geographic concentration of tech companies, investors, incubators, and service providers creates network effects**,** knowledge spillovers, and collaboration opportunities.

Lessons for India: By encouraging university-industry ties, expanding venture capital availability, cultivating a culture that accepts measured risks, and supporting geographic clusters of innovation, India can imitate Silicon Valley.

2.2 Tel Aviv, Israel

The country with the most startups per capita worldwide is Israel, sometimes referred to as the "Startup Nation." Israel has established a deep-tech and innovation-led ecosystem that can compete on the global stage, despite its small population. High R&D expenditure, military-driven technology exposure, and proactive government support are the key factors contributing to its success.

Key Elements of Tel Aviv's Ecosystem:

1. **High R&D Investment:**
   - Israel invests approximately 4.9% of its GDP in research and development**,** one of the highest globally.
   - Government-funded research programs incentivize innovation in fields such as cybersecurity, AI, biotechnology, and defense technologies.

2. **Military-Driven Innovation:**
    - Compulsory military service exposes young individuals to advanced technologies, problem-solving, and leadership skills**.**
    - Units like the IDF's Unit 8200 serve as incubators for tech talent, producing entrepreneurs who later establish successful startups.
3. **Government Support:**
    - Agencies like the Israel Innovation Authority provide grants, incubation programs, and low-interest loans to reduce early-stage financial risk.
    - The government's proactive role accelerates technology commercialization, bridges the gap between research and market deployment, and attracts foreign investment (Senor & Singer, 2009).
4. **Global Orientation:**
    - Israeli startups often target international markets from inception due to the country's small domestic market, fostering export-oriented innovation.

Lessons for India: By increasing R&D spending, incorporating technology-focused skill development programs, and assisting startups with government grants and incubation programs, India can take a cue from Israel's model. Additionally, encouraging startups to prioritise the global market can aid Indian businesses looking to expand globally.

2.3 Singapore

Singapore provides a hybrid model that combines effective private sector operations with strong government leadership, creating a highly effective and globally connected startup ecosystem. Singapore is a hub for global businesspeople and is ideally situated to reach markets in Southeast Asia.

Key Elements of Singapore's Ecosystem:

1. **Low Taxes and Grants:**
    - The government provides tax incentives, R&D grants, and startup-friendly funding to reduce financial barriers for entrepreneurs.
    - Early-stage support encourages experimentation and lowers entry risks for high-potential ventures.
2. **Global Market Access:**
    - Singapore's strategic geographic location connects startups to regional and global markets, facilitating international expansion.
    - Government policies promote trade, foreign partnerships, and cross-border investments**,** ensuring startups are globally competitive.
3. **Efficient Regulation and Ease of Doing Business:**
    - Streamlined processes for business registration, intellectual property protection, and regulatory approvals attract foreign entrepreneurs.

- Efficient legal and financial infrastructure reduces operational barriers, making Singapore a preferred destination for startups in Asia.

4. **Collaborative Public-Private Ecosystem:**
   - Initiatives like Enterprise Singapore foster collaboration between government agencies, private investors, and entrepreneurs.
   - Focus on talent development, international collaboration, and global market integration enhances ecosystem resilience.

Lessons for India: By easing regulations, facilitating business transactions, and encouraging regional hubs that link startups to international markets, India can take a cue from Singapore. Collaboration between the public and private sectors can guarantee ongoing support for high-growth projects and chances for global scaling.

Table 1: Key Success Factors in Global Startup Hubs

Factor	Silicon Valley (USA)	Tel Aviv (Israel)	Singapore
Venture Capital Access	Very High	Moderate	High
Government Role	Minimal	Active	Highly Active
R&D Spending (% of GDP)	~3.1%	~4.9%	~2.2%
University-Industry Links	Strong	Strong	Strong
Cultural Risk Appetite	Very High	High	Moderate
Market Orientation	Domestic + Global	Global	Regional + Global

Summary of Global Lessons for India

1. **Funding and Risk-Taking:** India must increase early-stage funding and foster a culture where failure is considered a learning experience, not a stigma.
2. **R&D and Innovation:** Investment in research, especially in emerging technologies such as AI, biotech, and renewable energy, can drive deep-tech innovation.
3. **Education-Industry Collaboration:** Linking universities, research institutes, and startups can create a pipeline of entrepreneurial talent.
4. **Government Support:** Strategic grants, incubation programs, and simplified regulations can reduce barriers and encourage experimentation.
5. **Global Orientation:** Encouraging startups to think internationally from inception can increase global competitiveness.
6. **Public-Private Partnerships:** Collaboration between government agencies, private investors, and incubators enhances ecosystem resilience and scalability.

3. The Indian Startup Landscape

Over the past ten years, India's startup ecosystem has expanded quickly thanks to a confluence of factors including digital infrastructure, policy support, technology adoption, and a thriving entrepreneurial culture. Startups are now major drivers of social innovation, economic growth, and job creation, filling gaps in mobility, healthcare, education, agriculture, and finance.

Together, the public, commercial, and civil society sectors have fostered an environment that encourages innovation, scalability, and international competitiveness.

3.1 Policy Initiatives

The Government of India has implemented several policy measures to simplify the startup journey, reduce regulatory bottlenecks, and provide financial support:

- **Startup India (2016):** Provides tax exemptions for eligible startups, facilitates faster Intellectual Property Rights (IPR) filing, and eases regulatory compliance. It also promotes awareness programs and mentorship support, creating a supportive environment for first-time entrepreneurs.
- **Fund of Funds for Startups (FFS):** Offers government-backed capital to early-stage ventures, enabling startups in seed and pre-Series A stages to access much-needed funding without depending entirely on private investors.
- **Digital India:** Expands digital connectivity, increases internet penetration in rural and semi-urban areas, and promotes digital payment adoption, allowing startups to reach wider markets efficiently.
- **Atal Innovation Mission (AIM):** Supports innovation and entrepreneurship through incubation centers, innovation labs in schools, and grant funding for technology-driven startups.

These initiatives collectively reduce entry barriers, encourage experimentation, and promote a culture of entrepreneurship across India.

3.2 Sectoral Growth

The Indian startup ecosystem is characterized by diverse sectoral growth, reflecting the country's socio-economic needs and technological advancements:

- **Fintech:** Companies like Razorpay, PhonePe, and Paytm are revolutionizing digital payments, lending, and financial inclusion, particularly for small businesses and underserved populations.
- **Edtech:** Platforms such as BYJU's, Unacademy, and Vedantu are transforming learning outcomes by leveraging AI, gamification, and adaptive learning technologies to reach students in Tier-2 and Tier-3 cities.
- **Agritech:** Startups like DeHaat, Stellapps, and Ninjacart provide farmers with access to AI-driven crop advisory, market linkages, inputs, and supply chain solutions, increasing productivity and income.
- **Mobility & EVs:** Companies like Ola Electric and Ather Energy are driving sustainable urban mobility solutions, promoting electric vehicle adoption, and creating new energy-efficient ecosystems.

3.3 Challenges

Despite the rapid growth of the startup ecosystem, several challenges remain:

- **Limited Access to Seed Funding:** Tier-2 and Tier-3 cities often lack sufficient early-stage funding, leading to concentration of startups in metro regions.
- **Complex Regulatory Compliance:** Even after reforms, regulatory procedures, taxation, and licensing can be cumbersome for first-time entrepreneurs.
- **Skill Shortages:** There is a shortage of skilled professionals in emerging technologies like AI, blockchain, IoT, and renewable energy, limiting the capacity of startups to scale innovative solutions.
- **Market Penetration:** Reaching rural markets or creating nationwide distribution networks remains a challenge for startups with limited resources.

Addressing these challenges is crucial for creating a balanced and sustainable startup ecosystem across India**.**

4. Pillars of a Thriving Startup Ecosystem

A robust startup ecosystem relies on multiple interconnected pillars that work together to support innovation, growth, and global competitiveness:

4.1 Policy & Regulatory Support

By lowering uncertainty and boosting investor confidence, clear, predictable, and transparent policies promote entrepreneurship. The startup recognition program of the Department for Promotion of Industry and Internal Trade (DPIIT) expedites IPR procedures, streamlines tax filings, and grants qualified startups regulatory exemptions. The goals of ongoing reforms are to encourage the adoption of technology, facilitate compliance for micro and small businesses, and provide incentives for sustainable business practices.

4.2 Access to Finance & Investment

Financial support is critical for innovation and scaling:

- **Venture Capital (VC) and Private Equity (PE):** Provide growth capital for high-potential startups.
- **Angel Networks & Crowdfunding Platforms:** Offer early-stage support, enabling entrepreneurs to convert ideas into viable businesses.
- **Funding Statistics:** In 2022, Indian startups collectively raised $24 billion, yet funding remained heavily concentrated in Tier-1 cities like Bangalore, Mumbai, and Delhi (IVCA, 2023).

Expanding access to finance across Tier-2 and Tier-3 cities will democratize entrepreneurship and unlock untapped potential.

4.3 Incubation, Acceleration & Mentorship

Incubators and accelerators play a pivotal role in nurturing startups:

- **T-Hub (Hyderabad)** provides co-working spaces, mentorship, investor connections, and sector-specific support.

- **CIIE (IIM Ahmedabad)** facilitates startup funding, global linkages, and skill development programs.
- **Incubation Impact:** Startups supported by incubators show higher survival rates, better access to funding, and accelerated product-market fit.

Mentorship from experienced entrepreneurs and industry experts is crucial to navigating early-stage challenges and scaling successfully.

4.4 Technology & Infrastructure

Technological adoption and infrastructure support are foundational for scaling startups:

- **Affordable Internet Access:** Initiatives by Jio and other telecom providers have drastically reduced internet costs, enabling startups to reach wider markets.
- **Cloud Computing & SaaS Platforms:** Facilitate scalable operations without heavy upfront investment in IT infrastructure.
- **Logistics Infrastructure:** Efficient supply chain networks support startups in product distribution across India, including remote regions.

5. Role of Innovation in Entrepreneurship

Innovation differentiates startups from conventional businesses:

- **Product Innovation:** Example: Ola Electric's EV scooters provide sustainable mobility solutions addressing urban transport challenges.
- **Process Innovation:** Example: Zerodha's discount brokerage model disrupted traditional stock trading and democratized financial markets.
- **Business Model Innovation:** Example: Paytm's super-app integrates multiple financial services into a single platform, enhancing user convenience.

Looking forward, sustainability-driven innovation will be central, ensuring alignment with the UN Sustainable Development Goals (SDGs) and India's environmental objectives.

6. Inclusive Growth through Startups

Startups also serve as vehicles for inclusive growth, promoting equity and empowerment:

6.1 Women Entrepreneurs (Naari Shakti)

- Women-led startups like Nykaa, Sugar Cosmetics, and UrbanClap demonstrate the economic and social impact of gender-inclusive entrepreneurship.
- Support initiatives such as WE Hub provide mentorship, networking, and funding opportunities specifically for women entrepreneurs.

6.2 Rural Entrepreneurship

- Rural startups like DeHaat connect farmers to inputs, AI-driven crop advisory, and markets, increasing income and improving livelihoods.
- These startups bridge the urban-rural innovation divide and create opportunities for sustainable economic development.

6.3 Social Enterprises

- Companies such as SELCO Solar and AgroStar deliver social impact by bringing clean energy and modern agricultural tools to underserved populations.
- These enterprises create dual value—economic growth and social well-being—demonstrating the potential of startups to solve societal challenges.

7. Roadmap to 2047

Achieving a globally competitive startup ecosystem by 2047 requires phased strategic planning**:**

Short-term (2024–2030):

- Simplify regulatory processes and reduce compliance complexity.
- Expand incubation centers and accelerators to Tier-2 and Tier-3 cities.
- Increase availability of seed funding and government-backed venture capital.

Medium-term (2030–2040):

- Strengthen R&D in frontier technologies such as AI, biotechnology, and renewable energy**.**
- Establish 10 globally recognized startup hubs in key Indian cities.
- Encourage cross-border partnerships and global market integration.

Long-term (2040–2047):

- Achieve a balanced urban-rural startup ecosystem, fostering inclusive growth.
- Make India a global leader in sustainable innovation, aligning startups with SDGs.
- Integrate entrepreneurship into the national education curriculum, cultivating an entrepreneurial mindset across generations.

Table 2: Milestones for Viksit Bharat @ 2047

Phase	Key Actions	Expected Outcome
2024–2030	Policy reforms, seed funding, incubation	Increased startup formation
2030–2040	Global partnerships, R&D investment, hubs	Enhanced innovation & competitiveness
2040–2047	Sustainability integration, nationwide scale	India as a global innovation leader

8. Case Studies

Examining successful startups both in India and globally provides practical insights into innovation, scaling strategies, business model design, and ecosystem utilization. These case studies demonstrate how technology, customer focus, and visionary leadership can transform industries and contribute to economic and social development.

8.1 BYJU's (India)

BYJU's began as a small coaching venture focusing on providing personalized learning solutions for students in India. Leveraging mobile technology, gamified content, and adaptive learning algorithms, the company transformed the edtech landscape:

- **Growth Strategy:** BYJU's expanded rapidly through acquisitions of international edtech companies like Osmo and WhiteHat Jr**,** enabling it to enter global markets.
- **Innovation:** The platform uses AI-driven adaptive learning to tailor content to individual student needs, enhancing engagement and retention.
- **Impact:** BYJU's has over 150 million registered users globally, including millions in underserved regions, improving access to quality education.

Lessons for India: Education-focused startups can scale by combining technology, content innovation, and global expansion strategies while addressing local learning challenges.

8.2 Zerodha (India)

Zerodha disrupted India's traditional stock brokerage market by introducing **a** discount brokerage model, making investment more accessible to retail investors:

- **Innovation:** Technology-driven platforms allow users to trade stocks at minimal fees, replacing conventional commission-heavy models.
- **Scalability:** With over 6 million clients**,** Zerodha demonstrates how digital solutions can expand market participation across demographics.
- **Business Model:** Revenue is primarily subscription-based, highlighting sustainable financial models for startups.

Lessons for India: Startups can democratize access to services and scale rapidly by leveraging technology to reduce costs and improve user experience.

8.3 Ather Energy (India)

Ather Energy exemplifies green mobility innovation through smart electric scooters and charging infrastructure:

- **Technology Integration:** Ather scooters feature connected dashboards, real-time navigation, and AI-driven performance optimization.
- **Sustainability:** Promotes clean energy and reduces urban pollution while creating a model for EV infrastructure development.
- **Market Impact:** Competes effectively with traditional two-wheeler manufacturers by offering superior user experience and innovative features.

Lessons for India: Startups in sustainability-focused sectors can combine technology, design, and infrastructure development to create scalable solutions that align with environmental goals.

8.4 Tesla (USA)

Tesla is a global benchmark for clean-energy innovation and disruption in the automotive industry:

- **Visionary Leadership:** Under Elon Musk, Tesla pursued a mission-driven approach to accelerate the world's transition to sustainable energy.
- **Innovation:** Tesla pioneered electric vehicles, battery technology, and autonomous driving solutions.
- **Global Strategy:** Effective marketing, production scaling, and international market penetration positioned Tesla as a global leader in EVs.

Lessons for India: Visionary leadership combined with innovation and strategic global positioning can enable startups to disrupt traditional industries.

8.5 Canva (Australia)

Canva transformed graphic design by making it accessible and user-friendly:

- **Business Model:** Cloud-based platform with freemium and subscription options allows users of all skill levels to create professional designs.
- **Global Reach:** Serves over 100 million users across more than 190 countries, demonstrating the scalability of intuitive software solutions.
- **Innovation:** Simplified complex design tools and integrated collaborative features, appealing to businesses, educators, and individuals.

Lessons for India: User-centric design and global scalability can help technology startups expand beyond domestic markets.

8.6 Stripe (USA)

Stripe revolutionized online payments by simplifying digital financial infrastructure for businesses worldwide:

- **Innovation:** Provides APIs that enable startups and enterprises to integrate payment systems effortlessly.
- **Global Impact:** Supports thousands of startups, reducing the friction of cross-border transactions and enabling rapid scaling.
- **Business Model:** Transaction-based revenue model aligns with user growth, ensuring sustainable income streams.

Lessons for India: Fintech startups can enable other startups by building platforms and infrastructure solutions that scale globally, enhancing ecosystem connectivity.

Conclusion:

India's startup ecosystem is central to achieving the vision of Viksit Bharat @ 2047**.** By combining policy support, access to capital, technological innovation, global partnerships, and

inclusivity, India can establish a sustainable, resilient, and globally competitive entrepreneurial environment**.**

- **Inclusivity as a Core Principle:** Women entrepreneurs, rural innovators, and youth are key drivers of inclusive growth. Startups like Nykaa, DeHaat, and SELCO Solar highlight how entrepreneurship can empower marginalized groups while creating economic and social impact.
- **Technology as an Enabler:** Innovation in digital payments, electric mobility, edtech, and SaaS demonstrates how Indian startups can compete globally and solve domestic challenges.
- **Global Mindset:** Learning from Silicon Valley, Tel Aviv, and Singapore, Indian startups can scale internationally, attract global investment, and participate in worldwide innovation networks.
- **Sustainability Focus:** Aligning startup growth with UN Sustainable Development Goals (SDGs) ensures that entrepreneurship contributes to long-term environmental, social, and economic development.

Startups are no longer just economic instruments—they are vehicles of social change, technological advancement, and national pride. By nurturing innovation, inclusivity, and sustainability, India can transform its entrepreneurial potential into tangible outcomes, positioning itself as a global innovation leader by 2047**.**

In essence, India's startup ecosystem represents a strategic pathway to national development, leveraging the energy, creativity, and resilience of its people to drive economic growth, social equity, and technological leadership for decades to come.

References:

1. Invest India. (2024). *Indian startup ecosystem overview.* https://www.investindia.gov.in
2. IVCA. (2023). *Annual investment report.* Indian Venture Capital Association.
3. Isenberg, D. (2011). *The entrepreneurship ecosystem strategy as a new paradigm for economic policy.* Institute of International European Affairs.
4. Kenney, M., & Zysman, J. (2016). *The rise of the platform economy.* Issues in Science and Technology, 32(3), 61–69.
5. Senor, D., & Singer, S. (2009). *Start-up nation: The story of Israel's economic miracle.* New York: Twelve.
6. United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development.*
7. Startup Genome. (2025). *Global Startup Ecosystem Report 2025.* https://startupgenome.com

8. Reuters. (2025). Venture capital firm Speciale Invest to back Indian startups with $69 million by 2029. https://www.reuters.com/world/india/venture-capital-firm-speciale-invest-back-indian-startups-with-69-million-by-2025-08-12/
9. Business Insider. (2024). Some techies are leaving cushy Silicon Valley jobs to launch startups at home in India. https://www.businessinsider.com/indians-leaving-big-tech-to-launch-startups-back-home-2024-9
10. Times of India. (2024). Chandigarh eyes global spotlight with fintech & innovation hub blueprint. https://timesofindia.indiatimes.com/city/chandigarh/chandigarh-eyes-global-spotlight-with-fintech-innovation-hub-blueprint/articleshow/123243434.cms
11. NASSCOM. (2024). *Indian Tech Startups Report 2024.* https://nasscom.in
12. KPMG. (2023). *India's startup ecosystem: Investment and growth trends.* https://home.kpmg/xx/en/home/insights.html
13. World Bank. (2023). *Doing Business in India 2023.* https://www.worldbank.org/en/country/india/publication/doing-business-2023
14. EY. (2023). *India Startup Barometer 2023.* https://www.ey.com/en_in
15. Global Innovation Index. (2023). *GII 2023: Tracking innovation performance across countries.* https://www.globalinnovationindex.org

INDIA'S ROLE IN GLOBAL GOVERNANCE OF SUSTAINABLE DEVELOPMENT: A POLITICAL SCIENCE PERSPECTIVE ON VIKSIT BHARAT @2047

Tripti Sharma
Department of Political Science
G.M.N. College, Ambala Cantt, Haryana

Abstract:

India, as the world's largest democracy and one of the fastest-growing economies, occupies a pivotal position in the global governance of sustainable development. The vision of *Viksit Bharat @2047* reflects India's aspiration to emerge as a fully developed nation by the centenary of its independence, with innovation, inclusion, and sustainability at its core. This research paper examines India's role in shaping global governance structures related to sustainable development through political science, international relations, and policy analysis. It investigates India's engagement with multilateral institutions such as the United Nations, the G20, BRICS, and climate change platforms like COP summits. The study also highlights the domestic reforms India must undertake to align its national development agenda with global sustainability frameworks. Using a qualitative and analytical methodology, this paper explores the interplay between state capacity, political will, and international cooperation in defining India's trajectory as a leader in sustainable governance. The findings underscore that India's leadership potential rests on balancing national development priorities with international commitments, ensuring inclusivity, and advancing innovation-driven sustainable growth.

Keywords: India, Viksit Bharat @2047, Global Governance, Sustainable Development, Political Science, Multilateralism, Climate Politics, International Relations, Policy Innovation, Inclusive Development.

Research Questions

1. What is India's current role in the global governance of sustainable development?
2. How does the vision of *Viksit Bharat @2047* shape India's approach to international sustainability commitments?
3. In what ways do political institutions and state capacity influence India's global leadership in sustainable governance?
4. What challenges does India face in balancing domestic developmental needs with global sustainability responsibilities?
5. How can India strengthen its position as a global leader in sustainable development by 2047?

Objectives

1. To analyse India's engagement in global governance institutions related to sustainable development.
2. To examine the impact of *Viksit Bharat @2047* on India's international policy orientation.
3. To evaluate India's role in climate negotiations, environmental diplomacy, and SDG implementation.
4. To assess the domestic-international linkage between India's policies and global commitments.
5. To propose strategies for enhancing India's leadership in sustainable global governance by 2047.

Research Methodology

This study employs a qualitative, analytical, and descriptive research methodology grounded in political science approaches to international relations and governance. The methodology includes: Secondary sources such as books, journal articles, policy reports, and government documents on India's foreign policy and sustainable development; Case Study Approach to Analyse India's participation in global institutions (e.g., UN, G20, BRICS, COP summits); Thematic Analysis to Identify the key themes such as climate diplomacy, energy transition, multilateralism, and inclusive growth; Comparative Method to Compare India's sustainability governance strategies with other emerging powers like China and Brazil and; Normative Approach to Evaluate the vision of *Viksit Bharat @2047* to political theories of development and global governance. The study relies primarily on secondary data collected from credible international organizations, government publications, and peer-reviewed scholarship, analyzed through the lens of political science.

Introduction:

The idea of *Viksit Bharat @2047* represents India's long-term developmental vision of becoming a fully developed nation by the centenary of its independence. This vision places innovation, inclusion, and sustainable development at the centre of India's growth trajectory. From a political science perspective, this aspiration is not limited to domestic governance alone but is equally tied to India's role in the international system. In a rapidly globalizing world where issues like climate change, inequality, and sustainable resource management transcend national boundaries, India's contribution to the global governance of sustainable development has become increasingly significant.

Global governance, in political science terms, refers to the framework of institutions, norms, and decision-making processes that facilitate collective action on global issues. Sustainable development, enshrined in the United Nations' Sustainable Development Goals

(SDGs), requires states to cooperate in areas of environment, economy, and social justice. As one of the world's largest democracies, a major emerging economy, and a country with vast developmental challenges, India occupies a unique position. It is simultaneously a voice of the Global South, a rising power in multilateral institutions, and a test case for inclusive sustainable growth.

Historically, India has maintained a dual role: on the one hand, advocating for the rights of developing nations in global forums, and on the other, increasingly taking on responsibilities as a global leader. From the Non-Aligned Movement (NAM) during the Cold War to its contemporary engagement with the G20 and BRICS, India has consistently emphasized equity, justice, and sovereignty principles in international cooperation. With *Viksit Bharat @2047*, India's engagement is expected to shift from being a norm-taker to a norm-shaper, actively contributing to the institutional design and normative frameworks of global governance. Thus, the central question is: how can India, by 2047, leverage its domestic development strategies and democratic institutions to assume a leadership role in shaping global sustainable governance?

Literature Review

The literature on India's role in global governance of sustainable development spans across international relations, comparative politics, and public policy.

Theoretical Foundations

Political science provides multiple approaches to analysing global governance like

- **Realist perspectives,** which argue that states pursue national interest even in global cooperation. From this lens, India's participation in global sustainability forums reflects a strategic need to secure energy resources, protect national sovereignty, and gain bargaining power against developed nations (Mearsheimer, 2001).
- **Liberal institutionalist approaches** highlight the role of multilateral cooperation, international institutions, and interdependence (Keohane, 1984). India's involvement in UN climate negotiations and SDG monitoring mechanisms exemplifies liberal engagement.
- **Constructivist theories** emphasize the role of identity, norms, and ideas (Wendt, 1992). India's identity as a leader of the Global South and its cultural emphasis on harmony with nature (Gandhian ideals of sustainable living) shape its participation in sustainability governance.

These theoretical lenses suggest that India's role is not fixed but is dynamic and evolving within the global order.

India in Global Sustainability Politics

Several scholars have emphasized India's importance in climate and environmental negotiations. Dubash (2017) argues that India balances a developmental state identity with

increasing global responsibility. The principle of "common but differentiated responsibilities" (CBDR), championed by India in climate diplomacy, reflects this balancing act.

Other scholars, such as Saran (2020), highlight India's energy transition as both a domestic challenge and a global opportunity. As the world's third-largest emitter of greenhouse gases, India faces pressure to reduce carbon emissions while sustaining rapid economic growth. Programs like the International Solar Alliance (ISA) demonstrate India's attempt to exercise leadership in renewable energy governance.

India's Engagement with Multilateral Institutions

India's engagement with institutions like the United Nations, World Trade Organization, G20, and BRICS has been widely studied.

- At the UN, India has consistently argued for equity in climate finance and technology transfer.
- In the G20, India has promoted issues of food security, digital inclusion, and sustainable financing.
- Through BRICS, India collaborates with other emerging economies to challenge the dominance of Western institutions.

Scholars like Mohan (2019) note that India's rising economic power has expanded its bargaining capacity, but domestic challenges limit its ability to commit fully to international obligations.

Domestic–International Linkages

The literature also underscores that India's role in global governance is intertwined with its domestic policies.

- Acharya (2014) argues that states like India can only become effective leaders in global governance if domestic institutions are strong.
- India's initiatives, such as Digital India, Swachh Bharat, Atmanirbhar Bharat, and National Solar Mission, are not merely internal programs but also contribute to India's international credibility in sustainable governance.

Thus, India's global standing depends on its ability to translate domestic successes into global leadership.

Vision of Viksit Bharat @2047

Government policy documents and think tank reports (NITI Aayog, 2022) outline the long-term vision of *Viksit Bharat*. These highlight sustainable infrastructure, inclusive growth, digital governance, and environmental stewardship as pillars of development. Scholars argue that India's vision of 2047 will serve as a strategic narrative in global governance, positioning India as not only a developing country seeking support but as a responsible stakeholder shaping the rules of global cooperation.

Synthesis

The literature reveals three important insights:

1. India's role is transitional, that is, from a developing state demanding equity to a rising power expected to contribute leadership.
2. Global governance and domestic politics are inseparable i.e., India's credibility depends on aligning domestic reforms with global commitments.
3. Viksit Bharat @2047 is both a developmental and political project as it represents India's aspiration to reshape global norms on sustainability, inclusion, and governance.

India's Current Role in Global Governance of Sustainable Development

India's role in global governance has undergone a significant transformation since its independence. From being a post-colonial state advocating for sovereignty and equity, India has evolved into an emerging power shaping international norms. In the realm of sustainable development, India's participation is visible across multilateral institutions, climate diplomacy, regional groupings, and developmental partnerships.

India at the United Nations and the Sustainable Development Goals

The United Nations (UN) remains the central platform for global governance of sustainable development, particularly through the 2030 Agenda and Sustainable Development Goals (SDGs). India played an active role in the formulation of the SDGs in 2015, emphasizing that development must balance the three pillars: economic growth, social inclusion, and environmental protection. India's Voluntary National Reviews (VNRs) at the UN High-Level Political Forum demonstrate how domestic policies align with global goals. For instance:

- SDG 1 (No Poverty): Programs like *Pradhan Mantri Jan Dhan Yojana* and *Direct Benefit Transfer (DBT)* schemes.
- SDG 6 (Clean Water and Sanitation): *Swachh Bharat Abhiyan* and *Jal Jeevan Mission*.
- SDG 7 (Affordable and Clean Energy): *National Solar Mission* and *International Solar Alliance (ISA)*.

From a political science perspective, India's UN engagement reflects both Liberal Institutionalism (cooperation in multilateral frameworks) and Constructivism (norm-building through its identity as a voice of the Global South). India insists on equity, justice, and technology transfer, pushing back against Western-dominated narratives that often burden developing nations disproportionately with climate responsibilities.

India and Climate Diplomacy (COP Summits)

Climate change governance is one of the most critical aspects of sustainable development. India has consistently articulated the principle of "Common but Differentiated Responsibilities" (CBDR) in international negotiations.

- At the Paris Agreement (2015), India committed to reducing the emission intensity of GDP by 33–35% by 2030, increasing the share of non-fossil fuels in energy generation, and creating a 2.5–3 billion tonne carbon sink through afforestation.
- At COP26 (Glasgow, 2021), Prime Minister Narendra Modi announced the Panchamrit pledge, including achieving Net Zero by 2070, 500 GW of renewable energy capacity by 2030, and reducing emissions intensity by 45%.
- At COP28 (Dubai, 2023), India pushed for a phasedown of fossil fuels rather than an abrupt phaseout, balancing energy security with sustainability.

India's climate diplomacy demonstrates a realist balancing act, like protecting its right to development while engaging as a responsible stakeholder. The creation of the International Solar Alliance (ISA), launched jointly with France, showcases India's ambition to lead institutional innovation in renewable energy governance.

India in the G20

The G20 has emerged as a critical platform for global economic governance with sustainability dimensions. India's presidency of the G20 in 2023 was historic as it emphasized inclusive and sustainable growth under the theme "One Earth, One Family, One Future."

Key achievements include:

- Launch of the Global Biofuels Alliance, promoting sustainable energy transitions.
- Initiatives for Digital Public Infrastructure (DPI) sharing, reflecting India's success with *Aadhaar* and *UPI* models.
- Focus on climate finance and green development pacts.

From a political science perspective, India's role in the G20 illustrates the emergence of middle powers in shaping global norms. Unlike the UN, where structural inequalities persist, the G20 allows India greater bargaining power as a major economy. The G20 presidency was used not only to highlight domestic developmental models but also to promote India as a bridge between the developed and developing worlds.

India in BRICS and the Global South

India's participation in BRICS (Brazil, Russia, India, China, South Africa) highlights its commitment to building alternative governance structures. The New Development Bank (NDB) established under BRICS, represents an attempt to finance sustainable infrastructure in the Global South, countering Western-dominated institutions like the IMF and World Bank.

India also plays a leadership role in the Voice of the Global South Summit (2023–24), emphasizing inclusive governance and sustainable solutions for developing nations. This reflects a constructivist dimension: India positioning itself as the normative leader of the South.

In addition, India's developmental partnerships in Africa, Southeast Asia, and the Pacific reflect a South–South cooperation model, providing sustainable energy projects, capacity-

building, and digital inclusion initiatives. These efforts strengthen India's credibility in multilateral sustainable governance.

India and Regional Platforms

Beyond global institutions, India engages in regional organizations such as:

- South Asian Association for Regional Cooperation (SAARC) – though limited by political tensions, India has promoted disaster management and climate resilience.
- Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) – focuses on energy cooperation and coastal sustainability.
- Indian Ocean Rim Association (IORA) – promotes blue economy and maritime sustainability.

These regional engagements show how India integrates foreign policy, regional security, and sustainability into one framework, strengthening its global leadership credentials.

Domestic Sustainability Policies as Global Models

India's domestic policies are increasingly projected as models for global governance.

- Renewable Energy: With one of the world's largest renewable energy expansion programs, India is becoming a leader in solar and wind capacity.
- Digital Governance: India's *Digital Public Infrastructure* is being promoted globally as a model for inclusive governance.
- Social Inclusion Programs: Initiatives such as *Ayushman Bharat* (healthcare) and *PM Ujjwala Yojana* (clean cooking fuel) are showcased in global forums as examples of inclusive sustainable development.

These domestic efforts serve a dual purpose: they address India's internal developmental challenges while also enhancing India's soft power in global governance.

Challenges in India's Current Role

Despite its achievements, India faces several constraints in playing a leading role:

- **Energy Dependence:** India still relies heavily on coal for electricity, making its climate commitments challenging.
- **Institutional Capacity:** Bureaucratic hurdles, implementation gaps, and governance challenges reduce India's global credibility.
- **North–South Divide:** Developed countries often criticize India for not committing enough to emission reductions, while developing countries expect India to act as their strongest advocate.
- **Geopolitical Tensions:** Relations with China, regional conflicts, and great-power rivalries limit India's ability to fully exercise leadership in multilateral frameworks.

Thus, while India's role in global governance is significant but constrained, the vision of *Viksit Bharat @2047* offers a framework to expand its leadership in the coming decades.

India's Vision of Viksit Bharat @2047 and Its Implications for Global Sustainable Governance

The vision of *Viksit Bharat @2047* encapsulates India's aspiration to emerge as a developed, inclusive, and sustainable nation by the centenary of independence. For political science, this vision is not only a domestic developmental roadmap but also a strategic narrative for international politics. It shapes how India will be perceived in global governance structures and how it positions itself as a leader in sustainable development.

The Political Dimensions of Viksit Bharat @2047

Political science emphasizes that developmental visions are inherently political. The roadmap to 2047 is framed around three interlinked dimensions:

- **Innovation:** Harnessing technology and science for governance and economic growth.
- **Inclusion:** Strengthening democratic institutions, gender equity, and social justice.
- **Sustainability:** Achieving long-term development without compromising environmental stability.

India's political leadership has articulated this vision as not just a domestic goal, but as a responsibility towards the world. For instance, Prime Minister Narendra Modi's slogan *"One Earth, One Family, One Future"* during India's G20 presidency reflects a cosmopolitan perspective in political theory, emphasizing that India's development is tied to global collective action.

Institutional Reforms for Global Leadership

For India to assume a central role in global governance, domestic institutional reforms are necessary. Political science highlights the importance of state capacity and institutional credibility in international politics.

- **Strengthening Democratic Institutions:** As the world's largest democracy, India's ability to project democratic resilience will strengthen its moral leadership in sustainable governance. Ensuring free elections, judicial independence, and protection of civil liberties are essential for global credibility.
- **Decentralization and Federalism:** India's local governments (Panchayati Raj Institutions and Urban Local Bodies) are critical for implementing sustainable policies. Their success enhances India's global reputation as a model for inclusive governance.
- **Bureaucratic Efficiency:** Institutional reforms to reduce red tape and enhance transparency will improve India's implementation capacity, thus strengthening its ability to honor international commitments.

Thus, the political institutional reforms undertaken in pursuit of *Viksit Bharat @2047* will directly shape India's global standing.

Innovation and Technology Diplomacy

India's future leadership will depend significantly on innovation in governance and technology diplomacy. Political scientists increasingly study how technological capabilities influence global power structures.

- **Digital Public Infrastructure (DPI):** India's success with Aadhaar, UPI, and CoWIN has already been projected internationally. By 2047, if scaled globally, India could lead in digital multilateralism, shaping rules for data governance, AI ethics, and cybersecurity.
- **Green Technology Leadership:** Through initiatives like the International Solar Alliance (ISA) and National Hydrogen Mission, India positions itself as a hub of renewable energy innovation. Technology transfers and partnerships with Africa, Latin America, and Asia strengthen India's role as a South–South leader.
- **Space and Satellite Diplomacy:** By 2047, India's space programs (ISRO, Chandrayaan, Gaganyaan) may contribute to climate monitoring, disaster management, and resource tracking, enhancing its role in global sustainability governance.

This demonstrates a shift from India being a norm follower to a norm entrepreneur, actively shaping governance structures around technology and sustainability.

Inclusive Governance as a Global Norm

Inclusion lies at the heart of *Viksit Bharat @2047*. Political science connects inclusive governance with democratic deepening and legitimacy in global affairs. India's global role will be shaped by how it demonstrates inclusivity at home and promotes it abroad.

- **Gender Inclusion:** Increasing women's participation in politics and policymaking strengthens India's moral authority to champion gender equality in global institutions.
- **Youth Empowerment:** By 2047, India will have one of the world's largest educated youth populations. Their involvement in policymaking, innovation, and diplomacy will reflect India's democratic vitality.
- **Marginalized Voices:** By ensuring representation of minorities, Scheduled Castes, and tribal communities in governance, India can project itself as a model of inclusive democracy, contrasting with authoritarian models of development.

This inclusivity will enhance India's soft power and strengthen its claim as a responsible global leader.

Sustainable Development as Foreign Policy Priority

Political science literature identifies the linkage between domestic policies and foreign policy legitimacy. India's ability to mainstream sustainability in foreign policy will determine its international leadership.

- **Climate Leadership:** India's Net Zero 2070 commitment and expansion of renewable energy capacity can be used diplomatically to argue for greater global equity in climate governance.
- **Blue Economy:** With its vast coastline and Indian Ocean presence, India can lead global governance in maritime sustainability, fisheries, and oceanic biodiversity.
- **Food and Water Security Diplomacy:** By sharing sustainable agricultural practices and water management expertise with developing nations, India can expand its **developmental diplomacy**.

Here, India's approach reflects a constructivist orientation, projecting its developmental identity as a global good.

Balancing National Interest with Global Commitments

India's challenge in 2047 will be to balance national development priorities with global sustainability responsibilities. Political science recognizes this as a dual-level game (Putnam, 1988): domestic politics influences international commitments, and vice versa.

- **Energy Security vs. Climate Goals:** While renewable energy expansion is critical, coal dependency remains a challenge. Balancing these interests requires strategic diplomacy.
- **Economic Growth vs. Environmental Protection:** With aspirations to become a $30 trillion economy by 2047, India must ensure growth does not compromise ecological balance.
- **Sovereignty vs. Multilateralism:** India has historically resisted external interference, but global governance requires compromises in sovereignty for collective action.

Thus, India's political strategy must combine realist self-interest with liberal institutional engagement, navigating between national needs and global expectations.

Geopolitical Implications of Viksit Bharat @2047

By 2047, India is projected to be among the top three economies in the world. This economic rise will translate into greater political influence in global governance.

- **UN Security Council Reform:** India's long-standing demand for permanent membership will gain more legitimacy if it demonstrates leadership in sustainable governance.
- **Multipolarity and South–South Cooperation:** India's vision aligns with creating a **multipolar order** where the Global South has a stronger voice.
- **Strategic Autonomy:** India's foreign policy tradition of non-alignment is evolving into **multi-alignment**, balancing partnerships with the U.S., EU, Russia, and the Global South. By 2047, this flexibility will enhance India's role as a bridge-builder in sustainability governance.

Challenges Ahead

Despite its ambitious vision, India faces constraints:

- **Poverty and Inequality:** Unless domestic inequality is reduced, India's credibility in inclusive governance will be questioned.
- **Institutional Weaknesses:** Corruption, bureaucratic inefficiency, and governance deficits weaken international commitments.
- **Geopolitical Rivalries:** Border tensions with China, instability in South Asia, and great-power competition may divert attention from sustainability priorities.
- **Climate Vulnerabilities:** India remains highly vulnerable to climate disasters, which could undermine developmental gains.

Addressing these challenges will be crucial for India's successful rise as a global sustainability leader.

Synthesis

The vision of *Viksit Bharat @2047* is not merely aspirational but serves as a political strategy for global leadership. Through domestic institutional reforms, innovation-driven governance, inclusive democracy, and sustainability-centered foreign policy, India seeks to redefine its role in global governance. From the lens of political science, India represents a unique case where domestic development, democratic resilience, and international leadership converge to shape the future of sustainable governance.

India's Dual Identity in Global Governance

India operates simultaneously as a developing country seeking equity and as an emerging power shaping global rules. In climate negotiations, India often invokes the principle of Common but Differentiated Responsibilities (CBDR), advocating for the rights of developing nations. At the same time, initiatives like the International Solar Alliance (ISA) demonstrate India's ambition to lead in renewable energy governance. This duality strengthens India's bargaining power and creates tensions between expectations and capacities.

Multilevel Engagement in Global Institutions

India's contributions to UN, G20, BRICS, and regional groupings demonstrate a multilevel engagement strategy. At the UN, India pushes for equity in SDG implementation. In the G20, India is a bridge between the Global North and South. In BRICS, India works with emerging economies to establish alternative development finance institutions. This layered approach reflects India's strategy of balancing liberal institutional engagement with realist national interest.

Domestic–International Linkages

India's global credibility is tied to its domestic achievements. Programs such as *Swachh Bharat Abhiyan, Digital India,* and *National Solar Mission* serve as both domestic reforms and soft power tools in international forums. Political science underscores that state capacity and

institutional strength determine a country's ability to honor international commitments. India's ability to project domestic successes globally enhances its leadership role.

Viksit Bharat @2047 as a Strategic Narrative

The vision of *Viksit Bharat @2047* functions as more than a developmental goal—it is a political narrative for global leadership. By linking domestic development to international responsibilities, India projects itself as a responsible stakeholder in global governance. This vision embodies constructivist dimensions, shaping international norms around inclusion, innovation, and sustainability.

Balancing National Priorities with Global Commitments

India faces the two-level game dilemma (Putnam, 1988), where domestic developmental needs (economic growth, energy security, poverty eradication) must be balanced with international sustainability obligations (carbon neutrality, climate finance, biodiversity protection). India's negotiation strategies reveal a pragmatic balancing act between realist self-interest and liberal cooperation.

Challenges and Constraints

Despite achievements, challenges persist:

- Energy Dependence: Reliance on coal complicates Net Zero goals.
- Institutional Weaknesses: Bureaucratic inefficiency limits effective policy implementation.
- Geopolitical Tensions: Border conflicts and great-power rivalries constrain leadership.
- Socio-economic Inequality: High poverty and inequality undermine India's credibility in advocating inclusive governance globally.

Pathways to 2047

The findings suggest that for India to fulfill its vision of *Viksit Bharat @2047* and assume a leadership role in global sustainable governance, it must:

- Strengthen domestic institutions for effective policy implementation.
- Expand technology diplomacy in digital governance, renewable energy, and climate resilience.
- Prioritize inclusive democracy as a soft power tool.
- Deepen South–South cooperation to amplify the voice of the Global South.
- Balance economic growth with ecological sustainability, adopting a holistic governance approach.

Conclusion:

India stands at a critical juncture in the global governance of sustainable development. From its historical role as a post-colonial advocate of sovereignty and equity, India has evolved into a rising power with growing responsibilities. The vision of *Viksit Bharat @2047* offers a

comprehensive roadmap that ties India's domestic transformation with its international obligations. From a political science perspective, India's role can be understood as a dynamic interplay of realism, liberal institutionalism, and constructivism. Realism explains India's focus on energy security and sovereignty. Liberalism accounts for India's active participation in multilateral institutions. Constructivism highlights India's identity as a voice of the Global South and its projection of inclusive governance as a normative principle.

The future of global sustainable governance will depend on whether countries like India can act as bridges between the developed and developing worlds. By 2047, India's leadership potential lies in its ability to demonstrate that democracy, inclusion, and sustainability are compatible with rapid economic growth. Its domestic policies, institutional reforms, and innovation-driven strategies will serve as both examples to emulate and tools of diplomacy. Yet, challenges remain. Without addressing inequality, corruption, and energy dependence, India's international credibility may be weakened. The test for India is whether it can transform its ambitious rhetoric into tangible outcomes both at home and abroad. In conclusion, *Viksit Bharat @2047* is not just a national aspiration but a political project with global implications. If successfully realized, India will not only achieve the status of a developed nation but also emerge as a leader in global sustainable governance, shaping the rules, norms, and institutions of the 21st century.

Endnotes:

1. Mearsheimer, J. J. (2001). *The tragedy of great power politics*. New York: W.W. Norton & Company.
2. Keohane, R. O. (1984). *After hegemony: Cooperation and discord in the world political economy*. Princeton University Press.
3. Wendt, A. (1992). Anarchy is what states make of it: The social construction of power politics. *International Organization, 46*(2), 391–425.
4. Dubash, N. K. (2017). India's energy and climate policy: A mixed record. *Oxford Handbook of Indian Foreign Policy*. Oxford University Press.
5. Saran, S. (2020). *How India sees the world: Kautilya to the 21st century*. Juggernaut.
6. Mohan, C. R. (2019). *Modi's world: Expanding India's sphere of influence*. HarperCollins.
7. Acharya, A. (2014). *The end of American world order*. Polity Press.
8. Putnam, R. D. (1988). Diplomacy and domestic politics: The logic of two-level games. *International Organization, 42*(3), 427–460.
9. NITI Aayog. (2022). *Viksit Bharat @2047: Strategy for New India*. Government of India.

References:

1. Acharya, A. (2014). *The end of the American world order*. Polity Press.

2. Dubash, N. K. (2017). India's energy and climate policy: A mixed record. In D. Malone, C. Mohan, & S. Raghavan (Eds.), *The Oxford Handbook of Indian Foreign Policy* (pp. 441–457). Oxford University Press.
3. Keohane, R. O. (1984). *After hegemony: Cooperation and discord in the world political economy*. Princeton University Press.
4. Mearsheimer, J. J. (2001). *The tragedy of great power politics*. W.W. Norton & Company.
5. Mohan, C. R. (2019). *Modi's world: Expanding India's sphere of influence*. HarperCollins.
6. NITI Aayog. (2022). *Viksit Bharat @2047: Strategy for New India*. Government of India.
7. Putnam, R. D. (1988). Diplomacy and domestic politics: The logic of two-level games. *International Organization, 42*(3), 427–460.
8. Saran, S. (2020). *How India sees the world: Kautilya to the 21st century*. Juggernaut.
9. Wendt, A. (1992). Anarchy is what states make of it: The social construction of power politics. *International Organization, 46*(2), 391–425.

SPORTS AND FITNESS AS CATALYSTS FOR VIKSIT BHARAT 2047

Jyoti Solanki[1] and Vivek Solanki[2]

[1]Department of Physical Education,
Government College for Girls, Sector-14, Gurugram, Haryana

[2]Department of Physical Education,
Maharaja Surajmal Institute, C-4 Janak Puri, New Delhi

Abstract:

This chapter investigates how sports and fitness can shape India's aspiration of becoming a *Viksit Bharat* (Developed India) by 2047, when the country celebrates 100 years of independence. Developmental narratives often center around economic growth, governance, and technological progress, yet this study argues that physical well-being and athletic culture are equally vital for national advancement. It analyzes the contribution of the sports industry to the economy through employment, tourism, exports, and league-driven revenue. The discussion also explores how investments in sports facilities across cities and villages expand accessibility, while structured sporting activities channel youth energy into constructive pursuits, leadership, and skill development.

Furthermore, the chapter positions fitness as a public health necessity, noting its role in reducing non-communicable diseases, improving workplace efficiency, and enhancing mental health. Sports are also examined as a diplomatic instrument, amplifying India's global influence through hosting international events, sporting excellence, and cultural promotion. The role of flagship programs such as *Khelo India*, the *Fit India Movement*, and the *Target Olympic Podium Scheme (TOPS)*, along with CSR-backed initiatives, is reviewed.

Challenges such as inadequate infrastructure, scarcity of trained experts, and the urban-rural divide are highlighted, with proposed solutions including curriculum-based physical education, stronger public-private partnerships, and the establishment of sports science institutions. The chapter concludes that sports and fitness are not marginal pursuits but integral to India's progress. Embedding them into policy and social life will ensure that by 2047, India emerges not only prosperous and technologically advanced but also healthy, cohesive, and globally respected.

Keywords: Fitness Culture, Non-Communicable Diseases (NCDs), Mental Health, Sports Governance.

1. Introduction:

India, the world's largest democracy and one of the fastest-growing economies, has charted an ambitious course toward becoming a *Viksit Bharat* (Developed India) by 2047, marking a century since independence. This vision is not limited to achieving higher GDP

figures or industrial progress but encompasses a holistic approach to nation-building—anchored in innovation, environmental sustainability, inclusivity, and the overall well-being of its citizens. Central to this transformation is the strengthening of human capital: a population that is healthy, skilled, resilient, and motivated to contribute meaningfully to society.

Historically, national development strategies have placed stronger emphasis on sectors such as agriculture, industry, technology, education, and defense. While these remain critical pillars, sports and fitness have often been relegated to the margins of policy discourse, perceived as secondary or recreational pursuits rather than instruments of progress. However, in recent years, a paradigm shift has emerged. Policymakers, scholars, and civil society increasingly recognize that sports and fitness play a transformative role not only in enhancing individual well-being but also in shaping collective identity and driving sustainable development.

Sports extend far beyond competitive achievements. They foster discipline, teamwork, perseverance, and leadership qualities among youth—traits that translate into productivity and innovation in the workforce. Moreover, sporting success elevates national pride and enhances India's global standing through the soft power of sports diplomacy. Fitness, on the other hand, directly addresses public health challenges. With non-communicable diseases rising rapidly due to sedentary lifestyles, widespread fitness awareness reduces healthcare costs, improves workplace efficiency, and enhances life expectancy. Together, sports and fitness strengthen the very fabric of society by building community cohesion, promoting inclusivity, and bridging rural-urban divides.

As India progresses toward its centenary of independence, the inclusion of sports and fitness within the broader framework of national development is not a matter of choice but necessity. They represent vital accelerators of economic growth, social integration, health security, and diplomatic engagement. Recognizing this, the Government of India has introduced several initiatives, such as *Khelo India*, the *Fit India Movement*, and the *Target Olympic Podium Scheme*, which reflect a renewed commitment to institutionalizing sports and fitness as drivers of progress.

This chapter explores these dimensions in depth, analyzing the multifaceted role of sports and fitness in shaping India's journey toward becoming a developed nation by 2047. It examines how they contribute to economic and social advancement, strengthen international relations, and promote sustainable development, while also identifying the structural challenges and policy gaps that must be addressed to unlock their full potential.

2. Sports as a Driver of National Progress

2.1 Economic Contribution:

Sports have evolved from being regarded merely as a recreational pursuit into a globally recognized industry. In India too, this sector has grown remarkably, contributing to GDP, creating livelihoods, and opening up new markets.

a) Growth of the Sports Economy

The emergence of professional leagues such as the Indian Premier League (IPL), Pro Kabaddi League (PKL), Indian Super League (ISL), and Ultimate Table Tennis demonstrates India's rising sports culture. These leagues have attracted domestic and foreign investment, sponsorships, and global broadcasting contracts. The IPL alone, valued at over USD 10 billion, exemplifies how sport can become an economic powerhouse.

According to recent estimates, the Indian sports sector was worth nearly ₹9,000 crore in 2023, with projections of doubling by the end of this decade. Beyond ticketing, revenues are increasingly generated through broadcasting rights, merchandise sales, sponsorship deals, sports tourism, and digital content creation.

Emerging areas such as esports, adventure sports, and fitness tourism are adding further momentum. With a youthful demographic and a rising middle class, India presents a vast consumer base, ensuring that the sports economy will continue to expand.

b) Employment Opportunities

The sports ecosystem creates diverse employment avenues:

- **Coaching and Training:** Schools, universities, and academies require certified coaches, trainers, and physical education experts.
- **Sports Medicine and Science:** Physiotherapists, psychologists, analysts, and nutritionists play key roles in athlete performance.
- **Event and Administration Roles:** Major tournaments such as the IPL or Commonwealth Games generate thousands of jobs in logistics, ticketing, operations, and broadcasting.
- **Media and Creative Services:** Journalism, photography, advertising, and influencer marketing add to the broader ecosystem.

Government initiatives like *Khelo India* and *Start-Up India* are also encouraging sports entrepreneurship, especially in sports technology and fitness-related.

c) Sports Goods and Wellness Exports

India has a strong tradition in manufacturing sports equipment. Regions such as Jalandhar, Meerut, and Ludhiana are well known for producing cricket bats, footballs, hockey sticks, and related gear, which are exported globally. The *Make in India* campaign has further boosted the international visibility of these exports.

Alongside goods, India also exports wellness services. Yoga instructors, trainers, and holistic fitness professionals are in growing demand worldwide, strengthening India's cultural and economic influence abroad. Together, these trends reinforce India's position as both a sports producer and a global wellness hub.

2.2 Infrastructure in Urban and Rural India:

For talent to flourish and participation to widen, accessible and modern sports infrastructure is essential.

a) Expanding Facilities Beyond Metros

Earlier, advanced sports facilities were mostly concentrated in metropolitan areas. However, recent years have seen targeted investments in Tier II and Tier III cities, leading to the construction of multipurpose stadiums, training academies, and community sports centers. The inclusion of sports in the *Smart Cities Mission* highlights its rising importance in urban development. These projects stimulate local economies by attracting visitors, generating employment, and inspiring young athletes.

b) Flagship Programs Promoting Infrastructure

- **Khelo India (2018–present):** Focused on nurturing grassroots talent through scholarships, infrastructure development, and annual games.
- **Fit India Movement (2019–present):** Encourages individuals, schools, and workplaces to adopt a fitness-oriented lifestyle.
- **Target Olympic Podium Scheme (TOPS):** Supports elite athletes with coaching, financial aid, and international exposure.

Together, these initiatives reduce the urban-rural disparity and embed sporting culture into everyday life.

2.3 Engaging Youth and Building Skills:

India's demographic advantage — with nearly two-thirds of its population below 35 years — makes youth participation in sports particularly significant.

a) Addressing Social Challenges Through Sports

In regions struggling with unemployment, crime, or drug abuse, sports serve as constructive outlets for youth energy. For example, community sports programs in Punjab are helping to fight substance abuse, while similar initiatives in Jammu & Kashmir and the Northeast provide young people with alternatives to conflict-related challenges. These programs foster belonging, self-worth, and structured engagement.

b) Developing Life Skills

Participation in sports nurtures qualities that are crucial beyond the field:

- **Discipline** through regular training routines.
- **Teamwork** through collaboration and strategy.
- **Leadership** through responsibility, decision-making, and resilience.

Such skills are transferable to workplaces, producing a more cooperative and efficient workforce.

c) Pathways for Sports-Based Careers

- Training programs in sports management, physiotherapy, fitness coaching, and journalism are increasingly available.
- Scholarships provide support for promising athletes at multiple levels.
- Government and public sector organizations offer job reservations for sportspersons, ensuring career stability.

By expanding opportunities, sports are emerging as a credible and respected career option for India's youth.

3. Fitness For a Healthy and Productive Bharat

Sports and fitness are not simply forms of entertainment or leisure — they are foundational to public health, productivity, and national well-being. A fit population reduces healthcare burdens, enhances workforce efficiency, and strengthens resilience against physical and mental health challenges.

3.1 Public Health Advantages:

a) Tackling Non-Communicable Diseases (NCDs)

India is facing a rapid rise in lifestyle-related illnesses such as diabetes, hypertension, cardiovascular conditions, and obesity, which account for over 60% of total deaths (WHO, 2022). Regular physical activity, combined with balanced nutrition, is one of the most effective tools for preventing and managing these conditions.

b) Reducing Healthcare Expenditure

Preventive fitness measures ease pressure on both families and the healthcare system. By lowering the incidence of costly chronic illnesses, households save on medical expenses while the government can redirect resources from treatment toward wellness-oriented initiatives. This aligns closely with the goals of *Ayushman Bharat* and the *National Health Policy*, which emphasize preventive health.

c) Building Habits through School Programs

Early exposure to structured physical activity helps inculcate lifelong habits. Programs such as the *Fit India School Certification* and yoga-based sessions under the *School Health and Wellness Programme* have shown tangible benefits — improved student focus, reduced absenteeism, and better academic outcomes.

3.2 Mental Health and Emotional Well-being:

a) Reducing Stress, Anxiety, and Depression

Regular exercise is linked with improved mood, better sleep, and lower stress hormone levels. Group activities such as community yoga classes, running clubs, and sports leagues also create social bonds, which provide an added shield against loneliness and mental health struggles.

b) Building Psychological Resilience

Sports and fitness nurture inner strength by teaching individuals to cope with pressure, recover from setbacks, and maintain confidence. For students, this means greater capacity to handle academic competition; for professionals, it helps manage workplace stress; and for entrepreneurs, it builds perseverance in uncertain environments.

A population that is both physically active and mentally resilient is indispensable for innovation, entrepreneurship, and nation-building.

4. Sports Diplomacy and India's Global Standing

Sports today extend far beyond fields and stadiums — they serve as instruments of diplomacy, cultural exchange, and national branding. For India, sporting success and international participation are valuable tools for enhancing its soft power and strengthening global presence.

a) Strengthening Global Image through Achievements

Victories on the world stage elevate India's identity as an emerging sporting nation. Milestones such as Neeraj Chopra's Olympic gold medal in javelin, P.V. Sindhu's triumphs in international badminton, and India's continued dominance in cricket showcase national excellence. Consistent medal-winning performances at the Olympics and world championships are essential for India's long-term ambition of joining the ranks of the top ten sporting nations by 2047.

b) Hosting Mega International Events

India has repeatedly demonstrated its ability to organize major global competitions, including the Cricket World Cup, the Commonwealth Games, the FIFA U-17 World Cup, and the Chess Olympiad. Such events generate tourism, provide economic stimulus, and reinforce India's reputation as a capable and welcoming host. Future aspirations — such as bidding for the Asian Games or even the Olympics — further reflect the country's growing global ambitions.

c) Sports as a Bridge Across Cultures

Sport serves as a universal language, breaking barriers of region, religion, and language. National competitions like *Khelo India* and the National Games bring together athletes from diverse backgrounds, highlighting India's unity in diversity. At the international level, the growing popularity of indigenous sports such as kabaddi and kho-kho strengthens India's cultural footprint abroad. By blending modern achievements with traditional heritage, India projects itself as both a progressive and culturally rooted nation.

5. Policy Landscape and Government Initiatives

The transformation of India's sporting culture is not happening in isolation — it is being shaped by a combination of government policies, institutional frameworks, and corporate participation. Together, these measures provide the structural foundation necessary for embedding sports and fitness into the national development agenda.

a) National Sports Policy and Physical Fitness Framework

The National Sports Policy emphasizes two parallel goals: encouraging mass participation in physical activity and nurturing excellence at the elite level. Complementing this, the *National Physical Fitness Programme (NPFP)* introduces structured fitness assessments in schools, ensuring that children view physical activity as a core part of education rather than a leisure option. This dual approach strengthens both grassroots participation and competitive performance.

b) University-Level Games and Youth Initiatives

The *Khelo India University Games* act as a feeder system for identifying and developing young athletes, bridging the gap between college-level sports and national representation. Similarly, the *National Youth Festival* provides a platform for cultural exchange, leadership development, and the promotion of traditional sports. Both initiatives ensure that youth — India's largest demographic resource — remain central to the country's sporting vision.

c) Budgetary Support and Corporate Engagement

In recent years, government funding for sports authorities and federations has steadily increased. Institutions such as the Sports Authority of India (SAI) receive enhanced allocations for infrastructure, coaching, and athlete development. Alongside this, corporate social responsibility (CSR) investments have become a major driver of sports development. Organizations such as Reliance Foundation, JSW Sports, and Tata Trusts have invested in training academies, scholarships, and grassroots talent programs.

Public-private partnerships (PPP) ensure that sports development is not entirely dependent on the state but supported through innovation, resources, and long-term sustainability.

6.1 Challenges

Despite significant progress, India's sports and fitness ecosystem continues to face systemic challenges that hinder its full potential. Addressing these issues is essential for achieving the vision of *Viksit Bharat 2047*.

a) Weak Grassroots Infrastructure

One of the most critical concerns is the shortage of basic sports facilities in rural and semi-urban areas, where a majority of the population lives. While metropolitan cities have access to modern stadiums and training centers, many villages and small towns lack even safe playgrounds.

- **Play Spaces:** School playgrounds are often encroached upon or neglected, depriving children of opportunities to engage in sports.
- **Equipment Access:** Athletes in rural areas frequently rely on improvised gear, which restricts both safety and skill development.
- **Limited Competitions:** The absence of structured competitions at the school or community level means that talent often goes unnoticed.

Without strengthening grassroots infrastructure, India risks overlooking vast pools of potential talent.

b) Shortage of Coaches and Sports Science Experts

Even in areas with infrastructure, the lack of qualified professionals restricts growth.

- **Coaching Gaps:** Many grassroots coaches use outdated methods, limiting athlete development.
- **Scientific Expertise:** Fields such as biomechanics, performance analysis, and exercise physiology are underdeveloped in India.
- **Medical Support:** The shortage of physiotherapists, nutritionists, and psychologists means that injuries are often mishandled, and athletes do not receive holistic care.

This skills gap prevents Indian athletes from reaching their highest potential on the global stage.

c) Urban–Rural Divide

Opportunities in sports remain unevenly distributed between urban and rural regions.

- **Infrastructure Inequality:** Cities benefit from better facilities and sponsorships, while villages struggle with minimal resources.
- **Exposure Gap:** Rural athletes lack access to advanced training or international-standard competitions.
- **Financial Barriers:** Even when rural talent is identified, limited financial support restricts access to training camps and tournaments.

This divide is particularly concerning since many of India's most celebrated athletes — especially in wrestling, hockey, and athletics — have historically come from rural backgrounds.

d) Social and Cultural Barriers

Cultural attitudes also hinder sports participation, especially for girls and differently-abled individuals.

- **Gender Bias:** In some regions, girls face restrictions on playing sports due to stigma or safety concerns.
- **Academic Priority:** Many families and schools prioritize academics over physical activity, discouraging children from pursuing sports seriously.
- **Lack of Awareness:** Families often overlook diverse career opportunities in sports, such as coaching, management, or physiotherapy.

Transforming mindsets is as important as building facilities, since social acceptance determines participation levels.

e) Fragmented Governance and Policy Execution

The governance of sports in India is often marked by inefficiency and poor coordination.

- **Overlapping Authorities:** Multiple federations and ministries create confusion and dilute accountability.

- **Corruption and Mismanagement:** Nepotism and financial irregularities undermine trust in sporting bodies.
- **Short-Term Vision:** Policies are frequently medal-driven rather than focused on long-term grassroots development.

Unless governance is streamlined and transparent, even the best-designed initiatives risk falling short of impact.

6.2 Recommendations:

To transform India into a sporting and fitness-driven nation aligned with the vision of *Viksit Bharat 2047*, a multi-dimensional strategy is needed. This requires policy reform, infrastructure development, private-sector engagement, and cultural change.

a) Integrating Sports into Education

Sports must be treated as a core component of education rather than an optional extracurricular activity.

- **Mandatory Physical Education:** National standards should make physical education a compulsory subject, with participation and performance assessed formally.
- **Academic Credits:** Students should earn credits for sports achievements, contributing to grades or scholarships.
- **Regular Competitions:** Schools and colleges must hold annual sports events, giving every student exposure to structured competition.

This approach will create healthier youth while also cultivating discipline, teamwork, and resilience.

b) Strengthening Public–Private Partnerships (PPP)

The government cannot single-handedly build a robust sports ecosystem. Collaboration with private stakeholders is essential.

- **Infrastructure Creation:** Corporates can invest in stadiums, gyms, and training centers, especially in Tier II and III cities.
- **Talent Support:** CSR funds should be directed toward nurturing athletes from underprivileged communities.
- **Innovation and Technology:** Private players can introduce advanced tools such as AI-driven coaching, wearable fitness trackers, and digital training platforms.
- **Tax Incentives:** The government can encourage corporate investment in sports by providing tax benefits for grassroots contributions.

This model, successful in other countries, can be scaled effectively in India.

c) Establishing Sports Science and Research Institutions

India must reduce its dependency on foreign expertise by building a strong domestic base in sports sciences.

- **Specialized Courses:** Universities should offer programs in biomechanics, sports medicine, performance analytics, and psychology.
- **Global Collaboration:** Partnerships with international research centers can transfer best practices to India.
- **Professional Training:** These institutions can create a steady pipeline of coaches, physiotherapists, and performance analysts.

Such measures will improve elite sports performance while also supporting community fitness with evidence-based interventions.

d) Mandating Physical Activity in Schools

Beyond curriculum reforms, concrete standards must be established.

- **Minimum Hours:** Students should complete at least 150 minutes of structured physical activity per week, in line with WHO guidelines.
- **Inclusive Approach:** Programs should ensure equal participation for girls and differently-abled children.
- **Variety of Activities:** Schools should provide options including athletics, team sports, martial arts, and yoga, enabling students to pursue their interests.

This will instill fitness as a lifelong habit.

e) Promoting Gender Equality and Inclusion

Active measures are needed to overcome social barriers.

- **Awareness Campaigns:** Highlighting the achievements of women athletes such as P.V. Sindhu, Mary Kom, and Mirabai Chanu can inspire participation.
- **Safe Infrastructure:** Sports facilities must include secure spaces, sanitation, and proper lighting to encourage girls' participation.
- **Support for Differently-Abled Athletes:** Adaptive equipment and specialized training programs must be developed to ensure inclusivity.

These steps not only widen the talent pool but also reflect India's commitment to equitable development.

f) Improving Governance and Accountability

Reforms in governance are critical to building trust and efficiency.

- **Centralized Coordination:** A unified body should oversee collaboration among federations, ministries, and private stakeholders.
- **Transparency Measures:** Open selection processes, regular audits, and clear performance benchmarks must be enforced.
- **Long-Term Vision:** Policies should balance immediate medal targets with sustainable grassroots development and community wellness.

A transparent and accountable system will foster credibility and attract further investment.

Conclusion:

As India approaches its centenary of independence in 2047, the vision of becoming a *Viksit Bharat* must extend beyond economic prosperity and technological progress. True development rests on the foundation of a healthy, disciplined, and united population. In this context, sports and fitness should no longer be seen as optional pursuits but as essential drivers of national transformation.

This study highlights how sports not only generate employment, tourism, and economic value but also cultivate resilience, leadership, and community spirit. Similarly, fitness initiatives help reduce healthcare burdens, enhance productivity, and foster mental well-being. Together, they serve as instruments of both individual empowerment and collective nation-building. Government programs such as *Khelo India*, the *Fit India Movement*, and the *Target Olympic Podium Scheme*, complemented by corporate engagement, mark significant progress toward a sporting and fitness culture.

Yet, persistent challenges are inadequate infrastructure, shortage of trained professionals, rural-urban imbalances, and governance gaps - must be addressed with urgency. Holistic reforms such as integrating sports into education, encouraging public–private partnerships, expanding sports science research, ensuring inclusivity, and improving policy execution are indispensable to realizing this goal.

By making fitness a way of life and recognizing sports as a tool for both social cohesion and global recognition, India can redefine progress beyond GDP metrics. A developed India in 2047 will not only be economically and technologically advanced but also physically robust, mentally resilient, socially harmonious, and internationally respected.

Ultimately, sports and fitness are not mere supplements to development - they are transformative forces that will shape the strength, unity, and identity of a truly *Viksit Bharat*.

References:

1. Central Government, Sports Authority of India & Ministry of Youth Affairs and Sports. (n.d.). *Sports Authority of India – structure and mandate.*
2. Fit India Movement. (2019–2023). *Progress reports.* Government of India.
3. Government of India. (2020). *National Education Policy 2020 – emphasis on sports and physical education.*
4. Government of India. (2025). *National Sports Policy 2025 (Khelo Bharat Niti).* Drishti IAS.
5. Government of India. (n.d.). *Khelo India Programme operational guidelines and infrastructure expansion.*
6. Government of India. (n.d.). *Target Olympic Podium Scheme (TOPS).*
7. GroupM ESP. (2024). *Indian sports industry growth report.* ResearchGate.
8. GS Score. (2025). *India's sporting industry forecast to 2030.* IASSCORE.

9. Gupta, R., & Misra, A. (2021). Epidemiology of non-communicable diseases in India. *Journal of Public Health in Developing Countries.*
10. IBEF. (2023). *Indian sports industry report.* India Brand Equity Foundation.
11. IBEF. (2024, July). *Sports as a profession in India and its economic impact.* India Brand Equity Foundation.
12. Indian Council of Medical Research (ICMR). (2021). *State-level disease burden initiative reports.*
13. International Council of Sports Science and Physical Education. (2020). *Sport for development and peace.*
14. Khelo India Scheme Reports. (2019–2024). Government of India.
15. Majumdar, B. (2020). *India and the Olympic Games: A historical overview.* Routledge.
16. Ministry of Youth Affairs and Sports. (2018–2024). *Annual reports.* Government of India.
17. Ministry of Youth Affairs and Sports. (n.d.). *Evolution of sports policy and governance in India.* Taylor & Francis Online.
18. NITI Aayog. (2021). *Vision India @2047.* Government of India.
19. NITI Aayog. (n.d.). *Play 4 India model and integration of sports in education under NEP 2020.*
20. Parvez, S. (2020). A comparative analysis of Indian sports management models: Public, private, and non-profit. *International Journal of Creative Research Thoughts (IJCRT).* ResearchGate.
21. Policy implementation and governance issues in Indian sport. (n.d.). *Taylor & Francis Online.*
22. Press Reports. (2025, August). NSP 2025 and sports promotion in remote areas (PM speech). *The Economic Times; The Times of India.*
23. Press Reports. (2025, August). National Sports Governance Bill becomes Act; reforms in transparency and oversight.
24. Singh, J. P. (2022). Sports and soft power: India's emerging role. *Asian Journal of International Affairs.*
25. Sports and economic development in emerging markets: A case study of India. (2021). *Journal of Emerging Technologies and Innovative Research (JETIR).* ResearchGate.
26. WHO. (2022). *Global status report on non-communicable diseases.* World Health Organization.

Bhumi Publishing, India
September 2025

WEAVING THE FUTURE: TRANSFORMING INDIA'S TEXTILE AND APPAREL INDUSTRY THROUGH SUSTAINABILITY AND INNOVATION FOR VIKSIT BHARAT @2047

Mili
Govt. College for Girls, Sector-14, Gurugram

Abstract:

India's textile and apparel sector, recognized as one of the most ancient and varied globally, plays a crucial role in the country's socio-economic framework. Nonetheless, the challenges posed by rapid globalization, environmental issues, and changing consumer beliefs necessitate a transformative strategy. This chapter investigates how sustainability and innovation can serve as complementary forces propelling the industry's advancement toward the vision of Viksit Bharat (Developed India) by 2047. It assesses present challenges, emerging technologies, eco-friendly practices, regulatory frameworks, and inclusive strategies. The incorporation of circular economy models, intelligent manufacturing, sustainable materials, and workforce skill enhancement is evaluated as vital pathways to guarantee resilience, competitiveness, and equitable growth. It delves into the sector's shift from a linear and resource-heavy model to a circular and regenerative framework, emphasizing the necessity of adopting sustainable fibers, green manufacturing technologies and energy-efficient methods. It also looks at the impact of digitalization like CAD/CAM, AI-powered forecasting, and blockchain-based traceability on transforming supply chains. Through policy assessment, real-world examples from textile and apparel sector, and alignment with India's national initiatives (PLI, PM MITRA, NTTM), the chapter offers a framework for developing a just green, and inclusive textile economy. The insights provided aim to enrich discussions within academia, industry, and policymaking regarding India's potential to lead in sustainable textile advancement. Case studies from Tirupur, Panipat, and KVIC illustrate how locally adapted sustainable practices are establishing scalable models that are in harmony with India's national objectives and the UN Sustainable Development Goals (SDGs) notably SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 12 (Responsible Consumption and Production). It presents a strategic framework and roadmap for policymakers, industry stakeholders, and academic entities to collaborate in fostering a resilient, inclusive, and future-ready textile and apparel industry charting the course toward a genuinely Viksit Bharat.

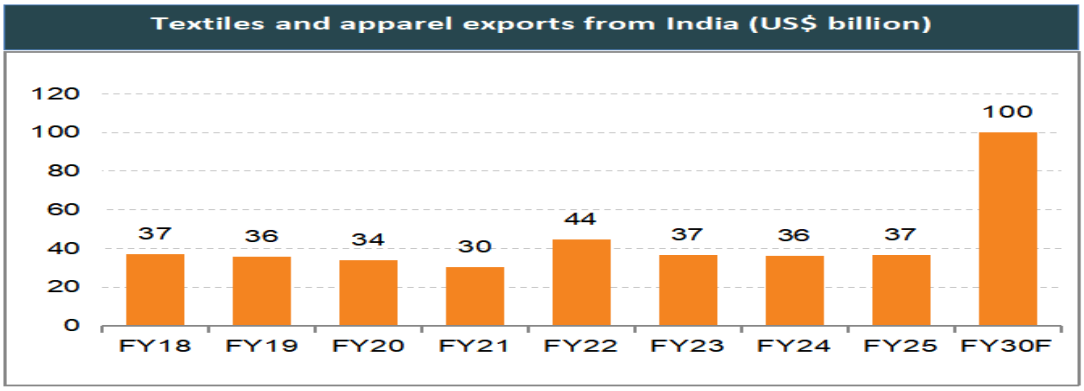
Keywords: Viksit Bharat, Textile and Apparel Industry, Sustainability, Innovation, Circular Economy, Digital Transformation, Inclusive Strategies, CAD/CAM

1. Introduction:

India's textile industry is among the oldest sectors in the country's economy, with roots extending back several centuries. The initial signs of textile production in India can be traced back to the Indus Valley Civilization (circa 2500 BCE). Textiles played a significant role in the economy of the Indus Valley Civilization, with numerous homes containing equipment for spinning and weaving. The Indian subcontinent was renowned for its exquisite muslins, which were traded with Roman Egypt and various other regions worldwide. During the Mughal era (1526-1857), India's textile sector thrived under the support of the ruling elite. High-quality muslins and silks were manufactured in regions such as Kashmir and Bengal, with Mughal emperors being avid supporters of the textile craft, promoting artisans to create stunning fabrics. The British colonization of India (1757-1947) had a significant influence on the nation's textile industry. The Industrial Revolution introduced advanced technologies and machinery to India, significantly boosting production levels. Following independence, the textile industry in India experienced a revival, focusing on manufacturing superior fabrics. Currently, India stands as one of the top producers and exporters of textiles globally. The industry is highly diverse, ranging from sectors that specialize in hand-spun and hand-woven textiles to capital-intensive and advanced mill operations. The core strength of India's textile industry lies in its robust production base, which includes a wide array of fibers and yarns, from natural materials like cotton, jute, silk, and wool, to synthetic and man-made fibers such as polyester, viscose, nylon, and acrylic. The decentralized power loom, hosiery, and knitting sectors constitute the largest part of the textile industry. India's textile sector possesses a capacity to produce a diverse range of products catering to various market segments, both domestically and internationally.

According to Crisil Ratings, revenue growth for the organized retail apparel sector is anticipated to reach 8-10% in FY25, driven by increased demand due to a normal monsoon, reduced inflation, and the festive and wedding seasons. The market for Indian textiles and apparel is expected to grow at a 10% compound annual growth rate (CAGR), reaching US$ 350 billion by 2030. Additionally, India ranks as the third largest exporter of textiles and apparel globally. The country is among the top five global exporters in various textile categories, with exports projected to hit US$100 billion. The textiles and apparel sector contributes 2.3% to the nation's GDP, 13% to industrial output, and 12% to exports. By the end of this decade, the textile industry in India is forecasted to double its GDP contribution, increasing from 2.3% to about 5%. Textile manufacturing in India has been gradually recovering following the pandemic, with the manufacturing index for textiles reported at 106 for June 2024. The global apparel market is expected to experience an approximate CAGR of 8%, reaching US$ 2.37 trillion by 2030, while the Global Textile & Apparel trade is projected to grow at a CAGR of 4%, reaching US$ 1.2

trillion by 2030. India's home textile market is forecasted to grow at a CAGR of 8.9% from 2023 to 2032, rising from US$ 10.78 billion in 2023 to US$ 23.32 billion in 2032.



Source: Ministry of textiles

Note: F- Forecast

Source: https://www.ibef.org/industry/textiles

The textile sector contributes notably to the Indian economy, representing more than 15% of total exports. It is also one of the primary employment providers in India, creating both direct and indirect jobs for over 45 million individuals. In recent years, the industry has experienced robust growth, fueled by increased domestic and international demand, government initiatives, and enhanced infrastructure. The sector is projected to continue its healthy growth trajectory in the upcoming years, bolstered by favorable macroeconomic indicators and rising consumer expenditure. The textile industry is integral to the Make in India initiative due to its vast potential for expansion and job creation. The government has undertaken multiple initiatives to enhance the sector, including offering financial aid and subsidies, establishing special economic zones, and streamlining regulations. The sector has substantial growth potential and can contribute significantly to realizing the government's development objectives.

2. Economic Significance of India's Textile and Apparel Industry:

- **GDP Contribution and Exports**

The textile and apparel sector in India represents around 2.3% of the national Gross Domestic Product (GDP) and roughly 7% of the overall industrial output (Ministry of Textiles, 2022). It contributes to 10–12% of total merchandise exports, placing India among the leading textile exporters worldwide. This sector is crucial for both the formal and informal economies, with its success closely linked to the broader ambitions of Viksit Bharat—particularly industrial advancement and job creation.

- **Foreign Exchange Earnings and Export Value**

The industry plays a significant role in foreign exchange earnings, constituting 10–12% of total exports. In the fiscal year 2022–23, textile and apparel exports surpassed USD 35 billion, with major segments including ready-made garments, cotton textiles, handlooms, carpets, and

technical textiles. India has set a target to boost textile exports to USD 100 billion by 2030, aiming to establish itself as a global sourcing center for sustainable and value-added textiles.

- **Employment Generation and Labor Absorption**

As the second-largest source of employment in India after agriculture, the textile sector directly engages over 45 million individuals and indirectly supports more than 60 million others, including artisans, cotton farmers, machinery operators, logistics personnel, and retailers. This sector fosters a diverse employment framework, encompassing both rural handloom clusters and urban apparel manufacturing facilities.

- **Strengthening MSMEs and Local Industry**

Over 80% of the textile businesses in India are categorized as Micro, Small, and Medium Enterprises (MSMEs), which encompass power loom operations, dyeing facilities, printing workshops, and garment manufacturing units. Government initiatives like the Technology Upgradation Fund Scheme (TUFS), Credit Linked Capital Subsidy Scheme (CLCSS), and Emergency Credit Line Guarantee Scheme (ECLGS) during the COVID-19 pandemic have been instrumental in supporting this sector. Additionally, PM MITRA Mega Textile Parks are designed to integrate these dispersed MSMEs into global supply chains.

- **Diversification into Technical and Smart Textiles**

India is becoming a hub for technical textiles utilized in healthcare, defense, sports, and agriculture. With projections estimating the market size to reach USD 40 billion by 2025, this segment presents opportunities for high-value manufacturing and growth driven by innovation. Government initiatives under the National Technical Textile Mission (NTTM) are encouraging this shift.

3. Social Relevance of India's Textile and Apparel Industry:

- **Rural Livelihood and Artisan Welfare**

The textile industry in India benefits millions of artisans involved in handloom weaving, natural dyeing, embroidery, block printing, and spinning. These traditional crafts are deeply embedded in rural areas, particularly in states like Gujarat, West Bengal, Assam, Odisha, and Tamil Nadu. The handloom sector alone employs around 3.5 million weavers, many of whom belong to self-help groups (SHGs) or cooperatives. Traditional weaving clusters such as Chanderi, Kanchipuram, Bhuj, Banaras, and Pochampally etc not only sustain India's textile heritage but also serve as vital economic support for rural families, particularly during agricultural off seasons.

- **Women's Employment and Empowerment**

A significant portion of the workforce in garment and home-textile production consists of women, especially in roles related to cutting, sewing, packaging, embroidery, and quality control. In export centers like Tirupur, Bengaluru, and Noida, women represent up to 70% of the

workforce, most of whom are first-time earners from disadvantaged backgrounds. Securing stable jobs in the textile industry has led to greater financial inclusion, improved family health, and enhanced educational opportunities for children—thereby serving as a key factor in fostering gender-inclusive development.

Figure 1: Empowering women in India's Textile Sector

Source: https://www.ethicaltrade.org/resources/blog/i-can-do-anything-empowering-women-indias-garment-sector

- **Cultural Preservation and Indigenous Knowledge Systems**

India's textile legacy showcases its rich cultural diversity and traditional knowledge systems. Techniques such as ikat, bandhani, batik, kalamkari, and zari embroidery hold both aesthetic value and environmental benefits, supporting local communities while promoting low-carbon living. Organizations such as the Khadi and Village Industries Commission (KVIC), Dastkar, Crafts Council of India, and a variety of NGOs are essential in maintaining these crafts while incorporating artisans into mainstream e-commerce and design platforms.

Source: https://www.drishticuet.com/blog/indian-textiles-and-handicrafts-a-legacy-of-skill-and-tradition

- **Equivalent Regional Advancement of the Textile and Apparel Sector:**

The rise of textile clusters, industrial parks, and artisan-centric hubs has facilitated the distribution of manufacturing and job opportunities across various locations thereby supporting the national objective of Viksit Bharat through inclusive and decentralized development. Regional industrial hubs have arisen within the textile industry across India, such as Panipat, which is noted for recycling wool and cotton textiles, Tirupur, renowned for knitwear and export-oriented garment production, Surat, specializing in synthetic fabrics and polyester, and Ludhiana, known for woolen and winter apparel. Bhilwara is recognized for its suiting fabrics. These hubs have stimulated semi-urban industrialization, promoted rural-to-urban migration and enhanced local economies. These clusters enable regional economies to flourish, generating employment, supporting entrepreneurship, and contributing to export revenues.

4. Challenges Faced by the Textile and Apparel Sector in India:

This sector encounters a range of issues that hinder its potential for growth. Environmental deterioration attributed to water-heavy production methods, chemical waste from dyeing processes, and excessive reliance on non-renewable energy continues to tarnish its competitive position on a global scale (Grönwall & Jonsson, 2022). Furthermore, the industry's fragmented structure largely comprised of small and medium enterprises (SMEs) restricts technological integration, economies of scale, and standardization in quality, creating weaknesses in both domestic and international markets (Das, 2025). Labor-related challenges such as informal work arrangements, inadequate wages, and absence of social security further jeopardize social sustainability, despite the sector being the second-largest employer after agriculture. Growing global concerns surrounding fast fashion, carbon emissions, and ethical supply chains exert significant pressure on Indian producers to adhere to stricter international regulations.

Figure 2: AI-Generated Fashion designs
https://www.textiletoday.com.bd/artificial-intelligence-on-fashion-and-textiles-in-2023

Figure 3: 3D printing clothes
https://www.sculpteo.com/en/3d-learning-hub/applications-of-3d-printing/3d-printed-clothes

Additionally, the industry faces economic hurdles, including competition from low-cost manufacturing countries like Bangladesh and Vietnam, fluctuating prices of raw materials, and a heavy reliance on cotton that leaves the sector vulnerable to climate challenges (Habibullah & Yadav, 2024). The lack of strong infrastructure regarding logistics, warehousing, and value chain integration exacerbates these difficulties, restricting opportunities for export diversification. Moreover, the absence of systematic branding and positioning in global markets hinders India's ability to fully leverage its rich textile heritage and craftsmanship traditions. Despite facing various obstacles, the Indian textile and apparel sector presents vast prospects in the framework of Viksit Bharat 2047. The swift expansion of technical textiles, such as medical, industrial, and geotextiles, offers another valuable niche that corresponds with both domestic development objectives and international market needs. Technological advancements—like AI-enhanced design, blockchain for supply chain transparency, and the use of 3D printing in garment production—provide opportunities to boost efficiency, minimize waste, and cater to shifting consumer demands (Das, 2025).

Figure 4: Types of Technical Textiles (https://acmemills.com/industry-news-blog/12-applications-of-technical-textiles-12-types-of-technical-textiles/)

Government programs like the Production Linked Incentive (PLI) scheme, the National Technical Textiles Mission, and the establishment of mega textile parks under PM-MITRA are laying the groundwork for modernization and global competitiveness. Moreover, the expanding e-commerce landscape and digital marketplaces enable small manufacturers and artisans to reach urban and international customers, effectively closing historical gaps in market access. India's demographic advantage, characterized by a large and skilled workforce, further bolsters its ability to scale production while focusing on sustainable and inclusive practices. By prioritizing sustainability, embracing innovation, and aligning with global trends, the sector can transform itself from a volume-focused, cost-driven approach to a value-oriented, resilient, and

environmentally accountable leader, thereby making a substantial contribution to India's vision of Viksit Bharat 2047.

5. Environmental, Social, and Economic Sustainability in the Indian Textile Sector:

The Indian textile and apparel sector is currently experiencing a significant transformation to meet sustainability objectives. This change is directed by the three pillars of environmental, social, and economic sustainability, each vital for positioning India as a leading textile hub globally while furthering the national aspiration of Viksit Bharat 2047.

- **Environmental Sustainability**

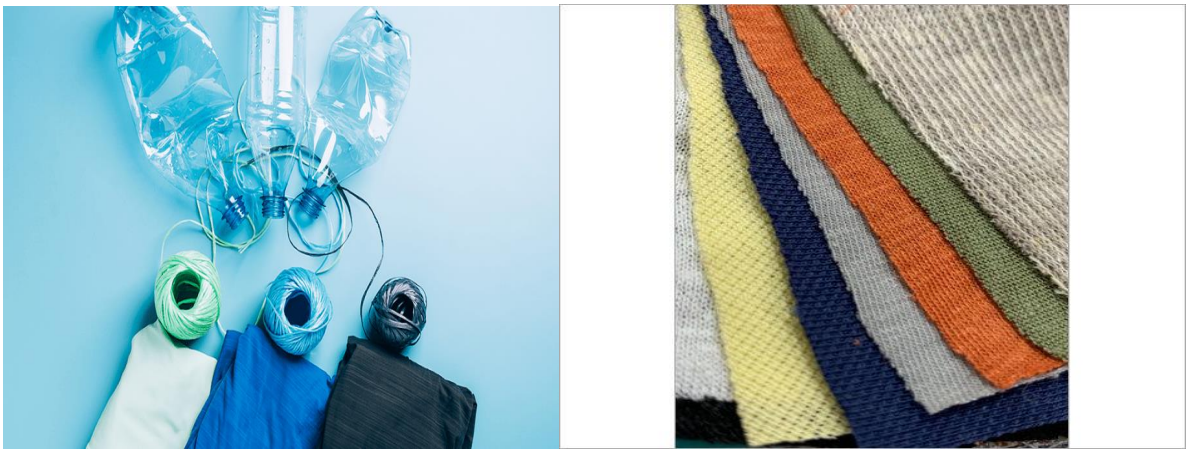
The push for environmental sustainability within the Indian textile industry is fueled by the pressing need to lessen its considerable ecological impact. The production of textiles is intensive in resource usage, involving substantial quantities of water, energy, and chemicals. For example, cotton farming is responsible for nearly 25% of pesticide usage in India, leading to potential soil degradation and water pollution issues (Grönwall & Jonsson, 2022). Moreover, the dyeing and finishing processes significantly contribute to effluent discharge, which makes wastewater management a key sustainability concern. A primary approach has been the encouragement of sustainable fibers, which greatly minimize the ecological impact of the sector (Shen *et al.,* 2020). In addition, fibers like hemp and bamboo need minimal water and chemicals, making them very sustainable options for conventional textile production. Numerous Indian brands, such as BLabel and No Nasties, are leading efforts to incorporate hemp and organic cotton blends, while major corporations like Reliance Industries are boosting the production of recycled polyester through their R Elan initiative.

No Nasties Brand BLabel Indian Brands

Source: https://www.fibre2fashion.com/industry-article/10101/top-26-sustainable-fashion-brands-in-india

A prominent example is the Tirupur knitwear cluster in Tamil Nadu, recognized as India's first major zero liquid discharge (ZLD) textile hub. Over 700 dyeing facilities in this area have invested in cutting-edge effluent treatment technologies (The Better India, 2025). Similarly, regions like Surat are increasingly implementing solar-powered dyeing facilities to reduce

carbon emissions. India's National Technical Textiles Mission (NTTM) is also advocating for eco-friendly fibers such as jute, hemp, and banana fibers, lessening reliance on synthetic, petroleum-derived textiles that lead to microplastic contamination (Ministry of Textiles, 2023).



Recycled Polyester Hemp and Organic cotton blends

Source: 1. https://blueassociatessportswear.com/post/the-pros-and-cons-of-recycled-polyester/)

2.(https://www.tradeindia.com/products/hemp-and-organic-cotton-blends-c5417581.html)

- **Social Sustainability**

The social aspect of sustainability within the Indian textile industry centers on labor rights, gender empowerment, and inclusive growth. With more than 45 million individuals employed directly and about 60 million in related sectors, textiles serve as the second-largest employment source in India, following agriculture (IBEF, 2024). Positive changes are emerging through initiatives like the Khadi and Village Industries Commission (KVIC), which integrates solar-powered charkhas to modernize traditional manufacturing. By connecting rural artisans, particularly women and tribal groups, to online marketplaces such as Amazon and Flipkart, KVIC has facilitated both income opportunities and the preservation of cultural practices (KVIC, 2023). Additionally, social compliance certifications like SA8000 and Fair Trade are becoming increasingly popular among exporters, guaranteeing fair wages, safe working conditions, and the eradication of exploitative practices. Initiatives aimed at empowering women in clusters such as the Bhubaneswar and Varanasi handloom hubs illustrate how inclusive strategies can uplift marginalized groups while preserving traditional crafts. These efforts align with SDG 8 (Decent Work and Economic Growth) and SDG 10 (Reduced Inequalities).

- **Economic Sustainability**

In the fiscal year 2023, India's textile and apparel exports totaled USD 36.7 billion, with goals set to reach USD 100 billion by 2030 (IBEF, 2024). To maintain this growth trajectory, it is essential to diversify into areas such as technical textiles, home furnishings, and medical textiles. For instance, India has positioned itself as a key player in the global market for

geotextiles used in infrastructure projects like roads and dams, as well as in the production of biodegradable sanitary products, merging economic potential with ecological responsibility (Ministry of Textiles, 2023). The Panipat wool recycling center serves as a model for economic sustainability through practices rooted in the circular economy thus generating employment while decreasing reliance on raw materials (Fibre2Fashion, 2025). The implementation of AI-based demand forecasting, virtual 3D sampling, and blockchain technology for supply chain traceability is helping to minimize inventory waste and enhance access to global markets.

6. Innovation as a Catalyst for Textile & Apparel Industry Transformation:

At its essence, innovation in this sector encompasses more than merely new products or machinery; it involves a coordinated integration of cutting-edge materials, processes, business models, and data systems that enhance performance in terms of cost, speed, quality, and sustainability. Materials and chemistry are advancing with innovative fibers (such as hemp, nettle, banana, recycled polyester, and bio-based nylons) and engineered blends that cater to both performance and sustainability goals. Techniques like enzyme-assisted scouring, low-salt reactive dyeing, digital pigment printing, and non-aqueous (e.g., supercritical CO_2) coloration significantly reduce water, energy, and chemical consumption while enhancing reproducibility. Advanced chemical additives (biobased softeners and PFAS-free repellents) alongside effective input-chemistry management aligned with MRSLs mitigate risks, simplify compliance, and facilitate entry into premium markets. The digitized approach to design and delivery includes 3D design, virtual prototyping, and digital twins, which shorten sampling phases from weeks to days, decreasing fabric waste and development costs. AI-driven demand sensing connects assortment planning with real-time sales data, allowing for smaller, more frequent purchases and significantly decreasing overproduction. Innovations in computer-vision quality control and IoT-enabled equipment boost first-time quality rates on the production floor, while predictive maintenance reduces downtime. For exporters, SKU-level traceability through QR/RFID and blockchain technology is becoming essential for entering regulated markets and substantiating claims related to fiber origin and processing. Closed-loop water systems, heat recovery from stenters, and the use of rooftop solar or biomass steam contribute to lowering operational costs and emissions. The adoption of robotics in fabric handling and automated cutting reduces ergonomic risks and improves yield; microfactories located near demand centers facilitate on-demand, custom -fit production with minimal inventory levels.

Circular business strategies include recovering pre-consumer off-cuts, fiber-to-fiber mechanical or chemical recycling, and product-as-a-service models (such as rental, resale, and repair) to prolong value and lessen reliance on virgin materials. Innovations in sorting technologies like NIR spectroscopy and digital watermarks enhance feedstock purity for high-quality recycling. Transparent take-back initiatives forge new feedstock sources and foster brand

loyalty. In the realm of technical textiles, innovation is tapping into higher-value segments including medical applications (barrier fabrics, advanced wound care), mobility (airbags, acoustic insulation), geotextiles, filtration media, and protective clothing. Increasingly stringent global regulations (including due diligence laws, digital product passports, and PFAS restrictions) are turning sustainability into a necessity for market access. Companies that adopt verifiable life cycle assessment (LCA)/environmental product declaration (EPD) data, MRSL-compliant chemistry, and transparent wastewater practices gain preferential sourcing opportunities while reducing risks of detention transforming compliance costs into a competitive edge.

Enablers within the ecosystem include shared resources in integrated research parks (offering testing labs, CETPs, renewable energy, and logistics), collaborative innovation with academic institutions, and public-private partnerships that mitigate risk in research and development while accelerating dissemination especially crucial for clusters dominated by micro, small, and medium enterprises (MSMEs).

7. Government and Policy Frameworks Supporting the Vision:

The Government of India has introduced various policy frameworks, initiatives, and missions to strengthen every stage of the value chain from fiber production to high-value fashion exports while adhering to sustainability requirements and the adoption of Industry 4.0.A prominent initiative is the Production Linked Incentive (PLI) Scheme for Textiles (2021), which focuses on man-made fibers (MMF) and technical textiles. The scheme aims to stimulate large-scale investments, boost global value chain participation, and encourage product diversification by providing performance-based incentives on increased turnover for five years (Ministry of Textiles, 2023a). In addition, the National Technical Textiles Mission (NTTM), introduced in 2020, has received an allocation of ₹1,480 crores over four years to advance research and development, skill enhancement, and standardization in technical textiles, which are essential for sectors like defense, healthcare, and infrastructure (NITI Aayog, 2023).

The PM MITRA Parks Scheme represents a significant infrastructure initiative, planning for seven large integrated textile and apparel parks across India. Each park aims to offer plug-and-play facilities, shared processing units, and contemporary logistics centers, which will help lower operational expenses and enhance competitiveness (Ministry of Commerce & Industry, 2023). This is in line with the Viksit Bharat focus on equitable regional development and decentralized manufacturing.

Export competitiveness is further enhanced through the Remission of Duties and Taxes on Exported Products (RoDTEP) and the Rebate of State and Central Taxes and Levies (RoSCTL) schemes, which ensure that Indian textile exports retain their cost-competitive edge in the global market (Directorate General of Foreign Trade [DGFT], 2023). Additionally, Quality

Control Orders (QCOs) have been established for several textile products to comply with global standards, strengthening India's reputation as a provider of high-quality goods (Bureau of Indian Standards, 2024).On the sustainability front, programs like the Sustainable and Accelerated Adoption of Efficient Textile Technologies (SAATHI) promote the use of energy-efficient machinery, while the Zero Liquid Discharge (ZLD) regulations in processing centers tackle environmental pollution (Central Pollution Control Board, 2023). The Amended Technology Upgradation Fund Scheme (ATUFS) also incentivizes the acquisition of modern, environmentally friendly machinery, enabling both MSMEs and larger enterprises to boost productivity while minimizing carbon emissions.Human capital development is being tackled through the Samarth (Scheme for Capacity Building in the Textile Sector), which prioritizes the training and advancement of workers in new areas such as technical textiles, digital design, and sustainable processing techniques (Ministry of Skill Development & Entrepreneurship, 2023). This strategy meets industry needs for a workforce equipped to integrate AI, IoT, and advanced automation into production processes.

8. *Viksit Bharat* and Global Alignment in the Textile and Apparel Industry:

Positioning India's textile and apparel (T&A) industry as a key driver for Viksit Bharat @ 2047 necessitates a deliberate alignment with the changing landscape of global trade, sustainability, and product governance frameworks. Three main influences shape this alignment challenge:

(i) Preferential market access granted through "new generation" trade agreements;

(ii) Adherence to extraterritorial sustainability and due-diligence regulations that affect access to lucrative markets; and

(iii) Alignment with international standards regarding products, chemistry, and traceability that are rapidly becoming essential for entry into global value chains. India's recent policy framework—including PM MITRA integrated parks, Performance Linked Incentive (PLI) for Man-Made Fibers (MMF) and technical textiles, along with a shift towards Free Trade Agreements (FTAs)—establishes an institutional foundation for this alignment; however, successful implementation will depend on the swift adoption of clean processing methods, reliable disclosures, and digital traceability among millions of MSME suppliers (Ministry of Textiles, 2021/2024; Press Information Bureau, 2025).

The Australia–India Economic Cooperation and Trade Agreement (ECTA), effective since December 29, 2022, expedited the elimination of tariffs across most bilateral trade categories, providing near-total, scheduled zero-duty access for Indian T&A exports and facilitating imports like Australian cotton—boosting India's cost structure for MMF-cotton blends (DFAT, n.d.; Ministry of Commerce & Industry, 2022).

The UAE Comprehensive Economic Partnership Agreement (CEPA) has already accelerated trade significantly, offering zero duty on a broad range of textile items while simplifying logistics into GCC and African markets, evidenced by the increase in preferential certificates of origin issued in FY 2024-25—indicating actual utilization rather than mere theoretical preferences (Law.asia, 2025; Beyond Numbers, 2025).

Particularly significant for the apparel sector is the comprehensive agreement with the UK, finalized in July 2025, which anticipates tariff reductions for labor-intensive goods like apparel and footwear—potentially compensating for the preference losses India experienced relative to LDC competitors (Financial Times, 2025; House of Commons Library, 2025; Ministry of Commerce & Industry, 2025). Concurrently, India–EU negotiations are seeking concessions for textiles as the EU pushes for regulatory commitments on sustainability and due diligence—tying tariff advantages to compliance with European product and process standards (European Parliament, 2024; European Commission DG Trade, 2025).

The EU's Corporate Sustainability Due Diligence Directive (CSDDD), effective as of July 25, 2024, mandates large EU and relevant non-EU companies to detect, prevent, and reduce negative human rights and environmental consequences throughout their "chains of activities," pushing due diligence demands down to Tier-N suppliers in India (European Commission, 2024; Latham & Watkins, 2024). Simultaneously, the EU Strategy for Sustainable and Circular Textiles and the proposed Ecodesign for Sustainable Products Regulation will establish upcoming Digital Product Passports (DPPs) for textile (European Commission, 2022; European Parliament Research Service, 2024). Programs for international buyers, like the ZDHC Roadmap to Zero, along with eco-label initiatives such as OEKO-TEX®, are merging to create common standards for wet processing and the management of input chemicals.

Source: https://apaengineering.com/compliance-blog/the-ecodesign-for-sustainable-products-regulation (https://www.hohenstein.in/en-in/trust/oeko-tex/product-labels)

The Viksit Bharat initiative is closely aligned with global sustainable development goals, especially the United Nations Sustainable Development Goals (SDGs). In relation to the textile

and apparel industry, this vision actively contributes to SDG 8 by promoting decent work opportunities through the encouragement of inclusive, safe, and fair employment practices, especially in labor-intensive manufacturing areas. It also furthers SDG 9 by fostering industrial innovation, infrastructure development, and the use of cutting-edge technologies like digital manufacturing, technical textiles, and circular production models that boost global competitiveness. Additionally, it addresses SDG 12 by advocating for sustainable consumption and production patterns, including the usage of eco-friendly raw materials, energy-efficient processes, and waste reduction strategies.

9. Case Studies:

The **Tirupur Knitwear Cluster in Tamil Nadu** exemplifies a leading model of sustainable industrial transformation in India's textile and apparel industry. Tirupur was the first major textile cluster in India to adopt Zero Liquid Discharge (ZLD) systems on a large scale. In addition to these water conservation efforts, numerous facilities within the cluster have embraced solar-powered dyeing technologies and energy-efficient machinery, which has considerably decreased greenhouse gas emissions and reliance on fossil fuels.

Figure 4: Textile recycling but also with strong thrust on Sustainability

Source: https://apparelresources.com/business-news/sustainability/textile-waste-panipat-answer

The **Panipat Wool Recycling Hub** in Haryana has emerged as one of the world's most significant centers for textile recycling, particularly in the domain of post-consumer wool and cotton waste. Often referred to as the "cast-off capital," Panipat imports vast quantities of used garments, woolen blankets, and textile waste from both domestic sources and international markets, including Europe, North America, and the Middle East. Through a labor-intensive yet resource-efficient process, these discarded materials are sorted, shredded, and re-spun into new yarns, which are then used to manufacture a wide range of low-cost, upcycled woolen products such as blankets, shawls, sweaters, and rugs. These products are supplied not only across India but also to global markets in Africa, South America, and parts of Asia, where affordability and

durability are highly valued. The hub's operations exemplify a circular economy model, significantly reducing landfill waste and conserving natural resources like water and energy that would otherwise be consumed in virgin textile production. However, while Panipat's recycling ecosystem contributes meaningfully to sustainability goals, it also faces challenges related to labor welfare, mechanization, and the need for advanced sorting technologies to improve product quality and meet evolving environmental standards.

Khadi and Village Industries Commission (KVIC): The Khadi and Village Industries Commission (KVIC) is a fundamental part of India's initiatives to encourage sustainable, inclusive, and culturally grounded textile manufacturing while empowering rural communities. In recent times, KVIC has adopted technological advancements by introducing solar-powered charkhas (spinning wheels), which improve efficiency, lessen the physical burden on artisans, and remove reliance on grid electricity, thus reducing the carbon emissions associated with khadi production. Alongside these technological enhancements, KVIC has purposefully broadened its market reach through e-commerce to connect with a larger urban and even global audience. This transformation has revitalized khadi's reputation as a trendy, eco-conscious, and ethically produced option for contemporary shoppers. Most importantly, KVIC's initiatives have significantly influenced socio-economic conditions, especially in empowering rural women and tribal communities. KVIC exemplifies how grassroots industries can prosper within the context of Viksit Bharat, in line with broader objectives of social inclusion, environmental sustainability, and rural economic resilience.

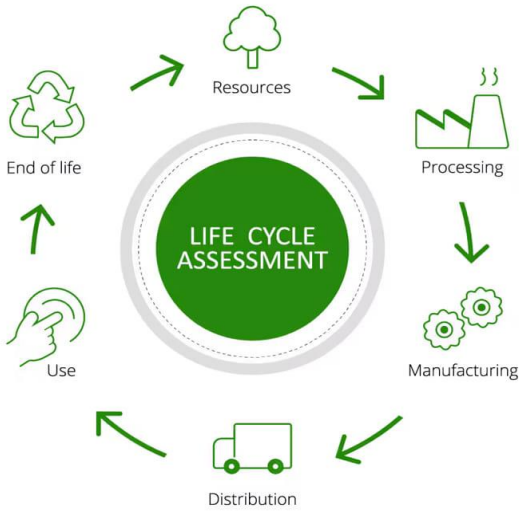
Figure 5: Strong Demand for khadi products in cities produced by KVIC

Source: https://in.fashionnetwork.com/news/Kvic-expects-revenue-of-rs-5-000-crore-for-fy-2019-20,1179590.html

10. Policy Recommendations for Sustainable and Innovative Growth in textile Sector:

To expedite the shift towards a sustainable and innovation-focused textile industry, policy measures must effectively promote environmentally responsible practices while maintaining

competitiveness in the global marketplace. A key initiative could be the implementation of carbon tax relief for manufacturers that embrace verified sustainable production techniques, including the use of renewable energy, closed-loop water systems, and environmentally friendly dyes. These financial incentives would motivate widespread investment in green technologies across the industry, helping to alleviate the initial higher costs typically linked to sustainable manufacturing. Furthermore, the government should require Environmental Product Declarations (EPDs) and life cycle assessments (LCAs) for all significant textile items, ensuring clarity regarding environmental impacts from the sourcing of raw materials to disposal at the end of life. Such measures would assist consumers in making educated choices and establish a common sustainability standard for both domestic and international markets. By incorporating these requirements into regulatory policies, India can establish its textile and apparel industry as a frontrunner in sustainable production, aligning with the Viksit Bharat 2047 vision as well as global commitments like the Sustainable Development Goals (SDGs) and carbon neutrality objectives.



Source: https://www.textileschool.com/10339/life-cycle-assessment-lca-for-textiles/
(https://www.enperas.com/en/epd **)**

11. Industry Recommendations or Sustainable and Innovative Growth in textile Sector:

To achieve sustainable and innovative growth in the Indian textile sector, initiatives led by the industry must go hand in hand with supportive policy measures. Prioritizing the expansion of green certifications like the Global Organic Textile Standard (GOTS) and OEKO-TEX is essential, as these internationally recognized standards not only ensure adherence to rigorous environmental and social guidelines but also boost the credibility and market potential of Indian textile goods in high-end global markets. The broad implementation of such certifications would promote sustainable procurement, environmentally friendly processing, and enhanced labor

practices throughout the supply chain. At the same time, cultivating public-private partnerships (PPPs) focused on research and development (R&D) in textiles can hasten innovation in areas like sustainable materials, circular economy approaches, waterless dyeing techniques, and digital production methods.

12. Research and Education for Sustainable and Innovative Growth in textile Sector:

To promote sustainable and innovative growth in the textile industry, it is essential to establish a robust foundation in research and education, ensuring that upcoming professionals possess the necessary skills, values, and technical knowledge required for a rapidly changing field. Incorporating sustainability concepts like life cycle thinking, circular economy strategies, eco-design principles, and ethical supply chain practices into the educational curricula for both undergraduate and postgraduate programs in textile and fashion will nurture a new generation of industry leaders who prioritize environmental stewardship and social fairness alongside profitability. Concurrently, creating textile innovation labs and centers of excellence can act as central hubs for applied research, technology incubation, and collaboration between industry and academia. These facilities would facilitate the creation and evaluation of advanced solutions, such as sustainable fibers, low-impact dyeing techniques, waste-to-fiber recycling systems, and AI-enhanced manufacturing methods.

13. Financial and Market Access or Sustainable and Innovative Growth in textile Sector:

Ensuring access to finance and markets is crucial for fostering sustainable and innovative growth in the textile industry, especially for small and medium enterprises (SMEs) that are vital to India's textile value chain. Focused green financing options, such as affordable loans, sustainability-linked bonds, and credit guarantee programs, can help manufacturers invest in resource-saving machinery, renewable energy solutions, and waste reduction technologies without incurring overwhelming capital expenses. Moreover, improving access to both domestic and international markets through trade facilitation initiatives, export promotion programs, and participation in global green textile exhibitions can broaden the prospects for sustainably produced textiles from India. Digital platforms encompassing both B2B and B2C should be utilized to link rural and semi-urban textile producers directly with international buyers, increasing transparency and minimizing reliance on intermediaries. Additionally, incorporating sustainability performance indicators into market access criteria can motivate producers to embrace innovative practices while meeting buyer expectations. By merging financial assistance with enhanced market connections, India can develop a competitive, future-oriented textile sector that excels in the global green economy and contributes to the Viksit Bharat 2047 vision.

Conclusion:

The evolution of India's textile and apparel industry into a sustainable, innovation-focused sector that competes globally is vital for achieving the Viksit Bharat 2047 vision. Being

one of the country's oldest and most culturally relevant sectors, textiles have significant potential for not only economic development and job creation but also for promoting environmental responsibility and social fairness. By integrating sustainability goals—such as circular economy approaches, eco-friendly manufacturing, and ethical labor practices—together with advancements in digital technology, technical textiles, and intelligent manufacturing, the industry can tackle both international market needs and local developmental goals. The successful execution of this transformation will depend largely on collaborative efforts from government policies, industry innovation, educational reform, and improved financial and market accessibility. Additionally, aligning national strategies with the United Nations Sustainable Development Goals (SDGs) will ensure that India's textile industry both meets global sustainability standards and strengthens its competitive advantage. The journey toward Viksit Bharat 2047 requires that India's textile and apparel sector transition from a focus on cost to one centered on value, sustainability, and innovation. Current challenges in the industry including resource-heavy production methods, significant environmental impact, disjointed supply chains, and international competition can be transformed into beneficial opportunities through specific interventions. Critical to this transformation is the implementation of sustainability priorities, which encompass circular production models, waste-to-fiber recycling, adoption of renewable energy, and technologies that eliminate water use in dyeing processes. Equally vital is the incorporation of social sustainability, which ensures fair wages, safe work environments, gender equality, and the integration of underrepresented communities within the supply chain. Achieving economic sustainability will involve diversifying into higher-value areas such as technical textiles, medical textiles, and specialized fabrics, thereby reducing dependence on low-cost commodity exports. The integration of digital innovation from AI-driven production optimization and blockchain-supported supply chain transparency to 3D design and virtual sampling will boost efficiency, shorten lead times, and enhance visibility for both domestic and international customers. Government initiatives like the Production Linked Incentive (PLI) scheme, PM MITRA mega textile parks, and support for eco-friendly manufacturing will create the necessary infrastructure, while policy initiatives such as carbon tax exemptions for sustainable producers, mandatory Environmental Product Declarations (EPDs), and incentives for achieving green certifications will promote industry compliance and enhance competitiveness. Simultaneously, research, education, and skill development will serve as the foundation for enduring growth. Financial tools such as green bonds, soft credit lines, and market connections will further enable particularly small and medium enterprises to embrace sustainable transformation. By aligning itself with global initiatives India can establish its textile sector as a frontrunner in climate action, efficient resource usage, and inclusive development. To truly realize Viksit Bharat 2047 in the textile and apparel industry, a comprehensive and unified

strategy will be essential, one that merges environmental responsibility, social equity, technological advancement, and strong policy backing.

References:

1. Textile Magazine. (n.d.). *Embracing sustainability: The textile industry's transformation in India.*
2. The Tribune. (2025, July 15). *'Handloom city' Panipat weaves world's largest recycling empire*. https://www.tribuneindia.com/news/haryana/handloom-city-panipat-weaves-worlds-largest-recycling-empire-496548
3. Times of India. (2025). *How Indian textiles sector should embrace sustainability for achieving competitiveness*.
4. arXiv. (n.d.). *Investigating Circularity in India's Textile Industry: Overcoming Challenges and Leveraging Digitization for Growth*.
5. Textile Value Chain. (n.d.). *Revolutionising global textile partnerships: India's sustainable pathway to ESG excellence*.
6. NextIAS. (2025). *Seeds of sustainability for India's textile leadership*.
7. Indian Textile Journal. (2023). *Sustainability and circularity in textiles: A policy paradigm*.
8. Bureau of Indian Standards. (2024). *Quality control orders for textiles: Implementation and compliance framework*. Government of India.
9. Business & Human Rights Resource Centre. (2023). *India: Textile industry in crisis as global demand declines amid inflation, causing factory closures and reduced working hours*.
10. Business Standard. (2025). *Economic survey backs MMF shift as India lags in global textile production*. https://www.business-standard.com/budget/news/economic-survey-backs-mmf-shift-as-india-lags-in-global-textile-production-125013101149_1.html
11. Central Pollution Control Board. (2023). *Environmental compliance in textile clusters: ZLD and beyond*. Government of India.
12. Centre for Responsible Business (CRB) & United Nations Environment Programme (UNEP). (2025). *Accelerating the transition of the Indian textile sector towards circularity*.
13. Confederation of Indian Textile Industry (CITI). (2025, June). *Industry calls for innovation to revive textile sector*. *Times of India*.
14. Das, S. K. (2025). *Investigating circularity in India's textile industry: Overcoming challenges and leveraging digitization for growth (Preprint)*. arXiv. https://arxiv.org/abs/2501.15636

15. Dev Sethi, R. D. (2025). *Dry dyeing and beyond: The future of waterless textile processing*. *Textile Value Chain*. https://textilevaluechain.in
16. Textile Value Chain. (2025). *Digital transformation in textile management: From ERP to smart factories*.
17. Directorate General of Foreign Trade. (2023). *RoDTEP and RoSCTL: Export incentive schemes for textiles*. Ministry of Commerce & Industry.
18. Down To Earth. (2024). *Tripartite MoU to reduce textile waste in India gives hope, but cautious steps needed*.
19. Export Promotion Council for Handicrafts (EPCH). (2024). *Annual export performance report 2023–24*. New Delhi: EPCH.
20. Federation of Indian Chambers of Commerce & Industry (FICCI). (2023). *Technical textiles: The next growth frontier for India*. New Delhi: FICCI.
21. ForumIAS. (2023). *Challenges faced by India's textile and apparel industry*. https://forumias.com/blog/challenges-faced-by-indias-textile-and-apparel-industry/
22. Gartex Texprocess. (2025). *The digital transformation of textile production*. *Gartex Texprocess India 2025*.
23. Global Textile Source. (2025). *Waterless dyeing: Innovations addressing fashion's water crisis*. *Global Textile Source*.
24. Indian Textile Journal. (2025). *Green tech reshaping textiles*. *Indian Textile Journal*. https://indiantextilejournal.com
25. Grönwall, J., & Jonsson, A. C. (2022). The impact of 'zero' coming into fashion: Zero-liquid-discharge uptake and socio-technical transitions in Tirupur. *Water Alternatives, 10*(2), 426–445.
26. Textile World. (2025). *Growth & transformation of India's textile industry*. *Textile World*. https://textileworld.com
27. Habibullah, H., & Yadav, A. (2024). *Panipat: The global textile recycling hub tainted by pollution*. *FairPlanet*.
28. India Water Portal. (2024). *Approaches for circular textile and apparel industry in India (GIZ & ABFRL circularity guidelines)*.
29. Textile Value Chain. (2025). *India's textile industry: A paradigm shift towards sustainable practices*. https://textilevaluechain.in
30. Indian Textile Journal. (2023). *Sustainability and circularity in textiles: A policy paradigm*. https://indiantextilejournal.com
31. Indian Textile Journal. (2024). *The future of textiles: A look at the current state of affairs*. https://indiantextilejournal.com/the-future-of-textiles-a-look-at-the-current-state-of-affairs/

32. Indian Textile Journal. (2025). *Green tech reshaping textiles*. *Indian Textile Journal*.
33. Indian Textile Journal. (n.d.). *Driving a greener future for the industry*. *Indian Textile Journal*.
34. Indian Textile Journal. (n.d.). *Sustainability and circularity in textiles: A policy paradigm*. *Indian Textile Journal*.
35. Invest India. (2024). *Technical textiles: Market opportunities*.
36. iTexClouds. (n.d.). *Textile industry digital transformation*. Infopine.com
37. Kant, R. (2012). Textile dyeing industry: An environmental hazard. *Natural Science, 4*(1), 22–26.
38. Khadi and Village Industries Commission. (n.d.). In *Wikipedia*. Retrieved August 2025, from https://en.wikipedia.org/wiki/Khadi_and_Village_Industries_Commission
39. KPMG. (2022). *Medical textiles in India: Post-pandemic opportunities and strategies*. New Delhi: KPMG India.
40. KPMG. (2025). *Rethinking: Textile sector*. https://kpmg.com
41. Le Monde. (2024). *In India, a second life for saris: I Was A Sari's zero-waste initiative*.
42. Linking Sustainability. (2025). *How Indian companies are slowing fast fashion and promoting a circular economy*.
43. Malik, R. (2025). Barriers to adopting Industry 4.0 in Indian textile and clothing industries. *Discover Applied Sciences*.
44. Manavalan, R. A. (2023). Sustainability journey of Tirupur apparel cluster: Series 001—Zero liquid discharge (ZLD), water stewardship. *Virtual Vastra*.
45. McKinsey & Company. (2021). *Fashion on climate: How the fashion industry can urgently act to reduce its greenhouse gas emissions*.
46. Ministry of Commerce & Industry. (2023). *Foreign trade policy and export incentive schemes*. Government of India.
47. Ministry of Commerce & Industry. (2023). *PM MITRA parks: Catalyzing integrated textile value chains*. Government of India.
48. Ministry of Skill Development & Entrepreneurship. (2023). *Samarth scheme annual performance report*. Government of India.
49. Ministry of Textiles, Government of India. (2024). *Annual report*.
50. Ministry of Textiles. (2022). *Annual report 2021–22*. Government of India.
51. Ministry of Textiles. (2023). *Annual report 2022–23*. Government of India.
52. Ministry of Textiles. (2023a). *Production linked incentive scheme for textiles: Guidelines and impact projections*. Government of India.
53. Ministry of Textiles. (2023b). *Annual report 2022–23*. Government of India.

54. Ministry of Textiles. (2024). *National technical textiles mission: Progress update*. Government of India.
55. Outlook Business. (2024). *Indian textile industry gears up for global ESG mandates with new training initiative*. *Outlook Business*.
56. Fibre2Fashion. (2025). *Panipat's textile recycling industry turning waste into wealth*.
57. Wikipedia. (2025). *Plastic weaving in Dharavi*. https://en.wikipedia.org
58. Indian Textile Journal. (2025). *Reshaping India's textile ecosystem*. *Indian Textile Journal*. https://indiantextilejournal.com
59. Sethi, R. D. (2025). *Dry dyeing and beyond: The future of waterless textile processing*. *Textile Value Chain*. https://textilevaluechain.in
60. Shen, B., Li, Q., Dong, C., & Perry, P. (2020). Sustainability issues in textile and apparel supply chains. *Sustainability, 12*(15), 6176.
61. Stoppa, M., & Chiolerio, A. (2014). Wearable electronics and smart textiles: A critical review. *Sensors, 14*(7), 11957–11992.
62. Study IQ. (2024). *India's textile industry: Challenges and opportunities*. https://www.studyiq.com/articles/indias-textile-industry/
63. Tapscott, D., & Tapscott, A. (2018). *Blockchain revolution: How the technology behind bitcoin and other cryptocurrencies is changing the world*.
64. Wikipedia. (2025). *Textile recycling*. https://en.wikipedia.org/wiki/Textile_recycling
65. Textile Value Chain. (2024). *Indian textiles & clothing industry struggles as incentives erode competitiveness*.
66. Fibre2Fashion. (2025). *The future of Indian textiles: A circular economy perspective*. https://fibre2fashion.com
67. Upadhyay, P., & Pathak, R. D. (2020). Sustainability in Indian fashion: Traditional dyeing, printing, and weaving. *Textile Outlook International* (206), 37–44.

Bhumi Publishing, India
September 2025

A SUSTAINABLE AND MENTALLY HEALTHY VIKSIT BHARAT BY 2047 THROUGH ECO-CONSCIOUS BEHAVIOUR

Nishita[1] and Priya[2]

[1]Amity Institute of Clinical Psychology (AICP) Amity University, Patna, Bihar

[2]Amity School of Buisness (ASB) Amity University, Patna, Bihar

Corresponding author E-mail: nishitanishita71@gmail.com, mishrapriya646@gmail.com

Abstract:

In the 21st century, eco-conscious behaviour, which includes both individual and group actions to reduce harm to the environment, has become a psychological necessity. Although environmental discourse frequently emphasises policy frameworks and technological advancements, the psychological foundations influencing individuals' decisions to adopt or eschew sustainable practices are inadequately examined, particularly within the Indian context. This chapter examines the cognitive, emotional, social, and cultural determinants that affect eco-conscious behaviour, synthesising insights from environmental psychology, behavioural economics, and social identity theory. It emphasises the relationship between mental health and sustainability, demonstrating how environmental awareness enhances personal well-being, community resilience, and national advancement. Case studies from India, encompassing rural conservation initiatives to urban green innovations, illustrate the practical applications of psychological principles. The chapter ends with a plan for making eco-consciousness a part of India's development strategy for Viksit Bharat @2047. It says that changes should be driven by educational reforms, community mobilisation, and policy integration.

Keywords: Eco-Consciousness, Environmental Psychology, Sustainability, India, Behavioural Determinants

Table 1: Psychological Theories of Eco-Conscious Behavior

Theory	Key Concept	Application in Indian Context
Theory of Planned Behavior (TPB)	Attitudes, subjective norms, perceived control	Delhi Metro's public transport campaigns
Value-Belief-Norm (VBN)	Values → Beliefs → Norms → Behavior	Chipko Movement's biospheric values
Self-Determination Theory (SDT)	Intrinsic motivation and identity	"Responsible Citizen" eco-campaigns
Social Identity Theory	Group identity shapes norms	Kerala organic farming cooperatives
Nudging	Choice architecture	"Opt-out" towel reuse in hotels

Case Study: Chipko Movement

The Chipko Movement of the 1970s was a grassroots environmental protest in Uttarakhand, India, where villagers, primarily women, hugged trees to prevent them from being cut down. This act of non-violent resistance was driven by deep emotional and cultural connections to the forest, reflecting biospheric and altruistic values. It remains a powerful example of community-led eco-conscious behavior in India.

1. Introduction:

The 21st century is witnessing an unprecedented awareness of the intricate and reciprocal relationship between human well-being and the ecological health of our planet**.** Global crises such as climate change, biodiversity loss, pollution, and resource depletion are no longer perceived solely as environmental challenges; they are increasingly recognized as profound public health concerns (Whitmee *et al.,* 2015). These environmental stressors are intricately linked to physical health outcomes, such as respiratory diseases, malnutrition, and heat-related illnesses, as well as mental health consequences, including eco-anxiety, depression, and a pervasive sense of loss (Clayton *et al.,* 2017). The concept of *planetary health*—which emphasizes that the health of human civilization depends on the state of the natural systems on which it relies—underscores this interdependence.

Eco-conscious behavior, defined as voluntary actions and lifestyle choices aimed at reducing environmental harm and fostering ecological sustainability (Kollmuss & Agyeman, 2002), has emerged as a critical component in mitigating these interconnected crises. These behaviors can range from individual practices, such as reducing energy consumption and choosing sustainable products, to collective actions, such as community-driven conservation initiatives and environmental policy advocacy. From a psychological perspective, such behaviors are not simply the outcome of environmental awareness; they are shaped by complex cognitive processes, emotional motivations, and deeply rooted social norms.

In the Indian context, the adoption of eco-conscious behavior is influenced by a unique interplay of cultural heritage, socio-economic realities, and national developmental aspirations. India's traditional philosophies—such as *Vasudhaiva Kutumbakam* ("the world is one family") and the Gandhian ethic of minimal consumption—resonate strongly with modern sustainability principles (Rangarajan, 2019). Rural communities often retain ecological wisdom embedded in agricultural practices, water conservation methods, and forest stewardship. However, rapid urbanization, industrial expansion, and consumerism present formidable challenges to sustaining such eco-centric values (Sharma & Kumar, 2021).

At the same time, India's participation in global sustainability frameworks, such as the United Nations' Sustainable Development Goals (SDGs), reflects a growing policy emphasis on integrating environmental stewardship with economic growth. This creates a critical opportunity to align traditional eco-values with contemporary strategies for sustainable innovation. As the

nation envisions *Viksit Bharat @ 2047*—a developed, prosperous, and inclusive India—eco-conscious behavior becomes not only an environmental imperative but also a psychological and cultural mission that integrates well-being with ecological responsibility.

This chapter therefore examines the psychological foundations of eco-consciousness, elucidating how cognitive appraisals, affective responses, and socio-cultural influences shape sustainable behavior. It further explores the bidirectional relationship between environmental stewardship and mental health, highlighting case studies from India where traditional knowledge, modern innovation, and community engagement intersect to foster resilience. In doing so, the discussion situates eco-conscious behavior as a cornerstone of both environmental sustainability and the holistic well-being of individuals and communities.

2. Psychological Foundations of Eco-Conscious Behavior

2.1 Cognitive Factors

Cognitive factors are central to how individuals process environmental information and translate it into actionable, eco-conscious behavior. These factors include not only basic awareness of environmental issues, such as understanding the consequences of pollution or resource depletion, but also deeper cognitive constructs like risk perception and future orientation. When individuals recognize both the immediacy and the magnitude of environmental threats, they are more likely to engage in preventive action. The Theory of Planned Behavior (Ajzen, 1991) further elaborates that eco-friendly intentions stem from a belief in the effectiveness of one's efforts (self-efficacy) as well as anticipated outcomes. For instance, studies in urban India have revealed that residents with higher knowledge of pollution sources and effective waste management techniques show greater commitment to household recycling (Sharma & Tripathi, 2019). Moreover, digital tools and environmental apps now enhance cognitive engagement by tracking personal carbon footprints, making environmental impacts more tangible and immediate, which reinforces planned, sustainable behaviours.

2.2 Emotional Drivers

While rational decision-making plays a role, emotional responses are equally pivotal in fostering sustained eco-consciousness. Positive emotions—such as pride from participating in tree-planting campaigns or satisfaction after water conservation efforts—encourage continued engagement in sustainability initiatives (Singh *et al.,* 2021). Conversely, negative emotions like guilt after witnessing environmental degradation can prompt corrective behavior, especially when accompanied by accessible solutions. Importantly, eco-anxiety, though often associated with stress, can be channeled productively when individuals are provided with clear avenues for involvement in solutions—such as joining environmental NGOs or participating in local clean-up drives. Educational institutions and awareness programs that address both the emotional and cognitive dimensions of sustainability have been shown to foster durable environmental stewardship (Chatterjee, 2020).

2.3 Social and Cultural Influences

The collective aspect of eco-conscious behaviour in India is often embedded in social and cultural traditions. Generational values, such as respecting river systems and forests as sacred entities, continue to influence practices in both rural and urban settings. Social learning, wherein individuals adopt behaviors modeled by respected community members or peer groups, reinforces sustainable actions at scale. National campaigns like Swachh Bharat Abhiyan not only introduce practical frameworks for cleanliness but also leverage the power of shared identity and pride in a cleaner nation (Narain, 2018). In addition, participatory governance models—such as involvement of residents' welfare associations in managing waste segregation or rainwater harvesting—demonstrate the effectiveness of harnessing cultural capital and social cohesion for environmental outcomes. Social media, too, plays a growing role in shaping narratives, creating virtual communities that motivate and normalize eco-friendly behaviors across diverse socio-economic groups.

3. Mental Health and Eco-Consciousness

Eco-conscious behavior and mental health are mutually reinforcing. Access to green spaces, community gardening, and sustainable lifestyles have been shown to reduce stress, improve mood, and enhance life satisfaction. Conversely, environmental degradation can contribute to psychological distress, displacement-related trauma, and a sense of loss. Integrating environmental activities into mental health promotion—such as 'green therapy' and nature walks—can foster both ecological responsibility and well-being.

4. Case Studies from India

Sikkim: India's First Organic State

Sikkim's transition to 100% organic farming demonstrates the power of policy, community participation, and education in shaping eco-conscious behavior. Farmers received training, subsidies for organic inputs, and support in marketing produce, fostering both environmental sustainability and economic resilience.

Indore's Cleanliness Drive

Indore's success in becoming India's cleanest city for several consecutive years is a product of consistent behavioral nudges, public-private partnerships, and community pride. Residents were encouraged to segregate waste, with regular feedback and rewards creating lasting habits.

Chipko Movement

The Chipko Movement, led primarily by women, involved physically embracing trees to prevent deforestation in Uttarakhand. This act was rooted in cultural values, community solidarity, and a deep sense of place, making it a landmark in India's environmental history.

5. Strategies for Promoting Eco-Conscious Behavior

Effectively fostering eco-conscious behavior across India demands a comprehensive, multi-level strategy that leverages psychological insights, social dynamics, institutional frameworks, and supportive policy environments. Each societal level has a critical role to play in embedding sustainability into daily life, ensuring that eco-friendly choices become desirable, accessible, and habitual.

5.1 Individual-Level Interventions

At the individual level, behavioral economics provides potent tools for guiding choices. 'Nudges,' a concept popularized by Thaler and Sunstein (2008), are subtle alterations in the environment or "choice architecture" that steer people toward sustainable behavior without restricting freedom of choice. Examples include making energy-efficient appliances the default option, placing recycling bins at convenient locations, or setting default temperatures on air conditioners to energy-saving settings. Such interventions work because they reduce the cognitive load of making pro-environmental decisions, making sustainable actions the path of least resistance.

Digital reminders, gamified tracking of energy and water use, and personalized feedback via mobile apps also encourage individuals to adjust habits and see the tangible benefits of their actions. Furthermore, public recognition—such as community awards or features in local media for green initiatives—can foster positive reinforcement and social status, motivating not only the recipient but also observers within their social networks.

5.2 Community and Social Influence

Communities serve as powerful multipliers for eco-conscious behaviors, given the ingrained nature of social learning and peer influence. Organizing neighborhood clean-up drives, "zero waste" festivals, and collective rainwater harvesting projects promote environmental stewardship, foster a sense of belonging, and enhance communal pride. Facilitating platforms for the sharing of stories, best practices, and challenges allows successful models to be replicated and tailored to local contexts.

When community leaders and influential local figures model sustainable behaviors—such as practicing segregation of waste or using public transport—social norms begin to shift. In rural areas, leveraging existing self-help groups and panchayat institutions can rapidly spread awareness and mobilize resources for eco-friendly initiatives.

5.3 Institutional and Educational Approaches

Institutionalizing eco-consciousness through education is a cornerstone strategy. Integrating environmental psychology, climate science, and behavioral studies into formal curricula from an early age cultivates eco-literacy and emotional investment in sustainability. Experiential learning—such as school vegetable gardens, field visits to natural reserves, or

participation in environmental monitoring—makes connections between theory and daily life more vivid and lasting. Higher education and vocational institutes can promote green entrepreneurship and research on sustainable innovations, preparing future leaders for a green economy.

Workplaces and corporate entities can contribute by instituting green office policies, incentivizing carpooling, providing mental health support tied to environmental wellness programs, and aligning business objectives with Environmental, Social, and Governance (ESG) standards.

5.4 Policy and Structural Supports

At the highest level, sustained eco-consciousness flourishes only when policies make sustainable choices feasible and appealing. Government policies can mandate green building codes, enforce efficient waste management systems, and offer subsidies for renewable energy adoption. Tax incentives for sustainable products, penalties for polluting activities, and clear labeling systems guide consumer decision-making. National and state-level public awareness campaigns should use emotionally engaging storytelling as well as factual data to appeal to a diverse populace—combining rational arguments about cost and safety with narratives that evoke pride, empathy, and collective responsibility.

Furthermore, collaborative policymaking—where citizens, businesses, and civil society co-create and monitor regulations—ensures that policies are grounded in reality, context-sensitive, and have greater community buy-in.

In summary, promoting eco-conscious behavior is most effective when it blends nudges, strong social and community engagement, educational investment, and enabling structural supports. By aligning all levels, India can accelerate its journey toward a sustainable and mentally healthy Viksit Bharat by 2047.

6. Policy Integration for Viksit Bharat @2047

Viksit Bharat @2047 envisions a self-reliant, inclusive, and prosperous nation that purposefully integrates economic growth with environmental stewardship and social well-being. A truly transformative policy framework for this vision must embed psychological insights into every sustainability initiative, ensuring that progress is both measurable and meaningful for all segments of society.

Firstly, communication strategies should be culturally resonant. Messaging that draws from India's rich heritage of ecological harmony—such as the reverence for rivers, forests, and sacred groves—can build on deep-rooted values to encourage mass participation in green initiatives. Tailoring policy communication to regional languages and local idioms, and involving community influencers, amplifies the reach and emotional impact of sustainability messages. By invoking social identity—such as pride in being part of a "Green Village" or

"Smart Clean City"—policy makers harness collective action, making eco-consciousness a point of communal honor and belonging.

Accessibility to green infrastructure is essential. Policies must prioritize equitable access, ensuring that marginalized communities benefit from renewable energy, clean water, and resilient urban spaces. This includes subsidized solar panels for rural households, widespread public charging facilities for electric vehicles, incentivized rooftop farming, and walkable, shaded cities that support both physical and mental well-being. Urban planning must integrate green belts, biodiversity corridors, and noise reduction zones—all of which have proven links to reduced stress and improved mental health.

The effectiveness of integrated, eco-psychological policy hinges on robust monitoring and evaluation mechanisms. Beyond tracking environmental indicators—such as air and water quality, forest cover, or energy mix—it is vital to measure changes in public attitudes and behaviors. Periodic national surveys, behavioral audits, and real-time feedback via mobile apps or citizen science platforms can quantify shifts in eco-literacy, public engagement, and personal well-being. This data-driven approach enables quick policy corrections and adaptive learning, making governance nimbler and more responsive.

Policy frameworks should also draw on the principles of "nudge theory," embedding sustainable choices into public services, procurement norms, and urban design. For example, making public transport the default, or incentivizing green certifications in the housing sector, can subtly but powerfully tip social behaviors toward sustainability. Capacity-building investments in institutions—schools, panchayats, businesses—ensure that the knowledge, skills, and motivation for eco-conscious living are distributed widely.

Finally, integrated policy for Viksit Bharat @2047 must foster cross-sectoral collaboration: linking ministries of environment, health, education, industry, and urban development with civil society and private sector stakeholders. Only through such holistically crafted, psychologically-informed, and inclusively implemented policy can India move steadfastly towards a sustainable, mentally healthy, and truly developed Viksit Bharat by 2047.

Conclusion:

The psychology of eco-conscious behavior provides a powerful lens for understanding how individuals and communities can harmonize personal well-being with the health of the planet. Psychological research demonstrates that sustainable behavior is influenced by multiple interrelated factors, including environmental values, perceived behavioral control, intrinsic motivation, and social identity (Bamberg & Möser, 2007; Steg & Vlek, 2009). Understanding these psychological drivers is crucial for developing interventions that do not merely encourage one-time pro-environmental acts, but nurture enduring lifestyle transformations rooted in ecological responsibility.

In the Indian context, the integration of traditional ecological wisdom with modern psychological principles holds immense potential for scaling sustainable practices. Ancient Indian philosophical frameworks, such as *Prakriti-Purusha* balance in Ayurveda and the *Pancha Mahabhutas* (five elements) in Vedic thought, emphasize the interdependence of human life and the natural environment (Rangarajan, 2019). These cultural narratives naturally align with contemporary behavioral interventions aimed at fostering long-term environmental stewardship. For example, community-based initiatives grounded in local traditions—such as *van mahotsav* (tree-planting festivals) or *jal yatra* (water conservation campaigns)—can be enhanced by psychological tools like social norm feedback, habit formation strategies, and self-determination theory to strengthen engagement and retention.

As India advances towards the vision of Viksit Bharat @ 2047, cultivating an eco-conscious citizenry will be critical for ensuring that economic growth does not compromise ecological integrity. This vision demands a paradigm shift—from perceiving sustainability as an external obligation to embracing it as an intrinsic part of personal identity and collective national purpose. An eco-conscious population is more likely to adopt behaviors that enhance resilience against climate-related disasters, promote equitable resource distribution, and contribute to the overall health and happiness of society.

Such cultivation requires multi-level interventions, including:

- Educational initiatives that embed environmental psychology into school and university curricula.
- Policy frameworks that incentivize sustainable consumer choices through behavioral nudges and green subsidies.
- Urban and rural community programs that create shared spaces for environmental action, reinforcing social belonging and ecological responsibility.

Ultimately, the fusion of psychological insights, traditional cultural values, and modern sustainability science offers a uniquely Indian pathway toward resilience, equity, and prosperity. By grounding environmental action in the motivations, identities, and aspirations of people, India can build not only a vibrant economy but also a thriving, sustainable civilization that serves as a model for the world.

References:

1. Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice Hall.
2. Braithwaite, I., Zhang, S., Kirkbride, J. B., Osborn, D. P., & Hayes, J. F. (2019). Air pollution (particulate matter) exposure and associations with depression, anxiety, bipolar, psychosis and suicide risk: A systematic review and meta-analysis. *Environmental Health Perspectives, 127*(12), 126002. https://doi.org/10.1289/EHP4595

3. Clayton, S., & Karazsia, B. T. (2020). Development and validation of a measure of climate change anxiety. *Journal of Environmental Psychology, 69*, 101434. https://doi.org/10.1016/j.jenvp.2020.101434
4. Clinical ecopsychology: The mental health impacts and underlying processes. (2021). *Frontiers in Psychiatry*. https://pmc.ncbi.nlm.nih.gov/articles/PMC8175799/
5. Eco-emotions and psychoterratic syndromes: Reshaping mental responses to environmental change. (2023). *Frontiers in Psychology*. https://pmc.ncbi.nlm.nih.gov/articles/PMC10303262/
6. Editorial: Green psychology: Nature and scope for sustainability. (2023). *Frontiers in Psychology*. https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1260680/full
7. Green space and mental well-being research in India. (2024). *ResearchGate*. https://www.researchgate.net/publication/383580465
8. Intergovernmental Panel on Climate Change. (2023). *Climate change 2023: Synthesis report*. IPCC.
9. Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally, and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8*(3), 239–260.
10. Mangalamchery, V., & Uvais, N. A. (2025). Climate change and mental health: A scoping review of Indian studies. *Primary Care Companion for CNS Disorders, 27*(4), 24r03903. https://doi.org/10.4088/PCC.24r03903
11. Mehta, R. (2022). Behavioural change for climate action in India. *Indian Journal of Sustainable Development, 14*(2), 33–47.
12. Misra, P., & Poddar, J. (2025). *With climate in mind: Psychoanalysts on climate breakdown*. Routledge.
13. NITI Aayog. (2021). *Vision for India @100*. Government of India.
14. Patel, S., & Banerjee, A. (2022). The climate mental health nexus in South Asia. *Asian Journal of Public Health, 14*(1), 45–57.
15. Psychology of sustainability: Education for sustainable development in India. (2025). *ResearchGate*. https://www.researchgate.net/publication/393247874
16. Spending time in nature is associated with good health and wellbeing. (2019). In M. P. White, I. Alcock, J. Grellier, S. Bell, L. R. Elliott, M. Gascon, S. Gualdi, L. Mancini, M. J. Nieuwenhuijsen, D. A. Sarigiannis, M. van den Bosch, & L. E. Fleming. *Scientific Reports, 9*(1), 7730. https://doi.org/10.1038/s41598-019-44097-3
17. Urban green spaces and mental health during the COVID-19 pandemic. (2024). *Frontiers in Public Health*. https://www.frontiersin.org/articles/10.3389/fpubh.2024.1334425/full
18. Ecological empathy and conservation behavior. (n.d.). In *Wikipedia*. https://en.wikipedia.org/wiki/Ecological_empathy

NATIONAL EDUCATION POLICY 2020: A CATALYST FOR INDIA'S EDUCATIONAL AND ECONOMIC GROWTH

Pragya Singh and Desh Deepak
Faculty of Education,
Dayalbagh Educational Institute, Dayalbagh, Agra, Uttar Pradesh 282010
Corresponding author E-mail: pragya191459@dei.ac.in, deshdeepak161368@dei.ac.in

Abstract:

India's National Education Policy (NEP) 2020 envisions a transformed education system that is equitable, flexible, multidisciplinary, and aligned with twenty-first-century skills. This chapter critically examines NEP 2020 as an engine for educational improvement and economic growth. It synthesizes key provisions—school restructuring (5+3+3+4), foundational literacy and numeracy (FLN), multilingualism, curricular reforms, the Academic Bank of Credits (ABC), flexible higher education pathways, research funding through the Anusandhan National Research Foundation (ANRF), and digital and vocational integration—alongside early implementation initiatives such as NIPUN Bharat and PM SHRI schools. Drawing on recent datasets (AISHE 2021–22; provisional AISHE 2022–23), the National Curriculum Framework 2023, and the World Bank's economic analyses, the chapter argues that NEP's human-capital orientation is central to India's pursuit of higher productivity, innovation, and inclusive growth by 2047. It also flags execution risks—teacher capacity, assessment reform, financing to the 6%-of-GDP target, and governance coherence—and proposes a practical roadmap.

Keywords: National Education Policy 2020, Human Capital, Economic Growth, Higher Education, Foundational Literacy and Numeracy

1. Introduction: Why NEP 2020 Matters for Growth

Education shapes both the capabilities of individuals and the productive capacity of nations. NEP 2020—India's first comprehensive overhaul of education in over three decades—states plainly that universal access to quality education is key to India's ascent in economic growth, scientific advancement, and social equity (Ministry of Education [MoE], 2020). Beyond expanding years of schooling, NEP emphasizes *what* children learn—critical thinking, problem solving, ethical reasoning, and vocational relevance—reflecting contemporary evidence that learning quality predicts growth and earnings more powerfully than schooling duration alone (World Bank, 2024; Azevedo *et al.,* 2021; Hanushek & Woessmann, 2021). At the macro scale, each additional year of schooling is associated with around a 10% return in earnings on average, while systems that boost actual learning (not just enrolment) see stronger growth dividends (World Bank, 2024; Kaffenberger & Pritchett, 2021).

NEP targets universalization of school education by 2030 and a Gross Enrolment Ratio (GER) of 50% in higher education by 2035, alongside a public-spending goal of 6% of GDP (MoE, 2020). These goals link directly to human-capital deepening and to India's ambition to reach higher-middle-income status by 2047 (World Bank, 2025).

2. Core School-Education Reforms

2.1 Curricular–pedagogical restructuring (5+3+3+4)

NEP replaces the 10+2 structure with a 5+3+3+4 design spanning ages 3–18, integrating early childhood care and education (ECCE) and aligning pedagogy with developmental stages. The National Curriculum Framework for School Education (NCF 2023) operationalizes this vision with competency-based learning, flexible assessment, and a strong push for mother-tongue/home-language instruction in early years (MoE, 2023). In 2025–26, CBSE has directed affiliated schools to operationalize NCF-aligned language guidelines emphasizing "mother tongue first" in the Foundational and Preparatory stages, signaling implementation traction (Times of India, 2025a, 2025b; Economic Times, 2025).

Table 1: NEP 2020 – 5+3+3+4 Structure

Stage	Ages	Classes	Key Focus Areas
Foundational	3–8	Pre-school–2	Play-based, activity-based, foundational literacy & numeracy
Preparatory	8–11	3–5	Discovery learning, language development, basic numeracy
Middle	11–14	6–8	Conceptual understanding, sciences, arts, vocational intro
Secondary	14–18	9–12	Multidisciplinary, critical thinking, flexibility in subjects

2.2 Foundational Literacy and Numeracy (FLN)

NEP identifies FLN as a non-negotiable prerequisite for all learning. NIPUN Bharat (2021) provides a mission framework for states/UTs to achieve FLN by Grade 3 through teacher support, graded learning trajectories, and monitoring (MoE, 2021a, 2021b). ASER 2023 underscores the urgency: roughly a quarter of youth aged 14–18 still require support in foundational competencies, suggesting the FLN drive must be sustained and data-driven (ASER Centre, 2024).

2.3 Multilingualism and inclusion

NEP encourages multilingual proficiency, flexible language choices, and local-context materials. This is not merely cultural; early literacy in home languages reduces cognitive load and improves comprehension, which in turn lifts later subject achievement—an effect with long-run productivity returns (MoE, 2020; NCF 2023; World Bank, 2024).

2.4 Exemplar schools and system demonstration (PM SHRI)

The PM SHRI scheme seeks to develop ~14,500 exemplar schools showcasing NEP components, teacher development, and resource convergence, creating a demonstration effect for surrounding schools (PIB, 2022; PM SHRI Dashboard, 2025). If designed as learning labs with rigorous evaluation, PM SHRI can seed system-wide adoption at lower diffusion cost.

3. Higher-Education Reforms and Economic Linkages

3.1 Flexible pathways and Academic Bank of Credits (ABC)

NEP's ABC enables credit accumulation, multiple entry/exits, and student mobility across institutions and modalities, reducing sunk-cost risks and encouraging lifelong learning (UGC/ABC, n.d.). Over time, such flexibility can raise human-capital stock and labor-market matching efficiency by allowing workers to upskill/reskill without leaving the workforce.

3.2 Multidisciplinary universities, research, and innovation

The policy calls for large, multidisciplinary institutions and a new research architecture. The Anusandhan National Research Foundation Act (2023) establishes the ANRF to strategically fund research in science, technology, social sciences, and humanities, while catalyzing industry–academia partnerships (DST, 2023; PRS India, 2023). A robust research ecosystem expands India's knowledge-intensive sectors and total factor productivity—essential for sustaining high growth.

3.3 GER expansion and equity

The higher-education GER rose from 23.7% (2014–15) to 28.4% (2021–22), with a provisional 29.5% in 2022–23 per a parliamentary reply (MoE, 2024a; MoE, 2024b). This trajectory is positive but must accelerate to reach 50% by 2035. Targeted expansion—especially for SEDGs, women, SC/ST communities, and underserved geographies—can unlock labor force participation and earnings growth, thereby compounding macroeconomic gains.

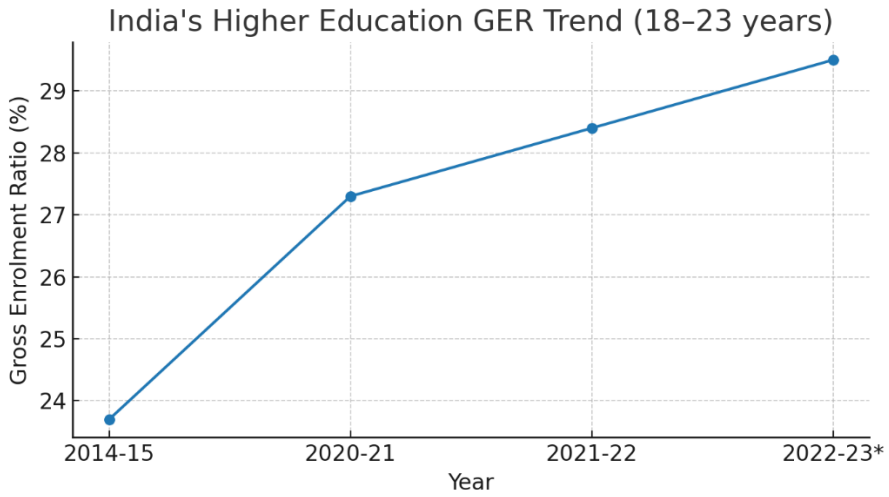


Figure 1: Higher-education GER gains since 2014–15 and the policy ambition for 2035 (AISHE 2021–22; 2022–23 provisional). Sources: MoE AISHE; MoE parliamentary reply.

4. Financing and Governance: The 6% Imperative

NEP explicitly calls for public education expenditure to reach 6% of GDP (MoE, 2020). While Union and state allocations have increased in nominal terms since 2020, aggregate public spending remains below this benchmark (PIB, 2023; World Bank, 2025). International evidence is clear: sustained, efficient investment in early-grade learning, teacher development, and research ecosystems yields large growth payoffs, but only when spending quality and governance improve in tandem

Table 2: NEP 2020 Goals and Pathways to Economic Impact

NEP Goal/Instrument	Educational Effect	Economic Channel
FLN via NIPUN Bharat	Early reading & numeracy mastery by Grade 3	Higher learning trajectories; reduced remediation costs; productivity gains (ASER Centre, 2024; MoE, 2021a)
5+3+3+4 & NCF 2023	Development-aligned curriculum; competency-based assessments	Better cognitive/soft skills; innovation capacity (MoE, 2023)
Mother-tongue instruction	Improved comprehension and retention	Larger cohort completing secondary; higher human-capital quality (MoE, 2023; World Bank, 2024)
ABC & multiple entry/exit	Flexible learning; reduced attrition	Labor-market agility; upskilling/reskilling; earnings growth (UGC/ABC, n.d.)
ANRF research funding	Scaled R&D and collaboration	TFP growth; high-tech sectors; spillovers (DST, 2023; PRS, 2023)
PM SHRI exemplars	Demonstration & diffusion of best practices	System-wide quality improvements; cost-effective scale (PIB, 2022)
6% of GDP financing	Adequate, predictable funding	Sustained quality gains; equitable access (MoE, 2020; World Bank, 2025)

5. Implementation Snapshot: Progress and Gaps

5.1 Early traction

- **NCF 2023** released to drive competency-based learning and the 5+3+3+4 structure (MoE, 2023).
- **Language policy**: CBSE has directed schools to implement mother-tongue-first in early stages from AY 2025–26 (Times of India, 2025a, 2025b; Economic Times, 2025).
- **NIPUN Bharat** operational with national/state frameworks (MoE, 2021a, 2021b).
- **PM SHRI** notified and rolling out exemplar schools (PIB, 2022; PM SHRI Dashboard, 2025).

- **ABC** launched and scaled via UGC circulars and a national portal (ABC, n.d.).
- **ANRF** legislated through the 2023 Act to fund high-impact research (DST, 2023; PRS India, 2023).

5.2 Persisting challenges

- **Foundational learning gaps**: ASER 2023 finds ~25% of adolescents (14–18) need foundational support—learning recovery and acceleration remain priorities (ASER Centre, 2024).
- **Teacher capacity and workload**: Sustained professional development is crucial to enact NCF pedagogy; several states still face high pupil-teacher ratios, especially in disadvantaged areas (MoE, 2020; contemporary reporting).
- **Assessment reform**: Moving from high-stakes rote exams to competency-based assessments requires item banks, psychometrics, and teacher training at scale (MoE, 2023).
- **Tertiary expansion**: GER progress is real but needs faster growth and better equity to reach 50% by 2035 (MoE, 2024a; MoE, 2024b).
- **FFinancing**: Reaching and sustaining 6% of GDP—while enhancing spending efficiency—remains a work-in-progress (MoE, 2020; PIB, 2023; World Bank, 2025).

Table 3: Selected Implementation Milestones and Status

Area	Milestone	Status/Notes
Curriculum	NCF 2023 issued for 3–18 years	Guides the 5+3+3+4 stages; competency-based assessments (MoE, 2023).
Language	CBSE circular for AY 2025–26	Mother-tongue/home-language emphasized in early stages (Times of India, 2025a; Economic Times, 2025).
FLN	NIPUN Bharat guidelines	States/UTs implementing mission approach; ongoing teacher support (MoE, 2021a).
Exemplar schools	PM SHRI	~14,500 schools to demonstrate NEP components; dashboard operational (PIB, 2022; MoE, 2025).
Higher ed flexibility	ABC platform	Accumulates/transfer credits; enables multiple entry/exit (ABC/UGC, n.d.).
Research funding	ANRF Act 2023	Legal foundation for strategic research funding and partnerships (DST, 2023; PRS, 2023).
Access	GER rising	23.7% (2014–15) → 28.4% (2021–22) → 29.5% (2022–23 provisional) (AISHE; MoE).

6. From Policy to Productivity: How NEP Drives Growth

NEP's growth logic works through three reinforcing channels:

1. **Human-capital accumulation and employability.** Early reading and numeracy enable cumulative learning; competency-based curricula and vocational integration build job-relevant skills; flexible tertiary pathways (ABC) support lifelong learning. Better skills raise individual earnings and labor-force productivity (World Bank, 2024).
2. **Innovation and knowledge creation.** ANRF aims to widen and deepen India's research base, crowding in private R&D and enabling commercialization. Multidisciplinary universities, incubators, and industry linkages further productive innovation, crucial for moving up value chains (DST, 2023; PRS India, 2023; World Bank, 2025).
3. **Inclusion and balanced growth.** NEP promotes access for socio-economically disadvantaged groups, girls, and learners from diverse linguistic backgrounds. Inclusive human capital correlates with broader labor-market participation, reduced inequality, and more stable consumption growth, reinforcing macroeconomic resilience (MoE, 2020; World Bank, 2025).

7. Risks and How to Mitigate Them

- **Learning recovery and acceleration.** ASER 2023's "beyond basics" findings show many adolescents still struggle with everyday numeracy and literacy (ASER Centre, 2024). States should intensify structured pedagogy, formative assessment cycles, and targeted tutoring.
- **Teacher professional development (TPD).** NEP's pedagogy requires continuous TPD, mentoring, and time for collaborative planning. PM SHRI can function as a TPD hub, diffusing lesson study, coaching, and low-cost assessment practices (PIB, 2022).
- **Assessment transformation.** Establish national/state item banks, train teachers in competency-aligned assessment, and phase in high-quality board-exam changes per NCF 2023 (MoE, 2023).
- **Higher-education quality with scale.** To avoid enrolment growth without learning, accreditations must focus on outcomes, work-integrated learning, and research quality; ABC data can inform early-warning systems for attrition and course redesign (ABC/UGC, n.d.).
- **Financing and efficiency.** Reaching the 6%-of-GDP target should prioritize cost-effective investments—FLN, teacher coaching, assessment, and research infrastructure—backed by independent evaluations and outcome-based grants (MoE, 2020; World Bank, 2025).

8. A Pragmatic Roadmap (2025–2035

1. **Double down on FLN** through time-bound state compacts, classroom observation rubrics, and quarterly progress dashboards aligned to NIPUN Bharat.
2. **Operationalize NCF 2023** with curated teacher guides, exemplar units, and formative-assessment blueprints; accompany CBSE's language policy with teacher materials and community engagement.
3. **Use PM SHRI schools as "improvement engines,"** running rapid-cycle evaluations and sharing playbooks statewide.
4. **Scale ABC utilization** with micro-credentials aligned to sector skill councils; incentivize HEIs to recognize workplace learning.
5. **Fund ANRF competitively** with multi-year programs and industry co-funding; focus on priority missions (AI, climate tech, health, education technology).
6. **Track GER and learning outcomes together,** disaggregated by gender, caste, and location; link finance with performance on both access and learning.
7. **Build data interoperability** across UDISE+, AISHE, ABC, and assessment systems to inform policy in real time.

Collectively, these steps can turn NEP's aspirations into measurable learning and productivity gains—moving India closer to its 2047 growth ambition (World Bank, 2025).

Conclusion:

NEP 2020 is not only an education blueprint; it is a growth strategy. By marrying strong foundations in early grades with flexible, multidisciplinary higher education and energized research ecosystems, the policy aligns human-capital formation with India's structural transformation. The agenda is demanding—particularly on teacher development, assessment reform, and financing—but the returns are commensurately large. With disciplined implementation and evidence-led course corrections, NEP can accelerate India's journey to an innovative, inclusive, and prosperous economy.

References:

1. Academic Bank of Credits (ABC). (n.d.). *Resources*. University Grants Commission/Ministry of Education. https://www.abc.gov.in
2. ASER Centre. (2024). *ASER 2023: Main findings (14–18 years)*. https://asercentre.org/ (PDF dated Feb. 22, 2024).
3. Department of Science & Technology (DST). (2023). *The Anusandhan National Research Foundation Act, 2023*. Government of India.
4. Economic Times. (2025, June). *CBSE's new language rule: Use mother tongue in early stages*.

5. Ministry of Education (MoE). (2020). *National Education Policy 2020*. Government of India.
6. Ministry of Education (MoE). (2021a). *NIPUN Bharat guidelines for foundational literacy and numeracy*. Government of India.
7. Ministry of Education (MoE). (2021b). *NIPUN Bharat mission portal*. Government of India.
8. Ministry of Education (MoE). (2023). *National Curriculum Framework for School Education (NCF 2023)*. Government of India.
9. Ministry of Education (MoE). (2024a). *All India Survey on Higher Education (AISHE) 2021–22* (Report & dashboard). Government of India.
10. Ministry of Education (MoE). (2024b). *Parliamentary reply on AISHE 2022–23 (provisional)* (GER 29.5). Government of India.
11. Press Information Bureau (PIB). (2022, Sept.). *PM SHRI Schools scheme—Cabinet approval & note*. Government of India.
12. Press Information Bureau (PIB). (2023). *NEP 2020 initiatives and 6% of GDP financing vision* (MoE press release). Government of India.
13. PRS Legislative Research. (2023). *The Anusandhan National Research Foundation Bill, 2023—Bill summary*.
14. Times of India. (2025a, June). *Mother tongue first: CBSE directs schools to implement NCF language guidelines*.
15. Times of India. (2025b, June). *CBSE and its 'mother tongue first' move: Debate and implications*.
16. World Bank. (2024). *Education overview*. https://www.worldbank.org/en/topic/education/overview
17. World Bank. (2025). *India Country Economic Memorandum 2024/25: Becoming a high-income economy in a generation* (Human capital chapter).

INDIGENOUS KNOWLEDGE SYSTEMS FOR WOMEN'S EMPOWERMENT AND ECONOMIC SUSTAINABILITY: A STEP TOWARDS VIKSIT BHARAT @ 2047

Ritu Pradhan and Anupreet Kaur Sobti

Department of Foods and Nutrition, Government Home Science College, Chandigarh
(Affiliated to Panjab University, Chandigarh), India

Abstract:

Background: Indigenous knowledge systems (IKS) have played a pivotal role in shaping sustainable livelihoods, particularly for women in indigenous communities. Women are the custodians of traditional knowledge; however, globalization and modernization threaten the preservation and transmission of IKS, impacting women's economic and social roles. The objective of this review is to examine how indigenous knowledge contributes to women's empowerment, analyse the role of IKS in nurturing economic sustainability and to identify challenges and opportunities in integrating IKS into modern economic frameworks.

Methodology: A comprehensive and in-depth review of literature from academic journals, policy reports, and case studies was conducted, focusing on indigenous communities. Thematic analysis was employed to categorize findings under key areas: traditional skills and livelihoods, economic sustainability, and policy interventions.

Findings: Indigenous women play a crucial role in preserving and transmitting knowledge related to agriculture, food processing, handicrafts, and herbal medicine, contributing to community resilience. Women-led indigenous enterprises and cooperatives have emerged as effective models for economic sustainability, though they face barriers in accessing markets, financial resources, and policy support. Government policies, NGO interventions, and capacity-building initiatives have shown mixed results in integrating IKS into broader economic frameworks, with the need for more culturally sensitive approaches. Technology and innovation, when adapted appropriately, can enhance indigenous women's participation in sustainable economic activities while preserving traditional practices.

Conclusion: Indigenous knowledge remains a vital yet underutilized resource for women's empowerment and economic sustainability. A balanced approach—one that respects tradition while embracing innovation—can enhance the resilience and agency of indigenous women in a rapidly changing world. Strengthening institutional support, promoting fair market access, and fostering intergenerational knowledge transfer are crucial for empowering indigenous women and sustaining traditional economies.

Keywords: Indigenous Knowledge, Women's Empowerment, Economic Sustainability, Traditional Livelihoods, Policy Interventions

Introduction:

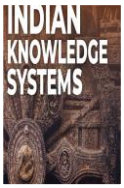
Indigenous knowledge systems (IKS) have long been the foundation of sustainable livelihoods, particularly in traditional societies where knowledge is passed down through generations (Kom & Nethengwe, 2024). These knowledge systems encompass diverse domains such as agriculture, food processing, healthcare, handicrafts, environmental management, and community governance (Macusi *et al.,* 2023). According to Aluko (2018), women in indigenous communities are often the primary custodians of this knowledge, playing a vital role in ensuring food security, biodiversity conservation, and cultural preservation. Despite their significant contributions, indigenous women frequently face economic marginalization, social inequalities, and a lack of institutional support.

The intersection of IKS and women's empowerment is increasingly recognized as an essential factor in achieving economic sustainability. Empowering women through the revitalization and commercialization of indigenous knowledge can lead to improved livelihoods, enhanced community resilience, and stronger local economies. However, globalization, modernization, and climate change threaten the survival of IKS, reducing opportunities for indigenous women to leverage their knowledge for economic advancement (Kugara *et al.,* 202; Makondo & Thomas, 2018). There is an urgent need to document, protect, and integrate IKS into contemporary economic frameworks to promote sustainable development while respecting cultural heritage.

The objective of this review is:

To examine how indigenous knowledge contributes to women's empowerment

To analyse the role of IKS in nurturing economic sustainability



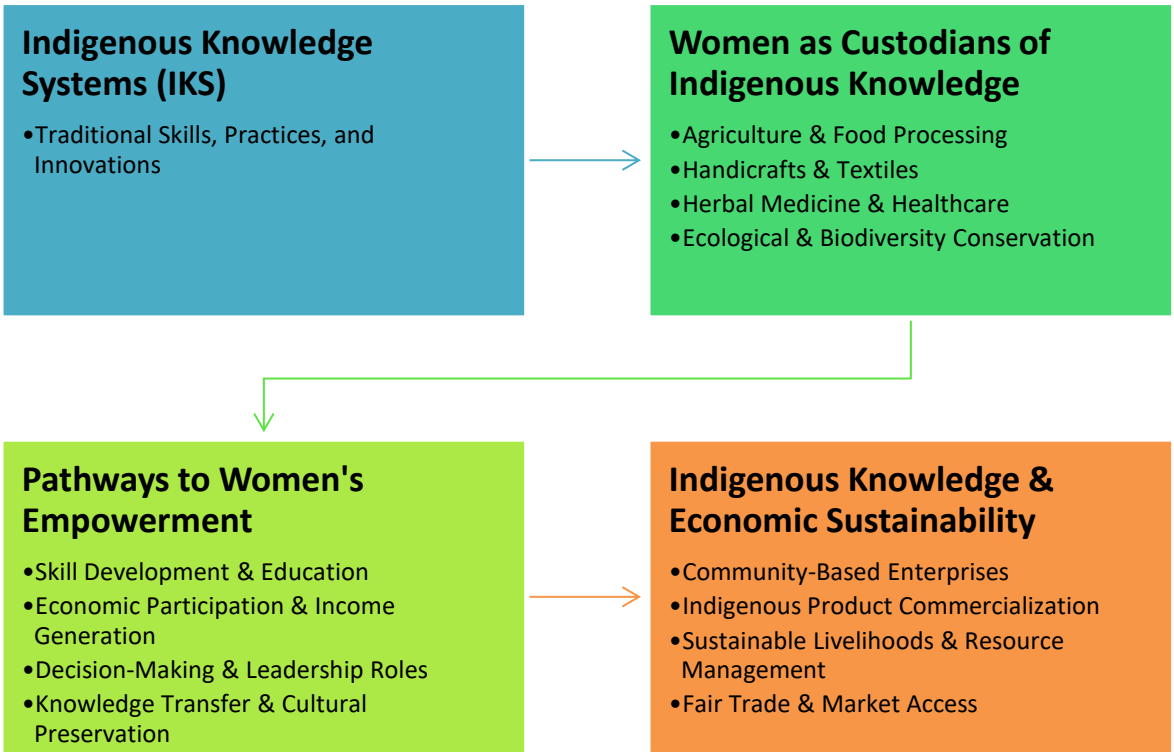
To identify challenges and opportunities in integrating IKS into modern economic frameworks.

This review examines a broad range of indigenous knowledge domains, such as traditional agricultural practices, food processing and preservation techniques, handicrafts, herbal medicine, and ecological conservation.

A comprehensive and detailed review of relevant literature, including peer-reviewed journal articles, policy reports, case studies, and indigenous knowledge documentation, was conducted. Thematic analysis was employed to categorize findings into three key areas:

i. Indigenous knowledge and women's empowerment
ii. Indigenous knowledge and economic sustainability
iii. Policy interventions and institutional support for indigenous women.

Conceptual Framework



Indigenous Knowledge and Women's Empowerment

Indigenous knowledge systems (IKS) play a crucial role in empowering women by providing them with skills, economic opportunities, and social recognition (Von Maltitz & Bahta, 2024; Emeagwali, 2021). Indigenous women are the primary custodians of traditional knowledge, preserving and passing down expertise in agriculture, food processing, handicrafts, herbal medicine, and environmental conservation. Their contributions not only sustain local economies but also enhance food security, cultural identity, and community resilience. However, despite their extensive knowledge and skills, many indigenous women face challenges such as limited market access, gender inequality, and the erosion of traditional practices due to modernization. This section explores the pathways through which IKS contributes to women's empowerment and the challenges that need to be addressed.

A) Traditional Skills and Livelihoods

Indigenous women have historically engaged in diverse livelihood activities that are deeply rooted in traditional knowledge. These activities, including farming, food preservation, handicrafts, herbal medicine, and resource management, provide them with economic independence while ensuring the sustainability of their communities (Dagar, 2021).

B) Agriculture and Food Processing

Indigenous women play a significant role in traditional agriculture, relying on their deep understanding of local ecosystems, soil fertility, and seed preservation. They practice sustainable farming techniques such as crop rotation, intercropping, and organic composting, which contribute to environmental conservation and food security. Additionally, women are responsible for post-harvest processing, employing techniques like fermentation, drying, and smoking to enhance food shelf life and nutritional value. By selling surplus produce in local markets, they generate income, improving household financial stability and strengthening their economic agency (Sharma *et al.,* 2020).

C) Handicrafts, Textiles, and Artisanal Skills

Handicrafts and textile-making are key sources of livelihood for indigenous women, who create intricate products such as woven fabrics, embroidery, pottery, and basketry. These crafts reflect cultural heritage and identity, serving as symbols of indigenous traditions. In many communities, women's cooperatives have emerged to organize production and marketing, ensuring fair trade opportunities and better income generation. With growing interest in ethically sourced, handmade products, indigenous women are increasingly accessing national and international markets, contributing to economic sustainability (WIPO Training, Mentoring and Matchmaking Program on Intellectual Property for Women Entrepreneurs from Indigenous Peoples and Local Communities, n.d.).

D) Herbal Medicine and Traditional Healthcare Practices

Indigenous women are often the primary healers within their communities, possessing extensive knowledge of medicinal plants, holistic therapies, and traditional healing rituals. They treat common ailments using herbal remedies and play a vital role in midwifery, maternal care, and child health. The global rise in demand for natural and alternative medicine presents an opportunity for indigenous women to commercialize their herbal knowledge while preserving traditional healing practices. However, intellectual property rights and ethical commercialization remain key concerns in safeguarding indigenous knowledge from exploitation (Kropi *et al.,* 2024).

E) Environmental Conservation and Resource Management

Women are central to indigenous environmental conservation efforts, using their traditional ecological knowledge to sustainably manage forests, water sources, and agricultural

lands. Their expertise in biodiversity conservation helps protect native plant species, restore degraded ecosystems, and promote climate resilience (Anju & Kumar, 2024). Many indigenous women engage in activities such as seed-saving programs, reforestation projects, and community-based sustainable fishing and farming initiatives. By leading conservation movements, they contribute to both ecological sustainability and the economic well-being of their communities through eco-tourism and sustainable enterprises.

Role of Women as Knowledge Keepers

Indigenous women serve as the primary knowledge keepers within their communities, ensuring that traditional wisdom, skills, and values are transmitted across generations. They play a key role in educating children and young women in cultural practices, traditional crafts, food preparation, and ethical resource management. Through oral traditions, storytelling, and hands-on learning, they pass down vital knowledge that maintains the cultural identity and resilience of their communities.

Additionally, many indigenous women hold spiritual and ritualistic knowledge, playing important roles in cultural ceremonies, healing practices, and governance. Their leadership in community decision-making is especially evident in matters related to land use, food security, and environmental protection. However, patriarchal structures in some societies limit their ability to exercise authority in formal leadership roles. Efforts to strengthen indigenous women's participation in governance, policymaking, and advocacy are essential for ensuring their knowledge is recognized and valued in both local and global contexts.

Indigenous Knowledge and Economic Sustainability

Indigenous knowledge systems (IKS) are deeply connected to economic sustainability, as they support self-sufficient communities through traditional livelihoods, entrepreneurship, and resource management. Women, as custodians of indigenous knowledge, play a crucial role in sustaining local economies by producing, processing, and marketing traditional goods and services. However, to ensure long-term economic viability, indigenous knowledge-based enterprises must navigate challenges such as globalization, market integration, and access to financial resources.

Indigenous women engage in a range of economic activities that promote sustainability and self-reliance. Community-based enterprises, such as agricultural cooperatives, handicraft collectives, and herbal medicine groups, allow women to pool resources, share knowledge, and increase their bargaining power. These enterprises often follow principles of sustainable production, utilizing local materials and traditional techniques that minimize environmental impact. For instance, women-led farming cooperatives use organic and regenerative agricultural practices, ensuring both food security and income generation. Additionally, community-driven

financial models, such as self-help groups and microfinance initiatives, enable women to invest in their businesses while reducing dependency on external funding sources.

The commercialization of indigenous products—such as handmade textiles, organic food products, and medicinal herbs—provides an opportunity for economic growth while preserving cultural heritage. Fair trade initiatives have emerged as a key mechanism to support indigenous women's enterprises by ensuring that producers receive fair compensation for their work.

Barriers to Economic Sustainability in Indigenous Communities

Despite the potential for indigenous knowledge to drive economic sustainability, several challenges persist:

- Limited Market Access: Many indigenous women lack the infrastructure, digital literacy, and financial resources to expand their businesses beyond local markets.
- Cultural Erosion and IPR Protection: The commercialization of indigenous knowledge raises concerns about cultural appropriation and intellectual property rights (IPR), as traditional knowledge is often exploited without proper compensation to the communities.
- Climate Change and Environmental Degradation: Indigenous economies are closely linked to natural resources, making them vulnerable to environmental threats such as deforestation, soil degradation, and water scarcity.
- Legal and Institutional Barriers: Bureaucratic hurdles, lack of legal recognition for indigenous businesses, and gender-based discrimination further hinder economic sustainability.

To overcome these challenges, there is a growing need for policies that support indigenous entrepreneurship, ensure fair market participation, and provide women with access to financial and technological resources (DISD, 2021; Bansal *et al.,* 2023).

Policy Implications and Institutional Support

Empowering indigenous women through traditional knowledge requires strong policy support, legal protection, and institutional interventions. Governments should implement policies that recognize indigenous intellectual property rights, facilitate market access, and provide financial assistance to women-led enterprises. Strengthening land ownership rights and ensuring participation in decision-making processes are crucial for sustainable economic inclusion. Additionally, NGOs and community-based organizations play a vital role in providing training, microfinance, and advocacy to support indigenous entrepreneurship.

Global frameworks such as the United Nations Sustainable Development Goals (SDGs) and the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) emphasize gender equality, fair trade, and sustainable resource management. Public-private partnerships

(PPPs), education programs, and digital inclusion initiatives can further bridge economic gaps. To ensure long-term impact, policymakers must integrate indigenous knowledge into development strategies, fostering a sustainable and inclusive economy for indigenous women.

Conclusion:

The integration of indigenous knowledge into economic frameworks presents a transformative opportunity for women's empowerment and sustainable development. While indigenous women have long been the backbone of local economies, systemic barriers continue to limit their access to markets, financial resources, and policymaking spaces. Strengthening institutional support through targeted policies, education, and global partnerships is essential to ensuring that indigenous knowledge remains a valuable and sustainable economic resource.

References:

1. Aluko, Y. A. (2018). Women's use of Indigenous knowledge for environmental security and sustainable development in Southwest Nigeria. *International Indigenous Policy Journal*, *9*(3). https://doi.org/10.18584/iipj.2018.9.3.2
2. Anju, T., & Kumar, A. (2024). Traditional ecological knowledge and medicinal plant diversity usage among the Mullu Kuruman tribes of Wayanad district of Kerala, India and its implications for biodiversity conservation in the face of climate change. *Trees Forests and People*, *16*, 100595. https://doi.org/10.1016/j.tfp.2024.100595
3. Bansal, S., Sarker, T., Yadav, A., Garg, I., Gupta, M., & Sarvaiya, H. (2023). Indigenous communities and sustainable development: A review and research agenda. *Global Business and Organizational Excellence*, *43*(4), 65–87. https://doi.org/10.1002/joe.22237
4. *Challenges and Opportunities for Indigenous Peoples' Sustainability | Division for Inclusive Social Development (DISD)*. (2021, April 23). https://social.desa.un.org/publications/challenges-and-opportunities-for-indigenous-peoples-sustainability
5. Dagar, P. (2021). Vocational education and training for indigenous women in India: toward a participatory planning approach. *International Journal of Training Research*, *20*(1), 43–57. https://doi.org/10.1080/14480220.2021.1959379
6. Emeagwali, G. (2021). African Indigenous knowledge systems and the empowerment of African women. In *Springer eBooks* (pp. 123–134). https://doi.org/10.1007/978-3-030-28099-4_146
7. Kom, Z., & Nethengwe, N. S. (2024). Indigenous and Local Knowledge: Instruments towards Achieving SDG2: A Review in an African Context. *Sustainability*, *16*(20), 9137. https://doi.org/10.3390/su16209137
8. Kropi, K., Jastone, K. P., Kharumnuid, S. A., Das, H. K., & Naga, M. M. (2024). Cross-cultural study on the uses of traditional herbal medicine to treat various women's health

issues in Northeast India. *Journal of Ayurveda and Integrative Medicine*, *15*(5), 101024. https://doi.org/10.1016/j.jaim.2024.101024

9. Kugara, S. L., Kugedera, A. T. T., Sakadzo, N., Chivhenge, E., & Museva, T. (2021). The role of Indigenous Knowledge Systems (IKS) in climate change. In *Advances in religious and cultural studies (ARCS) book series* (pp. 1–23). https://doi.org/10.4018/978-1-7998-7492-8.ch001
10. Macusi, E. S., Sales, A. C., Macusi, E. D., Bongas, H. P., Cayacay, M. A., Omandam, J. L., Schüler, M., & Vidal, C. (2023). Indigenous Knowledge Systems and Practices (IKSPs), livelihood resources and aspirations of the Matigsalog and Ata tribes. *Sustainability*, *15*(14), 11182. https://doi.org/10.3390/su151411182
11. Makondo, C. C., & Thomas, D. S. (2018). Climate change adaptation: Linking indigenous knowledge with western science for effective adaptation. *Environmental Science & Policy*, *88*, 83–91. https://doi.org/10.1016/j.envsci.2018.06.014
12. Sharma, I. P., Kanta, C., Dwivedi, T., & Rani, R. (2020). Indigenous agricultural practices: a supreme key to maintaining biodiversity. In *Rhizosphere biology* (pp. 91–112). https://doi.org/10.1007/978-981-15-1902-4_6
13. Von Maltitz, L., & Bahta, Y. T. (2024). The impact of indigenous practices to promote women's empowerment in agriculture in South Africa. *Frontiers in Public Health*, *12*. https://doi.org/10.3389/fpubh.2024.1393582
14. *WIPO Training, Mentoring and Matchmaking Program on Intellectual Property for Women Entrepreneurs from Indigenous Peoples and Local Communities*. (n.d.). Traditional-knowledge.https://www.wipo.int/en/web/traditional-knowledge/women-entrepreneurs/indigenous-peoples-gallery

THE PATH TO SUSTAINABILITY: NAVIGATING CHALLENGES AND IMPLICATIONS IN IFRS S1 AND S2 COMPLIANCE

Vijay Singh and Ankit Yadav
Department of Commerce,
Indira Gandhi University, Meerpur, Rewari, Haryana (India)
Corresponding author E-mail: vijay.commerce@igu.ac.in, ankit.comm.rs@igu.ac.in

Abstract:

Incorporating sustainability in corporate life has become a new trend that has impacted every dimension of business, regardless of the nature of business (i.e., Manufacturing or Service). Meanwhile, traditional economic systems have substantially impacted sustainable management and unequal income distribution, resulting in natural disasters and demographic disparities. Resultant sustainability reporting was integrated into company's financial reporting by adopting IFRS S1 & S2. It could be difficult to fully evaluate the effects or ramifications of these standards given how recently they were introduced. Therefore, this study examines several research avenues pertaining to the application of IFRS S1 and S2 aiming to answer desirable queries about how these two standards are pivotal in enabling organizations to integrate sustainability considerations into their business models, what were the implications, challenges, and considerations for implementing these two standards.

Keywords: IFRS S1, IFRS S2, Sustainability Reporting, Corporate Disclosures, ESG

Introduction:

The primary goal of the corporate sector in earlier times was often increasing profit. As a result, all reporting policies were devised to fulfil this objective. Corporations have indulged in serious violations of rules and regulations for the same goals, causing environmental and ecological harm and endangering employee safety (Tambunan *et al.,* 2022). These issues seriously harm enterprises, compromising supply chains, operational resilience, and market access. However, as the world advancedafter the 1990s, the ecosystem of world sustainability grewat an impressive rate. As the corporate landscape evolves, formerly unimportant characteristics have become critical information for stakeholders(Kipngetich & Gatauwa, 2024).The word sustainability was described as matching the needs of the present generation without compromising the needs of future generations. As a result, corporations were forced to take more stake in their ethical and social duties (Aris *et al.,* 2024; Villiers *et al.,* 2022). For organizations striving to flourish in a fast-changing world, sustainability has also become a strategic need. Consumers increasingly make purchase decisions based on a company's environmental credentials, and investors value firms with high ESG performance (Borrego *et al.,*

2022) .Sustainability-related factors are now being placed in investment decision-making (Pratama *et al.,* 2024). Companies that embrace sustainability may recruit and keep great people, establish consumer loyalty, and gain a competitive advantage. Sustainability has emerged as a vital component driving economic success in the ever-changing world of corporate responsibility. Various regulatory bodies, academicians, and organisations have led to a paradigm shift in reporting patterns by introducing sustainability reporting to adapt to these changes (Kumar *et al.,* 2023). Looking at sustainability reporting as a whole, the idea is todisclose corporations' non-financial performance or commitment towards the environment and social initiatives to stakeholders such as consumers, workers, investors, and the general public (Tambunan *et al.,* 2022).

Table 1: Development of Sustainability Concept

Year	Development
1713	Origin of Sustainability
1971	Formal Use of word Sustainability
1987	Brutland Report
1997	Formation of GRI
2000	Emergence of CSR
2004	Introduction of Integrated Reporting
2011	NVG guidelines
2012	Introduction of BRR by SEBI
2017	Introduction of TCFD (Taskforce or Climate related Financial Disclosure)
2021	BRR was replaced by BRSR
2022	Introduction of IFRS S1 & S2

According to the Global Reporting Initiative (GRI), which creates sustainability reporting guidelines, the goal of sustainability reporting is to be open and honest about how much a company contributes to or plans to contribute to sustainable development (Villiers *et al.,* 2022). Therefore, sustainability reports serve as both a reporting tool and an explanation of the connection between financial and non-financial data (SABAN *et al.,* 2017). Businesses can benefit from sustainability reporting in a number of ways, including improved brand value and reputation of the company, competitive advantage, and internal accountability and transparency through their business operations, products, and services that have an impact on the environment and society (Küçükgül *et al.,* 2020). The journey of sustainability reporting tends to touch base on several ear-marked points in history across different eras, marked by the policy actions taken by authorities like in theIndian case, the Ministry of Corporate Affairs issued National Voluntary Guidelines (NVG) in 2012, Companies Act in 2013 and Business Responsibility and

Sustainability Reporting (BRSR) guidelines in 2021 (Das *et al.,* 2024). In the same way on a global level to enhance business reporting on sustainability, the Sustainability Accounting Standards Boards (SASB) collaborate with other organizations, such as the International Sustainability Standards Board (ISSB), a derivative of the International Accounting Standards Board (IASB) which was formed in 2001. On 31 March 2022, the International Sustainability Standards Board (ISSB), published the IFRS S1 General Provisions for the Disclosure of Sustainability-Related Financial Information Standard and the IFRS S2 Climate-Related Disclosures Standard were released on March 31, 2022.While the aims in S2 particularly address climate change risks and opportunities, the ISSB requirements in IFRS S1 are mostly focused on general sustainability reporting (Suta *et al.,* 2022). Sector-related disclosure requirements are outlined in IFRS S2, which is based on the general provisions of the IFRS S1 standard(Zhou, 2022).These standards provides supplement information still the sustainability information has to be put together in organised way. In the same line the Task Force on Climate Financial Disclosure (TCFD) also developed a framework that is also used by IFRS standards (Pratama *et al.,* 2024). Governance, Strategy, Risk Management, and Metrics and Targets are the four TCFD frameworks. The IFRS S1 and IFRS S2 Standards are designed to give users comprehensive, unbiased, and accurate information on the opportunities and dangers that the reporting entity faces in relation to sustainability and climate change. Businesses' corporate value is impacted by these possibilities and threats (Pratama *et al.,* 2024). A mix of data from financial statements and financial data on sustainability make up assessments of business value. The information in the financial accounts is far less comprehensive than the information on climate change and sustainability. The emergence of IFRS S1 and S2 is expected to give a base for bringing harmony in disclosures in the context of providing information on sustainability related dimensions. This work presents the main aspects of these sustainability standards by highlighting their challenges and implications.

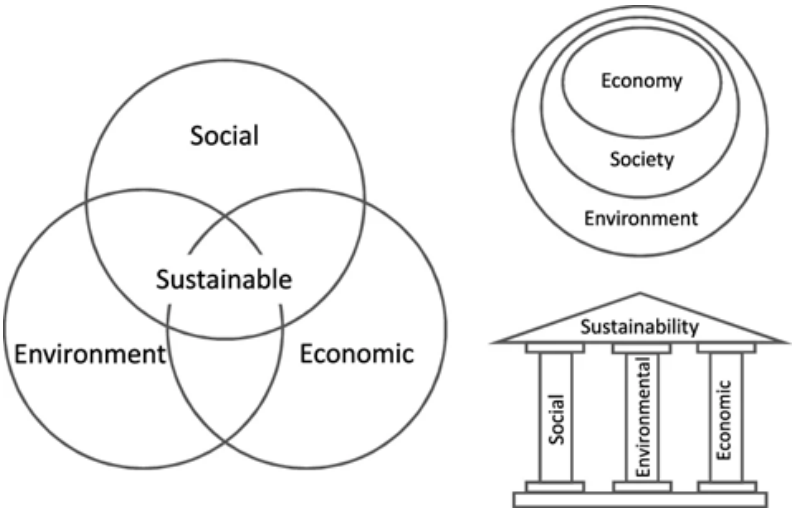


Figure 1: Constituents of Sustainability (Source: Barbier, 1987)

Figure 1 on the left shows three crossing circles, which is a common symbol of sustainability. With total sustainability at its core, the three-pillar notion of sustainabilitysocial, economic, and environmentalis now widely accepted(Barbier, 1987). It is typically shown by three crossing circles. Here are several alternate representations: a concentric circle approach and actual "pillars."

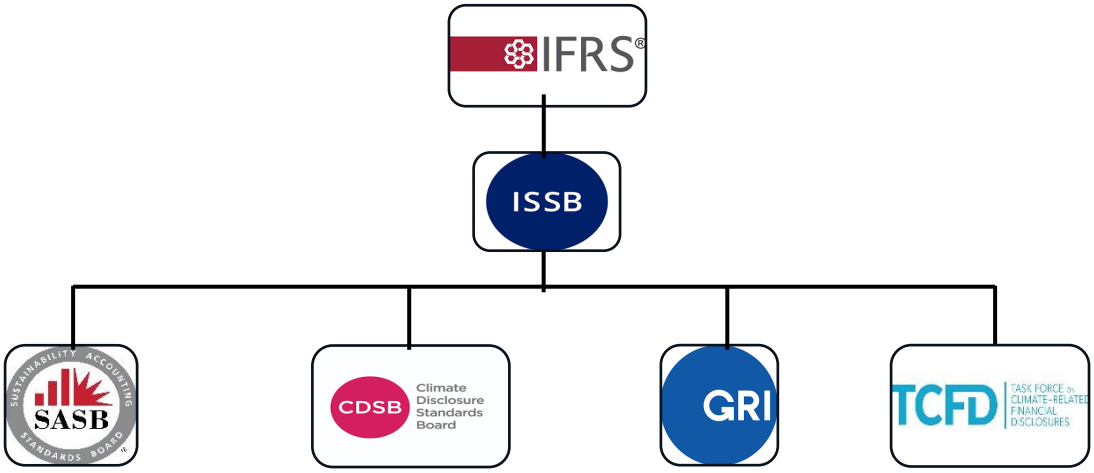


Figure 2: Family tree of Sustainability standards

The IFRS tree map is explained in Figure 2. The two standards IFRS S1 and S2, issued by IFRS significantly rely on disclosures issued by European Sustainability Reporting Standards (ESRS), Global Reporting Initiative (GRI), Greenhouse Gas Protocol, and other industry specific disclosures of SASB. The TCFD has influenced the ISSB S2 disclosure format, which is structured according to governance, strategy, risks, and metrics. The ISSB Standards now include the industry-based standards and materiality map developed by SASB. The ISSB Standards currently include the CDSB subjects of water, biodiversity, climate, and social. The development of the ISSB has been significantly impacted by the GRI's wide sustainability focus, which is a complement to the ISSB Standards.

IFRS S1: General Provisions for the Disclosure of Sustainability-Related Financial Information Standard

The IFRS S1 establishes the groundwork for sustainability reporting by establishing the core principles for sustainability reporting, outlining the broad requirements for firms to disclose sustainability-related information critical to investors' financial decisions. The recommendation emphasizes providing investors with relevant, trustworthy, and comparable information to make informed investment decisions(Arbidane *et al.,* 2023).As in the Conceptual Framework for Financial Reporting, the IFRS S1 Standard focuses on the characteristics that financial information must have in order to be useful. Sustainability-related information should basically be relevant to the need and reality. Supporting qualitative features are comparability, verifiability, timely presentation and comprehensibility (Pratama *et al.,* 2024).

Challenges

- As previously mentioned, the framework adheres to the TCFD pattern. The primary issue is that not every jurisdiction has disclosed sustainability in accordance with the TCFD pattern. As a result, some nations can find it challenging to incorporate them into their frameworks (Auzepy *et al.,* 2023). While GRI is used in regions like Asia, TCFD is frequently used in European countries (Pratama *et al.,* 2024).
- IFRS S1 cover the same ground as other financial reporting organisations. This element presents difficulties, particularly for businesses operating in different segments. varying parents and subsidiaries companies operating in different businesses may have varying sustainability information materialities (Pratama *et al.,* 2024). Because of this, figuring out what sustainability disclosures from a subsidiary may be combined with those from the parent business is challenging.
- The main emphasis of disclosures was focused on sustainability-related themes especially concerning dangers and possibilities. The fact that not all states mandate publication of certain sustainability disclosures poses a challenge (Arbidane *et al.,* 2023).

IFRS S2: Climate-Related Disclosures Standard

Delving into Climate-related Disclosures and following the groundwork laid by the IFRS S1, IFRS S2 examines climate-related disclosures in compliance with the TCFD standards. That said, the standard provides companies with a concrete structure within which climate-related risks, opportunities and their effects, physical, transition and financial, have to be reported. Corporations are required to provide details about the physical risks, legal risks, and other transition hazards that they face in relation to global warming (Baboukardos *et al.,* 2022)**.**

Challenges

- Physical and transition hazards associated with climate change are subject to disclosure requirements. Physical risk disclosures are often simple since the organization can locate and quantify the data, whereas transition risk is more difficult because it involves government policy, which varies by province and can either be or not be obvious (Eccles & Krzus, 2019).
- The resilience to climate change is linked to disclosure requirements. Scenario analysis must be used to reveal climate resiliency. Because scenario analysis must be modified to fit the framework set by the legal authority, it will be difficult (Dey *et al.,* 2024). At the moment, there is disagreement among jurisdictions over a framework for climate resilience that allows for cross-border comparison (Bircan & Özcan, 2023).
- According to scopes 1–3, there are various disclosure requirements for targets and metrics about GHG emissions. Here Scope 2 and even Scope 3 disclosures are prohibited in some areas, due to data collection challenges and disclosure-related cost-benefit considerations (Baboukardos *et al.,* 2022).

Implications of IFRS S1 and IFRS S2 for Corporate Disclosures

The adoption of IFRS S1 and IFRS S2 heralds a period characterized by a new level of clarity and responsibility in the management of environmental issues in the corporate report. This has far-reaching consequences for companies of varying sizes engaged in a multitude of activities and will in effect bring about a transformation in how companies account for and report on sustainability (Pratama *et al.,* 2024). Among the most important results of IFRS S1 and S2 is an improvement in transparency as well as the ability to compare sustainability reporting. Companies have a greater responsibility to communicate their aids as well as obstacles to achieving the sustainability goals, and such information will help the stakeholders in making better decisions regarding the ESG investments (Baboukardos *et al.,* 2022). Such advanced looking calculative measures will also enhance the accountability of organizations for such resources by introducing effective monitoring of claims made about their sustainability policies. Moreover, IFRS S1 and S2 irrefutably mean that companies will be required to adopt better management and decision-making tools relating to sustainability in the future. This will enjoin firms to incorporate sustainability strategies in their management processes as they will be made to clearly specify the challenges as well as opportunities that are associated with sustainability initiatives.

This will lead to better-informed decisions that align with long-term sustainability goals and increase a company's overall resilience (Kipngetich & Gatauwa, 2024). The growing importance of sustainability reporting will have far-reaching implications for corporate governance. Boards of directors will have an enhanced role in managing sustainability concerns, ensuring that organizations are well-prepared to deal with ESG issues and opportunities. Strengthening corporate governance systems and creating clear accountability for sustainability performance will be required (Tambunan *et al.,* 2022). Implementing IFRS S1 and IFRS S2 will need a change in business culture and thinking. Companies must cultivate a sustainable culture that permeates all operations, from strategy formulation to risk management and performance monitoring. A concerted effort will be required to educate and involve workers, suppliers, and stakeholders in sustainability activities (Yong *et al.,* 2024). The consequences of IFRS S1 and S2 go beyond individual firms and into the more significant investment environment (Pratama *et al.,* 2024). These criteria will be critical in establishing sustainable investing practices by encouraging investors to include ESG factors in their investment decisions. This will result in more sustainable capital allocation, assisting organizations dedicated to long-term sustainability goals.

Conclusion:

The idea of sustainability is one that can be applied to many different aspects of corporate management and it is becoming a more significant trend in management. With the influence of ESG sensitivities that emerge in governance risks, sustainability has become a crucial component

of business management strategies. In reality, nowadays, businesses are required to dedicate resources for sustainable growth and include the notion of sustainability in their management plans due to the impact of events like pandemics, climatic crises, etc. In a similar vein, the idea of sustainability has altered how companies operate and, consequently, how they report. The main reason for this is the increasing impact of ESG risks, which is a system based on sustainability, in the investment decisions of financial information users for businesses and the performance indicators of businesses. Today, financial information users take into account non-direct financial indicators such as the benefit that businesses create to society, their contribution to sustainable development, sensitivity to environmental issues, action to combat the climate crisis, etc., as well as financial performance indicators when making investment decisions about businesses. In such an environment, the information provided by businesses within the scope of current financial reporting practices is not sufficient and sustainability reporting practices are needed. Sustainability reporting practices of enterprises were initially seen as the presentation of environmental and social information and indicators related to sustainability, which are included in environmental reports, corporate social responsibility reports and social reports, separately in environmental reports and social reports as part of non-financial reporting (Higgins *et al.,* 2020). With the increasing importance of sustainability in the reporting process of businesses and the gradual expansion of its scope, the sustainability reporting application has started to be seen as a separate report under the name of "sustainability report" and published by some businesses in practice (Hedley *et al.,* 2024). Accordingly, when the development process of sustainability reporting practices over time is examined, it is seen that businesses present their sustainability-related information in reports published under different names and there was no standardization in this regard (Agostini *et al.,* 2022). The establishment of the ISSB and the publication of international sustainability standards can be considered as one of the important steps taken in this regard in order to ensure the standardization needed in sustainability reporting practices.Still, it is evident that businesses must put in a significant amount of planning and effort to comply with the recently published IFRS S1 and S2 Standards, which call for full reporting of the data required by the applicable standards as well as adherence to extensive sustainability-related information and criteria. The fact that no company fully complies (100%) with the governance criterion, the most fundamental criterion in the IFRS S1 and S2 Standards, is actually one of the tangible indicators of this situation, according to the research findings included in the study. Therefore, by addressing the challenges mentioned in this study, the implementation of these two standards and the issuance of new standards would be put in an easier and harmonious manner.

References:

1. Agostini, M., Costa, E., & Korca, B. (2022). Non-financial disclosure and corporate financial performance under Directive 2014/95/EU: Evidence from Italian listed companies. *Accounting in Europe, 19*(1), 78–109.

2. Arbidane, I., Khachatryan, N., & Martirosyan, N. (2023). Issues of accounting information disclosures for ecosystem services (IFRS-S1 interpretations). *Economics, Finance and Accounting, 2*(12), 87. https://doi.org/10.59503/29538009-2023.2.12-87
3. Aris, N. M., Auzair, S. M. D., Saleh, N. M., & Abdullah, M. (2024). Navigating sustainability: A bibliometric analysis of carbon management accounting. *International Journal of Business and Society, 25*(2), 440–460. https://doi.org/10.33736/ijbs.7599.2024
4. Auzepy, A., Tönjes, E., Lenz, D., & Funk, C. (2023). Evaluating TCFD reporting—A new application of zero-shot analysis to climate-related financial disclosures. *PLOS ONE, 18*(11). https://doi.org/10.1371/journal.pone.0288052
5. Baboukardos, D., Evangelos, S., Richard, S., & Tsoligkas, F. (2022). Companies' readiness to adopt IFRS S2 climate-related disclosures ACCA and Adam Smith Business School research report. *University of Glasgow*. https://www.gla.ac.uk/schools/business/aboutus/
6. Barbier, E. B. (1987). The concept of sustainable economic development. *Environmental Conservation, 14*(2), 101–110. https://doi.org/10.1017/S0376892900011449
7. Bircan, G., & Özcan, İ. (2023). Sürdürülebilirlik raporlaması açısından UFRS S1 ve S2 taslak standartlarına uyum sürecinin değerlendirilmesi: BIST sürdürülebilirlik 25 endeksi işletmeleri üzerine bir araştırma. *Muhasebe Enstitüsü Dergisi / Journal of Accounting Institute, 0*(69), 24–43. https://doi.org/10.26650/med.1253502
8. Borrego, A. C., Carreira, F. A., Pardal, P., & Abreu, R. (2022). Social responsibility and SDG 8 during the first wave of the COVID-19 pandemic: The role of chartered accountants in Portugal. *Sustainability (Switzerland), 14*(14). https://doi.org/10.3390/su14148625
9. Das, I., Das, S., & Kar, S. (2024). The regulatory challenges of environment social governance in India (pp. 485–495). https://doi.org/10.2991/978-2-38476-255-2_40
10. Eccles, R. G., & Krzus, M. P. (2019). Implementing the Task Force on Climate-related Financial Disclosures recommendations: An assessment of corporate readiness. *Schmalenbach Business Review, 71*(2), 287–293. https://doi.org/10.1007/s41464-018-0060-4
11. Hedley, T., Porco, B., Keiningham, T. L., Aksoy, L., Statuto, L. A., & Amin, M. (2024). Beyond apples and oranges: Unraveling the complexity in corporate sustainability reporting. *Journal of Service Management, 35*(4), 512–524. https://doi.org/10.1108/JOSM-12-2023-0505
12. Higgins, C., Tang, S., & Stubbs, W. (2020). On managing hypocrisy: The transparency of sustainability reports. *(Journal details incomplete—please provide full citation if available).*

13. Kipngetich, G. C., & Gatauwa, J. (2024). Environmental sustainability reporting and financial performance of firms listed at the Nairobi Securities Exchange, Kenya. *IOSR Journal of Economics and Finance (IOSR-JEF), 15*(2), 54–68. https://doi.org/10.9790/5933-1502015468
14. Küçükgül, E., Cerin, P., & Liu, Y. (2020). Corporate sustainability and reporting frameworks: A methodology for aligning various guides on sustainable development goals. *(Journal details missing—please provide full reference).*
15. Kumar, M., Raj, N., & Singh, R. R. (2023). Ranking Indian companies on sustainability disclosures using the GRI-G4 framework and MCDM techniques. *International Journal of Sustainable Development and Planning, 18*(9), 2791–2799. https://doi.org/10.18280/ijsdp.180917
16. Pratama, A., Dewi, N., Sofia, P., Muhammad, K., & Megawati, L. R. (2024). Sustainability reporting ecosystem and IFRS S1 and S2: How accounting research can assist its implementation. *Journal of Ecohumanism, 3*(4), 3101–3168. https://doi.org/10.62754/joe.v3i4.3830
17. Saban, M., Küçüker, H., & Küçüker, M. (2017). Kurumsal sürdürülebilirlik ile ilgili raporlama çerçeveleri ve sürdürülebilirlik raporlamasında muhasebenin rolü. *İşletme Bilimi Dergisi*, 1–1. https://doi.org/10.22139/jobs.291818
18. Suta, A., Tóth, Á., & Borbély, K. (2022). Presenting climate-related disclosures in the automotive sector: Practical possibilities and limitations of current reporting prototypes and methods. *Chemical Engineering Transactions, 94*, 379–384. https://doi.org/10.3303/CET2294063
19. Tambunan, S., Siregar, A., Wijaya, M., & Pratama, I. (2022). The impact of corporate governance on the integrated reporting quality of Indonesian listed firms: Moderating role of CSR disclosure and corporate sustainability. *International Journal of Economics and Finance Studies, 14*, 252–274. https://doi.org/10.34109/ijefs
20. Villiers, C., Torre, M. L., & Molinari, M. (2022). The Global Reporting Initiative's (GRI) past, present and future: Critical reflections and a research agenda on sustainability reporting (standard-setting). *Pacific Accounting Review, 35*(5), 728–747.
21. Yong, C. K., Alfan, E., & Mustapha, M. Z. (2024). Sustainability committee and environmental, social and governance (ESG): A systematic literature review. *International Journal of Business and Society, 25*(2), 484–508. https://doi.org/10.33736/ijbs.7603.2024
22. Zhou, S. (2022). Reporting and assurance of climate-related and other sustainability information: A review of research and practice. *Australian Accounting Review, 32*(3), 315–333. https://doi.org/10.1111/auar.12387

VIKSIT BHARAT@2047: AN EMPIRICAL REVIEW OF INNOVATION, INCLUSION, AND SUSTAINABLE DEVELOPMENT

Pankita D. Gohil[1], Sandipkumar G. Prajapati[2] and Vishal B. javiya[2]

[1]B.V. Patel Institute of Commerce,
Uka Tarsadia University, Maliba Campus-Bardoli
[2]Department of Commerce and Business Management,
Faculty of Commerce, The Maharaja Sayajirao University of Baroda

Overview of Viksit Bharat@2047:

As India approaches its centenary of independence in 2047, the nation envisions a future characterised by remarkable progress in innovation, inclusion, and sustainable development (Goh, 2006; Kumar, 2022) (Kumar, 2024). VIKSIT BHARAT@2047 embodies this aspirational journey, serving as a comprehensive framework that integrates technological advancements, social equity, and environmental stewardship. This initiative aims to harness the country's vast human capital, foster a culture of innovation, and ensure that development benefits all segments of society, thereby transforming India into a vibrant, resilient, and equitable nation by its centenary year.

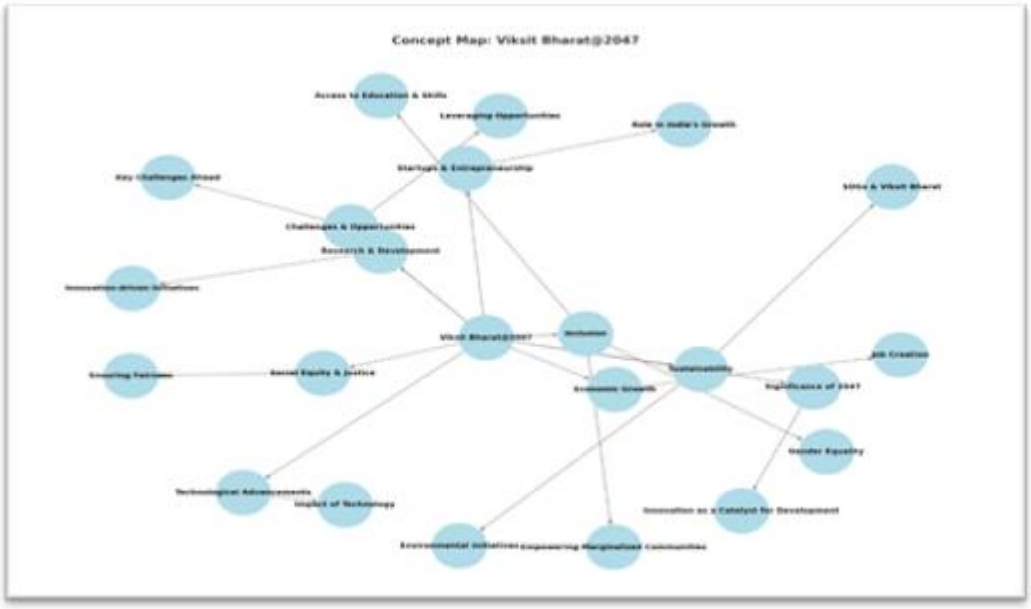


Figure 1: Concept Map – Viksit Bharat 2047

Significance of the Year 2047 (Jalkanen *et al.,* 2011) (Dribnenki *et al.,* 2003) (Patel *et al.,* 2024)

The year 2047 holds profound significance as it marks 100 years since India's independence, symbolising a milestone for reflection, aspiration, and strategic planning. It is envisioned as a moment to realise the nation's full potential—economically, socially, and environmentally. Achieving the goals set for 2047 will demonstrate India's emergence as a

global leader in innovation, sustainable development, and social inclusion. This milestone serves as both a target and a catalyst, inspiring policymakers, citizens, and stakeholders to work collectively towards a future where development is inclusive, sustainable, and aligned with the nation's long-term vision of progress and prosperity.

"Innovation as a Catalyst for Development" Technological Advancements and Their Impact (Joosten, 2018)

Innovation has been a driving force behind India's rapid development, transforming sectors such as agriculture, healthcare, education, and manufacturing. The advent of cutting-edge technologies like artificial intelligence, blockchain, Internet of Things (IoT), and 5G connectivity has enabled more efficient service delivery, improved governance, and enhanced quality of life. For instance, digital platforms have expanded financial inclusion through mobile banking and digital payments, reaching even remote rural areas. Additionally, technological innovations have facilitated data-driven policy-making, enabling governments to address local needs more effectively. These advancements not only boost productivity but also foster a culture of continuous improvement, positioning India as a global leader in innovation-driven growth.

Startups and Entrepreneurship in India (Babu *et al.,* 2019)

India's vibrant startup ecosystem exemplifies the nation's entrepreneurial spirit and its role as a catalyst for development. The proliferation of startups across diverse sectors—such as fintech, healthtech, agritech, and edtech—has created millions of jobs and spurred economic activity. Government initiatives like Startup India and Atal Innovation Mission have provided vital support through funding, incubation, and mentorship programs, encouraging innovation at grassroots levels. These startups are addressing local challenges with innovative solutions, promoting inclusive growth by empowering youth, women, and marginalised communities. The rise of unicorns and scale-ups demonstrates India's potential to become a global innovation hub, fostering sustainable development through scalable and impactful business models.

Research and Development Initiatives (Joosten, 2018)

Robust research and development (R&D) efforts are fundamental to sustaining innovation-led development. India's investment in R&D has increased significantly, with institutions like the Indian Space Research Organisation (ISRO), Council of Scientific & Industrial Research (CSIR), and numerous universities spearheading breakthroughs in science and technology. Focus areas include renewable energy, biotechnology, information technology, and healthcare, aligning with national development priorities. Public-private partnerships have further amplified R&D impact, translating scientific discoveries into market-ready solutions that address societal needs. Strengthening R&D infrastructure, fostering a culture of innovation, and promoting collaboration between academia, industry, and government are essential to realising India's vision of a knowledge-driven economy by 2047.

Gender Equality and Women's Empowerment (Kumar, 2024).

Achieving gender equality and empowering women is central to India's sustainable development agenda. This entails dismantling societal norms and barriers that limit women's participation in education, employment, and leadership roles. Policies promoting equal opportunities, safety, and rights are essential to create an enabling environment. Initiatives such as skill development programs tailored for women, increased representation in decision-making positions, and awareness campaigns can accelerate progress. Empowered women contribute significantly to economic growth, innovation, and social stability. By fostering an inclusive culture that values gender diversity, India can harness the full potential of its female population, ensuring equitable development for all.

Access to Education and Skill Development

Universal access to quality education and skill development is fundamental to bridging socio-economic divides and fostering inclusive growth. Efforts must focus on expanding educational infrastructure in underserved areas, integrating technology-enabled learning, and ensuring affordability for marginalised communities. Special emphasis on vocational training and lifelong learning opportunities can equip individuals with relevant skills for emerging industries and entrepreneurship. Inclusive education policies should also address barriers faced by disadvantaged groups, including girls, differently-abled persons, and minority communities. By investing in human capital and fostering a culture of continuous learning, India can create a skilled workforce capable of driving innovation and sustainable development, ensuring no one is left behind on the path to 2047.

"Sustainable Development Goals (SDGs) and VIKSIT BHARAT" Environmental Sustainability Initiatives (Jalkanen *et al.*, 2011) (Dribnenki *et al.*, 2003)

VIKSIT BHARAT aligns closely with the United Nations Sustainable Development Goals (SDGs) by prioritising environmental sustainability as a core component of its vision for 2047. The initiative emphasises the adoption of clean energy sources, promotion of renewable energy projects, and the implementation of eco-friendly technologies across sectors. Efforts include fostering innovation in sustainable agriculture, conserving biodiversity, and reducing carbon footprints through thoughtful urban planning and green infrastructure. By integrating environmental considerations into policy frameworks and development programs, VIKSIT BHARAT aims to ensure that economic growth does not come at the expense of ecological health, thereby safeguarding natural resources for future generations.

Economic Growth and Job Creation (Kumar, 2022).

A fundamental aspect of VIKSIT BHARAT's strategy is driving inclusive economic growth that generates ample employment opportunities. The initiative promotes the development of a robust startup ecosystem, encourages innovation-driven enterprises, and supports small and medium enterprises (SMEs) to thrive. By leveraging technological advancements and fostering

entrepreneurship, VIKSIT BHARAT aims to create a resilient economy capable of absorbing a diverse workforce. Special focus is placed on skill development programs aligned with emerging industries, ensuring that the youth and marginalised communities are equipped to participate actively in the nation's economic progress. This approach not only boosts GDP but also ensures equitable distribution of economic benefits across society.

"Challenges and Opportunities" Identifying Key Challenges Ahead

The path toward VIKSIT BHARAT@2047 is fraught with several significant challenges that require strategic attention and concerted efforts. One of the primary hurdles is ensuring equitable access to technological advancements across diverse regions, predominantly rural and remote areas, to prevent the digital divide from widening further. Infrastructure deficits, such as inadequate internet connectivity, electricity, and transportation, pose barriers to inclusive development. Additionally, addressing socio-economic disparities remains a complex challenge, as marginalised communities often face systemic barriers to education, employment, and social participation. Environmental sustainability also presents a critical challenge, with climate change and resource depletion threatening long-term development goals. Furthermore, fostering innovation within a framework of regulatory and institutional reforms demands overcoming bureaucratic inertia and resistance to change. Ensuring that growth is sustainable, inclusive, and resilient in the face of global uncertainties, such as economic fluctuations and geopolitical tensions, will be essential for realising the vision of a developed India by 2047.

Leveraging Opportunities for Growth

Despite these challenges, numerous opportunities exist to propel India toward its 2047 vision. The rapid pace of technological innovation, including advancements in artificial intelligence, renewable energy, and digital infrastructure, offers a robust foundation for transformative growth. The burgeoning startup ecosystem and entrepreneurial spirit across the country can be harnessed to create new industries, generate employment, and foster inclusive economic development. Additionally, India's demographic dividend presents a unique opportunity to build a skilled workforce through targeted education and skill development initiatives, thereby enhancing productivity and competitiveness. The global emphasis on sustainable development aligns with India's commitments to environmental conservation and social equity, opening avenues for international collaboration and investment. Moreover, leveraging digital platforms and data-driven governance can improve service delivery, transparency, and citizen engagement. By strategically addressing challenges and capitalising on these opportunities, India can accelerate progress toward a resilient, inclusive, and sustainable future, fulfilling the aspirations of VIKSIT BHARAT@2047.

Conclusion:

Looking ahead to 2047, India aims to become a fully developed country that showcases innovation, inclusivity, and sustainability. By leveraging advanced technologies, promoting

entrepreneurship, and providing equal opportunities, India seeks to unlock its full potential as a global leader. A developed India will feature strong infrastructure, a resilient economy, social harmony, and a dedication to environmental care, ensuring a high standard of living for all citizens. This vision outlines a nation where every individual, regardless of their background, can contribute significantly to collective progress—embodying the principles of an inclusive and sustainable society.

References:

1. Goh, A. L. S. (2006). Evolution of industrial policy-making in support of innovation: The case of Singapore. *International Journal of Innovation and Learning.*
2. Holroyd, C. (2020). Technological innovation and building a 'super smart' society: Japan's vision of Society 5.0. *Journal of Asian Public Policy.*
3. Jalkanen, A. J., Hakkarainen, J. J., Lehtonen, M., Venäläinen, T., Kääriäinen, T. M., Jarho, E., Suhonen, M., & Forsberg, M. M. (2011). Brain pharmacokinetics of two prolyl oligopeptidase inhibitors, JTP-4819 and KYP-2047, in the rat. *Basic & Clinical Pharmacology & Toxicology.*
4. Joosten, T. (2018). Introduction to special issue: National Research Center for Distance Education and Technological Advancements (DETA). *Online Learning.*
5. Kumar, N. (2022). Indian economy@75: Achievements, gaps and aspirations for the Indian centenary. *The Indian Economic Journal.*
6. Kumar, R. (2024). A family physician for all Indian families: A vision for 2047. *Journal of Family Medicine and Primary Care.*
7. Nguyen, H. T., & Marques, P. (2021). The promise of living labs to the quadruple helix stakeholders: Exploring the sources of (dis)satisfaction. *European Planning Studies.*
8. Patel, K. K., & Patel, P. R. (2024). Advancing sustainable urban development in India through energy-efficient HVAC solutions for Viksit Bharat 2047 mission. *ITM Web of Conferences, 65*, Article 04001. https://doi.org/10.1051/itmconf/20246504001 ITM Conferences
9. Rigon, A. (2018). An analysis of well-being in urban Nigeria. *Development in Practice.*
10. Sahoo, J., & Vadranam, S. (2024). Viksit Bharat@2047 transformation of society: Vision and accomplishments. *International Journal of Political Science and Governance, 6*(1), 79–83. https://doi.org/10.33545/26646021.2024.v6.i1b.306 BVICAM
11. Singh, N. R. (2024). Inclusive and Viksit Bharat 2047: A proactive strategy to a better future. *Educational Administration: Theory and Practice, 30*(5), 9116–9122. https://doi.org/10.53555/kuey.v30i5.4521

ENHANCING ACCESSIBILITY FOR INCLUSIVE EDUCATION: A VISION FOR VIKSIT BHARAT

Aditya
Department of English and Other Foreign Languages,
Gurugram University, Gurgaon, Haryana

Introduction:

Education has long been recognised as the bedrock of national progress and development, which not only imparts knowledge but actively forges the path for social, economic, and cultural development of a nation. Education is an integral part of the fabric of Indian identity. As India moves towards the centenary of its independence, the vision of "Viksit Bharat", a developed, self-sufficient, and self-reliant nation, places education as the focal point for national interest. Education changes lives, and the changed lives change the course of development of the nations. Education is a fundamental right in India for children between the ages of 6 to 14. The Right to Education Act is an Act of the Parliament of India that was passed on 4 August 2009, which describes the degrees of the importance of free and compulsory education for children between 6 and 14 in India under Article 21A of the Indian Constitution. While monumental steps have been taken in order to make education accessible to all, the penetration rate of these steps has been marginal.

The United Nations' Universal Declaration of Human Rights (1948) and the Sustainable Development Goals (SDG 4) cement the stance that education is essential for promoting equality and advancing sustainable development. In the Indian context, education is not merely a means to personal advancement but also a vital tool for national integration, poverty reduction, and empowerment of marginalised communities.

The modern convergence of technology and education has emerged as a strong initiative for inclusion for accessibility. Online platforms such as SWAYAM, Study Webs of Active-Learning for Young Aspiring Minds, launched on July 9, 2017, by the Ministry of Human Resource Development (now Ministry of Education) aimed at providing a single platform for quality education, keeping in mind the aim of easy accessibility. SWAYAM stands on a trident with the aim of access, equity, and quality in education. On the other hand, NPTEL (National Programme on Technology Enhanced Learning), launched in 2003, aims to make this content accessible to a wide range of learners, including students, working professionals, and faculty, through web and video-based courses.

Schemes and its Impact

With 3G and 4G connectivity being available in many villages, access to data has greatly increased in rural India. Even if there are now more internet users generally, there is still a difference in internet usage and digital skills between urban and rural communities. According to

TRAI (Telecom Regulatory Authority of India), a nodal agency that issues yearly data of the Internet and Telephone subscribers in India, the accessibility of the Internet among rural subscribers is 27.57 out of a hundred population. As per the PIB report of March 2024:

Under the Digital India Initiative, the government has taken several initiatives to connect not only Metros but also tier-2 and tier-3 cities as well as rural and remote areas. As of March 2024, out of a total Internet Subscribers of 954.40 million in India, there are 398.35 million Rural Internet Subscribers. Further, as of April 2024, out of 6,44,131 villages in the country (villages data as per Registrar General of India), 6,12,952 villages are having 3G/4G mobile connectivity. Thus, 95.15 % villages are having access to internet.

In rural India, however, where digital access is still inconsistent and patchy, the potential of these platforms is still far from being realized. While internet usage is over 70% in cities, it is much lower in rural areas due to poor infrastructure, high costs, and low levels of digital literacy, according to the Telecom Regulatory Authority of India (TRAI). Many rural students' dreams of using SWAYAM or NPTEL are still crushed by unreliable connectivity, faulty devices, and a lack of instructions on how to use these resources. These difficulties are more than just technical annoyances; they reestablish the systemic injustices that Viksit Bharat @2047 aims to uproot. One cannot stress the importance of digital platforms in attaining educational inclusion. Online learning offers scalability and reaches at a fraction of the cost of traditional classroom settings, which demand large investments in buildings, faculty, and logistics. Thousands of students nationwide can be served by a single SWAYAM course at once, ensuring equal access to high-quality instruction. This implies that students in rural areas will have equal access to lectures, course materials, and certification opportunities as their counterparts in urban areas. NPTEL courses can be a vital bridge in fields like advanced engineering, data science, or specialized vocational training where there is a severe faculty shortage.

The broader Sustainable Development Goals (SDGs) of India are also in line with these platforms, especially Goal 4: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all." The inclusive potential includes addressing the needs of women in conservative communities, working adults looking for upskilling opportunities, and students with disabilities in addition to bridging the urban-rural divide. Although the progress is still uneven, features like mobile app integration, downloadable transcripts, and subtitles have started to make these platforms more accessible. Inclusion of rural India is essential for the country's development, both economically and morally. Over 65% of India's population still lives in rural areas, where they make significant contributions to small-scale industries, agriculture, and the unorganized sector of the economy. India must develop its rural youth's potential and give them the skills, information, and flexibility they need to engage in the knowledge economy if it hopes to become a high-income country by 2047. The developmental trajectory in rural digital education runs the risk of widening rather than narrowing disparities in the absence of focused interventions.

Accessibility and Challenges

Accessibility is a complex issue, though. Installing fiber optic cables in villages as part of programs like BharatNet is insufficient. Reliable internet bandwidth, reasonably priced devices, local language content, and digital literacy that allows users to efficiently navigate platforms are all necessary for true accessibility. Focusing on inclusivity is also necessary for accessibility, as it addresses the unique needs of first-generation students who are not accustomed to self-directed online learning, women who are limited by domestic duties, and learners with disabilities. These structural issues are made worse by socioeconomic factors. Some children in poverty are forced to work for pay or take care of the home, which limits their ability to regularly attend school. In some areas, gender disparities still exist, and girls face extra obstacles because of cultural norms, safety concerns, and expectations about the home. Furthermore, one of the 21st century's most prominent challenges is the digital divide between rural and urban areas. Even though mobile connectivity has grown quickly, many villages still lack broadband internet access that is adequate for long-term online education. Rural students are essentially shut out of the advantages of online learning platforms in the absence of dependable digital infrastructure, which exacerbates educational disparities. In rural India, a number of interconnected pedagogical, socioeconomic, and infrastructure issues limit the availability of SWAYAM and NPTEL. Infrastructure-wise, it is challenging to stream video lectures or take part in interactive sessions because many villages lack reliable broadband networks. Learning continuity is further disrupted by frequent power outages. Participation among low-income households is restricted by socioeconomic factors, such as the high relative cost of digital devices and internet data. Even when there are gadgets available, they are frequently shared by several family members, which limits the amount of time a single student can spend studying online.

Pedagogical obstacles are also important. Since many of the courses on SWAYAM and NPTEL are made for urban, English-speaking students, students from rural areas, where regional languages may be the primary language of instruction in schools, may find them less accessible. Inclusion is diminished by the scarcity of local language course materials and the absence of transcripts or subtitles for students with hearing impairments. Furthermore, MOOCs' self-paced format necessitates a level of digital literacy and self-motivation that rural learners, especially first-generation students, might not yet have without organized instruction. To get past these problems, we need to take a multi-layered approach that includes both expanding infrastructure and making targeted changes to teaching and policy. Projects like BharatNet that expand broadband access must be combined with efforts to make sure that students can get online for a low cost, maybe by offering subsidized data plans or community Wi-Fi hubs. Government-backed programs that give students in rural areas low-cost tablets or laptops can help make devices more accessible.

Scope of Improvement

It is important to localize content. Courses should be offered in a number of regional languages, and lecture videos should be available in low-bandwidth versions for areas with poor internet access. All courses should have the same accessibility features, like subtitles, transcripts, and the ability to work with screen readers. Partnerships between the government, schools, and businesses can also be very important. For instance, telecom companies could work with educational platforms to make some educational content free of data charges. Colleges and universities could add SWAYAM and NPTEL courses to their programs and offer mentoring and discussion groups to help rural students get more out of online materials. Education is positioned as the most important factor promoting social justice, equitable growth, and the development of human potential in the Viksit Bharat @2047 vision. All children between the ages of six and fourteen are guaranteed the right to free and high-quality education under the Indian Constitution through Article 21A and the Right of Children to Free and Compulsory Education Act (RTE), 2009. This legislative commitment demonstrates the understanding that education is both a developmental necessity and a fundamental right. However, there are structural obstacles in India's way of attaining universal, high-quality, and inclusive education, particularly in rural areas where socioeconomic inequality, digital divides, and infrastructure deficiencies hamper educational attainment. With almost 65% of the population living in rural areas, rural education is crucial to India's demographic and economic future (Census of India, 2011; projected rural share in 2025 still above 60%). However, rural schools frequently struggle with a lack of qualified teachers, poor facilities, and restricted access to contemporary educational materials. Only 43% of Grade 5 students can read a Grade 2 text, according to the Annual Status of Education Report (ASER) 2023, despite the fact that primary school enrollment rates are high, nearly 98%, and learning outcomes are still woefully low. This suggests that ensuring meaningful and high-quality learning is more difficult than just getting kids to school. Online learning platforms and digital connectivity present a remarkable chance to decrease these educational inequalities in the twenty-first century. Through government programmes like SWAYAM (Study Webs of Active Learning for Young Aspiring Minds) and the National Programme on Technology Enhanced Learning, internet access and massive open online courses have been integrated, creating new opportunities for knowledge democratisation. Any student with an internet connection can access more than 2,500 courses offered by SWAYAM, which cover school, undergraduate, graduate, and vocational training. Established by the Indian Institutes of Technology (IITs) and the Indian Institute of Science (IISc) in 2003, NPTEL provides top-notch science, engineering, and management courses that can help teachers and lifelong learners in rural areas in addition to college students. However, in spite of these platforms' potential, unequal access is a reality in rural India.

Conclusion:

Internet penetration in rural India is about 38%, while in urban areas it is 69%, according to the IAMAI and Kantar India Internet Report 2023. Effective use of online educational content is hampered, even for those who have access, by bandwidth restrictions, unstable electricity, and a lack of digital devices. This disparity was glaringly highlighted by the COVID-19 pandemic: whereas urban students made the switch to online learning with relative ease, many rural students experienced months of disruptions to their education. Since girls were frequently forced to help out around the house or get married young, school closures in a number of states resulted in higher dropout rates. The concepts of inclusivity, universal design, and flexibility to accommodate a range of learning needs are all part of accessibility in education, which goes beyond simple internet access or physical infrastructure. Launched in 2015, the Accessible India Campaign (Sugamya Bharat Abhiyan) focused mainly on physical accessibility in public areas, but its principles also apply to digital accessibility. This includes creating course interfaces that work with assistive technologies like screen readers, providing transcripts and subtitles, offering content in regional languages, and making sure that rural users can access video lectures with low bandwidth. Although there are still obstacles to overcome, SWAYAM and NPTEL have made progress in these areas. While 26% of their students were from rural areas, according to a 2022 NPTEL learner survey, many of them had trouble streaming lectures because of bad connectivity, and more than 40% said they needed offline access to the entire course materials. NPTEL's distribution of lecture DVDs to distant engineering colleges and SWAYAM's availability of downloadable PDFs are two examples of interventions that have tried to address these problems, but they are still small in scope.

In rural education, language plays an equally important role. Even though NPTEL has started to offer a few courses in Hindi and other regional languages, the vast majority of them are still in English, which prevents students whose primary language of instruction in school from participating. Digital literacy is a crucial issue that goes beyond access. According to a 2021 UNESCO report on the digital divide in South Asia, less than 20% of rural youth in India are proficient in digital literacy, making it difficult for them to do simple tasks like creating documents or efficiently using search engines. Even when internet access is available, rural learners are less likely to fully benefit from MOOCs or e-learning resources if they lack the necessary skills for digital navigation. The Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) of the Indian government intends to close this gap by teaching 60 million rural residents the fundamentals of digital literacy. However, incorporating these skills into the larger context of formal and informal education is a difficult task. Crucially, inclusion and accessibility are dynamic processes that call for constant observation, input, and modification rather than fixed objectives. Models for replication can be found in pilot projects in states like Kerala that incorporated SWAYAM local chapters into public libraries and rural schools. Such initiatives circumvent connectivity problems and establish community learning spaces by setting up offline

learning hubs where course content is pre-downloaded and made available through local servers. Similar to this, Maharashtra's partnership with NPTEL to train faculty at rural polytechnics has shown how focused interventions can enhance teaching quality and increase local capacity. If political will, consistent funding, and cooperation from the government, academic community, business community, and civil society are supported, the transformation of rural education through widely available internet and inclusive online platforms like SWAYAM and NPTEL is a practical milestone rather than a pipe dream. India can guarantee the fulfillment of the RTE Act in letter and spirit by removing the barriers of geography, language, disability, and socioeconomic status. This will enable the rural learner of today to become an empowered citizen of Viksit Bharat by 2047.

References:

1. Annual Status of Education Report. (2023). *Annual Status of Education Report (Rural) 2023*. ASER Centre. https://www.asercentre.org
2. Census of India. (2011). *Primary Census Abstract*. Office of the Registrar General & Census Commissioner, India. https://censusindia.gov.in
3. IAMAI & Kantar. (2023). *Internet in India Report 2023*. Internet and Mobile Association of India. https://www.iamai.in
4. Ministry of Electronics and Information Technology. (n.d.). *Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA)*. Government of India. https://www.pmgdisha.in
5. Ministry of Human Resource Development. (2017). *SWAYAM – Study Webs of Active Learning for Young Aspiring Minds*. Government of India. https://swayam.gov.in
6. Ministry of Information and Broadcasting, Press Information Bureau. (2024, March). *Status of Internet Connectivity in Rural Areas*. Government of India. https://pib.gov.in
7. Ministry of Social Justice and Empowerment. (2015). *Accessible India Campaign (Sugamya Bharat Abhiyan)*. Government of India. https://accessibleindia.gov.in
8. National Programme on Technology Enhanced Learning. (n.d.). *About NPTEL*. Indian Institutes of Technology & Indian Institute of Science. https://nptel.ac.in
9. Telecom Regulatory Authority of India. (2024). *The Indian Telecom Services Performance Indicators: January – March 2024*. Government of India. https://www.trai.gov.in
10. United Nations. (1948). *Universal Declaration of Human Rights*. United Nations General Assembly. https://www.un.org/en/about-us/universal-declaration-of-human-rights
11. United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. United Nations. https://sdgs.un.org/goals
12. United Nations Educational, Scientific and Cultural Organization. (2021). *Digital skills for life and work: South Asia report*. UNESCO. https://unesdoc.unesco.org

FROM GREEN IDEAS TO GLOBAL IMPACT: PROMOTING SUSTAINABLE PRACTICES ACROSS SECTORS

Sikandra Devi
Department of Home Science,
Government College for Girls, Sector-14, Gurugram
Corresponding author E-mail: sikandra.shanwal@yahoo.co.in

1. Introduction:

Sustainability has become one of humanity's top concerns in the twenty-first century. The problems posed by climate change, biodiversity loss, excessive natural resource consumption, and increasing environmental degradation cut across national, political, and cultural borders. These worldwide concerns pose a threat to ecosystem balance and human welfare, but they also present fresh opportunities to reconsider progress and embrace creative, environmentally responsible solutions. Sustainability is now a multifaceted term that incorporates economics, technology, governance, and social responsibility; it is no longer limited to environmental advocacy. "From Green Ideas to Global Impact" captures a journey of change, from grassroots creativity and personal awareness to the widespread adoption of sustainable methods in a variety of industries. Adopting green techniques offers the ability to rethink growth paradigms and guarantee intergenerational justice in a variety of fields, including agriculture, energy, industry, healthcare, education, and urban planning. When backed by research, technology, policy frameworks, and community involvement, ideas that start out as localized—like the use of renewable energy, recycling, or organic farming—can grow into global movements.

A comprehensive strategy that strikes a balance between the three interrelated facets of social justice, economic growth, and environmental preservation is also necessary for sustainable practices. Industries and institutions are vital to the development of greener technology and operating models, even as governments and international organizations draft regulations and agreements. At the same time, via active involvement in sustainability projects, lifestyle changes, and responsible consumerism, communities and individuals serve as change agents.

The purpose of this chapter is to examine how sustainable concepts might be developed, expanded, and institutionalized to have a significant worldwide influence. It draws attention to the tactics, partnerships, and best practices that allow various industries to move toward ecologically friendly paths without sacrificing social or economic advancement. This conversation highlights the importance of group action and the transformative potential of sustainability in creating a resilient, inclusive, and environmentally friendly future by bridging the gap between theory and practice.

Relevance of Study

The concept of "From Green Ideas to Global Impact" emphasizes the necessity of converting eco-friendly behaviors and small-scale inventions into all-encompassing plans that have an impact on global systems. For instance, formerly considered experimental, waste management innovations, sustainable farming models, renewable energy projects, and green supply chains are increasingly being mainstreamed into corporate strategy and legislative frameworks. In order to achieve the Sustainable Development Goals (SDGs) of the UN and create a future that protects people and the environment, it is essential to comprehend how these practices may be promoted across sectors.

Objectives:

This chapter aims to:

1. Examine how important industries like agriculture, energy, industry, healthcare, and education envision and apply sustainable techniques.
2. Examine the community-based, policy-driven, and technology processes that allow local concepts to grow into global movements.
3. Emphasize case studies and best practices that show how sustainability may be successfully incorporated into a variety of professions.
4. Give a plan for implementing green practices on a larger scale using creativity, teamwork, and moral leadership.

2. Defining Sustainability Across Sectors

Sustainability is not confined to recycling or conserving energy; it embraces practices that enhance ecological balance, economic viability, and social equity. A guiding concept, the circular economy, encourages designing out waste and retaining material value through reuse, recycling, and regeneration—across industries like construction, packaging, steel, and food systems. Implementing circular models globally could reduce nearly 39% of emissions from key sectors like cement, aluminum, and plastics.

The Brundtland Commission (1987) provided the most widely used definition of sustainability, which is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Although this definition offers a general framework, different sectors understand and use sustainability differently based on their own priorities, opportunities, and difficulties. Translating the global vision of sustainability into tangible practices and quantifiable results requires an understanding of these sector-specific factors.

i. Agriculture: Sustainability in agriculture refers to methods that preserve soil fertility, save water, and lessen reliance on chemicals while guaranteeing food security for an expanding population. Crop diversification, organic farming, agroforestry, precision

farming, and climate-smart practices that strike a balance between environmental stewardship and productivity are all components of sustainable agriculture. It aims to preserve rural livelihoods and biodiversity while lowering greenhouse gas emissions from farming.

ii. Energy: Reducing reliance on fossil fuels and switching to low-carbon, renewable energy sources like solar, wind, hydro, and bioenergy are how the energy industry defines sustainability. Enhancing efficiency using smart grids, energy-saving devices, and waste-reduction circular systems are further aspects of energy sustainability. A key component of this sector's sustainability responsibility is guaranteeing that everyone has access to reasonably priced, clean energy, which is in line with SDG 7.

iii. Industry and Manufacturing: Sustainability in industry is lowering carbon footprints, using cleaner production techniques, and consuming less resources. Sustainable packaging, eco-design, waste recycling, and green supply chains are essential elements. The circular economy, which aims to lengthen life cycles and reduce waste by designing items for reuse, remanufacturing, and recycling, is being embraced by manufacturing industries more and more. Corporate Social Responsibility (CSR) and Environmental, Social, and Governance (ESG) frameworks further guide sustainable industrial practices.

iv. Healthcare: The goal of sustainability in healthcare is to create systems that minimize environmental effects while providing high-quality, equitable care. This entails lowering hospital energy consumption, securely handling biological waste, encouraging telemedicine to ease the burden on resources, and guaranteeing that necessary medications are accessible. Public health programs that address the socioeconomic determinants of health, preventative care, and health disparities are also included in sustainable healthcare.

v. Education: Sustainability in education extends beyond campus greening programs and includes incorporating sustainable development principles and environmental knowledge into courses. The goal of Education for Sustainable Development (ESD) is to equip students with the values, attitudes, abilities, and information needed to create a more sustainable future. Schools and universities serve as centers for community outreach, research, and awareness-raising, impacting generational changes toward sustainable living.

vi. Infrastructure and Urban Planning: The goal of urban sustainability is to build inclusive, livable, and resilient cities. This comprises climate-resilient infrastructure, green spaces, waste management strategies, energy-efficient buildings, and sustainable transportation systems. Initiatives for smart cities combine technology and environmentally friendly architecture to guarantee less traffic, lower emissions, and a higher standard of living.

vii. Social and Community Development: Community-level sustainability places a strong emphasis on gender equality, fair resource distribution, participatory governance, and cultural preservation. Cooperative structures, grassroots initiatives, and indigenous knowledge systems are frequently essential for promoting inclusivity and resilience.

3. What Drives Cross-Sectoral Sustainability

The convergence of economic, environmental, social, and governance pressures propels cross-sectoral sustainability, motivating businesses, governments, and communities to coordinate their objectives in the direction of a more resilient future. Cross-sectoral methods, as opposed to sector-specific sustainability, place an emphasis on connections and partnerships that tackle common issues including resource depletion, climate change, inequality, and economic instability.

i. **Global Environmental Difficulties:** Problems including pollution, water scarcity, biodiversity loss, and climate change transcend sectoral lines. Effective sustainability must be cross-cutting because of the interdependencies between agriculture, industry, health, transportation, and energy. Collaboration between sectors is motivated by the urgency with which these global threats must be mitigated.

ii. **Interdependence of the Economy:** Agriculture, industry, logistics, banking, and retail are all connected via global supply chains. Food production, for instance, is reliant on energy efficiency, packaging industries, transportation networks, and farming methods. Sectors are compelled to collaborate for sustainable practices due to shared economic interests.

iii. **Frameworks for Governance and Policy:** Through laws, rewards, and cooperative platforms, national governments and international organizations—such as the UN Sustainable Development Goals—promote cross-sectoral projects. Policies pertaining to waste management, renewable energy, or carbon emissions sometimes call for collaboration between several industries.

iv. **Innovations in Technology:** Biotechnology, artificial intelligence, digital tools, and renewable energy technologies frequently have cross-sector applications. ICT, for instance, helps with smart agriculture, and sustainable energy solutions revolutionize the fields of healthcare, building, and transportation. Innovations that are shared serve as a unifying factor.

v. **Market Demand and Consumer Awareness:** Consumers of today are calling for more eco-friendly services, ethical goods, and production process transparency. Food, fashion, healthcare, and energy businesses are all compelled by this trend to harmonize their operations, which spreads sustainable norms throughout other industries.

vi. **ESG objectives and corporate social responsibility (CSR):** Businesses are embracing Environmental, Social, and Governance (ESG) frameworks, which emphasize accountability beyond profit. Since multinational firms work in a variety of industries, their sustainability pledges have an impact on several supply chains at once.

vii. **Inclusivity and Social Equity:** Enhancing human well-being is just as important to sustainability as protecting the environment. Health, education, housing, agriculture, and government must all work together to address poverty, inequality, and resource access. Cross-sectoral relationships are therefore crucial for inclusive development.

viii. **Global Disasters and the Need for Resilience:** The interdependence of sectors is emphasized by occurrences like pandemics, natural disasters, or energy shortages. For example, COVID-19 demonstrated the interdependence of the food systems, education, economy, and health.

4. Illustrative Models from Industry Leaders

ESG objectives and corporate social responsibility (CSR)

Environmental, social, and governance (ESG) frameworks are being adopted by businesses; these frameworks place an emphasis on accountability that goes beyond profit. Since multinational firms work in a variety of industries, their sustainability pledges have an impact on several supply chains at once.

Illustrative Models from Industry Leaders

- Numerous national and international business leaders have shown how sustainability can be successfully incorporated into partnerships, supply chains, and operations. These models demonstrate how sustainability may promote long-term value development in addition to showcasing exemplary practices.

1. Unilever's FMCG Sector Sustainable Living Plan

Model: Supply chain management, community involvement, and product design are all incorporated into Unilever's Sustainable Living Plan.

Key practices:

- Cutting back on plastic packaging and pursuing solutions for the circular economy.
- Obtaining all agricultural raw materials in a sustainable manner.
- Linking business growth with positive social and environmental impact.

Cross-Sectoral Impact: Agriculture (raw materials), packaging (plastics), water conservation, consumer awareness, and waste management.

2. Tesla: Renewable Energy & Clean Mobility (Automobile & Energy Sector)

Model: By combining solar and renewable energy storage technologies with electric automobiles, Tesla advances a zero-emission ecosystem.

Key practices:

- Constructing extensive battery systems to assist renewable energy systems.
- Encouraging the recycling of EV batteries in a circular manner.
- Bringing transportation, technology, and energy together.

Cross-Sectoral Impact: Cars, clean energy, mining, technology, and urban planning

3. **Patagonia: Ethical Fashion (Apparel Industry)**

   Model: By fusing activism, ethical sourcing, and environmentally friendly materials, Patagonia invented sustainable clothing.

   Key practices:

- Plans for "Worn Wear," or repair and reuse, to prolong the life of products.
- Renewable agricultural investments for the procurement of cotton.
- Fair labor practices and supply chain transparency.

Cross-Sectoral Impact: trash reduction, consumer behavior, fashion, agriculture, and community development.

4. **IKEA: A Climate-Friendly Business Model for the Retail and Furniture Industry**

   Model: IKEA wants to provide reasonably priced goods while becoming climate-positive by 2030.

   Key practices:

- Creating goods that can be recycled and used again.
- Switching operations to run entirely on renewable energy.
- Collaborating with forestry communities to get wood responsibly.

Cross-Sectoral Impact: housing, consumer education, logistics, energy, and forestry.

5. **Indian Conglomerate ITC Limited's Triple Bottom Line Strategy**

   Model: ITC incorporates sustainable practices within FMCG, paperboards, hotel, and agriculture.

   Key practices:

- A computerized tool called "e-Choupal" provides farmers with weather and market data.
- Programs for conserving soil and water in rural regions.
- Status that is positive for recycling solid waste, water, and carbon.

Cross-Sectoral Impact: Environment, education, technology, agriculture, and rural development.

6. **Tata Group – Integrated Sustainability (Indian Multisector Model)**

   Model: Tata integrates sustainability across steel, automobiles, energy, IT, and consumer products.

   Key practices:

- Tata Power’s investment in renewables.

- Tata Steel's circular economy initiatives for waste utilization.
- Tata Chemicals' focus on green chemistry.

Cross-Sectoral Impact: Manufacturing, energy, technology, community development, and environmental conservation.

5. Sector Highlights

Beyond manufacturing and tech, sustainability innovations are reshaping other sectors:

1. Fashion Industry: Decarbonization Amid Constraints

Context: The fashion industry, which is frequently criticized for using a lot of resources worldwide, is changing to be more sustainable.

South Asian Leadership: To lessen their carbon footprints, businesses like Arvind Ltd. in India are investing in biomass boilers and renewable energy systems. This is important since South Asia is a region that uses a lot of energy and is a global center for textiles.

Challenges: Smaller suppliers with narrow profit margins find it challenging to make the switch to greener energy sources since it demands a large upfront investment.

Collaborative Platforms: Projects like the Asia Textile Technology Initiative (ATTI), which partners with Vogue Business, offer technological assistance, shared learning, and finance approaches. They serve as a link between local manufacturers that are having difficulty adapting and international brands that want sustainability.

Impact: In addition to lowering emissions, these programs increase the openness of the global supply chain, allowing companies to exhibit true ESG (Environmental, Social, Governance) compliance.

2. **Packaging & Logistics: Small Changes, Big Impact**

Amazon's Example: Amazon reduced the amount of plastic in their international shipments by 16% by moving from single-use plastic mailers to recyclable paper packing.

Why It Is Important: Although packaging waste significantly contributes to landfill and marine pollution, logistics is frequently disregarded in the context of sustainability.

Additionally, packaging that is recyclable and biodegradable enhances brand recognition and satisfies consumer desire for environmentally responsible products.

The Ripple Effect: Similar actions are being taken by other retail and e-commerce behemoths (e.g., Flipkart phasing out single-use plastics in India, Walmart's pledge to do away with plastic shopping bags).

Carbon emissions are further reduced through logistics optimization, which includes lightweighting, reducing the amount of packaging, and moving to electric delivery vehicles.

Result: Shows that significant sustainability advantages can be achieved with operational adjustments rather than only radical innovations.

3. Urban Living & Housing: Low-Carbon, Community-Centric Models

Case Studies in the UK:

Lilac (Leeds): An affordable, shared-ownership cooperative housing project constructed using low-carbon materials (such as straw bales). By guaranteeing that people live in energy-efficient dwellings and fostering social harmony, it exemplifies community-led sustainability.

Citu's Passivhaus Communities in Leeds: Compared to conventional homes, these Passivhaus-certified dwellings consume 90% less energy for heating and cooling. They incorporate sustainable urban planning, intelligent insulation, and renewable energy technologies.

Greater Significance:

i) Addresses social issues (cheap, inclusive housing) as well as climatic goals (lower emissions from buildings, which account for about 40% of global CO_2).

ii) Uses renewable building materials, lowers energy use, and builds community resilience to promote a circular economy approach to urban development.

Global Trends: Similar concepts are appearing all over the world, including solar-powered cheap housing prototypes in India, net-zero housing in North America, and eco-villages in Europe.

6. Strategies for Scaling Impact

To elevate green ideas into global progress, cross-industry strategies include:

1. **Adopt Circular Economy Practices**

Concept: A circular economy uses "reduce-reuse-recycle" loops in place of the conventional "take-make-dispose" paradigm.

Applications in Various Sectors:

Fashion: Closed-loop textile recycling, such as the clothing collection programs offered by H&M.

Electronics: Fairphone's readily repairable cellphones are examples of modular designs that enable the reuse of parts.

Food systems: converting waste into valuable byproducts (breweries converting discarded grain into foods high in protein).

Benefits

i) Lessens reliance on raw materials, which lowers expenses and emissions.

ii) Encourages design innovation (eco-design, biomaterials).

iii) Corresponds with international regulatory measures (such as the EU's Circular Economy Action Plan).

Challenge: Necessitates redesigning the system at every level, including lifecycle, logistics, packaging, and product, which makes cooperation between customers, recyclers, and producers essential.

2. Proactive Supply Chain Governance

Idea: Because sustainability at the procurement stage ripples down via hundreds of suppliers, supply chains can have a significant influence.

For example:

Through certification, the Forest Stewardship Council (FSC) guarantees ethical forestry.

Through its Project Gigaton initiative, Walmart is working with its suppliers to reduce greenhouse gas emissions by a gigaton by 2030.

Governance tools include third-party audits, supplier rules of conduct, standards, and initiatives to increase small suppliers' capacity.

Benefits

i) Enhances transparency and accountability.

ii) Guarantees adherence to international ESG standards that investors and regulators have requested.

iii) Shields companies from reputational hazards associated with environmental damage or labor mistreatment.

Challenge: Small suppliers face high compliance costs, necessitating training and supported funding from lead corporations.

2. Use Technology to Promote Transparency

Electronic Instruments:

AI & Machine Learning: Resource optimization and carbon emission forecasting.

Product lifecycle tracking (origin, materials, and recyclability) is done with digital product passports, or DPPs.

IoT sensors: tracking environmental data in real time throughout supply chains.

Blockchain: Preventing greenwashing by protecting supply chain data.

For instance:

Blockchain is used by IBM Food Trust to improve safety, reduce waste, and trace food.

Fashion products now have digital IDs thanks to tech businesses like Provenance, which encourage environmentally conscientious shopping.

Impact: Increases regulatory compliance, dispels false sustainability claims, and empowers customers with clear product histories.

4. Enable Cross-Industry Collaborations

Concept: Because sustainability issues are systemic, sectors must work together rather than compete.

For instance:

PPPs (public-private partnerships) in the implementation of renewable energy (such as the International Solar Alliance in India).

Cross-sector initiatives aimed at achieving net-zero supply chains, such as the Fashion Pact (retailers, governments, and NGOs).

Corporate alliances such as the World Business Council for Sustainable Development (WBCSD) are tackling food, energy, and mobility at the same time.

Benefits

i) Speeds up the transfer of technology between industries.

ii) Reduces the risks associated with green breakthroughs by pooling funding.

iii) Creates multi-sectoral resilience, such as connecting housing, transportation, and clean energy.

The challenge is to bring disparate stakeholders with varying priorities together and make sure that collaborations progress from public relations to concrete commitments.

5. Encourage Grassroots and Community Innovations

Concept: Local communities must be empowered with resources, education, and flexible solutions; sustainability cannot be merely top-down.

For instance:

Just resilience initiatives in South Asia: Providing social safety nets and assistance for climate adaption to textile workers.

Community-led energy: In rural Africa, local solar cooperatives offer reasonably priced, sustainable electricity.

Rooftop farms are lowering food miles and generating green jobs in urban areas through urban agriculture.

Benefits

i) Ensures that vulnerable populations are not left behind throughout green transitions, so promoting social fairness.

ii) Develops scalable, culturally appropriate solutions based on local expertise.

iii) Increases long-term adoption of eco-practices and community ownership.

Challenge: To go from pilots to broader effect, grassroots initiatives require financial backing and policy assistance.

7. Challenges & Opportunities

1. Capital Access: Smaller Players Face Financial Obstacles

Context: Making the changeover to green practices, such using renewable energy, building energy-efficient equipment, or using sustainable raw materials, necessitates a large initial outlay of funds.

Difficulties for Suppliers and SMEs:

Small and medium-sized businesses (SMEs) and tier-2/3 suppliers in global supply chains frequently function on low margins, in contrast to major multinationals.

They might be seen as high-risk borrowers by banks and investors, which would restrict their access to reasonably priced funding for green initiatives.

Green finance products (such as ESG funds, green bonds, or sustainability-linked loans) are frequently designed for big businesses rather than small vendors.

Consequences: Without funding, these vendors risk being shut out of international marketplaces where consumers are calling for adherence to sustainability guidelines. This raises the possibility of "sustainability inequality," in which only wealthy businesses are able to achieve environmentally friendly standards.

Yet global consumer preferences, regulatory momentum, and mounting investor support create fertile ground for scaled transformation.

Potential solutions:

i) Types of blended finance, which combine development, private, and public funding.

ii) ii) Buyer-supported financing, in which major brands provide concessional loans or share investments with suppliers.

iii) Green microfinance for local businesses is being expanded.

2. Policy Gaps: Inequitable Rules and Rewards

Worldwide Inequalities:

Although many developing nations lack comparable policies or enforcement, the EU has robust environmental rules (such as the Green Deal, circular economy directives, and carbon border tax).

Multinational corporations find it challenging to comply with the "patchwork" of regulations created by inconsistent standards across different countries.

Blind Spots in Sectors:

Compared to well-known industries like energy or automobiles, some—including textiles, logistics, or construction—get less policy attention.

Renewable energy incentives are frequently more advanced than those for low-carbon homes or sustainable agriculture.

As a result, businesses operating under less stringent regulatory frameworks could carry on with unsustainable methods with no repercussions, leveling the playing field and impeding global advancement.

Potential solutions:

i) Harmonization of global sustainability norms (by means of regional trade blocs, the WTO, or the UN).
ii) Extending eco-incentives to include biodiversity, waste reduction, and water conservation in addition to renewable energy.
iii) Enhancing accountability and enforcement rather than merely announcing policies.

3. Tech Footprints: Hidden Environmental Costs of Innovation

Green tech paradox: Although cutting-edge technologies like artificial intelligence (AI), blockchain, the Internet of Things (IoT), and data centers make sustainability possible, they also have negative environmental effects of their own.

For instance:

AI & Machine Learning: It takes a lot of energy to train big AI models, perhaps as much as the emissions from many cars combined.

Blockchain: Energy-intensive procedures have the potential to compromise sustainability objectives, particularly in proof-of-work systems.

E-Waste: The problems associated with electronic waste are exacerbated by the quick technological advancements for digital gadgets, EV batteries, and smart sensors.

Risk: If left unchecked, the costs associated with implementing "green tech" could potentially outweigh the benefits it is supposed to provide, leading to a sustainability rebound effect.

Potential solutions:

i) Creating data centers and AI that use less energy (by switching to servers that run on renewable energy sources and implementing liquid cooling systems).
ii) Putting money into innovative green hardware (recyclable batteries, biodegradable electronics).
iii) Incorporating lifespan evaluations into technology deployment plans in order to strike a balance between expenses and advantages.

Conclusion:

It is both feasible and crucial to convert green concepts into systemic, cross-industry transformation, from regional pilot programs to international regulations. We can grow sustainability from concept to systemic impact by utilizing technology-driven transparency, empowered supply chains, circular models, and inclusive collaborations. Not only is this change inevitable, it's long time.

References:

1. Vogue Business. (2025, August). *Can manufacturers lead on climate action as brands back off?* Vogue Business.
2. TechRadar. (2025). *The roadmap to sustainable IT*. TechRadar.
3. Financial Times. (2025). *How AI might save more energy than it soaks up*. Financial Times.
4. United Nations Environment Programme. (2024, September 21). *AI has an environmental problem. Here's what the world can do about it*. UNEP.
5. Zewe, A. (2025). *Explained: Generative AI's environmental impact*. MIT News.
6. Yao, Y. (2024). *Can we mitigate AI's environmental impacts?* Yale Environment.
7. Wikipedia. (n.d.). *Environmental impact of artificial intelligence*.

Bhumi Publishing, India
September 2025

EMPOWERING INDIA'S YOUTH: BUILDING RESILIENCE FOR A SUSTAINABLE AND AI-DRIVEN VIKSIT BHARAT

Shagun Gupta and Neha Sharma
Department of Human Development,
Government Home Science College, Sector 10 D,
Affiliated to Panjab University, Chandigarh
Corresponding author E-mail: guptashagun191@gmail.com

Abstract:

India's aspiration to become a developed nation by 2047 under the "Viksit Bharat" vision places its youth at the centre of transformation. The rapid integration of Artificial Intelligence (AI) across sectors is shaping opportunities and challenges that demand a resilient, adaptive and ethically aware generation. This chapter examines the frameworks, strategies and policy interventions needed to prepare Indian youth for a technologically advanced yet sustainable future. It underscores the role of digital literacy, emotional intelligence and environmental stewardship in fostering resilience. The discussion also highlights how educational reforms; community engagement and governmental support can ensure that the demographic dividend is fully realized in an AI-driven era.

Keywords: Viksit Bharat, Indian youth, Artificial Intelligence, Digital literacy, Sustainable future, Resilience.

1. Introduction:

India's youth, accounting for over 65% of its population between the ages of 15-64, form a demographic dividend with immense potential for national progress (Ghosh, 2025). By 2030, this segment will be the backbone of the workforce, driving the vision of "Viksit Bharat 2047." However, this transition is unfolding amid a technological revolution led by AI, which is redefining economic structures, labour markets and social systems.

While AI presents unprecedented opportunities for efficiency, innovation and inclusivity, it also poses various challenge like automation-related job displacement, ethical dilemmas and the risk of widening the digital divide (Virmani, 2021). Resilience, in this context, extends beyond emotional strength to encompass critical thinking, adaptability, digital competence and a sustainable mindset (Sargiotis *et al.,* 2025). This chapter explores how these capacities can be systematically cultivated to align with India's developmental goals.

2. Concept and Ideology

2.1 The Role of AI in India's Sustainable Development

AI applications have the potential to revolutionize agriculture, urban planning, healthcare and education. Predictive analytics can enhance food security by providing farmers with real-time insights, while AI-assisted diagnostics can improve patient outcomes and reduce systemic inefficiencies in healthcare (UNESCO, 2024). In smart cities, AI can optimize energy usage and reduce environmental footprints. However, realizing these benefits depends on a workforce proficient in AI technologies and committed to ethical practices.

2.2 Resilience in the Context of AI

Resilience for India's youth in an AI-driven context implies:

- Technological Adaptability: Navigating rapid changes in work processes and learning systems.
- Lifelong Learning: Continuously upgrading skills in sync with evolving AI applications.
- Ethical Consciousness: Ensuring AI serves societal values and sustainable goals (Bhasin *et al.,* 2024).
- Mental Well-being: Coping with uncertainty, automation-driven change and information overload.

Such resilience will prepare young people to respond effectively to both opportunities and disruptions caused by AI.

3. Empowering Youth with AI: Building a Sustainable Tomorrow

Global challenges such as climate change and environmental degradation demand innovative, data-driven solutions. AI is a critical enabler in this regard, helping identify environmental risks, optimize resource use, and design climate-resilient infrastructure (Yadav, 2023).

Youth-led initiatives, supported by AI, can drive localized solutions in agriculture, waste management, and disaster response. Social media and digital platforms also provide unprecedented avenues for mobilization, awareness campaigns, and collaborative problem-solving (UNESCO, 2024).

4. Strategies to Empower Youth and Build Resilience

4.1 Educational Initiatives

- Integrate digital literacy and AI fundamentals across school and university curricula.
- Expand Skill India and similar vocational programs to cover AI-related competencies.
- Foster project-based learning that addresses real-world challenges.

4.2 Policy Frameworks

- Create inclusive AI regulations prioritizing ethics and accessibility.
- Incentivize public-private-academic partnerships for youth-led AI innovation.

- Bridge the digital divide through rural internet access and affordable devices.

4.3 Community Engagement

- Conduct AI awareness workshops in rural and urban regions.
- Support initiatives like Mera Yuva Bharat to encourage socially beneficial AI applications.

4.4 Ethical Education

- Train youth in ethical AI principles, privacy, fairness, and transparency.
- Encourage AI solutions targeting inclusive growth and inequality reduction.

4.5 Mental Health Support

- Introduce stress management and mindfulness programs in educational institutions.
- Leverage AI-powered mental health platforms for personalized support.

5. Challenges and Considerations

While AI integration holds promise, critical concerns include:

- Data privacy risks from unregulated AI use.
- Automation-driven unemployment in vulnerable sectors.
- Algorithmic bias reinforcing social inequalities.
- Environmental costs of large-scale AI infrastructure.

Moreover, overreliance on AI may diminish problem-solving skills, creativity and face-to-face social engagement, potentially eroding psychological resilience.

Conclusion:

Empowering India's youth to thrive in an AI-driven era requires a multidimensional approach combining education, ethics, mental well-being and community engagement. If resilience is systematically built into youth development strategies, the demographic dividend can be fully leveraged to drive inclusive and sustainable progress toward "Viksit Bharat 2047."

By fostering adaptability, critical thinking, and environmental responsibility alongside technological proficiency, India can ensure its youth are not just passive consumers of AI but active architects of a sustainable future.

References:

1. Bhasin, S., Kapoor, R., & Mehta, P. (2024). Resilience in the age of AI: Preparing youth for uncertain futures. *Journal of Youth Development Studies, 12*(3), 45–59.
2. Chaturvedi, S. (2024). Digital leadership for a Viksit Bharat 2047: Fostering innovation, shaping tomorrow. *India Foundation*. https://indiafoundation.in/articles-and-commentaries/digital-leadership-for-a-viksit-bharat-2047-fostering-innovation-shaping-tomorrow/

3. Ghosh, S. (2025). Digital transformation fuelling India's economic growth and inclusion. *Business Standard*. https://www.business-standard.com/economy/analysis/digital-transformation-fueling-india-s-economic-growth-and-inclusion-125011500374_1.html
4. Sargiotis, P., Kumar, V., & Singh, A. (2025). Ethical AI and youth capacity building: Pathways to sustainable innovation. *Technology and Society Review, 18*(1), 87–102.
5. UNESCO. (2024). *Artificial intelligence and sustainable development: A youth perspective*. United Nations Educational, Scientific and Cultural Organization.
6. Virmani, A. (2021). *India Vision 2050* (Policy Paper No. PP No.-01/2021). *EGROW Foundation*. https://egrowfoundation.org/site/assets/files/1559/policy_paper_no01_2021_250521_1.pdf
7. Yadav, K. (2023). Empowering youth with AI: Building a sustainable tomorrow. *India Today*. https://www.indiatoday.in/education-today/notification/story/empowering-youth-with-ai-building-a-sustainable-tomorrow-2420732-2023-08-14

Bhumi Publishing, India
September 2025

RURAL DEVELOPMENT THROUGH DIGITAL INITIATIVES: BRIDGING THE GAP BETWEEN TECHNOLOGY AND RURAL COMMUNITIES

Pooja Rana[1], Mangeet Kaur[2] and Shilpi Manne[2]

[1]Department of Retail Management,

[2]Department of Commerce,

Guru Nanak Khalsa College, Yamunanagar

Corresponding author E-mail: poojarana248@gmail.com, kmangeet1989@gmail.com, shilpimanne32@gmail.com

Abstract

This study investigates how digital projects contribute to rural development, with a focus on how rapid technological advancement might result in revolutionary transformation in rural communities. Rural communities might potentially overcome a multitude of challenges by utilizing digital tools and platforms to seize opportunities for development and success. This essay investigates how digitization might assist rural populations solve important challenges such as improving access to critical information, healthcare, education, and agricultural productivity. It investigates how to bridge the gap between rural and urban areas via telemedicine services, online markets, smart farming technologies, and e-learning platforms. The study also looks at several case studies of successful digital initiatives and evaluates how they improve social cohesion, local economy, and quality of life. Although it recognizes the benefits, it also evaluates the challenges that rural areas confront when implementing digital solutions, such as inadequate infrastructure, low levels of digital literacy, and regulatory barriers. The paper presents policy recommendations to encourage sustainable economic growth, boost digital inclusion, and ensure that no one falls behind in the digital age. To develop an environment that fosters rural digital transformation, it emphasizes the importance of collaboration between the governmental and private sectors, as well as the community.

Keywords: Rural Development, Digital Initiatives, Technology, Agriculture, Digital Inclusion, E-Governance, Telemedicine, Digital Literacy

1. Introduction:

Globally, rural populations have long faced numerous challenges, including limited access to infrastructure, economic opportunities, high-quality healthcare, and education. These concerns have impacted rural communities' overall progress and well-being, resulting in a continued difference in living standards between urban and rural areas. However, the rapid growth of digital technology has opened up new opportunities for overcoming these hurdles and transforming rural environments. Digital projects, ranging from e-learning and digital agriculture

to telemedicine and mobile connectivity, have shown to be beneficial in serving the specific needs of rural areas. Using digital platforms, rural communities may increase production, gain access to important services, raise their standard of living, and participate in the global economy. By crossing the digital divide, the digital revolution has the potential to foster inclusion and long-term development in rural communities. This study investigates how digital initiatives effect rural development, focusing on key sectors such as government, healthcare, education, and agriculture. Furthermore, it will examine successful case studies, explore the challenges of digital transformation, and make policy recommendations to promote digital inclusion in rural communities. The goal of this inquiry is to highlight the vital role that digital technology will play in shaping future rural development and providing opportunities for disadvantaged populations.

2. Objectives:

i. 1 Consider the role of digital technologies in tackling rural issues.
ii. 2 Identify and assess successful rural digital development programs.
iii. Evaluate the challenges to digital transformation in rural locations.
iv. Make policy suggestions to improve digital inclusiveness.
v. Investigate the impact of emerging technology on rural development.
vi. Encourage collaborative initiatives for successful digital transformation.

3. Digital Initiatives and Their Impact on Rural Development

Rural areas are fast changing as a result of digital initiatives that address long-standing issues such as educational health information and market linkages. The numerous digital projects that have a significant impact on rural development are discussed here.

3.1 E-Governance and Digital Services

E-government projects have had a huge impact on how rural populations get government services. Technology has enabled rural populations to have online access to services such as government subsidies, land records, pension plans, and birth certificate applications. By eliminating the need for in-person visits to government offices, digital platforms help to promote transparency, reduce corruption, and save time.

Impact:

- Increased production and reduced administrative delays.
- Enhancing rural residents' access to public services.
- Improved transparency and accountability for public services.

3.2 Digital Financial Inclusion

With the introduction of online transactions, mobile money, and digital banking services, rural financial inclusion has changed dramatically. Millions of rural households now have bank

accounts, thanks to programs like the Pradhan Mantri Jan Dhan Yojana (PMJDY), which enables them to participate in the formal economy.

Impact:

- Improved access to banking services, especially for those who lack bank accounts.
- More opportunities for investments and savings.
- Enhanced independence from unofficial moneylenders and financial establishments.

3.3 Telemedicine and Health Services

In rural areas where medical professionals are scarce, telemedicine has helped close the access gap to healthcare. In rural areas, patients can use mobile apps and digital health platforms to remotely monitor their health, get prescriptions, and consult with doctors.

Impact:

- Better access to healthcare, particularly in isolated places.
- Decreased expenses and travel time for medical consultations.
- In urgent situations, prompt medical intervention improves health outcomes.

3.4 Digital Education and E-Learning

Rural students now have easier access to education thanks to the proliferation of online courses, virtual classrooms, and digital education platforms. To reduce the educational gap, projects such as India's PM eVIDYA aim to provide children in rural areas with high-quality digital learning resources.

Impact:

- There are less geographic constraints on schooling.
- Access to high-quality instructional materials enhances learning chances.
- Gave teachers digital materials to enhance engagement and education.

3.5 Agri-Tech and Digital Agricultural Services

Agriculture is critical to rural economies, and digital technologies are transforming farming practices. Digital platforms help farmers make more informed decisions, maximize crop yields, and get better prices for their produce by giving weather forecasts, market prices, crop management information, and e-commerce possibilities.

Impact:

- Access to professional supervision and modern farming methods leads to increased productivity.
- Better pricing results from increased market connectivity for produce sales.
- Decreased reliance on intermediaries and better financial results for farmers.

3.6 Digital Connectivity and Internet Infrastructure

One of the most ambitious digital projects is the expansion of mobile and broadband networks in rural areas. Rural villages may now access information, participate in the digital

economy, and connect to the outside world thanks to the growth of internet access caused by the deployment of 4G and 5G networks.

Impact:

- Better availability of news information and digital services.
- More opportunities for cooperation and communication in rural areas.
- Made it possible for entrepreneurs and small businesses to use online platforms to run and grow.

3.7 Smart Villages and Digital Infrastructure

The purpose of numerous efforts is to develop smart communities with digital infrastructure. This entails establishing e-governance centres equipped with solar-powered digital kiosks and high-speed internet access. Smart communities strive to improve people's overall quality of life by infusing technology into basic services such as waste management, water, and sanitation.

Impact:

- Higher living standards as a result of easier access to infrastructure and services.
- Enhanced economic growth through the promotion of digital entrepreneurship.
- Sustainable rural development by utilizing resources and technology wisely.

3.8 Digital Entrepreneurship and Skill Development

Improved skill development leads to greater career prospects. Reduced urban migration as young individuals from rural areas start local companies. Digital platforms and initiatives are allowing rural youngsters to pursue business opportunities. Rural communities are being equipped to start and scale businesses utilizing technology, through online markets and digital skill development initiatives. Training in digital skills like coding, web development, and digital marketing is also helping rural kids find better jobs.

Impact:

- Creating new revenue sources through digital entrepreneurship.

3.9 Digital Supply Chains and E-Commerce

Reduced transportation costs and time in product distribution. Better product delivery and supply chain management were made possible. The growth of e-commerce platforms has provided rural producers with access to national and international markets. Digital supply chain solutions enable rural businesses to optimize inventory management, distribution, and logistics, making them more competitive and efficient.

Impact:

- Enhanced market accessibility for small enterprises and producers in rural areas.

4. Case Studies of Successful Digital Initiatives in Rural Areas

4.1 Strengthen digital infrastructure.

4.1 Strengthen Digital Infrastructure

Public-private cooperation can be used to develop broadband networks and mobile connectivity.

Case Study: Bharat Net Project

The Indian government's BharatNet initiative seeks to provide high-speed broadband to 2.5 lakh gram panchayats. It has helped rural communities gain access to e-governance, telemedicine, and online education, thereby bridging the digital divide.

4.2 Enhance Digital Literacy

Establish community centers in remote areas to provide digital education and skill training.

Case Study: Digital Saksharta Abhiyan (DISHA)

DISHA, a government effort, has taught nearly 6 crores rural inhabitants basic digital skills, allowing them to use e-wallets, digital banking, and access a variety of internet services.

4.3 Improve Accessibility

Subsidize low-income households' mobile data and internet services.

- **Case Study: Jio's Affordable Internet Plans**

Reliance Jio transformed internet access by introducing low-cost mobile data plans, significantly expanding rural internet penetration and allowing millions to access online education, e-commerce, and digital payment systems.

4.4 Promote Localized Solutions

Encourage the creation of digital platforms that cater to specific rural requirements.

- **Case Study: e-Choupal by ITC**

e-Choupal uses digital kiosks in communities to offer farmers with information on the weather, crop prices, and best agricultural techniques. This has increased farmers' income and productivity by reducing their dependency on middlemen.

4.5 Foster Rural Entrepreneurship

Offer digital tools, funding, and training programs to empower rural businesses and startups.

- Case Study: Amazon Saheli and Flipkart Samarth

  These initiatives help rural artisans and entrepreneurs access larger markets by training them in e-commerce and promoting their products on online platforms, thus boosting rural incomes.

4.6 Ensure Data Security and Privacy

Establish precise guidelines and procedures to safeguard the data of rural consumers and promote confidence in digital services.

- Case Study: Aadhaar-enabled Payment System (AePS)

Using Aadhaar authentication, AePS enables safe financial transactions in rural areas, giving the unbanked people convenient access to banking services while maintaining data security.

5. Challenges in Implementing Digital Initiatives in Rural Areas

5.1 Lack of Infrastructure

- Talk about how many rural areas lack dependable access to cell networks, electricity, and the internet.
- Describe the difficulties in establishing broadband infrastructure in distant and remote areas.

5.2 Digital Literacy Barriers

- Bridging the digital literacy gap between urban and rural populations.
- Addressing the problems of teaching fundamental digital skills to individuals with low education and technological exposure.

5.3 Socio-Economic Barriers

- Financial hurdles for rural areas to adopt new technologies.
- Impact of poverty, limited resources, and poor investment in digital infrastructure.

5.4 Policy and Governance Challenges

- Inadequate policy coordination between national and local governments.
- Concerns about privacy, data security, and digital rules in rural areas.

6. Suggestions

6.1 Strengthen Digital Infrastructure:

Through public-private partnerships, expand mobile connectivity and broadband networks. To guarantee smooth internet connection in even the most remote locations, this entails installing optical fibers, setting up rural Wi-Fi zones, and extending mobile network coverage.

6.2 Promote Digital Literacy:

Establish community centers in remote regions for skill development and digital education. To enable communities to efficiently use digital resources, these centers must to offer practical instruction in fundamental digital skills, online financial transactions, and e-governance platforms.

6.3 Increase Accessibility:

Give low-income households subsidies for internet and mobile data services. To close the pricing gap and make digital services accessible to underserved populations, governments and telecom companies should implement inexpensive data plans and low-cost devices.

6.4 Encourage Localized Solutions:

Support the creation of online resources that are suited to particular rural need. This entails developing tools and applications in regional languages, including regional cultural contexts, and tackling particular difficulties such as weather updates, market pricing information, and agricultural advice.

6.5 Encourage Rural Business Ownership:

Provide training programs, money, and digital technologies to support entrepreneurs and small enterprises in rural areas. Rural business owners can increase their revenue prospects and reach a larger market by utilizing digital payment systems, social media marketing, and e-commerce platforms.

7. Future Prospects and Policy Recommendations

7.1 Future Trends in Digital Rural Development

- The potential impact of emerging technologies like as AI, IoT, and blockchain on rural development.
- How smart cities, rural e-commerce platforms, and advanced data analytics can help bridge the digital divide.

7.2 Policy Recommendations

- Improving rural digital infrastructure through public-private partnerships.
- Promoting digital literacy through community centers and partnerships with educational institutions.
- Subsidizing mobile data and internet connectivity for low-income rural communities.
- Implementing digital technologies in rural and national development plans.

7.3 Collaborative Efforts for Sustainable Digital Growth

- Effective rural digital transformation requires collaboration between governments, NGOs, and private sector firms.
- Long-term initiatives aim to ensure equitable access to digital services in rural regions.

Conclusion:

To summarize, digital initiatives have shown to be a catalyst for transformative change in rural development, resulting in significant improvements in governance, healthcare, education, agriculture, and economic empowerment. These programs have not only improved rural inhabitants' quality of life by expanding access to essential services, boosting financial inclusion, and closing educational gaps, but they have also boosted economic growth and entrepreneurial

potential. However, difficulties such as digital literacy, infrastructure restrictions, and connectivity remain and must be solved before these benefits may be fully realized. Despite these limitations, the continued usage and deployment of digital technology in rural regions has the potential to foster long-term, sustainable development, eventually bridging the urban-rural divide and creating a more equitable society.

References:

1. World Bank. (2016). *World development report 2016: Digital dividends*. World Bank.
2. UNESCO. (2017). *Harnessing digital technologies for sustainable development in rural areas*. United Nations Educational, Scientific and Cultural Organization.
3. Narayan, P., & Gulati, A. (2019). Digital India: Empowering rural India through digital platforms. *Indian Journal of Economics and Development, 7*(12), 1–12.
4. Ghosh, D., & Manohar, A. (2019). Telemedicine in rural India: Challenges and opportunities. *Journal of Telemedicine and Telecare, 25*(5), 271–278.
5. United Nations Development Programme (UNDP). (2020). *Digital transformation for rural development*. UNDP.
6. M-Pesa Foundation. (2019). *The role of mobile money in financial inclusion in rural Africa*. M-Pesa Foundation.
7. Kamal, M. (2020). The role of digital literacy in rural development: A case study of Bangladesh. *International Journal of Information and Communication Technology, 14*(3), 201–214.
8. Mohan, P., & Kapoor, V. (2018). Digital agriculture: Empowering farmers through technology. *International Journal of Agricultural Technology, 14*(4), 1279–1291.
9. India's Ministry of Electronics and Information Technology. (2019). *Digital India: Achievements and way forward*. Government of India.
10. World Economic Forum. (2018). *The future of digital transformation in rural areas*. World Economic Forum.
11. Digital India Programme. (n.d.). *Digital India: A vision to transform India into a digitally empowered society*. https://www.digitalindia.gov.in
12. The World Bank. (2021). *Digital economy for Africa report*. https://www.worldbank.org/en/topic/digital-economy

Bhumi Publishing, India
September 2025

INNOVATION IN DEFENCE TECHNOLOGY: AI, CYBERSECURITY, AND SPACE IN INDIA'S STRATEGIC VISION @2047

Asif Ahmed
Department of Defence & Strategic Studies,
Kurukshetra University, Kurukshetra

Abstract:

India's aspiration of *Viksit Bharat @2047*, a technologically advanced, inclusive, and sustainably secure nation, places defence innovation at the core of statecraft. This paper examines how three mutually reinforcing technology frontiers, i.e. artificial intelligence (AI), cybersecurity, and space, are reshaping India's defence policy, force design, and industrial base on the road to 2047. Using a qualitative policy-analysis methodology that triangulates primary government documents, institutional reports, and scholarly work, the study maps India's evolving policy architecture (e.g., Defence Acquisition Procedure 2020; Defence Production and Export Promotion Policy; Indian Space Policy 2023; India AI Mission; CERT-In directions; DPDP Act), organisations (Defence Cyber Agency, Defence Space Agency, DRDO labs, iDEX), and partnerships (INDUS-X, iCET). It analyses capability pathways (autonomous systems, decision-support, cyber defence/offence, space situational awareness, counter-space), governance and ethics (Responsible AI, data protection, civilian oversight), and the industrial ecosystem (startups, primes, export momentum). Findings show that India has built an enabling scaffold for accelerated defence innovation anchored in indigenisation, dual-use spillovers, and coalition partnerships, but faces execution challenges: talent depth, test/evaluation infrastructure, systems integration, and standards/interoperability. The paper proposes a phased roadmap to 2047: fieldable AI at scale; resilient, zero-trust cyber posture with CII protection; space power for persistent ISR and assured access; and a metrics-driven governance regime that aligns operational effectiveness with ethical, legal, and sustainability commitments.

Keywords: Viksit Bharat @2047; Defence innovation; Artificial Intelligence; Cyber Security; space power; iDEX; indigenisation; Responsible AI; Indian Space Policy; dual-use; INDUS-X.

Research Objectives:

1. **Map the policy architecture** enabling AI–cyber–space innovation in Indian defence, and connect it to *Viksit Bharat @2047*.
2. **Analyse capability pathways** in AI (autonomy, C2 decision-support), cybersecurity (defence, offence, CII protection), and space (ISR, PNT, counter-space).
3. **Evaluate institutional and industrial ecosystems** (DRDO, DPSUs, private sector, startups, academia) driving defence innovation and exports.

4. **Assess governance/ethical frameworks,** Responsible AI, data protection, export controls, shaping democratic oversight and legitimacy.
5. **Propose a phased roadmap to 2047** with milestones, metrics, and risk mitigations to operationalise India's strategic vision.

Methodology:

This is a qualitative policy analysis with four methods:

- **Document analysis** of official policies, acts, and guidelines (e.g., DAP 2020; DPEPP; India AI Mission; CERT-In directions; DPDP Act; Indian Space Policy 2023).
- **Institutional and program review** (IN-SPACe, iDEX, Defence Cyber/Space Agencies, Mission Shakti, Drone Rules 2021).
- **Secondary literature and expert analyses** (IDSA/IISS/ORF/industry), including initiatives like INDUS-X/iCET and sector metrics.
- **Comparative inference** across peer programmes and alliances to identify gaps and best practices.

Limitations include data sensitivity in defence programmes and evolving timelines for space and AI missions; therefore, the paper privileges official releases and triangulated sources.

Introduction:

Modern defence power is increasingly defined by the AI cyber space triad. AI accelerates OODA loops through perception, prediction, and planning; cybersecurity underwrites the integrity of networks and weapons; space assets provide persistent ISR, communications, and navigation, i.e. the scaffolding for multi-domain operations. India's *Viksit Bharat @2047* frames national transformation with innovation, inclusion, and sustainability as pillars; the military analogue is a smart, resilient, and indigenised force that deters adversaries, assures escalation control, and contributes to global stability.

Over the past decade, New Delhi has overhauled its defence policy toolkit to spur indigenous innovation and secure strategic autonomy. The Defence Acquisition Procedure (DAP) 2020 pushed "Make" categories, iDEX pathways, and technology absorption to shorten cycles and privilege domestic design. The Defence Production & Export Promotion Policy (DPEPP) set targets for turnover and exports, aligning budgets, testing, and quality standards. Simultaneously, the India AI Mission (2024) provides an economy-wide AI backbone (models, compute, skilling) that dual-use defence can leverage. In cyber, CERT-In's 2022 directions imposed rapid incident reporting and 180-day log retention, complementing the Digital Personal Data Protection Act (2023), a keystone for secure, rights-aware data ecosystems. In space, Indian Space Policy 2023 and IN-SPACe opened the sector to private providers and PPP constellations, while ISRO's Chandrayaan-3 success and DRDO's Mission Shakti signalled capability maturation, including in counter-space.

This architecture is not self-executing. It requires talent pipelines, rigorous test & evaluation (T&E), standards, and coalition-ready interoperability, all within a constitutional democracy that values transparency and rights. The following sections examine the three pillars, the ecosystem that powers them, and a practical roadmap to 2047.

Strategic Logic of the AI–Cyber–Space Triad

Interdependence defines the triad:

- **AI ↔ Space:** AI enables onboard autonomy, target recognition, and sensor fusion; space assets supply the high-quality data AI needs.
- **AI ↔ Cyber:** AI augments cyber defence (anomaly detection, automated patching) and offence (automated discovery), while cyber secures AI supply chains and models.
- **Cyber ↔ Space:** Satellites and ground segments are cyber-physical systems; resilience demands encryption, zero-trust architectures, and supply-chain assurance.

For India, the triad's logic maps to three strategic goals by 2047: deterrence credibility, coalition interoperability, and cost-effective mass through autonomy, digital twins, and modular open architectures (MOSA). It also supports sustainable security, smaller logistics footprints, energy-efficient networks, and precision effects that reduce collateral impacts.

Policy Architecture and Institutions

AI policy stack for defence use

- **India AI Mission (2024):** Rs. 10,371.92-crore, multi-year push for compute, datasets, models, skilling, and startup support, vital for military AI at scale.
- **Defence AI governance:** The Defence AI Council (DAIC) and Defence AI Project Agency (DAIPA) were created to coordinate adoption, seed projects, and define roadmaps across DPSUs; the government reports that each DPSU now maintains an AI roadmap.
- **Responsible AI & ethics:** NITI Aayog's National Strategy for AI and Principles for Responsible AI provide normative guardrails, safety, accountability, and fairness, which are essential for military adaptation (e.g., human-on-the-loop, testability).

Cybersecurity and data protection

- **CERT-In directions (2022):** Six-hour incident reporting, 180-day log retention in India, and obligations for service providers materially change operational hygiene and incident response.
- **DPDP Act (2023):** India's umbrella data law clarifies lawful processing and rights—critical to defence-industrial data sharing and AI pipelines—while coexisting with national-security exemptions.

- **CII protection:** The **National Critical Information Infrastructure Protection Centre (NCIIPC)** under NTRO is the nodal body for critical infrastructure cyber security, power, finance, and telecom, directly relevant in a hybrid conflict.
- **National Cyber Security Policy (2013):** A legacy umbrella outlining goals for resilience, capacity, and public–private collaboration now due for an updated strategy aligned to zero-trust, post-quantum crypto, and AI threat models.

Space policy and organisation

- **Indian Space Policy (2023):** Enables private participation across the value chain (launch, satellites, downstream services) and clarifies the roles of ISRO-SPACe and NSIL, key to dual-use space power and rapid innovation cycles.
- **IN-SPACe:** Single-window regulator that authorises private activity and is driving PPP constellations for Earth observation and communications.
- **Defence Space Agency & Mission Shakti:** The DSA consolidates tri-service space operations; DRDO's 2019 **ASAT test** demonstrated a kinetic intercept capability at LEO altitudes.

Acquisition and industrial policy

- DAP 2020 streams procurement via "Make," iDEX, and innovation-friendly routes; DPEPP provides production/export targets and skilling/testing initiatives; Positive Indigenisation Lists progressively bar imports of hundreds of items to create assured demand for Indian industry.
- iDEX connects startups/MSMEs to Service problem statements and offers a procurement path, an important instrument for AI/counter-UAS/edge-compute solutions.

Capabilities

AI for operations, logistics, and C2

The Services have fielded and trialled AI across ISR exploitation (EO/IR/SAR analytics), predictive maintenance, logistics optimisation, simulation and training, and decision support. Government and independent analyses document the transition from pilots to programmes, including a list of 75 priority defence AI projects announced in 2022, and sectoral roadmaps in DPSUs.

- **Autonomous and teamed systems:** Swarming UAVs, loitering munitions, and unmanned surface/underwater vehicles depend on trustworthy autonomy (navigation in GNSS-denied environments; resilient comms).
- **Targeting and fires:** AI-enabled sensor fusion shortens kill chains; Responsible AI principles demand human judgment for lethal decisions.
- **Digital twins and T&E:** Model-based systems engineering can compress development timelines for indigenous platforms.

Cyber defence, offence, and resilience

India's Defence Cyber Agency (DCyA) operationalises tri-service cyber operations and coordinates with CERT-In/NCIIPC for national posture. Key thrusts include:

- **Zero-trust enterprise:** Identity, micro-segmentation, and continuous monitoring across bases and platforms.
- **Operational technology (OT) security:** Protecting C2, air defence networks, radars, and logistics from cyber-physical effects.
- **Threat intelligence and hunt:** AI-assisted detection; mandated logging/reporting under CERT-In improves forensics and learning loops.
- **Offensive cyber:** Strategic ambiguity persists, but the capability to impose costs (disruption, deception) is integral to deterrence in limited conflicts.

Space-power: ISR, comms, PNT, and counter-space

Space assets are the high ground of multi-domain operations. India's trajectory includes:

- **Chandrayaan-3 (2023)**—a complex landing near the lunar south pole that showcased end-to-end mission assurance and autonomy; a symbol of systems engineering maturity.
- **Private sector expansion** via **IN-SPACe**, with startups entering launch and smallsat markets; policy aims at multibillion-dollar revenues and PPP EO constellations relevant to national security.
- **Counter-space posture:** Mission Shakti (2019) demonstrated a direct-ascent ASAT; going forward, India's focus is expected to emphasise non-kinetic means (EW, cyber, SDA) to avoid debris.

The Ecosystem:

Indigenisation and exports

Policy consistency has driven record-high defence production and exports in recent years—helpful for scaling dual-use AI/space/cyber vendors and building a sustainable supply chain. Official figures place FY 2024–25 defence exports at ₹23,622 crore alongside new production highs. Positive Indigenisation Lists have expanded to hundreds of complex items for DPSUs and DMA, creating assured demand signals.

Innovation bridges and coalitions

- **INDUS-X (2023–)** links iDEX with the U.S. Defence Innovation Unit to run joint challenges (e.g., space-based ISR) and facilitate co-development/co-production.
- **QUAD and like-minded partners**: standards, resilient supply chains, and critical tech cooperation underpin interoperability in the Indo-Pacific.
- **Space PPPs:** IN-SPACe's push for private EO constellations and downstream analytics supports defence ISR autonomy and dual-use markets.

Drones and counter-UAS

The Drone Rules (2021), Digital Sky platform, and National Counter Rogue Drone Guidelines (2019) form the regulatory base for both proliferation and control of UAS. This is vital as swarms, loitering munitions, and counter-UAS become central to tactical advantage.

Governance, Ethics, and Law

Responsible Military AI

Adopting Responsible AI principles (explainability, bias mitigation, human oversight) in lethal and non-lethal contexts is essential for legitimacy and coalition operations. NITI's guidance offers a civilian template; defence must extend it to operational test & evaluation, fail-safe design, and after-action auditability.

Data protection and lawful access

The DPDP Act (2023) clarifies rights, obligations, and government exemptions. For defence AI, it enables lawful data use with safeguards and supports trust frameworks with industry partners handling sensitive telemetry, maintenance, and training data.

CII and national-level cyber posture

CERT-In's reporting/logging regime and NCIIPC's CII guidance underpin a whole-of-nation cyber resilience critical in crises where attacks span public and private networks.

Space norms and sustainability

India's space doctrine emphasises peaceful uses and responsible behaviour. Future counter-space doctrine should privilege reversible effects and SDA while participating in norm-building to keep orbits safe, aligned with India's diplomatic posture after Mission Shakti.

Gaps and Risks

1. **T&E and certification:** Need for a unified, fast-cycle test enterprise (digital twins, hardware-in-the-loop, range access) and AI safety certification for operational deployment.
2. **Talent and retention:** Engineering depth in ML, cyber reverse-engineering, space avionics, and crypto; flexible career tracks and lateral entry.
3. **Supply-chain security:** Assurance across semiconductors, RF components, optics, propulsion, and software toolchains; SBoM mandates and secure-by-design.
4. **Standards and MOSA:** Interoperability across Services and with partners; common open standards to prevent lock-in and accelerate upgrades.
5. **Acquisition velocity:** DAP reforms must translate to **contracting speed** and **risk-tolerant experimentation**, especially for software-intensive systems.

A Phased Roadmap to 2047

Phase I (2025–2030): Scale the foundations

- **AI at the edge:** Field computer-vision and SIGINT models on small UAVs/UGVs/USVs; mandate model lifecycle management and red-teaming in all programmes.
- **Zero-trust by design:** Retrofit identity-centric architectures across bases and platforms; deploy continuous diagnostics and mitigation; integrate CERT-In reporting with Defence SOCs.
- **Space PPPs:** Launch PPP EO and communications constellations with secure downlinks and domestic ground segments; incentivise radiation-hardened components via PLI-style schemes.
- **Procurement fast lanes:** Expand iDEX challenges to squad/platoon-level tech; institutionalise "software pathways" that deliver capability increments quarterly.

Phase II (2030–2040): Integrate and dominate decision loops

- **Joint all-domain C2 (JADC2-like):** Build a Services-agnostic data fabric with common APIs; standardize metadata for rapid sensor-to-shooter links.
- **Autonomy with human command:** Swarm tactics and loyal wingmen, with explicit human command authorities; embed ethical constraints by design.
- **Cyber-resilient weapons:** SBoM, secure boot, and post-quantum crypto across new munitions and platforms; red-teams embedded in programme offices.
- **Space resilience:** SDA network with domestic sensors, allied data-sharing, and automated conjunction warnings; prioritise **reversible counter-space**.

Phase III (2040–2047): Assured superiority and sustainable security

- **Cognitive C2:** AI-assisted campaign design with wargaming digital twins and continual learning from exercises.
- **Industry at scale:** Tier-1/2/3 suppliers with export-class QA; defence exports as a flywheel for R&D and cost amortization. Official targets and recent performance show a credible trajectory.
- **Normative leadership:** India champions responsible AI in defence, space debris mitigation, and cyber stability, aligning security with sustainability and inclusion.

Findings:

The trajectory of India's technological and strategic evolution reflects a careful orchestration of institutional scaffolds, policy initiatives, and innovation ecosystems that together are positioning the country as a credible actor in the domains of artificial intelligence (AI), cyberspace, and outer space. Over the past decade, India has moved beyond a reactive posture to one that emphasizes proactive planning, structural readiness, and international credibility. This

transformation is neither accidental nor spontaneous; rather, it emerges from a layered framework of governmental acts, policy regimes, and regulatory instruments that are converging with entrepreneurial activity and public–private partnerships (PPPs). The following discussion examines India's contemporary advancements across six broad dimensions: the institutional scaffolding, dual-use technological momentum, operational credibility, industrial production and exports, challenges in execution, and the governance advantage rooted in democratic legitimacy.

The first notable finding relates to the construction of a comprehensive policy and institutional scaffold that has been carefully assembled to guide and consolidate India's technological rise. Instruments such as the Defence Acquisition Procedure (DAP), Defence Production and Export Promotion Policy (DPEPP), the IndiaAI Mission, the Digital Personal Data Protection (DPDP) Act, and the cybersecurity regime under CERT-In collectively form a structured basis for governance and innovation. In addition, India has released a dedicated Indian Space Policy and institutionalized mechanisms such as the Indian National Space Promotion and Authorization Centre (IN-SPACe) and the Defence AI Council/Defence AI Project Agency (DAIC/DAIPA). Complementary cyber frameworks under the Digital Cybersecurity Authority (DCyA) and the Digital Security Agency (DSA) further expand this scaffold. Taken together, this array of instruments demonstrates that India is not lacking in strategy or institutional preparation; rather, it has created a dense architecture that, if executed with discipline and coherence, can significantly multiply innovation effects. Much like scaffolding in an engineering project, these policies provide the skeleton that supports the edifice of innovation, enabling both state and non-state actors to participate in the construction of a technology-driven future.

Parallel to this institutional readiness is the momentum being generated by dual-use technologies, especially in the domains of space and AI. Dual-use momentum refers to the ability of technologies to serve both civilian and defence applications, thereby compounding their impact and ensuring a higher return on investment. India's space and AI ecosystems are increasingly converging with defence requirements, allowing for a seamless transfer of innovation between sectors. The proliferation of public–private partnership constellations in space and the expansion of startup pipelines via the Innovations for Defence Excellence (iDEX) initiative have accelerated the pace of technological insertion into defence platforms. For instance, AI algorithms originally designed for civilian data analysis are now being adapted for surveillance, targeting, and logistics optimization in the military domain. Similarly, small satellite constellations designed for commercial communication are being harnessed for strategic situational awareness. This dual-use dynamic is critical for India, given budgetary constraints and the need to maximize synergies across domains. Moreover, it underscores the adaptive nature of India's innovation landscape, where boundaries between civilian and military research are deliberately porous to encourage cross-pollination.

The consolidation of India's operational credibility represents another major development. In the past, India's international perception was often framed by its aspirational rhetoric rather than demonstrable capability. This gap has narrowed substantially. The success of Chandrayaan-3, which established India as the first country to achieve a soft landing on the lunar south pole, was not merely a symbolic triumph but also a testament to India's growing competence in systems engineering, risk management, and mission assurance. Similarly, Mission Shakti, India's anti-satellite (ASAT) demonstration in 2019, conveyed an unmistakable message regarding its counter-space capabilities and deterrence posture. These accomplishments are further buttressed by the strengthening of India's cyber posture under CERT-In (Computer Emergency Response Team-India) and the National Critical Information Infrastructure Protection Centre (NCIIPC), both of which have progressively institutionalized cyber defence mechanisms. Operational credibility is therefore not limited to headline-grabbing missions; it extends into the invisible domain of cyber resilience, where India has made steady strides in monitoring, detection, and response. Collectively, these successes enhance India's ability to signal competence and reliability in international coalitions while reducing perceptions of vulnerability.

A fourth dimension of India's ascent lies in the growing emphasis on exports and scale. Industrial policy vectors in recent years have explicitly sought to transform India from a technology consumer into a technology producer and exporter. Record production and export figures in the defence and technology sectors serve as validation of this strategy. By creating a scale economy for AI, cyber, and space modules, India is attempting to replicate the developmental trajectories of earlier industrializers who leveraged exports to fuel domestic innovation. Export momentum not only boosts India's balance of payments but also embeds its technologies into global supply chains, thereby raising switching costs for international partners and enhancing strategic leverage. Furthermore, export success legitimizes the industrial ecosystem at home, as it demonstrates that Indian products are competitive in demanding international markets. Such validation is particularly important in sensitive areas like AI-enabled surveillance, encryption systems, and space-based communication platforms, where credibility is often as crucial as capability.

Despite these significant advances, India faces execution gap risks that could blunt the impact of its ambitious scaffolding and industrial momentum. Bottlenecks remain in the domains of testing and evaluation (T&E) infrastructure, where limited facilities slow down the process of scaling prototypes into deployable systems. Standards and Modular Open Systems Approach (MOSA) adoption are uneven, creating interoperability challenges that are particularly acute in coalition operations. Acquisition velocity continues to be constrained by bureaucratic inertia, which delays the translation of innovation into operational platforms. Most critically, India

continues to lag in the production of advanced components, particularly in compute-intensive semiconductors, radio frequency (RF) modules, and electro-optical (EO) systems. These shortfalls risk creating a dependency on external suppliers, which could undermine strategic autonomy in critical situations. The challenge, therefore, lies not in the absence of vision but in the unevenness of execution. Unless bottlenecks are systematically addressed, India's strategic momentum could dissipate under the weight of implementation gaps.

Finally, India's governance advantage represents a subtle but significant differentiator in the evolving global technology order. In contrast to authoritarian regimes that prioritize speed and control over accountability, India has consciously emphasized frameworks of Responsible AI and data protection as enshrined in the DPDP Act. This normative emphasis confers legitimacy on India's technological rise, as it signals alignment with global democratic values. Governance rooted in democratic legitimacy can serve as a powerful tool of coalition-building, particularly in multi-national operations where shared values matter as much as shared capabilities. By anchoring its technological architecture in rights-based governance, India positions itself as a trusted partner for advanced democracies while also offering a credible alternative model for developing nations. In the long run, this governance advantage may prove as significant as material capability, as it provides the moral authority to shape global norms in AI, cyber, and space governance.

Conclusion:

India's current trajectory in the domains of artificial intelligence, cyber capability, and space power rests on a robust policy scaffolding, the growing momentum of dual-use innovation, rising operational credibility, industrial scaling, and the legitimacy of democratic governance. Each of these elements reinforces the others, generating a virtuous cycle that can elevate India's position as both a regional and global technological power. Yet, this path is not without vulnerabilities: critical gaps remain in infrastructure, standards adoption, and advanced component production. The central challenge for policymakers is to ensure that institutional frameworks are translated into timely operational outputs. If this translation succeeds, India will consolidate its regional primacy and emerge as a responsible actor in the evolving global order.

Looking ahead to Viksit Bharat @2047, these foundations acquire even greater significance. Defence innovation is no longer a peripheral aspiration but a defining element of state capacity in an era of intelligent, networked, and orbital warfare. India has already moved beyond isolated projects to embrace a policy-backed, ecosystem approach spanning AI, cybersecurity, and space. The task now is disciplined execution at scale: secure and interoperable digital backbones, ethical and accountable deployment of AI, cyber resilience that protects both military and national critical infrastructure, and a space power strategy that fuses sovereign assets with a dynamic commercial sector.

If India sustains procurement reform, invests in test ranges and digital twins, professionalises software acquisition, hardens supply chains, and deepens innovation partnerships such as INDUS-X, it can achieve a credible, sustainable, and exportable military-technological edge. That advantage—rooted in democracy, responsible technology use, and coalition leadership—will be central to securing India's people, sustaining its prosperity, and shaping a stable Indo-Pacific order by 2047.

References

1. Press Information Bureau. (2024). *Cabinet approves comprehensive IndiaAI Mission (₹10,371.92 crore).* Press Information Bureau
2. Ministry of Defence. (2020). *Defence Acquisition Procedure (DAP 2020).* Ministry of Defence
3. Press Information Bureau. (2020). *Draft Defence Production and Export Promotion Policy (DPEPP) 2020.* Press Information Bureau
4. Department of Defence Production. (n.d.). *Innovations for Defence Excellence (iDEX).* ddpmod.gov.in
5. Indian Computer Emergency Response Team (CERT-In). (2022, May 4). *Directions under section 70B—incident reporting/log retention.* (Summarised via legal briefs.) Trilegal
6. Government of India / MeitY. (2023). *Digital Personal Data Protection Act, 2023 (No. 22 of 2023).* MeitY
7. Department of Space / ISRO. (2023). *Indian Space Policy 2023.* ISRO
8. IN-SPACe. (n.d.). *Mandate and private-sector authorisations.* inspace.gov.in
9. Defence Research & Development Organisation (DRDO). (2019, March 27). *Mission Shakti (ASAT) announcement.* DRDO
10. ISRO. (2023–2024). *Chandrayaan-3 mission updates (soft landing near lunar south pole).* Wikipedia
11. U.S. Department of Defense. (2024, February 21). *Fact Sheet: India-U.S. Defense Acceleration Ecosystem (INDUS-X).* U.S. Department of Defense
12. Directorate General of Civil Aviation. (2021). *Drone Rules, 2021* (and Digital Sky). Directorate General of Civil Aviation
13. Ministry of Civil Aviation. (2019). *National Counter Rogue Drone Guidelines.* Ministry of Civil Aviation
14. Press Information Bureau. (2024, July 16). *Fifth Positive Indigenisation List for DPSUs (346 items).* Press Information Bureau
15. Press Information Bureau. (2025, April/July). *Record defence production and exports (₹23,622 crore in FY 2024–25).* Press Information Bureau

16. National Security Council Secretariat / NCIIPC (overview via VIF brief). (2024). *Protection of Critical Information Infrastructure.* Vivekananda International Foundation
17. NITI Aayog. (2021). *Principles for Responsible AI.* NITI AAYOG
18. NITI Aayog. (2018). *National Strategy for Artificial Intelligence.* NITI AAYOG
19. IDSA (MP-IDSA). (2020). *Decoding DAP 2020.* (Issue brief synthesis.) MP-IDSA
20. U.S. DIU. (n.d.). *INDUS-X overview.* Defense Information University
21. Reuters / FT analyses (2024–2025). *Private-sector role in India's space and defence export push.* (Corroborating trend data.)
22. U.S. Department of DefenseCarnegie Endowment
23. Ministry of DefencePress Information Bureau+1TrilegalMeitYISRO
24. inspace.gov.inddpmod.gov.inWikipedia+1DRDOPress Information Bureau
25. Directorate General of Civil AviationPress Information BureauMinistry of Civil Aviation

Viksit Bharat @ 2047:
Innovation, Inclusion and Sustainable Development

(ISBN: 978-81-991070-0-7)

About Editors

Gourav Kamboj is an accomplished academician and researcher in the field of Commerce and Business Management. A Gold Medalist in B.Com, he holds an M.Com (Finance and Marketing), DCAA, and MBA from Kurukshetra University, Kurukshetra. Currently serving as an Assistant Professor at LM Thapar School of Management, Thapar University, Patiala, he is also pursuing a Ph.D. at the same institution. He has presented over 30 research papers at various national and international conferences and has published widely in reputed journals. In addition, he has authored several book chapters and serves as a reviewer for multiple international journals. Demonstrating a strong commitment to professional development, he regularly participates in faculty development programs, webinars, and workshops. With rich experience in teaching and research, he continues to contribute meaningfully to academia while inspiring the next generation of scholars.

Dr. Mili is a Ph.D. qualified Associate Professor and Head of the Department of Home Science at Government College for Girls, Sector 14, Gurugram, with over 23 years of teaching and research experience. A Gold Medalist in B.Sc. Home Science, she completed her M.Sc. in Clothing and Textiles and earned her Ph.D. in Anthropology from Panjab University, Chandigarh. She has guided numerous undergraduate students and contributed extensively to higher education through research published in reputed national and international journals. Actively involved in conferences, seminars, and workshops, her areas of specialization include fashion and textile design, fashion illustration, personal styling, merchandising, entrepreneurship, and sustainable development. A life member of the Home Science Association of India, she also plays a vital role in academic committees, curriculum development, and extension activities.

Manju Bala is an accomplished academician with over 15 years of teaching experience in the field of Commerce. She is currently serving as an Assistant Professor in Commerce at Government College for Girls, Rania. Throughout her career, she has shown a strong commitment to teaching, research, and academic excellence. She has actively contributed to higher education by mentoring students and supporting their academic and personal growth. Manju Bala regularly participates in seminars, workshops, and faculty development programs to stay updated and enhance her professional skills. Her dedication to student success and passion for education have earned her respect among colleagues and learners alike. She remains devoted to continuous learning and professional development while making meaningful contributions to the academic community through her teaching and active engagement in academic activities.

Dr. Tripti Sharma is an accomplished academician and researcher in Political Science, specializing in International Organizations, International Law, and Public Administration. She is currently serving as an Assistant Professor at G.M.N. College, Ambala Cantt, where she teaches both undergraduate and postgraduate students. A Gold Medalist in M.A. Political Science and a Silver Medalist in Public Administration, she holds a Ph.D. in Political Science. In 2024, she was honored with the Best Paper Presenter Award at an international conference. Her academic work includes research papers and book chapters on governance, federalism, constitutionalism, elections, bureaucracy, and digital transformation. She has also explored contemporary topics such as Artificial Intelligence in border security and energy dependencies in national security. Dedicated to teaching and research, she continues to inspire students and contribute meaningfully to academia.

Bhumi Publishing

ISBN 978-81-991070-0-7
9 788199 107007