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Green Growth and Digital Transformation: Policy, Technology, and Business Strategies for Viksit Bharat 2047

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Abstract

The pursuit of economic growth and sustainable development has become a defining challenge for emerging economies in the 21st century. As India envisions its transformation into *Viksit Bharat* by 2047, integrating green growth principles with digital transformation is essential to foster inclusive, resilient, and future-ready progress. This paper develops an integrative conceptual framework linking policy, technology, and corporate strategy to advance green growth in India. Drawing upon comparative international best practices, policy documents and scholarly literature, the study analyzes how digital technologies (artificial intelligence, big data analytics, Internet of Things, blockchain and digital finance) can accelerate decarbonization, resource efficiency and inclusive development in domains such as energy systems, supply chains, agriculture and urban governance. The paper proposes a phased Roadmap to *Viksit Bharat 2047*, supported by policy instruments (green finance, regulatory reform, capacity building) and corporate governance measures (ESG integration, Green HRM, circular supply chains). It also presents measurable monitoring indicators aligned with the Sustainable Development Goals (SDGs) and identifies institutional mechanisms for policy coordination. The analysis underscores that digital innovation, when embedded within coherent policy and corporate governance frameworks, represents a strategic opportunity for India to reconcile economic competitiveness with environmental stewardship.

Keywords: *Green growth, Digital transformation, Policy, Technology, SDGs, Business strategies, Viksit Bharat 2047.*

Introduction

India's aspiration for Viksit Bharat 2047 entails not only higher per capita incomes but also socio-economic inclusivity and ecological resilience. The 2030 Agenda for Sustainable Development (United Nations, 2015) and the global push for net-zero emissions sharpen the urgency for development pathways that are both economically productive and ecologically sustainable. Green growth—the pursuit of economic expansion while preserving ecological systems—is thus integral to national development planning (OECD, 2011).

Simultaneously, the rapid diffusion of digital technologies has transformed governance, industry and daily life. India's digital infrastructure (including Aadhaar, UPI and broadband expansion) provides an unprecedented platform to mainstream sustainability interventions through data-driven governance, efficient market mechanisms and inclusive finance. The convergence of green growth and digital transformation can catalyze systemic changes in energy, transport, manufacturing, and agriculture. However, realizing this convergence requires careful policy design, institutional coordination, capacity building and attention to equity and digital sustainability.

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This paper addresses the following research question: How can policy, technology and corporate strategy be integrated to deliver green growth for India on the path to *Viksit Bharat 2047*? The paper contributes a conceptual roadmap, policy recommendations and monitoring metrics designed to be actionable for policymakers, businesses, and civil society.

Literature Review

Defining Green Growth and Its Rationale

Green growth is an economic strategy that aims to decouple economic growth from environmental degradation by promoting resource efficiency, low-carbon technologies, and ecosystem restoration (Barbier, 2016; OECD, 2011). Scholars emphasize that green growth is not merely a technocratic engineering problem but requires socio-institutional transformations, including shifts in consumption patterns, fiscal incentives, and governance structures (Bowen & Hepburn, 2014).

In India, green growth intersects with objectives such as energy access, rural livelihoods and industrial modernization (TERI, 2022). Policy interventions must therefore be tailored to reconcile developmental priorities with planetary boundaries.

Digital Transformation as an Enabler of Sustainability

Digital technologies hold promises for improving governance transparency, optimizing resource usage, and enabling new market mechanisms (George, Merrill, & Schillebeeckx, 2021). Specific technology roles include:

Artificial Intelligence (AI): Forecasting energy demand, optimizing grid operations, and enabling precision agriculture.

Internet of Things (IoT): Real-time monitoring for water, air, and energy systems.

Blockchain: Traceability for sustainable supply chains and carbon accounting.

Big Data Analytics: Urban planning, disaster-risk reduction, and evidence-based policymaking.

Digital Finance / Fintech: Facilitating green microfinance and carbon trading for MSMEs.

However, digitalization entails environmental footprints (data centers, electronic waste) and equity concerns (digital divide), necessitating policies that promote green IT and inclusive access (World Bank, 2023).

Policy Instruments and Governance for Green Digital Transitions

Policy frameworks that combine regulation, incentives and public investment have been effective in other settings (European Commission, 2020). Instruments such as carbon pricing, renewable energy mandates, public procurement standards and green public investments have catalyzed transitions in OECD countries. For digital-enabled transitions, governance must also address data governance, interoperability, and cyber-physical security.

India's institutional architecture (e.g., NITI Aayog, Ministry of Environment, Ministry of Power, Ministry of Electronics and IT) provides the building blocks but often operates in silos. Integrated institutional arrangements have been proposed to overcome fragmentation and align incentives across ministries (NITI Aayog, 2023).

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Corporate Strategies for Sustainability

Corporations play a central role in operationalizing green practices at scale. Concepts such as Green Human Resource Management (Renwick, Redman, & Maguire, 2013), Sustainable Supply Chain Management (Seuring & Müller, 2008), and ESG integration are increasingly mainstream. India-specific mechanisms such as SEBI's Business Responsibility and Sustainability Reporting (BRSR) provide regulatory pressure and reporting standards that guide corporate behavior (CII, 2023).

Despite progress, many firms, especially small and medium enterprises (SMEs), face barriers including insufficient access to green finance, technology, and skills. Policy measures aimed at de-risking green investments and building technical assistance can accelerate diffusion.

Theoretical Framework

This paper adopts an integrative socio-technical framework that situates digital technologies within policy and market systems. The framework recognizes three interdependent layers:

Policy & Institutions: Regulatory instruments, fiscal incentives and governance mechanisms that set the rules of the game.

Digital-Technical Layer: Technologies and digital infrastructure that enable measurement, optimization, and market mechanisms.

Corporate & Social Practices: Business models, organizational processes and community practices that operationalize sustainability.

Transitions occur when interventions across these layers co-evolve through feedback loops (e.g., policy incentives driving corporate innovation; technological affordances enabling new policy instruments).

Objectives

The primary objectives are to:

Analyze how digital technologies can be leveraged for green growth in India.

Propose an integrated policy and institutional architecture to coordinate green-digital transitions.

Develop a corporate strategy toolkit (Green HRM, green supply chain, ESG reporting) for scaling sustainable business models.

Offer an actionable Roadmap and Monitoring & Evaluation (M&E) framework to guide progress toward *Viksit Bharat 2047*.

Methodology

The study is conceptual and policy-oriented, using a multi-method approach combining:

Systematic literature synthesis of peer-reviewed articles, policy reports and

international initiatives.

Comparative policy analysis examining selected country cases (Denmark, South Korea, Singapore) that have integrated digital and green policies.

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Document analysis of India's national policies (e.g., NAPCC, National Hydrogen Mission, Digital India initiatives) and corporate reporting frameworks (BRSR).

Framework development through iterative synthesis, stakeholder logic (policy, industry, civil society), and alignment with SDG indicators.

Limitations: The study does not present original primary data collection but is intended to inform policy design and scholarly debate through an evidence-based conceptual framework.

Analysis and Discussion

This section integrates the conceptual insights, policy frameworks, and technological pathways discussed earlier to interpret how digital transformation can concretely advance India's green growth agenda. The analysis addresses the four objectives of this study

(1) leveraging digital technologies for green growth.

(2) designing an integrated policy and institutional architecture.

(3) formulating corporate strategy toolkits for sustainable business models; and

(4) proposing a roadmap and monitoring framework for *Viksit Bharat 2047.*

Leveraging Digital Technologies for Green Growth

Digital technologies are not isolated tools but systemic enablers that can transform how energy, agriculture, and manufacturing systems interact with the environment. AI, IoT, blockchain, and big data analytics have been shown to produce **synergistic effects** that increase resource efficiency and lower carbon intensity.

For example, in the **energy sector**, AI-driven demand forecasting combined with IoT-based sensors can balance renewable supply variability and optimize transmission efficiency, reducing technical losses that currently account for nearly 18 percent of India's power distribution inefficiency. In **agriculture**, IoT sensors and satellite imagery allow farmers to adopt site-specific crop management, lowering water and fertilizer use by 20–30 percent while improving yields (FAO, 2022). Such empirical evidence demonstrates that technology acts as a **force multiplier** for sustainable outcomes, provided data governance and accessibility issues are properly managed.

Moreover, **digital public infrastructure (DPI)** such as Aadhaar, UPI, and DigiLocker serves as a backbone for inclusive green finance. It enables micro-credit and insurance distribution for small enterprises and farmers engaged in renewable energy or organic agriculture. This validates Objective 1 by showing how technology directly contributes to ecological efficiency, economic productivity, and social inclusion — the three pillars of green growth.

Institutional and Policy Integration

Addressing Objective 2, India's policy ecosystem still operates through fragmented silos: energy, environment, IT, and industry ministries often pursue parallel programs with limited convergence. A **National Council for Green Digital Transformation (NCGDT)**, as proposed in this paper, could serve as the apex coordination mechanism, harmonizing these initiatives. Its mandate would include:

Developing interoperable standards for **Green Digital Infrastructure** (energy-efficient data centers, eco-design principles, and green procurement norms).

Mainstreaming **digital sustainability metrics** in national budgeting and performance evaluations.

Promoting sub-national implementation through capacity-building grants to states and municipalities.

International experience reinforces this approach. The European Green Deal (2020) and Korea's Green Digital Strategy (2022) both show that central policy coherence accelerates investment and innovation diffusion.
By integrating regulatory sandboxes for AI-based carbon markets or IoT-enabled grid management, India can foster experimentation without imposing premature regulationThus, institutional convergence transforms fragmented initiatives into a cohesive policy architecture, satisfying Objective 2.

Corporate Strategy and Green Business Models

Objective 3 requires interpreting how corporate strategies operationalize green-digital synergies. Corporate entities are the implementation arm of policy innovation; their adoption of **Green HRM, ESG integration, and sustainable supply chain management** determines the pace of green transformation.

Seuring and Müller (2008) demonstrate that sustainability in supply chains arises when firms respond to regulatory and stakeholder pressures through eco-efficiency and life-cycle assessment practices. In India, digital traceability via blockchain extends this model by ensuring transparency from raw-material sourcing to product disposal, thereby realizing a **digitally enabled circular economy**.

Green Human Resource Management (Renwick et al., 2013) is another crucial dimension. By embedding digital literacy and environmental awareness into HR practices, firms cultivate a workforce capable of implementing sustainability analytics, carbon accounting, and responsible innovation. ESG-linked executive incentives, green product design, and data-driven reporting (through SEBI's BRSR framework) represent tangible strategies that bridge business competitiveness with environmental accountability.

This alignment of corporate policy with digital sustainability creates a **triple bottom-line advantage**—profitability, planet, and people—meeting Objective 3.

Roadmap and Monitoring Framework for *Viksit Bharat 2047*

The fourth objective demands a forward-looking roadmap that links green digital initiatives to measurable progress indicators.

The proposed roadmap follows a three-phase trajectory

Phase I (2024–2030): Foundation and Integration

Establish NCGDT and national Green Digital Mission.

Digitize renewable-energy monitoring, waste-management, and agricultural advisory systems.

Launch nationwide digital-skills programs focused on green competencies.

Phase II (2030–2040): Acceleration and Innovation

Scale blockchain-based carbon trading and circular-economy marketplaces.

Incentivize industry adoption of AI-based resource-optimization platforms through fiscal benefits.

Embed sustainability KPIs into national and corporate reporting frameworks.

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Phase III (2040–2047): Consolidation and Global Leadership

Position India as a net exporter of green digital technologies.

Strengthen South–South cooperation through open-data platforms and green technology transfer.

Align national monitoring with SDGs 7, 9, 11, 12, and 13 using real-time dashboards integrated with NITI Aayog's governance portals.

Monitoring and Evaluation (M&E) should rely on hybrid indicators combining environmental outcomes (carbon intensity, energy efficiency), digital inclusion metrics (broadband access, data literacy), and economic indicators (green employment, innovation index).
Such an integrated M&E framework transforms aspirational goals into **evidence-based policy steering**, thereby fulfilling Objective 4.

Synthesis

The four analytical threads together reveal a **virtuous cycle** of technology, policy, and corporate adaptation.
Digital tools provide real-time intelligence; policy integration ensures enabling conditions; corporate strategies translate innovation into measurable impact

The interpretation underscores that India's pathway to Viksit Bharat 2047 must evolve as a co-evolutionary system, where governance, technology, and societal values interact dynamically.

The analysis thus demonstrates that **green digital transformation is not merely an additive process** but a **systemic re-alignment of national development priorities** toward resilience, inclusion, and sustainability.

Conclusion

The intersection of green growth and digital transformation is more than a convergence of two policy domains—it represents a new paradigm of development. India's journey toward *Viksit Bharat 2047* depends on reimagining technology not merely as a tool of efficiency, but as an enabler of ecological balance, social inclusion, and ethical governance. The proposed sectoral pathways illustrate how AI, IoT, blockchain, and data analytics can drive low-carbon transitions across energy, agriculture, industry, and cities. However, technological solutions alone are insufficient unless embedded within robust policy ecosystems that address issues of equity, digital divide, cybersecurity, and environmental justice.

To achieve transformative impact, India must invest in digital literacy, green skill development, and inclusive innovation ecosystems that empower local communities. Public–private partnerships, open-data platforms, and regulatory frameworks that promote interoperability and sustainability can accelerate the diffusion of green digital technologies. As global economies compete for leadership in climate-smart innovation, India has a unique opportunity to define an indigenous model of *"Digital Green Growth"*—one that is inclusive, circular, and globally replicable.

In essence, the path to *Viksit Bharat 2047* lies not merely in leveraging digital technology for economic gain but in reorienting it toward the shared goal of planetary stewardship and human well-being. By institutionalizing a Green Digital Mission and integrating sustainability principles into every layer of policy, industry, and society, India can emerge as a pioneer of equitable and resilient green digital transformation in the Global South.

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