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Achieving Sustainable Development Goals using AI

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Author Note

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ABSTRACT

Artificial Intelligence (AI) is emerging as a transformative technology with the potential to accelerate progress toward achieving the United Nations' Sustainable Development Goals (SDGs). By enabling optimized decision-making, predictive analytics, and intelligent automation, AI offers innovative pathways to address global challenges such as poverty, climate change, inequality, and resource management. This paper explores the intersection of AI and sustainable development, analyzing key applications across social, economic, and environmental pillars. AI-driven solutions in agriculture improve crop yield prediction and water efficiency, contributing directly to SDG 2 (Zero Hunger). In healthcare, predictive models and intelligent diagnostics enhance disease surveillance and early intervention, supporting SDG 3 (Good Health and Well-being). AI's role in renewable energy optimization aids SDG 7 (Affordable and Clean Energy), while data-driven urban planning fosters sustainable cities under SDG 11. Despite these opportunities, the ethical, social, and governance dimensions of AI—such as algorithmic bias, data privacy, and unequal access to digital infrastructure—pose significant challenges. Integrating AI ethics with the SDG agenda can create a global ecosystem where technology serves humanity sustainably. The discussion concludes that AI, when guided by ethical principles and aligned with inclusive policy strategies, has the potential to serve as both an enabler and accelerator of the SDGs, transforming global development outcomes by 2030.

Keywords: Artificial Intelligence, Sustainable Development Goals, Roles and applications of AI, SDG India Index, AI for Sustainable Development Goals

Sustainable Development Goals (SDGs): United Nations Initiative

The Sustainable Development Goals (SDGs) are a universal set of 17 global goals adopted by the United Nations (UN) to address the world's most pressing social, economic, and environmental challenges. They aim to achieve a better and more sustainable future for all by 2030. The SDGs are also known as the 2030 Agenda for Sustainable Development. They were formally adopted on 25 September 2015 by all 193 UN Member States during the UN General Assembly in New York.

The idea of SDGs was formally proposed at the United Nations Conference on Sustainable Development (Rio+20) held in Rio de Janeiro, Brazil, in June 2012. Key outcome document was "The Future We Want". At Rio+20, the member states agreed to develop a set of Sustainable Development Goals and an Open Working Group (OWG) was established to draft the goals.

The Open Working Group (2013–2014) consisted of representatives from 70 countries. Extensive consultations were conducted with Governments, Civil society, Academics, Private sector and Citizens worldwide. In July 2014, the OWG proposed 17 goals and 169 targets. On 25 September 2015, at the UN Sustainable Development Summit, the 2030 Agenda was officially adopted. The declaration was titled: "Transforming Our World: The 2030 Agenda for Sustainable Development."

The SDGs emerged due to growing global concerns in the late 20th and early 21st century:

(a) Rising Global Inequality: Large sections of the population lacked access to education, healthcare, clean water, sanitation, and employment. Income inequality widened both within and between countries.

(b) Environmental Degradation: Climate change, biodiversity loss, deforestation, pollution, and depletion of natural resources were intensifying. Unsustainable industrialization and consumption patterns were harming ecosystems.

(c) Persistent Poverty: Despite economic growth, extreme poverty still affected hundreds of millions of people. Hunger and malnutrition remained major global issues.

(d) Limitations of Earlier Development Models: Economic growth alone did not ensure social justice or environmental sustainability. There was a need for an integrated framework combining economic, social, and environmental dimensions.

(e) Expiry of Millennium Development Goals (MDGs): The Millennium Development Goals (2000–2015) were ending in 2015. A broader, more inclusive development agenda was required beyond poverty reduction.

Thus, the SDGs were designed as a comprehensive, universal, and transformative agenda to balance Economic growth, social inclusion & Environmental protection.

The 17 Sustainable Development Goals:

1.No Poverty: Extreme poverty persists, affecting 1 in 10 people worldwide. Recent crises have stalled progress, with the burden falling heavily on sub–Saharan Africa and conflict-affected regions. Without a significant acceleration in efforts, 8.9 per cent of the global population will still be living in extreme poverty by 2030, under the revised international poverty line. Similarly, at the current trajectory, only 1 in 5 countries are projected to have halved its national poverty by 2030.

2.Zero Hunger: Hundreds of millions of children and women are affected by malnutrition, and dietary diversity remains inadequate for both women and young children. Global hunger and food insecurity have declined in recent years but

remain above pre-pandemic levels.

3.Good Health and Well-being: Infectious and non-communicable diseases remain major threats. AIDS related deaths have halved since 2010, and 54 countries have eliminated at least one neglected tropical disease. Meanwhile, malaria cases are rising; tuberculosis returned to being probably the world's leading cause of death. Despite a growing health workforce and expanded services, major inequalities persist. Low-income and fragile settings face the highest risks due to underfunded systems, service gaps and workforce shortages.

4.Quality Education: Education is vital for sustainable development, yet progress remains off track. While enrolment and completion rates have improved since 2015, with girls outperforming boys in most regions, progress is slowing. Learning outcomes are declining in many countries. Although literacy has improved modestly, hundreds of millions of people remain illiterate, with women disproportionately affected.

5.Gender Equality: Deep inequalities persist due to gender, wealth and geography. discriminatory laws and gender-based norms continue to hinder gender equality. Women remain underrepresented in decision-making and leadership roles and often lack autonomy over sexual and reproductive health, land rights and technology access.

6.Clean Water and Sanitation: Water systems are under strain from pollution, water stress and weak governance. Only 56 per cent of domestic wastewater is safely treated, water stress remains critical in several regions, freshwater ecosystems are declining, and transboundary cooperation is limited.

7.Affordable and Clean Energy: Meeting global climate targets and net-zero emission warrants the rapid deployment of renewable energy across all sectors and more significant improvements in energy efficiency. Tailored and integrated policy interventions and actions remain essential to advancing just energy transitions and to meeting climate objectives.

8.Decent Work and Economic Growth: To achieve decent work for all, Governments must accelerate comprehensive strategies including formalization pathways for informal workers, enhanced social protection systems, strengthened labour rights enforcement, and investments in green and digital economy initiatives, while ensuring equitable access to finance and economic opportunities, particularly as global economic uncertainties intensify.

9.Industry, Innovation and Infrastructure: Countries must boost investment in resilient infrastructure and research and development (R&D), expand access to financing for small manufacturers, and bridge the digital divide by prioritizing affordable broadband and innovation systems in the world's most underserved regions.

10.Reduced Inequalities: Reports of discrimination are rising globally, with higher prevalence among urban residents, women, persons with disabilities, the poorest and those with lower education levels. It is required to provide extra support for vulnerable population groups, combating rising discrimination, protecting labour income and introducing structural reforms to boost growth in emerging and developing economies.

11.Sustainable Cities and Communities: With rapid urbanization and now over half the world's population living in cities, housing affordability has reached crisis levels. Up to 3 billion people worldwide struggle to afford a place to live, and 1.12 billion live in slums or informal settlements without basic services. Creating safe, resilient and sustainable cities requires coordinated investments in affordable housing, climate-resilient infrastructure and inclusive governance.

12.Responsible Consumption and Production: Food waste, food loss and electronic waste are reaching unprecedented levels, while rising consumption continues to drive increases in domestic material consumption and material footprint. These trends are placing growing pressure on the environment, accelerating climate change and exacerbating global resource inequalities.

13.Climate Action: Climate change is accelerating, with 2024 marking the hottest year on record, at approximately 1.55°C above pre-industrial levels. Extreme weather is intensifying, driving the highest climate-related displacement in 16 years and worsening food insecurity, economic losses and instability.

14.Life Below Water: Oceans and seas are vital to life on Earth, regulating climate, sustaining biodiversity, supporting livelihoods and food security, enabling global trade and providing countless ecosystem services. Yet they face mounting threats from overfishing, pollution, biodiversity loss and climate change.

15.Life on Land: Persistent challenges continue to hinder progress in protecting life on land, managing natural resources sustainably and combating the biodiversity crisis. Global forest cover is shrinking; protection of key biodiversity areas (KBAs) has stalled recently, and species extinction is accelerating.

16.Peace, Justice and Strong Institutions: Violence and conflict continue to drive human suffering and displacement. Access to justice remains elusive: one in three prisoners worldwide are held without a proper sentence, and risks to human rights defenders and journalists persist. Urgent action is needed to protect lives and restore trust through peacebuilding, justice reform and accountability.

17.Partnerships for the Goals: Accelerating progress requires renewed international cooperation to bridge the investment gap, innovative financing to reduce debt burdens, targeted digital infrastructure support and strengthened statistical capacity. Access to information and communications technology continues to expand, but the digital divide remains wide, especially in lower-income regions.

After adoption of these goals, several important early steps were taken. Among them were:

(a) Global Indicator Framework (2016): The UN Statistical Commission developed a framework of indicators. This framework currently includes over 230 global indicators to measure progress.

(b) Voluntary National Reviews (VNRs): Countries began presenting progress reports at the High-Level Political Forum (HLPF). These reports assess national implementation strategies.

(c) Integration into National Policies: Many countries aligned their national development plans with SDGs, created national coordination mechanisms and established SDG monitoring cells. For example, India integrated SDGs into NITI Aayog's planning framework. Other countries prepared SDG index dashboards.

(d) Private Sector and Civil Society Engagement: Businesses aligned CSR activities with SDGs. Universities integrated SDGs into research and curriculum. NGOs and international organizations supported implementation of SDGs.

(e) SDG Financing Mechanisms: emphasis on mobilizing domestic resources, foreign direct investment, Public-private partnerships and international development assistance.

The SDGs represent one of the most ambitious global agreements in history and SDGs provide a universal blueprint for sustainable growth, social justice, and environmental protection. It also promotes sustainable economic development, address climate change and environmental sustainability, reduce poverty and inequality, encourage global partnerships and provide a common global development language.

Objectives of the Research

The objectives of the research are to understand roles and applications of the AI in achieving Sustainable Development Goals, the present progress analysis of the achievements of sustainable development goals world-wide and specifically in the Indian context, Major challenges while using AI for SDGs and opportunities for improvement in applying AI for the purpose.

Role and Applications of Artificial Intelligence (AI) in Achieving Sustainable Development Goals (SDGs):

Artificial Intelligence (AI) plays a transformative role in accelerating progress toward the 17 Sustainable Development Goals (SDGs) by improving decision-making, optimizing resource use, predicting risks, and enhancing service delivery. AI supports governments, industries, and civil society in addressing complex sustainability challenges through data-

driven solutions.

1. AI and SDG 1: No Poverty

The Role of AI includes Identifying vulnerable populations, Improving targeting of welfare schemes and financial inclusion through digital platforms. Examples:

India: The Government uses AI and data analytics in Aadhaar-linked welfare schemes to reduce leakages and ensure targeted delivery of subsidies (e.g., LPG subsidy under PAHAL scheme). AI-powered fintech platforms offer microloans to underserved populations using alternative credit scoring models.

Kenya: Mobile money platform M-Pesa uses AI-driven credit scoring (M-Shwari) to provide microcredit to low-income citizens.

2. AI and SDG 2: Zero Hunger

The Role of AI includes Precision agriculture, Crop yield prediction, Pest and disease detection and Climate-smart farming. Examples:

United States: Companies like John Deere use AI-powered smart tractors and computer vision to optimize pesticide use and reduce waste.

India: Microsoft's AI Sowing App helps farmers predict optimal sowing dates based on weather data. AI-based crop advisory systems are used in states like Andhra Pradesh.

Israel: AI-enabled drip irrigation systems improve water efficiency in agriculture.

3. AI and SDG 3: Good Health and Well-being

The Role of AI includes Disease diagnosis, Pandemic prediction, Drug discovery, Telemedicine. Examples:

United Kingdom: The NHS uses AI tools for early cancer detection through medical imaging analysis.

United States: AI was used by BlueDot (Canada/US collaboration) to detect early signals of COVID-19 spread before WHO's announcement.

Rwanda: AI-enabled drone systems (Zipline) deliver blood and vaccines to remote areas.

India: AI-based tuberculosis detection systems used in rural health centers.

4. AI and SDG 4: Quality Education

The Role of AI includes Personalized learning, Intelligent tutoring systems, Automated grading, Dropout prediction. Examples:

China: AI-based adaptive learning platforms (e.g., Squirrel AI) personalize student learning paths.

Finland: National AI education initiative ("Elements of AI") to build digital literacy.

India: DIKSHA platform uses AI to recommend customized learning content for students.

5. AI and SDG 5: Gender Equality

The Role of AI includes reducing Gender-Based Violence (GBV) by Predictive analytics to identify violence hotspots, monitoring online harassment, AI-powered chatbots for reporting abuse, identifying dropout risks among girls, Gender pay gap analytics, Workforce diversity monitoring. Examples:

Spain: The VioGén system uses data analytics to assess risk levels of domestic violence cases and provide protection to victims.

United States: AI tools are used to detect and remove online abusive or gender-based harmful content on social media platforms.

India: AI-powered learning platforms under DIKSHA provide personalized education support, helping reduce gender gaps in rural education.

Finland: The "Elements of AI" initiative promotes digital literacy among women, encouraging female participation in tech sectors.

Canada: AI tools are used by companies to audit gender pay disparities and improve workplace equity.

Australia: Government-backed AI workforce analytics platforms help track gender participation in STEM industries.

6. AI and SDG 6: Clean Water and Sanitation

The Role of AI includes Water quality monitoring, Leak detection, Flood prediction. Examples:

Singapore: Uses AI for smart water management under the PUB Smart Water Grid system.

Netherlands: AI models predict flooding risks and manage water infrastructure.

7. AI and SDG 7: Affordable and Clean Energy

The Role of AI includes Smart grids, Renewable energy forecasting, Energy demand prediction. Examples:

Germany: AI optimizes integration of wind and solar energy into the national grid.

United States: Google DeepMind reduced energy consumption in data centers by 40% using AI.

China: AI is used to optimize solar power generation efficiency in large solar farms.

8. AI and SDG 8: Decent Work and Economic Growth

The Role of AI include AI-driven job matching platforms, Automation and smart manufacturing, MSME digitization and productivity enhancement, Fraud detection in financial systems. Examples:

Japan: Uses AI-powered robotics in manufacturing to improve productivity and address labor shortages.

India: AI-based platforms like National Career Service use analytics to match job seekers with employment opportunities.

United States: AI used in financial systems to detect fraud and improve economic stability.

9. AI and SDG 9: Industry, Innovation and Infrastructure

The Role of AI includes Predictive maintenance in factories, Smart logistics and supply chain optimization, AI-driven research and product innovation, Smart transportation systems. Examples:

Germany: Industry 4.0 initiatives use AI for smart manufacturing and automation.

South Korea: AI-enabled smart factories enhance production efficiency.

Spain (Barcelona): AI-based traffic management reduces congestion and improves urban infrastructure.

10. AI and SDG 10: Reduced Inequalities

The Role of AI includes Alternative credit scoring for unbanked populations, AI-driven welfare targeting, Assistive technologies for persons with disabilities, Language translation systems for inclusive access. Examples:

Kenya: AI-based mobile banking (M-Pesa) expands financial access to low-income groups.

India: AI-supported Direct Benefit Transfer systems reduce leakage and ensure targeted subsidies.

Brazil: AI satellite mapping identifies underserved informal settlements for public service planning.

11. AI and SDG 11: Sustainable Cities and Communities

The Role of AI includes Smart traffic management, Waste management, Urban planning.

Examples:

Spain (Barcelona): AI-powered smart city systems optimize traffic flow and reduce congestion.

Japan (Tokyo): AI-based disaster prediction and earthquake early warning systems.

India: AI-enabled traffic monitoring systems in cities like Pune and Bengaluru.

12. AI and SDG 12: Responsible Consumption and Production

The Role of AI includes Supply chain optimization, Waste reduction, Circular economy tracking. Examples:

Sweden: AI-powered waste sorting robots improve recycling efficiency.

France: Carrefour uses AI to reduce food waste through demand forecasting.

13. AI and SDG 13: Climate Action

The Role of AI includes Climate modeling, Carbon emission tracking, Disaster prediction.

Examples:

United States: NASA uses AI for climate pattern analysis.

Australia: AI-based bushfire prediction systems reduce disaster impact.

Brazil: AI satellite monitoring detects illegal deforestation in the Amazon.

14. AI and SDG 14 & 15: Life Below Water & Life on Land

The Role of AI includes Wildlife monitoring, Biodiversity mapping, Illegal fishing detection.

Examples:

Indonesia: AI monitors illegal fishing activities using satellite data.

South Africa: AI-powered anti-poaching surveillance in wildlife reserves.

Norway: AI used in sustainable fisheries management.

15. AI and SDG 16: Peace, Justice and Strong Institutions

The Role of AI includes Fraud detection, Transparent governance, Predictive policing (with ethical safeguards).

Examples:

Estonia: AI-driven e-governance systems for transparent public services.

United States: AI tools detect financial fraud and cyber threats.

16. AI and SDG 17: Partnerships for the Goals

The Role of AI includes Global data sharing, Cross-border innovation, international research collaboration.

Example: UN Global Pulse Initiative uses AI and big data analytics to support humanitarian action worldwide.

Thus, AI has emerged as a powerful enabler of sustainable development by supporting poverty reduction, climate action, healthcare improvement, smart agriculture, and sustainable urban planning. Countries across the globe—India, USA, Germany, Singapore, Brazil, Estonia, and others—have demonstrated practical applications of AI in achieving various SDGs.

If implemented ethically and inclusively, AI can significantly accelerate progress toward the 2030 Agenda for Sustainable Development, ensuring that technological advancement benefits humanity and the planet. The advantages can be summarized as:

1. Data-driven policy formulation

2. Cost reduction in service delivery

3. Real-time monitoring and forecasting

4. Improved efficiency and resource optimization

5. Enhanced inclusivity through digital access

Challenges in Applying AI for Achieving SDGs

Despite its transformative potential, countries face significant structural, ethical, economic, technological, and governance-related challenges in applying AI effectively for sustainable development. These challenges can be of:

1. Data privacy issues

2. Algorithmic bias

3. Digital divide between developed and developing nations

4. Job displacement due to automation

5. High energy consumption of AI systems

Thus, responsible AI governance is necessary.

These challenges vary between developed and developing nations. Below is a detailed explanation divided into:

1. Global challenges faced by different countries,

2. India-specific challenges in applying AI for SDGs

Part I: Global Challenges in Applying AI for Achieving SDGs

While AI offers immense potential to accelerate achievement of SDGs, global countries face systemic challenges related

to infrastructure, governance, ethics, cost, and data quality. This can be explained as below:

1. Digital Divide and Infrastructure Gaps: Unequal access to high-speed internet, cloud computing, and digital devices. Developing and least developed countries lack robust digital infrastructure. Its Impact on SDGs limits AI use in healthcare (SDG 3), education (SDG 4), and smart agriculture (SDG 2), Rural and marginalized populations remain excluded. For Example, Sub-Saharan African countries struggle with limited broadband penetration, restricting AI-based public service delivery.

2. Data Availability and Quality Issues: AI systems require large, clean, reliable datasets. Many countries lack structured, digitized public datasets. This may result in Weak monitoring of SDG indicators, Poor policy predictions due to incomplete data. The key concern being lack of real-time environmental and poverty-related datasets affects climate and poverty modeling.

3. Ethical and Governance Challenges: Algorithmic bias and discrimination, Lack of explainability (black-box models), Data privacy violations, Surveillance misuse. Its impact is it could undermine SDG 10 (Reduced Inequalities) and SDG 16 (Peace, Justice & Strong Institutions). For example, AI-based facial recognition systems criticized for racial bias in some Western countries.

4. High Cost of AI Development and Deployment: AI requires high-performance computing, Skilled workforce, advanced research ecosystems. Low-income nations cannot afford large-scale AI investments. This creates an "AI inequality gap" between developed and developing nations.

5. Shortage of Skilled Workforce: Lack of data scientists, AI engineers, and AI policy experts. This results in slows down AI integration into public administration, Brain drain from developing countries to developed economies.

6. Energy Consumption and Environmental Impact: AI systems, especially large models, consume significant electricity. Data centers contribute to carbon emissions. This is contradictory to AI aim to support SDG 13 (Climate Action). High energy use may increase emissions if not powered by renewable energy.

7. Regulatory and Policy Gaps: Many countries lack clear AI regulations, ethical AI frameworks, Accountability mechanisms. The associated risk is unregulated AI may cause misuse, cyber threats, and inequality.

8. Integration Challenges with Public Systems: Legacy government systems are outdated. Bureaucratic resistance to technological adoption. This result in slower implementation in healthcare, agriculture, and governance sectors.

9. Trust Deficit and Public Acceptance: Citizens may distrust AI in Healthcare diagnosis, Policing, Welfare targeting. Its impact may be the resistance to adoption delays SDG progress.

Part II: Challenges Faced by India in Applying AI for SDGs

For India, additional complexities such as rural digital divide, linguistic diversity, fragmented data systems, and institutional coordination make implementation more challenging. However, with initiatives like Digital India, IndiaAI Mission, and increasing startup ecosystem growth, India has strong potential to overcome these barriers. India has launched initiatives like:

1. National Strategy for AI (NITI Aayog)

2. IndiaAI Mission

3. Digital India Programme

Despite progress, several challenges remain. These can be explained as below:

1. Digital Infrastructure Imbalance

Issue: Urban–rural digital divide, Unequal access to reliable internet and electricity.

Impact on SDGs: Limits AI in rural agriculture (SDG 2), Restricts telemedicine in remote areas (SDG 3), Affects online education platforms (SDG 4).

2. Data Fragmentation and Lack of Standardization

Issue: Government data scattered across departments, Lack of standardized data-sharing mechanisms.

Impact: Difficulty in building AI models for poverty mapping and climate forecasting.

3. Limited High-Quality Public Datasets

Although India has Aadhaar and digital governance platforms, issues include:

Incomplete data, Outdated surveys, Privacy constraints

This affects SDG monitoring accuracy.

4. Skill Gap in AI Workforce

Issue: Shortage of advanced AI researchers, Mismatch between industry needs and academic curriculum.

Impact: Dependency on foreign AI technologies, Slower indigenous innovation.

5. Funding and R&D Constraints

Issue: Lower R&D spending (as % of GDP) compared to developed countries, Limited AI startups in deep-tech SDG sectors like climate modeling and biodiversity mapping.

6. Ethical and Privacy Concerns

Issues: Concerns over surveillance and data misuse, Bias in AI-based credit scoring or recruitment systems.

India's Digital Personal Data Protection Act is still evolving in implementation.

7. Language and Diversity Barriers

India is linguistically diverse: 22 official languages, Hundreds of dialects

AI systems trained mostly in English face difficulty serving non-English populations, affecting: Education (SDG 4), Governance (SDG 16), Financial inclusion (SDG 1)

8. Agricultural Complexity

India has small landholdings, Diverse agro-climatic zones, Informal farming practices

AI adoption in agriculture faces Low digital literacy, Limited smartphone penetration among farmers, Resistance to technology adoption.

9. Energy and Sustainability Concerns

Growing AI infrastructure increases power demand. India still depends partly on coal-based electricity. This creates tension with SDG 13 (Climate Action).

10. Coordination Challenges

AI for SDGs requires coordination between Central government, State governments, Private sector, NGOs, Academic institutions, etc. Policy fragmentation slows implementation.

Comparative Perspective: Global vs India

Aspect	Global Challenge	India-Specific Challenge
Infrastructure	Digital divide across nations	Urban-rural gap
Data	Poor data availability	Data fragmentation
Skills	Global shortage	Brain drain & curriculum gap
Ethics	AI bias & surveillance	Privacy & multilingual bias
Finance	High cost	Limited R&D budget
Governance	Weak regulation	Multi-level governance complexity

Opportunities Available for India in Achieving Each Sustainable Development Goal (SDGs):

India, being one of the fastest-growing major economies and home to nearly one-sixth of the world's population, has significant opportunities to leverage its demographic strength, digital transformation, policy reforms, and entrepreneurial ecosystem to achieve the 17 Sustainable Development Goals (SDGs) by 2030.

Below is a detailed explanation of goal-wise opportunities for India.

SDG 1: No Poverty

Opportunities:

Digital Direct Benefit Transfers (DBT): India's Aadhaar-linked welfare system reduces leakage and ensures targeted subsidy delivery.

Financial Inclusion (Jan Dhan Yojana): Over 50 crore bank accounts opened.

Self-Help Groups (SHGs): Empower rural women economically.

Start-up Ecosystem: Job creation through MSMEs and startups.

Strategic Potential: Using AI-driven poverty mapping and targeted welfare schemes can significantly reduce extreme poverty.

SDG 2: Zero Hunger

Opportunities:

Agri-tech Innovation: Precision farming, AI-based crop advisory.

Public Distribution System (PDS) Reforms: Digitization reduces food diversion.

Millet Mission: Promotion of climate-resilient crops.

Cold Chain Expansion: Reducing post-harvest losses.

Strategic Potential: India can become a global leader in sustainable agriculture through climate-smart farming.

SDG 3: Good Health and Well-being

Opportunities:

Ayushman Bharat Scheme: World's largest public health insurance scheme.

Telemedicine Expansion: Reaching rural populations.

Pharmaceutical Strength: India as the "Pharmacy of the World."

Digital Health Mission: Health ID and electronic medical records.

Strategic Potential: AI-based diagnostics and digital health platforms can improve healthcare access and affordability.

SDG 4: Quality Education

Opportunities:

National Education Policy (NEP) 2020: Focus on digital and skill-based education.

DIKSHA Platform: Online teacher and student resources.

EdTech Growth: Strong startup ecosystem (e.g., online learning platforms).

Skill India Mission: Workforce readiness.

Strategic Potential: India's large youth population (demographic dividend) can be transformed into a skilled global workforce.

SDG 5: Gender Equality

Opportunities:

Women-led SHGs and entrepreneurship.

Beti Bachao Beti Padhao initiative.

Increasing female participation in STEM fields.

Digital financial inclusion for women.

Strategic Potential: Improving female labor force participation can significantly boost GDP growth.

SDG 6: Clean Water and Sanitation

Opportunities:

Jal Jeevan Mission: Household tap water coverage expansion.

Swachh Bharat Mission: Improved sanitation coverage.

Water recycling technologies.

River rejuvenation projects (Namami Gange).

Strategic Potential: Smart water management systems can address water scarcity challenges.

SDG 7: Affordable and Clean Energy

Opportunities:

Global Solar Leadership: International Solar Alliance (ISA).

Large-scale Renewable Expansion: Solar and wind capacity growth.

Green Hydrogen Mission.

Electric Vehicle (EV) promotion policies.

Strategic Potential: India can become a renewable energy hub and reduce import dependence on fossil fuels.

SDG 8: Decent Work and Economic Growth

Opportunities:

Make in India & Atmanirbhar Bharat.

Digital economy expansion.

Manufacturing push under PLI schemes.

Gig and startup economy growth.

Strategic Potential: Leveraging demographic dividend for industrial and service sector growth.

SDG 9: Industry, Innovation and Infrastructure

Opportunities:

Infrastructure expansion (Gati Shakti Plan).

5G rollout and digital infrastructure growth.

Robust startup ecosystem (third-largest globally).

Semiconductor manufacturing initiatives.

Strategic Potential: Position India as a global innovation and manufacturing hub.

SDG 10: Reduced Inequalities

Opportunities:

Inclusive digital banking.

Affirmative action policies.

Regional development programs.

Rural infrastructure development.

Strategic Potential: Digital platforms can bridge urban–rural and socio-economic disparities.

SDG 11: Sustainable Cities and Communities

Opportunities:

Smart Cities Mission.

Metro rail expansion.

Affordable housing schemes (PMAY).

Urban mobility innovation (EV buses).

Strategic Potential: India can design sustainable urbanization models for developing countries.

SDG 12: Responsible Consumption and Production

Opportunities:

Circular economy promotion.

Plastic ban initiatives.

E-waste recycling sector growth.

Green supply chain adoption by Indian industries.

Strategic Potential: India can build sustainable manufacturing systems aligned with global ESG standards.

SDG 13: Climate Action

Opportunities:

Commitment to Net Zero by 2070.

Climate-resilient agriculture programs.

Carbon markets development.

Expansion of renewable energy capacity.

Strategic Potential: India can lead climate diplomacy among developing nations.

SDG 14: Life Below Water

Opportunities:

Blue Economy initiatives.

Sustainable fisheries management.

Coastal regulation and marine biodiversity protection.

Strategic Potential: India can develop sustainable marine industries and protect coastal ecosystems.

SDG 15: Life on Land

Opportunities:

Afforestation programs (Green India Mission).

Wildlife conservation initiatives (Project Tiger).

Agroforestry promotion.

Biodiversity mapping using satellite technology.

Strategic Potential: Balancing development with ecological conservation.

SDG 16: Peace, Justice and Strong Institutions

Opportunities:

Digital governance (e-Governance platforms).

Online grievance redressal systems.

Judicial digitization initiatives.

Transparency through RTI and digital records.

Strategic Potential: AI-driven governance systems can enhance accountability and efficiency.

SDG 17: Partnerships for the Goals

Opportunities:

Global South leadership.

South-South cooperation.

International Solar Alliance.

Public-Private Partnerships (PPP).

Strategic Potential: India can serve as a bridge between developed and developing nations in global development initiatives.

Overall Strategic Opportunities for India

1.Demographic Dividend – Young and growing workforce.

2.Digital Public Infrastructure (DPI) – Aadhaar, UPI, CoWIN platforms.

3.Strong IT and AI ecosystem.

4.Growing startup culture.

5.Global geopolitical influence.

6.Commitment to renewable energy leadership.

India stands at a critical juncture where economic growth, digital transformation, and policy innovation provide unprecedented opportunities to achieve the Sustainable Development Goals. By integrating technology, inclusive

governance, sustainable industrialization, and climate-conscious strategies, India can not only achieve SDGs domestically but also emerge as a global leader in sustainable development.

India adopted the Sustainable Development Goals (SDGs) in 2015 as part of the UN 2030 Agenda. Nearly a decade later, India's SDG Composite Index score improved from 57 (2018) to 71 (2023–24) according to NITI Aayog. While progress is visible in poverty reduction, renewable energy expansion, and digital governance, substantial gaps remain in nutrition, employment quality, urban sustainability, inequality reduction, and climate resilience. This paper analyzes India's latest progress against planned 2030 targets for each SDG using recent government datasets (NITI Aayog SDG Index 2023–24, NFHS-5, PLFS, MoSPI, MoHFW, Forest Survey of India). A structured gap analysis is presented, followed by strategic countermeasures.

India's Progress Toward the Sustainable Development Goals (SDGs):

Below is a comprehensive, India-specific status review of Actual vs Planned Progress on all 17 SDGs, with recent statistics (largely based on NITI Aayog SDG India Index 2023–24, NFHS-5, MoHFW, MoSPI, and government releases up to 2024) and a brief gap analysis for each goal.

Overall, India SDG Performance

India SDG Composite Score (NITI Aayog 2023–24): 71/100

2018 score: 57

2020–21: 66

2023–24: 71

Progress is steady, but uneven across goals and states.

The analysis compares:

1.Planned Targets: 2030 SDG national commitments.

2.Actual Performance: Latest available official statistics (2023–24).

3.Gap Analysis: Quantitative and structural deficits.

4.Policy Countermeasures: Evidence-based recommendations.

SDG 1: No Poverty

Planned Target (2030): Eradicate extreme poverty, Reduce multidimensional poverty significantly.

Actual Status: Multidimensional Poverty reduced from 24.85% (2015–16) to 14.96% (2019–21) (NITI Aayog MPI report 2023), 13.5 crore people exited multidimensional poverty (2015–2021).

Gap Analysis: Poverty still concentrated in Bihar, UP, Jharkhand, MP. Urban informal sector vulnerability remains high. Need for stronger livelihood generation beyond welfare transfers.

SDG 2: Zero Hunger

Planned Target: End malnutrition and hunger by 2030.

Actual Status (NFHS-5, 2019–21): Stunting: 35.5% (down from 38.4%), Wasting: 19.3% (almost stagnant), Anaemia in women (15–49 years): 57% (increased).

Gap: Severe malnutrition persists, Food security improved, but nutrition quality remains weak. Climate change affecting crop productivity.

SDG 3: Good Health and Well-being

Planned: Reduce maternal mortality ratio (MMR) <70, Reduce infant mortality rate (IMR)

Actual: MMR: 97 per 100,000 live births (2018–20), IMR: 28 per 1,000 live births, Ayushman Bharat covers 50+ crore beneficiaries.

Gap: Rural–urban healthcare gap, Shortage of doctors (1:1500 approx vs WHO 1:1000), Rising lifestyle diseases.

SDG 4: Quality Education

Planned: Universal secondary education, Improve literacy and learning outcomes.

Actual: Literacy rate: ~77.7%, Gross Enrollment Ratio (GER) in higher education: ~28.4%

Dropout rates declining but still high at secondary level.

Gap: Learning outcome gaps (ASER reports show foundational skill gaps), Digital divide in rural areas.

SDG 5: Gender Equality

Planned: Increase female labor force participation (FLFP), Reduce gender-based violence

Actual: FLFP: ~37% (Periodic Labour Force Survey 2023) – improved but largely informal.

Sex Ratio at Birth improving (~929 per 1000 males).

Gap: Wage inequality persists, Low female representation in leadership roles.

SDG 6: Clean Water and Sanitation

Planned: Universal tap water access, Eliminate open defecation

Actual: Rural tap water coverage: ~74% households (2024), Open Defecation Free (ODF) declared nationally.

Gap: Water quality (fluoride/arsenic issues), Groundwater depletion in many states.

SDG 7: Affordable and Clean Energy

Planned: 50% installed electricity capacity from non-fossil sources by 2030.

Actual: ~44% of installed capacity from non-fossil sources (2024), 100% village electrification achieved.

Gap: Coal still dominant in actual electricity generation, Energy storage infrastructure insufficient.

SDG 8: Decent Work and Economic Growth

Planned: Sustained GDP growth, Productive employment for all.

Actual: GDP growth ~7% (2023–24), Unemployment rate ~3.2% (PLFS usual status).

Informal employment >80%.

Gap: Job quality and skill mismatch, Automation risks in manufacturing.

SDG 9: Industry, Innovation and Infrastructure

Planned: Expand manufacturing share in GDP to 25%.

Actual: Manufacturing share ~16–17%, India ranks 40th in Global Innovation Index 2023,

Rapid digital infrastructure growth (UPI, 5G rollout).

Gap: Low R&D expenditure (~0.7% of GDP), Logistics costs high (~14% of GDP).

SDG 10: Reduced Inequalities

Planned: Reduce income inequality and regional disparities.

Actual: Gini coefficient moderate but wealth inequality high, Significant state-level disparity in SDG Index scores.

Gap: Urban-rural income gap, social inequality persists in marginalized communities.

SDG 11: Sustainable Cities and Communities

Planned: Sustainable urban planning, Affordable housing

Actual: Smart Cities Mission implemented in 100 cities, PMAY urban houses delivered in large numbers, Severe air pollution in cities (Delhi AQI often >300).

Gap: Urban congestion, Waste management inefficiencies.

SDG 12: Responsible Consumption and Production

Planned: Reduce waste generation, Promote recycling and circular economy

Actual: Plastic ban implemented, E-waste rules strengthened, Recycling sector expanding but informal.

Gap: Low waste segregation compliance, High material consumption growth.

SDG 13: Climate Action

Planned: Net Zero by 2070, Reduce emissions intensity by 45% (2005 levels)

Actual: Emission intensity reduced ~33–35%, Renewable capacity expanding rapidly.

Gap: High coal dependency, Climate vulnerability (heatwaves, floods).

SDG 14: Life Below Water

Planned: Reduce marine pollution, Sustainable fisheries.

Actual: Blue Economy initiatives launched, Coastal Regulation Zones enforced.

Gap: Marine plastic pollution, Overfishing concerns.

SDG 15: Life on Land

Planned: Increase forest cover, Protect biodiversity

Actual: Forest & tree cover: ~24.62% of geographical area, Tiger population increasing (3,000+).

Gap: Human-wildlife conflict rising, Deforestation due to infrastructure projects.

SDG 16: Peace, Justice and Strong Institutions

Planned: Reduce corruption, Strengthen governance.

Actual: Digital governance expansion (Aadhaar, UPI), Judicial backlog remains high (4+ crore pending cases).

Gap: Slow judicial reforms, Transparency perception challenges.

SDG 17: Partnerships for the Goals

Planned: Strengthen global partnerships and SDG financing.

Actual: Leadership in Global South, International Solar Alliance initiative, Increasing FDI inflows.

Gap: Financing gap for SDGs estimated in billions annually, Limited private sector SDG reporting compliance.

Cross-Cutting Structural Gaps:

1.Financing gap for SDGs.

2.State-level implementation disparities.

3.Weak inter-ministerial coordination.

4.Data gaps in real-time monitoring.

5.Climate vulnerability risk.

Summary of Major Gaps

Area	**Key Gap**
Nutrition	High Anaemia & child wasting
Jobs	Informal employment dominance
Climate	Coal dependence
Urban	Pollution & waste management
Education	Learning outcome deficits
Health	Rural healthcare infrastructure

Overall Assessment

India is:

On track in: Renewable capacity expansion, poverty reduction, digital governance.

Moderately progressing in: Health, education, gender equality.

Lagging in: Nutrition, urban sustainability, inequality reduction, climate resilience.

Conclusion:

1.India has made measurable progress since 2015, improving its SDG composite score from 57 to 71. However, achieving the 2030 targets requires:

2.Increased SDG financing

3.Stronger state-level implementation

4.Data-driven governance

5.Private sector participation

6.Sustainable industrial transition

India remains one of the few major economies broadly aligned with long-term climate and development commitments, but significant structural gaps must be addressed in the next five years. Suggested countermeasures are as follows:

SDG 1: No Poverty

Countermeasures: Expand urban employment guarantee schemes, strengthen skill-linked livelihood programs, Integrate AI-based poverty mapping for targeted delivery.

SDG 2: Zero Hunger

Countermeasures: Diversify PDS to include protein-rich foods, Strengthen Poshan Abhiyaan with AI monitoring, Promote climate-resilient agriculture.

SDG 3: Good Health

Countermeasures: Increase health spending to 2.5% of GDP, Expand telemedicine networks, Preventive healthcare campaigns.

SDG 4: Quality Education

Countermeasures: Universal digital infrastructure in schools, AI-based adaptive learning systems, Teacher training reforms.

SDG 5: Gender Equality

Countermeasures: Expand childcare infrastructure, incentivize women in STEM, Strengthen workplace safety laws.

SDG 6: Clean Water & Sanitation

Countermeasures: Smart water metering, Water recycling infrastructure, Strict groundwater regulation.

SDG 7: Affordable & Clean Energy

Countermeasures: Accelerate green hydrogen mission, Invest in grid storage, Phase down coal gradually.

SDG 8: Decent Work & Growth

Countermeasures: Expand PLI schemes, Deep skill alignment with industry, Promote MSME digitization.

SDG 9: Industry & Innovation

Countermeasures: Increase R&D to 2% of GDP, Infrastructure modernization, Support semiconductor ecosystem.

SDG 10: Reduced Inequality

Countermeasures: Fiscal equalization grants, Inclusive digital finance, Regional industrial corridors.

SDG 11: Sustainable Cities

Countermeasures: Electric public transport expansion, Circular waste management systems.

Smart urban zoning reforms.

SDG 12: Responsible Consumption

Countermeasures: Extended Producer Responsibility enforcement, Circular economy incentives.

SDG 13: Climate Action

Countermeasures: Carbon pricing mechanisms, Climate-resilient infrastructure, Disaster early-warning systems.

SDG 14: Life Below Water

Countermeasures: Sustainable fishing quotas, blue economy governance frameworks.

SDG 15: Life on Land

Countermeasures: Ecological impact-based planning, Community Forest management.

SDG 16: Strong Institutions

Countermeasures: AI-based case management, Fast-track courts, Police modernization.

SDG 17: Partnerships

Countermeasures: Green bonds expansion, PPP model scaling, international climate finance mobilization.

India has demonstrated measurable progress in poverty reduction, renewable energy, digital governance, and infrastructure expansion. However, to meet 2030 targets, accelerated action is required in nutrition, employment formalization, climate adaptation, urban sustainability, and institutional reforms.

Achieving SDGs by 2030 demands:

1.Increased public investment.

2.Technology integration (AI, data analytics).

3.Strengthened federal coordination.

4.Private sector engagement.

5.Sustainable and inclusive growth model.

India remains broadly aligned with long-term development goals but must intensify structural reforms in the remaining critical decade.

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