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A RURAL DEVELOPMENT MONTHLY SINCE 1952



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Technology Hubs
for Welfare



FinTech for
Financial Inclusion



Social Protection
Through Technology



HealthTech for
Universal Healthcare

Technology for Welfare





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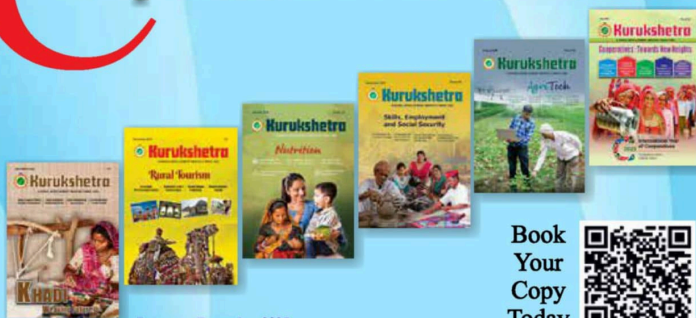
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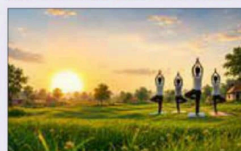
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Editorial

Technology has become one of the most powerful drivers of social transformation in modern India. Whether it is a farmer receiving weather advisories on a mobile phone, a patient consulting a doctor through telemedicine, a student accessing quality learning resources online, or a beneficiary receiving government support directly into a bank account—technology is emerging as a vital instrument of welfare, inclusion and empowerment.

India's development experience demonstrates that technology is most meaningful when it serves people. Over the past decade, the country has built a robust digital public infrastructure that has transformed public service delivery. Through the JAM (Jan Dhan–Aadhaar–Mobile) architecture, welfare benefits are reaching beneficiaries directly, reducing leakages, improving transparency and strengthening trust in governance. Digital platforms have enabled citizens to access services more quickly and efficiently than ever before.

One of the most visible outcomes of this transformation has been financial inclusion. Mobile banking, digital payments and fintech innovations have brought millions of previously excluded citizens into the formal financial system. Technology has democratised access to financial services and created new pathways for savings, credit, insurance and entrepreneurship.

The impact is equally significant in agriculture, where technology is helping farmers make informed decisions, improve productivity and build resilience against climate risks. Precision farming, drone-based monitoring, satellite imagery and AI-enabled advisory systems are enabling better management of water, soil and crop resources. Climate-smart technologies are supporting sustainable agriculture while helping rural communities adapt to changing weather patterns.

Healthcare too is being transformed through digital innovation. Telemedicine platforms, digital health records and AI-assisted diagnostics are bringing quality healthcare closer to remote and underserved populations. Similarly, EdTech platforms such as DIKSHA, SWAYAM and other digital learning initiatives are expanding access to quality education, personalised learning and skill development, helping bridge long-standing rural–urban learning gaps.

Multilingual platforms such as BHASHINI are enabling citizens to access services in their own languages, while assistive technologies are empowering Divyangjan by improving accessibility, mobility and independence. These innovations reaffirm that technology is not merely about efficiency; it is about widening participation and ensuring that no one is left behind.

As India advances towards the vision of *Viksit Bharat 2047*, the challenge is not only to create new technologies but also to ensure that their benefits reach every citizen. Bridging digital divides, strengthening digital literacy and expanding affordable access must remain key priorities. Ultimately, the success of technology will be measured not by innovation alone, but by its ability to improve lives, expand opportunities and uphold the dignity of every individual. When guided by these principles, technology becomes far more than a tool of progress—it becomes a powerful force for welfare, inclusion and nation-building. □

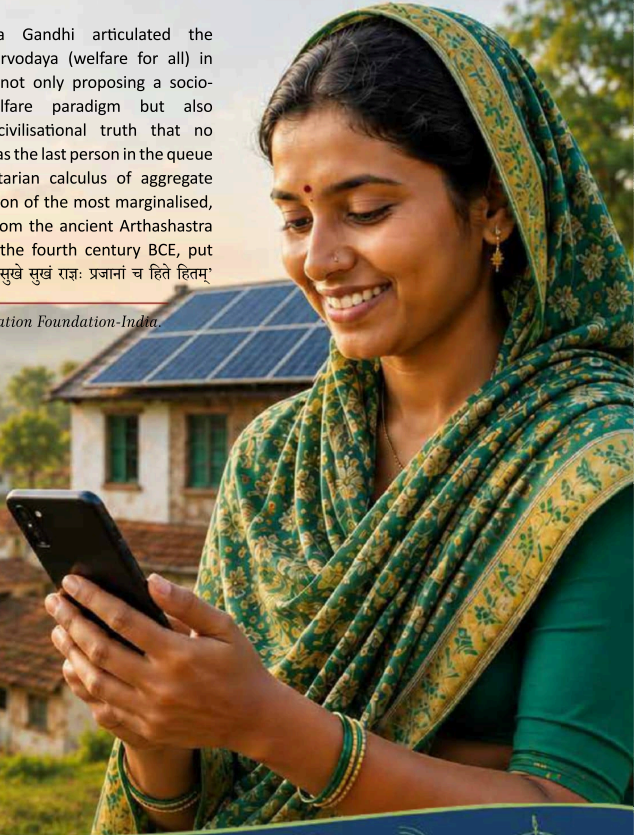
Democratising Technology: Empowering the Last Person

India today stands at a moment where technology is no longer merely a tool of convenience, but a means of advancing social justice, transparency, and inclusive development. Digital Public Infrastructure, artificial intelligence, data-driven governance, and multilingual technology platforms are reshaping governance into a more citizen-centric system. Initiatives such as the JAM Trinity, UPI, BHASHINI, SVAMITVA, and the Agri Stack demonstrate how the democratisation of technology can expand access to services and opportunities for the last person in the queue.

Dr. Arvind C Ranade

When Mahatma Gandhi articulated the doctrine of Sarvodaya (welfare for all) in 1908, he was not only proposing a socio-economic welfare paradigm but also advancing a civilisational truth that no society can declare itself just so long as the last person in the queue remains deprived. Unlike the utilitarian calculus of aggregate welfare, which can mask the condition of the most marginalised, the spirit of Sarvodaya emanates from the ancient Arthashastra tradition itself. Kautilya, writing in the fourth century BCE, put it with characteristic precision: 'प्रजासुखे सुखं राज्ञः प्रजानां च हिते हितम्'

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(in the happiness of his subjects lies the king's happiness; in their welfare, his welfare). Governance, in the Kautilyan framework, is not merely an exercise in administration but a moral engagement between the state and the most vulnerable citizen. Two and a half millennia separate these two thinkers, yet the underlying principle remains unchanged, and it is within this framework that India's contemporary technology-led governance must be understood.

The JAM Trinity and Socio-Economy

For decades after independence, the central problem of welfare delivery in India was not the absence of intent, but the structural intermediation that allowed leakage of public resources through multiple intermediary chains between the government and the intended beneficiary. The JAM trinity of Jan Dhan bank accounts, Aadhaar biometric identity, and Mobile connectivity fundamentally reimaged this architecture. By creating a biometrically authenticated chain from government disbursement to the individual beneficiary, the Direct Benefit Transfer (DBT) programme significantly reduced the role of intermediaries.

The numbers are significant. By April 2026, cumulative DBT transfers had crossed Rs 50 lakh crore, with estimated savings of Rs 4.31 lakh crore between 2015 and March 2024 through the removal of duplicate and ghost beneficiaries. Jan Dhan accounts grew from 14.72 crore in 2015 to 57.71 crore by March 2026, with aggregate deposits of Rs 2.94 lakh crore, representing the rapid formalisation of a largely unbanked population in modern economic history.

It is at this moment that Dr. Ambedkar's vision acquires fresh institutional relevance. His enduring counsel, expressed to the Constituent Assembly in November 1949, was that "political democracy cannot last unless there lies at the base of it social democracy." According to him, formal rights are only as meaningful as the substantive access they enable.

The JAM architecture takes this counsel seriously, not merely by creating accounts and identities, but also by continuously investing in making them operationally meaningful for those who remain outside the formal economy. This is why the government's approach to JAM has been one of iterative refinement. Face authentication has been introduced alongside fingerprint biometrics to address authentication variability among elderly citizens and manual workers. Banking Correspondents

and Common Service Centres have been expanded to ensure that the last-mile interface remains human, trusted, and locally embedded. The government is also actively investing in financial literacy through the Jan Dhan Darshak app, Pradhan Mantri Jan Dhan Yojana helplines, and panchayat-level outreach programmes to decentralise access to banking services.

The Digital Innovation State

Globally, India's digital governance is often judged through the comparative lens of other countries. This framing misses something essential. India has not adopted another country's model; it has innovated its own. India has followed a philosophy of democratic infrastructure development that conceives connectivity not as a commodity, but as a public good to be made universally accessible. The India Stack, comprising UPI, Aadhaar, DigiLocker, Open Network for Digital Commerce (ONDC), and the emerging Agri Stack, is operationalising this vision at a national scale.

The distinctive feature of this architecture lies in the construction of a layered technological pathway. Unlike many Western economies, where private platforms have become the primary intermediaries between citizens and services, India has built its core digital infrastructure as an open, interoperable sovereign public good and invited both the private sector and government institutions to innovate within it. UPI processed over 185 billion transactions in FY 2024–25, and it remains a non-exclusive architecture.

ONDC separates e-commerce into three independent functions—discovery, fulfilment and payment—with each function capable of being provided by different service providers operating on a common protocol. A seller onboarded through one application becomes accessible to buyers across all applications on the network, without any single platform intermediating the entire transaction. This structural decoupling reduces the leverage that vertically integrated platforms often use to impose high commission rates on merchants.

Moreover, 5G connectivity has now reached a substantial majority of Indian districts, with 85 per cent of the population having access to high-speed mobile internet. Smartphone penetration has reached 85.5 per cent of households. The UMANG platform offers a single-window interface to over 2,400 government services. DigiLocker has issued authenticated documents to over 67.63 crore active users.



SVAMITVA and the Question of Land

Kautilya devoted considerable attention in the Arthashastra to land measurement and record-keeping, understanding them as foundational instruments of both revenue administration and rural justice. A king who does not know the land his subjects occupy cannot protect their rights over that land.

For decades after independence, agricultural land was systematically mapped and recorded, but residential land in villages remained legally invisible. People lived on land whose ownership they could not formally prove and, as a result, they could not access institutional credit against their homes. They also remained perpetually vulnerable to boundary disputes, with little documentary basis for legal redressal.

The SVAMITVA (Survey of Villages Abadi and Mapping with Improved Technology in Village Areas) scheme addresses this challenge through precision technology. Drone-based surveys combined with Continuously Operating Reference Stations (CORS) deliver geo-referencing accuracy within five centimetres, generating property records that are both legally valid and judicially defensible.

In many developing economies, informal property rights have remained a form of ‘dead capital’—physically present, yet legally invisible and unable to

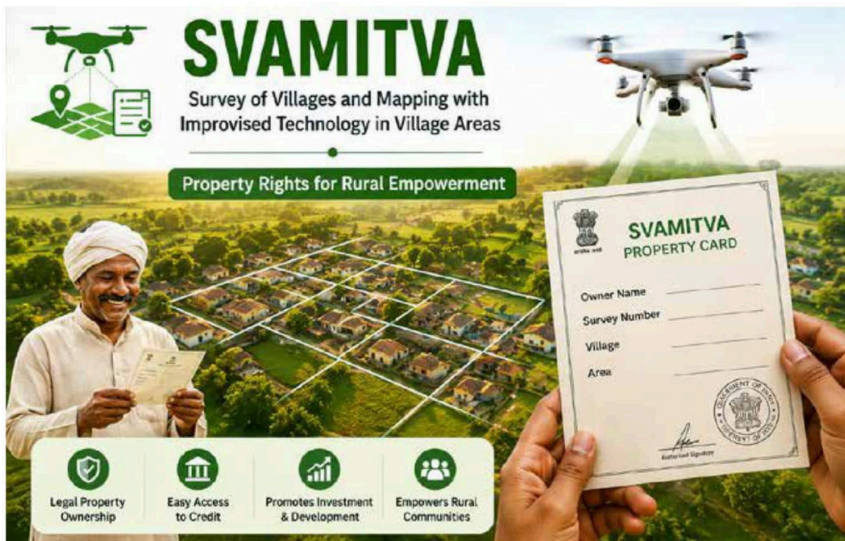
enter the formal circuits of credit and investment. SVAMITVA is precisely aimed at converting the informal into the formal. A rural household holding a SVAMITVA property card can now approach a scheduled bank for institutional credit. The difference between a bank’s lending rate and an informal moneylender’s rate is often the difference between manageable debt and a debt trap.

The significance of SVAMITVA extends beyond individual access to credit. The high-resolution spatial data being generated across villages provides the basis for accurate Gram Panchayat property tax assessment, thereby creating a stronger local fiscal base. It also supports the development of Digital Twin models for disaster resilience planning in flood-prone and geographically vulnerable communities. Land records, therefore, are instruments of both individual justice and state capacity.

The Agri Stack and the Kisan

India’s transition towards Agriculture 4.0—the integration of AI, IoT, satellite remote sensing, and data analytics into farming—is being pursued through an integrated framework. The Comprehensive Agriculture Management System (CAMS), under the national Agri Stack, connects land records, weather data, subsidies, yield patterns, and crop insurance through a unified digital platform.





Post-harvest losses in India account for nearly 15 per cent of production value, while information asymmetries continue to allow middlemen to extract disproportionate value between the farm gate and the consumer. To address this, satellite-based crop monitoring, AI-enabled pest prediction, and soil moisture sensors are increasingly being deployed.

However, to enable farm households to effectively utilise the data they generate, there is an urgent need to modernise and strengthen agricultural extension services. This would ensure that the informational value created through farmers' participation in the digital ecosystem translates into better advisory services, improved credit access, and more efficient price discovery.

This represents an important opportunity to develop the Agri Stack into one of the world's most farmer-centric agricultural data infrastructure.

BHASHINI

Language is not merely a medium of communication, but also a bearer of civilisational consciousness. BHASHINI, India's National Language Translation Mission, has evolved into the country's first shared digital public infrastructure for language AI. As of early

2026, the platform hosts over 350 optimised AI models delivering real-time translation, speech recognition, and text-to-speech services across 22 scheduled languages and 14 additional tribal and regional languages.

Its open APIs (Application Programming Interfaces) now power numerous government platforms, including PM-Kisan, UIDAI, eSanjeevani telemedicine services, grievance redressal portals, and Indian Railways passenger services. This represents a profound demonstration of substantive citizenship.

Likewise, SabhaSaar, an AI-enabled tool built on BHASHINI, strengthens grassroots citizenship. Panchayat officials upload audio or video recordings of Gram Sabha meetings through their e-GramSwaraj login, and the tool transcribes, translates (currently in 13 Indian languages), and summarises the proceedings in a structured manner. Since its rollout, SabhaSaar has recorded more than five lakh engagements daily across India's 2.55 lakh village panchayats.

Gram Sabha proceedings contain some of the richest repositories of local knowledge in Indian governance, including land tenure practices, ecological wisdom, and community dispute resolution norms, much of which has historically remained undocumented. When these deliberations are captured in a structured and

searchable form and integrated into Gram Panchayat Development Plans, the resulting knowledge base becomes significantly more robust. This represents a bottom-up preservation of local knowledge.

Gandhian Talisman for the Last Person

Mahatma Gandhi left behind a talisman that belongs as much to the vocabulary of public administration as to moral philosophy:

“Whenever you are in doubt, recall the face of the poorest and weakest man whom you may have seen, and ask yourself if the step you contemplate is going to be of any use to him. Will it restore him control over his own life and destiny?”

This remains the ultimate test of Antyodaya and perhaps the most rigorous evaluative framework for any welfare programme.

So far, nearly 58 crore Jan Dhan bank accounts, 271 billion digital transactions in FY 2025–26, tap water connections in nearly 85 per cent of rural households under the Jal Jeevan Mission, and over 67 crore DigiLocker users together represent a substantial advancement in the condition of ordinary citizens.

The governance challenge now is to ensure that this momentum reaches the remotest tribal and rural regions of the country. Atal Tinkering Labs in schools, which engage students in design thinking, Atal Incubation Centres in Tier-2 and Tier-3 cities, and startups, including women-led enterprises, represent India’s long-term investments in critical skill development and innovation capacity.

India’s DPI as a Global Contribution

The ancient Indian concept of *Vasudhaiva Kutumbakam* (the world is one family) has found a concrete institutional expression in India’s active sharing of its Digital Public Infrastructure (DPI) architecture with the global community. Through the G20 DPI framework, India has helped establish a multilateral foundation for open and interoperable digital governance as a global norm.

The Modular Open-Source Identity Platform (MOSIP), developed drawing upon lessons from the Indian experience, is now deployed in Ethiopia, Morocco, the Philippines, Sri Lanka, and more than a dozen other countries. Similarly, UPI is interoperable with payment systems in Singapore, the UAE, Mauritius, Nepal, and France, with further expansion underway.

This reflects a form of development statecraft rooted in the Indian tradition, where governance knowledge is shared not as an instrument of cultural imposition, but as a voluntarily offered global public good. Ancient India’s contributions to mathematics, medicine, astronomy, and statecraft were never framed as instruments of leverage. They were shared in the spirit of “बहुजन सुखाय, बहुजन हिताय” — for the happiness and welfare of the larger community.

Next Frontier of Ambition

Every governance project of civilisational ambition carries within its achievements the blueprint for its next phase. India’s technology-led development architecture is no exception, and the challenges ahead are best conceived as the coordinates of the next stage of development.

The task of deepening last-mile digital access in low-connectivity and geographically remote regions is becoming a catalyst for developing ever-improving governance solutions. India’s investments in satellite broadband, community Wi-Fi networks, and multipurpose AI systems capable of functioning even without continuous internet connectivity are precisely the kind of frontier innovations that will define the next generation of inclusive digital infrastructure.

The investments required in human capital, particularly in enhancing the digital capacities of elected Panchayat representatives, frontline health and nutrition workers, and rural entrepreneurs, present an opportunity to redefine the meaning of local governance in the 21st century. Programmes that equip Sarpanches to use spatial data for village planning, train ASHA workers to interpret AI-generated health advisories, and help Farmer Producer Organisations participate in ONDC-enabled markets represent investments in a new category of public service.

In this light, the path to *Viksit Bharat 2047* runs through these very challenges. The Bhagavad Gita’s concept of *Lokasamgraha*, meaning action undertaken for the welfare and coherence of the world, offers perhaps the most appropriate philosophical framework for the developmental enterprise India is undertaking.

It represents governance in its deepest sense: the creation of infrastructure through which millions of citizens can realise their capabilities, exercise their rights, and participate in the economy and polity in a dignified manner. □





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Smart Villages as Technology Hubs for Welfare

Smart villages integrate digital infrastructure, institutional reform, and community participation to extend inclusive development beyond urban centres. Using India's digital public goods—BharatNet, CSCs, DBT, eSanjeevani, e-NAM, and MPACS—the model emphasises convergence over connectivity. The country's greater success depends on interoperability, local capacity, and accountable execution within a rights-based governance framework.

K. K. Tripathy
Ananya Arzare

India's development trajectory is intensely intertwined with the transformation of its villages. About 870 million (63 per cent) of India's population are rural and are distributed across 2.70 lakh Gram Panchayats covering 6.5 lakh villages. Agriculture employs close to 45 per cent of the national workforce, and yet welfare delivery

at the village level has remained leaky, slow, and unaccountable for decades.

Understanding Smart Village

The Smart Cities Mission was a necessary intervention for urban rejuvenation. While urbanisation has often been viewed as the primary engine of economic growth, the idea of smart villages has emerged as an

equally compelling concept. Unlike a narrow focus on infrastructure development, smart villages represent a holistic approach to rural development, where technology would generate development momentum by serving as a catalyst for improving quality of life, enhancing livelihood opportunities and ensuring equitable access to essential services. The idea of smart villages aims to reduce rural-urban disparities in the access to healthcare, education, credit and governance.

Rapid advancements in digital technologies offer unparalleled opportunities for rural areas to address age-old development constraints. When a village is equipped with sustained digital connectivity, renewable energy, knowledge access, and institutional capacities, it evolves into a decentralised technology hub capable of delivering efficient and equitable welfare services.

Architecture of a Smart Village

The conceptual architecture of a smart village rests on sustainability, inclusiveness and technological enablement. It is built on interconnected pillars – reliable digital connectivity, clean and affordable energy, robust knowledge infrastructure, and a local economic ecosystem capable of absorbing and

sustaining technological innovation. These pillars align closely with the Sustainable Development Goals framework, which emphasises that lasting transformation depends on convergence across sectors. A smart village is defined not merely by connectivity, but by human agency. Welfare gains emerge when communities possess the institutional capacity to utilise digital tools for governance, healthcare, education, market access, and grievance redressal. This indicates community participation and decentralised governance are foundational for making a village smart. Technology serves as an enabler, while the smart village model strengthens local institutions alongside digital infrastructure, thereby deepening the democratic promise of the 73rd Constitutional Amendment.

Policy Ecosystem in India

India has made significant progress in building a policy architecture that supports the emergence of smart villages as technological hubs. Flagship schemes like Digital India have laid the foundation for rural digital transformation by promoting connectivity, digital literacy, and e-governance. BharatNet has transformed rural connectivity. It has connected over 2.14 lakh Gram

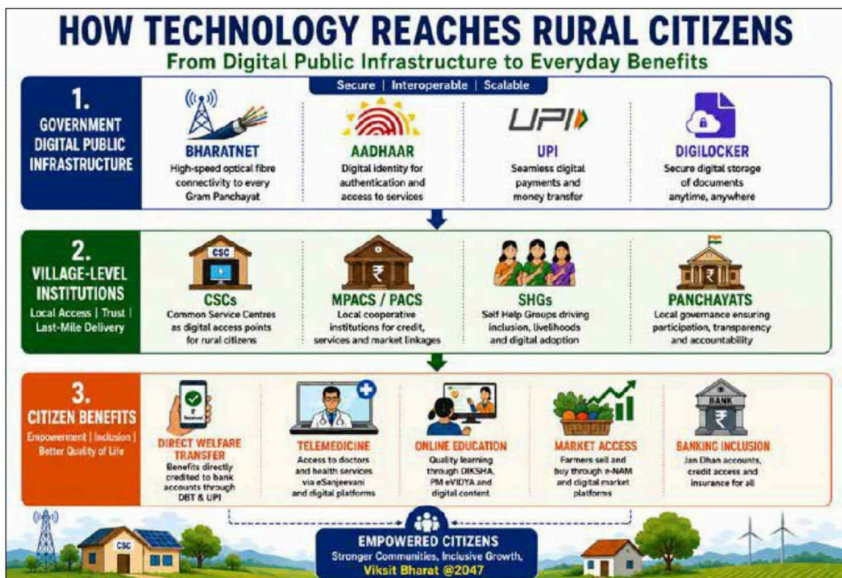


Table 1: Smart Village: Domain-wise Transformative Benefits

Domain	Transformative Benefit
Digital Infrastructure	- Reliable internet connectivity and mobile penetration form the backbone of smart villages. - Institutions such as Common Service Centres (CSCs) act as local access points, enabling citizens to avail digital services ranging from documentation to financial transactions.
E-Governance	- Technology enables seamless delivery of welfare schemes through digital platforms. - Direct Benefit Transfer (DBT) mechanisms reduce leakages, enhance transparency, and ensure timely support to beneficiaries.
Healthcare	- The use of telemedicine has the potential to revolutionise rural healthcare by connecting patients with doctors in urban centres. - Digital health records and remote diagnostics further improve efficiency and accessibility.
Education	- Smart villages facilitate access to online learning resources, digital classrooms, and skill development platforms. - This helps bridge the educational divide and equips rural youth with capabilities relevant to the modern economy.
Livelihoods/ Income	- Technology-driven platforms such as e-NAM provide farmers with access to market information, better price discovery, and broader market linkages. - Precision agriculture, weather forecasting, and digital advisory services further enhance productivity and resilience. - The PM Vishwakarma Scheme of Ministry of MSME, the Government of India has enhanced rural self-employment through digital interventions such as CSC-based enrolment, Aadhaar-enabled verification, online registration, e-vouchers for toolkits worth ₹15,000, digital loan processing, and incentives for adopting digital payments.

Panchayats through 6.93 lakh kilometres of optical fibre, supporting 12.81 lakh Fibre-to-the-Home connections and 1.04 lakh Wi-Fi hotspots by 2025. Rural internet users increased from 115 million in 2015-16 to over 405 million by September 2024, while data costs dropped from Rs. 269 per GB in 2014 to approximately Rs. 8-10 per GB by 2025. The National Broadband Mission 2.0, launched in January 2025, further reinforces this digital trajectory.

Infrastructure development has been further strengthened through programmes like Pradhan Mantri Gram Sadak Yojana and the Saubhagya scheme for rural electrification ensuring physical connectivity and reliable electricity both critical for technology deployment and adoption. The National Rural Livelihoods Mission simultaneously builds the institutional capacity at the community level that technology adoption requires. The Ministry of Electronics and Information Technology and the Ministry of Rural Development are the primary institutional drivers in promoting convergence across

schemes. The emergence of Digital Public Infrastructure encompassing Aadhaar, Unified Payments Interface, and DigiLocker further enabled efficient, transparent and became the backbone of targeted delivery of welfare benefits. Convergence of schemes became an operational imperative where a beneficiary accesses credit through a Primary Agricultural Credit Society (PACS), receives wages through a Jan Dhan account, consults a doctor via eSanjeevani, and sells produce on National Agriculture Market (e-NAM).

Smart Villages as Technology Hubs

The emergence of smart villages as decentralised technology hubs can be examined through five interconnected sub-systems/domains (Table 1). Together, these components create an integrated ecosystem where technology acts as a multiplier of welfare outcomes. The transformation of villages into technology hubs involves the integration of multiple domains:



Turning Farmers into Solar Entrepreneurs – A Success Story from Gujarat



In 2016, a small village in Gujarat introduced a groundbreaking idea that transformed local farmers into renewable-energy entrepreneurs. The Dhundi Solar Energy Producers' Cooperative Society (DSEPCS), supported by the International Water Management Institute (IWMI), became the world's first solar irrigation cooperative. The initiative aimed to address two major rural challenges: unreliable electricity for irrigation and rising farming costs. This brought in rural tech-enabled solar innovation.

Most farmers in the region were small landholders who could not independently afford solar infrastructure. By forming a cooperative, they pooled resources to install six solar pumps with a combined capacity of 56.4 kWp. The cooperative signed a 25-year Power Purchase Agreement (PPA) with Madhya Gujarat Vij Company Limited (MGVCL), allowing members to sell surplus electricity to the grid at a fixed rate. This facilitated establishment of a collaborative clean-energy infrastructure.

The project created a dual-income model: farmers used solar power for irrigation while earning additional revenue through energy sales. It also reduced dependence on diesel pumps, lowered operational costs, and ensured a more reliable daytime power supply. Initially, farmers were hesitant due to high installation costs and unfamiliarity with solar technology. However, training, pilot demonstrations, and institutional support gradually built confidence. This indicated that smart energy, collective efforts can ensure sustainable income.

Innovation has driven transformation in Dhundi. The Dhundi model highlights how cooperative structures, technological innovation, and strategic partnerships can create sustainable rural business ecosystems while contributing to clean energy goals.

CSCs have institutionalised last-mile digital access, with 5.34 lakh centres operational by April 2025, including 4.17 lakh in rural India. These centres deliver Aadhaar, banking, insurance, crop insurance, and e-governance services. The DBT architecture, powered by the JAM trinity, expanded beneficiary coverage from 11 crore in 2013 to 176 crore in 2024, generating cumulative savings of Rs. 3.48 lakh crore. Under Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), 98 per cent of wages are transferred on time, while DBT accountability has saved Rs. 42,534 crores. The Public Distribution System alone recorded savings of Rs. 1.85 lakh crore through technology-enabled targeting.

In rural healthcare, the eSanjeevani under Ayushman Bharat linked 1.76 lakh Ayushman Arogya Mandirs with district and tertiary hospitals, facilitating nearly 372 million teleconsultations by mid-2025, through over 2.30 lakh providers. Women account for more than 57 per cent of users, indicating reduced mobility barriers in rural healthcare access. Educational digital platforms like Digital Infrastructure for Knowledge Sharing (DIKSHA) and PM eVIDYA, alongside Pradhan Mantri Gramin Digital Saksharta Abhiyan, have expanded digital learning with Pradhan Mantri Gramin Digital Saksharta Abhiyan training 6.39 crore rural citizens by March 2024. Meanwhile, e-NAM integrated 1,389 mandis and registered 1.78 crore

farmers and 2.62 lakh traders, with trade volumes rising from Rs. 34,940 crores in 2019-20 to Rs. 78,424 crores in 2023-24.

Cooperatives and Community Institutions

Primary Agricultural Credit Societies (PACS), serving over 16 crore farmer-members are critical intermediaries between digital infrastructure and rural adoption. Beyond credit delivery, they increasingly function as agricultural aggregators, and digital service centres. Their transformation into Multipurpose PACS (MPACS), enabled by revised model bye-laws permitting over 25 business activities, marks a major cooperative sector reform. Under the *Sahkar se Samridhhi* vision, the Government targets 2 lakh multipurpose cooperatives at the panchayat level by 2027. By April 2025, 19,619 MPACS had been registered, while 31 States and UTs have adopted the model bye-laws. Simultaneously, 67,930 PACS across 30 States and UTs have been approved for computerisation with Rs. 865.81 crore in support. Integrated into the Cooperative Stack ecosystem, PACS are evolving into decentralised, community-owned technology hubs delivering DBT services, Banking, and telemedicine, backed by deep reservoirs of local trust. A case in point is ensuring smart energy solutions for community development through cooperation.

Challenges and Constraints

Despite notable progress, smart villages continue to face major constraints. The digital divide – across gender, geography, age, caste, and income, remains significant. Rural women are particularly disadvantaged by low smartphone ownership, limited digital literacy, mobility restrictions and gendered social norms. Only 38 per cent of Indian households are considered digitally literate. Pratham's Annual Status of Education Report (ASER) findings highlight a persistent digital gender divide in rural India, where girls continue to lag behind boys in smartphone ownership, digital access, and online skills. The report found that only 26.9 per cent of girls owned smartphones compared to 36.2 per cent of boys, reflecting unequal access to digital opportunities and learning resources.

BharatNet also faces persistent last-mile connectivity and maintenance challenges while fragmented welfare architecture requires citizens to navigate multiple portals and grievance systems for schemes viz. Pradhan Mantri Kisan Samman Nidhi, Pradhan Mantri Fasal Bima Yojana and MGNREGS. At the same time, rural data

privacy frameworks remain underdeveloped, and the financial sustainability of CSCs in low-demand areas continues to require policy support.

Addressing these challenges requires a multi-pronged coordinated investment in infrastructure, institutional reform, and community empowerment. National Broadband Mission 2.0 provides a renewed institutional framework, but success will depend on reliable connectivity, improved service quality in remote regions, and satellite solutions where fibre deployment is unviable. Digital literacy should be prioritised alongside infrastructure. ASHAs, anganwadi workers, Self-Help Group (SHG) leaders, and PACS can serve as effective last-mile digital facilitators when supported with appropriate remuneration and training.

The Way Ahead

Scheme convergence must become operational rather than aspirational. The MPACS model bye-laws provide a framework for integrating credit, inputs, digital services, and market access within community institutions. The PM Dhan-Dhaanya Krishi Yojana, and Agri-Stack with the MPACS reflects this shift. Public-private-community partnerships in agri-tech, ed-tech, and digital health, supported by open platforms like Open Network for Digital Commerce and Ayushman Bharat Digital Mission, can further deepen rural innovation. Within the *Viksit Bharat@2047* vision, smart villages are not ancillary to development.

The smart village idea seeks to ensure that the benefits of the digital economy – good governance, education, healthcare, market access, and financial inclusion extend equitably beyond urban India. Over the past decade, India has created a substantial policy ecosystem through BharatNet, CSCs, DBT, eSanjeevani, e-NAM and MPACS framework. The central challenge now is convergence, ensuring these systems work together in tandem seamlessly at the village level. Former President of India APJ Abdul Kalam's Provision of Urban Amenities in Rural Areas vision recognised that isolated connectivity cannot create sustainable development ecosystems. Smart villages, built on community participation, digital public infrastructure, and trusted local institutions viz. MPACS and SHGs, offer a practical pathway towards national progress. If effectively implemented, smart villages can not only bridge the rural-urban divide but also position rural India as a key driver of *Viksit Bharat*. □





FinTech, Financial Inclusion and Rural Welfare

Financial inclusion forms the bedrock of equitable growth and rural welfare in India. Operationalising the “Trust–Technology–Transformation” framework, FinTech innovations such as microcredit and digital lending are dismantling traditional barriers and empowering underserved communities. However, addressing persistent gaps in digital literacy, connectivity and financial awareness remains imperative. Ultimately, a robust digital financial ecosystem can accelerate socio-economic empowerment, deepen financial inclusion and drive sustainable development across rural India.

Dr. Amiya Kumar Mohapatra

Financial inclusion has been regarded for long time as the cornerstone of inclusive development in emerging economies, particularly in India, where equitable growth remains a cardinal policy priority. At its core, development is increasingly understood not merely in terms of income expansion and livelihood support but as the enlargement of citizens’ choices and capabilities, reflecting a people-centric governance approach that places individuals at the heart of policy design and implementation.

In this context, keeping people at the centre of the

development agenda becomes essential for ensuring that economic progress translates into meaningful socio-economic and human development outcomes. Development becomes meaningful only when its benefits reach and remain accessible to all sections of society, especially vulnerable and rural masses.

If a substantial proportion of the rural population remains outside the formal financial system, then growth cannot be considered truly inclusive. Financial inclusion is the process of ensuring access to financial services, with timely, adequate and affordable credit - primarily for vulnerable groups such as weaker sections, low-income groups and underserved areas.

It therefore constitutes the foundation of equitable and holistic development, as it enables access to essential financial services such as savings, credit, insurance, pensions, and digital payments in ways that enhance human dignity, financial security, economic participation and overall well being.

FinTech and Financial Inclusion

In this context, FinTech has emerged as a transformative enabler of financial inclusion, particularly in rural and underserved regions. It has reshaped financial service delivery by reducing dependence on traditional branch-based banking and replacing it with faster, transparent and more accessible digital systems. Services that were earlier limited to urban populations are now increasingly reaching farmers, women, small traders, migrant workers, and rural households.

In India, initiatives such as the Pradhan Mantri Jan Dhan Yojana (PMJDY) have expanded access to banking, but meaningful inclusion depends on usage rather than mere account ownership. FinTech has emerged as a transformative force in driving financial inclusion by converting passive access into active and meaningful

financial participation through digital platforms. It has significantly expanded reach, simplified financial engagement, and empowered even rural users to confidently participate in formal financial systems with greater ease, speed, and trust.

Digital innovations such as UPI, Aadhaar-enabled Payment System (AePS), mobile banking, QR-code payments, digital wallets, and Direct Benefit Transfers (DBTs) etc. have significantly improved last-mile financial access and availability. India's digital ecosystem, driven by the JAM Trinity (Jan Dhan-Aadhaar-Mobile), has strengthened the infrastructure of inclusion, and reshaping rural financial behaviour and integrated millions of previously excluded citizens into the formal financial system.

Government Initiatives and Outcomes

The Government of India has undertaken several initiatives for augmenting financial inclusion and strengthening fintech ecosystems. Initiatives such as Pradhan Mantri Jan Dhan Yojana (PMJDY), Direct Benefit Transfer (DBT), and the JAM Trinity have especially strengthened the digital financial ecosystem and smoothen the FinTech pathways in India.

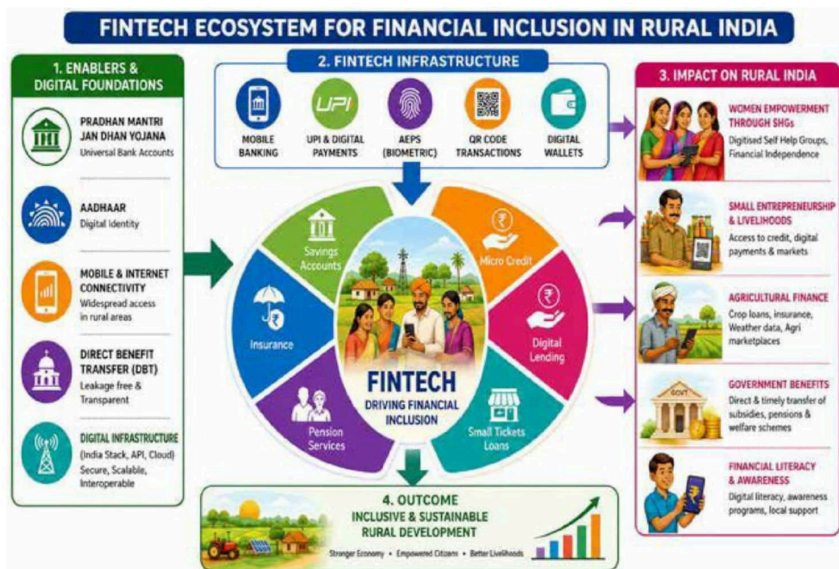


Table 1: Impact and Outcomes of Government-led Financial Inclusion Initiatives

Initiatives	Concepts / Objectives	Achievement / Outcome
JAM Trinity (Jan Dhan-Aadhaar-Mobile)	The JAM Trinity integrates universal bank accounts, biometric identity and mobile connectivity to provide every citizen with a unique financial identity and direct access to financial and welfare services. It seeks to eliminate geographical barriers and strengthen financial inclusion.	- As of March 2026, over 144 crore Aadhaar numbers have been generated for secure authentication. - Jan Dhan accounts have grown to 58.16 crore (As of 29 April 2026) from 14.72 crore in 2015, with cumulative deposits totalling ₹3.02 lakh crore (As of 29 April 2026), bringing the unbanked into the formal economy. - Mobile connectivity completes the triangle, with 125.87 crore wireless telephone subscribers and 5G mobile services covering 99.9% of districts, covering 85% of the population.
Unified Payments Interface (UPI)	UPI is a real-time payment system that enables for instant money transfers between bank accounts via mobile platforms. It aims to democratise digital payments by offering a low-cost, interoperable, and secure experience for both small merchants and individual users.	- In March 2026, approx. ₹29.53 lakh crore worth of 2,264.11 crore UPI transactions were carried out on the Unified Payment Interface (UPI). - With 691 banks live on the platform, it accounts for nearly 81% of total retail payment volume in India, becoming the primary digital rail for both person-to-person and person-to-merchant payments.
Direct Benefit Transfer (DBT)	DBT facilitates the direct transfer of government subsidies and welfare benefits into beneficiaries' bank accounts to improve transparency and efficiency by eliminating intermediaries, leakages, and delays in delivery.	- The system has transferred a cumulative ₹49.09 lakh crore directly to citizens as of January 2026. - By eliminating duplicate and fake beneficiaries, it has saved the government over ₹4.31 lakh crore.
BHASHINI	The initiative aims at promoting financial inclusion across India's diverse linguistic landscape by providing multilingual access to banking services.	- By providing in all 22 scheduled Indian language, thus removing literacy and language barriers. - By providing AI-powered solutions for communication and service delivery, it ensures that all citizens, regardless of language, can access essential services and information effectively.
RBI Regulatory Sandbox	The Reserve Bank of India (RBI) introduced the Enabling Framework for Regulatory Sandbox (RS), to foster responsible innovation, enhance efficiency, and benefit consumers in the fintech sector.	It has enabled ongoing experimentation and adoption of new financial technologies, achieved improved regulatory oversight and consumer protection, and is expected to further strengthen financial stability, innovation, and inclusive digital finance in the future.

Source: Compiled from: www.pib.gov.in/PressNoteDetails

FinTech Ecosystem and Financial Inclusion

The figure on comprehensive 'FinTech Ecosystem' supporting financial inclusion in rural India. It highlights how PMJDY, Aadhaar, mobile connectivity, and digital infrastructure enable mobile banking, UPI, QR-based transactions, and digital wallets, thereby expanding access to formal financial services and promoting inclusive growth.

FinTech has transformed the rural credit landscape by addressing long-standing challenges of affordable and timely credit access for rural households, small entrepreneurs, and micro businesses. Through micro-credit, digital lending platforms and the digitisation of Self-Help Groups (SHGs), access to affordable and timely credit in rural India has improved significantly. Digital lending platforms are replacing traditional barriers such

as paperwork, collateral requirements, and slow approvals through technology-based credit assessment, by reducing the dependence on informal high-interest lenders.

Digital lending platforms can assess transaction records, mobile usage patterns, repayment behaviour, and online activity to evaluate creditworthiness quickly and efficiently. This has significantly broadened access to credit for individuals without established formal credit histories, especially in rural and underserved regions. In addition, FinTech start-ups are helping to solve the rural credit gap and strengthening last mile delivery. By introducing technology-led solutions, artificial intelligence and mobile-based platforms, they are enhancing financial access, creating a more efficient, transparent, and inclusive rural credit ecosystem in India.

Trust-Technology-Transformation (T3) Framework

The emerging transformation in rural India can be understood through the Trust–Technology–Transformation (T3) Framework, which posits that ‘trust’ encourages adoption and usage, ‘technology’ enables access and ‘transformation’ leads to meaningful socio-economic empowerment.

The rapid growth of the FinTech sector strongly reinforces this framework by expanding access to digital financial services and strengthening trust in formal financial systems through secure, transparent, and efficient platforms. By enabling seamless digital payments, mobile banking, and access to credit, FinTech is directly improving rural livelihoods, enhancing income-generating opportunities, and fostering entrepreneurship. Collectively, these developments are accelerating deeper financial inclusion and driving sustainable socio-economic transformation and empowerment.

Opportunity for Improvement

Financial inclusion is meaningful only when people actively utilise the financial services for savings, transactions, credit, and financial security. While FinTech has significantly improved access, trust, transparency, and efficiency in rural India, its full potential is still constrained by some persistent challenges.

In certain cases, limited digital literacy restricts the confident use of digital financial tools, while growing concerns around online fraud and data privacy reduce user trust in digital platforms. In addition, infrastructural limitations like poor internet connectivity, irregular electricity supply, and inadequate digital support

systems further hinder effective adoption and usage. The digital divide across age, income, and education groups also remains significant, with elderly individuals, less educated users, and economically weaker households facing greater difficulties in adapting to digital finance.

Despite these challenges, FinTech remains a powerful driver of rural transformation by improving access to finance, enabling faster credit delivery, supporting women farmers and artisans, and strengthening direct benefit transfers, thereby contributing to a more inclusive and empowered rural economy.

The Way Forward

India's financial inclusion journey is progressively moving from expanding access to enabling intelligent, AI-driven financial empowerment. With the support of advanced analytics, alternative data, and robust Digital Public Infrastructure (DPI), the focus is shifting toward deeper credit penetration, improved risk management, and stronger consumer protection. This evolving ecosystem, shaped by collaboration among regulators, financial institutions, and FinTech firms, is building a more transparent, efficient, and inclusive financial system. In this context, FinTech is not only enhancing access to financial services but also strengthening economic participation, financial independence, and inclusive growth, especially in rural India.

The convergence of PMJDY, Aadhaar, UPI, and expanding mobile connectivity has significantly transformed rural financial access by bringing millions into the formal financial system. However, this progress requires continued strengthening to achieve its full developmental potential. The next phase must go beyond technological diffusion toward deeper economic empowerment. Sustained government support, active citizen participation, and stronger institutional engagement are essential to reinforce trust, financial literacy, and last-mile inclusion. In addition, improved rural-urban financial linkages and integrated digital ecosystems are crucial for reducing disparities and enhancing system efficiency.

In this evolving landscape, India's economy among the fastest-growing globally, continues to be strengthened by FinTech-driven financial inclusion rooted in “*Sabka Saath, Sabka Vikas*”, paving the way for a digitally empowered, financially inclusive and self-reliant ‘*Viksit Bharat 2047 vision*, characterised by shared prosperity and sustainable well-being. □





AgriTech and Climate Resilient Technologies for Farmer Welfare

AgriTech and Climate Tech are emerging as transformative tools for enhancing farmer welfare, ensuring food security and strengthening climate resilience. These technologies integrate digital innovation, scientific advancements and climate-smart practices to improve productivity, optimise resource use, and promote environmental sustainability. AgriTech and climate-resilient technologies are reshaping Indian agriculture into a more adaptive, inclusive, and sustainable sector by enabling data-driven decision-making, strengthening Agricultural Value chains, and promoting climate-resilient farming systems. As a result, Farmers are better equipped to manage risk, enhance incomes and adopt to the growing challenges posed by climate change.

Dr. H.L. Sharma
Dr. Shyam Lal

Agriculture plays a pivotal role in the Indian economy, contributing significantly to national income, employment generation, foreign exchange earnings, and rural development. In 2024–25, the agriculture and allied sectors accounted for nearly 18 per cent of the country's Gross Value Added (GVA) and provided livelihood support to more than 46 per cent of the population.

The sector has witnessed substantial growth over the years, with its GVA increasing more than threefold, from ₹15.02 lakh crore in 2011–12 to ₹53.9 lakh crore in 2024–25 (Table 1). Although the relative share of agriculture in the economy has declined over time due to the rapid growth of the industrial and services sectors, it remains central to India's socio-economic structure by ensuring food security, sustaining rural livelihoods, and fostering inclusive growth.

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Table 1: Sector Wise Gross Value Added at Current Prices (₹ Lakh Crore)

Year	Agriculture & Allied Sector	Non-Agricultural Sector	Total GVA
2011–12	15.0	66.1	81.1
2012–13	16.8	75.3	92.0
2013–14	19.3	84.4	103.6
2014–15	20.9	94.1	115.1
2015–16	22.3	103.5	125.8
2016–17	25.2	114.5	139.7
2017–18	24.6	126.8	151.4
2018–19	30.3	141.5	171.8
2019–20	33.7	150.1	183.8
2020–21	37.1	145.1	182.1
2021–22	41.0	175.4	216.4
2022–23	44.5	202.0	246.5
2023–24	48.8	225.4	274.1
2024–25	53.9	246.3	300.2

Source: National Statistics Office, MoSPI, Statistical Report on Value of Output from Agriculture and Allied Sectors, June 2025

Need for AgriTech and Climate-Resilient Technologies

Indian agriculture is undergoing a structural transformation driven by climate change and the rising demand for food security. Increasing temperatures, erratic rainfall, frequent droughts, floods, soil degradation, and shrinking landholdings are posing serious challenges to agricultural sustainability and rural livelihoods. These challenges require innovative, technology-enabled solutions to build a more resilient and efficient agricultural system. The convergence of AgriTech and Climate Tech offers a strategic pathway for sustainable farming by enabling efficient resource use, reducing production risks, and supporting data-driven decision-making through digital and climate-responsive innovations.

Major AgriTech and Climate-Resilient Technological Interventions

India's agricultural landscape has been undergoing a rapid technological transformation through a wide range of AgriTech and Climate Tech interventions. These innovations are enhancing agricultural productivity, improving resource-use efficiency, strengthening climate resilience, and empowering farmers with real-time, data-driven solutions for informed decision-making.

• Precision Farming and IoT-Based Smart Agriculture

Precision agriculture and Internet of Things (IoT)-based smart farming represent a transformative shift towards data-driven and technology-enabled agricultural practices. These systems integrate advanced technologies such as GPS, drones, sensors, satellite imagery, artificial intelligence, and automated monitoring tools to facilitate real-time tracking of soil health, crop growth, pest incidences, weather variability, and livestock management.

Major applications include smart irrigation systems, drone-based crop monitoring, soil moisture sensors, and AI-enabled forecasting and decision-support platforms. By enabling optimisation of critical agricultural inputs such as water, fertilizers, and pesticides, these technologies help reduce production costs, enhance productivity, strengthen climate resilience, and promote environmentally sustainable farming practices.

• Climate-Smart Agriculture Technologies (CSAT)

In the wake of increasing climate variability and extreme weather conditions, Climate-Smart Agriculture Technologies (CSAT) have emerged as a critical approach for ensuring sustainable agricultural development. These technologies focus on enhancing productivity, resilience and reducing green house gas emission. Key practices such as crop diversification, agroforestry, conservation agriculture, organic farming, zero tillage, integrated nutrient management, and efficient water-use practices improve soil health and farm sustainability.

• Weather Forecasting and Agro-Advisory Services

Weather forecasting and agro-advisory services, supported by satellite remote sensing and geospatial technologies, have become essential tools for risk-informed farming. High-resolution data on weather patterns, soil conditions, and crop health enable the generation of location-specific and timely advisories for farmers. These services support timely decision-making related to sowing, irrigation, fertilization, pest control, and harvesting, thereby minimising pest outbreaks and climate-related risks.

• Disaster Preparedness and Early Warning Systems

Disaster preparedness and early warning systems have become indispensable in rural India due to the increasing frequency and intensity of natural



disasters caused by climate change and environmental degradation. Advanced technologies such as remote sensing and GIS-based platforms and digital monitoring systems enable timely warnings for floods, droughts, cyclones, landslides, and other climate-related hazards. These early warning systems help governments, local authorities, and farming communities receive timely alerts, undertake preventive measures, and respond rapidly during emergencies. As a result, they minimise loss of life, reduce crop and livestock damage, protect rural infrastructure, and ensure faster restoration of agricultural livelihoods and rural economic stability.

- Artificial Intelligence and Digital Advisory Systems in Agriculture**

Artificial Intelligence (AI) is playing a transformative role across the agricultural value chain, from production to marketing. AI-enabled systems support crop planning, yield estimation, and risk management through predictive analytics. In agricultural marketing, AI enhances price discovery, demand forecasting, supply chain efficiency, and quality assessment, thereby improving transparency and ensuring better returns for farmers. AI-driven digital platforms also facilitate direct linkages between farmers and buyers, reduce intermediaries, promote standardised grading systems, and provide real-time market information for informed decision-making and improved market access.

Government Initiatives

The Government of India has launched several initiatives to promote AgriTech and Climate-Smart Agriculture with the objective of enhancing agricultural productivity, ensuring environmental sustainability, strengthening climate resilience, and improving farmers' welfare.



The **National Mission for Sustainable Agriculture (NMSA)**, launched in 2014-15, aims to make Indian agriculture more resilient, eco-friendly, and productive, particularly in rain-fed regions. The Mission adopts a holistic approach to sustainable agricultural development by integrating water-use efficiency, soil health management, and climate-resilient farming practices.

The **National Innovations in Climate Resilient Agriculture (NICRA)**, launched in 2011 by the Indian Council of Agricultural Research (ICAR) as a flagship programme, focuses on promoting climate-resilient technologies through strategic research, technology demonstrations, and capacity-building initiatives in climate-vulnerable districts. It supports adaptation measures such as seed banks, fodder banks, and custom hiring centres to strengthen farmers' adaptive capacity and livelihood security. Since its inception, NICRA has made significant progress, including the development of around 3,000 climate-resilient crop varieties and the establishment of 448 Climate-Resilient Villages (CRVs) across the country between 2014 and 2025.

The **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)**, launched on 1 July 2015, aims to ensure irrigation access for every farm under the vision of "Har Khet Ko Pani" and improve water-use efficiency through "More Crop Per Drop". The scheme promotes micro-irrigation technologies such as drip and sprinkler systems, along with watershed development and rainwater harvesting initiative. Since 2015–16, approximately 109 lakh hectares of agricultural land have been brought under micro-irrigation with central assistance of ₹26,325 crore, contributing significantly to improve irrigation efficiency and water conservation.

The Soil Health Card Scheme, launched on 19 February 2015, seeks to promote balanced and judicious use of fertilizers for improving soil productivity and long-term sustainability. Under this scheme, farmers are provided with detailed information about the nutrient status of their soil along with scientific recommendations for balanced fertilizer application.

In 2023, the scheme was further strengthened through a GIS-integrated digital platform for spatial mapping of

soil health data. Since its launch and up to 31 March 2026, more than 25.79 crore Soil Health Cards had been issued and 11,531 soil testing laboratories established across the country, making it one of the largest soil health monitoring initiatives in the world.

Among the most significant recent interventions, the **Digital Agriculture Mission** launched on September 2, 2024, with an outlay of ₹2,817 crore, marks a transformative step towards building a robust digital ecosystem in Indian agriculture. The Mission promotes the adoption of advanced technologies such as satellite imaging, remote sensing, Geographic Information Systems (GIS), drones, Internet of Things (IoT), and Artificial Intelligence (AI)-based solutions. It emphasises the development of GIS-based digital land records, farmer registries, and digital crop surveys to improve resource efficiency and strengthen climate-resilient agricultural systems. As per the Ministry of Agriculture & Farmers Welfare, more than 9.20 crore Farmer IDs had been generated across the country up to 19 March 2026.

Government Digital Agriculture Platforms

The Government of India has launched several digital platforms and mobile applications to empower farmers through improved access to markets, weather forecasts, and real-time advisory services. The Electronic National Agriculture Market (e-NAM), launched on 14 April 2016, integrates APMCs across the country into a unified digital trading platform, enabling transparent online trading, digital bidding, and direct payments while reducing transaction cost and market inefficiencies.

As of 28 February 2026, e-NAM had integrated 1,656 mandis across 23 States and 4 Union Territories. Around 1.80 crore farmers, 2.72 lakh traders and over 4,724 Farmer Producer Organizations (FPOs) registered on the platform, facilitating trade worth more than ₹4.82 lakh crore since its inception.

Complementing this initiative, the Kisan Suvidha App and mKisan platform provide farmers with real-time information on weather, market prices, crop protection, insurance schemes, pest management, and expert advisories through mobile and SMS-based services. Collectively, these digital initiatives are promoting data-driven, efficient, and climate-resilient agriculture by enabling informed decision-making and improving market access for farmers.

The Challenges and Way Forward

The integration of AgriTech and Climate Tech is transforming Indian agriculture from a subsistence-based system into a more scientific, market-oriented, and climate-resilient sector. However, challenges such as the digital divide, inadequate infrastructure, affordability constraints, data privacy concerns and weak institutional coordination continue to limit their large-scale adoption.

Addressing these issues requires stronger public-private partnerships, supportive policy frameworks, and continuous technological innovation. Improving rural connectivity, digital literacy, and farmer-centric institutions such as Krishi Vigyan Kendras (KVKs) and Farmer Producer Organizations (FPOs) is essential for expanding access to modern technologies.

Greater investment in agricultural research, climate-resilient infrastructure, institutional credit, crop insurance, and climate-risk financing can further strengthen resilience. In addition, strengthening value chains through better storage, processing and market linkages, together with integration of traditional knowledge modern science, will ensure inclusive growth, and sustainable farming, and stable rural livelihoods.

Conclusion

AgriTech and Climate Tech are transforming agriculture into a more resilient, sustainable, and efficient sector. Climate-smart and resource-efficient practices such as precision farming, digital advisory systems, and renewable energy solutions have significant potential to improve farmer welfare and strengthen rural resilience.

However, challenges such as the digital divide, infrastructure gaps, affordability constraints, and uneven technology access must be addressed through stronger rural connectivity, institutional support, farmer-centric policies, and inclusive innovation ecosystems with sustained investment, supportive policies and wider technology adoption, India can build a future ready agricultural system that ensures food security, environmental sustainability, and long-term social and climate resilience. In essence, the convergence of AgriTech and Climate Tech offers an immense potential for farmer welfare and sustainable agricultural transformation in India. □





HealthTech : Bridging the Last Mile

Bridging rural India's health divide requires moving beyond physical infrastructure toward an integrated digital ecosystem. While foundational initiatives like ABDM and eSanjeevani offer unprecedented reach, last-mile execution faces structural gaps in utilization and digital literacy. Integrating purpose-built HealthTech, AI diagnostics, and continuous monitoring tools into frontline workflows is crucial. Success hinges on an explicit equity mandate that transforms digital architecture into sustainable healthcare delivery for the underserved.

Urvashi Prasad
Sneha Chetri
Vishakha Sharma

India's rural health challenge does not have a single face. It is the undetected tuberculosis case in a remote hamlet in Jharkhand. It is the diabetic patient in Uttar Pradesh who has never seen a specialist. It is the pregnant woman in Assam who

begins labour far from a facility capable of managing complications. These are not isolated gaps, they are structural ones, reproduced across geographies that India's health system has consistently struggled to reach. The question that HealthTech now forces us to confront is whether digital infrastructure can do what

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physical infrastructure alone has not deliver quality care reliably, equitably, and at scale to the last mile.

This article uses maternal health as the primary lens because maternal mortality is among the most sensitive indicators of a health system's equity, and because the gaps it exposes apply equally to primary care for chronic disease, infectious disease, and reproductive health across rural India. India's Maternal Mortality Ratio (MMR) has declined from 254 per 1,00,000 live births in 2004-06 to 88 in 2021-23, still above the global SDG target of fewer than 70 by 2030, and still concealing stark state-level disparities. Aggregate progress without disaggregated equity is an incomplete victory.

The Challenges Rural Maternal Care Continues to Face

India has a functioning Janani Suraksha Yojana, a network of over 30,000 Primary Health Centres, and an ASHA workforce of over one million. The National Family Health Survey-5 (NFHS-5) records 88.6 per cent of deliveries nationally as institutional – a substantial improvement. Yet three structural gaps persist: quality within institutions (a facility's presence does not guarantee skilled care or functioning equipment); deep geographic disparities (Nagaland records under 50 per cent institutional delivery; within states, rural tribal women lag further still); and information asymmetry (neither the patient nor her health worker typically has real-time clinical decision support). These are the gaps that digital health infrastructure, if designed with equity at its core, has genuine potential to close.

The Ayushman Bharat Digital Mission: Building the Foundation

The Ayushman Bharat Digital Mission (ABDM), launched nationally on 27 September 2021, represents India's most ambitious attempt to create an interoperable digital health ecosystem. At its centre is the Ayushman Bharat Health Account (ABHA) a unique 14-digit health identifier that allows individuals to link and share their health records across providers. As of late 2025, over 81 crore ABHA IDs have been created, with the Health Facility Registry and Healthcare Professionals Registry building out the complementary architecture.

For rural maternal care, the significance is concrete. A pregnant woman moving from sub-centre to Community Health Centre to district hospital has historically arrived at each facility as a stranger - records lost, histories reconstructed from memory,

prior complications invisible to the next provider. ABHA changes this her antenatal history, risk flags, and investigations follow her across the referral chain in real time.

The caveat is implementation depth. ABDM's potential depends on facility-level adoption and readiness in rural India remains uneven. Health Information Systems must be integrated, frontline workers trained, and connectivity maintained. The federated architecture is sound; the execution challenge lies at the last mile, where the stakes are the highest.

Pradhan Mantri Jan Arogya Yojana (PM-JAY) which provides up to ₹5 lakh in annual cashless hospitalisation cover to 55 crore beneficiaries across 12 crore families, sits alongside ABDM as the financial architecture of universal healthcare. Yet entitlement alone does not convert to utilisation: a peer-reviewed study in rural Bihar found PM-JAY awareness at 68.6 per cent among eligible participants, but actual utilisation at just 1.3 per cent (Cureus, 2023). ABHA bridges this gap by linking entitlement to a portable digital record, while the Health Claim Exchange (HCX) automates claim processing so that smaller, rural-empanelled facilities remain economically viable.

eSanjeevani: Telemedicine at Public Scale

India's eSanjeevani platform has achieved something genuinely notable: a government-built telemedicine service that scaled to more than 430 million consultations as of November 2025, handling 0.4 to 0.45 million consultations a day is the world's largest documented primary-care telemedicine implementation. Two modalities serve rural care: eSanjeevani AB-HWC connects Ayushman Arogya Mandirs to specialist hubs through a hub-and-spoke model, enabling provider-to-provider consultation; eSanjeevani OPD allows direct patient access from anywhere. Over 93 per cent of usage flows through the AB-HWC model a provider-assisted design for populations with limited digital literacy with women and adults aged 25-45 as the highest users.

For maternal care, the implications are direct. An ASHA accompanying a high-risk pregnant woman can now initiate a specialist teleconsultation rather than face a choice between inaction and an arduous referral journey. Obstetricians at district hospitals can triage remotely, advise on danger signs, and determine whether





emergency transfer is warranted before the patient has moved. This is not a replacement for in-person obstetric care; it is a triage layer that extends specialist reach into geographies where specialists do not live.

Tamil Nadu, Andhra Pradesh, Uttar Pradesh, Madhya Pradesh, and Karnataka collectively account for nearly 70 per cent of total eSanjeevani consultations. Yet a community study in Karnataka found awareness of eSanjeevani at just 2.2 per cent of rural residents, with 82.5 per cent of those unwilling to use it citing unfamiliarity, even as 56 per cent said they would try it if introduced (Indian Journal of Community Medicine, 2024). Embedding eSanjeevani explicitly into antenatal care pathways and deploying ASHAs as the bridge to digital access is the next critical step.

Case Study: Janitri and the Case for Continuous Monitoring

The story of Janitri Innovations illustrates what purpose-built HealthTech for maternal care can look like in practice. Founded in 2016, the Bengaluru-based company developed Keyar - a wearable, AI-powered foetal heart rate and uterine contraction monitor designed for low-resource settings. Unlike conventional cardiotocography (CTG) machines, which require trained technicians to interpret and can cost more than a lakh of rupees, Keyar is designed to be operated by an ANM or nurse, with automated risk categorisation that flags foetal distress in real time.

Deployed in government health facilities across Karnataka and Rajasthan, Keyar's impact has been most visible in reducing delayed recognition of foetal distress – a leading cause of preventable perinatal deaths. In facilities where waiting time for a manual CTG could stretch to hours, automated continuous monitoring allowed clinical staff to identify deterioration early and act promptly. Nurses at peripheral hospitals describe the shift not merely as technological but as a restoration of confidence, they no longer feel they are managing high-risk labour without clinical backup.

Janitri's model stands out for being designed from the outset for integration with public health systems rather than as a private-sector premium product. Its focus on appropriate technology, accessible pricing, and HMIS compatibility offers a valuable template for the maternal HealthTech ecosystem.

AI-Based Diagnostics: Promise and Precaution

Beyond telemedicine and monitoring, AI is entering rural diagnostics across multiple conditions. Qure.ai's chest X-ray tool, deployed in Telangana, Maharashtra, Karnataka, Goa, and at the Maha Kumbh, flags tuberculosis without specialist radiologists and has been validated by the Government of India Health Technology Assessment as both clinically effective and cost-saving. AI-powered devices like AiSteth, which analyses heart and lung sounds through machine learning, and Niramai's Thermalytix, which uses radiation-free thermal imaging for early breast cancer detection, are designed precisely for specialist-absent settings. Pfizer's INDovation 2025 Deployment Track places regulator-approved screening startups under Ayushman Arogya Mandirs to generate real-world evidence. In maternal care, India-based research in partnership with the Translational Health Science and Technology Institute, Faridabad, is developing AI-guided point-of-care ultrasound protocols enabling non-specialist staff to conduct reliable foetal assessments.

National Health Mission's (NHM) Anaemia Mukh Bharat programme has rolled out digital point-of-care haemoglobin testing at sub-centres and Ayushman Arogya Mandirs, targeting a condition affecting over 52 per cent of pregnant women in India. AI-based smartphone tools for non-invasive anaemia screening are now being piloted in India, with potential to extend screening to community level without laboratory infrastructure.

Caution is warranted, however. AI diagnostic tools trained predominantly on urban or high-income datasets can perform poorly in rural settings where patient demographics, imaging quality, and disease presentation differ. Equity in AI requires equity in training data, a principle India's regulatory frameworks are beginning to articulate. The National Health Authority's sandbox framework and the Digital Health Incentive Scheme provide useful scaffolding, but clear performance benchmarking requirements for AI tools in public maternal care facilities remain a gap.

Integration, the Human Layer, and Adoption as the Real Multiplier

Across all three domains, digital health infrastructure, telemedicine, and AI diagnostics – the common thread is integration with India's public health system. Point solutions that operate outside public infrastructure will reach relatively small numbers. The transformation rural care demands embedding digital tools within the Ayushman Arogya Mandir network, within NHM protocols, and within the ASHA and ANM workflows that already reach the last mile.

This is where Social and Behaviour Change Communication (SBCC) becomes indispensable. India's community workforce – over one million ASHAs and 1.4 million Anganwadi workers is the world's largest last-mile health delivery network, and the single largest source of PM-JAY awareness in rural communities. Equipping these workers with ABHA-linked devices,

vernacular decision-support tools, and the capacity to initiate eSanjeevani consultations converts every household visit into a verified digital touchpoint.

This integration demands procurement frameworks that favour interoperability; training investments that build digital literacy among frontline workers; and accountability mechanisms that track equity outcomes not just aggregate volumes. Government procurement and NHM state programme plans must explicitly budget for rural HealthTech integration, moving beyond pilot-funding to sustained, system-embedded investment.

Conclusion: Technology as a Means, Not an End

Every maternal death in rural India carries a story of a system that was unable to reach a woman in time. Digital health tools cannot resolve every link in that chain – they cannot build roads, staff facilities, or stock blood banks. What they can do, deployed deliberately and with accountability, is compress the distance between a woman in need and the clinical intelligence that could save her life.

ABDM creates the connective tissue for a health record that travels across a fragmented referral chain. PM-JAY converts that record into financial entitlement. eSanjeevani brings specialist judgment to geographies where specialists do not live. Devices like Keyar and AiSteth place diagnostic and monitoring capability in the hands of nurses who have never had it. AI diagnostics extend early risk identification to community touchpoints. Together, these represent a genuinely different architecture for care delivery.

But architecture without the will to build equitably produces infrastructure that serves the already served. India's HealthTech moment demands an explicit equity mandate: that every investment in digital health be evaluated not just for scale but for where that scale reaches – whether it is closing MMR gaps between Assam and Kerala, whether it is extending AI diagnostics into public sub-centres rather than private clinics, whether it is ensuring that the 80 crore ABHA IDs translate into continuity of care for a woman in a remote village, not just convenience for an urban patient at a well-connected hospital.

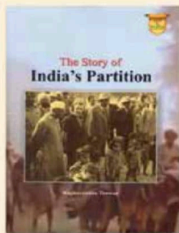
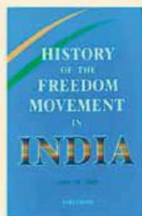
The tools now exist to make universal healthcare something more than an aspiration. The accountability frameworks needed to ensure they are deployed equitably, that is work that needs to be done. □





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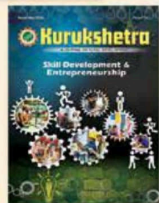
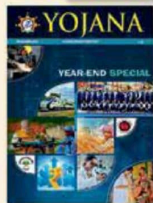
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Digital Public Infrastructure Empowering Citizens

India's governance paradigm has undergone a monumental shift over the past decade, transitioning from traditional, siloed bureaucratic processes to an integrated, technology-driven ecosystem. At the heart of this transformation lies the strategic deployment of Digital Public Infrastructure (DPI), coupled with the emerging capabilities of Artificial Intelligence (AI). This article, intended for policymakers and development practitioners, explores how foundational platforms are ensuring seamless access to services and targeted delivery of benefits. By converging DPI with predictive analytics and AI, India is institutionalising a more responsive, transparent, efficient, and citizen-centric governance framework, actualising the overarching vision of "Technology for Welfare."

Subhashree Sahu
Satyapriya

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he concept of the digital welfare state represents a paradigm in which state-citizen interactions and the delivery of social protection are mediated largely, if not entirely, by digital technologies. In India, a nation characterised by vast geographical expanse and socio-economic diversity,

the imperative to deliver governance at scale has driven unprecedented innovation. NITI Aayog (2018) aptly noted that for a developing economy, technology is not merely a tool for economic growth but a critical enabler of social inclusion and equity.

By building a robust Digital Public Infrastructure (DPI), India has democratised access to essential

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services, reduced exclusion errors, and plugged leakages that previously constrained public distribution and welfare delivery mechanisms. As the foundational digital platforms mature, the governance machinery is increasingly integrating Artificial Intelligence (AI) and predictive analytics. This convergence marks a transition from reactive governance to proactive, data-driven policymaking. By anticipating citizens' needs, particularly in critical sectors such as healthcare, agriculture, and disaster management, the Indian state is setting a global benchmark for digital governance.

The Role of Foundational Digital Platforms (DPI)

India's DPI ecosystem rests on a set of foundational platforms that ensure scale, interoperability, and inclusion.

Aadhaar: Universal Digital Identity

At the core of India's DPI is Aadhaar digital identity, administered by the Unique Identification Authority of India (UIDAI). As of early 2026, more than 1.44 billion Aadhaar numbers had been generated, effectively covering nearly the entire adult population and enabling seamless authentication across governance systems.

This universal identity layer ensures that welfare services reach the intended beneficiaries, reducing cases of duplication and leakages that historically plagued public programmes. Studies by the National Institute of Public Finance and Policy (NIPFP, 2017) estimate that digitised beneficiary databases and Aadhaar-enabled authentication have reduced leakage in subsidy programs such as LPG distribution.

Jan Dhan–Aadhaar–Mobile (JAM) Trinity

The JAM trinity-Jan Dhan (financial inclusion), Aadhaar (biometric identity), and Mobile (connectivity) has created a seamless financial inclusion ecosystem. Under the Pradhan Mantri Jan Dhan Yojana, millions of unbanked individuals were brought into the formal financial system. Between 2014 and 2026, bank accounts under the Jan Dhan scheme grew from 14.72 crore to over 57.71 crore, with deposits rising from ₹15,670 crore to ₹2.94 lakh crore. Aadhaar provides a unique, verifiable identity to residents, effectively resolving the historical challenge of identity verification that hindered the poor from accessing state benefits. Linking bank accounts to Aadhaar and mobile numbers has enabled instant, transparent benefit transfers.

During the COVID-19 pandemic, emergency relief payments under the Pradhan Mantri Garib Kalyan Yojana were transferred directly into beneficiaries' accounts, demonstrating the operational resilience of DPI in crisis situations.

Unified Payments Interface (UPI)

Building on Aadhaar, the Unified Payments Interface (UPI) has revolutionised the financial landscape, making digital micro-transactions seamless and ubiquitous. The Unified Payments Interface (UPI) developed by the National Payments Corporation of India (NPCI) has emerged as the most widely adopted digital payment systems globally. UPI's open architecture supports interoperability among banks, fintech firms, and service providers. For welfare delivery, UPI-enabled platforms facilitate real-time fund transfers and enable last-mile service access in remote areas. In 2024-25, UPI processed an estimated 185.8 billion transactions, with a market share of 83.7 per cent of all digital payments in India, demonstrating its deep penetration into everyday economic activities. Moreover, UPI serves nearly 460 million active users and 65 million merchants worldwide, a testament to its role not only in financial inclusion but also in enabling welfare delivery and micro-economic participation.

DigiLocker and Digital Health Infrastructure

Beyond payments, foundational platforms such as DigiLocker for secure document storage and the Ayushman Bharat Digital Mission (ABDM) for integrated health records further extend DPI across service domains. Platforms like DigiLocker and e-Sign have enabled paperless governance, allowing citizens to store and share authentic digital documents, thereby reducing bureaucratic friction and administrative bottlenecks. More recently, the Open Network for Digital Commerce (ONDC) is democratising e-commerce, offering a level playing field for small retailers and artisans in rural and semi-urban areas. In the health sector, the CoWIN platform demonstrated the scale and agility of India's DPI by orchestrating one of the world's largest COVID-19 vaccination drives. This success laid the groundwork for the Ayushman Bharat Digital Mission (ABDM), that integrates digital health records, enabling portability and targeted healthcare benefits.

Together, these foundational platforms form the technological backbone of inclusive governance.



digitally transferred to farmers. The integration of land records, Aadhaar authentication, and banking systems ensures precision in beneficiary identification.

Advantages of Digital Systems in Welfare Governance

The transition to digital welfare governance offers multifaceted advantages that fundamentally alter the state-citizen relationship:

Transparency and Reduced

Leakages: Digital trails make it nearly impossible for systemic leakages to go unnoticed. The elimination of ghost beneficiaries ensures that the exchequer's resources reach only the intended and legitimate recipients.

Speed and Scale: The automated nature of DPI allows the state to roll out welfare measures almost instantaneously. During the COVID-19 lockdowns, cash transfers under the PM Garib Kalyan Yojana were credited to millions of Jan Dhan accounts within days, a feat unimaginable in the pre-digital era. With almost universal mobile connectivity (over 97% of villages connected) and broadband penetration having grown nearly fivefold from 2014 to 2024, digital welfare services have unprecedented geographical reach.

Cost Efficiency: Real-time fund transfers and instant verification reduce administrative costs and delays.

Financial Inclusion: Digital platforms like UPI and JAM have brought tens of millions into the formal financial system, a prerequisite for inclusive economic participation and welfare eligibility.

Empowerment and Dignity: By removing the need for citizens to repeatedly prove their identity to multiple government departments, digital platforms foster dignity. Direct and automated transfer of government benefits reduce corruption by limiting the discretionary power of local officials in distributing welfare payments.

Data-Driven Policymaking: The aggregation of anonymised transactional data provides policymakers with real-time insights into the effectiveness of schemes, allowing for rapid course corrections and evidence-based decision-making.

Institutional Systems Ensuring Timely and Targeted Welfare Delivery

The translation of digital infrastructure into tangible welfare delivery is facilitated by robust institutional systems, primarily the Direct Benefit Transfer (DBT) mechanism. Operationalised through the Public Financial Management System (PFMS), DBT ensures that subsidies, scholarships, and pensions are transferred directly into the bank accounts of targeted beneficiaries. By eliminating middlemen and the cascading layers of administrative hierarchy, DBT has profoundly enhanced transparency and efficacy of public expenditure. In 2023-24, digitally powered DBT transfers under 314 schemes amounted to more than ₹6.9 lakh crore, benefiting over 176 crore citizens. Cumulatively, DBT has led to savings of over ₹3.48 lakh crore since its inception by plugging leakages and eliminating ghost beneficiaries.

Institutional systems in India are now designed to be “interoperable by default.” For instance, the ‘One Nation One Ration Card’ (ONORC) scheme leverages the Aadhaar-seeded Public Distribution System (PDS) to allow migrant workers to claim their food grain entitlements from any fair price shop across the country.

The National Agriculture Market (eNAM) platform integrates procurement and price discovery across agricultural markets, empowering farmers with transparent pricing information and wider market access. While not exclusively a welfare platform, eNAM's digital market linkages promote economic inclusion of small and marginal farmers. Digital crop insurance systems and soil health card databases further enable targeted agricultural support. Under Pradhan Mantri Kisan Samman Nidhi, income support payments are



The Application of AI in Welfare Governance

While DPI has solved the problem of scale and identity, Artificial Intelligence is solving the problem of intelligence and foresight. AI in governance shifts the focus from building infrastructure to optimising its usage. In the context of the Indian welfare state, AI, Machine Learning (ML), and Natural Language Processing (NLP) are being deployed to bridge language barriers, automate grievance redressal, and identify systemic anomalies.

For example, Bhashini, India's AI-led language translation platform, is instrumental in making digital services accessible in local languages. This ensures that the digital divide is not exacerbated by a linguistic barrier. Furthermore, AI chatbots and voice-assisted interfaces integrated into government portals (like the PM-KISAN chatbot) allow rural citizens with limited digital literacy to query their entitlement status simply by speaking into their mobile phones.

In healthcare, AI-powered diagnostic tools support early disease detection under digital health initiatives. Machine learning models analyse health records to identify high-risk populations, enabling preventive interventions. In agriculture, AI-based crop advisory systems integrate weather data, soil health information, and satellite imagery to recommend precision advisories to farmers. Predictive models assist in pest surveillance and yield estimation. Under social protection, AI algorithms detect anomalies in beneficiary databases, identifying fraud or duplication.

Predictive Analytics Across Key Sectors

The true transformative potential of AI in governance lies in predictive analytics, i.e. using historical data, machine learning algorithms, and real-time inputs to predict future outcomes and intervene proactively. This is particularly evident in three crucial sectors: healthcare, agriculture, and disaster management.

Healthcare

The convergence of the Ayushman Bharat scheme with AI is facilitating early detection and predictive healthcare. AI models are being trained on anonymised clinical data to predict disease outbreaks, assess epidemiological trends, and optimise the allocation of medical resources. For instance, predictive models can forecast surges in vector-borne diseases like dengue or malaria based on climate data, rainfall patterns, and

historical health records, allowing local administrations to undertake pre-emptive sanitation and medical stocking measures (NITI Aayog, 2018). Furthermore, AI is being utilised to screen for non-communicable diseases, such as diabetic retinopathy, in remote primary health centres where specialist doctors are unavailable.

Agriculture

Agriculture remains the backbone of the rural Indian economy. AI-driven predictive analytics are revolutionising farming through precision agriculture. Initiatives supported by the Ministry of Agriculture deploy satellite imagery, soil health card data, and weather forecasts to provide farmers with hyper-local, and timely advisories regarding sowing schedules, pest attacks, and crop yield estimations. The PM Fasal Bima Yojana (Crop Insurance Scheme) utilises drone imagery and AI to assess crop damage swiftly, reducing the time taken to settle insurance claims for distressed farmers from months to days. Studies by international institutions such as World Bank emphasise the potential of data-driven governance in enhancing adaptive capacity and resilience.

Disaster Management

India is highly vulnerable to natural disasters, including cyclones, floods, and droughts. Predictive analytics play a lifesaving role in disaster risk reduction. The Indian National Centre for Ocean Information Services (INCOIS) and the National Disaster Management Authority (NDMA) leverage AI to map vulnerable geographies and predict the trajectory and impact of extreme weather events. This foresight enables district administrations to evacuate vulnerable populations, pre-position relief materials, and efficiently target post-disaster financial compensation through the DBT infrastructure.

By integrating predictive insights with DPI, governments can shift from traditional, post-facto, reactive welfare responses to anticipatory governance.

Ethical Considerations, Data Privacy and Accountability

While the convergence of DPI and AI offers immense promise, it is fraught with complex ethical and regulatory challenges. The transition to a data-heavy governance model necessitates a robust framework to safeguard citizens' fundamental right to privacy. Universal digital

identity and data integration make systems vulnerable if not accompanied by safeguards against misuse, breaches, and unauthorised profiling. Population-scale digital infrastructure does not remain confined to its original purpose. Databases built for subsidy delivery create centralised repositories of identity, financial, and behavioural data. Once such infrastructure exists, the temptation to expand its use; to policing, migration control, credit profiling, or political monitoring, becomes structurally embedded. The boundary between welfare administration and citizen tracking can gradually blur. What begins as a tool for efficient service delivery may evolve into an instrument of social oversight. The enactment of the Digital Personal Data Protection (DPDP) Act, 2023, is a critical step towards establishing legally binding norms for data collection, processing, and fiduciary accountability. Robust consent mechanisms and data minimisation principles are essential. Clear grievance redressal mechanisms and institutional oversight ensure responsible deployment. Responsible governance must balance efficiency with rights-based safeguards.

Algorithmic bias is another profound ethical concern. AI systems are only as objective as the data on which they are trained on. If historical data reflects societal biases or systemic exclusions, the AI models may inadvertently perpetuate or even exacerbate them, leading to the wrongful denial of welfare benefits. When automated systems determine eligibility, opacity becomes a governance challenge. If beneficiaries do not understand why they were excluded, or cannot challenge algorithmic decisions, trust erodes. For communities with historical experiences of discrimination or administrative neglect, opaque digital systems may reinforce perceptions of bias. Welfare is not merely a fiscal transfer; it is also a political signal of state responsiveness. When decisions are made by “the system” rather than identifiable officials, accountability becomes diffuse, and grievance redressal weakens. Therefore, “Algorithm Audits” and human-in-the-loop governance models are essential to ensure fairness and accountability.

Furthermore, while digitisation aims for inclusion, the digital divide, characterised by disparities in smartphone ownership, internet connectivity, and digital literacy poses the risk of excluding the most marginalised. ID-linked delivery assumes universal documentation, stable connectivity, and functional

digital literacy. In reality, the poorest citizens often lack one or more of these prerequisites. Biometric failures, mismatched records, inactive bank accounts, authentication errors, or weak internet connectivity can result in benefit denial. When welfare is digitised, access shifts from being mediated by discretion to being mediated by data accuracy. The irony is stark: systems designed to target the vulnerable can systematically exclude those who are hardest to identify, hardest to verify, and least equipped to navigate digital bureaucracies. In welfare systems, even small error rates can scale into large human consequences. Policymakers must ensure that digital systems supplement, rather than entirely replace, physical administrative mechanisms, maintaining a safety net for those unable to navigate the digital ecosystem. Welfare governance must therefore incorporate assisted service channels and offline support mechanisms.

Conclusion

The evolution of India's governance architecture over the last decade illustrates a steadfast commitment to the vision of “Technology for Welfare” (*Sabka Saath, Sabka Vikas, Sabka Vishwas*). Foundational digital platforms have provided the necessary scaffolding to deliver services at an unprecedented scale, transforming the citizen-state dynamic from one of friction and opacity to one of efficiency and transparency. India's digital journey demonstrates how inclusive identity systems, interoperable platforms, and intelligent analytics can collectively strengthen state capacity and accelerate welfare outcomes, making them more transparent, targeted, and responsive. As India moves forward, the strategic integration of Artificial Intelligence and predictive analytics will further refine this ecosystem, enabling the state to anticipate needs and intervene with precision. However, the sustained success of this model relies not merely on technological sophistication, but on maintaining an unwavering focus on the human element. By embedding ethical safeguards, ensuring stringent data privacy, and keeping inclusivity at the core of technological design, India can ensure that its digital welfare state remains both powerful in its capabilities and deeply empathetic in application. The seamless convergence of DPI and AI, governed by responsible institutional frameworks, holds the key to a truly inclusive, resilient, and empowered future for all Indians. □





EdTech for Equity, Inclusion and Quality Education

Educational Technology (EdTech) serves as a systemic enabler to modernise the rural school ecosystem by substituting traditional limitations with personalised, interactive digital tools. Driven by the National Education Policy (NEP) 2020, flagship public interventions like PM eVIDYA, DIKSHA, and SWAYAM are successfully democratising access to high-quality, multilingual pedagogy across remote and tribal topographies. Realising the vision of *Viksit Bharat 2047* requires a holistic approach that couples robust digital public infrastructure with intensive teacher professional development and localised, community-supported content to ensure meaningful, lifelong learning for all rural youth.

Jai Prakash Pandey
Raja Pandit

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f we have to build a nation, we should start from the villages.” Emphasising the role of education in nation-building, Hon’ble Prime Minister Narendra Modi stated that India’s greatest strength lies in the aspirations of its youth across villages, towns and cities, who are eager to innovate and contribute meaningfully to the country’s progress. As

India advances towards an innovation-driven economy, there is a continuous need to modernise the education system to fully harness the potential of young minds.

Modern-day technology has transformed every sphere of human life, and education is no exception. Educational Technology (EdTech) has not only changed the medium of teaching and learning but has also fundamentally redefined the entire learning process.

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Educational Technology (EdTech) involves the use of digital tools, platforms and learning resources to enhance teaching and learning experiences. Over the years, EdTech has emerged as an effective way to make education more interactive, engaging and learner-centered. It has reshaped how we learn, what we learn, where we learn, and when we learn. Digital platforms, online resources, artificial intelligence and interactive learning tools have made education more accessible, flexible, personalised, and learner-centric, enabling students to learn beyond the boundaries of remote and tribal regions, hilly terrains, socio-economic disadvantageous circumstances, gender gaps, and traditional classrooms.

Rural Education Landscape

As per the Unified District Information System for Education Plus (UDISE+) data of 2024-25, about 16.35 crore students (approx. 66 per cent) out of 24.7 crore of total students and 12.1 lakh schools (approx. 82 per cent) out of 14.7 lakh schools are located in rural areas. Significant progress has been made to ensure accessibility and quality of education in rural areas, however EdTech can contribute significantly towards providing quality contents, personalised learning, skill developments and learning outcomes in rural areas.

NEP-2020

Recognising the transformative potential of technology in education, National Education Policy (NEP) 2020, has strongly advocated the integration of digital learning into the education system. The NEP 2020 envisions technology as a key driver for transforming India's education system into one that is inclusive, equitable, and future-ready. The policy recognises the role of technology from a supportive aid to a systemic enabler of quality education for all. It highlights the importance of integrating emerging areas such as Artificial Intelligence (AI), cybersecurity, digital ethics, and technological awareness into school curricula while also modernising vocational and professional education to meet changing workforce demands.

Chapter 23 and 24 of the NEP highlights the transformative role technology can play in bridging disparities in educational access and quality across regions, socioeconomic

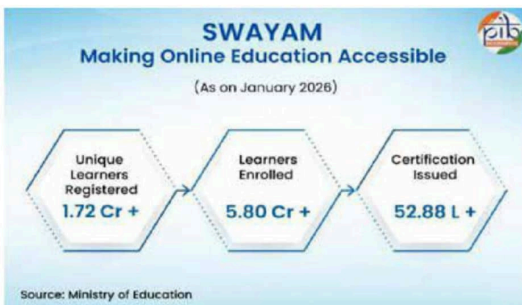
groups, and learners with different abilities. The policy proposes important institutional frameworks, including the National Educational Technology Forum (NETF) and the National Digital Education Architecture (NDEAR) to strengthen digital public infrastructure in education. It also emphasises bridging the digital divide through initiatives like PM eVIDYA initiative by integrating all digital, online, and on-air educational resources under a unified framework. This includes platforms such as DIKSHA, SWAYAM, and SWAYAM Prabha TV channels etc.

The policy also emphasises the creation of open educational resources, promotion of online and blended learning, use of educational applications, and capacity-building programs for teachers to bridge the rural-urban educational divide. In support of this vision, several government schemes, along with initiatives by NGOs and private organisations have been launched to improve access to technology in rural classrooms.

Role of EdTech in Bridging the Educational Gap

Educational Technology has emerged as a powerful solution for addressing the challenges faced by rural education systems.

- Access to Quality Learning Content:** Digital platforms provide students with reliable educational materials aligned with their curriculum, even in geographically isolated areas. Video lectures, interactive modules, digital textbooks, and e-learning resources make learning more engaging and effective. EdTech is helping to reduce educational inequality.
- Personalised Learning Opportunities:** Every child is special. EdTech platforms use Artificial Intelligence (AI) and machine learning to design personalised





learning experiences which enable students to learn at their own pace while focusing on areas that require improvement and strengthening their existing skills.

- **Breaking Geographical Barriers:** Virtual classrooms and online learning platforms connect students and teachers across regions and countries. Remote learning opportunities ensure continuity of education, especially in areas where access to physical schools and trained teachers is limited.
- **Teacher Training and Professional Support:** EdTech platforms offer training programmes, digital teaching tools, and professional development opportunities for educators. This helps teachers in rural and remote areas upgrade their teaching methods and stay updated with modern educational practices.
- **Multilingual and Inclusive Education:** NEP 2020 recommends multilingualism and many EdTech platforms support regional and local languages, making learning more accessible for students from diverse linguistic backgrounds. Features such as subtitles, translations, and accessibility tools also promote inclusive education for learners with different needs and abilities.
- **Cost-Effective Educational Solutions:** Digital learning reduces dependence on expensive physical infrastructure and printed materials, making education more affordable. There are availability of

free and low-cost EdTech resources has significantly expanded access to knowledge for economically disadvantaged communities.

Government Initiatives Promoting EdTech in Rural Areas

- **PM eVIDYA:** Introduced in 2020 under the “One Nation, One Digital Platform” initiative, PM eVIDYA combines multiple modes of digital education delivery. Through dedicated DTH television channels, community radio and online learning platforms, it has expanded access to education for millions of students in rural regions.
- **DIKSHA:** DIKSHA is a major digital learning platform that offers free educational content in more than 30 Indian languages. It provides curriculum-aligned textbooks, video lessons, assessments, teacher training modules, interactive learning resources, and QR-code linked digital content. The QR-code-enabled textbooks have transformed traditional textbooks into blended learning tools. A child in a village school can scan a textbook page and instantly access visual explanations, animations and practice exercises. As on May 2026, the platform had facilitated over 568.16 Crore learning sessions, making it one of India’s largest digital repositories for school education resources. Daily active users on DIKSHA platform exceed 1.75 Lakh.
- **SWAYAM:** SWAYAM provides Massive Open Online Courses (MOOCs) for both school and higher education learners. It enables students and teachers from rural areas to access high-quality courses from leading institutions such as IITs, IIMs etc free of cost. SWAYAM offers more than 4,400 courses in diverse disciplines, right from school education to higher education. These courses are developed by national coordinators such as NPTEL, AICTE, and UGC. SWAYAM platform has recorded over 1.2 Cr. student enrolments.
- **Solar-Powered Smart Classrooms:** States such as Rajasthan and Odisha have introduced solar-powered digital classrooms in remote locations lacking reliable electricity. These initiatives demonstrate how innovative solutions can help bridge infrastructural challenges and improve digital access in education.
- **Samagra Shiksha Scheme:** ICT and Digital Initiatives

component of Samagra Shiksha covers Government and Aided Schools having classes VI to XII. Under this component financial assistance is provided for establishing ICT Lab and Smart Classrooms in schools. Under Samagra Shiksha, 1,01,147 ICT labs and 2,89,815 smart classrooms are functional across States and UTs. These initiatives represent a key aspirational intervention of the Government of India aimed at saturating schools with digital infrastructure to strengthen EdTech integration and enhance technology-enabled learning opportunities for students.

- **PM SHRI Scheme:** Pradhan Mantri Schools for Rising India (PM SHRI) aims to provide a high-quality, inclusive, and future-ready education system that equips students with 21st-century skills to Schools which are under PM SHRI scheme. These schools are being equipped with computers, high-speed internet, interactive panels, and audio-visual learning tools to enhance engaging and technology-enabled education.
- **PM USHA:** Pradhan Mantri Uchcharat Shiksha Abhiyaan (PM-USHA) promotes open distance learning & virtual learning infrastructure in institutions. It also focuses on using information and communication technology to manage information and communicate within digital networks.
- **Initiatives by The Ministry of Skill Development and Entrepreneurship (MSDE):** MSDE is advancing EdTech in education through the Skill India Digital Hub (SIDH), which offers digital courses in emerging fields such as Artificial Intelligence (AI), the Internet of Things (IoT) and cybersecurity. Flagship initiatives like PMKVY 4.0 integrate emerging technologies into skill development, while schemes such as NAPS (National Apprenticeship Promotion Scheme) and the Skill Loan Scheme support technology-enabled training and improved access to skill education.
- **Initiative by The Ministry of Electronics and Information Technology (MeitY):** MeitY is driving EdTech integration in Indian education by recognising the barriers faced by marginalised groups (women, SC/ST, EWS, PwDs, and senior citizens). MeitY offers tailored training programmes designed in Indian languages for accessibility in remote areas. Under the Pradhan Mantri Gramin Digital Saksharta Abhiyaan (PMGDISHA), over 6.67

crore citizens have already been trained in digital literacy basics like MS Office, cyber hygiene.

Recognising a digital skills divide between urban and rural regions, MeitY invests in the expansion and modernisation of NIELIT centres nationwide. The NIELIT network, with 47 own centres and more than 700 accredited training centres, is being upgraded with smart classrooms, IoT labs, AI studios, and digital learning platforms.

Private Sector Initiatives Supporting Rural Education

Several private sector EdTech initiatives significant contributing to improving education in rural areas. They offer interactive video lessons and personalised learning experience.

- **Google's Internet Saathi Programme** focuses on improving digital literacy among rural women through community-based training. By equipping women with digital skills, the programme indirectly supports children's access to technology-enabled learning opportunities.
- **Initiatives by CSO/NGOs:** Civil Society Organisations (CSOs) and NGOs are also working to address learning challenges faced by rural children by using a variety of digital tools to improve literacy and numeracy skills and supports teachers and parents by strengthening classroom learning through accessible digital content. Pratham Education Foundation's tablet-based learning programmes provide engaging and region-specific educational content in local languages. EkStep's open digital learning platform offers free educational resources aligned with different school curricula.
- **Teach For India's TFlx Programme:** The TFlx programme supports social entrepreneurs in developing localized EdTech solutions tailored to the specific needs of rural communities, ensuring that educational interventions remain relevant and effective.

Additionally, initiatives such as the IndiaAI Mission and the Centres of Excellence for AI are playing a pivotal role in this transformation. These efforts are expanding access to computing infrastructure, promoting research and innovation, and enabling startups and educational institutions to develop solutions that directly benefit learners and communities. PARAKH (PRS 2024) data reveals a changing pattern in learning outcomes between rural and urban students. According to the PRS



scores, rural students in Grade 3 marginally outperform urban students, scoring 64 per cent in Language and 60 per cent in Mathematics, compared to urban averages of 63 per cent and 59 per cent respectively. However, in Grades 6 and 9, rural students continue to lag behind their urban students in learning outcomes.

Challenges

- **Improving Internet Connectivity and Infrastructure:** Reliable broadband and mobile network connectivity must reach remote regions to ensure uninterrupted access to online learning.
- **Promoting Digital Literacy:** Training programmes that develop basic digital skills among students, teachers, and parents are essential for the effective use of EdTech tools. Community centres and local NGOs can play a vital role in organising digital literacy workshops and awareness campaigns.
- **Localisation of Content:** Collaboration with local educators and community stakeholders can help create more relevant and effective educational solutions on EdTech platforms.
- **Strengthening Public-Private Partnerships:** Cooperation among governments, and non-profit organisations can pool resources, expertise, and innovation to expand EdTech initiatives and address

challenges related to funding and sustainability.

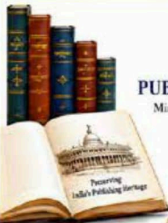
- **Ensuring Affordability and Equal Access:** Affordable or free access to EdTech platforms is crucial for promoting educational equity.
- **Continuous Monitoring and Evaluation:** Establishing systems to regularly assess the effectiveness of EdTech initiatives will help identify gaps and improve implementation.

Way Forward

EdTech has emerged as a transformative force with the potential to revolutionise rural education. India is committed to ensuring equitable and quality education for all, based on the principles of Sustainable Development Goal 4 and to emerge as a global leader while advancing the vision of *Viksit Bharat 2047*. Digital learning is a fundamental necessity for children in rural India for education and skill development. By integrating advanced technology with effective pedagogical practices, teacher engagement, parental participation, it can hugely improve the learning outcomes. Digital/Online apps, platforms, videos/shorts, channels, communities are norms of the day and reshaping the learning process. Anywhere and anytime quality education to all through Edtech is transforming NEP vision that “No child is left behind” and “Learning for Lifetime” into reality. □



PUBLICATIONS DIVISION
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17th BIENNIAL CONFERENCE on ENTREPRENEURSHIP FEBRUARY 24-26, 2027

CALL FOR PAPERS

Entrepreneurship Development Institute of India (EDII) has been organizing Biennial Conferences on Entrepreneurship since 1994 providing a forum for researchers, educators, and practitioners to share their research findings and experiences in entrepreneurship development. The conferences are organized under the aegis of the Centre for Research in Entrepreneurship Education and Development (CREED), setup by EDII. EDII has organized sixteen Biennial Conferences from 1994 to 2025. conference.ediindia.org

In line with the sixteen biennial conferences held over the past 32 years, the 17th Biennial Conference on Entrepreneurship continues to serve as an established forum to share their ideas and research findings with other researchers, professionals and thinkers in the field. Researchers are invited to contribute papers that explore and expand upon the field of entrepreneurship theory and practice. Some broad indicative themes include:

- Entrepreneurship Policy, Governance, and Ecosystems
- Entrepreneurship Theory, Practice, and New Venture Development
- Innovation, Technology, and Digital Entrepreneurship
- Entrepreneurship Education and Capability Development
- Cognitive, Behavioral, and Psychological Aspects of Entrepreneurship
- Inclusive Entrepreneurship and Social Innovation
- Sustainability, ESG, and Responsible Entrepreneurship
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Submissions on topics beyond those listed above are also welcome

The **3rd Doctoral Colloquium**, scheduled for **February 23, 2027**, will provide doctoral students with an opportunity to present and discuss their research with senior academicians.

Important Dates and Deadlines:

- Extended Abstract (approximately 2000 words) : August 7, 2026
- Decisions on the acceptance of Extended Abstracts : August 14, 2026
- Paper Development Workshop for Conference Paper : August 28, 2026
- Full Paper Submission : November 13, 2026
- Acceptance of Full Paper : November 27, 2026
- Last Date for Registration : December 31, 2026

For Registration



Please upload your contributions at <https://easychair.org/conferences/?conf=bice2027> or send your contributions to conference@ediindia.org.

Selected papers will be appreciated based on merit.

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The lives of persons with disabilities often remain confined within limited boundaries due to various physical and sensory challenges. However, the rapid expansion of technology in recent years has begun to open up entirely new horizons for them. Today, assistive technology is bringing fresh confidence, dignity, and self-reliance into the lives of persons with disabilities. Particularly in a country like India, where a large share of the population lives in rural areas, these technologies are emerging as a significant step towards inclusive welfare.

Satya Sindhu

Until a few years ago, many everyday activities were considered extremely difficult for persons with disabilities. Today, modern technology is steadily making those very tasks easier. A visually impaired student can now pursue education through a mobile phone; a hearing-impaired young woman sitting in a remote village can communicate with her office in a metropolitan city through live captions during a video call; and someone with a smart prosthetic limb is moving confidently towards fulfilling their dreams.

This transformation is not merely technological; it reflects a broader change in social attitudes and collective thinking. Today, a wide range of innovations based on assistive technology are bringing renewed confidence, dignity, and independence into the lives of persons with disabilities. In India, where nearly 70 per cent of persons with disabilities live in rural areas, these technologies are steadily proving their value and strengthening the path towards inclusive welfare.

What is Assistive Technology?

Assistive technology refers to devices, tools,

or technological solutions that help persons with disabilities perform everyday activities more easily and independently. Its primary objective is to enhance an individual's functional abilities and improve quality of life. Today, assistive technology supports needs ranging from simple daily tasks to highly complex activities. It helps in mobility, reading and writing, hearing and speaking, accessing digital services, and creating opportunities in education and employment.

Technology is now playing a major role in areas such as mobility, communication, learning, and healthcare. Earlier, many persons with disabilities had to depend heavily on others for routine activities. Today, technology is enabling them to lead more independent and dignified lives.

Lives Changing Through Technology

Until a few years ago, persons with disabilities living in rural areas had access to very limited resources. Schools were often located far away, transportation facilities were inadequate, and assistive devices were not easily available. As a result, education and employment remained distant dreams for many.

AI and the Future of Assistive Technology

Artificial Intelligence (AI) is transforming every sector today, and assistive technology is no exception. AI-powered devices are increasingly capable of understanding the needs of persons with disabilities and providing more personalised and effective support.

Voice assistants such as Google Assistant, Siri, and Alexa are proving highly useful for visually impaired and physically disabled individuals. Through simple voice commands, users can now make phone calls, send messages, browse the internet, and access information with ease.

In today's era of online meetings and digital education, real-time captioning technology has become especially important for people with hearing impairments. This technology instantly converts spoken words into on-screen text, making

communication and learning much more accessible.

AI-based smart navigation tools are also helping visually impaired individuals identify routes and move around more safely and independently. Technologies such as smart canes, AI-powered smart glasses, and GPS-enabled navigation apps are expected to become even more advanced in the future.

The Need for Inclusive Design

Technology alone is not enough; inclusivity must be integrated into the design process from the very beginning. Designs should be intuitive, user-friendly, and accessible for all users. In a diverse country like India, where multiple languages are spoken, technologies and digital platforms should be designed to support as many languages as possible to ensure wider accessibility and inclusion.

MAJOR TECHNOLOGICAL SOLUTIONS



SMART WHEELCHAIR

Equipped with sensors, GPS and voice control for greater independence and mobility.



SCREEN READER SOFTWARE

Converts text on screen into speech, helping visually impaired users access digital content.



BRAILLE DISPLAYS

Refreshable braille displays and braille printers make reading and learning easier.



HEARING AIDS

Digital hearing aids reduce background noise and improve sound clarity.



SPEECH-TO-TEXT AND TEXT-TO-SPEECH APPS

Convert speech to text and text to speech for better communication and understanding.



AI-BASED LEARNING TOOLS

Personalized learning solutions that adapt to individual needs and support inclusive education.

Today, however, mobile phones, internet connectivity, digital services, and AI-based devices have begun to change this reality. Many persons with disabilities are now receiving online education from home, working through digital platforms, and accessing government welfare schemes more easily.

Mobile applications now allow them to consult doctors remotely, send health reports, and obtain information about medicines with greater convenience. AI-based health monitoring devices are also proving beneficial for many users.

Through initiatives such as the Accessible India Campaign and Digital India, the Government of India has actively promoted an inclusive digital ecosystem. The National Education Policy has also placed strong emphasis on digital accessibility and inclusive education. Nevertheless, there is still a need to encourage greater innovation and wider adoption of technologies designed specifically for persons with disabilities.

Smart Wheelchairs: A New Path to Independence

Wheelchairs were once seen merely as mobility aids, but today smart wheelchairs have evolved into advanced technological solutions. Modern wheelchairs are equipped with sensors, GPS, and automatic control systems. Some can even be operated through voice



commands. These innovations reduce dependence on constant assistance and significantly boost the user's confidence and independence.

Hearing Aids: A New Hope for Better Hearing

Today's digital hearing aids are far more advanced than older devices. They can reduce background noise and deliver clearer sound. Many modern hearing aids can also connect with mobile phones and televisions. As a result, people with hearing impairments are now able to participate more effectively in education, employment, and social life.

Screen Reader Technology: A Digital Companion for the Visually Impaired

For visually impaired individuals, screen readers are nothing short of transformative. This technology converts written text on screens into speech, enabling users to access information independently. Available on both mobile phones and computers, screen readers help students with studies, online examinations, and internet access. Today, many visually impaired young people are using these technologies to work in government services as well as the private sector.

Screen readers such as NVDA, JAWS, TalkBack (Android), and VoiceOver (iPhone) are especially

helping students with visual impairments access digital content more easily and effectively.

Braille Devices: Strengthening Access to Education

Braille remains the most important medium of reading and writing for visually impaired individuals. Today, digital Braille devices and Braille printers have made education far more accessible and convenient. With the help of these technologies, books and online content are increasingly being made available in Braille format, thereby promoting inclusive education and expanding learning opportunities for visually impaired students.

Speech-to-Text and Text-to-Speech Software

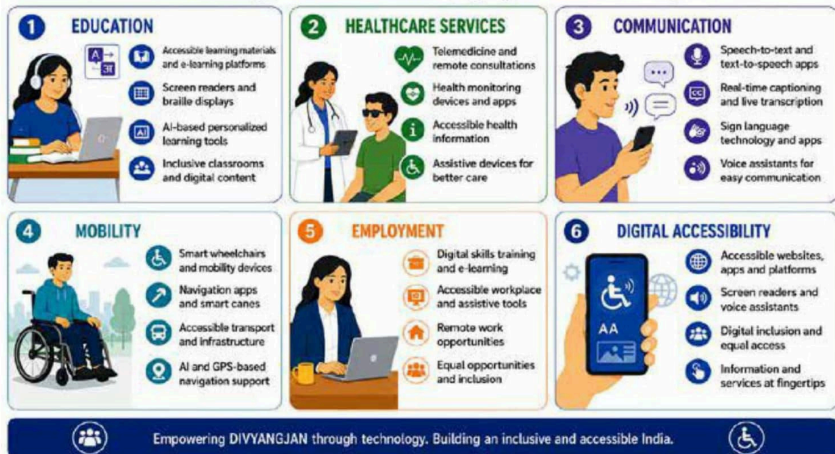
These technologies are extremely useful for people who face difficulties in hearing, speaking, or reading. Speech-to-text technology converts spoken words into written text, while text-to-speech software reads written content aloud. These tools are proving highly beneficial in online classes, workplaces, and mobile usage, making communication and learning more accessible and efficient.

Smart Prosthetics: Supporting a New Life

Smart prosthetics developed with the help of Artificial Intelligence (AI) and robotics are transforming lives today. Artificial limbs are no longer merely replacements for body

AREAS WHERE ASSISTANCE IS PROVIDED

Technology for an Accessible Life, Dignity and Inclusive Society



Technology Gave Me Mobility

"I have faced mobility challenges since childhood due to polio. Because I wear calipers on both legs, I have long depended on crutches for support. Travelling long distances was always difficult—not only for me, but also for my family members who had to assist me constantly.

The difficulties increased further after I started working at ITO in Delhi. Later, I came to know about a technology through which a hand-control system could be installed in a car, allowing the accelerator, brake, and clutch to be operated manually.



I got this system installed in my car, and it made life significantly easier.

Using this vehicle, I have driven as much as 600 kilometres in a single day, and I regularly travel nearly 85 kilometres daily between Greater Noida and ITO. Last year, I purchased a car with automatic transmission and made a few customised modifications, which have made my day-to-day life even more comfortable and convenient."

Dr Rishi Raj
Manager – Public Relations,
Delhi Transco Ltd.

parts; they have evolved into intelligent devices capable of responding to a user's movements and needs. By understanding and adapting to a person's activities, these advanced prosthetics are helping individuals become more independent and confident in their daily lives.

Mobile App-Based Assistive Services

Today, smartphones have become an important companion for persons with disabilities. A wide range of mobile applications now support navigation, communication, and health monitoring. These include live captioning apps, sign language applications, voice-command tools, and health-tracking apps. Such innovations are giving a new direction to digital inclusion and making technology more accessible for everyone.

Educational and Learning Tools

Audiobooks and e-learning platforms are creating learning opportunities for everyone. AI-based learning tools are helping personalise education according to the specific needs of each individual. Several initiatives undertaken by the Government under the Accessible India Campaign (Sugamya Bharat Abhiyan) aim to make educational content accessible to a larger population.

These efforts include measures ranging from accessible transportation systems to the provision of assistive devices for persons with disabilities. Such support includes hearing aids, wheelchairs, Braille kits, prosthetic limbs, smart canes, voice assistants, smart navigation devices, real-time captioning tools, and AI-based screen readers.

Challenges and Solutions in Rural Areas

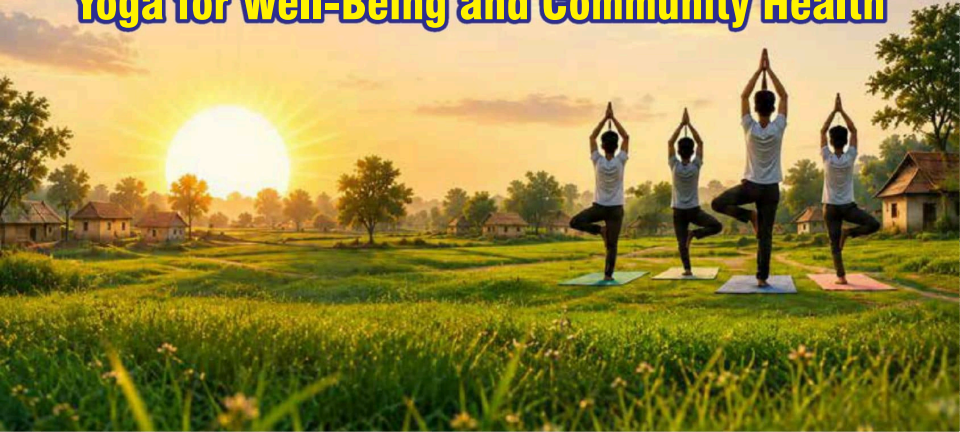
Lack of awareness remains one of the biggest challenges in rural India. Many families are not even aware that technologies exist which can significantly assist persons with disabilities. Even when awareness is present, AI-based technologies and smart assistive devices are often expensive and remain beyond the reach of poor rural households.

To address these challenges, several social organisations and companies are providing technological support to persons with disabilities under Corporate Social Responsibility (CSR) initiatives. Digital training camps, free distribution of assistive devices, and awareness campaigns are being conducted in rural areas, although there is a need to expand these efforts at a much faster pace.

Subsidies on expensive assistive devices can also play an important role in connecting economically weaker persons with disabilities to this movement. If accessibility support centres are established at the Panchayat level, a much larger number of people would be able to access information, technical guidance, and assistive devices more conveniently. At the same time, there is a growing need to develop low-cost technologies suited to local Indian conditions. Under initiatives such as Make in India, affordable and practical assistive devices can be developed on a larger scale. □



Yoga for Well-Being and Community Health



On 21 June each year, millions of people across the world come together to celebrate the International Day of Yoga, recognising India's timeless gift to humanity. Beyond its global appeal, yoga holds particular significance for rural India, where access to preventive healthcare remains uneven and communities often face physical strain, stress, and lifestyle-related health challenges. As the country advances towards the vision of *Viksit Bharat 2047*, promoting affordable and accessible wellness practices has become increasingly important. Yoga offers a simple yet powerful means of improving physical health, mental well-being, productivity, and social harmony, making it highly relevant to rural development.

N

early 65 percent of India's population resides in rural areas, where livelihoods continue to depend largely on agriculture and allied activities. Rural communities often face challenges such as inadequate healthcare infrastructure, limited access to specialised medical services, nutritional deficiencies, occupational health problems, and increasing incidence of non-communicable diseases. In recent years, lifestyle disorders such as diabetes, hypertension, obesity, and stress-related ailments have become increasingly common even in villages.

In this context, yoga emerges as a practical and cost-effective solution. Unlike many forms of fitness training, yoga requires no expensive equipment or specialised infrastructure. It can be practised individually or collectively in schools, community centres, village grounds, Panchayat premises, and even at home. Its accessibility makes it particularly suitable for rural populations.

Promoting Physical Health and Preventive Care

The physically demanding nature of agricultural and manual work often places considerable strain on the human body. Farmers and labourers frequently suffer from back pain, joint disorders, muscular fatigue, and

posture-related ailments. Regular practice of yoga helps improve flexibility, strength, balance, and endurance, thereby reducing the risk of such conditions.

Simple asanas such as *Tadasana*, *Bhujangasana*, *Trikonasana*, *Vajrasana*, and *Pawanmuktasana* can enhance mobility and relieve muscular tension. Breathing exercises and pranayama improve respiratory efficiency and overall vitality.

Yoga also complements the Government's growing emphasis on preventive healthcare. By encouraging regular physical activity and healthy lifestyles, yoga can help reduce the incidence of lifestyle diseases and lower healthcare expenditure for families. For rural communities where access to hospitals and specialist care may be limited, preventive wellness assumes even greater importance.

Strengthening Mental Well-being

Mental health has emerged as a critical concern across rural India. Farmers frequently face uncertainties arising from changing weather patterns, crop losses, market fluctuations, indebtedness, and economic pressures. Young people encounter academic stress and employment-related anxieties, while elderly citizens often struggle with isolation and age-related challenges.

Yoga offers a holistic approach to mental wellness through meditation, mindfulness, and breathing practices. Techniques such as *Anulom-Vilom*, *Bhramari*, *Pranayama*, and *Dhyana* (meditation) help reduce stress, improve concentration, regulate emotions, and promote better sleep.

Regular practice enhances emotional resilience and equips individuals to cope more effectively with everyday challenges. By fostering inner balance and mental clarity, yoga contributes significantly to overall quality of life and community well-being.

Building a Healthier Generation

India's demographic dividend rests substantially in its villages, where millions of young people will shape the country's future. However, changing lifestyles, increased screen exposure, declining physical activity, substance abuse concerns in some regions, and rising mental stress have created new challenges for rural youth.

Yoga offers an effective means of promoting physical fitness, discipline, self-confidence, and emotional stability. It improves concentration, memory, and decision-making

abilities while encouraging healthy behavioural habits.

For students, yoga can help reduce examination stress, improve focus, and support holistic development. For young farmers, entrepreneurs, and workers, it promotes stamina, mental alertness, and productivity. As rural India increasingly embraces digital technologies and modern opportunities, yoga can serve as an important anchor for balanced and healthy living.

Empowering Women and the Elderly

Women constitute the backbone of rural households and rural economies. Alongside household responsibilities, many contribute significantly to agriculture, livestock management, and self-help group activities. These multiple responsibilities often result in physical exhaustion and emotional stress.

Yoga provides women with a practical tool for improving fitness, reducing anxiety, and enhancing overall well-being. Community yoga sessions organised through Self-Help Groups (SHGs), Anganwadi centres, and local institutions can also strengthen social support networks and promote health awareness.

Similarly, India's rural population is witnessing a steady increase in the number of senior citizens. Gentle yoga practices help improve mobility, flexibility, balance, and cardiovascular health while reducing the risk of falls and age-related complications. Yoga thus supports healthy ageing and helps elderly citizens maintain independence and quality of life.

Enhancing Educational Outcomes

The benefits of yoga extend beyond health. Research indicates that regular practice improves concentration, discipline, emotional regulation, and learning outcomes among children and adolescents.

Introducing yoga in schools encourages students to develop healthy habits from an early age. Daily yoga sessions can improve attendance, reduce stress, and contribute to better classroom engagement. It also promotes values such as self-discipline, patience, mindfulness, and respect for others.

By nurturing physically healthy and mentally resilient students, yoga contributes to the development of human capital that is essential for India's long-term progress.

Government Initiatives

Recognising yoga as a powerful instrument for preventive healthcare and nation-building, the





Government of India has launched several initiatives to expand its reach across rural areas and among young people.

International Day of Yoga as a Mass Movement-

Since the first International Day of Yoga in 2015, the Ministry of AYUSH has transformed the event into a nationwide movement. The annual celebrations involve participation from schools, colleges, Gram Panchayats, community organisations, armed forces personnel, and citizens across the country. The Ministry's "Yoga Sangam" initiative encourages simultaneous yoga demonstrations at thousands of locations, including villages and educational institutions. Such events expose rural youth to yoga and encourage community participation.

Yoga in Schools and Colleges- Educational institutions play a central role in promoting yoga among young people. Schools are encouraged to organise yoga demonstrations, awareness campaigns, competitions, and wellness activities around the International Day of Yoga. These initiatives familiarise students with yoga from an early age and help embed healthy habits into everyday life.

Yoga Unplugged- The Ministry of AYUSH has launched "Yoga Unplugged", a youth-centric campaign designed to connect yoga with younger generations through creative competitions, digital engagement, social media outreach, quizzes, and campus-based activities. The initiative seeks to make yoga relevant and appealing to contemporary youth while encouraging regular participation.

Training Yoga Volunteers- The Yoga Certification Board (YCB) under the Ministry of AYUSH conducts certification programmes for Yoga Volunteers and instructors. These programmes create a cadre of trained individuals capable of conducting yoga sessions at schools, villages, community centres, and public events. Rural youth can benefit from these opportunities both as participants and as future wellness professionals.

Digital Access to Yoga Learning- The Government has also expanded digital access to yoga education through online resources, instructional videos, the Common Yoga

Protocol, and mobile applications such as the Namaste Yoga App. These tools enable young people in remote areas to learn and practise yoga using smartphones and digital connectivity. Together, these initiatives are helping transform yoga from an annual observance into a regular wellness practice across rural India.

Building Healthier Communities

One of yoga's greatest strengths is its ability to bring people together. Community yoga sessions organised in villages encourage participation across age groups, genders, and social backgrounds. Such activities strengthen social cohesion and create opportunities for promoting broader health awareness. Gram Panchayats, schools, Common Service Centres, community halls, and village organisations can serve as platforms for organising yoga camps and wellness programmes. These events can also be linked with campaigns related to nutrition, sanitation, mental health, and preventive healthcare. In this way, yoga contributes not only to individual well-being but also to healthier and more resilient communities.

Conclusion

Yoga embodies India's civilisational wisdom while offering practical solutions to many of the contemporary challenges facing rural communities. Its ability to promote physical fitness, mental well-being, preventive healthcare, social cohesion, and healthy lifestyles makes it a valuable instrument for rural transformation. Government initiatives, educational institutions, community organisations, and local leadership are helping expand its reach among rural youth and households across the country.

As India moves towards the goal of *Viksit Bharat 2047*, integrating yoga into everyday rural life can contribute significantly to building healthier individuals, stronger communities, and a more productive nation. The International Day of Yoga serves as a reminder that sustainable development begins with human well-being, and yoga remains one of the most accessible pathways to achieving it. □



Naxal-Mukt Bharat : A Strategic Turnaround

The story of *Naxal-Mukt Bharat* is not simply one of military or policing successes. It is a story of coordinated statecraft. It reflects how political will, institutional coordination, professional security operations, and developmental commitment can together confront and reverse a long-standing insurgency.

Kuldiep Singh



he vision of a *Naxal-Mukt Bharat* or Naxal-free India represents far more than a security objective. It reflects the commitment of the Government of India towards restoring governance, expanding development and protecting democratic institutions in Left Wing Extremism (LWE) affected areas. Naxalism posed one of India's gravest internal security challenges for decades. It affected large parts of central

and eastern India by disrupting development, targeting security personnel and exploiting socio-economic vulnerabilities. However, a significant shift has emerged in recent years. The Ministry of Home Affairs (MHA) has made substantial progress towards neutralising the Naxal threat through sustained security operations, strong central-state coordination, focused development initiatives, and strategic leadership. India has made substantial progress towards neutralising the Naxal threat.

The author is an IPS officer (Retd.), served as ADG and SDG – Central Zone in the CRPF and led several anti-Naxal operations across Chhattisgarh, Jharkhand, Odisha, Bihar, Madhya Pradesh, Uttar Pradesh and West Bengal during 2017–2021. He is presently serving as the Security Advisor to the Government of Manipur. Email: advisorsec.manipur@gmail.com

At the core of this transformation has been the recognition that the Naxal challenge cannot be addressed solely through force. It required a whole-of-government approach, integrating security operations with governance, infrastructure, and welfare delivery. While state police forces have rightly remained at the forefront of Naxal operations, given that the law and order is constitutionally a state subject, the MHA has played the critical role of strategist, coordinator, and force multiplier. The distinction is important: the fight may have been led operationally by states, but it has been driven structurally and strategically by the MHA, Government of India.

MHA designed a multipronged, zero-tolerance strategy aimed at ending LWE by March 2026 through the SAMADHAN doctrine (Smart Leadership, Aggressive Strategy, Motivation and Training, Actionable Intelligence, Dashboard-based Key Result Areas and Key Performance Indicators, Harnessing Technology, Action Plan for Each Theatre & No access to Financing). By March 2026, security forces neutralised almost all CPI (Maoist) leadership through enhanced intelligence, forward operating bases and intensive development in “red corridors”, shifting focus towards “growth corridors”.

Key Turnaround Strategies and Tactics (2014-2026)

Leadership and Policy Shift

A zero-tolerance approach under the Ministry of Home Affairs emphasised proactive operations rather than reactive measures aimed at eliminating the

ideological, financial and logistical support of LWE. Ministry of Home Affairs’ LWE division implemented a “National Policy and Action Plan (2015)” that prioritises the “Trace, Target, Neutralise” approach and “Development, security synergy” as outcome.

Forward Operating Bases (FOB’s)

One of the defining features of recent success against Naxalism has been the enhanced role of Central Armed Police Forces (CAPF’s) – primarily the CRPF (Central Reserve Police Force) (including CoBRA - Commando Battalion for Resolute Action units) BSF (Border Security Force), ITBP (Indo-Tibetan Border Police) and SSB (Sashastra Seema Bal), who acted as the backbone of anti-Naxal operations, providing fire power, intelligence and support to the state Police. As the lead CAPF in counter-LWE operations, the CRPF has played a pivotal role in reclaiming territory, disrupting insurgent strongholds and conducting targeted operations (through its specialised units – CoBRA) in difficult forested terrain where Maoist groups traditionally enjoyed tactical advantage.

Over 350 security camps were set up within extremist strongholds to create a security vacuum for Naxals. These camps comprise CAPFs and State Police specialised units like District Reserve Guards (DRG) of Chhattisgarh, C-60 Commandos of Maharashtra, Special Operations Group (SOG) of Odisha and Jaguars of Jharkhand. The contribution of such joint camps extends beyond combat. They enable area domination, secure roads and critical infrastructure,



protect polling stations during elections and facilitate the return of civil administration in previously inaccessible areas. It has created the necessary conditions for schools to reopen, roads to be built, health services to reach the remote population and the benefit of Government schemes to reach the needy.

The geographical spread of Left-Wing Extremism (LWE) has reduced from 126 affected districts in 2014 to just 11 in 2025, and most affected districts dropped from 36 to 6 in the same period.

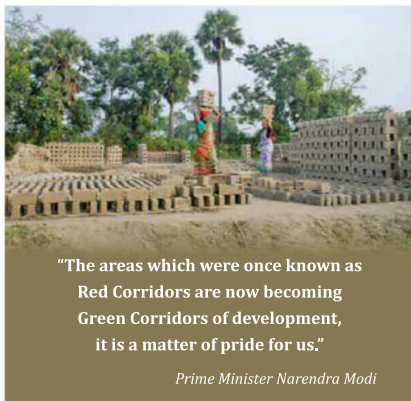
Key Operational Shift

The strategy has shifted from passive containment to aggressive, proactive operation. With the establishment of joint operating bases (Over 350 of them), high-impact operations, including 'Operation Octopus', 'Operation Double-bull', and 'Operation Bura Pahad', successfully targeted the Naxalite leadership and command structure, with over 300 Naxals neutralised and over 200 arrested in 2025. The entire top leadership of the CPI (Maoist) has been dismantled, with 12 neutralised, 07 surrendered, and 01 arrested out of 21 top leaders. Only one leader is still at large.

The leadership role of the MHA has been critical in maintaining sustained political and administrative focus. Counterinsurgency efforts often falter when attention becomes episodic or fragmented. In contrast, the anti-Naxal strategy has benefitted from continuity, regular monitoring with clearly defined objectives. This sustained institutional drive has ensured that gains made through security operations are consolidated through governance and developmental interventions.

Effective operational coordination has been achieved through a multi-disciplinary 'whole-of-government' approach, reducing the security vacuum in remote areas. The Multi-Agency Centre (MAC) is empowered to provide real-time intelligence to all security forces. In all, 15 new Joint Task Forces have been established to synchronise operations between CAPFs and state police forces. Two Multidisciplinary Groups (MDGs) have also been established in the Ministry of Home Affairs (since 2016) to choke the financial resources of the Maoists, which has already led to seizure of Rs 40 Crores (approx).

Another Key element in the push towards a *Naxal-Mukt Bharat* has been the strategy of targeting the insurgency's support structures rather than focusing



only on armed cadres. Efforts to disrupt recruitment, logistics, extortion networks and propaganda machinery have weakened the organisational resilience of Maoist groups. Simultaneously, surrender and rehabilitation policies have encouraged many cadres to rejoin mainstream society, further eroding insurgent strength.

Capacity Building of States

The MHA's strategic direction has been visible through the implementation of a multi-pronged national approach combining security, development, rights & entitlements and public outreach. This has included financial assistance to states for modernisation of police forces, infrastructure development in affected districts and support for capacity building. Central schemes targeting roads, telecommunications, skill development, education and banking access in LWE-affected areas have directly undercut the conditions that insurgents sought to exploit.

Security Related Expenditure (SRE) was increased by 155% with Rs 3,371 Crore released over the past 11 years for operational needs, training and rehabilitation of surrendered cadres. Similarly, in the Special Infrastructure Scheme (SIS), Rs 371 Crore was approved for strengthening specialised state forces and intelligence branches. Rs 620 crores were approved for the construction of 246 Fortified Police Stations (FPS). Apart from the above, huge funds have been spent on mobility, night landing helipads, surveillance, drone tracking, AI-based data analytics, GIS mapping, upgradation of intelligence gathering mechanisms, etc.



Reduction of Left-Wing Extremism in India

Comparison of affected districts between 2014 and 2025



The decisive factor has been unprecedented centre-state coordination, which has moved from episodic cooperation to institutional partnership. The MHA has been in control of this transformation. Through regular security reviews, joint operational planning, intelligence sharing mechanisms and targeted support to affected states, the MHA has ensured unity of purpose across jurisdictions.

Through these efforts, the government aims to end the red corridor era, replacing it with development projects like roads, schools and Eklavya Model Residential School (EMRS) to permanently remove the influence of Naxalism.

Importantly, the state's approach has increasingly emphasised winning the trust of local communities. This is crucial because the battle against Naxalism is not only about eliminating armed violence but also about restoring citizen confidence in the state. Security forces and civil administration have in many areas, worked to build stronger engagement with tribal communities and marginalised populations. Civic action programmes, welfare outreach, and responsive governance have helped counter the alienation that insurgents once leveraged.

The decline in Naxal violence across many previously affected districts is evidence that this approach has yielded results. Areas once considered

insurgent strongholds have witnessed restoration of governance, improved connectivity, increased economic activity, and greater citizen participation in democratic processes. Elections conducted peacefully in previously volatile regions are a powerful symbol of this transformation.

With the achievement of a Naxal-free *Bharat*, India has reached a historical milestone. Yet residual pockets of insurgency remain, particularly in difficult terrain where extremist groups attempt to regroup. Sustained vigilance, therefore, remains essential. Counter-insurgency successes can only endure if accompanied by continued development, responsive governance, and institutional resilience.

Going forward, the lessons from the anti-Naxal campaign offer a broader model for addressing internal security challenges. First, security responses are most effective when integrated with development and governance. Second, strong Centre-State coordination is indispensable in dealing with complex, cross-jurisdictional threats. Third, central leadership, particularly through institutions such as the MHA, can provide the strategic coherence needed for long-term success, even when operational responsibility lies primarily with states. And fourth, professional, adaptive security forces like the CRPF and other CAPFs remain vital pillars of national internal security.

The story of *Naxal-Mukt Bharat* is, therefore, not simply one of military or policing successes. It is a story of coordinated statecraft. It reflects how political will, institutional coordination, professional security operations, and developmental commitment can together confront and reverse a long-standing insurgency. In this effort, state police have led from the front, CAPFs - especially the CRPF, have acted as a powerful operational backbone, and the Ministry of Home Affairs has provided the strategic direction that has held the entire framework together.

As India moves closer to realising the goal of a Naxal-free Nation, this achievement stands as a testament to the strength of cooperative federalism, the professionalism of its security forces, and the enduring capacity of the Indian state to restore peace, order, and development even in the most challenging environments. *Naxal-Mukt Bharat* is thus not merely a security milestone; it is a reaffirmation of national resolve and democratic resilience. □



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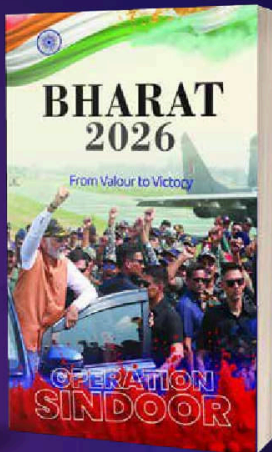
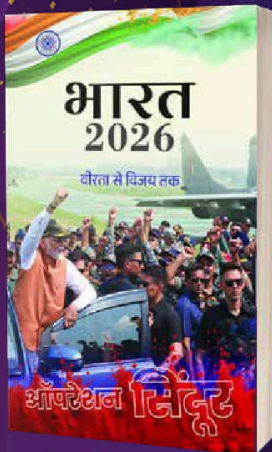
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