

Discussion Paper

Digital Just Transition

Digital Pathways for Community-centered Just Transition



Empowering Workforce Adoption in Diversified Economies of Ramgarh and Bokaro



Acknowledgments

This discussion paper, Digital Just Transition: Digital Pathways for Community-centered Just Transition, was developed as part of an ongoing effort to explore the role of digital accessibility in economic diversification in Ramgarh and Bokaro. It draws on extensive field research, stakeholder consultations, and collaborative discussions with experts, policymakers, and community members.

We sincerely acknowledge the contributions of researchers, field teams, and digital inclusion practitioners who played a crucial role in shaping this paper.

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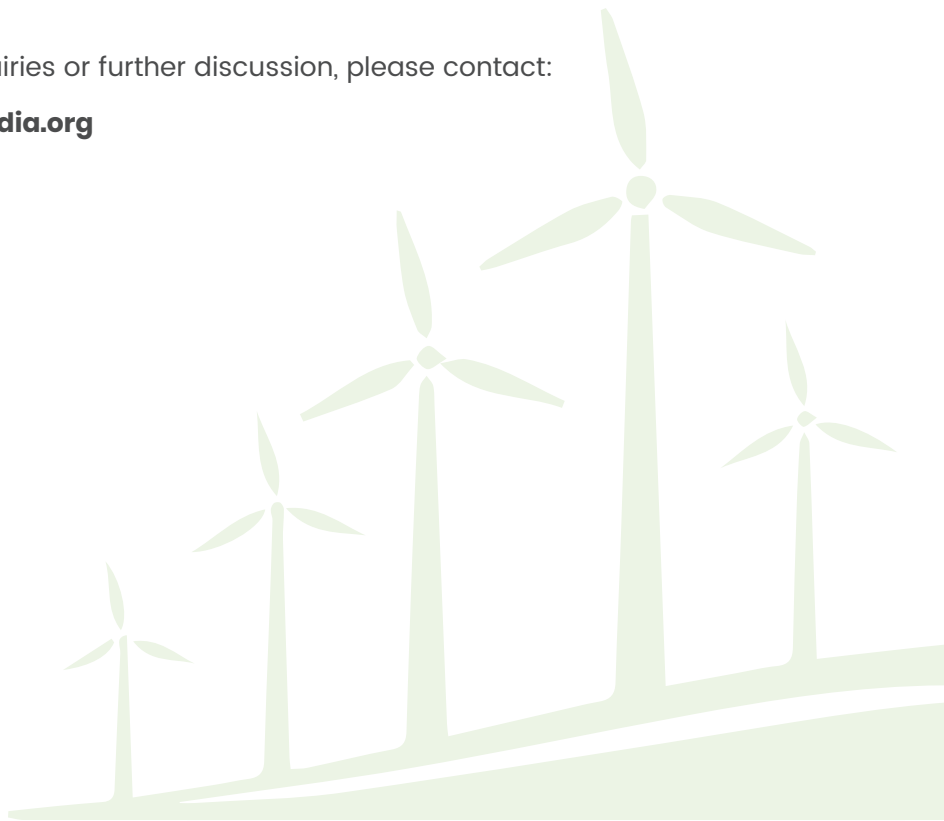
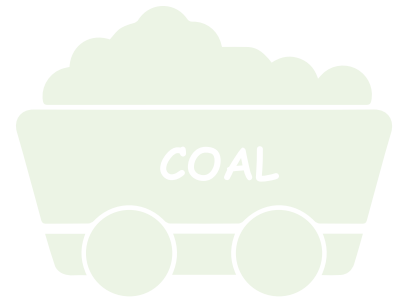




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Introduction

Digital technology is a defining force in shaping modern economies, governance structures, and environmental policies, making it a critical enabler of sustainable development (World Bank, 2022). From enhancing climate resilience through predictive analytics to optimizing resource use in agriculture and energy sectors, digital tools have demonstrated their potential to drive equitable progress (ITU, 2021). However, as global economies move toward a technology-driven future, marginalized communities risk being left behind—not only in digital access but also in crucial socio-economic transitions, including the shift to a low-carbon economy (UNCTAD, 2021). This reality underscores the urgent need for a Digital Just Transition—a framework ensuring that digitalization contributes to both social justice and sustainability, rather than exacerbating existing inequalities.

The intersection of digitalization and just transition is particularly significant in the context of climate action and economic restructuring. As industries decarbonize and adopt digital infrastructure, communities dependent on traditional industries—such as coal mining or informal labor markets—face heightened vulnerabilities (OECD, 2023). Without deliberate intervention, these transitions could widen digital divides, displace workers, and reinforce socio-economic disparities (UNDP, 2022). A Just Digital Transition is therefore essential, ensuring that technological advancements serve all segments of society, particularly those historically excluded from digital and economic opportunities.

This paper argues that a citizen-centric approach—anchored in hyper-local digital solutions—is key to making digitalization an instrument of justice rather than



exclusion. Localized digital interventions, tailored to the specific needs of vulnerable populations, can democratize access to technology, enhance workforce resilience, and enable marginalized communities to participate in the digital economy (UNESCO, 2023). However, achieving this requires aligning business strategies with policy actions that safeguard digital rights, promote sustainability, and bridge digital inequalities.

By examining the necessity of Digital Just Transition and Just Digital Transition, this paper explores how inclusive and sustainable digital policies can drive equitable climate action, economic participation, and technological access—ensuring that digital transformation is not just a privilege of the few but a right for all.

Digital Just Transition- An Emerging Discourse

Earlier data suggests that digitalization can either mitigate or deepen social inequalities, depending on how it is integrated into economic and environmental transitions. De Sousa Jabbour et al. (2022) highlight the potential of digital technologies to drive environmental, economic, and social sustainability, emphasizing the need for equitable digital policies.

Further studies stress the importance of people-centered strategies. Smith et al. (2024) explore the twin transition, advocating for policies that align digital and green transformations with skill development to prevent exclusion. Similarly, the International Labour Organization (ILO) underscores the necessity of integrated policy and financing frameworks, ensuring that digital and






environmental transitions create jobs and strengthen social protection. Collectively, these studies highlight the need for a comprehensive, rights-based digital transition, prioritizing social equity, sustainability, and economic inclusivity to ensure that technological advancements benefit all.

Digital development that does not respect human rights in the digital environment and that is not based on principles of inclusion and sustainability can reinforce patterns of social exclusion and unsustainable methods of resource exploitation and production, as well as exacerbating their negative environmental impacts. In this case, the net effect will depend on the way in which business strategies tie in with policy actions aimed at steering digitalization towards development with equality and sustainability.

Background of the Study

The report “Just Transition & Economic Diversification of Jharkhand’s Coal Heartland: Ground-up Studies from Ramgarh and Bokaro,” authored by Rishi Kishore, Sandeep Pai, Deeksha Pande, Arpita Kanjilal, Maitri Singh, Kumar Satyendra Singh, and Suresh Ram Ravidas, is a collaborative, year-long study by Digital Empowerment Foundation (DEF) and Swaniti Initiative.

A total of 2,305 surveys were conducted across Bokaro and Ramgarh to assess coal dependency and diversification potential. This included 1,833 household surveys (950 in Bokaro and 883 in Ramgarh) and 440 enterprise surveys (320 registered and 120 unregistered enterprises). Additionally, 12 Focus Group Discussions (FGDs) were held with coal communities, local businesses, and workers, alongside 20 semi-structured interviews with district officials and coal industry representatives. The extensive fieldwork, conducted by research and field teams over a period of one year, provide a comprehensive understanding of economic dependencies and pathways for diversification.



The study examines the urgent need for economic diversification in Ramgarh and Bokaro, where over 70% of registered enterprises rely on coal, coal-based boilers dominate industries, and coal remains the primary cooking fuel for over 90% of households in Ramgarh and 50% in Bokaro.

Despite this deep dependence, 57% of enterprises and many households express interest in transitioning to tourism, pisciculture, agro-processing, and solar manufacturing. However, inadequate infrastructure, financial constraints, limited skilled labor, and weak institutional support pose major challenges. To ensure a just and sustainable transition, the report recommends potential pathways for economic diversification, developing localized transition plans, enabling MSME growth in non-coal sectors, enhancing digital literacy and skill development programs, and recognising communities as key stakeholders in policymaking.

As Ramgarh and Bokaro move towards a post-coal economy, it is crucial to prioritize economic diversification while ensuring that affected workers and communities are not left behind. The study conducted in both districts highlighted tourism, agro-based industries, renewable energy, pisciculture, and MSMEs as promising sectors for economic diversification. A crucial enabler of this transition, as this paper argues, is digital accessibility, integration, and empowerment, which can support workforce reskilling, enhance financial inclusion, and improve access to e-governance, welfare schemes, and entrepreneurial opportunities.

This paper emphasizes the role of a Digital Just Transition, advocating for digital inclusion and adoption of tools, resources, and platforms to support the seamless integration of the workforce in the coal-dependent regions into emerging sectors. Digital accessibility within communities and digital integration across sectors will help form one of the fundamental and strongest pillars of economic diversification.



Socioeconomic Overview of Ramgarh and Bokaro Districts, Jharkhand

Ramgarh district has an average household size of 4.8, with an annual income of \$1,643 (137,366 INR). Approximately 18% of the population experiences multidimensional poverty. Housing conditions are relatively stable, with 82% of households living in pucca or semi-pucca structures and 90% owning their homes. Agriculture plays a crucial role in the district, occupying 24% of the land. Migration patterns indicate that 19% of migrants move for agricultural work, while 5% seek employment in the coal sector.

In Bokaro, households are slightly larger, averaging 4.93 members, and the annual income is higher at \$1,894 (158,923 INR). The proportion of multidimensionally poor individuals is lower at 15.28%. Housing infrastructure is more varied, with 56% of households in pucca houses and the remaining 48% in semi-pucca or kaccha dwellings. Land ownership is relatively high at 55%, with 61% of landowners engaging in agriculture and 21% using their land for commercial purposes. Migration trends show that 25% of households relocate for jobs in coal mines and thermal power plants, while 17% migrate for agricultural work.

Digital Accessibility and Economic Diversification

A pilot study undertaken as part of the household survey to evaluate the status of digital accessibility in these regions revealed varied levels of digital access across the two districts. In Ramgarh, 59% of households have at least one smartphone user, with 86% demonstrating basic digital literacy. Digital service centers are affordable for 69% of households, making digital access relatively widespread.

Bokaro, on the other hand, has a slightly lower smartphone penetration rate of 51%, with 78% of users possessing

fundamental digital skills. The affordability of digital service centers is reported by 66% of households, suggesting a need for greater accessibility to digital tools and training.

1. Digital Skilling and Workforce Readiness for Sectoral Transition

One of the primary challenges in economic diversification is preparing the workforce for new industries. The coal industry has historically required specialized but limited skills, and transitioning to new sectors demands a structured skilling strategy, especially in the content of the rapidly shifting and evolving digital ecosystem. Digital integration across viable sectors can be a powerful tool for providing accessible, scalable, and cost-effective training, enabling communities to adapt to emerging technologies and industries.

1.1 Tourism & Hospitality

Digital skilling programs can train local youth in hospitality management, tourism services, and online marketing. Platforms like Google's Tourism Accelerator or government-backed e-learning portals can offer certification courses in customer service, digital booking management, and sustainable tourism practices. Virtual Reality (VR) and Augmented Reality (AR) can enhance interactive training modules for guest interactions, safety protocols, and historical site management.

1.2 Agro-Based Industry & Food Processing

Digital literacy can enable farmers to leverage mobile applications for precision farming, quality control, and supply chain management. AI-based learning platforms can provide training in food safety standards, sustainable packaging, and export regulations. Mobile advisory services can offer real-time guidance on weather patterns, pest control, and best agricultural practices.





1.3 Renewable Energy & Solar Manufacturing

The growing solar industry presents new employment opportunities, but workers need training in solar panel assembly, installation, and maintenance. AI-driven tutorials and interactive simulations can facilitate remote learning. Partnerships with tech companies can create micro-certification programs in solar technology, enabling coal workers to transition smoothly into renewable energy jobs.

1.4 Pisciculture & Aquaculture

Digital training can enhance productivity in fish farming through IoT-based aquaculture monitoring, optimizing fish growth and reducing disease outbreaks. Mobile applications like e-Fishery and AquaConnect can provide training on breeding techniques, water quality management, and market linkages.

1.5 Non-Coal MSMEs & Digital Entrepreneurship

Digital business development courses can equip workers with skills in inventory management, online marketing, and digital payment systems. Tailored literacy and capacity building initiatives can be undertaken on digital financial literacy, digital marketing, and entrepreneurship, integrating small businesses into the formal economy.

2. Digital Financial Inclusion for Business Growth

Economic diversification requires financial support, but coal-dependent workers often lack access to formal banking and credit. Digital financial inclusion through financial literacy, digital literacy, fintech solutions and mobile banking can enable workers and small businesses to access capital, manage finances, and scale operations.

2.1 Tourism & Hospitality Digital payment

integration through UPI, QR-based payments, and online

booking platforms can help small tourism businesses streamline transactions and attract more visitors. Platforms like Airbnb, TripAdvisor, and Google My Business can enhance visibility for local tourism entrepreneurs.

2.2 Agro-Based & Pisciculture Industries

Farmers and fishery owners can access blockchain-based financial tracking, digital credit platforms, and government subsidy applications through mobile banking. Digital microfinance solutions can help small producers invest in better equipment and expand production.

2.3 Renewable Energy & MSMEs

Digital credit assessment tools can facilitate loans based on alternative credit scores derived from mobile transaction history and digital payment behavior. Government schemes such as PM-KISAN and Mudra Loans can be made accessible through mobile-friendly platforms.

3. E-Governance for Seamless Access to Government Schemes

Coal workers and small businesses in Ramgarh and Bokaro districts often face challenges in navigating bureaucratic processes to access government schemes and support systems. The Common Service Centers (CSCs) play a crucial role in bridging this gap by offering digital access to public services, financial assistance, and welfare schemes at the grassroots level.

CSCs facilitate transparent, accessible, and efficient service delivery, ensuring that communities and small enterprises can seamlessly benefit from economic diversification initiatives. Whether it is availing subsidies, registering for skill development programs, or accessing social security benefits, CSCs empower communities by reducing dependency on intermediaries and eliminating procedural delays.



The integration of digital tools within CSCs can further enhance awareness, streamline documentation, and ensure last-mile connectivity for government benefits. As Ramgarh and Bokaro transition from a coal-dependent economy to a more diversified one, strengthening existing CSCs and establishing new ones in coal-dependent regions as digital enablers will be key to ensuring inclusive and equitable growth for all stakeholders.

4. Digital Market Linkages for Small Enterprises and Entrepreneurs

For economic diversification to succeed, local producers must be able to sell their goods and services beyond local markets. Digital platforms can provide market linkages that allow businesses in tourism, agro-processing, renewable energy, and MSMEs to thrive.

5. Adopting the Hyperlocal Models to Prevent Migration

Migration often results from a lack of local opportunities and access to essential services. To prevent this, self-sufficient smart villages must be developed using hyper-local models rooted in community participation. Such models ensure sustainability and scalability by using local knowledge and social networks. A successful example is the Digital Empowerment Foundation's (DEF) SoochnaPreneur Model, which trains local digital entrepreneurs—SoochnaPreneurs—to serve as information agents. Operating through Communication Information Resource Centers (CIRCs), these entrepreneurs provide access to government schemes, digital financial services, and skill-building programs. SoochnaPreneurs facilitate access to government services, provide digital financial literacy, offer digital skilling programs (including AI and STEM education), support women and marginalized groups in entrepreneurship, and strengthen digital infrastructure at the village level.

5.1 Digital Access to Government Schemes

SoochnaPreneurs can facilitate access to communities:

- Access welfare schemes like PM-KISAN, MGNREGA, and PM Ujjwala Yojana.
- Navigate digital applications for business loans, MSME support, and agricultural subsidies.

5.2 Enabling Digital Skilling and Workforce Transition

- Set up community learning hubs offering courses in tourism, agribusiness, and solar energy.
- Promote awareness of online job portals and gig work platforms.

5.3 Financial Inclusion for Economic Empowerment

- Educate communities on mobile banking, UPI payments, and fintech solutions.
- Facilitate access to credit and microfinance for small businesses and self-employed individuals.

6. Why Just Digital Transition is as Important and Central to Digital Just Transition

India's digital transition must be affordable, accessible, and culturally relevant, ensuring that digital transformation does not widen existing social inequalities. A just digital transition is not just about expanding internet access but also about ensuring meaningful participation in the digital economy, recognizing socio-economic disparities, linguistic diversity, and local knowledge systems.

This study is one of its kind in the Just Transition discourse, where the research was led by women SoochnaPreneurs, who come from the communities themselves. These women community leaders are digital entrepreneurs, providing essential digital services in their villages. Their leadership



ensures that ground realities shape policy recommendations, making the digital transition truly inclusive and responsive to local needs.

6.1 Addressing Connectivity Inequity

India has one of the largest mobile phone user bases in the world, yet approximately 300 million Indians still rely on 2G networks. The push for mandatory 4G and 5G transitions by telecom companies and government policies threatens to exclude millions from essential digital services such as UPI payments, online education, and telemedicine. A truly inclusive digital transition requires policies that:

- Maintain affordable 2G/3G services for those who rely on them.
- Provide subsidies or financial assistance for digital device and internet adoption.
- Promote community-led connectivity solutions in rural and remote areas.

Without these interventions, forced technological upgrades risk deepening the digital divide, disproportionately impacting marginalized groups such as rural communities, low-income workers, and the elderly.

6.2 Bridging the Gender Digital Divide

The gender digital divide is one of the most persistent forms of exclusion in India's digital landscape. Studies show that women in low-income households are often given only basic feature phones, while male family members have access to smartphones. This limited access reduces women's participation in digital economies, online education, and public services.

To bridge this divide, we must:

- Implement gender-sensitive digital literacy programs that empower women with skills to navigate the digital world.



- Develop affordable financing models for women's access to smartphones and internet services.
- Enforce policy safeguards to protect women's digital rights and prevent surveillance or control by male family members.

Without addressing these issues, digital transitions will reinforce gender inequalities rather than dismantle them.

6.3 AI & Data Sovereignty

The increasing adoption of Artificial Intelligence (AI) and data-driven technologies raises urgent questions about sovereignty, privacy, and ethical AI governance. Currently, much of India's AI infrastructure relies on foreign tech giants, which often operate with exploitative data extraction models—harvesting local data without reinvesting in India's digital ecosystem.

For a just AI transition, India must prioritize:

- Hyper-local AI solutions that reflect the linguistic, cultural, and socio-economic realities of Indian users.
- Stronger data protection laws to prevent the exploitation of personal data by global corporations.
- Public investments in AI research and development to reduce dependency on foreign technologies.

Additionally, AI policies should focus on empowerment rather than extraction, ensuring that marginalized communities benefit from AI-driven innovation rather than becoming its casualties.



The Way Forward

A Digital Just Transition is not just a necessity but an opportunity to create a more equitable and sustainable future for the communities of Ramgarh and Bokaro. As these districts move towards a diversified economy, digital integration across sectors will be crucial in bridging skill gaps, enabling digital financial inclusion, and ensuring equitable access to opportunities in emerging industries such as tourism, agro-processing, renewable energy, pisciculture, and micro, small, and medium enterprises (MSMEs).

To strengthen digital accessibility within communities, the Digital Empowerment Foundation's (DEF) SoochnaPreneur model provides a scalable and community-driven approach to equipping marginalized groups, particularly women and coal-dependent workers, with the necessary digital skills and tools to navigate this economic transition effectively.

However, this transformation is not without challenges. Persistent issues such as connectivity inequity, gender disparities in digital access, and the lack of citizen- and community-centric digital frameworks must be addressed to prevent the further marginalization of vulnerable populations. Policies that prioritize affordability, accessibility, and localized digital solutions will be essential in ensuring a just and inclusive transition. Additionally, the integration of e-governance, digital skilling, and financial inclusion will empower communities to participate actively in the emerging economy.

India has the opportunity to lead a community-centered digital transition, ensuring that digital transformation does not deepen existing inequalities but instead equips communities with the knowledge, resources, and autonomy needed to thrive in a post-coal economy.

Action Research: Implementing the SoochnaPreneur Model and Establishing of Digital Just Transition Taskforce

As part of its commitment to a Digital Just Transition, DEF is implementing its hyper-local model to support digital entrepreneurship in Ramgarh and Bokaro. Locations for digital entrepreneurship have been strategically identified based on survey data and Focus Group Discussions (FGDs), ensuring interventions are placed where they are most relevant and impactful.

A saturation-based approach will be used for location selection, categorizing areas within 1-5 km, 5-10 km, 10-20 km, and 20-25 km to capture diverse geographic experiences—ranging from urban peripheries to remote rural settlements. This approach ensures that digital services reach areas with both expressed interest and an identified need for digital integration.

The Role of SoochnaPreneurs

The SoochnaPreneurs, who will drive this transition, will be local community members, many of whom have previously worked as surveyors in this study. Their deep community ties and firsthand understanding of local needs position them as community champions, ensuring that digital entrepreneurship is not just externally introduced but locally owned and sustained. This shift transforms the study from mere research into action research, enabling continuous feedback loops where insights from implementation further inform and refine the approach.

Through this model, we aim to understand how digital entrepreneurship takes shape in different settings, from semi-urban clusters to deeply rural landscapes. By embedding the principles of Digital Just Transition and Just Digital Transition, Ramgarh and Bokaro can set a global precedent for equitable economic transformation—

demonstrating that sustainable development and technological progress must go hand in hand. The transition beyond coal is not just about new industries but about ensuring that workers and communities have ownership, agency, and direct benefits from this transformation.

Digital Just Transition Taskforce

The Digital Empowerment Foundation (DEF) is launching a Digital Just Transition Taskforce to explore where and how digitalization can facilitate just transitions. This initiative will take a bottom-up, community-centric approach, ensuring that digital solutions address local needs while informing broader policy frameworks.

Key objectives include:

- Mapping digital interventions to assess their role in economic and social transitions, particularly in diversifying livelihoods and industries affected by structural changes.
- Identifying policy gaps to ensure that community-driven digital solutions inform national and global policies.
- Proposing hyper-local solutions that integrate digital tools into employment, education, and social protection systems to build economic resilience.

Recommendations for a Just Digital Transition in Coal-Dependent Regions

1. Establish Digital Transformation Task Forces

Local governments should create expert-led task forces to drive digital transformation and ensure continuity across election cycles. These task forces should engage citizens, businesses, and academia to enhance public services, foster innovation, boost economic growth, and align with global frameworks such as the EU Green Deal and SDG 13 (Climate Action).

2. Digital Skilling for Workforce Transition

Governments and industries should implement targeted digital skilling programs to support workers transitioning from coal to emerging sectors like renewable energy, sustainable agriculture, tourism, and micro, small, and medium enterprises (MSMEs).

3. Enhancing Digital Financial Inclusion

Fintech companies and banks should expand access to mobile banking, digital payments, and micro-loans to empower small businesses and individuals. Government subsidy and loan programs should be fully digitized for easier access and transparency.

4. Strengthening E-Governance for Social Schemes

Local governments should improve e-Governance services to ensure marginalized communities can easily access essential social security schemes and benefits through digital platforms.

5. Developing Digital Market Linkages

Public-private partnerships should establish digital platforms that connect small businesses and local entrepreneurs to national and international markets, boosting e-commerce and fostering economic resilience.

6. Multistakeholder approach to design local solutions

Institutions should scale up hyper local models to coal-dependent regions, training women and youth as local digital entrepreneurs who provide crucial community-based digital services and information.

7. Improving Connectivity and Device Accessibility

Governments and telecom providers should work together to expand affordable and reliable internet access, particularly in remote areas, ensuring equitable participation in the digital economy.

8. Bridging the Gender Digital Divide

Special programs should focus on enhancing digital literacy, financial inclusion, and online safety for women,

enabling them to actively participate in digital economies and leadership roles.

9. Advancing AI & Data Sovereignty

Governments and research institutions should develop localized AI solutions and enforce strong data protection laws to safeguard citizen privacy and ensure ethical AI governance.

10. Implementing Inclusive Digital Transition Policies

National and regional policies should prioritize affordability, accessibility, and digital inclusion. Infrastructure development should focus on underserved areas, ensuring that coal-dependent communities have the tools needed for a just digital transition.



Recommendations

1. Digital Skilling for Workforce Transition

Governments and Industry should implement targeted digital skilling programs for workers transitioning from coal to sectors like tourism, agriculture, renewable energy, and MSMEs.

2. Digital Financial Inclusion

Fintech and Banks should expand access to mobile banking and loans, empowering small businesses and individuals with digital financial services.

Government Programs should be digitized for easy access to subsidies and loans.

3. E-Governance for Access to Schemes

Local Governments should enhance e-Governance services, ensuring marginalized communities can easily access digital services and schemes.

4. Digital Market Linkages

Government & Private Sector should build platforms connecting small businesses to national and international markets, promoting e-commerce in local industries.

5. Scaling the SoचनाPreneur Model

DEF should expand the SoचनाPreneur model tailored to the needs of the coal-dependent regions, training women and youth to become local digital entrepreneurs, improving community access to information and services.

6. Improving Connectivity

Telecom Providers and Governments should ensure affordable connectivity and device access, especially in remote areas, ensuring no one is left behind.

7. Bridging the Gender Digital Divide

Programs should focus on digital literacy and financial support for women, empowering them to engage in digital economies and ensuring digital safety.

8. AI & Data Sovereignty

Government and Research Institutions should develop local AI solutions and strengthen data protection laws to safeguard citizen privacy.

9. Inclusive Digital Transition Policies

National Policies should focus on affordability, accessibility, and inclusion, prioritizing underserved areas for digital infrastructure development tailored to the needs of coal-dependent regions.

10. Establish Digital Transformation Task Forces

Local governments should form task forces with experts from various departments to drive digital transformation and ensure continuity across election cycles. For example, Bratislava's innovation team, within its Department of Digitalisation, leads digital transformation through the Bratislava ID portal. By collaborating with citizens, businesses, and academia, the team tackles urban challenges in mobility, environment, social inclusion, and governance. This approach improves public services with technology-driven solutions, boosts city competitiveness and economic growth, strengthens innovation and stakeholder collaboration, and aligns with European and global agendas like the EU Green Deal and SDGs.



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