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Anusha Kesarkar-Gavankar | Sauradeep Bag | Prithvi Gupta Editors













HOPE IN THE HORIZON India's Youth and Global Futures





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Editors' Note

Anusha Kesarkar-Gavankar, Sauradeep Bag, and Prithvi Gupta

oday, at the quarter mark of the century, the world faces seemingly intractable challenges including heightening geopolitical tensions, widening economic gaps, consequential cultural shifts, and worsening environmental concerns. Inaction is no longer an option-in particular, for the world's youth. After all, it is the nearly 1.2 billion of them worldwide, ages 15 to 24, who will inherit these legacy problems and bear the brunt of their consequences. Yet, these same young people can actively shape the future. The imperative for their generation is therefore to respond effectively, armed with critical thinking and a strong sense of accountability.

India, with over half its population under the age of 25, stands at a defining moment as it aims to become a US\$10trillion economy. Its youth must see themselves not just as participants but as leaders of nation-building. Nurturing a stable and prosperous future will require discipline, ambition, and a commitment to solving today's challenges with practical, sustainable, and equitable solutions. This is not a distant goal but a pressing responsibility, keeping in mind India's Viksit Bharat 2047 aspiration of becoming a fully developed economy.

In 2024, ORF published "Hope in the Horizon: India's Youth and Global Futures (Vol. 1)", the first compendium outcome of our flagship forum for India's youth, the 2024 Spark Dialogue. The volume highlighted issues such as the future of work, environmental responsibility, and social innovation. Notably, 11 of the 16 articles in the publication were authored by women, emphasising the importance of women-led growth and development. Volume I made a case for India's youth to step up with courage and clarity of mind as they help create a more sustainable future.

This present volume is the second and final edition of the series, capturing insights from the 2024 iteration of the ORF SPARK Dialogue. Held in Mumbai on 9 January 2024, in partnership with Tata Institute of Social Sciences (TISS) and supported by the Consulate General of Australia in Mumbai, the Detox Group, Sigma University, Vadodara, and Kohinoor Education Trust's Schools of Management, the dialogue explored the tensions between ambitions and responsibilities, as well as the idealism of youth and the realities of leadership in a world filled with uncertainty.

This anthology explores themes of public policy, digital transformation, and sustainable development, offering not just insightful expositions of the challenges but, more importantly, plausible solutions.

Dharini Mishra examines the persistent challenge of anaemia among Indian women of reproductive age, identifying the policy gaps and exploring the strategies needed to address this public health crisis. *Chaitanya Prabhu* explores how digital innovation can enhance electoral engagement among young voters in India, shedding light on the societal paradigms that influence political participation. *Meeta Gupta, Pennan Chinnasamy, and Basant Maheshwari* follow with a piece on the power of academic collaborations in strengthening the India-Australia partnership for sustainable development.

Mihir Pradyut Kulkarni then highlights the barriers to water, sanitation, and hygiene (WaSH) accessibility among marginalised communities. In the subsequent essay, *Sara Swain* analyses the impact of digital platforms on India's global identity and soft power. *Swarali Bhutekar* follows with a piece that highlights the urgent need for digital financial inclusion, emphasising the importance of placing women at the heart of urban development efforts.

In the latter pages of the compendium, Yookta Ahuja examines the role of digital literacy in shaping the future of work, while Pranadh Mampilamthoda and Pennan Chinnasamy explore alternative data sources to combat climate change in data-scarce rural regions. Tenzin Karma closes the volume with an essay that discusses the role of seamless digital payments in enhancing India's appeal to global visitors.

Together, these essays offer a compelling vision for a more equitable, inclusive, and sustainable future—one where policy, technology, and innovation converge to drive meaningful change. It is our hope that this effort enables policymakers to prioritise the voices of the youth and aids in the endeavour towards this goal.

Anusha Kesarkar-Gavankar is Senior Fellow, Centre for Economy and Growth, ORF.

Sauradeep Bag is Associate Fellow, Centre for Security, Strategy, and Technology, ORF.

Prithvi Gupta is Junior Fellow, Strategic Studies Programme, ORF.

Anaemia in Girls and Women in India: Challenges and Policy Strategies

Dharini Mishra

naemiaª is global а public health issue and is prevalent among women of reproductive age (WRA)^b between 15 and 49 years, particularly menstruating adolescent girls and postpartum women. Globally, anaemia affects approximately 1.8 billion individuals,1 accounting for 50.3 million years lived with disability in 2019.1 The primary manifestation of anaemia is iron deficiency anaemia (IDA), which is often linked with malaria, nutritional deficiencies, and haemoglobinopathies.² In developing countries, the physical and cognitive deficits caused by IDA also lead to Gross Domestic Product (GDP) losses.3 To address this, the 65th World Health Assembly in 2012 set a goal to halve anaemia in women of reproductive age by 2025, which was later extended to 2030 under the UN Sustainable Development Goals (SDGs).⁴

In India, anaemia among the WRA population has escalated to emergency levels, increasing from 53.1 percent to 57 percent between 2015⁵ and 2021,⁶ with anaemia among adolescent girls seeing a 5-percent rise. Anaemia affects half of India's pregnant women, leading

A state where the number of red blood cells or haemoglobin content is insufficient. Anaemia leads to reduced oxygen transport capacity and causes fatigue, impairs cognitive and motor functions, and increases maternal and perinatal mortality risks as well as low birth weight in newborns. See: https://pubmed.ncbi.nlm.nih.gov/25103581/.

The WRA population is more susceptible to anaemia than men due to unique physiological factors like menstruation, pregnancy, and blood loss during childbirth. The problems are compounded in certain cultural contexts where intra-household dietary inequities that disadvantage women and girls are prevalent. See: https://pubmed.ncbi.nlm.nih.gov/22742612/.

to health issues and socio-economic consequences and contributing to an estimated 1.18-percent annual GDP decline due to productivity loss and healthcare costs.⁷ Addressing anaemia is vital for improving health, gender inclusivity, and women's participation in education and the economy.

Policies for Tackling Anaemia in India

India's anaemia policy has evolved since the initiation of the National Nutritional Anaemia Prophylaxis Programme (NNAPP) in 1970, which focused on iron and folic acid provision for children and pregnant and lactating women. In 1989, the NNAPP expanded to include iron supplementation and anaemia management, emphasising health and nutrition education.8 Later in 2018, the Anemia Mukt Bharat (AMB) initiative was launched under the POSHAN Abhiyaan and targets six age groups through six interventions and six institutional mechanisms (i.e., the '6x6x6 strategy').9 The Weekly Iron and Folic Acid Supplementation (WIFS) programme complements the AMB by targeting adolescents with supervised supplementation, biannual deworming, and nutrition education.¹⁰ This policy evolution reflects а comprehensive public health response to address the multifaceted issues of anaemia. Table 1 provides a comparative analysis of WIFS and AMB.

| Criteria | Objective | WIFS Assessment | AMB Assessment | Key Characteristics |
|------------------------------------------------------|--------------------------------------------|--------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Coverage and Reach | Beneficiary inclusivity | High | High | WIFS: Targeted and comprehensive scope AMB: Reaches a wider demographic |
| Implementation, Complexity, and Sustainability | Operational intricacy and durability | Moderate | High | WIFS: Moderate operational complexity but suffers from sustainability due to challenges like supply chains (e.g., frequent Iron and Folic Acid (IFA) tablet stockouts) AMB: Demonstrates higher sustainability due to integration into the national framework |

Table 1: AMB and WIFS

| Monitoring and Evaluation | Effectiveness assessment | Low | Moderate | WIFS: Requires enhancement on monitoring and evaluation AMB: Emphasis on rigorous monitoring and evaluation |
|------------------------------------------|-----------------------------------------|-----|----------|--------------------------------------------------------------------------------------------------------------------------|
| Community Engagement and Education | Stakeholder participation | Low | High | WIFS: Sub-optimal engagement AMB: Comprehensive strategy to communicate and educate |
| Supply Chain Management | Logistics of supplement provision | Low | Moderate | WIFS: Has encountered notable challenges in supplement procurement AMB: Assumes but does not detail efficacy |

Sources: Harvard University¹¹ and Ministry of Health and Family Welfare¹²

Despite these policies, anaemia prevalence in India continues to rise, signalling daps in implementation. Critical areas for improvement include monitoring and evaluation mechanisms and supply chain management. Best practices in countries like Bangladesh offer and Panama can insights. Bangladesh, through its national strategy initiated in 2006, targeted a 25-percent reduction in anaemia among high-risk groups and adopted a combination of micronutrient supplementation, enhanced dietary practices, and broad-based health education. Similarly, Panama's National Plan on Nutrition and Food Security (2009-2015)reducing focused on anaemia in postpartum women and integrating young children, strategies

like delayed umbilical cord clamping, iron supplementation, and fortified food distribution.

Data Analysis and Key Findings

This article used National Family Health Survey (NFHS) data to examine anaemia prevalence and intervention effectiveness in India, with a focus on the following:

- Women's adherence to iron and folic acid supplementation during pregnancy, categorised into 100 days and 180 days
- The prevalence of anaemia among the WRA population, disaggregated for three key demographics:

adolescent girls, pregnant women, and non-pregnant women

There are significant regional disparities in anaemia prevalence among WRA in India (see Figure 1), with Ladakh having the highest prevalence at 92.8 percent. Eastern states (West Bengal, Bihar, Assam, and Odisha) also have high rates, while states in Central India (Madhya Pradesh and Chhattisgarh) and southern India (e.g., Kerala and Karnataka) have lower prevalence.

Figure 1: Anaemia Prevalence in Indian States



The percentage change in anaemia prevalence between NFHS-4 and NFHS-5 across three key groups in India is shown in Figure 2. Prevalence among pregnant women declined overall, although Sikkim, Puducherry, and Goa saw increases. Nonpregnant women in Assam, Mizoram, and Jammu and Kashmir experienced highest the increase in prevalence. Prevalence adolescent among girls showed the least reduction, with hilly regions experiencing the sharpest increases in prevalence. Union Territories (UTs) such as Lakshadweep, the Andaman and Nicobar Islands, Dadra and Nagar Haveli and Daman and Diu (DNHDD) experienced significant decreases in health interventions. Uttar Pradesh achieved significant progress, with declines across all parameters.





Percentage change in adolescent girls who are anaemic Percentage change in pregnant girls who are anaemic Percentage change in non-pregnant girls who are anaemic

Sources: NFHS-4¹⁵ and NFHS-5¹⁶

Figure 3 shows that the change in IFA supplementation intake during the 100day period was modest in most states, except in Jharkhand, Madhya Pradesh, Nagaland, Rajasthan, and Tripura, which experienced marked increases. Sikkim showed minimal fluctuation, while Ladakh was the only region to experience a downturn. Arunachal Pradesh had the highest increase in 100-day supplementation. In the 180-day period, Odisha had the most pronounced increase, followed by Tripura, West Bengal, and Mizoram, indicating a robust response to supplementation efforts in these regions. Ladakh, Karnataka, and Jammu and Kashmir showed a significant decrease in uptake.





Sources: NFHS-4¹⁷ and NFHS-5¹⁸

Recommendations

There is a need for further research to understand the success of administrations like Lakshadweep's and the challenges that hinder progress in the eastern and northern regions. India's high anaemia burden can be reduced by addressing immediate causes like poor nutritional intake and underlying factors such as poverty and gender norms, which can be achieved by implementing social support programmes and educational campaigns. Regional variability in IFA uptake necessitates targeted strategies to improve supplementation, supported by regional health initiatives, healthcare accessibility, and public health campaign effectiveness.

The recommendations in this article focus on WRA and emphasise the need for effective interventions for vulnerable groups to promote overall health and societal well-being. The recommendations are as follows:

Food fortification policies should incorporate "enhancers" that improve absorption, iron supported by public health education on avoiding "inhibitor" foods and promoting effective food-processing methods in resource-limited communities. Rigorous monitoring of anaemia interventions is essential to overcome implementation barriers and ensure targeted, effective delivery to highrisk groups.

- There is information asymmetry regarding anaemia among the public, community leaders, and stakeholders. A multi-pronged awareness campaign targeting pregnant women, adolescent girls, and community workers such as Accredited Social Health Activists (ASHAs) and Anganwadi Workers (AWW) is essential to improve self-care and adherence. Strategies could include workshops, mobile health apps, and educational materials distributed through local health centres. Similar to the 'Pulse Polio' campaign,^c community radio programmes and local influencers can be engaged to disseminate information. Men. particularly husbands and fathers, should be key stakeholders in the awareness campaign.
- A regional focus is essential. There have been alarming increases in anaemia prevalence in eastern India,

^c A nationwide vaccination initiative aimed at eradicating poliomyelitis (polio) by administering the oral polio vaccine (OPV) to all children under the age of five.

Gujarat, and high-altitude areas in northern and northeast regions. While food scarcity due to topography and socio-political issues contribute to a high nutritional anaemia burden, additional research is required for other factors, such as cultural dietary practices, healthcare accessibility, and environmental stressors. Understanding these factors is crucial for developing targeted interventions that address the specific needs of these regions.

To effectively reduce anaemia in adolescent girls, emphasis should be on micronutrient supplementation, adherence counselling, and regular screenings of haemoglobin levels. Enhancing programme effectiveness would involve training officials, optimising stock and coverage data, and ensuring last-mile delivery to schools and Anganwadi centres^d for consistent supply and access to resources. Focusing on improved patient testing, tracking, and treatment will also bolster overall impact.

Dharini Mishra holds a Bachelor's degree in Sociology from the University of Delhi and a master's in development studies from the Tata Institute of Social Sciences, Mumbai. She is currently Associate Consultant in the ESG domain.

^d Rural childcare centres. 'Anganwadi' translates to "courtyard shelter" in English, reflecting its community-based nature.

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Strengthening Electoral Engagement in India: Overcoming Challenges with Digital Innovation

Chaitanya Prabhu

percent ith over 65 of India's population under 35, the country boasts one of the world's youngest electorates.1 However, the 2024 general and state elections revealed a troubling trend-low voter registration, particularly among the youth; with only about 38 percent of 18-19-year-olds registering to vote.^{2,3} While efforts have been made to improve voter engagement, many young and first-time voters remain disengaged. Often dismissed as "apathetic", this narrative oversimplifies the complex structural barriers in India's vast and demographic. Strengthening diverse youth development, expanding voter education, and fostering innovation in civic engagement can serve as pathways to increasing the youth's participation in the electoral process.

India's intricate social fabric, shaped by historical inequities and evolving aspirations have posed challenges to civic engagement, which often perpetuate a lack of understanding, awareness, and participation, leading to an erosion of trust in the democratic process. This disconnects, if not addressed, risks alienating the very individuals who form the backbone of this democratic experiment.^{4,5}



Investment in Youth Development

Institutions such as the Indian Institute of Technology and the Indian Institute of Management have shaped India's domestic intellectual capital and contributed to its global soft power⁶ while simultaneously positioning India as a global knowledge hub.⁷ As the youth population continues to grow, it is imperative that investments in education and skill development benefit current and future generations.

While premier institutions have bolstered intellectual India's capital, unequal access to quality youth development programmes perpetuates divides, limiting opportunities for the youth, especially those marginalised by socio-economic divides. Despite a large budget allocated for government expenditure under Union Budget 2024-25, the Central Government's Ministry of Youth Affairs and Sports received only 0.071 percent of the total allocation (INR 34.4232 billion).8 This underinvestment in youth-focused programmes is an oversight in a country that relies heavily on its youth population to drive economic growth and innovation.9 Key initiatives aimed at building youth leadership, such as the National Service Scheme (INR 2.5 billion), National Young Leaders Programme (INR 90 million), and National Youth Corps (INR 50 million), are severely underfunded. This could create regional disparities, limit outreach, and compromise the quality of youth leadership and employment programmes in India, weakening their ability to equip young people with skills and opportunities for socio-economic development.¹⁰

If India fails to invest in empowering its youth to question and improve the world around them, it would undermine its potential for long-term development and progress.

Gaps in Voter Education

Article 326 of the Constitution of India guarantees every person the right to vote, irrespective of caste, creed, or religion. This landmark provision created an inclusive space for political participation.¹¹ Despite the legal framework, historical inequalities often result in a different reality. Trends in voter participation reflect inconsistencies among marginalised and economically disadvantaged groups.

Another critical issue is the lack of comprehensive voter education. In the Indian schooling system, multiple boards, including the Council for the Indian School Certificate Examinations, International Baccalaureate. A-levels. Examination and Secondary School (SSE), fail incorporate effective to civic education into their curricula.12 Only the Central Board of Secondary Education provides some coverage of democratic processes, but it remains superficial, with the curriculum focusing on voter education but failing to address bureaucratic and systematic barriers that hinder voter participation and choices.^{13,14} Consequently, young people who are eligible to vote lack the knowledge to make informed decisions. With the rise of a globally aware and tech-savvy youth population, there is a growing need to align educational outcomes with democratic participation.

Revitalising Civic Engagement Through Social Innovation

Many eligible individuals in India are either unregistered or do not participate in elections. Addressing this issue solutions requires innovative that blend technological advancements with administrative reforms. By leveraging technology, digital infrastructure, and innovative frameworks, such initiatives can bridge the disconnect between voters, especially the youth, and the electoral process, fostering a culture of informed and active participation.15 This requires transformative approaches that transcend traditional methods of voter outreach. With over 90 million voters across the nation,16 leveraging the country's vast digital infrastructure enhance voter engagement to can revolutionise the electoral process.

Leveraging Digital Infrastructure for Voter Engagement

Building a framework that empowers communities to take ownership of their democratic rights would ensure participation that is not limited to voting but extends to continuous dialogue and accountability. This renewed focus on civic engagement can be coupled with advancements in digital infrastructure and the potential formulation of a Social Civic Credit System that could pave the way for a more dynamic and participatory democracy. A digital platform can be created to track participation, award credits, and provide civilians with real-time access to their scores by recognising and incentivising actions such as voting, community service, and adherence to civic duties. The introduction of a Social Civic Credit System would not only encourage civic responsibility but also foster a generation of more engaged and responsible voters.

Implementing Social Credit: Building a Movement for Civic Responsibility

Civic Activities as Credit Generators

- Voting: Casting votes in local, state, or national elections could help people earn civilian credits, encouraging higher voter turnout by transforming the act of voting into a rewarding experience.
- Volunteering: Participation in community service initiatives, such as cleanliness drives or disaster relief programmes, could accumulate credits, promoting a culture of social responsibility.
- Local Governance Participation: Credits can be awarded for attending town hall meetings, contributing to local problem-solving initiatives, or engaging in neighbourhood governance efforts.
- Civic Education: Civilians who attend workshops, seminars, or discussions on democratic values and governance can earn credits, fostering a more informed and active electorate.

- Youth Engagement: Universities and colleges can integrate the Social Credit System into extracurricular activities, awarding credits for student governance, volunteering, and organising events that promote civic values.
- Incentivising Innovation: National competitions can be organised to engage youth to propose creative ideas for civic engagement. Winners can be rewarded with credits, scholarships, or public recognition, driving a culture of innovation and involvement.

Tangible Benefits for Civilians

The credits accumulated through these activities can be redeemed for practical and meaningful rewards, making civic engagement a valued and incentivised experience:

- Access to Public Services: Active participants could receive priority access to essential government services, such as healthcare, housing schemes, or educational subsidies.
- **Tax Benefits:** Consistent civic engagement could yield small reductions in property taxes, income taxes, or other levies, incentivising sustained participation.
- Discounts on Public Amenities: Individuals could use credits to access discounted fares on public transport, reduced fees for recreational facilities, or entry to cultural institutions.

 Streamlined Processes: High social credit scores could result in expedited government services, such as faster passport or license issuance, enhancing convenience for responsible citizenship.

Another promising approach is Automatic Voter Registration (AVR) leveraging India's robust digital infrastructure, particularly Aadhaar and birth-certificate systems. With over 1.38 billion Aadhaar holders as of September 2023,¹⁷ integrating Aadhaar with birth-certificate data and the Election Commission of India (ECI) can help design a streamlined system wherein individuals are automatically registered to vote upon turning 18 years old.

The proposed framework involves Registrar of Births and Deaths the collaborating with the Unique Identification Authority of India (UIDAI) and ECI to track individuals reaching the eligible voting age. Birth certificates, which already include vital information like date and place of birth, can be cross-referenced with Aadhaar to verify identity, age, and address. This integration would ensure that voter IDs are issued without manual applications. Additionally, Aadhaar-linked utility services, such as electricity or telephone bills, can serve as supplementary address proof, further reducing bureaucratic hurdles. Individuals could receive automated notifications via SMS or email, informing them of their voter registration status and providing their voter ID details.

AVR minimises bureaucracy, making the process more accessible and inclusive for individuals from rural and marginalised communities who often face challenges with voter registration. The automation would ensure greater youth participation by enrolling every eligible person promptly, amplifying political youth engagement. Moreover, by utilising existing digital infrastructure, this solution is both cost-effective and scalable. The government's prior success with large-scale digital initiatives like Aadhaar and CoWIN¹⁸ highlights the feasibility of such a system and the need for policy support, as proven by the adoption of digital innovations like DigiLocker and Direct Benefit Transfer schemes.19,20

The Pathway to Inclusive Democracy

Structural factors influence the extent to which India's youth engage with the democratic process to create a disconnect rather than disengagement. Addressing this requires a multifaceted approach:

- Increased Investment in Youth Programmes: Allocate adequate resources to initiatives that build leadership, civic awareness, and employability among young Indians.
- Comprehensive Voter Education: Integrate robust voter education into school and college curricula, enabling young people to make informed electoral choices.

Adopting Innovative Solutions: Leverage technology and social innovation to simplify voter registration and reward civic participation.

By investing in the education, engagement, and empowerment of the youth, India can unlock the demographic's potential to shape a more inclusive, equitable, and participatory democracy. Voter education should not be limited to knowing the voting age but must include understanding governance structures, analysing political manifestos. and discerning the long-term implications of policy decisions. A robust voter-education framework is essential to empower young Indians to view their vote as a tool for change. Institutions must prioritise integrating such curricula to prepare students to engage meaningfully with democracy.

Additionally, social and digital innovations like the Social Civic Credit System and AVR have transformative potential. By reducing barriers to participation and incentivising engagement, these initiatives can increase voter turnout, particularly Recognising among the youth. and rewarding civic contributions motivates individuals to take a more active role in governance and community building. An engaged citizenry ensures greater accountability and transparency in governance, empowering democratic institutions to function more effectively. Incentivising youth involvement would position them as key stakeholders in shaping the nation's future, ensuring that their voices are represented in policymaking and governance.

India's democratic journey needs to evolve to remain inclusive and participatory. AVR would simplify the electoral journey, while the Social Credit System would redefine citizenship as a celebrated and incentivised aspect of life. These initiatives not only bridge systemic gaps but also inspire a cultural shift towards accountability, participation, and governance. Importantly, they pave the way for a vibrant, participatory democracy where every vote matters and every voice is heard.

Chaitanya Prabhu is the founder of Mark Your Presence, a non-profit and non-partisan organisation, and a lawyer with a Master's degree in Public Policy.

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Strengthening Academic Collaboration in the India-Australia Partnership for Sustainable Development

Meeta Gupta, Pennan Chinnasamy, and Basant Maheshwari

n an era of interconnected global challenges, collaboration between nations has become paramount to address complex issues such as climate change and foster sustainable growth. India and Australia, two geographically distant yet economically significant nations, have recognised the urgency of these challenges and are forging a robust partnership to confront them. Their collaborative efforts signify a shared commitment to achieving the Sustainable Development Goals (SDGs) and contributing to global environmental governance frameworks. At the heart of these collaborations are academic institutions, which act as catalysts for innovation, research, and exchange of knowledge.

Australia's population of 2.6 crores is far smaller than India's 144 crores, yet the two countries are facing similar challenges related to climate, water, and sustainability, including extreme flood and drought events; growing competition for limited water resources between urban, semi-urban, and rural areas; and water insecurity, compounded by climate change. The over-exploitation of surface and groundwater resources and the fall in water quality also create pressures. Additionally, both countries are experiencing increasing urbanisation,



which has added to urgency the of tackling water-related problems, including providing drinking water for all, managing storm water, providing proper sanitation services, and reducing water pollution. Therefore, effective surface and groundwater management is essential for both. India is also undergoing rapid socio-economic transformations and changing demographics. To manage this, it needs to sustain its agriculture sector, which requires water availability of a certain quality and quantity.1

As a result, both countries are facing challenges in achieving the United Nations (UN) SDGs, specifically in of sustaining terms investment in water infrastructure and innovation and achieving greater public participation. Thus, the partnership on water, climate action, and sustainability between the two countries can be mutually beneficial and reflects a convergence of interests and recognition of the urgency to address environmental challenges.

The collaborative efforts extend beyond specific initiatives, positioning India and Australia as influential players in global climate discussions. As they align their vision and resources, their synergy would become a catalyst for broader global choices and contribute to the accelerated achievement of the SDGs. The collaboration can be enhanced through the active involvement of academic institutions, which are pivotal to fostering innovation, driving research, facilitating knowledge exchange. and In the context of the Global South, where sustainable solutions are often urgently needed, academic collaboration is imperative.

Catalysts for Sustainable Development

Academic institutions can spearhead joint research initiatives that focus on developing sustainable solutions tailored to the unique challenges faced by countries in the Global South. Under the Australia-India Strategic Research Fund (AISRF), 93 collaborative projects spanning various scientific domains, such as food and water security, environment, health, and energy, have been undertaken by 90 universities and research institutions across both nations.²

2007 to 2021, academic and From collaborations research between India and Australia increased more fourfold,³ with than joint research programmes emerging as one of the most vital and effective forms of bilateral partnerships. In 2008, the Indian Institute of Technology (IIT) Bombay and Monash University, Melbourne, set up the IITB-Monash Research Academy. Subsequently, similar ventures have been initiated between Australian universities and Indian institutions. Examples include the University of Queensland-IIT Delhi partnership established in 2018, the IIT Kanpur-La Trobe University Research Academy formed in 2020, and the RMIT-BITS Higher Education Academy established by the Royal Melbourne Institute of Technology and the Birla Institute of Technology and Science, Pilani, in 2023. These programmes conduct research on themes such clean as energy, natural resource management, climate change, and food sustainability. As of writing, there are 40 joint doctoral programmes between the two countries.

Australian Indian universities and have also collaborated to establish research and development centres and laboratories. One notable example is the Australia India Water Centre (AIWC), founded in 2020. This virtual centre involves six Australian universities and 14 Indian institutions working in the water research, area of education, training, and capacity building.⁴ Similarly, in 2022, Deakin University and IIT Madras established the Australia India Centre for Energy (AICE), dedicated to research in decarbonisation and energy futures.⁵ These joint endeavours to develop research programmes and centres showcase the growing interest in both nations for increased collaboration between academia and industry. The primary goal is to conduct research that holds potential for commercialisation and provides an advantage in the rapidly evolving technological landscape.

Perceived Benefits

These collaborations offer multiple benefits that transcend academia and influence policy formulation, drive technological progress, and enhance societal awareness. The benefits are as follows:

Trans-disciplinary and cross-cultural collaboration

Sustainable development requires a holistic understanding of complex challenges, and academic institutions are well-positioned to facilitate trans-disciplinary collaboration. This approach transcends traditional disciplinary boundaries and involves interdisciplinary collaboration among individuals and non-academic stakeholders such as policymakers, community members, and industry professionals to address complex real-world issues such as climate change and water sustainability by integrating diverse knowledge, methodologies, and perspectives. The joint academic initiatives bring together researchers, experts, stakeholders, policymakers, and different industry partners from domains, such as engineering, environmental sciences, management, economics, and social sciences.

The Managing Aquifer Recharge (and Groundwater Use) through Villagelevel Interventions (MARVI) project is an example of trans-disciplinary collaboration between India and Australia. More than 10 years old,6 the project works with farmers and other village residents to build their capacity to monitor, share, and sustain groundwater. MARVI's approach has been adopted by the Ministry of Jal Shakti in its national groundwater Bhujal project, Atal Yojana.

Enhanced data collection and database generation

One of the primary outcomes of joint research initiatives is the creation of extensive datasets. Collaborative efforts enable the collection of diverse and comprehensive datasets, ranging from environmental socio-economic parameters to indicators, leading to a rich dataset that reflects the diverse contexts of developing nations, enhancing the applicability and relevance of the data generated. Thus, by consolidating data from joint research projects, academic collaborations contribute to establishing a robust repository databank or that becomes а valuable asset for understanding the intricacies of sustainability challenges and evaluating the effectiveness of implemented solutions.

Shared research facilities and resources

Resource-sharing agreements enable access to specialised equipment that may be limited or unavailable in individual institutions. Laboratories equipped with advanced instruments for analysing environmental samples, testing of renewable energy technologies, or conducting climate modelling become accessible to researchers from both nations, reducing the time required to complete research. This accelerated pace is crucial for addressing urgent sustainability challenges, contributing to the timely development and implementation of impactful solutions.

Knowledge exchange platforms and best practices

Establishing platforms for sustained knowledge exchange ensures that the lessons learned from successful sustainable initiatives are disseminated widely, contributing to a global repository of best practices. Collaborative research efforts lead to large numbers of joint publications and research journals dedicated to water and food security and development. sustainable These publications will serve as valuable resources for scholars, policymakers, and practitioners seeking evidencebased solutions. Additional available resources need to be to make these publications openaccess. Academic institutions should contribute to a culture of open knowledge sharing that transcends geographical boundaries. Platforms like conferences, panel discussions, and workshops can also provide opportunities to showcase successful case studies, share research findings, and engage in meaningful discussions on the challenges and opportunities in achieving sustainability goals, thus contributing to the broader scientific community and influencing policy discussions.

• Community engagement programmes and participatory approaches Collaborative community engagement programmes led by academic institutions can empower local communities to participate in sustainable initiatives. Workshops,

training sessions, and participatory research projects can be designed to incorporate traditional knowledge systems and ensure that solutions resonate with the cultural values and practices of the communities involved. One such initiative was jointly carried out by the University of Southern Queensland and Tamil Nadu Agricultural University in 2023 to conduct research aimed at helping local farmers adapt to the impacts of climate change on their agribusinesses.⁷

Policy research and advocacy

Academic collaborations act conduits between as research communities and policymakers. By engaging with policymakers in India, Australia, and beyond, institutions facilitate a dialogue transcending academic spheres and translating research into impactful policy recommendations. This advocacy role extends the reach of educational insights, fostering a more direct and influential connection between the research community and

those responsible for crafting and implementing policies. The aim is to inform decision-making and shape policies that prioritise sustainability, climate action, and environmental responsibility.

Conclusion

The collaborative initiatives between academic institutions in India and Australia embody a pragmatic approach to tackling the challenges of water, climate action, and sustainable development. A dynamic ecosystem can be cultivated through these academic synergies, allowing for the development and implementation of sustainable solutions, effective policy interventions, and technological innovations tailored to the unique challenges faced by the Global South. As nations navigate the complexities of the future, such collaborations serve tangible as examples of practical cooperation, laying the groundwork for a more sustainable, equitable, and resilient future on a global scale.

Meeta Gupta is Ph.D. Scholar, IIT Bombay-Monash Research Academy.

Pennan Chinnasamy is Associate Professor, Centre for Technology Alternatives for Rural Areas, and the Interdisciplinary Programme in Climate Studies, IIT Bombay. He is also visiting Professor, Nebraska Water Centre, University of Nebraska, US.

Basant Maheshwari is Distinguished Professor, Western Sydney University, Australia.

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Accessibility Gaps to WaSH Among Social Groups in India

Mihir Pradyut Kulkarni

he COVID-19 pandemic has brought renewed attention to public health, highlighting the essential role of water, sanitation, and hygiene (WaSH) in influencing health outcomes. Investments in creating inclusive access to WaSH reduce disease burdens and public health expenditures.1 It also enhances workforce participation, community involvement, and access to diverse information. ultimately empowering individuals to contribute to economic growth and poverty reduction.² The benefits of WaSH thus extend beyond immediate health improvements, offering multiple downstream advantages.³

Of the various initiatives of the Government of India to improve WaSH and make it universally accessible, the Swachh Bharat Mission (SBM) (2014) and the Jal Jeevan Mission (JJM) (2019),4 targeting sanitation and drinking water, respectively, have met with the most measurable success. Within five years of SBM's implementation, the percentage of households using improved sanitation facilities in rural areas increased from 41 percent in 2014 to 90 percent in 2019. Similarly, rural households with functional tap connections increased from 16.75 percent in 2019 to 77.85 percent in 2024.5



However, despite such improvements, millions of households, especially those in marginalised populations, still do not have adequate access to WaSH. Poor financial capacity, as well as the lack of proximity to drinking water sources, hinder access to clean and safe drinking water.⁶

Addressing these challenges is essential to achieving universal access to WaSH by 2030, as envisioned by the United Nations Sustainable Development Goal (SDG) 6.⁷ It is also vital for India's inclusive development.⁸ This article evaluates how WaSH accessibility differs among diverse social groups in various Indian states over time. It identifies the states with the most vulnerable social groups, including Scheduled Tribe (ST), Scheduled Caste (SC), Other Backward

Class (OBC), and Others, which need more targeted policy interventions.

Data Analysis

The unit-level data analysis is conducted using the 69th (2012),9 76th (2018),10 and 78th (2021)¹¹ National Sample Survey Office (NSSO) rounds. NSSO ranks states according to the percentage of households reporting accessibility to latrines. The states consistently ranked at the top, middle, and bottom across the three survey rounds-Tripura, Kerala, West Bengal, Maharashtra, Odisha, and Bihar, as shown in Table 1-are chosen for in-depth analysis. Table 2 outlines the state-wise sample^a and its distribution according to the social groups in the selected states.

^a NSSO has followed a representative sampling technique for concerned rounds. All percentage values in this study belong to the sample.

| | Table | 1: | Ranking | of | States | with | Access | to | Latrines | and | the | Selected | States^b |
|--|-------|----|---------|----|---------------|------|--------|----|----------|-----|-----|----------|---------------------------|
|--|-------|----|---------|----|---------------|------|--------|----|----------|-----|-----|----------|---------------------------|

| Ranking | 2012 | 2018 | 2021 |
|------------|------------------|----------------|----------------|
| 1 (Best) | Tripura | Tripura | Kerala |
| 2 | Kerala | Kerala | Tripura |
| 3 | Assam | Assam | Assam |
| 4 | Goa | Haryana | Punjab |
| 5 | Punjab | Uttarakhand | Haryana |
| 6 | Uttarakhand | Punjab | Uttarakhand |
| 7 | Haryana | Goa | Telangana |
| 8 | Himachal Pradesh | Chhattisgarh | Chhattisgarh |
| 9 | West Bengal | West Bengal | Goa |
| 10 | Maharashtra | Maharashtra | West Bengal |
| 11 | Gujarat | Telangana | Maharashtra |
| 12 | Andhra Pradesh | Gujarat | Karnataka |
| 13 | Karnataka | Andhra Pradesh | Andhra Pradesh |
| 14 | Tamil Nadu | Madhya Pradesh | Gujarat |
| 15 | Rajasthan | Karnataka | Tamil Nadu |
| 16 | Madhya Pradesh | Tamil Nadu | Uttar Pradesh |
| 17 | Uttar Pradesh | Rajasthan | Madhya Pradesh |
| 18 | Chhattisgarh | Jharkhand | Rajasthan |
| 19 | Bihar | Bihar | Bihar |
| 20 | Jharkhand | Uttar Pradesh | Jharkhand |
| 21 (Worst) | Odisha | Odisha | Odisha |

Source: Author's own, from NSSO rounds 69, 76, and 78

^b The selected states are in bold.

| State | Vear | Sample | State and year-specific distribution among the social groups | | | | | |
|-------------|------|--------------|-----------------------------------------------------------------|---------------|----------------|---------------|--|--|
| Otate | Tear | size (%) | ST | SC | OBC | Others | | |
| | 2012 | 2112 (2.21) | 611 (28.93) | 390 (18.47) | 428 (20.27) | 683 (32.34) | | |
| Tripura | 2018 | 2256 (2.11) | 641 (28.42) | 510 (22.61) | 485 (21.50) | 620 (27.49) | | |
| | 2021 | 4840 (1.75) | 1651 (34.12) | 1007 (20.81) | 902 (18.64) | 1280 (26.45) | | |
| | 2012 | 3837 (4.02) | 98 (2.56) | 475 (12.38) | 2268 (59.11) | 996 (25.96) | | |
| Kerala | 2018 | 3383 (3.17) | 84 (2.49) | 328 (9.7) | 2037 (60.22) | 934 (27.61) | | |
| | 2021 | 7840 (2.84) | 150 (1.92) | 769 (9.81) | 4684 (59.75) | 2237 (28.54) | | |
| | 2012 | 7288 (7.63) | 293 (4.03) | 1938 (26.6) | 705 (9.68) | 4352 (59.72) | | |
| West Bengal | 2018 | 7789 (7.29) | 540 (6.94) | 1848 (23.73) | 1023 (13.14) | 4378 (56.21) | | |
| | 2021 | 18236 (6.60) | 1315 (7.22) | 5234 (28.71) | 2758 (15.13) | 8929 (48.97) | | |
| | 2012 | 7818 (8.18) | 769 (9.84) | 1246 (15.94) | 2666 (34.11) | 3137 (40.13) | | |
| Maharashtra | 2018 | 9298 (8.70) | 905 (9.74) | 1133 (12.19) | 3140 (33.78) | 4120 (44.32) | | |
| | 2021 | 24069 (8.71) | 150 (1.92) | 769 (9.81) | 4684 (59.75) | 2237 (28.54) | | |
| | 2012 | 4380 (4.58) | 56 (1.28) | 1000 (22.84) | 2574 (58.77) | 750 (17.13) | | |
| Bihar | 2018 | 5240 (4.90) | 689 (13.15) | 1014 (19.36) | 2474 (47.22) | 1063 (20.29) | | |
| | 2021 | 18495 (6.69) | 537 (2.91) | 4404 (23.82) | 10540 (56.99) | 3014 (16.30) | | |
| | 2012 | 3544 (3.71) | 810 (22.86) | 613 (17.3) | 1215 (34.29) | 906 (25.57) | | |
| Odisha | 2018 | 3671 (3.44) | 859 (23.40) | 705 (19.21) | 1282 (34.93) | 825 (22.48) | | |
| | 2021 | 9760 (3.53) | 2650 (27.16) | 1748 (17.91) | 3398 (34.82) | 1964 (20.13) | | |
| | 2012 | 95548 (100) | 12524 (13.11) | 17420 (18.24) | 37307 (39.05) | 28297 (29.62) | | |
| India | 2018 | 106838 (100) | 14767 (13.83) | 18157 (17.00) | 43641 (40.85) | 30273 (28.34) | | |
| | 2021 | 276409 (100) | 43170 (15.62) | 48824 (17.67) | 111479 (40.34) | 72936 (26.39) | | |

Table 2: Sample Sizes for NSSO Rounds 69 (2012), 76 (2018), and 78 (2021), and their Distribution Across Social Groups $^\circ$

Source: Author's own, from NSSO rounds 69, 76, and 78

^c Values in parentheses indicate the percentages.

Access to Drinking Water^d

The percentage of households (HHs) using improved drinking water sources increased nationwide nearly by 5 percentage points, from 89.72 in 2012 to 94.40 percent in 2021, as depicted in Table 3. Bihar is the best-performing almost 99 state, with percent of households using improved sources, while Kerala is the worst, with only 53 percent coverage. Of the 47 percent of households that lack improved drinking water sources in Kerala, most belong to the OBC category. Most households that use unimproved drinking water sources belong to ST, Others, and OBC in Tripura, West Bengal, and Bihar, respectively. At the national level, OBC households constitute the most households that use unimproved drinking water sources.

Table 3: Distribution of Principal Sources of Drinking Water AcrossStates, Years, and Social Groups (%)

| State | Year | Principa drinki | l source of ng water | Distribution among HHs that use unimproved source of drinking water | | | |
|-------------|------|--------------------|-------------------------|---------------------------------------------------------------------------|-------|-------|--------|
| | | Improved | Unimproved | ST | SC | OBC | Others |
| | 2012 | 92.00 | 8.00 | 72.19 | 7.69 | 3.55 | 16.57 |
| Tripura | 2018 | 88.87 | 11.13 | 71.31 | 12.75 | 4.38 | 11.55 |
| | 2021 | 92.13 | 7.87 | 78.74 | 7.09 | 6.56 | 7.61 |
| | 2012 | 40.55 | 59.45 | 2.89 | 11.84 | 59.75 | 25.52 |
| Kerala | 2018 | 55.54 | 44.46 | 3.39 | 10.11 | 62.77 | 23.74 |
| | 2021 | 53.37 | 46.63 | 2.54 | 9.00 | 64.31 | 24.14 |
| | 2012 | 95.58 | 4.42 | 11.80 | 31.06 | 12.73 | 44.41 |
| West Bengal | 2018 | 97.88 | 2.12 | 32.73 | 23.03 | 19.39 | 24.85 |
| | 2021 | 97.94 | 2.06 | 33.25 | 20.16 | 21.20 | 25.39 |
| Maharashtra | 2012 | 91.84 | 8.16 | 28.84 | 12.07 | 34.01 | 25.08 |
| | 2018 | 96.64 | 3.36 | 28.21 | 13.78 | 25.64 | 32.37 |
| | 2021 | 96.00 | 4.00 | 31.86 | 10.82 | 33.97 | 23.35 |

^d Indicator variables consider whether households get drinking water from improved or unimproved sources, based on NSSO's classification. Improved sources of drinking water: Bottled water, piped water into dwelling, piped water to yard/plot, piped water from neighbour, public tap/standpipe, tube well, hand pump, protected well, public tanker truck, private tanker truck, protected spring and rainwater collection. Unimproved sources of drinking water: Unprotected springs, unprotected wells, and surface water from ponds, tanks, rivers, dams, streams, canals, and lakes.

| Bihar | 2012 | 97.60 | 2.40 | 2.86 | 26.67 | 52.38 | 18.10 |
|--------|------|-------|-------|-------|-------|-------|-------|
| | 2018 | 99.83 | 0.17 | 0.00 | 25.00 | 75.00 | 0.00 |
| | 2021 | 99.47 | 0.53 | 19.19 | 32.32 | 40.40 | 8.08 |
| | 2012 | 86.60 | 13.40 | 38.11 | 15.16 | 28.21 | 18.53 |
| Odisha | 2018 | 91.47 | 8.53 | 23.32 | 15.02 | 44.73 | 16.93 |
| | 2021 | 92.65 | 7.35 | 38.47 | 10.28 | 38.19 | 13.06 |
| | 2012 | 89.72 | 10.28 | 21.71 | 14.01 | 43.27 | 21.02 |
| India | 2018 | 94.71 | 5.29 | 24.47 | 11.03 | 45.72 | 18.79 |
| | 2021 | 94.40 | 5.60 | 31.59 | 9.97 | 43.13 | 15.30 |

Source: Author's own, from NSSO rounds 69, 76, and 78

Figure 1 illustrates the increased access to clean drinking water in 2018 and 2021, with projected coverage in 2030^e at the current growth rate. If unchanged, around 7 percent of the population may still continue to lack access to improved drinking water sources by 2030. The shaded portion highlights the acceleration required for universal accessibility to improved and safe drinking water in 2030.

^e We used the linear extrapolation technique to make the projections. We consider a simplistic situation and do not consider factors that may alter the growth rate.


Figure 1: National Coverage of the Use of Improved Sources of Drinking Water, 2012-2021 (%) and Acceleration Required to Reach Universal Coverage (>99%) by 2030

Source: Author's own, from NSSO rounds 69, 76, and 78

Access to Sanitation

Table 4 outlines household latrine accessibility from 2012 to 2021, with nearly 100-percent access observed in Tripura and Kerala and around 90-percent coverage in West Bengal and Maharashtra. Bihar and Odisha stand at 65-70 percent. Nationally, latrine accessibility increased from 62.64 in 2012 to 86 percent in 2021. At the national level, OBCs remain the most vulnerable group without access to improved sanitation facilities.

| State | Year | Access to latrine | No access to latrine | Distribution among HHs that do not have access to latrines | | | |
|-------------|------|-------------------------|----------------------------|---------------------------------------------------------------|-------|-------|--------|
| | | | | ST | SC | OBC | Others |
| Tripura | 2012 | 99.18 | 0.82 | 58.82 | 5.88 | 5.88 | 29.41 |
| | 2018 | 99.60 | 0.40 | 22.22 | 11.11 | 33.33 | 33.33 |
| | 2021 | 99.88 | 0.12 | 16.67 | 16.67 | 66.67 | 0.0 |
| Kerala | 2012 | 95.52 | 4.48 | 12.21 | 30.81 | 41.86 | 15.12 |
| | 2018 | 99.53 | 0.47 | 68.75 | 25.00 | 6.25 | 0.0 |
| | 2021 | 99.90 | 0.10 | 12.50 | 50.00 | 25.00 | 12.50 |
| West Bengal | 2012 | 72.33 | 27.67 | 7.49 | 39.26 | 10.07 | 43.18 |
| | 2018 | 88.83 | 11.17 | 19.89 | 31.38 | 10.80 | 37.93 |
| | 2021 | 89.99 | 10.01 | 26.12 | 31.93 | 15.77 | 26.18 |
| Maharashtra | 2012 | 63.07 | 36.93 | 19.15 | 18.88 | 36.16 | 25.81 |
| | 2018 | 88.02 | 11.98 | 26.48 | 17.50 | 33.03 | 22.98 |
| | 2021 | 89.46 | 10.54 | 26.99 | 18.83 | 32.27 | 21.91 |
| Bihar | 2012 | 35.13 | 64.87 | 1.48 | 29.68 | 58.77 | 10.07 |
| | 2018 | 70.91 | 29.09 | 2.65 | 38.15 | 53.24 | 5.95 |
| | 2021 | 69.62 | 30.38 | 4.84 | 37.00 | 50.79 | 7.37 |
| Odisha | 2012 | 30.78 | 69.22 | 28.62 | 20.99 | 34.01 | 16.37 |
| | 2018 | 55.78 | 44.22 | 30.98 | 24.48 | 31.90 | 12.64 |
| | 2021 | 66.80 | 33.20 | 37.90 | 22.07 | 30.09 | 9.94 |
| India | 2012 | 62.34 | 37.66 | 14.18 | 26.74 | 44.62 | 14.45 |
| | 2018 | 83.37 | 16.63 | 16.27 | 28.13 | 44.69 | 10.91 |
| | 2021 | 86.00 | 14.00 | 21.10 | 26.70 | 42.01 | 10.18 |

Table 4: Distribution of Latrines Accessibility Across States, Years, andSocial Groups (%)

Source: Author's own, from NSSO rounds 69, 76, and 78

Figure 2 depicts India's current latrine accessibility and the acceleration required for universal access by 2030. At the

current coverage rate, approximately 6 percent of the population will lack latrine facilities in 2030.



Figure 2: National Coverage of Accessibility to Latrines, 2012-2021 (%) and Acceleration Required to Reach Universal Coverage (>99%) by 2030

Source: Author's own, from NSSO rounds 69, 76, and 78

Hygiene

NSSO rounds 69 and 78 do not provide adequate information about hygiene.^f Thus, this article considers data from round 76 to analyse access to handwashing facilities. Table 5 shows the percentage of households that wash hands after defecation. Bihar emerged as the most improved state on this count, with 100 percent of the households reporting handwashing after defecation. The remaining states report more than 99.5 percent of handwashing. Nationally, of the small fraction of households that do not wash their hands, 53 percent belong to the ST category.

^f NSSO round 69 did not have any questions about handwashing. NSSO round 76 asked "Whether household members regularly wash their hands after defecation?", while round 78 recorded "Whether hand washing facility is available within the premises?" Since the two questions are different, the responses cannot be compared on a year-on-year basis.

| State | Year | Whether household members wash their hands after defecation | | Distribution among HH members who do not wash their hands after defecation | | | |
|-------------|------|----------------------------------------------------------------------|------|----------------------------------------------------------------------------------|--------|-------|--------|
| | | Yes | No | ST | SC | OBC | Others |
| Tripura | 2018 | 99.87 | 0.13 | 0.0 | 100.00 | 0.0 | 0.0 |
| Kerala | 2018 | 99.88 | 0.12 | 0.0 | 25.00 | 25.00 | 50.00 |
| West Bengal | 2018 | 99.95 | 0.05 | 50.00 | 0.0 | 25.00 | 25.00 |
| Maharashtra | 2018 | 99.91 | 0.09 | 37.50 | 25.00 | 25.00 | 12.50 |
| Bihar | 2018 | 100.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 |
| Odisha | 2018 | 99.97 | 0.03 | 0.0 | 0.0 | 0.0 | 100.00 |
| India | 2018 | 99.93 | 0.07 | 53.16 | 13.92 | 20.25 | 12.66 |

Table 5: Social Group-Wise Distribution of Households Based on WhetherHH Members Wash their Hands After Defecation (%)

Source: Author's own, from NSSO rounds 69, 76, and 78

Analysing the Gaps

Though India has made progress in accessibility to WaSH facilities, achieving universal coverage by 203012 requires strategic targeting of states and vulnerable social groups.^g The outcome of any programme is a function of the budgetary allocation, implementation, and other factors that differ from rural to urban. Identifying the target groups would require a nuanced study considering factors like occupation, income, wealth, land ownership, and education.

For 100-percent drinking water coverage, STs in Tripura, Maharashtra, and Odisha; OBCs in Kerala, Maharashtra, Bihar, and Odisha; and Others in West Bengal and Maharashtra need focused interventions. Similarly, attaining full sanitation coverage involves targeting STs in Kerala and Odisha; SCs in Kerala and West Bengal; OBCs in Tripura, Maharashtra, Bihar, and Odisha; and Others in West Bengal (Table 6).

^g To select the target states and social groups for policy intervention recommendations, we performed the following exercise. From Tables 3 and 4, we found the average of the three years across all the social groups for each state. We selected the social category for each state having the highest percentage value. We also selected the second-highest value if it lay within a 5 percent difference from the highest value.

^h 99.3 is the percentage coverage in 2018, since data for the concerned years is not available.

| Social Group | WASH parameter | | | | | | | |
|------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------|-----------------------------|--|--|--|--|--|
| | Drinking water | Sanitation | Hygiene | | | | | |
| | At current rates, India's standing in 2030 would be | | | | | | | |
| | 93% | 94% | 99.3% ¹ | | | | | |
| To achieve 100% coverage, the target states, according to social groups, should be | | | | | | | | |
| ST | Tripura, Maharashtra, Odisha | Kerala, Odisha | West Bengal, Maharashtra | | | | | |
| SC | | Kerala, West Bengal | Tripura | | | | | |
| OBC | Kerala, Maharashtra, Bihar, Odisha | Tripura, Maharashtra, Bihar, Odisha | | | | | | |
| Others | West Bengal, Maharashtra | West Bengal | Kerala, Odisha | | | | | |

Table 6: Target States for Each Social Group Across WaSH Parameters

Source: Source: Author's calculation from NSSO rounds 69, 76, and 78

Towards Universal WaSH Access

Achieving universal access to WaSH requires a multifaceted approach tailored to the unique needs of marginalised communities. The disparities in progress across different states and social groups highlight the limitations of SBM's and JJM's "one-size-fits-all" approach and underscore the urgent need to develop localised policies that address the specific barriers that STs, SCs, and OBCs face to bridge the gaps and empower vulnerable groups. Education and targeted awareness campaigns designed to challenge and change ingrained beliefs and behaviours, fostering collective change and prioritising the unique needs of socially and economically disadvantaged groups, must become an integral part of all WaSH initiatives and programmes.

Mihir Kulkarni is an economics graduate from Gokhale Institute of Politics and Economics with research experience at IIM Bangalore and NITI Aayog, currently pursuing PG Diploma in Applied Statistics.

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Digitising Soft Power: The Rise of Brand India

Sara Swain

s India concluded its G20 presidency at the 18th G20 Summit in 2023, the theme of 'Vasudhaiva Kutumbakam—One Earth, One Family, One Future' echoed the country's long-standing 'vishwaguru' vision¹ to be a global leader, guiding the world with its historical values, culture, and innovations. For decades, this vision has been supported by the country's dynamic mix of soft-power elements.^a

'Soft power', a concept coined by Joseph Nye in the 1980s, has shaped nations' preferences and generated economic, social, and political benefits. In the 21st century, soft power can be enhanced through digital means. As global connectivity increases, nations' influence depends not only on traditional diplomacy but also on effectively using digital tools to engage with the world. Various rankings of countries' soft power, such as the Soft Power 30 Index and the Global Soft Power Index, now include 'Digital' as a sub-index,

^a Defined by the Ministry of External Affairs (MEA) as the "ability to influence others through appeal and attraction, using non-coercive means," soft power represents a broader international strategy that transcends economic or military prowess. See: https://eparlib.nic.in/handle/123456789/1464479



which measures the impact of digital diplomacy.^{2,3} Digitalisation can rapidly spread nations' narratives, amplifying the reach and impact of soft power.^b

The link between digitalisation and soft power aligns with India's quest to establish 'Brand India'. In 2018, the Soft Power 30 Ranking Portland Communications updated 'Digital' as a sub-index under soft power resources, highlighting it as "India's best-performing area."⁴ Digitising soft power provides unprecedented opportunities to amplify India's global influence and present a dynamic image. In this article, the scope of digitalisation includes digital platforms (such as online websites, apps, and social media) and the digital transformation of traditional soft power instruments.

India's Soft Power

India's soft power can be analysed using the three pillars of soft power described by Nye. Culturally, it encompasses the country's heritage and diverse creative industries, including film, literature, music, dance, and festivals. Politically, India is the world's largest democracy and upholds its constitutional values. In foreign policy, it leads the Non-Aligned Movement, participates in the Quadrilateral Security Dialogue (QUAD), and engages in development cooperation through aid and expertise.

It is essential to assess the true impact of these components using tangible measures. Data from the United States (US), Germany, China, and South Korea⁵ (nations with diverse global influences as per soft power rankings) reveals five common factors in their soft power strategies. An examination of these factors in the context of India follows:

 Lifestyle and cultural exports: India's most well-known cultural exports— Indian films and shows—lack the international recognition of others, with Bollywood's overseas revenue significantly lower than that of

^b Nye identifies three components of soft power: culture, political and social values, and foreign policies. For example, the US leverages Hollywood as a key soft power tool to promote the 'American dream', generating global interest in its lifestyles, while events like the Super Bowl and Coachella enhance this influence. Hollywood movies have also been used to promote an aspirational image of the US, wherein viewers become familiar with their basic political values, laws, and cultural subtexts (See: https://doi.org/10.1080/1356977022000025678). In 2024, the Super Bowl drew an international viewership of 62.5 million from over 195 countries, which is a 10-percent jump from 2023

⁽See: https://www.reuters.com/sports/nfl/record-international-audience-super-bowl-indicatesnfl-growing-global-presence-2024-03-06/#:~:text=March%206%20(Reuters)%20%2D%20A,to%20 grow%20its%20global%20presence). Similarly, Coachella attracts international artists due to its large crowds and extensive media coverage

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Hollywood.⁶ American brands like Levi's and Nike have mass appeal, and chains like McDonald's operate in over 100 countries.⁷ Similarly, South Korea's K-Pop and Hallyu thrive globally.⁸ Indian lifestyle products, such as fashion and cuisine, have comparatively limited reach.

- **Education and tourism:** India's numbers for tourism and education are low compared to other countries. It does not rank among the top 10 for tourism,⁹ and the increase in foreign students coming to India remains modest.¹⁰
- International representation: А presence in international forums and institutions allows a nation to lead discussions on global issues. Despite its contributions, India is vet to attain the desired influence in organisations such as the World Trade Organization, International Monetary Fund, and United Nations Security Council.
- Cultural diplomacy via promotional institutes abroad: The Indian Council of Cultural Relations (ICCR) has expanded its outreach to 37 countries;¹¹ however, its impact is less significant compared to foreign initiatives like China's Confucius Institutes¹² and Germany's Goethe-Institut.¹³
- Overall attitudes: Global perceptions of India are mixed. A Pew Research study showed that, while 70 percent of Indians believe that India is

'influential', only 28 percent of people from other nations share this view.¹⁴ A median of 46 percent view India favourably, compared to 59 percent for the US.¹⁵

This does not suggest that India's soft power has yielded no results. However, India must refine its strategies to achieve greater impact in areas that have propelled other nations in the soft power race. The outcomes should align with the vast soft power resources that India already possesses.

Soft Power Strategies in the Digital Era

India can adopt multiple strategies to boost its soft power to achieve tangible results. First, Indian films and shows international should use streaming platforms like Netflix and Amazon Prime. Both Bollywood and regional producers should create content tailored for global audiences, with multiple subtitles. Additionally, producers should subtly promote Indian culture and political values as this could spark greater interest in Indian lifestyle products.

To boost tourism, India should promote the 'Incredible India' campaign through digital content creators. Incentivising popular YouTubers to feature India's festivals and cultural events will enhance global visibility. Heritage sites and festivals like the Kumbh Mela and Kutch Rann Utsav can also release special podcasts, similar to the Paris tourist office, which promotes the city's history through podcasts.¹⁶ To increase

educational admissions, the 'Study in India' government portal should offer virtual campus tours, detailed university information, and digital certifications from top Indian institutes.

Increasing representation in global institutions and enhancing the role of the ICCR require effective digital diplomacy. Social media is crucial for reaching the masses. Indian leaders, including Prime Minister Narendra Modi. have built substantial social media following. The Ministry of External Affairs (MEA) also has a strong digital footprint, with over one million followers on X.17 Indian leaders and ministries must actively share India's contributions to global forums. The ICCR's reach must extend beyond physical centres and include collaboration with content creators to promote events and reach new demographics.

Changing the perceptions of India and Indians is challenging to measure and execute. The key lies in increasing India's global visibility. A crucial strategy is to further develop digital public infrastructure like the United Payments Interface and Aadhaar and share these through India Stack and memoranda of understanding with other nations. This can boost international coverage and position India as a cooperative leader and a true *vishwaguru*.

Conclusion

In the digital era, soft power can help define India's global standing as a modern and influential nation. At this critical juncture, India must navigate towards its vishwaguru ambitions while leveraging diverse soft power tools. Establishing Brand India requires digital innovations, technology, and platforms.

While India's digitalisation offers new opportunities, the challenge is that some areas are making progress but lack effective marketing, whereas other domains still need to be developed. Addressing both issues requires the government to identify key priorities and formulate targeted strategies. India has ample soft power resources, but the global marketing of these resources has made little impact. Additionally, India must increase budgetary allocations to fully leverage its resources. This can be achieved by expanding the reach of Indian content, developing world-class education hubs and tourist destinations, and increasing ICCR funding.

Ultimately, Brand India represents not only the nation but its people. It is about moving beyond colonial stereotypes to showcase Indians as leaders of the largest democracy, CEOs of global giants, and architects of the future. For India to be recognised as a rising superpower, it must take control of its own narrative.

Sara Swain is a final-year Economics student at Jai Hind College, Mumbai.

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Digital Financial Inclusion: Women at the Centre of Urban Development

Swarali Bhutekar

he concept of 'financial inclusion' the refers to availability, accessibility, and affordability of financial services, for vulnerable groups in especially society.1 It fosters2 economic growth while reducing inequality and improving individuals' resilience to financial risks. Financial inclusion is considered critical for sustainable development.³ Digital transformation has made financial services more inclusive, accessible, and tailored to marginalised communities. Governments worldwide agree that digital financial services are a key enabler of financial inclusion.4

Digital financial inclusion (DFI) is crucial for achieving the Sustainable Development Goals (SDGs) by 2030 and is a key enabler for at least eight of the 17 SDGs.⁵ In recent years, multiple advancements have expanded digital financial inclusion. According to the World Bank's Global Findex Survey 2021,6 76 percent of adults worldwide have financial accounts; as of 2023, there were 435 million active mobile money accounts.7 This has enabled millions to shift from exclusive cash transactions to using digital platforms for financial services.

Despite these gains, there is a 9-percent gender gap in account ownership in developing economies;⁸ in India, for example, only 22.5 percent of women with mobile phones use them for

financial transactions.⁹ This gap highlights the lower participation of women in utilising financial services, limiting their access to opportunities for economic empowerment.

Hindrances to Women's DFI

Social norms influence women's demand for financial services, restricting their economic participation.¹⁰ Cultural beliefs, such as the notion that women should not have financial privacy from their male family members,11 discourage financial institutions from viewing women as independent clients and limit their efforts to pursue women-centric marketing and client-acquisition strategies. In African countries such as South Africa.12 Rwanda, and Uganda, women require the signatures of male family members to open a bank account.

Economic constraints, especially in lowincome households, also limit women's access to digital financial services due to the high costs of mobile phones and internet connectivity.¹³ Low digital financial literacy among women, with 60 percent of Indian women never using the internet, highlights a major barrier to DFI.¹⁴ A lack of digital financial literacy makes women more vulnerable¹⁵ to risks in digital financial services compared to men.

The lack of formal identification documents required for obtaining financial and mobile phone services further deter women from effectively utilising digital financial products and services.¹⁶ The

lack of gender-disaggregated data hinders the ability of financial service providers to design gender-focused interventions, thus impeding progress in creating gender-inclusive financial systems.¹⁷

Factors such unequal as access to technology, limited ownership of smartphones, and restricted internet access¹⁸ widen the gender gap in financial inclusion. These barriers hinder women's ability to engage with and benefit from modern financial tools such as digital payments and mobile banking. Deliberate efforts are required to address these issues to ensure enhanced women's engagement in digital financial services.

Achieving Inclusive DFI

Prioritising women in digital financial inclusion would improve their economic resilience and household decision-making ability on nutrition, education, and healthcare.¹⁹

Digital Infrastructure

Affordable and fast internet access²⁰ is crucial for women's accessibility to digital financial services. The World Economic Forum's EDISON Alliance²¹ works globally to address this need, with notable impact in South Asia and Africa, providing accessible digital solutions in health, education, and financial services. The Alliance aims to improve lives in over 90 countries by 2025 through its flagship initiative, the One Billion Lives Challenge.²² Other strategies to promote digital financial literacy²³ include Hey

Sister!,24 an interactive voice response campaign designed to increase women's ability to access and use digital financial services. Gender-intentional policy interventions, such as Mexico's tiered account-opening requirements,25 demonstrate further efforts to expand financial services to women and underserved groups.

Women-Led Enterprises

Promoting the digitisation of institutions such self-help as groups (SHGs), particularly those focused on women, can enhance financial inclusion.26 As of 2023, around 4.3 million²⁷ SHGs were digitally linked through the National Bank for Agricultural and Rural Development's (NABARD) Project E-Shakti.28 This has enhanced women's economic conditions by enabling their participation in incomegenerating activities, with a boost in loan disbursement to SHGs.29

Similarly, introducing digital credit systems³⁰ tailored women-led to enterprises, particularly micro and small businesses, can help address the credit gap faced by women entrepreneurs. With up to 95 percent of women-owned enterprises in India classified as microbusinesses, fintech solutions can play a critical role in enabling bias-free digital lending, ensuring formalisation and making women's economic contributions more visible. Initiatives like the Pradhan Mantri Mudra Yojana (PMMY)³¹ support entrepreneurs women with access to finance, while fintech firms³² like FlexiLoans and MoneyTap provide customised, small-sized loans through online marketplaces, addressing the specific needs of women-led businesses.

Initiatives by Financial Institutions

Financial institutions must adopt innovative approaches to bridge the gap in women's financial participation. Cultivating a sense of support through enhanced community engagement and trust is fundamental to this effort. One-on-one mentorship by agents can guide vulnerable women in using digital safety measures and accessing financial services. In Indonesia, women digital ambassadors³⁴ use community connections through women's cooperatives and training to mentor women in accessing and using digital financial services.

Reducing transaction costs for women and establishing community-based finance systems can further encourage engagement with formal financial services.³⁵

DFI in India: The Way Forward

As India aims for a US\$1-trillion digital economy by 2025,³⁶ focusing on women's digital financial inclusion is a crucial imperative as it could unlock their economic potential and help drive inclusive growth.

Making Digital Infrastructure Accessible

Digital public infrastructure, such as the India Stack approach,37 has played a pivotal role in advancing financial inclusion, particularly through innovations like the Unified Payments Interface (UPI).38 By facilitating seamless digital transactions between individuals, UPI has reduced barriers to accessing financial services. A closer examination reveals a critical second-order effect: small businesses³⁹ can now conduct transactions without the financial constraints that previously hindered them. This impact is especially pronounced for women, who have historically faced systemic exclusion from formal financial systems in India. By adopting this approach,40 countries can help close the digital gender gap, promote economic empowerment, and create more opportunities for women in the global financial system.

Digitising Government Payments

Digital government payments play a key role in integrating more women into the financial system and extending digital financial services to the last mile. Worldwide, as of 2020, 140 million women opened their first bank account⁴¹ to receive government payments, including public-sector wages, pensions, and safety net transfers. To maximise the benefits of these accounts, they must be digitally linked through initiatives such as Jan Dhan, Aadhaar, and mobile number Trinity).42 This linkage (JAM digital connection can allow the government to leverage Direct Benefit Transfer⁴³ systems to channel funds directly into bank accounts held by women, fostering greater financial autonomy.

Facilitating Gender-Disaggregated Data for DFI

Gathering gender-disaggregated data is crucial for analysing financial inclusion rates both within and between countries and assessing policy effectiveness.44 For instance, Ghana's⁴⁵ central bank has pioneered the collection of genderspecific data on digital finance to inform national policies. The Bank of Ghana has strengthened this effort by introducing a data portal⁴⁶ that captures gender-disaggregated information across all financial services, supported by the government's capacity-building initiatives and SDG reporting platform to enhance access to gender data. This data can development of guide the policies enhancing women's digital financial inclusion initiatives.

Encouraging Gender-Inclusive Digital Platforms

For instance, developing localised, user-friendly digital payment platforms can facilitate smoother adoption by women. Women-focused⁴⁷ training and awareness programmes led by banks government bodies can further and empower women to navigate digital financial systems effectively. One example is HDFC Bank's SmartUp Unnati Programme,⁴⁸ which offers mentorship to women entrepreneurs and provides

customised banking products to support their growth and business aspirations.

Promoting Public-Private Collaboration

Public-private partnerships⁴⁹ (PPPs) can drive innovation and improve digital financial inclusion for women by combining resources and expertise. The partnership between Women's World Banking and DANA Indonesia⁵⁰ tackled barriers like complex sign-ups and low digital literacy with targeted onboarding and incentives, demonstrating the effectiveness of PPPs in promoting inclusive use of digital financial services.

NITI Aayog's Women Entrepreneurs Platform (WEP) transitioned to a PPP in 2022.⁵¹ With over 20 public and private sector partners, WEP focuses on empowering women entrepreneurs and advancing women-led development.⁵²

While India has made strides in financial inclusion, a gender-specific approach is essential for digital financial inclusion. Policymakers need to be sensitised to gender inequalities within the financial ecosystem to develop strategies that prioritise women's needs and remove structural barriers.

Swarali Bhutekar is pursuing her Master's degree in Public Policy at St. Xavier's College, Mumbai. She is a former intern at ORF.

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Mind the Gap: Digital Literacy and the Future of Work

Yookta Ahuja

igital literacy has become a gateway to opportunities, with technological essential tools now across sectors and industries. Routine tasks are increasingly streamlined, systematic, and automated-hallmarks of the Fourth Industrial Revolution (4IR). However, as India's digital economy expands and technological advancements accelerate, a widening skill gap within the emerging workforce threatens economic progress. Despite the rising demand for basic and advanced digital skills, digital literacy remains a barrier. Is India's youth prepared for a digitally driven future?

What is Digital Literacy?

The Digital Literacy Global Framework (DLGF) by the United Nations Educational, Scientific and Cultural Organization (UNESCO) defines 'digital literacy' as the competency to access, manage, understand, integrate, communicate, evaluate. and create information using safely and appropriately digital technologies.^a The Sustainable Development Goals (SDGs) emphasise digital proficiency as a vital component of global development, highlighting its importance for achieving equitable progress.1 These skills are crucial for participation in the digital economy.

The DGLF identifies six components of digital literacy: basic operation of digital devices, applications, and the internet; information and data literacy; communication and collaboration; digital content creation; digital security and safety; and problem-solving related to career competencies. See: https://uis.unesco.org/sites/default/files/documents/ip51-global-framework-reference-digitalliteracy-skills-2018-en.pdf

A study by the Asia-Pacific Economic Cooperation (APEC) classified digital categories: skills into two baseline digital skills, such as spreadsheet use and computer literacy, and specific diaital skills, including programming languages and industry-specific platform expertise-both of which are increasingly in demand.² These skills, along with their associated levels of digital literacy, are further categorised by usage: for all, for many, and for few.^b This stratification, based proficiency levels-literacy, on fluency, and mastery-enables a targeted approach to skill development, addressing the diverse ways individuals engage with technology.

The "for all" category includes foundational skills relevant to everyone, regardless of profession. These include setting an alarm on phones, using Google Maps for navigation, making payments via the Unified Payments Interface (UPI), or safely navigating social media platforms. These skills depend on access to portable and affordable devices, like smartphones, and are essential for basic digital participation.

The "for many" tier involves more advanced competencies applicable in specific occupational contexts, such as proficiency in Microsoft Office tools or the use of generative AI platforms like ChatGPT. The National Programme on Artificial Intelligence (NPAI) categorises the use of generative AI tools, like ChatGPT, under basic AI literacy meant for everyone.³ However, digital literacy is neither universal nor synonymous with Al familiarity. Moreover, Al tools are not essential for accessing critical services, which is why this article categorises AI competency as "for many" rather than "for all." Finally, the "for few" category covers advanced technical skills tailored to specific careers, such as coding and data analytics, requiring specialised expertise.

Accessibility and Opportunity Through Digital Literacy

Digital literacy provides access to essential services like EdTech, banking, healthcare, and government schemes.^c

^b These three levels of digital skills: "for all, for many, for few" can be understood through digital competence, digital usage, and digital transformation. See:

https://www.tandfonline.com/doi/full/10.11120/ital.2006.05040249#d1e93

^c One example lies in the education sector: India saw a boom in the EdTech sector between 2020 and 2022 while in-person schooling was unviable. Teachers had to rely on online resources that were freely accessible and available to students, and easy to operate for parents. The absence of digital skills in this context directly affected the quality of education delivered by instructors and students' access to learning opportunities, underscoring the critical importance of digital literacy. See: https://timesofindia.indiatimes.com/blogs/developing-contemporary-india/how-covid-19-changed-indias-education-system/

An Asian Development Bank survey reveals a significant rise in demand for digital skills over the past five years.4 Nearly 70 percent of employers across five countries, including India, reported that basic and applied digital skills are now essential in the workplace. Digital skills are crucial for adapting to the evolving job market, where new roles require continuous upskilling. Familiarity with the "for all" category forms the foundation for skills needed across a wide range of occupations today. Digital literacy is not only useful in accessing government resources and schemes but also for securing employment and work opportunities.

India's gig economy workforce is expected to grow from 7.7 million in 2021-22 to 23.5 million by 2029-30.5 Most gig roles rely heavily on digital tools and platformbased work assignments. This platform economy, characterised by lower entry barriers and increased flexibility, has opened new employment and income opportunities.6 However. significant online inequalities between exist microtask workers^d and their traditional (formal) counterparts—as "individual contractors," they earn nearly 64-percent less and rarely have social security and other work-related benefits. Digital literacy is crucial for gig workers, not only to manage their income (including digital payment of wages) but also for accessing government platforms like E-Shram for social security schemes.^{8,9}

India's Digital Skill Gap

Despite increased smartphone ownership¹⁰ improved and internet connectivity, especially in rural areas,e foundational digital literacy remains a substantial hurdle in India. This skill gap is exacerbated by low foundational literacy and numeracy (FLN), limiting the effectiveness of upskilling programmes.11 The skills necessary for specialisation and effective use of digital technologies^f remain sluggish-creating a mismatch between organisational human resource demand and supply.¹²

Urban-rural and gender-based divides are primary challenges, creating intersectional disadvantages for youth. As of 2022, only

^d Platform economies characteristically assign significant portions of assignments as repetitive or micro tasks.

As of September 2024, the Telecom Regulatory Authority of India recorded 1059.97 million active wireless subscribers, with an impressive 45.56 percent rural component. See: https://www.trai.gov.in/sites/default/files/PR_No.89of2024_0.pdf; https://theprint.in/economy/rural-areas-will-be-growth-driver-of-internet-smartphone-penetration-in-india-iamai/2234947/

^f The National Digital Literacy Mission (NDLM) defines digital literacy as the ability of individuals and communities to understand and use digital technologies for meaningful actions in daily life. See: https://nielit.gov.in/ajmer/content/national-digital-literacy-mission

38 percent of households in India were digitally literate.¹³ The National Family Health Survey (NFHS) Report for 2019-2021 showed that only 57.1 percent of the male population and 33.3 percent of the female population had ever used the internet.14 While there are variances across states, urban residents-both male and female-generally have better access to the internet and mobile phones than their rural counterparts.¹⁵ Consequently, digital literacy is higher in urban areas (61 percent) compared to rural areas (25 percent).16 NFHS data also shows a clear gap in mobile ownership between urban and rural women,17 with further disparities based on caste groups.18,19

The Annual Status of Education Report (ASER) highlights gender disparities in smartphone access and usage among rural youth aged 14-18.9 While approximately 90 percent of those surveyed had a smartphone with internet access at home, males were twice as likely to own a smartphone compared to females, affecting their familiarity with digital tasks.h,20 Studies also indicate that socio-economically disadvantaged groups with lower education levels often use information and communication (ICT) devices for entertainment than for utilitarian purposes.²¹ For instance, ASER revealed that despite India's push for digital payments, only a quarter of the youth used smartphones for bill payments or booking tickets.²² Many students reported using social media, but nearly half did not know how to use safety features like blocking/reporting a profile or changing their password. Males were over 15 percentage points more likely to have done at least one of these activities.1 Only 40 percent of participants could successfully use Google Maps, with female participants facing a 25 percent disadvantage, even when they owned a smartphone.23 This may be attributed to mobility restrictions placed on women.

These disparities are reducing in younger age groups but remain a significant concern for the emerging workforce.²⁴ Over 70 percent of Indians aged 15 and above are not computer literate,²⁵ and only 51.25 percent of the youth workforce is deemed employable, as per the latest India Skills Report.^{26,27} Baseline digital literacy is imperative to bridge the gap between employers' expectations and the labour force's capabilities, and to achieve a larger specialised talent pool with skills deemed "for few", such as AI, machine learning (ML), and cloud computing.²⁸

^g ASER surveyed over 30,000 rural youth from 28 districts across India.

^h Smartphone ownership in males did not contribute to a marked improvement in their digital skills, which was attributed to freer access to devices for males in households.

ⁱ The gender gap was non-existent for educational activities, with over two-thirds of participants reporting weekly usage to access resources and material online. Females were also likelier to use smartphones to learn hobbies or a new skill.

India's Efforts Towards Digital Literacy

In 2014, India launched the National Digital Literacy Mission, followed by campaigns like Skill India,²⁹ Digital India in 2015,³⁰ and the Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA). Since its launch in 2017, PMGDISHA has trained and certified 63.9 million people as "digitally literate" across India, aligning with SDG 4.4.³¹

The National Education Policy of 2020 further advances digital literacy by emphasising the role of digital technology, particularly through the use of tools like AI in content delivery and curriculum plans aimed at building transferrable digital skills among youth.32 By creating blended modes of learning in the classroom, the goal is to familiarise students with digital tools for various purposes, sparking curiosity and guiding them toward digital competence and specialisation. Additionally, platforms like the Digital Infrastructure for Knowledge Sharing (DIKSHA) under the PM-eVidya scheme, provide open digital content and tutorials from the National Council of Educational Research and Training (NCERT), Central Board of Secondary Education (CBSE), National Institute of Open Schooling (NIOS), and state boards.33

Private institutions, EdTech companies, and NGOs have also been instrumental in addressing India's digital literacy gap through various initiatives. For instance, KPMG India collaborated with eVidyaloka to enhance cyber awareness in rural classrooms, equipping students with essential digital safety skills.34 The Central Square Foundation (CSF) has launched an initiative aimed at building Al literacy among teachers, students, and parents across India.35 Pratham, the NGO responsible for developing ASER, has integrated digital tools into its programmes to strengthen foundational skills and leverage technology to improve learning outcomes.³⁶ These collaborative efforts demonstrate the critical role of multi-stakeholder partnerships in bridging the digital divide and fostering an inclusive digital future for India.

Integrating digital skills into school curricula is important but remains hindered by two major challenges in the Indian education system: a shortage adequately trained educators and of an insufficient numerical strength to meet demand.³⁷ This prevents students from using educational technology and digital tools like open educational resources (OERs), course modules, and digital libraries like DIKSHA, that might enhance and democratise their learning experience.^{38,39} Without addressing these systemic issues, efforts to embed digital skilling in mainstream education may not reach their full potential.

Is the Future of Work Evolving?

This article explored the landscape of digital literacy in India–discussing its importance in the 4IR, the key barriers to accessing work opportunities and critical services, and the policies in place to adapt the evolving nature of work. While the demand for advanced skills like those in cloud skills, ML and AI is well-established, further research is required to understand the barriers in the "for all" tier of digital literacy. The implementation of schemes must accelerate to ensure equitable access to opportunities. Fundamental challenges in the education sector, such as studentteacher ratios and instructor training, must be addressed to improve quality capacity from the and grassroots. Utilisina digital technology should complement, not replace, in-person or teacher-based instruction, offering а range of techniques to achieve holistic learning outcomes.

The COVID-19 pandemic highlighted the critical need for digital readiness, as

education, healthcare, and government increasingly services shifted online. challenge Addressing the of digital literacy requires considering the digital divides along caste, class, gender, and geography. Developing multilingual learning tools and localised resources is essential to test whether access to materials in vernacular languages improves digital literacy. The gender gap in digital skills and smartphone ownership requires targeted interventions, including subsidised smartphone schemes for women and community-based digital literacy initiatives that promote equitable access. Emerging challenges, such as the rise of platform economies and gig work, must be studied closely to create more secure and inclusive workspaces. A sustained and collaborative effort is crucial to preparing the youth for a digital future.

Yookta Ahuja is Research Intern, ORF Mumbai.

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Alternative Data Sources in India's Rural Regions for Climate Action

Pranadh Mampilamthoda and Pennan Chinnasamy

much as 75 percent India's districts of are designated as hotspots for extreme climate events.1 Erratic rainfall patterns induced by climate change are disrupting agriculture, as more than 50 percent of the country's net sown area is completely rain-fed.² The situation is even more critical as ~65 percent of India's population live in rural areas and ~47 percent are dependent on agriculture.3 Of the 329 million hectares of land area, approximately 49.15 million hectares are susceptible to floods.⁴

Extreme events due to climate change, such as droughts and floods, are a serious concern in rural areas. The increased frequency of flooding is attributed to various reasons including geographical factors. erratic rainfall. rising temperatures, and poor drainage.⁵ Additionally, about one-third of the country, especially in arid, semi-arid, and sub-humid regions, experience moderate to severe drought each year.⁶ Such extremes make the rural populations highly vulnerable, amidst shortages of basic resources, food and livelihood insecurity, and debt traps, further worsened by socio-economic disparities.7,8

Timely and accurate information could aid rural populations in planning their livelihood activities and be better prepared for extreme events.⁹ Information-aided decision-making for region-specific challenges in rural areas, rather than a "one-size-fits-all" approach,

is essential.¹⁰ Accurate data would also help policymakers evaluate the impact of rural interventions over time,¹¹ ensuring efficient resource allocation. Thus, there is need for data pertaining to rural areas, especially in the context of climate change.

Data-Related Challenges

Among the crucial challenges in collating meaningful data from the rural districts in a large, agrarian nation like India is data fragmentation across various parameters12-such as land, crops, or health-and across agencies. Each agency uses different data-collection methods and levels of detail, leading to a lack of standardisation. This affects data interoperability, reduces accuracy, and increases computational complexity for obtaining desired results. Differences in spatial and temporal resolution, issues with data formats,13 as well as a lack of clarity in parameter definitions and units make cross-sectoral integration challenging. Additionally, data collection is highly influenced by administrative needs and resource availability, leading to content-related issues.14 Crop-area statistics, for example, are collected through complete enumeration of all survey numbers or fields in temporarily settled states, while in permanently settled states, only 20 percent of villages are sampled.^a Inconsistencies lead to incompatible data formats, limiting analyses and requiring complex corrections (or pre-processing). Consequently, it becomes difficult to harmonise the data with the use of advanced tools like machine learning and AL.15

Rural data suffers from delays in collection and publication,16 which affects important applications such as crop health monitoring and increases reliance on advance estimates. Similarly, the impact assessment of crucial rural development schemes is hampered by small sample sizes, higher costs, and time constraints.17 The growing need for more granular and accurate data at the block or agro-ecological level to improve rural resilience to climate change remains unmet.18 The availability and accessibility of granular data is vital for improving rural resilience to climate change. Data granularity can also aid in the monitoring of climate impacts, especially in rural environments.

Indian states and Union Territories (UTs) are classified into three categories based on crop-area statistics. Temporarily settled states, covering 86% of the reporting area, include 18 states and 5 UTs where cadastral surveys are conducted, and land use statistics are maintained as part of revenue agency records. In permanently settled states, which account for 9% of the reporting area and include West Bengal, Odisha, and Kerala, crop and land use statistics are collected through sample surveys due to the absence of village-level revenue agencies. The remaining states and UTs, comprising 5% of the reporting area, rely on conventional estimates based on the personal assessment of village chowkidars.

Given the aforementioned challenges, alternative sources of data such as proxy data becomes significant, especially in the context of India.

Proxy Data Sources

Proxy data sources and their derived indicators can serve as effective substitutes for direct observation when data is not available. Proxy sources include remote sensing (RS) techniques like satellite imagery, unmanned aerial vehicle (UAV) imaging, and crowdsourced data. Both RS data and UAV imaging enable the collection of information without physical contact and offer near-real-time, high spatial, and temporal resolution data,20 even in clouded environments during events like monsoons and floods.

Remote-sensing data products at moderate to high resolution can be obtained from various platforms hosted by government and international agencies, such as Bhuvan and Bhoonidhi by the Indian Space Research Organisation (ISRO) and Earth Explorer by the US Geological Survey (USGS). In India, users can obtain high-resolution data either with or without clearance depending on the type of user/institution seeking the information, its resolution, and intended use.²¹ To address the development needs of the country, the National Remote Sensing Centre (NRSC) of ISRO is vested with the authority to acquire and disseminate all satellite remote sensing data in India.22 UAV use in India is governed by Drone Rules 2021²³ and its amendments, wherein the flying permissions for data acquisition are based on factors such as flying region and UAV size.

The Indian airspace is divided into red, yellow, and green zones.^b Operations in red and yellow zones require prior permission, while no permission is needed in green zones for drones with a permitted all-up weight of up to 500 kg. Nano drones, weighing under 250 grams, are exempt from requiring a pilot licence.²⁴ It is worth mentioning that the data collected through these approaches can be processed using free and opensource GIS platforms such as Quantum GIS (QGIS).

Proxy data sources offer valuable applications in rural areas in the context

^b Green Zone: Airspace up to 400 feet and not been added in yellow or red zone; up to 200 feet between 8-12 km from the perimeter of an operational airport. No permission is required for operating drones up to 500 kg. Yellow Zone: Airspace above 400 feet in green zones, above 200 feet between 8-12 km from an airport, and airspace between 5-8 km from the perimeter of an operational airport. Permission from air traffic control is required for operating drones. Red Zone: A no-drone zone where drone operations require Central Government approval. More details can be found in Drone Rules, 2021 and amendments.

of climate change. Integrating RS data with Geographic Information Systems (GIS) offers various applications, including monitoring extreme events, managing natural resources, rural planning, and infrastructure development. Some important applications are as follows:

Flood management: RS data helps in the management of floods, supporting both structural (such as protection infrastructure) and non-structural measures (e.g., mapping). It helps in identifying flood-prone areas and thus enables the deployment of early warning systems. During flooding, it helps in the mapping and monitoring of flood inundation and movement. Postflood, it helps in identifying causative factors (such as encroachment), damage assessment, and resource allocation.25,26

Droughts: Satellite missions monitor crucial drought parameters like precipitation and evapotranspiration, supported by advanced analytical and indexes from RS approaches data. For instance, the Standardized Precipitation Index (SPI)^d facilitates comparison across regions with varying climates²⁷ using RS data. The deployment of active satellite sensors further helps in detecting details such as soil moisture deficit, ensuring reliable data even in cloudy conditions.

Agriculture: RS data aids in anticipating agricultural trends for planning purposes by supporting applications like climate modelling, crop identification, phenotyping, growth monitoring, and water situation assessment.28 This facilitates vield prediction²⁹ and helps anticipate food allocate shortages to resources in time. Given the small average landholding size in India (approximately 1.08 hectares)30 and the heterogeneity of its cropping patterns, UAVs with high spatial resolution are particularly useful, helping gather information on inter- and intra-field variability of crop-related data,³¹ which is important for monitoring climate risk and assessing post-disaster impacts.

Crowdsourcing

Crowdsourcing refers to the practice of gathering data from large and diverse groups of people to obtain large datasets collected through various digital platforms to solve specific problems.³² This method serves as a valuable tool

^c Evapotranspiration is the sum of all processes by which water moves from the land surface to the atmosphere via evaporation and transpiration (USGS definition).

^d A measure of the extent of drought, particularly meteorological droughts (abnormal precipitation deficits), that assigns a single numeric value based on precipitation anomalies.

in developing countries such as India, addressing the challenges discussed earlier, where limitations in infrastructure, time, and financial resources often restrict traditional survey methods. Crowdsourced data, when integrated with RS data, aids in establishing the empirical truth of RSderived results, enhancing their reliability and credibility. However, crowdsourcing and the subsequent release of geospatial data may raise ethical considerations, particularly concerning privacy and errors.33,34 This is especially important as it may involve socio-economic data from rural areas with vulnerable populations.

Therefore, obtaining informed consent³⁵ from participants is crucial, clarifying the purpose and usage of their data and the potential risks they may face for providing it. Measures such as ensuring that the data is anonymised and implementing controls on who can access it are required to protect sensitive information and the contributors. Engaging local stakeholders through participatory research methods and training and capacity-building initiatives would strengthen ethical, transparent, and responsive data collection while reducing the errors involved.

A notable example of crowdsourcing in India is the groundwater monitoring through participatory management initiatives. Through capacity building, community members gather insitu measurements of groundwater such parameters, as groundwater levels.³⁶ Aggregating this data enhances understanding of groundwater trends in data-scarce regions, ensuring better monitoring and management.

Balancing Accuracy and Economic Considerations

The of remotely sensed and use crowdsourced data to replace field data requires standardisation and an awareness of economic considerations. Raw remote-sensing data often suffers from noise, distortions, and irrelevant information due to sensor limitations and atmospheric conditions.³⁷ The preprocessing of raw images and the subsequent application of corrections are therefore essential.38 Choosing the right satellite-derived index from a wide range of indices is also important, as accuracy depends on various factors, such as the location and type of land surveyed. Proper calibration is important for better management decisions, with crowdsourcing playing an important role in assessing accuracy.39

Economic considerations are unavoidable while collecting data, especially when data granularity (village- or plot-level data) is required in countries like India, which has a large number of small land-holding households.⁴⁰ The trade-off is the higher cost for data granularity needed (spatial, temporal, or spectral).⁴¹ Satellite data with good spatial resolution may be a more affordable option. For applications like disaster management, high-resolution UAV data is key to better adaptation strategies in high-risk areas, while in lower-risk areas, cheaper alternatives like open-source remote sensing data may be sufficient. Therefore, cost implications must be the primary considerations when selecting alternative data sources.

Conclusion

Addressing the multifaceted challenges posed by climate change in rural India calls for innovative data collection and analytical methods to enable effective Direct observations of policymaking. rural data are affected by issues such complexity, inadequacy, as delivery delays, low standards, and limited spatial and temporal resolution, necessitating alternative sources like RS and GIS, which offer valuable insights across large areas, enabling rapid monitoring and impact assessment. UAVs provide high-resolution

data, vital for small landholdings in rural India, while crowdsourcing helps in validating RS data and community engagement and sensitisation for better resource management. While using such alternative sources of data, quality assurance needs to be ensured by following standard data-processing protocols alongside accuracy assessment or validation. The cost implication calls for 'application specificity' while choosing a particular type of RS data. Once these needs are addressed, the integration of alternative data sources would enable policymakers to develop cost-effective, context-specific solutions, ensuring climate resilience and sustainability for rural communities in India and beyond.

Pranadh Mampilamthoda is Ph.D. Scholar, Centre for Technology Alternatives for Rural Areas, IIT Bombay.

Pennan Chinnasamy is Associate Professor, Centre for Technology Alternatives for Rural Areas, IIT Bombay.

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Making Digital Payments Accessible to Foreign Travelers in India

Tenzin Karma

ince introduction in 2016, the Unified Payments Interface¹ (UPI) has become a hallmark of India's digital public infrastructure. enabling the country to become a global leader in realtime transactions and payments. India recorded nearly 46 percent of total digital transactions² worldwide in 2022 and 134.62 billion digital payment transactions³ nationwide in 2023. Thirdparty UPI apps⁴ are supporting the national transition away from cash.5

However, making the UPI facility available for foreign visitors to India remains a challenge. Establishing a UPI ID requires both an Indian phone number and a local bank account, the lack of which poses barriers to seamless participation in the digital economy. Enhancing tourists' access to digital transactions is critical, especially given the large volume of foreign visitors to India, which amounted to 6.44 million⁶ in 2022 and 600,496⁷ in May 2024 alone. Failing to address this issue would result in the exclusion of a key segment of the economy from the digital revolution.

Digital Disconnect

Both the private and public sectors have attempted to address the payment gap for foreign visitors. For instance, technology startups like CheqUPI are innovating with digital wallets⁸ to bridge this divide. The National Payments Corporation of India (NPCI) introduced UPI One World⁹ in 2023 to G20

country nationals,¹⁰ which allows foreign nationals visiting India to obtain UPI One World wallets at airports, hotels, and currency exchanges and use the app to make QR code payments. UPI One World expanded¹¹ to include most foreign nationals in July 2024.

International tourist arrivals in India are recovering to pre-pandemic levels.¹² Therefore, it is timely for early-stage initiatives like UPI One World, which allow foreign nationals to avail of UPI, to become the primary international marketing focus of the Government of India. The Ministry of Tourism's international campaigns could highlight digital transaction accessibility as a key incentivising factor for tourists to visit India. Additionally, promoting UPI One World would strategically place India as a global leader in accessible payments for prospective tourists.

Unlocking Convenience

The participation of foreign travellers in India's digital payments infrastructure could unlock value for both the visitors and the system. First, UPI accessibility would capitalise on foreign travellers' preference for mobile payments and accessible technology.13 A 2021 survey14 reported that technology and innovation increase people's confidence to travel, with 41 percent of respondents agreeing that contactless mobile payments would instil confidence to travel in the following year. A 2024 McKinsey report¹⁵ recommended that tourism players should accommodate the technological expectations of new travellers, especially those accustomed to advanced technology, to profit from recent travel demand. The NPCI's UPI One World was developed in part with the aim of accommodating these expectations. Additionally, it must be widely promoted to international audiences to maximise gains from the recovering travel industry.

Second, promoting UPI accessibility in its early stages would help capitalise post-pandemic on timely tourism spending. The use of UPI leads to more spending. In a 2024 study¹⁶ on spending behaviour in India, 74.2 percent of survey respondents reported that UPI led to increased spending, primarily due to the simplicity of digital transactions. 2022¹⁷ and 2023 Similar studies¹⁸ corroborated that mobile payments are associated with overspending behaviours and impulsive purchases. A 2003 study¹⁹ payment transparency highlighted on inverse relationship between the an transparency of a payment mechanism and its usage; the 2022 study²⁰ built upon this and underlined that mobile payment is the least transparent of payment mechanisms, which results in increased spending. These findings apply to prospective tourists, especially when combined with tourists wanting to spend freely after a lockdown period. The World Travel & Tourism Council reported²¹ that in 2023, international tourist spending in India still lagged behind spending in 2019. UPI One World could unlock the base of foreign tourists wanting to spend freely and contribute to international tourist spending returning

to pre-pandemic figures. The successful promotion and adoption of UPI One World among foreign travellers to India could result in increased spending compared to cash payments and additional benefits to Indian vendors through increased business.

Third, promoting UPI accessibility would appeal to tourists who have concerns about travelling in the post-pandemic era. CheqUPI²² uses an apt slogan: "When in India, pay like an Indian." Using UPI One World would allow foreigners to wholly experience Indian life. When foreign visitors discover that they can easily participate in digital transactions in India. it enhances their overall experience, making them feel welcomed rather than disconnected from the local population. This sense of inclusion not only improves their customer journey but also increases the likelihood that they will choose India as a favoured travel destination, confident in their ability to navigate the economy effortlessly.

Digitalisation at the Core of Progress

Ensuring accessibility to digital transactions for foreigners could offer India the opportunity to redefine its global identity for modern tourists. A 2000 study²³ highlighted that India's tourist destination image relies primarily on its arts and cultural heritage. The Ministry of Tourism's key international

campaign, Incredible India,24 tourism also focuses on India's historic and heritage aspects. The Ministry of Tourism could highlight technological advancements such as UPI One World into the Incredible India²⁵ campaign, or create a separate promotional campaign dedicated to technology to embolden the global image of a digital India. UPI itself was rolled out with the goal of a cashless, digitised²⁶ India that could fit into the larger Digital India²⁷ campaign. Promoting UPI One World could help establish India's reputation as a technologically advanced nation among tourists and citizens.

UPI accessibility would also address vulnerabilities in the Indian tourism industry. A 2023 study²⁸ highlighted that foreign tourists to India perceived poor banking services, inadequate tourism advertising campaigns, and government indifference to tourism among the industry's weaknesses. The government should demonstrate an interest in providing stronger banking services for tourists.

The large-scale promotion of accessibility to digital transactions is an ambitious but achievable initiative that India's public sector needs to launch in the short term. Government agencies such as the Ministry of Tourism, the India Tourism Development Corporation,²⁹ and the NPCI itself could take advantage of this opportunity and take relevant action.

Tenzin Karma is an undergraduate Economics major and Statistics minor at Wellesley College, US.

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20, Rouse Avenue Institutional Area New Delhi - 110 002, INDIA +91-11-35332000 Fax: +91-11-35332005 contactus@orfonline.org www.orfonline.org