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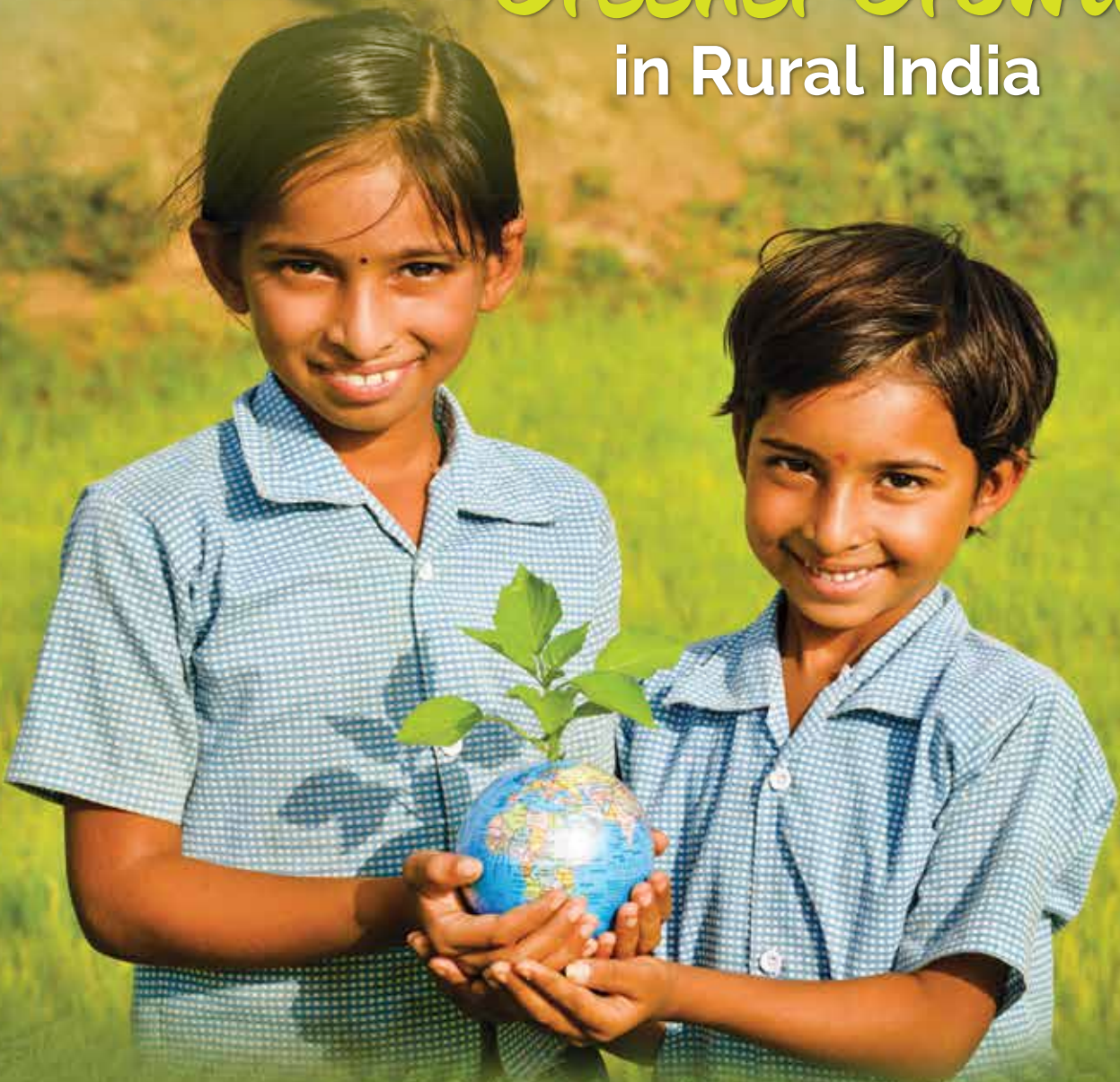
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Kurukshetra

A RURAL DEVELOPMENT MONTHLY SINCE 1952

Advancing Towards **Greener Growth** in Rural India



Nurturing Young
Minds for India's
Future

Smart Solutions
for Cleaner
Villages

Empowering
SHGs for
Greener Action

Community-led
Water Management
for Greener Villages



Smart Solutions for Cleaner Villages

Driving Green Growth through Rural Sanitation and Waste Management

India's rural sanitation has undergone a major transformation under the Swachh Bharat Mission-Gramin (SBM-G), achieving near-universal toilet access and widespread ODF status. SBM-G Phase II (2020–26) shifts focus to sustainability through the ODF Plus framework, emphasising waste management and behavioural change. This article examines the transition from infrastructure-led sanitation to systems-based models, highlighting decentralised innovations and institutional roles. Despite progress, challenges in operation and maintenance, safe sludge disposal, and sustaining behaviour persist. It argues for community-owned circular sanitation systems to deliver environmental, health, and economic benefits, positioning rural India as a driver of sustainable development.

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Rural India is witnessing a quiet yet profound transformation. Open fields that once symbolised sanitation deprivation are steadily being replaced by toilets, compost pits, biogas units, and decentralised wastewater systems. This transformation is not merely infrastructural; it reflects a deeper behavioural and systemic shift.

In 2014, only about 39 per cent of rural households had access to toilets, and open defecation posed significant risks to public health, environmental quality, and women's safety (Ministry of Jal Shakti, 2021). The launch of the Swachh Bharat Mission-Gramin (SBM-G) triggered an unprecedented national movement, combining financial incentives, mass awareness campaigns, and community participation.

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By October 2019, over 10.6 crore toilets had been constructed, and more than 600,000 villages were declared ODF (Government of India, 2019). As of 2026, over 95 per cent of villages are progressing towards ODF Plus status, reflecting a shift from access to sustainability (Ministry of Jal Shakti, 2024). This transition marks a paradigm shift—from sanitation as infrastructure to sanitation as a circular, community-driven system.

Expanding the Sanitation Agenda

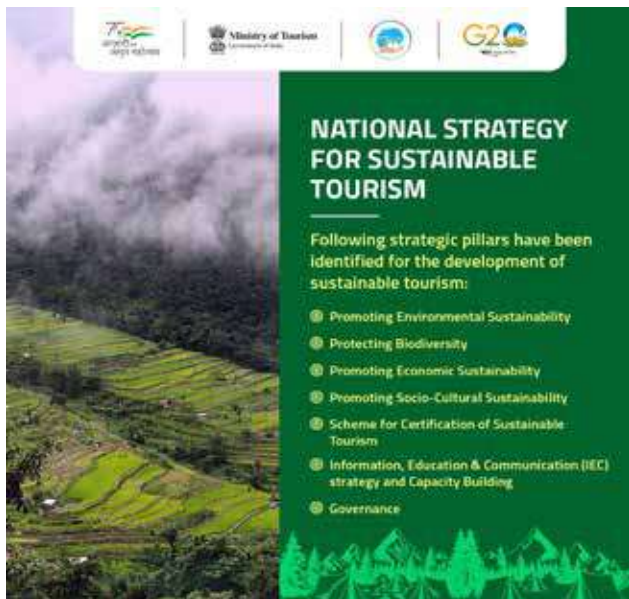
The success of SBM-G Phase I revealed new challenges. While toilets were constructed at scale, issues such as faecal sludge accumulation, greywater stagnation, and improper solid waste disposal began to emerge. Recognising this, SBM-G Phase II was launched with a broader focus on sustainability.

According to official data, by early 2026, approximately 5.68 lakh villages had achieved ODF Plus status, with significant progress in both solid and liquid waste management infrastructure (Ministry of Jal Shakti, 2024). This evolution reflects a shift towards integrated sanitation systems that address the entire waste cycle.

1. Decentralised Innovations

One of the defining features of India’s rural sanitation success is the adoption of decentralised and context-specific technologies.

- a. **Biogas-Linked Toilets** : In Maharashtra, toilet-linked biogas systems convert human and animal waste into cooking fuel and organic manure. Studies indicate that a standard 2 cubic metre biogas plant can meet



the cooking needs of a household while reducing dependence on LPG and firewood (MNRE, 2022).

- b. **GOBARDHAN Initiative** : Launched in 2018, the GOBARDHAN scheme promotes the conversion of cattle dung and organic waste into biogas and compressed biogas (CBG). As of 2024, over 2,700 biogas plants have been registered, contributing to renewable energy generation and rural livelihoods (Department of Drinking Water and Sanitation, 2024).
- c. **Eco-Sanitation in Water-Scarce Regions** : In Ladakh and parts of the Northeast, urine-diverting dry toilets (UDDTs) offer water-efficient solutions. These systems enable nutrient recovery while conserving scarce water resources, demonstrating the relevance of traditional ecological knowledge (Agarwal et al., 2020).
- d. **Zero-Waste Models** : Cities such as Ambikapur and villages such as Punsari illustrate how decentralised waste segregation and composting can create zero-waste ecosystems, generating employment and revenue for local communities (CSE, 2021).

2. Building a Circular Rural Economy

Rural India generates approximately 0.2–0.3 kg of solid waste per capita per day, of which 60–70 per cent is biodegradable (CPCB, 2021). SBM-G Phase II leverages this resource potential through circular economy approaches.

Key interventions include:

- **Composting**: Vermicomposting and NADEP techniques convert organic waste into nutrient-rich fertiliser.
- **Biogas production**: Household and community digesters generate renewable energy and slurry manure.
- **Plastic waste utilisation**: Segregated plastic waste is used in road construction and recycling.
- **Greywater reuse**: Constructed wetlands and soak pits enable reuse for irrigation.
- **Faecal sludge treatment**: FSTPs ensure the safe treatment and reuse of sludge.

These systems generate economic value while reducing environmental pollution. Estimates suggest that households can save between ₹500 and ₹1,500 per month through reduced fuel and fertiliser costs (World Bank, 2022).

CIRCULAR ECONOMY IN RURAL INDIA

A circular economy approach focuses on resource efficiency, waste minimisation and value recovery from biological and agricultural waste.



“ A circular economy keeps resources in use for as long as possible, extracts the maximum value, recovers and regenerates products and materials at the end of each service life. – MoEFCC

Source: MoEFCC Circular Economy Framework

3. Technology and Digital Monitoring

Digital tools are increasingly strengthening rural sanitation systems. The SBM-G Management Information System (MIS) enables real-time monitoring of sanitation infrastructure, including geo-tagging of toilets and waste management assets.

Mobile applications support desludging services, waste collection tracking, and grievance redressal. In pilot areas, IoT-based sensors are being used to monitor system performance and detect leakages. These innovations enhance transparency, accountability, and service delivery efficiency.

Convergence with Flagship Programmes

The success of rural sanitation is closely linked to convergence with other government initiatives:

- **Jal Jeevan Mission (JJM):** Ensures water supply, which is essential for sustaining sanitation systems.
- **MGNREGA:** Supports the construction of soak pits, drainage systems, and compost units.
- **National Rural Livelihoods Mission (NRLM):**

Mobilises women’s groups for waste management enterprises.

- **Finance Commission Grants:** Provide funding for ODF sustainability.

Such convergence reduces costs, enhances efficiency, and strengthens institutional capacity (NITI Aayog, 2023)

Challenges and Gaps

Despite significant progress, several challenges persist:

- **Behavioural sustainability:** Studies indicate that 5–10 per cent of households may revert to open defecation in the absence of sustained awareness (UNICEF, 2021).
- **Operation and maintenance:** Limited financial and technical capacity at the Panchayat level affects system sustainability.
- **Faecal sludge management:** Inadequate desludging services and treatment infrastructure remain a concern.

- **Plastic waste:** Increasing non-biodegradable waste poses new environmental challenges.
- **Regional disparities:** Diverse climatic conditions require tailored technological solutions.

Financing Sustainable Sanitation

Rural sanitation financing has evolved from subsidy-driven models to more diversified approaches.

Key sources include:

- Government incentives under SBM-G
- Public–Private Partnerships (PPPs) for service delivery
- Microfinance and SHG-based enterprises
- Revenue from compost, biogas, and recyclables
- Emerging carbon financing opportunities

Such models promote financial sustainability and reduce dependence on public funds (World Bank, 2022).

Impact on Health, Environment, and Livelihoods

Improved rural sanitation has generated multidimensional benefits:

- **Health:** Reduction in diarrhoeal diseases and child mortality; WHO estimates link improved sanitation to significant health gains (WHO, 2020).
- **Environment:** Reduced groundwater contamination, improved soil health, and lower greenhouse gas emissions.
- **Economy:** Employment generation and reduced healthcare expenditure.
- **Gender empowerment:** Enhanced dignity, safety, and participation of women.

These outcomes align with the Sustainable Development Goals, particularly SDG 6 (Clean Water and Sanitation) and SDG 13 (Climate Action).

Villages as Engines of Sustainability

India’s rural sanitation journey demonstrates the power of collective action, policy innovation, and community participation. The transition from open defecation to ODF Plus reflects a deeper shift towards sustainability and resilience.

Rural villages are no longer passive beneficiaries of development; they are emerging as active drivers of the circular economy and green growth. By transforming

waste into resources, they offer scalable models for sustainable development.

As India moves towards the vision of *Viksit Bharat 2047*, rural sanitation will play a pivotal role in shaping a cleaner, healthier, and more sustainable future.

Way Forward

Achieving universal ODF Plus status requires a phased and integrated approach that balances infrastructure, institutions, and sustainability.

- **Short term:** The priority is to ensure universal coverage and functionality of Solid and Liquid Waste Management (SLWM) systems, along with strengthening district-level faecal sludge management (FSM) infrastructure to safely handle waste streams.
- **Medium term:** The focus should shift towards developing cluster-based waste processing systems for greater efficiency and expanding the role of Self-Help Groups (SHGs) in sanitation services, thereby creating local livelihoods and strengthening community ownership.
- **Long term:** Rural sanitation must evolve into a circular and climate-resilient system by integrating bioenergy solutions such as biogas, leveraging carbon credit opportunities, and institutionalising digital monitoring for transparency and efficiency.

Together, these steps can transform rural sanitation into a key driver of green growth and sustainable development.

Conclusion

India’s transition to the ODF Plus framework signifies a major shift from infrastructure-led sanitation to sustainable, circular, and community-driven systems that integrate solid and liquid waste management, faecal sludge treatment, and plastic waste control, delivering environmental, health, and economic benefits.

However, to ensure long-term success, it is essential to strengthen behavioural change initiatives, institutionalise robust operation and maintenance mechanisms at the Panchayat level, scale decentralised and context-specific waste management solutions, enhance capacity and financing through public–private partnerships and self-help groups, and leverage digital monitoring and innovative financing mechanisms such as carbon credits. □