ROOTS & RESILIENCE

WATERSHED ORGANISATION TRUST • ANNUAL REPORT 2024-2025 • SCIENCE, TECHNOLOGY, AND TRADITIONS

DEEP DIVE
Nothing Exists in Isolation
A Systems Approach to Building Rural Resilience

DEEP DIVE
Innovating for Impact
Science and Technology in Service of the Poor

DEEP DIVE
Rethinking FPCs
for an Ecological and Climate-Smart Future

INSIDE

ROOTS & RESILIENCE

SCIENCE, TECHNOLOGY, AND TRADITIONS

WOTR
Rejuvenating Communities & Ecosystems

W-CReS
Building Resilient Futures

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From the Management's Desk

Every time we visit the villages we work with, we are reminded of a simple truth: resilience grows from the ground up. When a farmer shares that her soil retains more moisture, or when a community points to a well that now holds water year-round, it becomes clear that hope is built through collective effort and care for the land. These are the quiet victories that reassure us that change, though hard-won, is possible.

At the same time, the challenges before us are stark. India continues to grapple with rising land degradation—around 30% of our total geographical area is degraded, while almost 84% million hectares are facing desertification. This is not just a statistic; it is the lived reality of rural families, especially in rainfed regions, where erratic weather, floods, droughts, and heatwaves translate into crop failure, food insecurity, and lost livelihoods.

It is in this context that WOTR's work over the past three decades finds its meaning. Guided by the principles of **Ecosystem-based Adaptation (EbA), our Community-led Integrated Watershed Development approach** tackles these challenges systemically —restoring soils, conserving water, nurturing biodiversity, and opening new avenues for incomes. Together with our partners and communities, **we have reached 8.4 million people across more than 7,600 villages in 10 states.**

This progress has only been possible because of the steadfast support of our donors and well-wishers. Your belief in our work has enabled communities to not just survive, but adapt and thrive in the face of climate stress. For this, we extend our deepest gratitude.

The past year has also been a period of significant milestones for WOTR. Working closely with the Department of Environment and Climate Change, WOTR and the WOTR Centre for Resilience Studies (W-CReS) contributed to developing Maharashtra's first-ever draft Ecosystem-based Adaptation policy applicable to related departments. We also helped embed EbA principles into the **Maharashtra State Action Plan on Climate Change (MHSAPCC) 2.0.**

We developed the **NATUREPro Framework**, in collaboration with the Government of Maharashtra, which is used to benchmark villages' agriculture against climate vulnerability and nature positivity. It is expected to be used to obtain a granular picture of vulnerability at the village level across Maharashtra.

This year brought global recognition to our tech-driven approach. A W-CReS team member was selected as one of only nine global fellows for Amazon Web Services' inaugural Now **Go Build CTO Fellows Program**, strengthening our capacity to integrate advanced technologies for food security, drought resilience, and climate adaptation. At the same time, WOTR was chosen as one of 30 nonprofits worldwide for the **AI for Changemakers Accelerator Program**, supported by Google.org, which will enhance our ability to deliver real-time farm advisories and pest outbreak forecasts to farmers.

At the **UNCCD COP16** in Riyadh, WOTR shared its grassroots experience in land and water management while contributing to critical global dialogues on drought resilience. Our work in Akole and Sangamner, Maharashtra, was featured as a case study in the global Economics of Drought Report, while our Water Stewardship Initiative was highlighted in the World Drought Atlas 2024 as a global success story in community-led water governance, both released during the **UNCCD COP16** in Riyadh.

Perhaps the most memorable moment of the year was the celebration of more than three decades of WOTR's journey at our event, "**Ripples of Change**", held in Mumbai. The gathering brought together community representatives, donors, knowledge partners, and dignitaries who have walked alongside us over the years. Distinguished speakers shared reflections on the path ahead for sustainable development and climate resilience. More importantly, the event celebrated the stories of the rural communities whose determination and collaboration are at the heart of everything WOTR stands for.

As we step into the future, we remain acutely aware that the challenges of remunerative employment, land degradation, water scarcity, and climate change will continue to test us. But we also know that with strong partnerships—with communities, governments, knowledge institutions, and with our donors—solutions are within reach. Together, we can continue to nurture landscapes, strengthen livelihoods, and build resilience where it is needed the most.

Warmly,

Prakash Keskar
Executive Director

Marcella D'Souza
Founder Director, W-CReS

Crispino Lobo
Managing Trustee and Co-founder

A Vision For Rural India

Resilient rural communities that enjoy a fulfilling quality of life within vibrant and sustainable ecosystems.

A Mission To Make Rural Poverty A Distant Memory

WOTR tackles the key causes of rural poverty by rejuvenating ecosystems and building the community's resilience to climate change. We enhance the availability of water, increase the productivity of land and agriculture, diversify livelihoods, empower women, and strengthen the health and well-being of vulnerable rural communities.

Approach

WOTR adopts a systemic approach to tackle rural poverty that involves revitalising both rural communities and their surrounding natural ecosystems. Through our Ecosystem-based Adaptation (EbA) approach, we empower rural communities to restore and manage their land, water, and forests sustainably, while promoting participatory governance and enhancing adaptive capacities. This not only leads to healthier ecosystems and greater climate resilience but also creates more livelihood opportunities and improves overall quality of life, health, and nutrition.

Three Pillars Driving Our Mission

WOTR operates at the intersection of practice, knowledge, and policy, working across scales and collaborating with diverse stakeholders across sectors. Our approach is driven by

On-Ground Implementation
Executing thematic interventions that deliver tangible impact.

Applied Research and Policy Advocacy
Bringing science to practice and grounded insights to policy to ensure effective programme implementation and impact at scale.

Training and Capacity Building
Empowering people and institutions—including government bodies and NGOs—through tailored training and knowledge sharing.

Alignment With The International Agenda

Our work is closely aligned with major global priorities, including Land Degradation Neutrality, the Paris Agreement on Climate Change, the Sendai Framework for Disaster Risk Reduction, and the UN 2030 Agenda for Sustainable Development.

By focusing on environmental protection, natural resource conservation, enhancing adaptive capacities, and strengthening community resilience, we make meaningful contributions to 12 of the 17 United Nations Sustainable Development Goals (SDGs).

Themes of a Systemic Intervention

Land & Water Management

At WOTR, our primary commitment lies in revitalising ecosystems that have faced degradation. We understand that restored natural ecosystems offer the only sustainable path out of poverty in rural economies. A comprehensive, integrated, ecosystems-centric watershed development approach is adopted where we join hands with rural communities to conserve and restore natural resources, including soil, water and biodiversity. The approach is holistic and spans the entire landscape - from the ridge to the valley. We mobilise our communities to harvest each drop of rainfall, preserve every bit of soil and conserve their flora and fauna thus laying a firm foundation for them to thrive and prosper. In parallel, we work closely with these communities, fostering effective governance of these vital resources. This dual approach, we believe, not only yields lasting benefits but also ensures the sustainability of our efforts.

Livelihoods

Our Livelihoods programme focuses on the comprehensive development of both farm and non-farm-based enterprises in rural communities. We provide support to improve productivity and sustainability in agriculture, while also aiding the growth of non-farm activities to diversify income sources. By equipping communities with the skills, knowledge, and resources necessary to establish and expand local businesses, we enhance income stability and financial independence. Our approach includes promoting sustainable farming methods, enhancing market linkages, and encouraging entrepreneurship in areas such as crafts, livestock and food processing. Our goal is to help rural communities build resilient and diversified livelihoods that can weather economic and climatic uncertainties.

Climate Resilient Agriculture

Our focus on Climate Resilient Agriculture is aimed at empowering rural communities to effectively manage and enhance agricultural productivity amidst changing climate conditions. We strive to blend traditional knowledge with scientific advancements to develop sustainable farming practices that can withstand climatic uncertainties. Our goal is to improve crop productivity and livelihood resilience while reducing environmental footprints. Through comprehensive training, knowledge-sharing and technology application, we help communities transform their agriculture into a sustainable, adaptive, and economically viable system, ensuring food security and livelihoods in the face of climate change.

Women Empowerment

Our Women Empowerment programme places special emphasis on establishing and supporting Self-Help Groups (SHGs), recognising the transformational power they hold in rural societies. Through these groups, we aim to equip women with the necessary skills, resources, and confidence to become active economic and social contributors and decision makers in their families and communities. We provide training and support to foster leadership, entrepreneurship, and financial literacy. This not only enhances their income-generating capacities but also boosts their social status and decision-making power within their households and communities. By nurturing these SHGs, we are not just empowering individual women, but catalysing change that uplifts entire communities, advancing gender equality and contributing to overall rural development.

Health, Sanitation & Nutrition

Our Health, Sanitation, and Nutrition initiative is committed to improving the overall well-being of rural communities. We promote kitchen gardens and multilayer farms as sources of nutritious food, income supplementation and self-sufficiency. Through initiatives focused on accessing clean drinking water, we address a crucial aspect of disease prevention and good health. Our sanitation initiatives also include the construction of toilets and generating awareness on hygiene and toilet use. We organise health camps for anaemia detection and treatment, and monitor child growth to ensure proper nutrition and age-aligned growth and development. Our comprehensive approach to health extends to menstrual hygiene as well; we distribute Saafkins, an eco-friendly menstrual product, promoting a safe and hygienic menstrual cycle for women. By integrating these diverse components – nutrition from locally-grown food, improved sanitation from clean water, and direct health interventions – we foster healthier, more resilient communities.

Board of Trustees

Asoke Basak

Chairman and Trustee, WOTR
former Additional Chief Secretary, Maharashtra; former Chairman, Maharashtra State Electricity Board.

Crispino Lobo

Managing Trustee and Co-founder, WOTR
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Our Presence
in 2024-25

Maharashtra
Ahmednagar, Beed, Buldhana, Dharashiv, Gadchiroli, Chhatrapati Sambhajinagar, Jalna, Nagpur, Nanded, Nashik, Palghar, Pune, Raigad, Sangli, Thane, Wardha, Yavatmal, Jalgaon, Solapur, Satara

Rajasthan
Dungarpur, Udaipur, Salumbar, Sawai Madhopur, Karauli and Baran

Madhya Pradesh
Damoh, Mandla, Dindori, Singrauli

Chhattisgarh
Korea, Korba, Dantewada, and Surajpur

Odisha
Gajapati, Ganjam, Rayagada

Telangana
Sangareddy, Rangareddy, Narayanpet, Khammam

Jharkhand
Khunti, Ramgarh, West Singhbhum, Gumla, Giridih

Karnataka
Bidar, Chikkabalapur

8.4 million
People Impacted

> 3 lakh
People Impacted Through Health & Nutrition Initiatives

>78,461
Families Impacted Through WSI* Interventions

4.1 million ha*
Geographical Area Covered

10 States | **84** Districts | **7,635** Villages

2.34 million ha*
Land Treated

WOTR at a Glance

1 million +
People Trained**

2,55,129
Women Supported Through SHGs*

73
FPOs* Promoted/Supported

21,734
Women SHGs* Supported

244
NGOs/GOVT. Agencies Collaborated

>838
Research Articles, Books, Articles & Blogs

510
Films

WOTR and Partners | **FPO- Farmer Producer Organisation
WSI- Water Stewardship Initiative | **SHG-** Self Help Group | **ha** - hectares

>3.9 million
People Impacted

>1.81 billion
Litres Water Saved

7,56,588
Households Impacted

2,495
Villages

>13,799 ha*
Land Treated for
Soil and Water Conservation

4.23 billion
Litres of Water Storage
Capacity Created

WOTR in 2024-25

59
FPOs* Supported

>27,943 ha*
Area Under CRA* Practices

6,887
SHGs* Supported

138
Publications

1,57,721
People Trained

40
Films Produced

FPO- Farmer Producer Organisation | **SHG-** Self Help Group | **CRA-** Climate Resilient Agriculture | **ha-** hectares
Figures include new and continuing villages, households, and institutions; some overlap with previous years.

Maharashtra

Districts worked in:
Ahmednagar, Beed, Buldhana, Chhatrapati Sambhajinagar, Dharashiv, Gadchiroli, Jalna, Nagpur, Nanded, Nashik, Palghar, Pune, Raigad, Sangli, Thane, Wardha, Yavatmal, Jalgaon, Solapur, Satara.

2,267,937
LIVES IMPACTED

1,013
VILLAGES REACHED

6,800+ HECTARES
LAND TREATED FOR SOIL AND WATER CONSERVATION

1000 MILLION+ LITRES
WATER SAVED

2600 MILLION+ LITRES
WATER STORAGE CAPACITY CREATED

39
FPOs SUPPORTED

5213
SELF-HELP GROUPS SUPPORTED

Maharashtra's agriculture faces a severe crisis, with around 80% of its land under cultivation, and the irrigated area is about 17%. One-third of the state lies within a rain-shadow area of low, erratic rainfall.

Climate change, high input costs, market volatility, and shrinking landholdings have rendered the sector increasingly unprofitable, threatening the livelihoods of over half the state's population.

The average size of operational holdings has drastically decreased, and smallholder agriculture dominates the landscape, with 70% of holdings being small or marginal, yet these farmers face significant financial and operational pressures.

To address these challenges, Maharashtra needs a multi-pronged strategy focusing on reviving the natural ecosystems, climate-resilient agriculture, and support for small farmers by collectivising them through Farmer-Producer Organisations (FPOs).

Rejuvenation of watersheds, soil conservation measures, and regeneration of degraded commons and forested landscapes help restore groundwater levels, improve soil health, and moderate the impacts of erratic rainfall. By strengthening these natural systems, farming communities are better equipped to withstand climate stress while reducing input costs and long-term ecological damage.

Through FPOs, WOTR enables them to gain better bargaining power, access weather intelligence, connect with assured buyers, and reach markets with guaranteed prices while maintaining a balance with the environment. Women are further trained and incentivised to take on leadership roles in these FPOs, ensuring they lead alongside their work in the fields.

WOTR is also helping women find their voice, establish enterprises, and secure income through self-help groups. It is further working to improve nutrition in the region by supporting children and pregnant mothers—starting with better diets through kitchen gardens and ensuring malnutrition does not go undetected through regular height and weight monitoring. WOTR's work spans all aspects of rural life in Maharashtra, ensuring lasting impact and sustainable development for all.

Madhya Pradesh

Madhya Pradesh, where nearly three-quarters of the population depends on agriculture and related sectors, has made remarkable strides in transforming its agricultural landscape. It has emerged as a leading producer of food grains, pulses, and oilseeds, significantly contributing to India's agricultural output.

With over 49.43% of the state's land under cultivation, largely managed by small and marginal farmers, agriculture forms the backbone of the economy and sustains millions in rural areas.

However, despite this progress, environmental degradation poses a serious threat to sustainability. Unsustainable practices such as over-grazing, deforestation, and cultivation on marginal lands have led to soil erosion, water pollution, and declining soil fertility, jeopardising rural livelihoods.

The vulnerability of Madhya Pradesh's rural, especially tribal population—over 21% of the state—is further compounded by dependence on natural resources and low income levels.

WOTR is working to address these challenges. Key interventions include promoting sustainable farming practices that conserve soil and water resources, training and supporting small and marginal farmers, and implementing effective soil and water management techniques.

Additionally, WOTR supports communities in securing supplementary incomes through agriculture-allied livelihoods such as animal husbandry. In partnership with the government's Pashu Sakhi scheme, local women are trained to provide essential healthcare for livestock like goats and chickens, creating income opportunities while improving animal care.

By strengthening these areas, Madhya Pradesh can secure the future of its agricultural sector and safeguard the livelihoods of millions who depend on it.

Districts worked in:
Damoh, Mandla, Dindori, Singrauli

90,502
LIVES IMPACTED

92
VILLAGES REACHED

807 HECTARES
LAND TREATED FOR SOIL AND WATER CONSERVATION

13 MILLION+ LITRES
WATER SAVED

37.3 MILLION+ LITRES
WATER STORAGE CAPACITY CREATED

9
SELF-HELP GROUPS SUPPORTED

Rajasthan

Districts worked in:
Dungarpur, Udaipur, Salumbar, Sawai Madhopur, Karauli and Baran.

576,645
LIVES IMPACTED

430
VILLAGES REACHED

1,424+ HECTARES
LAND TREATED FOR SOIL AND WATER CONSERVATION

120 MILLION+ LITRES
WATER SAVED

230 MILLION+ LITRES
WATER STORAGE CAPACITY CREATED

11
FPOs SUPPORTED

19
SELF-HELP GROUPS SUPPORTED

Rajasthan's geography is characterised by hilly regions and undulating terrain, which leads to rainwater runoff and water shortages. Meanwhile, increasing desertification reduces the fertile land available for cultivation. Over 62% of the state's geographical area, approximately 21.23 million hectares, is undergoing desertification and land degradation.

Water scarcity is worsened by irregular rainfall and high livestock populations, making access to potable water increasingly difficult. With over 79% of groundwater blocks classified as overexploited or critical, the water crisis poses a formidable barrier to sustainable agricultural development, as farming is primarily rainfed, with the state being a major producer of wheat, barley, mustard, and pulses.

As agriculture falters, many turn to mining, often at the cost of their health. Limited income fuels other challenges, including rising malnutrition, increased burdens on women, distress migration, and the overuse of fragile natural resources.

Safeguarding Rajasthan's agricultural future calls for sustainable water management, strengthened irrigation systems, and dedicated support for small and marginal farmers.WOTR promotes water conservation and sustainable land management by reviving and building traditional, low-cost water harvesting structures like pokhars and pagaras, which capture rainwater and recharge groundwater. WOTR also introduces farmers to methods like the System of Crop Intensification (SCI) to maximise yield, alongside climate-resilient practices to mitigate the effects of climate change. Through Farmer Producer Organisations (FPOs), farmers can access fair prices, secure payments, and convenient produce collection points.

With water secured, initiatives to collectivise women through self-help groups, promote nutrition for children through kitchen gardens, and support animal husbandry-based livelihoods are helping communities reduce dependence on agriculture. Step by step, WOTR enables people to tackle climate change while improving lives with reliable access to water.

Chhattisgarh

Chhattisgarh's economy remains deeply rooted in agriculture, which supports around 70% of the population, even though it contributes just over a quarter of the state's GDP. Most of this agriculture remains rainfed—only about 21% of net sown area is irrigated—making rural livelihoods highly vulnerable to unpredictable rainfall, dry spells, and rising temperatures. More than 30% of the land suffers from low moisture retention and soil degradation, while over 17% of the state's geography shows signs of desertification and degradation, eroding both productivity and ecological health.

Moreover, while poverty levels are improving, serious health challenges persist—the maternal mortality ratio stands at 137, exceeding the national average, and child malnutrition remains alarmingly high, with stunting prevalent among nearly half of children under five.

In this context, WOTR's work across the districts of Korea, Korba, Dantewada, and Surajpur brings a hopeful, systemic approach rooted in long-term resilience. By combining watershed development and soil–water conservation, WOTR is revitalising landscapes and securing water availability—essential for climate-stable livelihoods.

Community institutions like women's Self-Help Groups are being strengthened to catalyse women's roles in decision-making and collective enterprise, while climate-smart agricultural practices help families diversify income and confidently navigate weather uncertainties.

Solar energy is ensuring dependable power for irrigation, drinking water systems, agriculture, and households, particularly in remote areas where grid access is limited. Integrated measures in livelihoods and health—such as nutrition outreach, antenatal care, and safe drinking water—are directly improving maternal and child well-being, closing critical gaps in local capacities.

Districts worked in:
Korea, Korba, Dantewada, and Surajpur

92,241
LIVES IMPACTED

103
VILLAGES REACHED

1855+ HECTARES
LAND TREATED FOR SOIL AND WATER CONSERVATION

214.9 MILLION LITRES
WATER SAVED

522.8 MILLION LITRES
WATER STORAGE CAPACITY CREATED

114
SELF-HELP GROUPS SUPPORTED

Telangana

Districts worked in:
Sangareddy, Rangareddy, Narayanpet, Khammam

225,659
LIVES IMPACTED

82
VILLAGES REACHED

915 HECTARES
LAND TREATED FOR SOIL AND WATER CONSERVATION

21.04 MILLION LITRES
WATER SAVED

44.86 MILLION LITRES
WATER STORAGE CAPACITY CREATED

4
FPOs SUPPORTED

Telangana faces significant agricultural and environmental challenges. About 31.68% of the state's land—around 3.6 million hectares—is experiencing degradation due to soil erosion, deforestation, and unsustainable farming practices. Small and marginal farmers, who form a large part of the rural population, struggle with shrinking landholdings, limited irrigation, and poor soil fertility. Erratic rainfall, frequent droughts, and groundwater depletion further heighten the risks, resulting in low productivity, crop failures, and economic distress. Limited access to modern technologies, market linkages, and post-harvest facilities compounds the challenges, while water scarcity affects both crop cultivation and drinking water availability in rural areas.

To address these vulnerabilities, WOTR has implemented an integrated watershed development program that encourages active community participation. Through this, groundwater tables are being revived, and effective micro-irrigation technologies are being introduced. Community members are trained in village-level water management, ensuring judicious use of water for agriculture. All interventions are guided by action research and scientific studies to maximise efficiency and sustainability.

Building climate resilience in agriculture is another core focus. WOTR promotes sustainable farming practices, including soil and water conservation, low-cost organic methods, and climate-resilient cropping patterns. Farmer Field Schools serve as educational hubs, empowering farmers with practical knowledge of eco-friendly farming techniques. In addition, the FarmPrecise app provides real-time, localised crop management data, enabling farmers to make informed decisions on sowing, irrigation, pest management, and harvesting.

WOTR's strategy is rooted in strengthening community institutions and fostering local ownership. Through this approach, WOTR is not only improving water security and agricultural productivity but also enhancing overall livelihoods, resilience, and well-being in Telangana's rural communities. By combining scientific tools, community mobilisation, and climate-smart practices, WOTR is helping farmers adapt to environmental challenges while securing sustainable development for the future.

Jharkhand

Jharkhand, despite its rich natural resources, faces significant development challenges. According to the National Multidimensional Poverty Index, approximately 28.81% of its population lives in multidimensional poverty, the second highest in India. Many Adivasi communities reside in remote forest fringe areas, far from urban centres, contributing to spatial poverty.

The state's topography is undulating, leading to soil erosion, nutrient loss, and sedimentation in lowland areas due to heavy downpours, causing excess water runoff. Water scarcity, erratic monsoon patterns, and declining groundwater levels exacerbate these issues. Additionally, Jharkhand grapples with malnutrition, low literacy levels, unemployment, and distress migration.

In response to these challenges, WOTR has been implementing Ecosystem-based Adaptation (EbA) through integrated watershed development in districts like Goilkera and Karra, focusing on building resilience through ecological restoration and community empowerment. This approach involves training community mobilisers and other stakeholders, like the government and civil society organisations, on EbA principles, ensuring inclusive decision-making at the village level throughout project implementation.

Key interventions include watershed management, sustainable agriculture practices, and the promotion of efficient micro-irrigation systems. These initiatives aim to enhance water availability, improve soil health, and promote climate-resilient cropping patterns. Community-based institutions, such as Village Development Committees (VDCs) and Gram Sabhas, play a pivotal role in implementing these interventions, ensuring community ownership and sustainability.

The community's active participation has been instrumental in the success of these initiatives. Villagers have embraced the concepts and practices introduced by WOTR, adapting them to their local contexts. This collaborative approach has led to improved agricultural productivity, enhanced water security, and strengthened community institutions, paving the way for a more resilient and prosperous future for Jharkhand's rural populations.

Districts worked in:
Khunti, Ramgarh, West Singhbhum, Gumla, Giridih

471,398
LIVES IMPACTED

535
VILLAGES REACHED

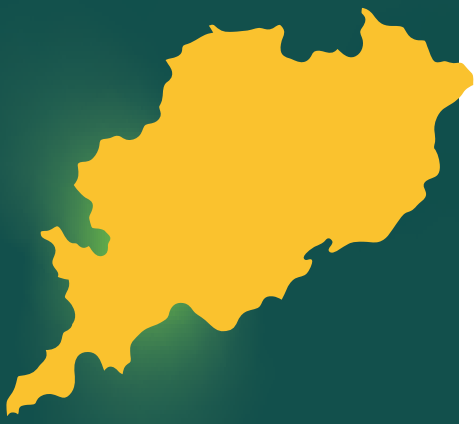
1,132+ HECTARES
LAND TREATED FOR SOIL AND WATER CONSERVATION

68.24 MILLION LITRES
WATER SAVED

172.24 MILLION LITRES
WATER STORAGE CAPACITY CREATED

1,181
SELF-HELP GROUPS SUPPORTED

Odisha



Districts worked in:
Gajapati, Ganjam,
Rayagada

139,796
LIVES IMPACTED

198
VILLAGES REACHED

128+ HECTARES
LAND TREATED FOR SOIL AND WATER CONSERVATION

1.76 MILLION LITRES
WATER SAVED

3.03 MILLION LITRES
WATER STORAGE CAPACITY CREATED

6
FPOs SUPPORTED

251
SELF-HELP GROUPS SUPPORTED

Agriculture and allied sectors remain the backbone of Odisha's economy, engaging nearly half of the workforce and sustaining the majority of its rural population. Yet the sector is under stress: more than 30% of soils in the state are affected by degradation, while irrigation coverage remains limited, leaving farmers highly dependent on erratic rainfall.

Though Odisha has made progress in reducing poverty, with multidimensional poverty falling to about 16%, challenges remain in nutrition and health. The state's maternal mortality ratio, at 119 per 100,000 live births, is still higher than the national average of 97, and child malnutrition affects nearly one in three children under five. These interlinked issues—land degradation, climate vulnerability, and health and nutrition insecurity—make rural livelihoods particularly fragile.

In this challenging but promising context, WOTR's work in Gajapati, Ganjam, and Rayagada districts is helping communities transform vulnerability into opportunity. By investing in watershed development, soil and water conservation, and water-harvesting systems, WOTR is improving the ecological health of landscapes and enhancing water availability even during dry spells.

But ecosystem regeneration is only part of the transformation. By nurturing robust local institutions, particularly women's Self-Help Groups and Farmer Producer Organisations, WOTR is enabling collective action, market access, and community resilience. Climate-resilient agricultural practices, such as crop diversification and access to real-time weather advisories through the FarmPrecise app, are helping farmers make informed decisions and reduce dependency on unpredictable rainfall.

This holistic approach—integrating ecological restoration, institutional strengthening, and climate-smart farming—is generating a forward-looking momentum among communities. Farmers are gaining reliability in their fields, women are stepping into leadership, and villages are building adaptive capacities for a changing climate.

Karnataka

Karnataka, the sixth largest state in India, faces severe agricultural challenges due to its heavy reliance on rainfed farming.

With only 24% of cultivated land under irrigation, agriculture depends largely on the monsoon, which is highly uneven in distribution. Desertification and land degradation add to the problems, significantly affecting productivity.

Frequent droughts have plagued the state, with 223 out of 236 talukas declared drought-affected in 2023–24, resulting in substantial crop losses. However, Karnataka has shown signs of recovery, registering 4% growth in 2024–25 following good rainfall.

In a state where 80% of cultivators are small and marginal farmers, WOTR is working to enhance water availability, improve irrigation infrastructure, and promote sustainable farming practices, which is critical to ensure long-term agricultural growth. Through our interactive Farmer Field Schools, WOTR is also imparting valuable insights on climate-resilient methods that lead to increased crop yields. By facilitating soil testing, we help farmers monitor and maintain soil health, while the adoption of micro-irrigation technologies optimises water use.

Additionally, WOTR is helping communities reduce their dependency on agriculture by creating farm and non-farm-based income-generating activities. This is especially crucial in today's times, as agriculture becomes more precarious due to unpredictable weather patterns. Women are being empowered through self-help groups, enabling them to set up enterprises and diversify household incomes. Some are choosing to set up agriculture-allied enterprises like poultry units, while others are increasing the scale of their operations with the assistance of machinery.

Through initiatives in water conservation, soil management, pest control, and income diversification, WOTR has boosted growth and strengthened community resilience in the districts of Bidar and Chikkaballapur.

Districts worked in:
Bidar, Chikkaballapur

77,775
LIVES IMPACTED

42
VILLAGES REACHED

680+ HECTARES
LAND TREATED FOR SOIL AND WATER CONSERVATION

278.1 MILLION LITRES
WATER SAVED

567.6 MILLION LITRES
WATER STORAGE CAPACITY CREATED

119
SELF-HELP GROUPS SUPPORTED

Nothing Exists in Isolation

A Systems Approach to Building Rural Resilience

DEEP DIVE

Marcella D'Souza

In the rural countryside, it's visible. Nothing exists in isolation! Not a village. Not a stream. Not a single farming plot. Everything is part of a living, breathing system — one that is complex, interconnected, and always in motion.

This is a fundamental truth we must grapple with when working in rural development. At the WOTR Centre for Resilience Studies (W-CReS), we don't see our work in silos; we can't afford to.

The communities we engage with don't live in silos.

Because the communities we engage with don't live in silos. Their lives are shaped by the convergence of soil, water, crops, forests, weather, social structures, customs, and livelihoods. Their futures depend on how well these elements work together, or don't.

Science, therefore, must reflect this reality. It must be interdisciplinary. It must be systemic. And above all, it must be rooted in context.

Science Must Reflect How Life Actually Works

Take agriculture. You cannot understand it by looking at seeds and yields alone. You have to look below the surface — at the soil, the terrain, the aquifers. You have to look above at rainfall patterns, wind, and temperature fluctuations. You have to look around at labour availability, gender roles, market access, and social norms.

A cropping decision is rarely just about what grows best; it is about what can be irrigated, what the family can manage, what is culturally valued, what climate extremes the community anticipates, and the hopes of the family.

The same goes for villages. A village downstream is affected by decisions taken upstream. Water does not stop at the boundary of a Gram Panchayat. Neither do aquifers. Neither should our thinking.

We often assume that expertise can be neatly divided into sectors: soil science, hydrology, agronomy, climate, and social science. But that is not how rural life operates. For communities, all of these disciplines converge on the ground. Water availability is linked to rainfall, which is linked to land use, which is shaped by policy, which is filtered through social norms and gender roles.

When a borewell dries, it is never just a technical failure. It is a signal of ecological, social, and historical interconnections under stress.

There is a tendency in development practice to treat villages as fixed, bounded units of intervention. But a village is part of a watershed, a microclimate, a network of relationships and dependencies. Its groundwater may originate in a forest several kilometres

Rural resilience must be grown through dialogue, observation, learning, and adaptation over time.

away. Its migration patterns may be linked to crop failures in a neighbouring district.

To work in one village without understanding its upstream and downstream connections is to risk designing solutions that solve one problem while creating another, or many more. Rural resilience must be understood not as a localised fix, but as a regional, relational, and layered process.

From Research On to Research With

At W-CReS, we believe science must not only break through disciplinary walls—it must also leave the lab and embed itself in everyday life.

Our approach is deeply participatory. Villagers help formulate research questions. They monitor rainfall and groundwater. They help track daily weather. Women collect data on water use and share their observations on changing seasons. Communities host automated weather stations in their homes and learn to interpret the data.

We've seen again and again that when people understand how climate, water, land, and livelihoods interact — and when they trust the tools being used to generate knowledge — they act with more confidence and purpose.

When Dialogue Triggers Systems Thinking

During a conversation with villagers in one of our watershed landscapes, we shared data on cropping patterns, groundwater levels, and climate trends. We didn't explain much — we simply laid the information before them. The response was immediate. They began drawing their own connections: how shifts in cropping choices were affecting water availability, and how climate variability was compounding the stress. What followed was not just a discussion — it was a powerful moment of collective analysis, grounded in lived experience and sharpened by data they now understood as their own.

A village is part of a watershed, a microclimate, a network of relationships and dependencies.

We need to reimagine how we do science, especially in the context of rural development.

> ***when people understand how climate, water, land, and livelihoods interact, they act with more confidence and purpose.***

As people shared, patterns emerged. They began connecting local changes to larger shifts — deforestation upstream, deeper borewells, changes in cropping, and rising temperatures. The dots joined slowly but clearly. And what had once been seen as isolated issues came into view as a system under stress.

That shift in perception — that system lens — became the foundation for collective action. The solution was not external. It came from within. And when women participated in equal measure—speaking from their lived knowledge, questioning long-held assumptions—the vision of a more inclusive, responsive system began to emerge.

Towards a New Scientific Imagination

In the face of climate change, we're often asked: What works?
But the more relevant question is: What sustains?

At W-CReS, we focus on low-regret or no-regret solutions — approaches that are robust across multiple futures, even ones we may not fully fathom. That kind of resilience cannot be engineered from a distance. It must be grown through dialogue, observation, learning, and adaptation over time. We don't believe in rushing to scale. We believe in going deep. Because depth — not speed — is what allows knowledge to take root and grow.

We need to reimagine how we do science, especially in the context of rural development. We need to move from reductionist thinking to relational thinking. From isolated expertise to integrated knowledge. From extractive research to collaborative inquiry.

At W-CReS, this is not a theoretical commitment. It is a daily practice. It shapes how we design projects, how we train our teams, how we measure impact, and how we engage with communities. Because we believe the future belongs to system thinkers — to those who see the web, not just the thread.
In the face of accelerating climate change, environmental degradation, and social inequity, we cannot afford to look away from complexity. We must learn to work within it — and learn from those who live it every day.

Because nothing stands alone. Not a village. Not a problem. Not a solution. And certainly not the science we depend on to chart a better future.

Marcella D'Souza is the Founder Director of the WOTR Centre for Resilience Studies (W-CReS).

Innovating for Impact

Science and Technology in Service of the Poor

DEEP DIVE

Crispino Lobo

When I look back at the many years I've spent in rural India, one thing stands out clearly: rural communities are not waiting to be "saved." They are observant, capable, and deeply attuned to the land. What they often lack is access—to timely information, to relevant technologies, to platforms where their voices shape decisions that affect them.

When young talent migrates, their villages miss out on the innovations they might have built locally.

Science and technology, for all their promise, still largely belong to the privileged. They are developed in conditions often far removed from the dusty village paths where the effects of climate change are most felt. For a smallholder farmer in Vidarbha or a tribal woman in the Sahyadris, terms like "climate models" or "AI-driven interventions" are not just unfamiliar—they feel alien, even irrelevant.

But are they?

When we shift the frame—when we root these concepts in lived realities like erratic rainfall, wilting crops, or a failed borewell—science suddenly becomes deeply personal. It becomes something to grasp, to question, to use. It becomes hope.

The Divide That Hurts Us All

The truth is, there is a dangerous and growing divide. Most innovation today—globally and within India—takes place in urban centres. That's where the money flows, where skilled professionals gather, where institutions flourish. It is also where the problems of the rural poor are least understood.

Private industry, understandably, chases markets with high returns. The bulk of solutions they generate are geared towards consumers who have purchasing power and are digitally connected. What incentive is there to develop drought-resilient crops or low-cost drip systems for farmers in a remote village?

Even when promising technologies do exist, they rarely make it to where they are most needed and local capacities are left untouched. Talented youth from rural areas, who might have become researchers or technologists rooted in their contexts, often migrate out, drawn to the glow of better opportunities, leaving their regions further behind.

All of this is happening while climate change, largely caused by consumption and emissions far from India's villages, is bearing down hardest on these very communities. Rainfall becomes unpredictable. Droughts stretch longer. Floods are increasing. Soils grow weary. And the margins that rural families live on become ever thinner.

Rural development isn't just emotional work; it's rigorous, technical, and grounded in evidence, with people at its heart.

Putting the Best of Science at the Service of the Poor

The work at WOTR rests on a simple conviction: quality should never be determined by income. Communities facing poverty deserve the same rigour of thought, science, technology, and data that is applied anywhere else. This is not charity, but a matter of equity and sound economics. And it is time we stop thinking of rural development as a “soft” or “emotional” sector. It is a deeply technical and systemically complex sector. If anything, it requires more engagement, more evidence and more technical integrity than many other sectors.

But how do we bring science to rural India in a way that does not intimidate, drown it in jargon or make it feel like an imposition? How do we make it not just accessible, but something rural communities can shape and own?
We start by recognising that no technology, however brilliant, works in isolation. It must be woven into the social fabric, introduced at a pace communities can absorb, and always —always—be accompanied by capacity building and hand-holding, in the initial period.

Innovation, But Not in a Vacuum

Real impact comes when we view challenges systemically. You can’t address falling farm yields by just giving better seeds. You have to understand the soil, the water availability, the family’s access to credit, the women’s labour burden, the way markets work and the changing climate. Everything is connected—from the aquifer beneath to the cloud patterns above.

This is why we take a holistic, eco-centric, systems approach at WOTR. We work not just with the individual farmer, but with the village, the community institutions, the ecosystems they depend on and the watersheds they live in. We know that piecemeal solutions might bring temporary relief, but lasting change demands depth, breadth, relationships and coordination.

Technology succeeds only when woven into the social fabric and adopted at a pace people can absorb.

Real development is co-created. It begins with truly listening.

> ***Change is best introduced when it is structured, paced, and sequenced—like a well-told story, not like a shock to the system.***

Community at the Centre

It is tempting, in our line of work, to arrive with ready-made solutions. But that is not development. Real development is co-created. It starts with listening—truly listening—to what people know, what they fear, what they aspire to. It grows through trust and takes time.

We believe development must preserve people's agency. They must define their own problems, weigh options, and decide what path to take. Our role is not to lead them but to walk alongside them—bringing in knowledge, science, and expertise, but never overpowering their voices.

Change, we have seen, is best introduced when it is structured, paced, and sequenced—like a well-told story, not like a shock to the system.

We ask hard questions:

Does this solution really work in this context?
What are the unintended consequences?

Can this be scaled without compromising its effectiveness?

We view technology not as a standalone solution but as an enabler—a bridge that connects communities with the tools, data, and insights they need to navigate uncertainty. Our approach begins with the belief that rural communities, particularly smallholder farmers, must have access to the same level of knowledge and foresight that more resourced sectors enjoy.

One of our flagship innovations is the FarmPrecise mobile application, which provides dynamic, weather-based, crop-stage-specific advisories in local languages. It draws on real-time weather forecasts, crop phenology (stages of crop growth and development), and soil conditions to help farmers make informed decisions—from when to sow and irrigate, to how to manage pests or prepare for adverse weather.
In a context where rainfall has grown increasingly

Participatory 3D Modelling helps communities visualise their landscape.

Every technology and study must centre people, communities, and their landscapes.

erratic and traditional cues are no longer reliable, such timely guidance can make the difference between a failed crop and a harvest. We are now integrating AI to refine these advisories further, pushing the boundaries of what's possible for climate-resilient farming in dryland and semi-arid regions.

Beyond individual farms, we are also harnessing technology to strengthen collective action and governance. In our water management programmes, we use Geographic Information Systems (GIS), hydrological modelling, and community-led water budgeting to enable equitable and sustainable use of local water resources.

Participatory 3D Modelling has proven especially powerful—bringing together physical terrain models, local knowledge, geo-hydrological and geo-referenced data to help communities visualise their landscape in new ways. Villagers, many of whom had never before seen a topographical map of their area, are now mapping out watershed structures, groundwater recharge zones, and critical interventions themselves.

These tools are further reinforced by the Water Governance Standard—a framework developed by WOTR that guides communities in assessing, strengthening, and institutionalising inclusive, transparent, and sustainable water management practices. Together, these platforms don't just support planning — they deepen participation, shift mindsets, and nurture a sense of ownership. When communities see how upstream actions affect downstream water availability, or how cropping patterns influence aquifer health, they begin to move from reactive use to proactive stewardship. In this way, technology becomes not only a scientific tool but a social one, cultivating both resilience and incentivising responsibility.

The Pillars That Guide Us

This journey of science -based development rests on certain non-negotiables:

Excellence:
We collaborate with some of the finest minds across disciplines to ensure rigour in all we do.

Transparency:
We hold ourselves accountable — to our data, to our partners, and above all, to the communities we serve.

Participation:
Every tool we introduce is designed with people, not for them.

Empirical Validation:
We measure, evaluate, question, and improve — always.

Capacity Building:
We democratise knowledge. Our goal is to make communities self-reliant, not dependent.

The Road Ahead

Innovation is not a luxury. For rural India, it is a lifeline. But innovation must be meaningful. It must arise from or lodge in the soil it seeks to serve. It must respect people, work with existing knowledge systems, and speak to the dreams and constraints of people who live far from urban promise.
At WOTR, we will continue to explore and experiment —with AI, with satellite data, with sensor networks and nature-based solutions —always asking: does this help the farmer in the village? Does this make her life better?

Because at the heart of every technology, every study, every intervention, there is—and must always be—a person. A family. A community. A landscape. A watershed.

And that is what drives us.

Crispino Lobo is the Co-founder and Managing Trustee of WOTR.

Every technology and study must centre people, communities, and their landscapes.

Rethinking FPCs

for an Ecological and Climate-Smart Future

DEEP DIVE

Prakash Keskar

When going through a field story documented by our team at WOTR, I came across a reflection from Samadhan, a farmer and director of the Krushiputra Farmer Producer Company (FPC) in Subhanpur village, Jalna district, Maharashtra. “Since the water used to run off, there was none left in the wells. Through training, we understood the importance of rainwater and how to store it in the ground,” he said.

It struck me as more than just a comment about water; rather, it reflected a deeper shift in mindset. For over a decade, WOTR has been working in this drought-prone region, reviving degraded land, restoring water bodies, and improving soil health to strengthen agriculture and rural livelihoods. The formation of the FPC in 2019, with support from WOTR, was a natural next step, an effort by Subhanpur's farmers not just to get better prices or access to markets, but to collectively navigate the ecological and climate uncertainties that shape their everyday lives.

Why FPCs Need to Evolve Beyond Business

Farmer-Producer Companies (FPCs) are often seen as instruments for economic empowerment. They help farmers pool resources, negotiate better prices, and access schemes and subsidies more effectively. But in ecologically vulnerable regions like Marathwada, these functions are not enough. The pressures of climate change —declining rainfall, groundwater depletion, soil degradation, and high input costs—are rapidly eroding the very base of agricultural livelihoods.

Jalna is a rainfed district, and over 85% of its land is under cultivation, highlighting both the region's agricultural reliance and its vulnerability to erratic rainfall. Farmers grow a range of crops, including cotton, soybean, pulses, maize, and vegetables, but their dependence on rainfall and costly chemical inputs makes them extremely vulnerable. In such a setting, collective action must go beyond the market. It must also focus on regenerating the ecosystems on which farming depends.
This is where Ecosystem -based Adaptation (EbA) becomes central.

EbA: A Natural Fit for Farmer Collectives

EbA is an approach that uses biodiversity and ecosystem services to help people adapt to climate change. It includes restoring degraded lands, reducing reliance on chemicals, improving water management, and promoting diverse cropping systems tailored to local conditions. It links environmental sustainability with economic resilience, a critical combination for smallholder farmers.

> ***Collective action must also focus on regenerating the ecosystems on which farming depends.***

Recognising this, WOTR began working with FPCs not just as business entities but as platforms for ecological change. The aim was to embed sustainability into their core operations, so that the FPCs could enable their members to not only improve incomes, but to do so by rebuilding the very ecosystems their livelihoods depend on.

FPCs help farmers pool resources, negotiate better prices, and access schemes and subsidies more effectively

Farmer-Producer Companies (FPCs) are often seen as instruments for economic empowerment.

Planning for Resilience: The TSP Approach

One of the turning points in this journey came with the introduction of Transformative Scenario Planning (TSP)—a participatory approach that encouraged farmers to reflect on how their landscape had changed over the past decade and imagine what it might look like in the future.

For many, it was the first time they had been asked to think of farming not just season-to-season, but over the long term. Discussions ranged from declining yields and rising costs to soil erosion and shifting rainfall patterns. As farmers reimagined their future together, conversations opened up around transitioning away from high-input crops like cotton, adopting soil and water conservation techniques, and diversifying their farming systems.
TSP workshops also created a shared sense of purpose across social groups, bringing together men and women, landowners and landless workers, and elders and youth to co-create a roadmap for their community's future.

From Ideas to Action: Water, Women, and Soil

With these shared insights, FPCs began operationalising EbA principles.
Water efficiency was the starting point. Supported by WOTR and linked to government schemes, farmers began adopting drip and sprinkler irrigation. Today, 90% of Krushiputra's 521 members use these systems, with yield gains of 30–40%.

Soil health and input costs came next. WOTR helped establish Bio-input Resource Centres (BRCs) run by local women's groups. These centres produce jeevamrut, amritpani, and compost using locally available materials. This shift away from synthetic fertilisers not only reduced costs but also began to reverse soil degradation. It also offered women a new source of income and agency.

Another story from our fields introduced me to Vijayshree Tukaram Shinde, a lemon farmer from Barshi. After adopting organic practices and pest traps introduced during workshops, she saw her prices rise from Rs 40 to Rs 58 per kg. But more than the income, she says, the confidence to manage her farm differently was transformative.

> ***A crucial element in the success of ecosystem-based adaptation efforts is the meaningful inclusion of gender perspectives.***

Gender inclusion is a key pillar of this work

A crucial element in the success of ecosystem-based adaptation (EbA) efforts is the meaningful inclusion of gender perspectives. Lower membership fees for women, subsidised inputs, and leadership training are helping ensure that women are active participants in the transition, not just beneficiaries.
In Jalna, 13 women now manage 12 maize collection centres across five FPCs. Using a mobile app, farmers notify centres of harvests; trained women inspect, grade, and weigh the produce. This direct link reduces middlemen, ensuring better prices and transparency. In one centre, Seema Eknath Kandhare now operates a 60-metric-tonne weighbridge, a role she never imagined herself in.

Between November 2024 and March 2025, these maize centres procured 1,910 metric tonnes of produce. In April 2025 alone, farmers earned

Rs 900 more per metric tonne than the market rate. These are not just success stories—they are proof points that FPCs can align livelihoods with landscape regeneration.

EbA doesn't exclude technology—in fact, it enhances its relevance. FPCs are also experimenting with drones for spraying organic inputs, covering one acre in just four minutes,

WOTR helped establish Bio-input Resource Centres (BRCs) run by local women's groups.

reducing chemical use by 30%, and helping protect beneficial soil organisms through targeted application.

Results and the Road Ahead

As the Government of India moves forward with its plan to form 10,000 FPCs, the question is not whether FPCs will scale, but how they will scale.
Will they follow extractive, input-heavy models that degrade ecosystems further? Or will they integrate EbA principles into their governance, operations, and business models—becoming institutions that are climate-resilient, ecologically grounded, and socially inclusive?

At WOTR, we believe the latter is not only possible but necessary. Our research arm, W-CReS, is developing tools and strategies—from ecosystem health assessments and participatory planning to governance frameworks—that help embed EbA into the DNA of FPCs.

> ***The future of farming is not just about higher productivity, it is about regenerating the ecosystems that farming depends on.***

Because in the end, the future of farming is not just about higher productivity, it is about regenerating the very ecosystems that farming depends on. FPCs that conserve water, rebuild soils, empower women, and democratise knowledge are not just adapting to climate change; they are leading the way through it.

Prakash Keskar is the Executive Director of WOTR.

From Survival to Growth to Reckoning

Now, Innovation Must Be for Impact

EXPERT SPEAK

Saurabh Kelkar

Whether developing new technologies or finding more efficient ways to utilise resources, innovators, their innovations, and inventions have consistently challenged the status quo for centuries. Long before language and structured societies emerged, early humans were already finding ways to adapt and thrive in a challenging environment. The discovery of fire provided warmth, protection, and the ability to cook food. Crafting stone tools and weapons increased chances of survival in the face of predators and the wilderness. The invention of the wheel

simplified transportation and reshaped human interaction.

All of these breakthroughs were purely instinctive, driven by the principle of the survival of the fittest. They laid the foundation for human progress and marked the dawn of the Innovation for Survival era, where each step forward was a response to nature's challenges.

From Machines to Markets: Innovation for Profit, Productivity, and Need

Beginning in the mid-18th century, the Industrial Revolution marked a shift toward increasing productivity through innovation, as new chemical manufacturing and iron production processes were developed, along with the growing use of hydropower, machine tools, and the emergence of mechanised factory systems. This shift from handcraft to machine-based production gave the economy an unprecedented boost, marking the beginning of the Innovation for Profit and Productivity era.

As the global economy expanded, so did the world's population, rapidly and dramatically. By the mid-20th century, the population boom had created an urgent and growing demand for essential resources, including food, water, housing, and energy. However, while demand surged, the supply of these resources remained limited and, in many cases, was being depleted at an alarming rate. This spurred a new wave of innovation aimed at meeting basic needs more efficiently and sustainably. High -efficiency agricultural machinery, improved irrigation systems, and the introduction of high-yield crop varieties transformed food production. This period, driven by the urgency to meet basic and growing demands, can be referred to as the era of Innovation for the Need.

While this period marked significant gains in food security and infrastructure, the benefits were often uneven. In countries such as India, while the Green Revolution increased grain production in select regions, its long-term sustainability came into question. With high input costs, degraded soil, and falling groundwater levels, many farmers—especially smallholders—found themselves locked in cycles of debt. Meanwhile, post-1991 economic reforms in the country boosted the service and manufacturing sectors but left agriculture largely stagnant, particularly for small and marginal farmers. As cultivation costs, such as seeds, fertilisers, and irrigation, rose, returns remained stagnant or even declined due to volatile market prices.

Climate change exacerbateds this vulnerability, with erratic monsoons, rising temperatures, and more frequent droughts and floods directly impacting crop yields and agricultural incomes. In contrast, sectors such as information technology, telecommunications, and urban manufacturing experienced rapid growth, attracting significant investment, generating employment, and contributing substantially to GDP. This created a widening

Today, innovation must look beyond growth to foster sustainability and resilience.

Today, innovation must look beyond growth to foster sustainability and resilience.

disparity: while urban centres modernised and prospered, rural agricultural communities were left behind, facing systemic neglect, ecological stress, and growing economic hardship.

The Reckoning: Innovation at a Cost

While the 21st century has seen remarkable improvements in lives and livelihoods, primarily due to technological advancements, this progress has not come without cost. Nature is continuously paying the price as forests are cleared to make room for cities and farms, and rivers are dammed for commercial purposes, disrupting the habitats of countless species. Pollution is making the air unbreathable, and overuse of chemicals is degrading the soil.

Humanity frequently takes more than it gives back, leaving nature to bear the unseen price of each step in the pursuit of comfort, power, and convenience. As a result of decades of unchecked development, the world is now facing rising global temperatures, depleting natural resources, and increased vulnerability to disasters. These consequences have modulated the focus of innovation.

Today, innovation must look beyond growth to foster sustainability and resilience. Across the world, innovators are harnessing science and technology to address pressing social and environmental challenges—whether by developing breakthrough solutions or by making smarter use of existing resources. This marks the beginning of a new era: the era of Innovation for Impact, where progress is measured not just in economic terms, but in how meaningfully it improves life for current and future generations.

The Era of Innovation for Impact

One such breakthrough is Direct Air Capture (DAC). This cutting-edge technology removes excess carbon dioxide from the atmosphere and stores it

underground or embeds it in long-lasting materials, such as concrete. Unlike traditional carbon capture methods, which work at the point of emission, DAC captures carbon dioxide from past emissions.
In the energy sector—one of the largest contributors to global greenhouse gas emissions—solutions like those from Form Energy are transforming the way we store and utilise power.

The company has developed a low-cost battery composed of iron and air, capable of storing energy for up to 100 hours. This long-duration storage helps balance the electric grid, making clean energy more reliable and accessible, even during periods when the sun doesn't shine or the wind doesn't blow. As cities expand and urban heat becomes an increasingly serious issue, simple but thoughtful innovations in green architecture, such as planted roofs and walls, help lower temperatures, reduce carbon footprints, and blend structures with their local environments. Countries around the world are leading with innovation to tackle climate change. Design thinking is often employed in rural and urban centres to motivate people to become climate-resilient. One example is from Bangladesh, where farmers are using a traditional yet innovative agricultural method. They are creating floating vegetable plots and gardens from water hyacinth and other organic materials that allow them to cultivate crops even when their land is submerged by floodwater, ensuring food security in the face of changing rainfall patterns.

In India, where nearly 65% of the population lives in rural areas, innovation is key to addressing persistent poverty and environmental degradation. For over 30 years, the Watershed Organisation Trust (WOTR) has responded to this need by empowering rural communities through integrated watershed development, ecosystem restoration, and climate resilience, earning global recognition for its impact.

WOTR's work is rooted in community-led watershed development, which restores degraded landscapes, enhances water availability, and improves soil health, directly contributing to more stable and sustainable rural

WOTR has pioneered innovative, community-specific strategies that build resilience.

livelihoods. By equipping local communities with the knowledge and tools to manage land, water, and forest resources, WOTR fosters long-term ecological regeneration and improved agricultural productivity.

WOTR has pioneered innovative, community -specific strategies that build resilience. From traditional watershed management to Ecosystem-based Adaptation (EbA), WOTR's strategy integrates practices likeagroforestry, water-efficient farming, and climate-resilient cropping systems to help communities withstand environmental shocks and stabilise rural incomes.

Moving forward, WOTR plans to deepen its climate adaptation efforts by harnessing data-driven tools, developing localised advisories, and strengthening livelihood practices. One such aspect is the integration of artificial intelligence to enhance decision-making and optimise resource use, thereby informing timely and context -specific interventions. Leveraging AI can further amplify the impact of existing tools, ensuring more responsive adaptation strategies. By integrating these innovations into its grassroots work, WOTR aims to establish stronger connections between community-led natural resource management and long-term climate resilience —ultimately creating adaptive rural ecosystems

In India, where nearly 65% of the population lives in rural areas, innovation is key to addressing persistent poverty and environmental degradation.

where communities not only withstand climate shocks but also thrive socially, economically, and ecologically.

While innovation is central to addressing today's most urgent challenges, its direction and success are often closely tied to financial resources. In the current era, funding is not just a support—it determines whether an idea can evolve into a practical and impactful solution. From research and development to prototyping and scaling, every stage of innovation requires adequate investment. On the other hand, a lack of funding can stifle even the most promising ideas, especially in underserved regions. What gets funded also shapes what gets built: commercially viable projects tend to get more attention than socially driven ones. In this way, finance doesn't just fuel

> ***WOTR plans to deepen its climate adaptation efforts by harnessing data-driven tools, and developing localised advisories.***

innovation; it also helps determine its direction. In other words, innovation is defined not just by technologies and optimised resource use but also by investment strategies. This era stands at the intersection where innovation must generate economic value while delivering social and environmental benefits. Yet the line between survival- and profit-driven progress is blurred.

Thus, today's innovations must strike a balance between sustainability and profitability for responsible development.

Rethinking Progress: Who Are We Innovating For?

True innovation demands a mindset that questions everything and seeks smarter, more effective approaches to challenges. In this cycle, innovation becomes the engine of global development, lifting societies and strengthening economies.

While inventions defined past eras of survival and industrial growth, today's world demands innovation for impact—solutions that not only advance technology or profit but also address social and environmental challenges. The underlying drive behind them has remained the same: a deep and instinctive need to survive, adapt, and improve. In this context, innovation is no longer just about what we create, but how, why, and for whom. It must go beyond growth or convenience towards resilience and sustainability.

The future depends on what we choose to build—and whom we choose to build it for.

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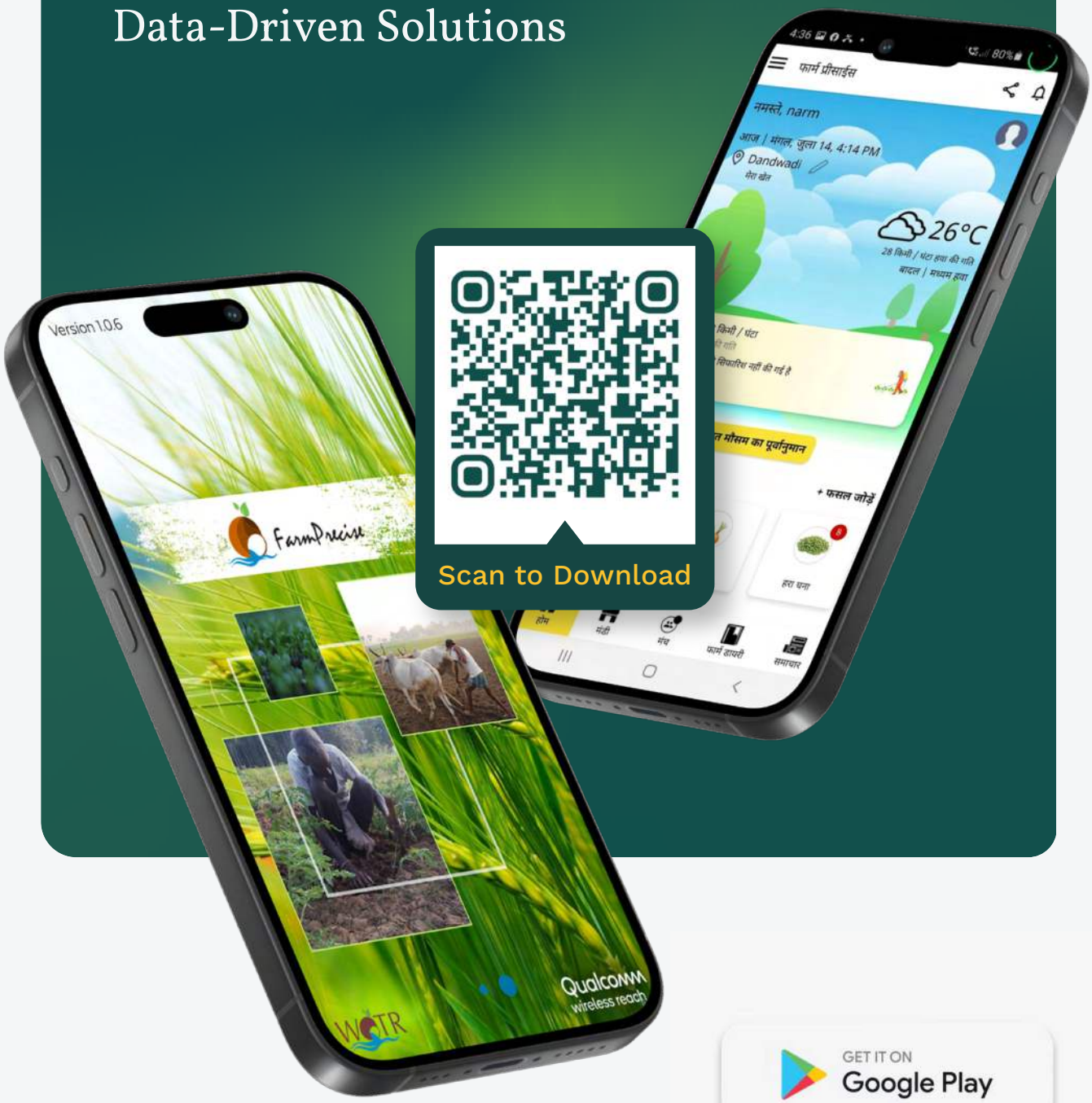
FarmPrecise

Advancing Agriculture with
Data-Driven Solutions



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In an era of changing climates and fluctuating markets, Indian farmers face mounting challenges that impact productivity and food security. While urban areas have benefited immensely from the digital revolution, rural farmers require a different kind of information—timely, localised, and actionable insights on sustainable farming practices. This is where WOTR's FarmPrecise app steps in, offering a comprehensive, data-driven tool designed to support informed decision-making in agriculture.

Why FarmPrecise?

For generations, Indian farmers have relied on oral traditions to determine which crops to grow, when to sow and reap, and how to deal with changing weather patterns. However, climate variability and unpredictable weather events have made traditional knowledge inadequate. Farmers now require precise, real-time advisories on weather conditions, soil health, and market trends to sustain their livelihoods.

Recognising this need, WOTR initially developed an Agromet Advisory System, which delivered crop and locale-specific advisories through SMS, based on data from the India Meteorological Department (IMD). While this system provided crucial weather forecasts, it lacked personalisation and farmer engagement.
Thus, WOTR, with support from Qualcomm's Wireless Reach programme, launched the FarmPrecise app in 2019, with a vision to provide dynamic, farm-specific advisories. Since its launch, the app has grown significantly, with over 1 lakh downloads, covering 30 crops across Maharashtra, Telangana, Odisha, and Madhya Pradesh, and is available in five languages

(English, Hindi, Marathi, Telugu, and Odia).

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Bridging the Gap

How Responsible AI Can Address Twin Crises of Biodiversity Loss and Climate Change

EXPERT SPEAK

Saurabh Purohit
YD Imran Khan

Climate change and biodiversity loss are two intertwined crises threatening human well-being, especially in developing nations. From Indonesia's deforestation to Kenya's recurring droughts, indigenous communities are on the edge of crisis. A recent analysis of 70,000 species on the IUCN Red List found over 3,500—about 5%—already at risk from climate change (Ripple et al. 2025).

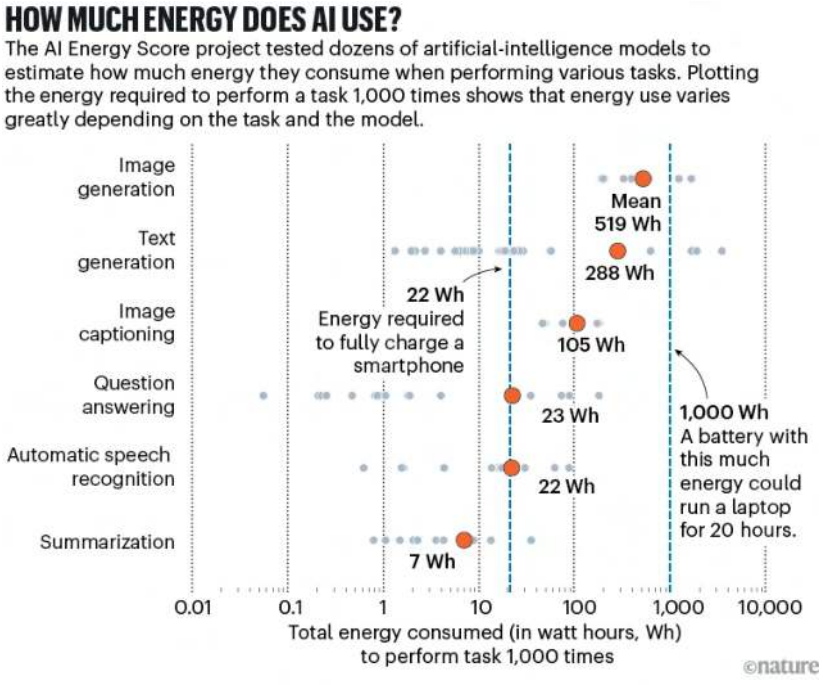
One emerging response is the use of Artificial Intelligence (AI). By integrating diverse tools, AI has helped conservationists monitor hard-to-track species and understand invisible ecological processes. Yet this promise comes with a cost. Running AI models demands immense fossil fuel-based electricity, much of it from coal, driving

further greenhouse gas emissions. Energy use depends on model type and task, and by 2027, the sector's annual consumption could rival that of entire countries such as the Netherlands (de Vries 2023). A single GPT-4o query consumes 0.43 Wh; scaled to 700 million queries a day, that equals the yearly electricity of 35,000 U.S. homes, water use matching the drinking needs of 1.2 million people, and emissions that would take a Chicago-sized forest to offset (Jegham et al. 2025)

Optimised AI algorithms have accelerated the extraction of non -renewables by locating new oil and mining sites. They also shape consumer preferences, often causing overbuying and waste. This adds to GHG (Greenhouse Gas) emissions, driving climate change and biodiversity loss. Since AI infrastructure is costly and energy-intensive, it is largely developed by richer nations (like the USA and China), while poorer countries bear the negative impacts with little role in creating them.

Responsible AI

Responsible AI isn't just about making efficient machines—it's about making AI for the well-being of the planet and its inhabitants. The true success of AI is not in its speed or data analysis capabilities but in its inclusiveness and transparency.



The energy use of different AI models (Source: Chen 2025)

This approach entails creating AI systems that are transparent about their decision-making, equitable for all communities, and designed with input from the individuals they will directly impact. It's about ensuring that when we deploy AI to tackle problems like climate change or biodiversity loss, we don't inadvertently create new problems or leave vulnerable communities behind.

In essence, responsible AI is a technology that not only works well but also works ethically, inclusively, and sustainably.

"A responsible AI future must be built on equal and meaningful participation, with actions to ensure that all stakeholders, especially those from emerging markets, developing economies, and vulnerable groups, have fair and equitable access to, as well as ownership of, computing, data, investment, and resources for capacity and talent development."

Hamburg Sustainability Conference (HSC) 2025

Principles of Responsible AI for Climate and Environmental Stewardship

1. AI systems should be designed, developed, and deployed to maximise energy efficiency and environmental sustainability throughout their value chain and lifecycle. This means designing AI that uses as little energy as possible, powering it with clean electricity, and ensuring

Data types/tools used for Biodiversity Monitoring (Source: Tuia et al. 2022)
AI has been actively used for biodiversity monitoring and its conservation over the years.

that every step of its development and use helps protect rather than harm the planet.

2. It should reduce its carbon and material footprints through reusing and recycling e-waste, and promote efficient water usage in AI infrastructure, particularly in networks and data centres, which consume enormous amounts of water for cooling.

3. AI should develop sustainable solutions for climate change, biodiversity loss, and pollution issues– the primary factors contributing to the planetary crisis.

4. Emerging markets and developing economies in the Global South should be empowered to develop their own AI infrastructure, rather than relying on it as users. It will help them to create AI solutions tailored to their local or regional needs.

5. All the relevant stakeholders should develop robust standards to measure the environmental footprint of the AI value chain. It will help to evaluate the trade-offs between environmental degradation and the societal benefits provided by AI.

6. The responsible authorities should ensure that AI development is aligned with global frameworks regarding climate change mitigation and adaptation, as well as the Sustainable Development Goals (SDGs).

Responsible AI and Climate Change

1. Smarter Energy Systems: AI integrates solar, wind, water, and other sources into power grids, reducing reliance on fossil fuels during peak demand.

2. Precision Climate Monitoring: Combining satellite, aerial, and ground data, AI enables accurate, real-time monitoring and prediction of extreme events.

3. Sustainable Transportation: AI optimises traffic (e.g.,

Google Maps), syncs real-time route data, and enhances EV efficiency, encouraging adoption.

4. Agricultural Innovation: AI analyses soil, weather, and crop health to guide farmers, boosting yields with fewer resources and less environmental impact.

5. Waste Reduction & Circular Economy: AI optimises supply chains and recycling by tracking materials from origin to disposal.

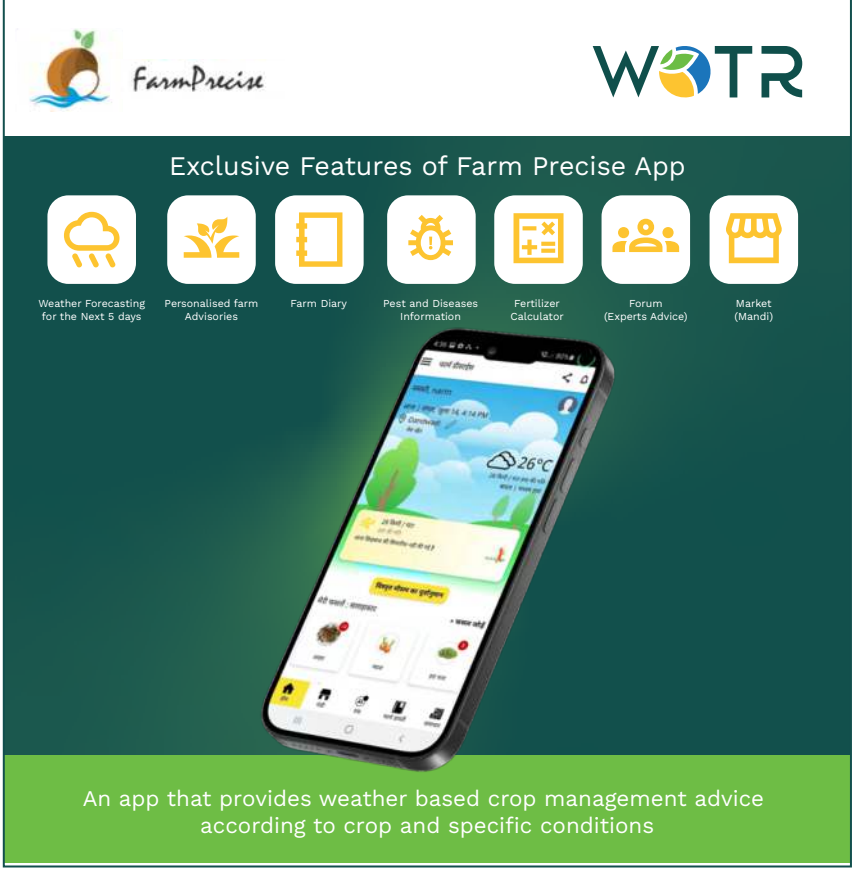
Some of the specific applications of AI for biodiversity conservation are as follows:

1. Automated Species Identification: The most common application of AI in biodiversity conservation is machine learning-driven species identification, utilising satellite data, aerial data, and data from camera traps. A significant advantage of using AI for these tasks is that it can process data much faster, more accurately, and more consistently than the manual method. Various AI-enabled applications have been developed for specific users (Microsoft AI for Earth MegaDetector, VanNetra for curbing wildlife smuggling) and the general audience (Merlin bird ID, iNaturalist, etc.) for identification.

2. Measurement of Essential Biodiversity Variables (EBVs): EBVs are key indicators used to understand and monitor the different layers of biodiversity, from the variety of genes within species to the structure and health of entire ecosystems, e.g. genetic compositions, species traits, ecosystem structure and function, etc. (Pereira et al. 2013). AI is used in predicting the species traits, species abundance and the structure and function of ecosystems using different datasets (species occurrence data, acoustic data and high to very high-resolution remote sensing data).

3. Modelling of biodiversity-related variables: Biodiversity-related variables, such as aboveground biomass and carbon stock, soil moisture content, or land use/cover classification, are critical for understanding the health of the ecosystem. With the rapid growth of technologies like machine learning and deep learning, AI is now helping automatically identify key features in data, improve accuracy in understanding patterns, and make

FarmPrecise includes weather forecasts, market prices, and even a community forum where farmers can connect and share knowledge.



stronger predictions about changes in the environment, whether caused by nature or human activities.

4. Citizen Science: AI is making it easier for people to join hands in protecting biodiversity. With apps like iNaturalist and eBird, anyone can snap a photo of a plant or record a bird call, and AI helps identify the species instantly. This information, shared by thousands of citizens, helps scientists track wildlife, spot rare species, and monitor changes in nature, making biodiversity conservation a collective effort.

WOTR and Responsible AI

For over three decades, the Watershed Organisation Trust (WOTR) has been assisting thousands of villages with water and soil conservation measures, and enhancing the productivity of their land through sustainable farming practices. Now, they have also integrated the use of AI to provide farmers with advisories regarding early warnings about crop-damaging pests, changing weather patterns, and adaptation techniques to make better decisions due to unpredictable climatic conditions.

In this direction, FarmPrecise, a comprehensive mobile application developed by WOTR with the support from Qualcomm Wireless Reach, provides location- and crop-specific advisories to farmers regarding sustainable agriculture practices, including integrated pest management and optimised fertiliser and irrigation use. Beyond just farming advice, FarmPrecise includes weather forecasts, market prices, and even a community forum where farmers can connect and share knowledge. The application serves as an excellent example of the responsible use of AI for climate change adaptation and mitigation, benefiting both the community and the planet.

WOTR is also utilising AI capabilities for land use/cover classification to understand the changes in the landscape over the years. It is also actively contributing to citizen science portals based on AI (eBird) for biodiversity conservation.

A Path Forward

Responsible AI for Regenerative Futures
The responsible use of AI can make a significant difference in the fight against climate change and biodiversity loss. The unmatched capability of AI in processing and analysing vast amounts of diverse data can provide innovative strategies for biodiversity conservation and climate change mitigation/ adaptation. But, all of this would make sense if the use of AI is ethical, inclusive and transparent. When this balance is right, AI can become an indispensable tool in making the planet better.

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Resilience Is Measurable

Investing in Impact Metrics That Matter

DONOR SPEAK

Garima Dutt,
YES Foundation

Across history, every era has prized different strengths — curiosity in the age of discovery, industry in the 19th century, and connectivity in the digital age. Today, in a world defined by cascading disruption — from climate volatility to pandemics and economic shocks — resilience has emerged as a defining imperative for human development. It is not a soft ideal, but a measurable capability that determines whether individuals, communities, and systems

Resilience demands a shift from counting activities to capturing transformation

can adapt, recover, and thrive. The question, however, is this: how do we know if we are truly building resilience? The answer lies in measuring what matters — a real, lasting change in people's lives.

From Inputs to Impact

Traditionally, development and CSR initiatives focused heavily on inputs and outputs—the number of people trained, workshops held, schools built, or funds disbursed. While these are necessary, they are not sufficient. Resilience demands a shift from counting activities to capturing transformation: Can communities sustain the impact of CSR interventions when companies and/or community-based organisations exit the region? Are vulnerable populations able to gain a voice in the decision-making process? Are systems becoming more inclusive, responsive, and future-ready?

This shift requires a recalibration of how we define, track, and invest in success.

Defining Resilience in Context

Resilience looks different in every context. For a rural farmer, it may mean access to climate-resilient crops and weather information. For urban youth, it might mean employable skills and digital access. For a healthcare worker, it could be mental health support and resource readiness. Therefore, contextual, community-driven indicators are crucial. The metrics must evolve beyond generic checklists to capture lived realities, including coping capacity, adaptability, recovery time, and system interconnectedness.

Investing in Meaningful Metrics

To make resilience measurable, funders and implementers must co-create impact frameworks that are:

1. **Outcome-Oriented**: Focused on behavioural, structural, and systemic shifts.
2. **Disaggregated:** Capturing equity across gender, age, ability, and geography.
3. **Dynamic:** Capable of evolving as risks and capacities change over time and contexts.

Resilience looks different in every context.

4. **Participatory:** Informed by those closest to the problem and the solution.

Innovative tools like resilience scorecards, real-time dashboards, and longitudinal studies offer actionable insights when designed collaboratively.

Example From the Field

Take the example of YES Foundation, which, in pursuit of its vision to build an empowered and equitable India, focuses on 3Es: Employability, Entrepreneurship, and Environmental Sustainability. While working on rural entrepreneurship, the Foundation has focused on enhancing the income of farmers, women, and artisans, rather than just tracking the number of people benefited. The Foundation has built an impact framework centred on resilience outcomes.

This includes:

Earning Continuity: How many farmers, women and artisans were able to secure or sustain livelihoods even amid weather or market cyclicality?

Digital Adaptability: To what extent trained farmers, women and artisans adopt and leverage digital tools for work or decision-making (like digital payments for widening customer base or adoption of ONDC for widening market demand or in the context of farmers, using technology to understand weather patterns)?

Measuring resilience is not just about accountability—it's about learning, adapting, and amplifying what works.

Psychosocial Strength: Were the trained women or artisans able to participate more or better in household decision -making? Is empowerment through financial decision-making and household budgeting made possible through our intervention?

Community Multiplier Effect: Did the farmers, women or artisans we supported help others in their networks to adapt, upskill, or set up nano enterprises?

Through these indicators, YES Foundation goes beyond training for better livelihood to capture the resilience quotient of community changemakers —not just

> ***A unified data platform can link schemes, reduce overlaps, and drive transformative change.***

their livelihood but their ability to be the voice for the transformation of their communities.

Why It Matters

Measuring resilience is not just about accountability—it's about learning, adapting, and amplifying what works. It helps decision-makers allocate resources more effectively, fosters trust with communities, and ensures that impact is not only felt but sustained.

Resilience is real. It is actionable. And yes, it is measurable—if we commit to listening deeply, learning continuously, and investing smartly. The future belongs to those who don't just build projects, but who build people, systems, and societies that can stand strong and rise stronger.

Garima Dutt is a purpose-driven CSR leader with nearly 20 years' experience across CSR, sustainability, diversity and inclusion and development communications. Currently serving as the CEO of YES Foundation, Garima is known for her strategic approach to CSR and for her focus on social sector ecosystem development.

Why Data-Driven Decisions Matter

in Rural Development

DONOR SPEAK

Sujata Tripathy
Water For People

Working in the rural development sector for the past several years, and more closely with government departments over the last two, one thing has become increasingly evident: the gap between reported data and ground realities is often vast. While official dashboards and reports may reflect impressive progress, the situation on the ground can tell a very different story. This disconnect raises critical questions about the accuracy, reliability, and use of data in decision-making processes. Also, it is important to ensure resources are used effectively and efficiently in the development process.

Real-time data allows for immediate visibility into the progress and performance of service providers on the ground.

The Problem with Data Discrepancies

In many rural development programmes, data flows hierarchically—from panchayat to block, from block to district, and then to the state or national level. However, this structure is often prone to data discrepancies. The numbers reported are frequently based on claims rather than verified facts. Field visits and close monitoring often reveal mismatches between what is reported and what exists in communities. For example, service delivery data may indicate 100% coverage of certain amenities, yet on the ground, communities still lack access to clean water, proper sanitation, or functioning health services. This undermines not just the credibility of the data but the entire developmental agenda, leading to inefficiencies, wasted resources, and community disillusionment.

The Illusion of Progress

Dashboards often show a smooth upward trajectory, with Key Performance Indicators (KPIs) suggesting consistent progress. But these figures can be misleading. Many a time, all the structural elements appear to be in place —schemes are launched, service providers are appointed, and funds are allocated. Yet, the accountability mechanism—who does what and how effectively—remains unclear. The lack of clarity in roles and incentives for frontline workers, along with limited checks and balances, affects the quality of services delivered. Without proper monitoring and data validation, it's difficult to assess whether services are truly reaching the people they are intended for.

Why Real-Time Data Matters

In such a scenario, the importance of real-time, evidence-based data becomes paramount. Real-time data allows for immediate visibility into the progress and performance of service providers on the ground. It highlights not just the numbers but also the qualitative aspects of development—challenges faced, gaps in implementation, and areas needing intervention. When real-time data is linked to payment disbursements or performance evaluations, it builds accountability. Service

Data also includes qualitative insights, gathered through community feedback, focus group discussions, and real-time monitoring.

providers become more committed to delivering quality work, knowing that their efforts are being tracked and evaluated in real time.

The Power of Integration and Convergence

Another critical aspect that hampers rural development is the lack of convergence between departments. Each department often operates in silos, leading to duplication of efforts and missed opportunities for resource optimisation. A unified data platform, accessible by all relevant departments, can act as a bridge. It can help link interrelated schemes and resources, identify overlaps, and create synergies that drive transformative change. When trained and skilled personnel are tracked and their performance is recorded, they can be leveraged across departments for more effective service delivery.

A Case: Participatory Digital Attestation Platform

Water For People piloted an innovative tool called the Participatory Digital Attestation (PDA) with Socion. Offered as a Software-as-a-Service (SaaS), this platform is designed to digitally enable large-scale development initiatives by capturing real-time data, tracking community engagement, and monitoring program performance. PDA was effectively used as a pilot during the Village Action Plan (VAP) exercise under the Jal

Jeevan Mission (JJM) at Birbhum district, involving grassroots actors like Self Help Groups (SHGs) and Village Resource Persons (VRPs). The platform allowed for real-time data collection and validation. When analysed, it revealed that 40–50% of previously reported data in a few metrics did not match ground realities. This startling insight prompted district officials to reassess and revise strategies, supporting more targeted and effective interventions.

Challenges in Adoption

While the advantages of real-time, data-driven decision-making are clear, its adoption is not without challenges. One significant concern is that evidence-based data can sometimes conflict with previously reported figures, leading to internal resistance. Drastic shifts in reported outcomes can appear as discrepancies or failures, even when they are actually corrections of earlier inaccuracies. However, it is important to see this not as a setback, but as a necessary step toward transparency and course correction. Data that reveals the truth enables better planning, resource

> ***For rural development to be truly impactful, data must serve as more than just a reporting tool.***

Rural development needs real-time, reliable, and actionable data that reflects the lived realities of rural communities.

allocation, and service delivery. It allows decision-makers to be proactive rather than reactive, and strategic rather than ad hoc.

Toward a Culture of Accountability and Impact

For rural development to be truly impactful, data must serve as more than just a reporting tool. It should be the backbone of strategy, planning, execution, and evaluation. This means investing in digital tools, training grassroots workers in data collection and validation, and fostering a culture where accuracy and accountability are prioritised over superficial progress. Moreover, data is not only quantitative but also qualitative insights, gathered through community feedback, focus group discussions, and real-time monitoring. They offer a more holistic view of progress and help tailor interventions to local needs. They help identify real needs, set priorities, and measure the impact of initiatives.

Rural development cannot rely solely on top-down data flows and aggregated statistics. It needs real-time, reliable, and actionable data that reflects the lived realities of rural communities. When decision-makers are equipped with accurate insights, they can design and implement interventions that are not just efficient but also equitable and sustainable.

As we continue to work closely with governments and communities, the path forward is clear: data-driven decisions are not optional —they are essential. The sooner we integrate real -time data platforms, enforce accountability mechanisms, and break departmental silos, the closer we will get to achieving genuine, ground -level progress in rural India.

Sujata Tripathy is a development professional specialising in WASH, public health, and livelihoods, adept at multi-stakeholder coordination, donor management, and program management. She is currently leading WASH programs in West Bengal with extended support to Assam and Odisha with Water For People.

Rajasthan's Rural Revival

How Simple Structures like Pokhars and Pagaras Brought Life Back to the Land

COMMUNITY STORY

WOTR Communications with WOTR Rajasthan

Until a few years ago, at 5 AM every morning, trucks would leave Mandi Bhat village in Rajasthan's Karauli district, packed with coughing men and their tools like spades and pickaxes. As they drove off, red dust would billow up, a silent goodbye from the village. These men would return late at night, happy if they earned good money from digging red sandstone, but disappointed if their hard work didn't pay off that day.

With an abundance of red sandstone, mining had long been the primary source of livelihood here. But the work came at a cost—its effects often visible as respiratory illnesses like tuberculosis and silicosis, or worse, hidden deep within, surfacing years later and slowly degrading the quality of life across the region. Fast forward to 2025. There are fewer trucks now. In their place, crops stand tall in the fields—wheat in January and maize in April. Alongside the lush green are cement embankments (pagaras) in fields and small village ponds (pokhars), brimming with water, quietly merging with the once-red, now-blue sky.

The construction of pokhars and pagaras has brought the community together to ensure a steady water supply and made cultivation possible in a region struggling with erratic climate patterns and scarce natural resources. With few alternatives to agriculture, many had turned to mining, often the only available source of income, despite the serious respiratory health risks it brings. These water conservation efforts are now offering a more sustainable and healthier way forward.

What are Pokhars and Pagaras?

A pokhar is an earthen water harvesting structure, reinforced with a stone masonry wall that acts as a diaphragm, helping retain water over long periods. A single pokhar is an embank--ment pond that can harvest around 12 TCM (thousand cubic metres)(1)—that's approximately 1.2 crore litres of rainwater, equivalent to around 1200 regular water tankers. Water stored in a pokhar is released through kothis (outlets) to irrigate agricultural fields downstream. Pagaras are cement barriers which act as bunds to retain water and

soil. These are constructed across the width of the drainage channels, which trap the soil and excess water flows over it.

Karauli's terrain is characterised by flat to undulating land, dotted with small hills(2). Its major rivers—Gambhir, Morel, Banas, and Chambal—form a well-directed runoff system. The unique inland drainage system and topography in this region makes pokhars and pagaras the ideal structures to retain water and recharge groundwater levels in Rajasthan, especially in Karauli, explains Dixit Joshi, Technical Officer with WOTR Rajasthan. Strategic placement of embankments (pagaras) along these rivers and tributaries intercepts rainwater before it drains away, making the most of every drop.

Unlike check dams, pokhars and pagaras require relatively low investment and minimal maintenance. They are also better suited to the local soil types—sandy, loamy, and hilly(3)—which is why such traditional water structures have existed in this region for generations.

However, over the years, these structures have fallen into disrepair. Leakage and desiltation rendered them ineffective. Drought and erratic rainfall strained the community's ability to maintain them. And when the rains did arrive, they often came in torrents, washing away mud-built pagaras in a single season.

"2–3 saal bach gaye iss kaam ki wajah se" (Two to three years of hard work were saved because of these structures), says Dixit Joshi, Technical Officer with WOTR Rajasthan, stressing the importance of building pucca (permanent) structures with cement, ensuring villagers don't have to rebuild them each year. But who maintains these structures now?

"One household takes responsibility for one pagara on their land. For pokhars, a Water User Group (WUG) is formed, typically 10 to 12 farmers whose fields benefit from it. Before construction begins, they are trained in maintenance, water budgeting, and repair. If there's less rainfall, what crops to grow, how many bighas to cultivate—it's all planned," explains Dixit. "Checks and balances are in place after handover. The community becomes the caretaker."

Rejuvenation of Life with Pokhars and Pagaras

Sumran Singh Gurjar, 31, a farmer from Mandi Bhat, remembers when water—or the lack of it—ruled their lives. With limited land under cultivation, men toiled in the sandstone mines. Others migrated to cities like Hyderabad and Ahmedabad to work as labourers. Women walked 6–7 kilometres to fetch drinking water from a bawdi (well), often unsafe. Children skipped school to manage the household in their parents' absence—either earning wages or securing water, the essence of life. Waterborne illnesses were common.

But that has changed.

For Om Prakash, a farmer from Shamipur, a newly constructed pagara not only ensured a steady water supply but also stopped topsoil erosion. The rain would previously wash away the fertile layer. Now, he's been able to cultivate an additional 1.5 bighas of land.

Once barren fields are now alive with crops, as the area under cultivation continues to grow. Livestock have access to a steady water source, and solar-powered hand pumps bring safe drinking water to homes. Families who had once left in search of better opportunities are returning to the village. With agriculture thriving once again, work is available close to home. Women now have more time to tend to their homes and fields, while children, once tasked with fetching water, are back in school—healthier, happier, and free to learn.

The Numbers Tell The Story

Between 2023 and 2026, in Karauli, 108 pokhars and pagaras were constructed or rejuvenated by WOTR, creating a storage capacity of more than 240 million litres of water, benefiting more than 393 households and almost 674 acres of farmland.

Pokhars and pagaras in Karauli remain steadfast as enduring symbols of what happens when science and tradition come together. Structures made of cement and bricks, reinforced with the spirit of community and the will to rise above adversity.

Trucks ferrying labour for mining are relatively empty now. With smiling faces in schools and crops standing tall, a wave of transformation has taken root in Karauli.

Shalmali Bhagwat, WOTR Communications, with contributions from Dixit Joshi and others from WOTR Rajasthan.

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Twice the Produce, Half the Harvest Time

The Future of Agriculture with Climate-Resilient Crop Varieties in Telangana

COMMUNITY STORY

WOTR Communications with WOTR Telangana

In the lively tribal hamlet of Errabodu Thanda, in Enkuru Mandal of Telangana's Khammam district, Bhukya Jagya stands tall and proud in his paddy field.

This year, his crop looks greener, healthier, and more abundant. Unlike previous years, the grain is fuller with fewer broken kernels, and it matured in over four months. From the same half-acre plot, he has harvested 20 bags—almost double his usual yield.

So, How Did This Happen?

Bhukya is one of 21 farmers in Errabodu Thanda who have shifted to a fine-grained paddy variety called Warangal Sannalu (Warangal 962), developed by the Regional Agricultural Research Centre in Warangal. This shift, catalysed by WOTR, has brought about a widespread change in this tribal farming community.

For years, farmers here cultivated traditional paddy varieties. However, increasing temperatures and erratic weather patterns made these crops highly susceptible to pests and diseases. The reliance on chemical fertilisers and pesticides not only increased production costs but also degraded soil health, threatening long-term agricultural sustainability.

Recognising this, Badavath Shirish, a Wasundhara Sevak (community mobiliser with WOTR), initiated awareness campaigns to introduce more sustainable farming methods. Farmers were informed about the environmental and economic pitfalls of chemical-heavy agriculture and were encouraged to explore climate-resilient crop varieties.

Inspired by this, Bhukya Jagya took the first step towards abundance. He sowed Warangal 962 seeds, locally known as Warangal Sannalu, and committed to using organic inputs, both fertilisers and biopesticides. Guided by WOTR throughout the process, he is now reaping the benefits: higher yield, better grain quality, and faster maturation.

Driving the Shift to Climate-Resilient Crops

Warangal Sannalu is one of several climate-resilient varieties being promoted by WOTR across Telangana. In

partnership with universities such as Agricultural Research Station, Kalaburagi; Professor Jayashankar Telangana State Agricultural University (PJTSAU), Hyderabad; Telangana State Seed and Organic Certification Agency (TSSOCA), Hyderabad; and Warangal Regional Agricultural Research Centre and funding agencies—including Viatris (formerly Mylan Laboratories), Wells Fargo, Axis Bank Foundation, and Honeywell Hometown Solutions India Foundation—WOTR is supporting farmers in their transition to these improved varieties.

In Nagoor K and Bheemra villages, 60 farmers growing red gram have shifted to the GRG-811 variety, developed by the Agricultural Research Station in Kalaburagi, Karnataka. This drought-tolerant legume variety has shown excellent resistance to dry root rot and pod borers, yielding up to 10 quintals per acre, even under difficult climatic conditions.

Other districts, including Narayanpet and Rangareddy, are also reporting success with alternative paddy and red gram varieties. Paddy varieties like RNR-15048, known for their low glycemic index, and red gram varieties such as WRG E-97 and TDRG-59, requiring less water, have improved both economic returns and ecological sustainability for over 450 farmers across Telangana.

What Makes These Crops Resilient?

Climate-resilient crop varieties are specifically bred to tolerate both biotic stresses (such as pests and weeds) and abiotic stresses (including drought, heat, salinity, and erratic rainfall). These characteristics help ensure stable or even increased crop yields despite adverse environmental conditions.

But transitioning to these new crop varieties is not always easy. It requires convincing farmers, overcoming scepticism, and providing technical support through the entire cropping cycle.

A Ground-Level View: Farmers Leading the Change

Before the red gram GRG-811 variety was introduced in Bheemra and Nagoor K, WOTR conducted detailed field assessments. With advice from Krishi Vigyan Kendra (KVK) scientists, GRG-811 was identified as ideal for local soil and weather conditions. Through multiple community meetings and training sessions, farmers were educated about its benefits.

One of the 60 farmers who have adopted this variety, Avuti Gundappa, explained how changing weather patterns—especially frequent dry spells and pest outbreaks—have made traditional farming increasingly unviable. After adopting this variety, he reported a 20% increase in yield and a complete absence of dry root rot disease infestation. His experience underscores how vital innovation is in tackling the effects of climate change.

Ensuring Access and Sustainability

A key challenge to widespread adoption of climate-resilient crop varieties in India is access to seeds and support. WOTR's convergence programme in Telangana addresses this by forming farmer groups that maintain direct links with Krishi Vigyan Kendras and government institutions. These groups continue to function independently, even without WOTR's presence, helping ensure sustained access to resources.

Though initial costs are higher, mainly due to expensive seeds and new farming techniques like intercropping, farmers report that these expenses diminish over time. Reduced reliance on chemical inputs, better pest resistance, and increased yields ultimately make these crops more profitable and sustainable.

Why Climate-Resilient Crops Matter for Telangana

With over 55% of Telangana's population dependent on agriculture, the need for climate-adaptive farming practices is critical. In 2024, paddy cultivation expanded to 56 lakh acres, yet climate variability continues to threaten productivity.

Drought-prone districts like Mahabubnagar, Nalgonda, and Rangareddy are especially vulnerable. Rising temperatures slow plant growth by disrupting photosynthesis, particularly during critical stages like flowering. Even urban consumers are indirectly affected—shrivelled tomatoes, bitter lemons, or flavourless onions are often the result of heat stress during cultivation.

For every 1°C increase in temperature, the yields of key crops like wheat, soybean, mustard, and potato may drop by 3–7%. Erratic rainfall further disrupts sowing and harvesting cycles, making traditional farming increasingly unpredictable.

A National Priority: Government Action on Climate-Resilient Agriculture

Recognising this, the Government of India has ramped up efforts under the National Innovations in Climate Resilient Agriculture (NICRA) project. Between 2011 and 2023, the Indian Council of Agricultural Research (ICAR) developed 1,888 climate-resilient crop varieties. In August 2024, the Government of India launched an additional 109 high-yielding, climate-resilient, and biofortified seed varieties.

These varieties include early-maturing cereals, drought- and heat-tolerant legumes, and rice capable of withstanding floods and salinity. The objective is to help farmers not only survive climate shocks but thrive despite them.

Developing and scaling climate-resilient crops is not just a local need—it is a global imperative. As climate change disrupts weather patterns across the Global South and North alike, ensuring reliable access to food, water, and shelter has become a top priority.

In this context, India's investment in climate-resilient agriculture positions it as a potential leader in the global food supply chain. Innovations like Warangal Sannalu and GRG-811 demonstrate how science, policy, and grassroots action can come together to secure the future of farming and food security for generations to come.

Shalmali Bhagwat, WOTR Communications, with contributions from Meghana Gaddam, Jyothirmayee Kandula, and Eshwar Kolanu (WOTR Telangana), and inputs from Nitin Kumbhar (W-CReS).

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From Soil to Sky

Innovations Changing the Face of Indian Agriculture

DEEP DIVE

Shailesh Haribhakti

India's agricultural landscape is undergoing a profound transformation, one driven by the convergence of tradition, science, and technology. Home to over 146 million farm holdings (Agricultural Census 2015–16), the sector supports nearly half of India's workforce, yet contributes only about 18% to the national GDP (World Bank, 2022). In the face of mounting challenges, declining soil fertility, depleting water resources, increasing input costs, and climate variability, farmers are seeking new ways to sustain their livelihoods and protect their land.

This shift is visible across the country. Drones, once restricted to high-tech labs, are now flying above village farms. Traditional water harvesting methods, many of which had faded from practice, are being revived and adapted using geospatial tools and hydrological planning. Young people are returning to the fields through natural farming.

The Government of India has taken the lead in supporting this transformation. The National Mission on Natural Farming aims to reach one crore farmers by 2025, promoting a low-input, climate-resilient alternative to chemical-intensive cultivation (PIB India). Parallel efforts are also underway to train rural women in emerging agri-tech skills such as drone operation, introducing precision into farming practices that have traditionally relied on manual labour (india.gov.in). These are not isolated success stories. They are part of a larger shift—one that organisations like Watershed Organisation Trust (WOTR) are helping to accelerate by integrating grassroots action with scientific rigour and scalable technologies. Innovation, when rooted in context, becomes impact. And for India's farmers, it is increasingly becoming a path to resilience and dignity.

Reviving the Soil, Rebuilding Trust: Natural Farming's Quiet Growth

Natural farming in India is no longer a fringe experiment. With institutional support and growing interest from farmers themselves, it is being seen as a viable solution to a long-standing crisis in soil health. Years of heavy reliance on chemical inputs have left many farmlands degraded. Input costs—particularly for fertilisers and pesticides—have risen sharply, while returns have often stagnated.

Natural farming offers a different approach: restoring soil vitality using bio-inputs made from cow dung and urine, composting, green manuring, and microbial cultures like Jeevamrut. These practices avoid synthetic inputs altogether, relying instead on ecological processes.

Pilot studies from NITI Aayog have shown that natural farming can reduce input costs by up to 60–70%, while enhancing soil organic carbon, improving water retention, and increasing crop resilience (NITI Aayog, 2021).

Amid declining soil health, water scarcity, rising costs, and climate variability, farmers are adapting to sustain their livelihoods.

Agricultural drones are becoming key tools in India's farming landscape.

In Andhra Pradesh, over 800,000 farmers have adopted the approach on nearly 4.7 lakh hectares (New Indian Express), many of them reporting increased profitability alongside improved soil health (Eco-Business, 2023).

WOTR's experience in dryland regions echoes these findings. In the states where WOTR works, farmers who switched to natural farming have not only reduced their dependence on external inputs but have also restored trust in the land, seeing agriculture once again as something that can sustain both their families and the ecosystems they rely on.

Drones and the Rise of Rural Women Agripreneurs

It's a striking sight: a group of women in saris operating remote-controlled drones, flying them low across paddy fields and vegetable plots. What was once unimaginable is now becoming reality in many parts of rural India.

Agricultural drones are emerging as powerful tools in India's farm landscape, capable of conducting aerial spraying, monitoring crop health through sensors, and mapping field boundaries using GPS. A single drone can cover 10–15 acres in a day, significantly improving efficiency over manual spraying. This precision allows for the targeted application of nutrients, reducing waste, saving time, and limiting farmers' exposure to harmful chemicals.

But perhaps the most transformative impact is social. As rural women learn to operate these drones, they are stepping into new roles as service providers, entrepreneurs, and decision-makers in agriculture. In communities where women's mobility and economic participation have long been restricted, this

Rural women are stepping into new roles as service providers, entrepreneurs, and decision-makers.

> ***Farmers are seeking new ways to sustain their livelihoods and protect their land.***

shift is not just technological; it's about agency and inclusion. In WOTR's work with farmer-producer groups, the integration of tools such as drones, soil testing kits, and digital applications is not only enhancing agricultural performance but also strengthening women's roles in decision-making, both on the farm and within community institutions. Under the ProRISE project supported by the Walmart Foundation, WOTR is prioritising the training of women from Farmer Producer Organisations (FPOs) in Bhokardan (Jalna) and Dharashiv.

Through a partnership with Garuda Aerospace, a leading drone manufacturer, women are being trained and certified as drone pilots. The drones, procured through the project, are then used by the FPOs to offer precision spraying and monitoring services to local farmers.

Though this initiative is in its early stages, the impact is already visible. The women involved are not only growing in confidence but are also taking full responsibility for drone operations. With continued support, this model holds great promise for scaling both women's leadership and technology-driven farming across the region.

Water: The Foundation of Resilience

Even the most advanced technologies cannot substitute the single most critical input for farming: water. Across India, water tables are falling, and rainfall patterns are becoming less predictable. According to the NITI Aayog Composite Water Management Index, nearly 600 million Indians face high to extreme water stress, and nearly 70% of available water is contaminated (NITI Aayog, 2019).

Watershed development, once seen as a rural employment strategy, is now emerging as a climate adaptation tool. By combining geospatial planning, hydrological modelling, and community mobilisation, WOTR and its partners have enabled hundreds of villages to build structures like farm ponds, check dams, percolation tanks, and continuous contour trenches.

These interventions are not large-scale infrastructure projects. They are small-scale, locally managed solutions that slow, spread, and store rainwater. A single farm pond can hold up to 3 million litres of rainwater —enough to irrigate crops during a dry spell or even support a second seasonal crop. In many WOTR-supported villages, such interventions have led to 30–40% increases in crop yields and significantly reduced out-migration during the lean season.

New Crops, New Markets: Expanding Farm Incomes

Once water and soil health improve and basic risks are reduced, farmers begin to

explore opportunities beyond subsistence. What we see across WOTR's project areas is a shift—from growing just enough to eat, to producing for markets.

Farmers have begun cultivating high-value vegetables suited to the local microclimate. In some cases, they are experimenting with multi-cropping models that combine food crops with market-oriented produce, reducing risk and increasing income.

This change is often accompanied by investments in post-harvest value addition: drying, processing, storing, and grading. Supported by producer groups and digital platforms, these efforts connect farmers to consumers more directly, increasing their share of the final price.

While the idea of a "10x income revolution" may be ambitious, the trajectory is clear: with the right ecological foundation, targeted technological support, and stronger market access, smallholder farmers can move from vulnerability to viability.

A Path Shaped by People and Possibility

What is emerging in rural India today is not just a technological shift; it is a cultural one. A return to ecologically rooted wisdom, made more powerful through science. A belief in the capacity of rural communities, not as passive recipients of innovation, but as co-creators.
WOTR's approach reflects this philosophy. Whether it is helping women take to the skies as Drone Didis, restoring forgotten water channels, or supporting farmers as they shift to natural inputs, the goal remains the same: to make farming not only sustainable but dignified.
The work ahead is immense. But the foundations are strong. When science, technology, and tradition come together—not in isolation but through integration—innovation becomes not just a tool, but a way of life.

Shailesh Haribhakti is a globally recognised thought leader, serial innovator, and sustainability evangelist with over five decades of experience in corporate governance and finance. At WOTR, he serves as the Chairman of the Advisory Council.

Woven Narratives

Films and Blogs That Told Our Story

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Women Leading the Way

The Power of Possibility

How a Village Learned to Catch Water

The Untold Story of National Award -Winning Film Paani

Hydro-Schizophrenia

The Fragmented Policy Approach to Water Management

100 Years of Bacher Baba:

The Visionary Leader through the Eyes of His Peers

How a School in Maharashtra's Jalna District

is Leading the Way in Multilayer Farming

Growing More With Less

The Communities That Became Stewards Of Their Own Water In Rural Maharashtra

Reviving Tribal Livelihoods in Odisha

Beyond the Monsoon

Farming for the Future

Beyond The Visible

Recognising Cultural Ecosystem Services in Development Practice

EXPERT SPEAK

Sharanya Chattopadhyay

Nature's Gifts Go Beyond What We Can See or Touch

When we think of what nature gives us, the first things that come to mind are often food, clean water, fresh air, or other resources. But nature offers something more—something less visible, but just as important. It offers peace, meaning, and a sense of belonging. These emotional and cultural connections to the land, rivers, forests, and animals around us are known as Cultural Ecosystem Services (CES).
As the world faces climate change, biodiversity loss, and growing inequality, Nature-based Solutions (NbS)—projects that work with nature rather than against it—are gaining traction.

Khecheopalri Lake, located near Khecheopalri village, West Sikkim, is considered sacred for both Buddhists and Hindus.

> ***For many rural, tribal, and Indigenous communities, nature is not merely a resource—it represents a deep, enduring relationship.***

These solutions help us grow food sustainably, recharge groundwater, reduce disaster risks, and much more. But too often, CES gets left out, simply because it's hard to put emotions, spiritual connections, or cultural traditions into a chart or spreadsheet. However, this presents a significant challenge, as for many rural, tribal, and Indigenous communities, nature is not merely a resource—it represents a deep, enduring relationship.

So, What Exactly Are Cultural Ecosystem Services?

CES are the non-material benefits we get from nature, like inspiration, recreation, spiritual connection, cultural identity, and mental well-being. These services were formally recognised in 2005 in the Millennium Ecosystem Assessment (MEA). Unlike more tangible provisioning (e.g., timber, food, water, NTFPs, etc.) or regulating services (e.g., climate regulation, flood control, water purification, etc.), CES are highly subjective, relational, and rooted in cultural context.

If we consider a sacred grove, its value may not be in timber or carbon sequestration, but in embodying ancestral beliefs, cultural continuity, and providing spiritual solace for a community and often in preserving local biodiversity, including endemic species. Likewise, that sense of serenity by a river, or the shared memories and rituals tied to a specific tree or mountain, are all lived examples of Cultural Ecosystem Services at work.

It's a fact that the introduction of CES in MEA 2005 popularised it across the scientific domain, but

CES are the non-material benefits we get from nature, like inspiration, identity, and well-being.

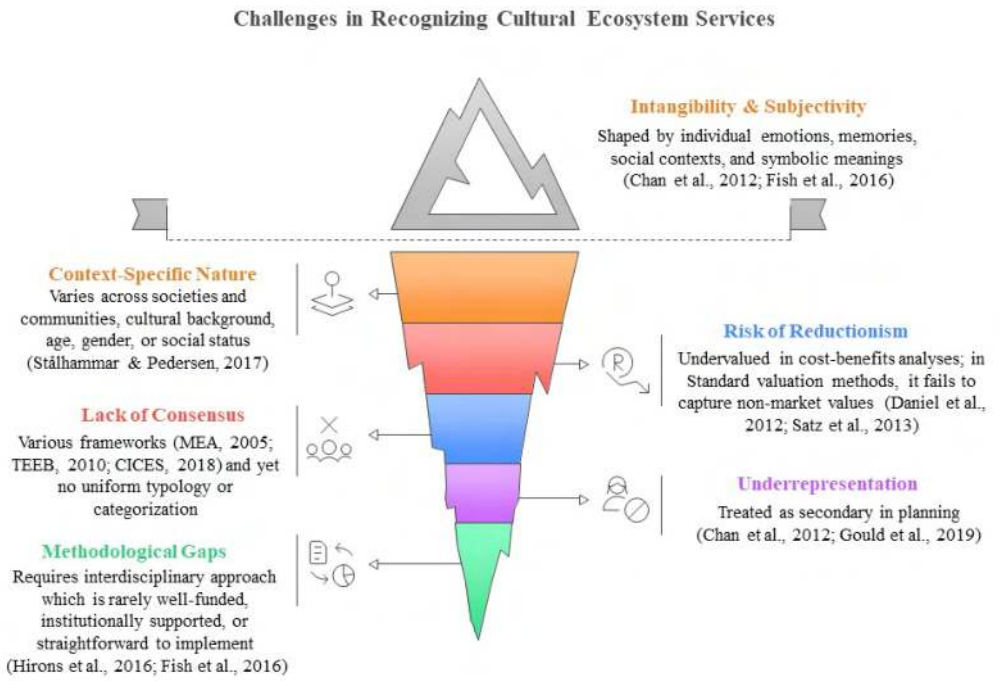
truth be told, people have recognised the emotional and cultural importance of nature for centuries. Philosophers like Kant and Thoreau, and concepts such as “topophilia” (Tuan, 1990) and “Place and Placelessness” (Relph, 1976), have long explored the deep emotional and spiritual bonds people form with landscapes. Today, more researchers and policymakers are acknowledging that land is not just physical space—it’s part of who we are.

Why CES Matter in Development Practice?

Imagine a well-meaning water resource development project that disrupts a community’s sacred spring. Or a new tourism development plan that limits access of the local indigenous community to a forest used for festivals and rituals. Without understanding how people relate to the land culturally and spiritually, even the best projects can backfire.

Cultural Ecosystem Services affect how people engage with conservation, developmental projects, restoration efforts, etc, adapt to change, and support (or resist) projects. When they’re taken into account, communities are more likely to feel respected and involved, leading to longer-lasting success. Moreover, CES contribute not only to conservation support and stewardship but also to economic and social well-being through tourism, mental health, and recreation (Masterson et al., 2019). Yet, research on CES remains largely concentrated in the Global North. In the context of the Global South, where traditions and local livelihoods offer diverse understandings of human-nature relationships (Milcu et al., 2013), bridging this gap requires more inclusive, context-sensitive, and pluralistic approaches. This is especially important in places where formal laws and informal practices overlap, like in many tribal or rural landscapes in the

Mawphlang Sacred Groves, a 800 years old forest located in Meghalaya, is believed to be the sacred abode of the local deity Labasa by the local Khasi community.



Global South. Recognising CES helps bridge these worlds, aligning policy with real community values.

Why Are Cultural Values So Hard to Measure?

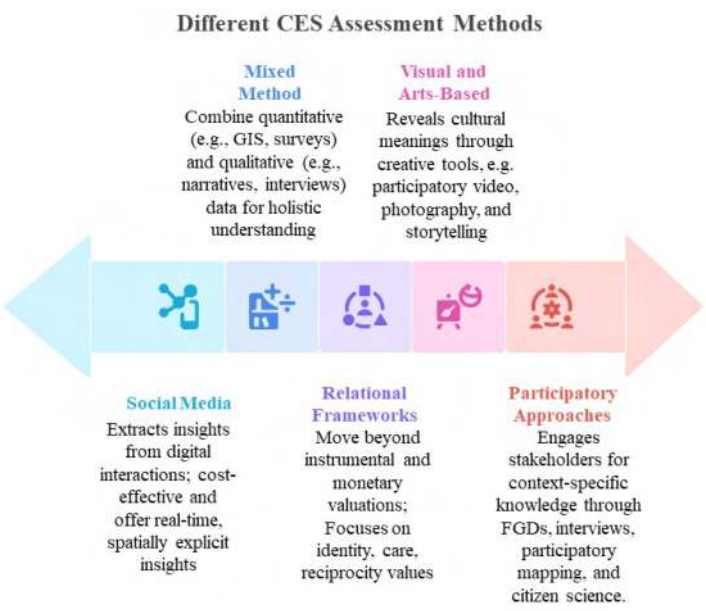
CES are often sidelined in ecosystem frameworks, treated as a "miscellaneous box" despite their centrality to human experience (Chan et al., 2012). Here's the tricky part: CES are highly personal and context-specific. What one group sees as sacred, another may see as recreational, or may not relate to at all.

Among several others, age, gender, traditions, and history are factors that shape these connections. A forested hill might be a pilgrimage site for one community, a hiking trail for another, a childhood memory for someone and just a piece of land available for development for someone else. So, putting a single number on its "value" doesn't capture the full picture. In fact, it may even erase it. Therefore, instead of just focusing on what can be counted, Chan et al. (2012) and Milcu et al. (2013) urge us to rethink and focus on what matters to people.

Ignoring the cultural dimensions of ecosystems carries practical risks. When sacred landscapes are disrupted by infrastructure, it can trigger community resistance and hinder project timelines. In contrast, development efforts that embrace CES are more likely to earn public trust and deliver enduring success. Recognising and integrating these intangible values is thus not only respectful—it's strategic. However, assessing CES is a tricky situation, and the general perception that CES is intangible and subjective is only the tip of the iceberg!

Finding Better Ways to Understand CES

However, it's not all grim, and in recent years, new tools and methods have emerged to help researchers, governments, and NGOs understand and include CES in their work. These methods are more participatory, culturally sensitive, and grounded in local knowledge. The IPBES framework's "Nature's Contributions to People" emphasises spiritual and relational values, and the IUCN Global Standard for Nature-based Solutions now calls for CES to be assessed at every stage of a project, from planning to implementation and beyond. These frameworks encourage us to look beyond scientific data and include community voices,



traditions, and lived experiences. They push us to value storytelling, memory, art, rituals, and everyday practices that connect people to place.

Moving Forward

For development practitioners, the takeaway is clear:

1. Engage with communities early and deeply—don't treat cultural values as an afterthought.

2. Use participatory methods like storytelling, mapping, and interviews to capture what matters most.

3. Push for policies that recognise CES, not just in theory, but in funding, evaluation, and planning.

4. Train teams to understand and respect cultural diversity, and invest in building capacity at all levels.

CES may be intangible, but they are far from invisible. They show up in rituals, festivals, place names, proverbs, songs, and sacred spaces. They influence how people live, adapt, resist, and care. Ultimately, recognising CES is about recognising people—their stories, struggles, identities, and hopes. And that recognition is not just respectful—it's essential for building just, resilient, and truly sustainable futures.

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India's Water Crisis

and Resilience through Circular Water Management

DONOR SPEAK

R. Pavithra Kumar
JSW Foundation

India's aspiration to become a developed economy by 2047 is ambitious and inspiring, but it hinges critically on one finite resource, WATER!

As the country advances in industrialisation, urbanisation, and agricultural intensification, its water systems are under increasing stress. India ranks 133rd globally in terms of per capita water availability. With demand projected to surge, addressing water scarcity and degradation is no longer optional.

This article explores a few of the many pressing issues related to water in India, focusing on scarcity, pollution, maladaptive technologies, and the promise of circular water management.

The Scale of the Crisis

India's total water demand is expected to rise from 611 billion cubic meters (BCM) in 2025 to 807 BCM by 2050. Per capita availability is projected to fall below 1,000 m^3 by 2050, classifying India as a water-scarce nation. Urban centres increasingly depend on distant resources, deepening supply inequities. Climate change compounds the crisis; erratic rainfall, prolonged droughts, and extreme weather events are disrupting the water cycle, reducing agricultural productivity, and intensifying rural distress. Industrial sectors face mounting risks from water shortages, pollution, and competition for resources. Alarmingly, 75% of India's rivers are unfit for drinking, and only 8% of wastewater is treated, leading to widespread contamination.

Circularity in Water Management

Water pollution is a major challenge. Industrial discharge, agricultural runoff, and untreated sewage have severely degraded water quality. The untreated wastewater not only poses health risks but also represents a missed opportunity for reuse.

In 2021, 8,603 MCM of treated wastewater could have irrigated 1.38 million hectares, equivalent to the output of a large dam like the Sardar Sarovar dam.

While chemical engineering solutions, such as membrane bioreactors and advanced oxidation processes, are effective, they are energy-intensive and costly. In contrast, Nature-Based Solutions (NbS)—such as constructed wetlands and bio-filtration systems that offer low-cost, decentralised, and ecologically integrated alternatives. These systems treat sewage using natural processes, support biodiversity, and recharge groundwater.

RO Purifiers: A Case of Maladaptation

The widespread use of Reverse Osmosis (RO) systems in India has become a significant concern. RO technology, designed for high-TDS water, is often misused for low-TDS sources, leading to

NbS for Water Treatment in Urban Areas

It is common belief that nature based system are slow and need large area. The Integrated Wetland Technology (IWT), developed by an IIT-founded startup, exemplifies this approach. Every day 4.85 litre sewage is being treated through these decentralised Sewage Treatment Plants (STP). These treatment facilities are odour-free and allow greenery above, with treated water reused for gardening and dust suppression (CSE India, 2024).

water rejection rates of up to 75%. This means, only 25% of the input water is available for drinking, while the rest is discarded. Misinformation runs so deep that even many government water schemes rely on RO systems.

This results in straining water supplies and increasing energy consumption. Recognising this, the National Green Tribunal (NGT) directed the Ministry of Environment, Forest and Climate Change (MoEF & CC) to regulate RO use under the Water Purification System (Regulation of Use) Rules, 2023, effective from November 2024. These rules mandate proper reject water management and discourage RO use for low-TDS water. However, enforcement of these directions remains weak. Manufacturers continue to market RO systems without educating consumers or ensuring accountability. India urgently needs stronger policy, and regulatory enforcement, mandatory labelling, and public awareness campaigns to promote appropriate filtration technologies.

Technology-Driven Circular Water Management in Agriculture

Agriculture, which consumes around 80% of India's water resources, is central to the water crisis. With 150 million smallholder farmers, access to reliable irrigation is vital. Emerging technologies like Artificial Intelligence (AI) and Internet of Things (IoT) are transforming water use in agriculture.

Low-cost soil moisture sensors, weather-integrated irrigation scheduling, and mobile-based AI tools help farmers decide when and how much to irrigate, reducing water use by up to 40% and increasing yields by 20–25%. Initiatives like Fasal and CropIn are tailoring solutions for smallholders, but scaling requires government support, digital literacy programs, and affordable access to smart tools.

India's total water demand is expected to rise from 611 billion cubic meters (BCM) in 2025 to 807 BCM by 2050.

Devanhalli's Low Cost Water Supply

The Devanahalli Indirect Potable Water Reuse Project in Karnataka demonstrates a sustainable model of urban water management. Treated wastewater is naturally filtered through ponds and aquifers, then supplied to 45,000 residents via a low-energy treatment process. This system avoids energy-intensive technologies and meets national water quality standards (CSE India, 2024).

Conclusion

India's water challenges extend beyond mere scarcity—they highlight areas where we can enhance efficiency, equity, and resource management. These challenges present an opportunity to rethink how we use and value water.

A circular water economy offers a forward-looking solution. By prioritising reuse, recycling, and regeneration, this approach not only conserves water but also builds resilience against future shortages. It encourages innovation in water infrastructure, promotes community participation, and supports sustainable development goals.

By integrating nature -based solutions (NbS), appropriate technologies, and smart agricultural practices, the country can move toward a more sustainable and equitable water future.

However, this transition demands immediate and coordinated action across sectors. Policymakers must prioritise water governance reforms, enforce pollution control norms, and actively

Case Study: Watershed Development with AI Integration in Maharashtra

In Maharashtra, NABARD supported a climate-proofing watershed development project that integrated AI-based hydrological mapping and predictive analytics to optimize water use in sugarcane and horticulture farming. The initiative used satellite data and IoT-enabled soil moisture sensors to guide farmers on regulated deficit irrigation, helping reduce water consumption by up to 35% while maintaining crop yields. AI tools also helped identify recharge zones and plan micro -irrigation layouts, improving groundwater sustainability.

promote circular water systems. Strategic investments in infrastructure, research, and capacity building are essential to scale these solutions effectively. Among the most actionable and impactful steps are: implementing decentralised wastewater treatment using NbS, deploying smart irrigation systems powered by AI and IoT, enacting policy reforms to regulate maladaptive technologies like indiscriminate RO usage, fostering public-private partnerships for innovation and infrastructure, and encouraging community engagement to drive behavioural change and local stewardship. These low-hanging interventions can catalyse a broader shift toward water security and climate resilience.

R. Pavithra Kumar is the CEO of JSW Foundation with 28 years of cross-sectoral experience spanning finance, technology, and social development. He previ-ously served as Chief Program Director at Tata Trusts, leading multi-thematic initiatives and forging key partnerships with government and global institutions.

Haryana's AI-Enabled Water Atlas

Haryana Water Resources Authority launched the Haryana Water Resource Atlas, an AI-powered geospatial platform aimed at monitoring and conserving the state's fast-depleting water reserves. Developed in collaboration with HARSAC, the atlas provides real-time insights into groundwater levels, aquifers, canal systems, and cropping patterns. It enables district officers and farmers to forecast stress points and plan interventions like water harvesting and alternate cropping

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Seeing the Unseen

How a 3D Tool Is Helping Villages Reclaim Their Groundwater Future

EXPERT SPEAK

Ankita Yadav

In the rain-fed villages of Maharashtra, people are finding new ways to understand their land — not with satellites or dashboards, but with cardboard, shared knowledge, and a fresh look at the soil beneath their feet.

For decades, groundwater, a silent, life-sustaining force, has been the backbone of rural India. It waters our crops, quenches our thirst, and sustains millions of people. Yet, its invisibility has also led to its decline. Over-extraction, lack of awareness, and the absence of collective understanding have turned it into a contested, diminishing resource.

Groundwater resides within the tiniest spaces of rock—microscopic pores and fractures that are often overlooked. It is not a vast underground tank or a hidden river, but rather water held within rock masses. It is part of a dynamic system shaped by multiple factors that influence its movement, direction of flow, recharge capacity, yield potential, and overall volume. This complexity makes it a challenging subject to fully grasp, even for scientists.

So, what if we could make groundwater visible, not just to scientists and developmental practitioners, but to the very people who depend on it the most?

That's the promise of CoDriVE-Visual Integrator (CoDriVE-VI) — a participatory 3D modelling tool that empowers communities to see, understand, and manage their groundwater resources.

A Model That Brings Science and Stories Together

CoDriVE-VI is not just a tool, but a process that brings together local wisdom, scientific data, and hands-on creativity. Developed by WOTR and adapted from participatory 3D modelling practices, it combines surface and subsurface mapping into one tangible, scaled model that communities can build and understand themselves.

Using GIS data, hydrogeological surveys, and village-level knowledge, communities craft layered 3D models with basic materials like cardboard, carbon paper, and paint. The surface model represents the visible landscape, such as farms, streams, and settlements, while the subsurface model reveals groundwater flows, aquifers, fractures, and recharge zones.

What was once invisible becomes real. Groundwater — often abstract, misunderstood, or ignored is now something to be seen, touched, and talked about.

The Technical Core: Demystifying the Subsurface

At the centre of CoDriVE-VI lies a rigorous technical process that transforms geophysical data into a participatory planning tool. This process follows a structured methodology to integrate scientific accuracy with grassroots engagement.

1. Data Collection and Mapping

The first step in building the CoDriVE-VI model is gathering detailed data, both primary (through field surveys) and secondary (from existing maps and records).

Geological Mapping: This involves identifying different rock types, fractures, and geological structures that influence groundwater storage and movement.

Well Inventory Survey: A structured format captures GPS locations, depths, water levels, and pumping details of dug and bore wells. This reveals the saturated lithological layers (physical characteristics of a rock) encountered during drilling

CoDriVE-VI is not just a tool, but a process that brings together local wisdom, scientific data, and hands-on creativity.

In many villages, the models are taken to community gatherings and local governance meetings.

and helps classify aquifers. Geophysical Survey: A Vertical Electrical Sounding (VES) method is employed to collect subsurface readings. This non-invasive technique sends electrical currents into the ground and measures resistivity (the ability to resist the flow of electric current), which varies based on rock type, porosity, and water content. These readings are later processed using software to produce lithological cross-sections.

2. Interpretation and Integration

The resistivity data, geological observations, and well inventories are integrated to interpret the properties of the aquifer. Using a software-based analytical tool, graphs are generated that reveal the thickness and type of geoelectric layers (stratified layers that are placed depending on their electrical resistivity). From these, Groundwater Potential Maps are created that depict storage capacity, transmissivity, and recharge-discharge zones.

3. 3D Model Construction (Stakeholder Engagement workshop)

With scientific maps in hand, community members are guided to build the physical 3D model using accessible materials: Corrugated card sheets are cut to match topographic contours traced from reference maps. These are superimposed and fixed to reflect surface elevation.

Subsurface zones are colour-coded to denote different groundwater potential areas. The final model is mounted on plywood and indexed for reference. The physical act of constructing the model becomes a learning process. Villagers begin to understand slope, flow direction, water accumulation areas, and the hidden links between what they see above ground and what exists below.

These workshops are interactive gatherings where villagers engage in model-making activities, guided by the local water management team. These sessions promote open dialogue through group exercises, games, and discussions, helping communities address individual concerns and collective challenges. Scientific insights on socio-economic, biophysical, and hydrogeological aspects are shared in simple language to support informed, aquifer-level water governance decisions.

From Ownership to Stewardship

In more than 80 villages across the Marathwada region of Maharashtra and semi-arid pockets of Madhya Pradesh, Telangana

and Odisha, CoDriVE-VI has opened new pathways for awareness and action.

“I never thought I could see our groundwater resource,” said one farmer. “Now, I can see every surface and sub-surface of our village, especially the number of borewells and dug wells. We are all pulling water from the same pot.”

The shift from seeing groundwater as private property to recognising it as a common-pool resource lies at the heart of CoDriVE-VI. Groundwater’s invisibility limits our ability to understand the boundaries of the groundwater system, what we call aquifers. Because we can’t see how wide or regionally connected these aquifers are from the surface, we often assume that water drawn from a well comes from an isolated point source. But in reality, that is not the case.

Groundwater is a shared resource, spread across vast and often immeasurable lengths and depths, making it possible for many people to tap into the same source without even realising it. By visually demonstrating the shared nature of aquifers, the tool sparks conversations about collective responsibility and equitable use.

“Attending this workshop enhanced our knowledge regarding the different rock types that are available in our village,” said a sarpanch from Palsunde village, Akole block, Maharashtra. “It made us realise that if we do not manage water sustainably now, the coming generation will suffer.”

A Tool That Builds More Than Models

The impact of CoDriVE-VI extends far beyond awareness. Villages begin to plan crop cycles based on realistic groundwater estimates. They implement water budgeting, identify recharge zones, and adopt rules for well drilling and pumping. These rules and regulations emerge from the shared understanding that the models help build. By visually representing the common aquifer, the models reveal how individual extraction activities are

The shift from seeing groundwater as private property to recognising it as a common-pool resource lies at the heart of CoDriVE-VI

The impact of CoDriVE-VI extends far beyond awareness

interconnected or how overuse by a few can lead to depletion for all. These rules are often self-imposed by the community, but they are also formalised through resolutions passed by the Gram Panchayat, with support from Village Development Committees (VDCs). This collective approach helps ensure that all villagers follow the agreed-upon norms for groundwater use.
In many villages, the models are taken to community gatherings, local governance meetings, and even to neighbouring villages, becoming a centrepiece for discussion, planning, and cooperation.

“When we saw the models of three villages together,” shared one participant, “we could understand the groundwater scenario not just of our own village but also of our neighbours. It helped us think of water as a shared challenge.”

Looking Ahead: Participation in Policy

Aligned with the Maharashtra Groundwater (Development and Management) Act 2009, the National Aquifer Mapping Program (NAQUIM), and the Atal Bhujal Yojana, the CoDriVE-Visual Integrator (CoDriVE-VI) tool serves as a strong catalyst for decentralised groundwater governance. By bridging technical knowledge and local understanding, the tool acts as both a capacity-building platform and a planning instrument. It helps communities move beyond awareness to collective decision-making, and ultimately, to sustainable stewardship.
In a time of growing water stress, tools like CoDriVE-VI remind us that groundwater management is not just about data — it’s about dialogue. It's about turning science into something local, tactile, and participatory.

Because sometimes, the best way to protect what lies beneath is first to bring it into the light.

Ankita Yadav, a researcher at W-CReS, is a hydrogeologist and groundwater expert with extensive knowledge in aquifer mapping. She is also a CDVI specialist, working closely with rural communities to develop these evaluation tools.

Ecohydrology

and Its Role in Sustainable Development

EXPERT SPEAK

Omkar Hande
Sejal Kulkarni

When we think about sustainable development, we often think of organic zero-waste farming, green buildings, electric vehicles, and solar panels. However, one element that connects all this is Water. It is not only a resource; it is the foundation of an ecosystem, which is a chain of interactions between organisms and their environment that support life on Earth.

The ecosystem is sustained through the interplay between ecology and hydrological processes. Hydrology is the occurrence, distribution, and circulation of water across landscapes through the unending hydrologic cycle that nurtures life. At the same time, nutrient cycling, primary production and species interaction are the ecological

processes which maintain the stability and health of natural systems. Together, both uphold the resilience of the planet and ensure support to biodiverse ecosystems and human wellbeing. Recognising the close connection between the interaction of water and living things, scientists have developed an integrative approach of **Ecohydrology.**

History and Evolution

Ecohydrology comes in as a powerful scientific tool that combines ecology and hydrology to understand the interactions between biotic components and hydrological processes, thereby enhancing the sustainability of ecosystems and human societies. The idea of ecohydrology formally emerged in the 1990s as researchers recognised the need to integrate ecological processes with hydrological dynamics to enhance management of water resources and ecosystems. A widely accepted formalisation was introduced through UNESCO's International Hydrological Programme (IHP). But ecohydrology goes beyond its static definition; it aims to use this knowledge to restore and manage ecosystems in a way that makes them more resilient and productive.

Principles of Ecohydrology

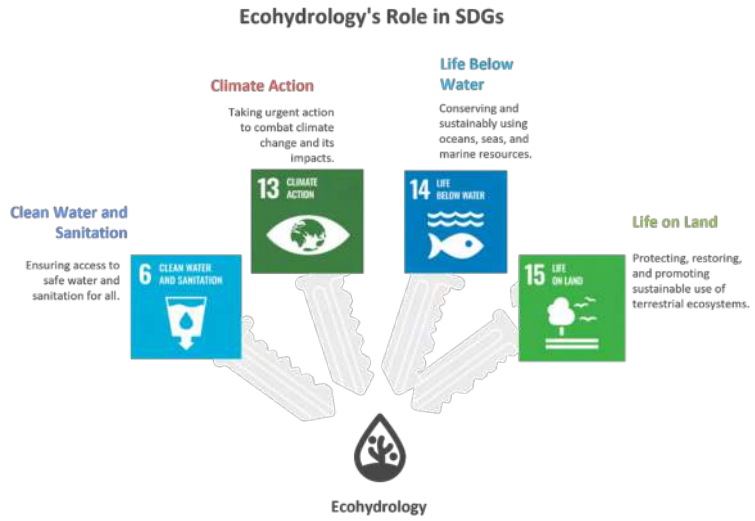
Ecohydrology is based on three interlinked principles to achieve sustainable management of water resources and ecosystems. First, hydrological processes, such as timing, pathway, and quantity of water flow, are essential for maintaining ecosystem processes, including the distribution, structure, and productivity of aquatic and riparian biota. Riparian biota are the plants, animals, and other organisms that live in and are strongly associated with riparian zones – the transitional areas of land along rivers, streams, lakes, and other water bodies.

The second principle states that the biotic components of ecosystems, including aquatic and terrestrial fauna, flora, and microbes, can be strategically utilised to control catchment-level hydrological and biogeochemical processes. i.e., the role of wetlands can slow water flow and trap sediments, while riparian flora can lessen nutrient runoff and strengthen banks.

The third and last principle emphasises the integration of hydrological and ecological processes at the catchment scale, which recognises the connection between water flow, land use, and the ecosystem health of the whole river.

Why Does It Matter?

Based on these fundamental principles, ecohydrology provides several practical principles to guide water and ecosystem management. This includes hydrological regulation, which is managing the timing, pathway and quantity of water flow to maintain ecosystem processes such as ensuring environmental flows in rivers to support migration of fish and protect aquatic habitats; Biotic Regulation, which acknowledges the ability of biota such as riparian flora, wetlands, and microbial communities to manage and



regulate water quality, reduce sediments, and improve nutrient cycling. It also helps in mitigating challenges like water scarcity, declining water quality, biodiversity loss, and an increase in floods and droughts, with the help of Nature-based Solutions (NbS) by acknowledging water as a driver as well as a regulator of ecological processes. Traditional water management has developed over centuries for storing and harvesting water, supporting agriculture, and controlling floods, while minimising the risk of drought.

It mainly focuses on achieving water security to support local needs. On the other hand, ecohydrology is a modern scientific discipline that helps to understand ecological and hydrological processes, addressing the challenges of water management, ecosystem health, and supporting living systems, which are central to sustainable development. It transitions from purely infrastructure solutions to more ecosystem-based approaches, which enhance water infiltration, restore natural flow, filter pollutants, and improve water availability and ecosystem services.

Ecohydrology and SDGs

The 17 Sustainable Development Goals (SDGs), with a series of targets and indicators associated with them, are part of the 2030 Agenda for Sustainable Development. The ecohydrological framework helps to achieve these goals and their targets, i.e., SDG 6 (Clean Water and Sanitation), SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land) (UNESCO, 2022). The ecohydrological practices can assist in breaking down the individual SDGs and promote action.

Table 1 gives examples of targets for the four foundational SDGs (6, 13, 14,15) where ecohydrology can provide support on the progress to achievement. To achieve SDGs 6 on water, 13 on climate change, 14 on coastal zones, and 15 on life on land, we must better focus on all aspects of the connections between water and biodiversity, from ecosystems to human usage. A more integrated and coordinated framework is necessary to address the increasing water stress, ecological degradation, and fragmented management approaches that hinder the

Target	Action
6.1	By 2030, achieve universal and equitable access to safe and affordable drinking water for all
6.4	By 2030, Substantially increase water-use efficiency across all sectors.
6.5	By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.
6.6	By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.
13.1	Strengthen resilience and adaptive capacity to climate - related hazards and natural disasters in all countries.
14.2	By 2020, sustainably manage and protectmatrine and coastal ecosystems to avoid significant adverse impacts.
14.5	By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information.
15.1	By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services
15.3	By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought, and floods and strive to achieve a land degradation-neutral world.

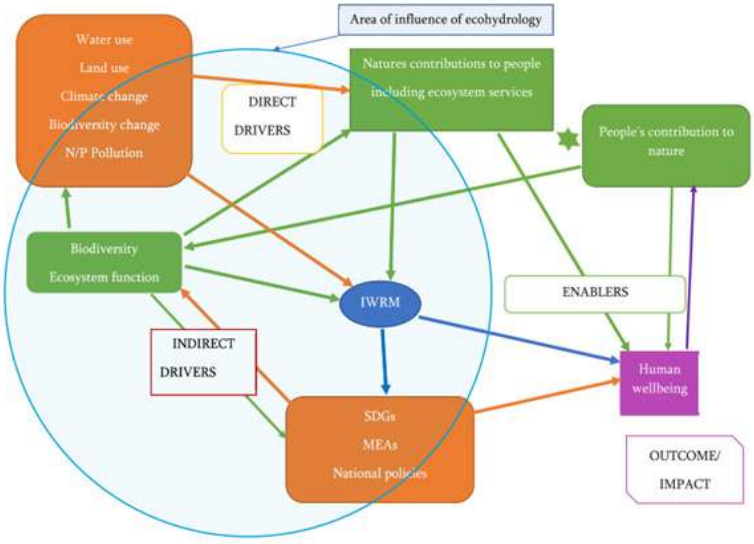
balance between human and ecological needs. Ecohydrology provides both a science base and a policy-relevant framework that advances the multidimensional targets of the SDGs holistically.

Supporting Integrated Water Resources Management (IWRM)

IWRM promotes the coordinated development and management of water, land, and related resources to maximise economic and social welfare equitably without compromising the sustainability of vital ecosystems (Global Water Partnership, 2009).

IWRM encompasses catchments, river basins, and watersheds, which means it contains a variety of habitats, from groundwater to man-made wetlands, all of which are part of a larger landscape. Ecohydrology strengthens the science of IWRM. It offers a methodology for designing such a water management plan that conserves ecosystem services and adjusts to local climate by taking into account the relationship between hydrology and ecology within the catchment.

This combines nature-based solutions with conventional technical solutions, for example, restoration and controlled floodplain inundation, and controlling flows with infrastructure. In practice, organisations like the Watershed Organisation Trust (WOTR) demonstrated



these principles through participatory watershed development. WOTR's ridge-to-valley approach integrates soil and water conservation, groundwater recharge, with community-led governance.

The creation of Water Stewardship Committees, village water budgeting exercises, and climate-resilient agriculture planning empower local institutions to equitably manage water resources while maintaining ecological balance. These initiatives are prime examples of how ecohydrology can achieve IWRM principles, balancing ecological integrity with water security and human resilience when it is integrated into participatory frameworks.

Ecohydrology As A Science-Policy Interface

Ecohydrology also plays an important role as a bridge between critical scientific ecology and hydrology understanding, and policy and decision-making beyond its useful field application. Ecohydrology offers the scientific knowledge of how ecosystems work, how water flows, and how human activity affects these processes. This information aids in the development of more effective strategies for biodiversity conservation, water resource management, and climate risk resilience. Some researchers give the importance of the connection between science and governance (Bridgewater, 2021)

Links To Human Health And Resilience

Ecohydrology establishes a direct link between human health and water management, diseases like Cholera and malaria spread with water and insects and are affected by hydrological processes. Ecohydrology offers an integrative framework for examining these connections with the

help of thoughtful management of water and landscapes. Aligned with these principles, WOTR's work in WASH (Water, Sanitation, and Hygiene) aligns with these principles through its emphasis on source protection and sanitation infrastructure improvements. In addition, WOTR conducted behaviour change campaigns to improve hygiene practices and strengthened village-level institutions like Village Water and Sanitation Committees, linking governance with ecological health. These efforts not only contributed to reducing waterborne diseases but also fostered long-term community resilience in semi-arid, climate-sensitive regions. WOTR's WASH initiatives provide a clear demonstration of how ecohydrology, when translated into local actions, can drive both environmental sustainability and improved human health.

Conclusion

Ecohydrology offers a transformative lens through which sustainable development can be pursued, one that harmonises ecological integrity with human needs through the intelligent management of water and landscape interactions. Unlike conventional methods that often isolate hydrology from ecological and social dimensions, ecohydrology promotes synergy between natural processes and human interventions. Its holistic framework supports climate adaptation, ecosystem restoration, inclusive governance, and long-term resource resilience. As water continues to face increasing pressure from population growth and environmental change, ecohydrology provides a scientifically grounded yet flexible approach to managing this vital resource sustainably.

Specialising in Ecology, Omkar Hande, a researcher at W-CReS, possesses extensive knowledge in biodiversity conservation and restoration.

Sejal Kulkarni worked as a research intern with the Ecology team at W-CReS.

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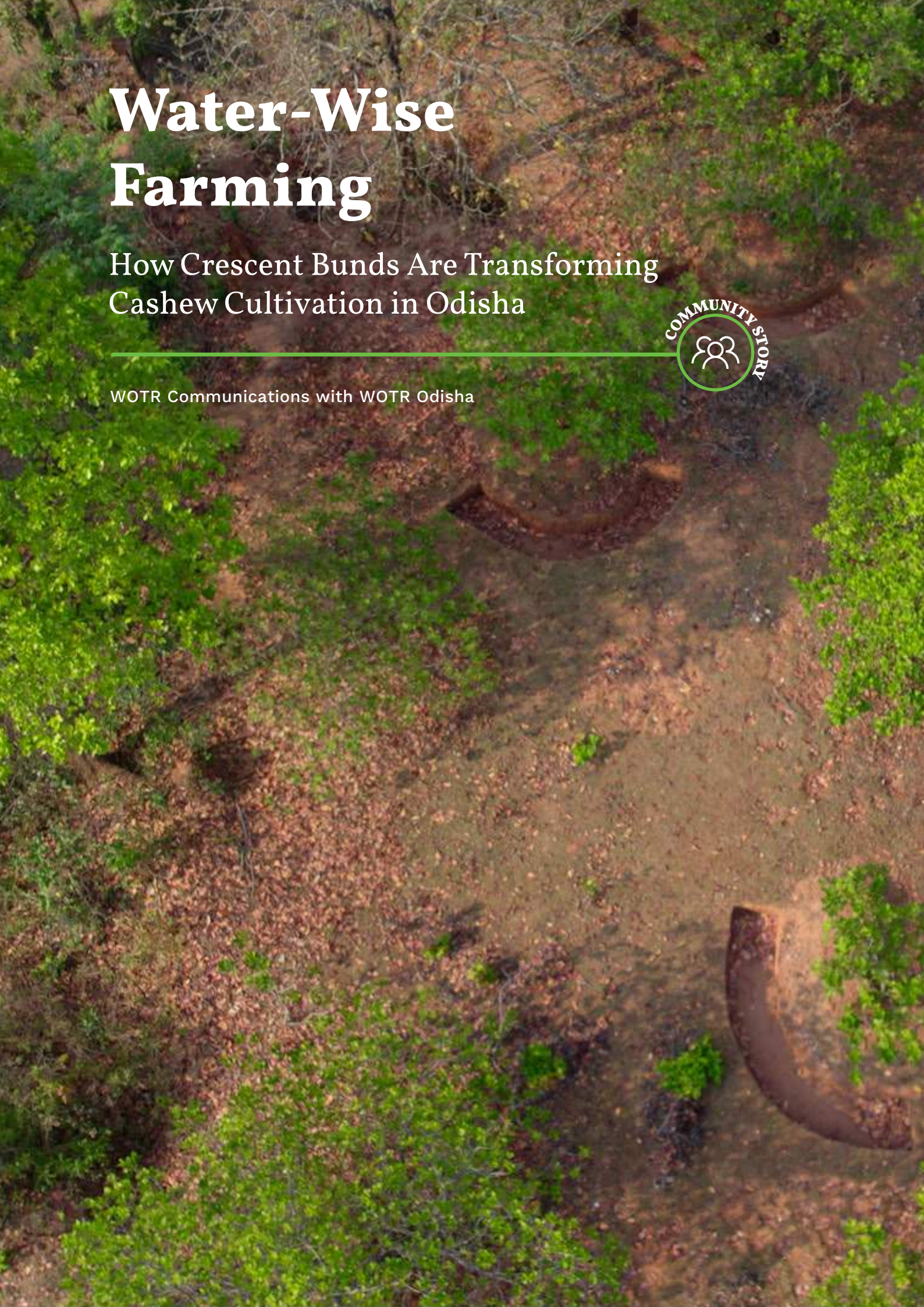

Water-Wise Farming

How Crescent Bunds Are Transforming Cashew Cultivation in Odisha

COMMUNITY STORY

WOTR Communications with WOTR Odisha

Walking through a cashew plantation in the charming Rayagada district of Odisha, one can't miss the half-moon-shaped bunds scattered across the hillsides. From a bird's-eye view, these geometrical shapes paint a striking pattern across the landscape. But beyond their aesthetic charm lies a powerful function. These bunds are dug at the base of each cashew tree to capture and retain water, when the tree needs it most and play a big role in increasing cashew yields.

Why Crescent Bunds Suit Odisha's Landscape

Cashew (Anacardium occidentale L.) is a primary source of livelihood for indigenous communities(1) in Odisha, including the Soura tribe, who are largely engaged in cashew cultivation.

Originally introduced by the Portuguese(2), the cashew was first used in India for afforestation and soil conservation. Over time, with research and government support, it gained recognition as a high-value, export-oriented crop.

In Odisha, large-scale cashew plantations began in 1954–55 under the Soil Conservation Department(3), which, lacking legal ownership, appropriated forest land for cultivation. By the 1990s, these plantations were handed over to the Odisha State Cashew Development Corporation Ltd., which began leasing them to private entities—displacing tribal communities and stripping them of rights to the cashew trade. However, tribal resistance—most notably against the POSCO steel project—has played a crucial role in defending traditional forest rights.

The transfer of cashew plantation ownership to the tribal communities(4) has significantly contributed to their financial stability, improved living standards and also been instrumental in women's empowerment.

The state, today, accounts for nearly 6% of India's total cashew cultivation area (DCCB, 2017).

Despite receiving 1200 to 1400 mm of annual rainfall, Odisha faces significant water scarcity, mainly due to a lack of effective water harvesting infrastructure. Cashew trees experience moisture stress from January to May, a critical period for flowering and fruit development. High temperatures (above 34.4°C) and low relative humidity (below 20%) often result in

flower drop and reduced yields. Unseasonal rainfall and heavy dew during the flowering and fruiting stages further increase susceptibility to pests and diseases, affecting kernel quality.

Addressing Irrigation Challenges Through Crescent Bunds

“Earlier, there was no irrigation facility for these plantations; agriculture relied solely on rain. Poor monsoons severely affected cashew production,” explains Ajit Majhi, Technical Officer at Watershed Organisation Trust (WOTR) in Odisha.

Given the terrain, installing irrigation infrastructure on hilly slopes proved expensive and impractical. Flat lands are primarily used for growing paddy, millets, and vegetables for local consumption, while cashew trees were planted on the hills. This led the WOTR team to turn to in-situ soil and water conservation methods, focusing on techniques that could maximise water availability for each tree.

Research has shown that in-situ techniques—like crescent bunds—are highly effective for capturing pre- and post-monsoon rainfall, improving soil moisture, and increasing cashew yields. Modified crescent bunds have shown yields of 6.45 tonnes per hectare compared to 4.88 tonnes in control plots, representing a 32–35% increase. (Rejani, R., et.al., 2010)

Crescent bunds are simple yet efficient soil and water conservation structures. Each is a crescent-shaped earthen barrier, 6 metres long, 1 metre wide, and 0.5 metres high, with a 2-metre curve radius. Placed just above the tree terrace, these bunds retain water, collect leaf litter, conserve moisture, and reduce erosion, improving both water management and soil health.

In Rayagada, WOTR introduced modified crescent bunds, enhanced with treatments like buried coconut husks and leaf litter. The husks retain moisture over time, increasing the bund's effectiveness during dry spells.

Rainwater harvested through these bunds also improved groundwater recharge in nearby wells and ponds, proving that even degraded slopes can be transformed into productive cashew farms. (Rejani, R., et.al., 2010)

How the Bunds Were Introduced in Rayagada

Before this initiative, similar structures were built by the Odisha government in the Ganjam district, but poor maintenance reduced their effectiveness. Learning from this, WOTR collaborated with village development committees and community resource persons (Wasundhara Sevaks and Sevikas) under a project supported by Bread for the World to ensure community involvement and long-term care.

“Based on the 2020 ICAR cashew pamphlet and the 2024 W-CReS study, we knew that these structures could significantly improve moisture retention and farmer incomes,” says Majhi. The team conducted village meetings to explain the bund design, allay concerns about tree root damage, and offer employment opportunities for the construction work. After clarifying that pits would be dug 2 metres away from the trees, villagers agreed—and the first bunds were built in September.

A detailed water requirement analysis by W-CReS in 2024(5) revealed that older cashew trees (above 10 years) planted with 7m x 7m spacing need up to 105 litres of water per day during peak growth months. This data helped WOTR design better water retention plans, determining the optimal placement and size of each bund.

Impact on the Ground

To date, 2030 modified crescent bunds have been constructed, directly benefiting 106 households and indirectly supporting 255 more across 11 villages in the Gunupur block, Rayagada district, Odisha.

In Puleda and Tada villages, farmers have reported an average yield increase of 5–10 kg per person this year for 10-12 farmers in the two villages among a group of 20. Additionally, the bunds have created 6090 cubic metres of water harvesting capacity, which will be replenished 3-4 times per year in the rainy season.

However, Ajit Majhi cautions that the full benefits will become evident over the next 2–3 years, as soil health improves and tree productivity stabilises.

Until then, the half-moon bunds remain a symbol of hope. Brimming with water, they support cashew trees laden with ripe nuts, and the farmers, who now look forward to more resilient harvests and a secure livelihood.

Shalmali Bhagwat, WOTR Communications, with contributions from Ajit Kumar Majhi, Gabriel Das and others from WOTR Odisha.

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Grasslands in the Face of Climate and Land Use Change

Need for Conservation, Restoration, and Sustenance

EXPERT SPEAK

Dada Dadas
Faraz Rupani

Let's picture a large patch of land during the summer months in a dry region of India, where rainfall is often scarce. You might imagine an expanse with little greenery, dominated by dried grasses, or perhaps nothing green at all. This is exactly what a grassland might look like in summer: an open ecosystem that often lies between forests and deserts (cold and dry), covering 20 to 40 per cent of global land and storing 34% of global terrestrial carbon stock.

Grasslands play an important role in conserving natural biodiversity and providing ecosystem functions and services for societies (Kapuria, 2022). The grassland ecosystem is dominated by graminoids, i.e., grasses and grasslike plants (Chandan, 2015). In Indian situations, grasslands house complex characteristics, and often form a mosaic of diversified uses and ecological types (Kavoori, Dixit, Motilal and Kulkarni, 2021).

Grassland is an important resource both for humans, wildlife and the sustenance of natural cycles. Such lands are neglected and overlooked in policy and research, and are known as endangered ecosystems. So, conservation of grassland is the need of the hour. This article throws light on the status of grasslands and the need for multi-partnership for their conservation, restoration and sustenance in the Indian context.

Significance of Grassland Ecosystem

As biodiversity hotspots, grassy ecosystems are home to a rich diversity of plant species, birds, and all existing mammals on earth (Kapuria, 2022). Many communities that practice pastoralism are linked by communal practices and the common use of land, sharing natural and cultural resources. Rights to access common lands and rights of way enable pastoralist transhumance systems to flourish and are crucial enabling parameters (Baku Declaration, 2025).

The grasslands are crucial for the livelihood of millions of pastoralists, landless and smallholder farmers in the dry, mountain and desert areas. Grasslands are not only a source of direct economic returns via the sale of milk and livestock, but they also provide numerous indirect benefits. This includes increased water infiltration by retaining water in the soil and reducing run-off. Grasslands are also beneficial for nutrient cycling, moving nutrients between soil, plants, animals, and the atmosphere, which in turn supports biomass production (Weigelt, 2021).

In India, over 200 tribes, making up 6% of the population, depend on pastoralism. Pastoral communities are critical in shaping diverse ecosystem services and conserving dryland biodiversity. Unfortunately, the positive contribution of these communities in critical ecosystem functions, like the water cycle in arid regions, is rarely recognised in academic, policy and research discourse. Instead they are held responsible for the degradation of the lands and the ecosystems they depend on.

Impact of Colonial and Post-Colonial Policies on Grassland

Grasslands are often mistaken for newly formed ecosystems that require no restoration efforts (Buisson et al., 2022), a misconception contributing to further deterioration. This has roots in the colonial system of treating grasslands as wastelands, which have suffered severe neglect and degradation in the past. The colonial administration introduced a land revenue system (Guha, 1982) that classified land into three categories: agricultural land (taxed), forest land (used for revenue), and all other land labelled as ‘waste’ due to its lack of direct economic benefit (Balooni & Singh, 2003). Grasslands were included in all three categories (Rangarajan & Sivaramakrishnan, 2014).

As early colonial rulers viewed semi-arid or arid

regions with low agricultural potential as wastelands (Dove, 2004), early plantation schemes by the colonial government led to the conversion of savannas (tropical grasslands) into closed-canopy forests (Agarwala et al., 2019), causing widespread damage to the savannas.

Both during British rule and in the early decades after independence, the assumption that grasslands were degraded forests continued (Kumar et al., 2020). Postcolonial policies aimed at reclaiming these lands to mitigate climate change, food insecurity, and ecological degradation accelerated the transformation of grasslands into annual croplands and closed-canopy forests. The National Forest Policy of 1952 was launched soon after to increase the country's forest cover to 33% (Joshi et al., 2011), further marginalising grasslands.

Present afforestation policies shaped by private, government and agrarian sectors are further affecting the existence of this neglected grassland, as many grassland tracts across countries are getting replaced with failed afforestation attempts. Studies show that croplands have increased from 92 million hectares to 140.1 million hectares, with a significant loss of grasslands and shrublands from 45 million hectares to 25 million hectares. Moreover, the conversion of grassland for infrastructure projects and industry on a large scale is underway, neglecting the land rights of marginalised communities. In recent years, migratory movements have become increasingly restricted due to land-use changes, climatic changes, etc., highlighting how the rights over pasture lands are important (Dadas, 2020).

Present Status and Challenges of Grassland

Grasslands that provide a variety of ecosystem services for humans, including carbon storage, are important towards mitigating climate change. (Kapuria, 2022). India lost 31 per cent, or 5.65 million hectares (mha) of its grassland from 2005 to 2015 to agriculture and other sectors.

Due to these changing dynamics, India's vast grazing land, nearly 40% of its total expanse, is under increasing pressure, as over 100 million livestock graze on the same area, growing at an annual rate of 2% over the last two decades (Hazra & Saha, 2015). Changing land use preferences have also been affecting access to grassland in local and migratory pastoralism. Multiple challenges, such as recurring climatic shocks, land-related conflicts, and rapid infrastructure development, continue to threaten grasslands and the pastoralist communities. Grasslands have also been impacted by factors, including rural-to-urban migration and diminished generational renewal, industrialisation of food

systems, dismantling traditional governance institutions and structures and changes in land use (Baku Declaration, 2025).

Need for Restoration, Conservation and Sustenance

Grasslands generate income, ensure food security in resource-scarce regions, support nutritional security and health, and promote sustainable land management while combating land degradation, contributing to global development goals, particularly Sustainable Development Goals (SDGs) 1 (No Poverty), 2 (Zero Hunger), 3 (Good Health and Well-being), and 15 (Life on Land). In this context, protecting grasslands is significant (Dadas & Rupani, 2024). The conservation, restoration and sustenance of grassland have the potential to contribute to both national and international goals for achieving Land Degradation Neutrality targets.

The Baku Declaration (2025) is a call to action for all actors in the complex and multi-layered governance networks across all countries. Sustainable Land and Ecosystem Management (SLEM) can help in the sustenance of grassland by reasonably planning land use and avoiding over-cultivation and urbanisation. The first critical step is implementing vegetation restoration measures by introducing native plant species to help increase ecosystem resilience to disturbances and improve vegetation stability. Regular monitoring and assessment of the growth and adaptability of introduced plants can inform more scientific vegetation restoration plans (Jianguo Li, 2024).

Restoration efforts need financial, political, and technical backing from state and national governments through adaptation plans with proper design and effective implementation. Special programs and policies must prioritise the livestock sector's role in fostering nature-based, sustainable solutions that strengthen rural communities and ecosystems.

> ***The conservation, restoration and sustenance of grassland have the potential to contribute to both national and international goals for achieving Land Degradation Neutrality targets.***

Grasslands that provide a variety of ecosystem services for humans, are important towards mitigating climate change

The grasslands are crucial for the livelihood of millions of pastoralists, landless and smallholder farmers

Collaboration among government, civil society organisations, and funders is crucial to leverage the potential of grasslands in sustaining the livelihood of millions and upscale innovative solutions to restore, conserve and sustain grasslands.

WOTR has treated around millions of hectares across the semi-arid regions of India and works to protect the livelihoods of smallholder farmers, pastoralists and other rural communities. The organisation is committed to restoring, conserving and sustaining such neglected grasslands through multi-stakeholder collaboration, not only for the protection of the livelihoods of millions who depend on grasslands but also protection of these neglected ecosystems.

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Figure 1: Presence of eDNA in land, water and air. (Source: Adapted from Gemini)

Environmental DNA

A Revolutionary Tool for Biodiversity Conservation and Ecosystem Monitoring

EXPERT SPEAK

Manendra Singh
Ashwini Wadhu

What is eDNA?

Nowadays, there is much buzz about Environmental DNA (eDNA) in conservation science, and researchers are using it in multiple areas. Environmental DNA is the genetic material left by organisms in their surroundings. The eDNA includes DNA (Deoxyribonucleic Acid) from cells, tissues, excrement, and fluids that are present in land, water, and air. It is the biggest discovery that provides novel source material for conservationists and researchers to monitor biodiversity, water and soil-based microscopic life, invasive and alien species that have left the environment.

Origin of eDNA

The eDNA approach originated from metagenomics i.e., the study of genetic material recovered directly from soil, water, air, and human gut samples (Figure 1). The term eDNA was first coined in 1987, and evolutionary geneticist Prof. Eske Willerslev is considered a pioneer in the discovery of eDNA. He experimented with two grams of permafrost soil from Siberia and found DNA of woolly mammoth, bison, reindeer, lemming, and hares, plus diverse plants, all extracted from ancient soil. This discovery brought a new chapter in ecological science.

eDNA helps us find out which plants or animals are in a sample—whether it's water, soil, or air—and how common they are. It is a powerful tool, especially for spotting species that are hard to see without disturbing the environment (Sivakamavalli et al., 2022; Hogg et al., 2024). It provides a clear view of how ecosystems change over time and highlights where conservation efforts are most needed. eDNA is already proving to be more effective than many traditional methods for finding wildlife, and scientists are working on the best methodology for collecting and utilising this data on a larger scale.

Figure 2. Importance of eDNA.
(Source: Adapted and modified from Gemini)

eDNA in the Era of Climate Change

Today, eDNA is changing the way of studying nature. Scientists use it to explore both current and ancient ecosystems, conserve and monitor wildlife, track the spread of diseases, and even uncover traces of long-extinct plants and animals. It helps to track invasive species before they cause severe damage. Programs like eBioAtlas and BIOSCAN are already using eDNA to track global biodiversity.

eDNA is recognised as a valuable tool for understanding how climate change affects the health and functioning of ecosystems. It enables assessment and monitoring of biodiversity, species shifts and migration in terrestrial as well as aquatic ecosystems.
eDNA is especially significant in the current times of climate change for:

Monitoring species shifts: Rising temperatures cause species to move to a higher elevation from sea level for optimal conditions, but they struggle to adapt to new soils. eDNA detects the presence or absence of species across locations and identifies early distribution changes influenced by climate and soil, enhancing biodiversity records. Figure 2 illustrates eDNA applications.

Identifying invasive and migratory species: eDNA helps detect early species invasions, enabling better

habitat management. It also tracks migratory bird routes and shifts in timing of migration cycles caused by climate change.

Studying ecosystem health: eDNA from ecosystems reveals changes in species richness—the number of species in a given area—and composition, identifying which species are present. Microbial eDNA is a key indicator for assessing the carbon and nitrogen cycles in ecosystems as a response to climate change.

Paleo-ecology: Ancient eDNA from sediments, ice, or permafrost reveals historical climate trends and biodiversity changes over centuries, and can predict future trends.

Marine biodiversity: Changes in ocean pH, temperature, and oxygen impact marine diversity. eDNA tracks sensitive species, fish, algae, and corals to detect shifts and bleaching effects on marine biodiversity.

Real World Use: Local and Global

The first scientific document on eDNA was "Species detection using environmental DNA from water samples" published in 2008 (Ficetola., 2008), when scientists proved for the first time that species could be detected just by testing water samples without actually seeing them. Thereafter, eDNA biomonitoring has been rapidly adopted to quantify methodological uncertainty and its appropriate and consistent application.

The eDNA methods are potentially making environmental surveys and monitoring easier and safer, and providing more actionable results to restore ecosystem health. International eDNA Standardisation Task Force (IeSTF), 2024, found that the future of eDNA-based biomonitoring depends on three main factors: (1) technological advancement, (2) scientific evidence, and (3) regulatory acceptance. However, this approach depends on a thoughtful understanding of DNA sources, bias, error, and sampling intensity (Lanzén et al., 2021).

Recently, the study of genomes of ancient organisms, using DNA recovered from the fossils (environmental paleogenomics), was used to analyse the impact of agricultural development, urbanisation and industrialisation during the Anthropocene (Angeles et al. 2023; Siano et al. 2021). Automated eDNA marine samplers are already being used to monitor inshore fish communities over time at fixed locations (Mynott, 2019), as well as to study the high-frequency, long-term dynamics of eDNA in coastal freshwater environments (Searcy et al., 2022). A study conducted by Jamwal et al. (2023) on the Eurasian otter in the Himalayan region showed that Eurasian otter eDNA was found in 73% of sites, while in traditional

Figure 3. Advantages of eDNA.
(Source: Adapted and modified from Gemini)

surveys it occurred in only 53% of sites. The eDNA method improved site detection by 20%, offering more reliable results than the traditional survey methods. Thus, the eDNA approach can be used to develop a species-conservation tool for updating the International Union for Conservation of Nature (IUCN) Red List of threatened species.

Benefits and Challenges

The eDNA is a revolutionary tool in environmental and ecological science with advanced applications in impact assessment, biodiversity conservation and habitat restoration in response to climate change. Its growing adoption and application are driven by technological advancement, accuracy, non-invasive sampling, high sensitivity, time efficiency, and cost-effectiveness. The eDNA approach can be employed in large-scale monitoring programmes, even in challenging terrains. (Figure 3).

However, like other methods, the eDNA method also comes with its challenges that require careful consideration, like: rapid degradation of samples, lack of standardised protocol, insufficient reference database and ethical or legal concerns. The sampling, collection, and analysis of eDNA can raise concerns about biodiversity sovereignty and compliance with international agreements like the Nagoya Protocol under the Convention on Biological Diversity. Despite these challenges, eDNA is a meaningful discovery for practitioners, conser--vationists and researchers who are devoted to biodiversity conservation and ecosystem restoration.

The Road Ahead

Environmental DNA offers multiple pathways for researchers, government and non-governmental organisations, and other institutions for environmental assessment and monitoring. This approach enables precise monitoring of environmental changes and comprehensive biodiversity assessments—without disturbing the ecosystem health—making it especially valuable in the era of climate change. It is crucial in conservation and restoration planning, as well as wildlife habitat management, ensuring the sustainability of ecosystem functions and the continued provision of services

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From Reuse to Regeneration

The Journey of Rural Odisha's Circular Economy

EXPERT SPEAK

Tushar Suryawanshi
Faraz Rupani
Dada Dadas

For millions in rural India, the environment is their lifeline—fields for food, forests for raw materials, rivers for water. But when we keep taking and give little back, nature struggles to cope. That's the trap of the "linear economy," where resources are used once and discarded. A circular economy offers a better way: recycling, reusing, and regenerating resources while also creating jobs and boosting local economies.

This idea isn't just theory. For over 30 years, WOTR has been putting circularity into practice in villages across India. Through watershed development, water conservation, regenerative farming, and community-led innovation, WOTR shows how restoring the environment can go hand in hand with improving agriculture, diversifying incomes, and building resilient livelihoods.
Rural Circular Economy: A Definition and Perspective
The circular economy aims to minimise waste and maximise the use of resources by reusing, repairing, refurbishing, and recycling existing materials and products (Ellen MacArthur Foundation, 2013).

The circular economy keeps resources in use for as long as possible, extracts maximum value from them, and then recovers and regenerates products at the end of service life.

The term 'rural circular economy' combines 'rural economy' and 'circular economy'. A 'rural economy' involves economic activity specific to rural areas, characterised by agriculture, forestry, resource extraction, tourism and small-scale manufacturing.

The circular economy keeps resources in use for as long as possible, extracts maximum value from them, then recovers and regenerates products at the end of service life.

The rural circular economy is a holistic approach that redefines rural sustainability.

The importance of the rural circular economy lies in reducing economic growth from resource depletion, promoting prosperity while reviving natural capital, and strengthening community resilience in rural areas marginalised by traditional economic models (Sustainability Directory, 2025).

The rural circular economy combines environmental principles, SDGs, and community-based approaches to drive rural sustainability.

WOTR's model is holistic, locally relevant, inclusive, and eco-friendly. It enhances local resource value, minimises waste, and regenerates both land and livelihoods—illustrating the circular economy in action.

Resource management: Contour trenches, check dams, and reservoirs provide water storage, prevent soil erosion, and recharge groundwater.

Synergy of agriculture and livelihood: Integrated development of climate-resilient agriculture, animal husbandry, horticulture, and handicrafts is integrated into the production chain.

Skill development: Promotes local entrepreneurship through training and tools, reduces dependence on external markets.

Community engagement: Social and economic transformation occurs through the active participation of women, youth, and self-help groups.

Regenerative agriculture: Biodiversity farming practices based on traditional knowledge lead to food security, increased income and reduced risk of disasters.

The idea follows simple principles—learning from nature's designs (biomimicry), creating things that don't harm the environment (eco-design), and treating the Earth like a shared spaceship with limited resources (a concept by economist Kenneth Boulding). This approach works especially well in regions like Odisha.

Odisha: A Snapshot of Challenges and Opportunities

The region faces significant hurdles: erratic rainfall and lack of irrigation hurt farming, while hillside cultivation causes soil erosion and depletes groundwater. Over-reliance on forests for resources leads to their destruction and threatens biodiversity. These environmental issues are exacerbated by socio-economic challenges, including a high rate of seasonal migration (40-45% of households) due to limited local economic opportunities, unstable incomes, and a general lack of infrastructure, such as low literacy, few skill development centres, and poor access to healthcare and markets. Moreover, with decades-old interventions of planting cashew trees in the forest, whose rights are now being transferred in the name of the communities, cashew farming remains a key source of livelihood for the community. The cashew tree requires minimal intervention throughout the year and has led to newer generations migrating for better livelihood opportunities —a necessity rather than a choice, leaving families divided and livelihoods uncertain.

Against this backdrop, WOTR saw an opportunity to create a sustainable, environmentally friendly and economically beneficial model through a solution plan based on the circular economy. Interventions in Odisha have proven that

positive change can be brought about through the recycling of local resources, the diversification of livelihoods, the empowerment of women, and skill development. This regenerative system can be applied to other parts of India as well.

WOTR's Interventions in Odisha

A thematic overview
Since 2021, WOTR and its partners have been working in the tribal areas of Odisha, where cashew farming—once introduced in forests—has become a key livelihood. While the crop requires little upkeep, it has also pushed younger generations to migrate in search of better opportunities, leaving families divided.

WOTR's interventions aim to improve water availability by restoring degraded land, enabling sustainable agriculture, and diversifying livelihoods. Special attention is given to landless and marginal families, with projects designed to strengthen their economic security. Following circular economy principles, local resources are used efficiently and repeatedly to create new livelihood models. These include initiatives like goat-rearing, rice and turmeric processing, carpentry, and local enterprises, which add value to local produce and reduce waste. Beneficiaries receive training and tools, helping them build skills and earn locally.

Alongside this, human and institutional capacities are being strengthened through active self-help groups, nutrition awareness, and leadership and enterprise training for women and youth. Together, these integrated, community -based solutions showcase how circular and sustainable development can take root in practice.

A Journey of Circularity: From Local Resources to Sustainable Livelihoods

The projects follow circular economy principles—using local resources wisely, building skills, and ensuring social inclusion. For example, activities like rice processing, flour making, carpentry, and running grocery shops increase the value of local products that were earlier underutilised. This not only supports ecological balance but also creates long-term employment opportunities. Soil erosion control, restoration of land and water through contour trenches, farmlands, and irrigation systems have revived the degraded landscape. These actions have led to improved soil moisture retention and water availability, which have directly increased agricultural productivity. As a result, farmers now have more consistent access to arable land, supporting year-round agricultural livelihoods.

After land restoration, agriculture has become more adaptive and eco-friendly with the adoption of climate-resilient and organic farming practices such as drought-tolerant crops, agro-horticulture, vermicompost, and biofuels. Crop diversification reduces risks, while organic inputs improve soil health and

reduce costs. This shift allows farmers to have a more sustainable and consistent income from a variety of sources of production.
Livelihood options such as goat farming, kitchen gardens, and self-help group activities encourage income generation using household-level assets. At the same time, training in sewing and small business management has given agency to people - especially women - to pursue independent livelihoods. Such efforts promote entrepreneurship and reduce the economic vulnerability of rural households.
Efficient irrigation systems, including micro-irrigation and drip technologies, have improved water management, allowing farmers to grow seasonal vegetables and high-value crops with minimal waste. This results in higher and stable income from the same land.

Together, these initiatives demonstrate the power of the circular economy in creating sustainable, inclusive and resilient livelihoods. By restoring resources, building skills, and empowering local industries, they have significantly reduced seasonal migration. Now, “more families can live in their villages and earn a respectable living from the land and resources around them.”

From Cyclicality to Prosperity

Implementing the circular economy in rural Odisha, WOTR not only achieved environmental improvement but also transformed the lifestyle of the rural community. Through this, damaged ecosystems were restored, water security and climate-resilient agriculture were strengthened, and various livelihood opportunities were created. Today, these communities have opted for local development instead of migration.

This model of WOTR has evolved into a representative framework that not only reduces poverty but also achieves social harmony, women's empowerment, and ecological balance.
Recommendations and directions for further research

CSR companies, UN agencies, and other international donors should prioritise CE projects for their wider impact on the environment, livelihoods, health, and women's empowerment.
The state and central governments should set up a "Circular Economy Think

Tank" based on WOTR's experience, which will provide technical guidance for policy and impact measurement.

Establishing a regional knowledge and training centre to replicate the CE model in other states will help local bodies in capacity building and facilitate local adaptation of the model.

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From Knowledge to Empowerment

Capacity Building as a Bridge to Sustainable Rural Futures

EXPERT SPEAK

Kranti Waghmare

In the quest for a sustainable future, one truth stands out: lasting change begins with informed people. Technologies may evolve, and policies may shift, but the most resilient foundations are laid when communities are equipped to shape their own development journeys. In this landscape, capacity building is not a peripheral activity; it is central to transformation. Across rural regions, where climate vulnerability, economic marginalisation, and ecological stress converge, capacity building becomes both a lifeline and

a catalyst. It empowers individuals to engage critically with their environment, connect with wider systems, and lead with confidence. Training is not a standalone intervention, it is the thread that ties knowledge with application, research with reality, and intention with action.

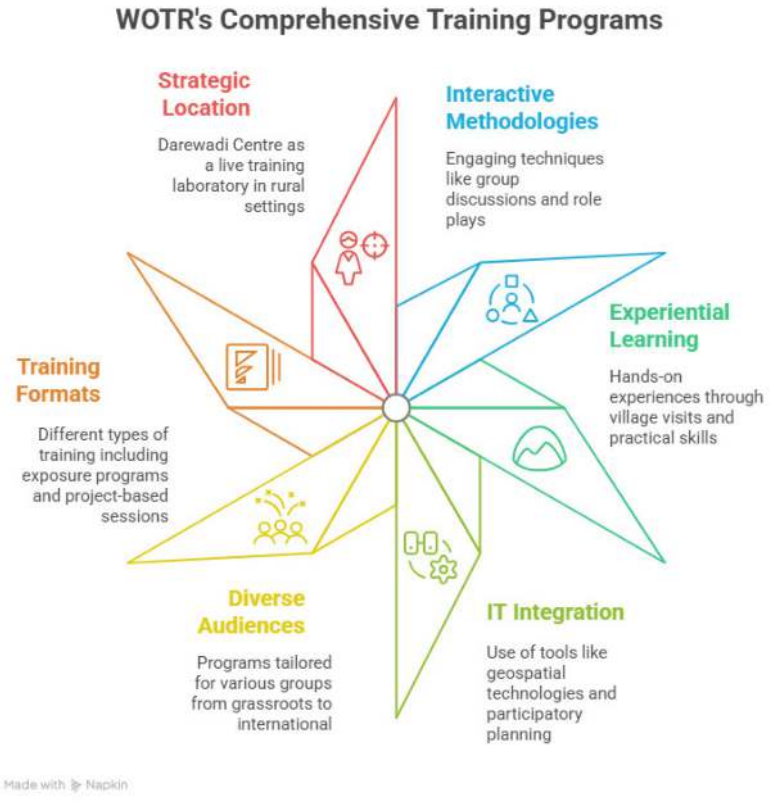
Capacity building in the rural context is a transformative process that enables individuals, institutions, and communities to steer their development paths. The Intergovernmental Panel on Climate Change (IPCC, 2022) emphasizes the critical role of local adaptive capacities in mitigating climate risk, especially in agrarian economies like India. Rather than simply transferring knowledge, effective capacity building fosters belief in the ability to learn, act, and lead. It manifests in the actions of a young woman farmer leading a composting session, a marginal farmer evaluating soil health with new indicators, or a village collectively negotiating market terms after a financial literacy workshop. These are not just outputs; they represent a shift from dependency to ownership.

Building at Every Level

Capacity building is most effective when it operates systemically. At the individual level, it builds technical skills like soil health, seed saving, record keeping etc. At the group level, it supports leadership and collective action. At the institutional level, it strengthens governance and connects community organisations with public systems and markets. However, its impact depends on intentional design, who is included, how often it happens, and how it continues. One-off sessions rarely lead to change; transformation requires time, trust, reinforcement, and co-creation.

WOTR's Role in Advancing Sustainable Rural Development through Training

The Watershed Organisation Trust (WOTR) has built one of India's most respected capacity-building ecosystems through the Fr. Hermann Bacher Learning Centre (HBLC) in Darewadi, Maharashtra. Since its inception in 1999, HBLC has trained over 55,800 individuals and reached more than 520,000 people from 63 countries. HBLC serves a broad audience from SHGs and farmer collectives to government officials, researchers, CSR teams, and international professionals. Its flexible training formats include exposure visits, customised sessions, project-based learning, and global knowledge exchange. The Darewadi campus itself is a living lab with 30 surrounding project villages, 75-bed residential facilities, and a solar-wind hybrid energy system.



HBLC functions as a national and international hub for experiential learning, policy dialogue, and knowledge exchange. With over 30 years of experience in capacity building and rural development, WOTR offers a strategic and holistic approach to training. The programs are thoughtfully designed to cater to diverse audiences from grassroots communities to international participants, ensuring inclusivity and relevance.

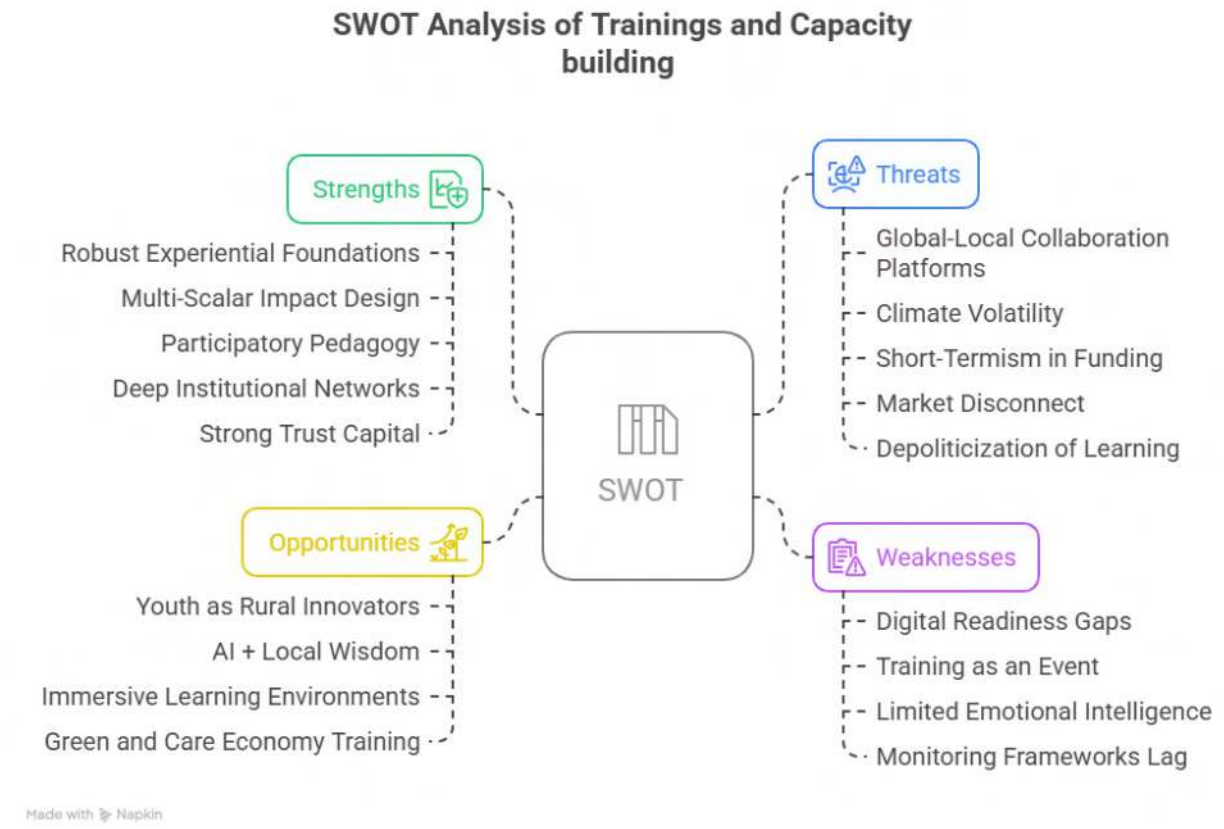
Training Themes and Methodologies

WOTR's programs span watershed development, climate adaptation, sustainable agriculture, biodiversity conservation, women's empowerment, and GIS-based hydrological planning. Sessions use participatory and experiential pedagogy, including simulation games, group work, and exposure visits. Tools like CoDriVE (Community-Driven Vulnerability Evaluation) and CDVI (Climate Data Visualisation Interface) are integrated for evidence-informed planning.

A vast amount of research on sustainable agriculture, climate adaptation, and nutrition-sensitive farming exists, but a critical question persists: how does this knowledge reach those who need it most? Often, it does not—not due to unwillingness, but because of the absence of systems to make it accessible, relatable, and usable. These programmes align with the "Working With People" model (Lopez & Pastor, 2015), blending technical, contextual, and human dimensions to co-create solutions. Anchored at the Darewadi Centre, an innovative live training lab in a rural setting, these programs offer practical, immersive learning experiences tailored to the evolving needs of individuals and organisations alike. Training is not delivered to communities, but developed with them fostering dignity and agency.

The Future of Training and Capacity Building

Looking forward, capacity building must evolve into hybrid models combining human-centered facilitation with digital technologies like AI-based advisories, mobile learning, and peer-to-peer platforms. Training must recognise rural youth as co-creators, and not just

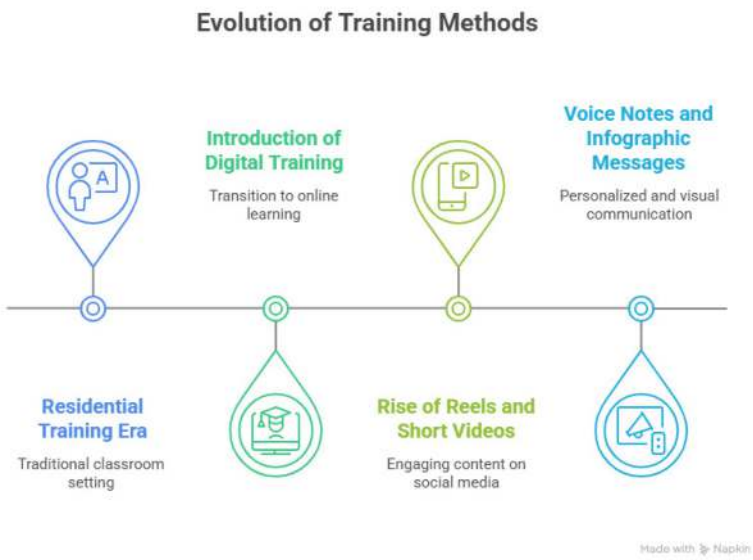


recipients. Key focus areas include regenerative agriculture, local governance, gender-inclusive leadership, and digital literacy. To remain future-fit, training programs must adopt systems thinking, ensure cross-sectoral integration, and create adaptive learning ecosystems that are inclusive, resilient, and demand-driven.

Strategic Perspective: SWOT Reflection

Institutions working in rural training and capacity building, such as WOTR and many others across India offer robust models grounded in both theory and practice. Their strength lies in blending experiential learning with participatory approaches, fostering ownership, trust, and inclusive leadership, and systemic engagement helps align programs with policy.

Yet, sector-wide challenges remain. The digital divide continues to exclude many rural learners; training efforts are often episodic and lack continuity, mentorship, or psychosocial support. Critical soft outcomes such as self-confidence, problem-solving, or innovation are rarely measured, even though they are essential for long-term transformation. Moreover, several structural factors continue to complicate capacity-building efforts. Climate change disrupts seasonal rhythms, agricultural cycles, and income patterns, making it difficult for rural learners to engage consistently. Short-term donor funding often drives fragmented, pilot-based interventions that lack long-term vision or sustainability. Market mismatches—where training is not aligned with local or emerging job markets—lead to underemployment and disillusionment. Finally, entrenched socio-cultural barriers such as gender roles, caste dynamics, or age hierarchies limit who participates, speaks, and benefits—hindering inclusive growth.. Nevertheless, the path ahead holds great promise. Advancements in AI, immersive learning, and global-local knowledge exchange platforms can revolutionise how training is delivered and scaled. New opportunities are emerging in climate-smart agriculture, care-based roles, and eco-enterprise development particularly for women and



must be treated not as optional enhancements, but as foundational principles of any transformative capacity-building effort.

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youth. For this potential to be realised, capacity building must be reimagined not as fragmented knowledge transfer, but as a systemic, inclusive, and enduring investment in people and ecosystems.

Conclusion: A Future Built by the People

When rural people believe in their collective capacity, development transforms into a locally driven journey rooted in empowerment. Well-structured and inclusive facilitation enables communities to manage their natural resources sustainably, make informed decisions, and lead local innovations. To truly scale this impact, capacity building must evolve into an adaptive learning ecosystem—decentralised, participatory, and contextually relevant. It should move beyond centralised workshops to leverage every available platform: community groups, local governance bodies, peer-to-peer learning circles, and especially digital tools suited for today's generation. In this YouTube WhatsApp and Instagram era, short-form, mobile-friendly content such as videos, voice notes, and infographics can complement field training and extend learning to remote areas. This blended model ensures that learning is inclusive of youth and women, rooted in local wisdom, and enhanced through technology. For all institutions engaged in rural transformation, this approach fosters deeper engagement, scalable impact, and meaningful partnerships built on trust. For the environment, it means healthier ecosystems, stronger local stewardship, and sustainable watershed and soil management. Above all, trust, emotional intelligence, participatory governance, and community ownership

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The People Behind the Progress

Why India Needs a Development Management Revolution

DEEP DIVE

Ravi Sreedharan
Shivakshi Bhattacharya

The Promise and the Paradox of Growth

India stands at a decisive inflexion point. With a steady economic growth rate of over 6%, the world's largest youth population, and growing technological prowess, the country is well-positioned to emerge as a global power by 2047. This momentum is captured in the national vision of Viksit Bharat—a developed, equitable, and self-reliant India. Yet, as impressive as the macroeconomic indicators are, they do not tell the whole story.

Beneath the surface, the development experience of millions—especially in rural India—remains marked by fragility.

Climate shocks, livelihood insecurity, gender inequality, and governance failures continue to plague communities, despite the proliferation of government schemes and technological interventions. India does not suffer from a lack of innovation or policy intent. What it suffers from is a deep and growing gap between vision and implementation. And the bridge across that gap is not more funding or infrastructure—it is human capital. More specifically, it is a new breed of purpose-driven, system-aware, community-rooted professionals trained in Development Management.

The Human Infrastructure Gap

We have entered an era where there is no shortage of schemes, funds, or even technologies designed to tackle India's most pressing challenges. From satellite-based irrigation platforms and AI-driven health diagnostics to digital governance tools, the ecosystem of innovation is vibrant. Yet the paradox is clear: many of these solutions fail to achieve meaningful impact at the last mile. The reason is not technical inefficiency—it is human disconnect. Most interventions fail not because the science was flawed, but because no one was there to align it with local realities, navigate institutional inertia, build community trust, or adapt to changing social dynamics. Development, after all, is not a linear delivery mechanism—it is a deeply political, social, and participatory process that demands human leadership at every step. What we lack today is not tools, but translators—people who can bridge the worlds of policy and community, of traditional knowledge and cutting-edge technology, of national ambition and local implementation.

Development Management: The Discipline We Forgot to Build

In response to this execution gap, India must urgently invest in a discipline that has long remained on the margins—Development Management. It is not business management repurposed for the social sector. Nor is it administrative training in a new form. It is a distinct field—one that blends the precision of systems thinking, the empathy of community work, the ethics of public purpose, and the discipline of strategic implementation. Development Managers are trained not just to solve problems, but to define them better. They understand that a health program is not just about medicines—it's about navigating gender norms, bureaucratic delivery structures, and local power equations. They know that a livelihood intervention doesn't succeed on product innovation alone, but on the ability to build market linkages, mobilise communities, and create institutional ownership.

The real gap isn't tools, but translators who connect policy with communities and knowledge with action.

Development Management equips individuals to work across sarkar (state), bazaar (markets), and saamaj (society)—to see development not as a silo, but as a system.

Bridging Science, Innovation, and Tradition Through People

Much of the country's focus on development has been structured around scaling innovation or introducing new technologies. But innovation divorced from context can be exclusionary, even harmful. Traditional knowledge systems—whether in agriculture, water conservation, forest management, or health—carry generations of wisdom that remain highly relevant, especially in a climate-vulnerable world. Yet, too often, these are either dismissed as backwards or co-opted without respect. The real opportunity lies not in choosing between modernity and tradition, but in enabling meaningful collaboration between them. This is where the role of Development Managers becomes irreplaceable. They are not passive facilitators—they are active bridges. They know how to work with scientists and with community elders, how to integrate satellite data with local cropping patterns, and how to co-create solutions that are both evidence-based and culturally rooted. They ensure that technology is not just deployed, but adopted; that policy is not just drafted, but lived.

Viksit Bharat Will Be Built by People, Not Just Policies

As we move into the decisive decades of Amrit Kaal, India must recognise that achieving the goals of Viksit Bharat will depend not only on macroeconomic stability, infrastructure, or industrial growth, but on its ability to build human infrastructure. The best-designed programmes will falter if we do not have people with the skill, patience, and moral clarity to manage complexity on the ground. We must make Development Management a national priority, not a fringe concern for NGOs or academic institutions. This means investing in educational institutions that nurture socially committed professionals, building

We must stop treating people as passive beneficiaries of development and start investing in those who will lead it.

> ***Innovation divorced from context can be exclusionary, even harmful.***

fellowships and leadership pathways into public systems and philanthropy, and fundamentally shifting how we value the work of managing change. Institutions like the Indian School of Development Management (ISDM) are already pioneering this path, training leaders who are equipped to understand the interplay of structure and agency, of systems and stories. But this needs to happen at scale. If India can institutionalise business schools and engineering colleges, it can—and must—do the same for Development Management.

The People Behind the Progress

Viksit Bharat is not simply a policy goal; it is a generational commitment to build a nation that works for all its people. To realise that vision, we must stop treating people as passive beneficiaries of development and start investing in those who will lead it. We must reimagine what it means to be a professional in the 21st century—not just in terms of qualifications or metrics, but in terms of purpose, relationships, and systems leadership. This is the promise of Development Management—and this is what the next phase of India's story demands. Innovation may give us the tools. Growth may give us momentum. But only Development Managers will give us direction—the kind that leads not just to progress, but to dignity, justice, and resilience for every Indian.

Ravi Sreedharan is the Founder of Indian School of Development Management (ISDM), building Development Management as a pioneering discipline and institution in India.

Shivakshi Bhattacharya is a lawyer, a Schwarzman Scholar, and a development professional. She works as a Senior Associate at ISDM, passionate towards building change ecosystems.

Sun, Water and Agriculture

How Solar Energy is Changing the Landscape in Rural Chattisgarh

COMMUNITY STORY

WOTR Communications with WOTR Chhattisgarh

Imagine waking up early in the morning and reaching for a pail of water to wash your face, only to find a vessel filled with brackish water. As you prepare to step outside, you see the women in your village already gathered, beginning their daily, arduous two-kilometre trek in search of drinking water—water that isn't even guaranteed to be clean. This was the reality in Narkeli village, Chhattisgarh, two years back.

The Sun Brings Drinking Water Closer

"Fetching drinking water took 4–5 hours every day, as all 41 households in Narkeli village relied on a single hand pump located about 2 kilometres away," says Sumira from Narkeli village, while talking about her daily trips in the past, to fill up vessels with 'red' water, unfit for consumption due to rusty pipes which supplied it.

When the WOTR's team visited Narkeli in Koriya district in 2024, all villagers agreed that drinking water was a problem that required immediate attention. And now, a water tank with a 2,000 litres capacity and a galvanised solar panel structure, along with an HDPE (High Density Polyethylene) pipe to prevent rust problems, provides safe and clean drinking water to residents of Narkeli. But how is solar energy being utilised to ensure this uninterrupted supply of drinking water in Chhattisgarh?

Solar energy is mainly used to pump water into the overhead tank. Every resident now enjoys access to sufficient water, and incidents of illnesses and vomiting induced by consuming 'red' water have also decreased, says Amita, another resident of Narkeli.

The village school also benefits from improved hygiene, resulting in lower absenteeism. The committee, consisting of villagers, was set up to ensure the effective implementation of this initiative. It looks after its maintenance every six months, making it a self-sufficient unit with 'no problems so far,' as the unit is close to completing a year, reports Amita.

As people now drink clean water in Narkeli by utilising solar energy, solar lift irrigation has turned barren land fertile in nearby Sonari village in Koriya district.

Fields Turn Green as the Sun Powers On

Earlier, in Sonari village, farming was entirely rainfed and limited to a single season of paddy cultivation. Water was not available to

irrigate these farmlands and was restricted to people who had fields adjacent to the canals or had borewells along with a guaranteed supply of electricity with backup. Without reliable water access, vast tracts of farmland remained underutilised or barren, which stunted agricultural productivity in the region as well as damaged food security.

Powered by 12 solar panels that generate 540 watts of power, the groundwater supply can now be utilised to irrigate nine acres of farmland, benefiting six farmers, and 12 acres of nearby farmland receive the benefits of this system too, taking the total number of beneficiaries to 21.

Using solar energy for irrigation solves multiple problems with a single intervention. Firstly, rural areas in developing countries often have poor access to reliable electricity or fossil fuel supplies. Secondly, countries where irrigation is essential for agriculture are geographically well-suited and have an abundant supply of solar radiation, which is harnessed by the solar panels, turning it into solar energy powering the pumps 'lifting' or extracting the groundwater and irrigating the farmlands. Solar lift irrigation tackles both challenges and helps mitigate risks associated with fluctuations in both fuel and electricity supply prices, and instead guarantees a reliable electricity supply by harnessing solar energy.

To ensure community ownership and long-term sustainability, each household which has benefited from this initiative contributed Rs 5,000 towards the infrastructure. A collective maintenance fund of Rs 25,000 has been created using these contributions to cover future upkeep and minor repairs, ensuring continuity without external dependency. The impact of solar lift irrigation has been

transformative. Barren fields have now been rejuvenated, and farmers, once caught in cycles of uncertainty, are now planning to grow multiple crops per year. Cropping intensity, which previously stood at just 95.23%, is now expected to double to nearly 200% (approx.) this year with a guaranteed water supply. Where previously only a single paddy crop was possible, farmers are now planning for vegetables, pulses, and other seasonal crops alongside rice, enhancing food availability as well as growth in income.

At Night, the Sun Lights Up the Villages

Along with ensuring a reliable supply of water, the sun is also lighting up villages in this state after retiring for the night, through streetlights. “Earlier, we would never step out after dark. Even going to the borewell or visiting a neighbour felt risky. But now, these lights... they’ve given us wings,” says Sangeeta Bhogami, a member of the village development committee in the quiet hamlet of Dokkapara in Mangnar village, Dantewada district, Chhattisgarh and mother to a young daughter. How did solar energy bring light to her village?

The absence of streetlights in the village not only restricted movement after dark due to the threat of animal attacks but also instilled fear in the children.

Mangnar is now witnessing a transformation. As part of a larger initiative that saw 150 solar street lights installed across 15 villages in Dantewada, 10 solar lights were placed strategically within Mangnar, bringing light to places that had long known only darkness. Villagers have also been provided with a toolkit and requisite training after installation to solve any fundamental issues with the solar panel or streetlight, making them self-sufficient.

Sangeeta shares that her daughter, Kirti, laughs freely, plays longer and even studies better. “Before, she used to be scared of the dark. Now she says, ‘Look, Mama, even the stars have come down to live with us.’”

The village streets, once deserted after dusk, are now thronged with people as women gather outside their homes to chat, elders share stories, and village festivals sparkle with renewed energy and enthusiasm.

In Chhattisgarh, WOTR, along with partners HDFC Bank, HDB Financial Services, Andheri Hilfe and National Bank for Agriculture and Rural Development (NABARD), is harnessing solar power.

In Koriya, Dantewada, and Surajpur districts of Chhattisgarh, the work has so far supported:

- **6,700** households with streetlights
- **677** families with access to drinking water
- **100** households with solar-powered irrigation systems for agriculture
- **245** households with fencing machines to protect their fields

By replacing diesel pumps, kerosene lamps, and coal-fired electricity with solar solutions, rural communities have generated 143,645 watts of energy and reduced greenhouse gas emissions.

These initiatives are emerging as guiding lights, showing how solar energy can simultaneously address environmental, social, and economic challenges in forested rural regions in India. By creating collective funds for maintenance, forming local committees, and distributing toolkits, communities are being empowered to take ownership of their future and move toward self-reliance. A steady yellow glow on the streets, vessels filled with clean water at home, and fields lush with healthy crops nourished by irrigated soil—all of these are signs of what becomes possible when a community rises with dignity instead of bowing to pity. Backed by science, policy, and collective resolve, such efforts can drive lasting progress for society as a whole.

Shalmali Bhagwat, WOTR Communications, with contributions from Anshuman Panda and others from WOTR Chhattisgarh.


WOTR

In 1989, Bacher conceived and launched a large-scale watershed development programme, the Indo-German Watershed Development Programme (IGWDP), in Maharashtra, a collaborative effort supported by the Governments of Germany, India, and Maharashtra.

1) In the IGWDP, the Village Watershed Committees (VWCs) became the project holders, directly managing funds and implementing watershed programs, facilitated by their partner NGOs.

WOTR and NABARD played a crucial role in identifying rural communities and NGOs, enhancing their technical and managerial skills to ensure successful watershed development implementation.

Villagers learned to advocate for their needs, access government schemes, and manage land, water and financial resources through the skills developed in the program.

The IGWDP shifted India's watershed development strategy to prioritize community involvement, a "ridge-to-valley approach, in-situ soil conservation and water harvesting and integration with local governance and development structures.

Starting its journey with watershed development, today, WOTR has expanded its vision and portfolio of interventions to build resilient rural communities enabling them to enjoy a fulfilling quality of life within vibrant and sustainable ecosystems.

WOTR & W-CReS Highlights

This year marked significant milestones for WOTR, both nationally and on the global stage, as we deepened our efforts toward building climate resilience, promoting sustainable land management, and fostering collaborative action.

Global Recognition and Policy Influence

UNCCD COP16, Riyadh, Saudi Arabia

WOTR participated in the 16th Conference of the Parties (COP16) to the United Nations Convention to Combat Desertification, contributing to critical dialogues on sustainable land and water management, and showcasing our grassroots experience.

Economics of Drought Report

WOTR's work in Akole and Sangamner, Maharashtra, featured as a key Indian case study in this global UNCCD report, highlighting the economic benefits of proactive drought resilience.

World Drought Atlas 2024

Our Water Stewardship Initiative was recognised as a global success story for community-led water governance and drought adaptation.

Expert Panel Contributions:

WOTR contributed to high-level panels on:

Financing land restoration (with UNEP, ELD, IRRI)

Agroecology and sustainable land management (with GIZ)

Gender-transformative land restoration (with GIZ, Landesa)

Nature-based solutions for drought resilience (with TNC)

Barriers and enablers to sustainable land management (with UNU-EHS)

Mainstreaming Ecosystem-based Adaptation (EbA) in Maharashtra's Policy Landscape

WOTR and the WOTR Centre for Resilience Studies (W-CReS) analysed existing policies and programs and collaborated closely with the Department of Environment and Climate Change (DoECC) to prepare Maharashtra's first-ever Ecosystem-based Adaptation (EbA) policy across integrated departments. Additionally, they worked with the Ministry of Environment and Climate Change to ensure the inclusion of EbA principles in the Maharashtra State Action Plan on Climate Change (MHSAPCC) 2.0.

Tools for Nature-Positive, Climate-Resilient Agriculture

NATUREPro Framework

The framework has been developed in collaboration with the Government of Maharashtra and is used to benchmark villages' agriculture against climate vulnerability and nature positivity. It is expected to be used to obtain a granular picture of vulnerability at the village level across Maharashtra.

Selected for Global Tech Fellowship

A W-CReS team member was selected as one of nine global fellows for the inaugural Amazon Web Services 'Now Go Build' CTO Fellows Program — an opportunity to strengthen

our tech-driven work in sustainable agriculture, food security, drought resilience, and climate adaptation.

Selected for AI for Changemakers Accelerator

WOTR was chosen as one of 30 global nonprofits for the second Impact Cohort of the AI for Changemakers Accelerator Program, supported by Google.org. The programme will help strengthen WOTR's AI capabilities for climate action, including real-time farm advisories and pest outbreak forecasting to enhance resilience in rural communities.

Strengthening Climate Science for Communities Technical

Knowledge-Sharing MoU with Indian Institute of Tropical Meteorology (IITM), MoES: This partnership aims to integrate cutting-edge climate science with community-level advisory systems. Together, WOTR and IITM are co-developing methodologies to monitor soil moisture, temperature, and other meteorological variables to support adaptive decision-making.

New Collaborations and Project Partnerships

Toyota Kirloskar Motor (TKM): In 2023, TKM partnered with WOTR through Project Jeevan Dhara in Aurad Taluka, Karnataka, to strengthen watershed management and rural development.

Genpact: Launched in 2023, the Dang Jalsanchay project in Karauli, Rajasthan, with Genpact's support, is working to restore water harvesting structures with a potential to save 128 million litres of water. It also promotes resilient farming practices for over 1,600 farmers, aiming to boost crop productivity by up to 30%.

LIC Housing Finance Limited: Since 2023, this partnership has been active in 10 villages of Kherwara Tehsil, Udaipur (Rajasthan), promoting irrigation management, groundwater recharge, climate-resilient farming, and livelihood diversification for more secure family incomes.

Grant Thornton: Beginning in April 2024, WOTR and Grant Thornton started a Water Resource Development and Management project in Shahapur Block, Thane District. Covering two villages, it focuses on soil and water conservation, sustainable agriculture, and livelihood opportunities.

Fertis India Pvt. Ltd. (FIPL): Through an MoU initiated in 2023, WOTR and FIPL continue to strengthen FPOs by providing access to quality agri-inputs, helping farmers increase productivity and incomes.

Knowledge Sharing and Advocacy

Contributed to the topic

1. Community-Based Water Resources Management on the 53rd Water Talk hosted by the Ministry of Jal Shakti.
2. Shared learnings from projects in Jharkhand and Maharashtra at a national workshop on climate-resilient watersheds, hosted by NABARD and KfW under the SEWOH initiative in New Delhi.

Ripples of Change: WOTR's 30th Anniversary Celebration

WOTR celebrated 30 years of transformative rural development at its **"Ripples of Change"** event on 17th January 2025 at the Yashwantrao Chavan Centre. The event spotlighted WOTR's far-reaching impact in rejuvenating India's rural landscapes and empowering communities.

The gathering included dignitaries, donors, knowledge partners, and community members. Distinguished speakers included Dr A.V. Bhavani Shankar, Chief General Manager of NABARD; Ms Shloka Nath, CEO of the India Climate Collaborative (ICC); Mr Shailesh Haribhakti, Chairman of the Advisory Council of WOTR; and H.E. Mr Achim Fabig, Hon. Consul General of Germany.

Awards & Recognitions

WOTR received the Award of Excellence in Water Conservation at the CASCA 2025 (Climate Action and Sustainability Conference and Awards), organised by The CSR Universe. The recognition highlights the impact of its Climate Resilient Agriculture through Land & Water Management project, supported by YES Foundation and implemented in select villages across Karauli and Udaipur in Rajasthan, and Jalna and Ahmednagar in Maharashtra.

Research Highlights (W-CReS)

Key Research & Consulting Projects in 2024-25

Nature-Based Solutions For Sustainable Rural Landscapes And Climate Resilience

Implemented in 14 villages across Maharashtra and Telangana with support from HSBC Software Development (India) Pvt. Ltd., this project focused on applying Ecosystem-Based Adaptation (EbA) on the ground—through riverine restoration, water stewardship, green livelihoods, and climate-resilient agriculture. It strengthened the capacities of gram panchayats through targeted training on conservation, sustainable agriculture, and water management. Seven research studies were conducted on themes such as biodiversity, circular economy, and community resilience.

Integrated Water Resources Development and Promotion Of EbA In Maharashtra And Telangana

In partnership with Honeywell Hometown Solutions India Foundation, this project adopted a practice- and knowledge-driven approach to promote Ecosystem-Based Adaptation (EbA) in rural landscapes. It engaged Farmer-Producer Organisations (FPOs) to protect agroecology while enhancing livelihood resilience, conducted a scientific Land Surface Temperature (LST) study in Jalna and Narayanpet to assess climate impacts on land and water, and delivered targeted capacity-building sessions on EbA in agriculture.

Building Resilience in Agriculture and Allied Sectors in Rural Maharashtra

Supported by the India Climate Collaborative (ICC), the project aimed to enhance rural resilience and ecosystem health through four key areas: (i) promoting nature-friendly agriculture, (ii) expanding climate-smart advisories via the FarmPrecise app, (iii) mainstreaming Ecosystem-based Adaptation (EbA), and (iv) strengthening water security through water stewardship. WOTR signed MoUs with key Maharashtra departments to co-develop and embed tools and frameworks into government policies and programs.

> ***W-CReS co-developed India's first state-level draft EbA policy for Maharashtra with the Department of Environment***

Notably, WOTR / W-CReS co-developed India's first state-level draft EbA policy for Maharashtra with the Department of Environment, which is reflected in the revised State Action Plan on Climate Change. Under agriculture, the NATUREPro framework, developed to assess climate vulnerability and nature-positivity in villages, was adopted under the Dr Panjabrao Deshmukh Natural Farming Mission. A few key APIs from the FarmPrecise app have been incorporated and linked to the Mahavistar app, a state-wide App developed by the Department of Agriculture. To promote water governance, WOTR and W-CReS developed an operation and maintenance (O&M) framework for drinking water schemes (Jal Jeevan Mission), which is adopted in principle by the Water Supply and Sanitation Department. A revised competition framework for GSDA under the Atal Bhujal Yojana and training manuals were also developed. A district-wide Water Governance Standard campaign was held in Dharashiv, with plans to scale up. WOTR also redesigned the WUA competition framework, which is now adopted by the Water Resources Department through a Government Resolution. Additionally, WOTR's water budgeting tool has been included in the Majhi Vasundhara competition framework.

Nature-friendly, Climate Resilient Precision Farming for Smallholder Farmers

With support from Bosch Global Software Technologies Pvt. Ltd., this ongoing initiative aims to develop and implement an intelligent decision support system tailored for smallholder farmers in India. By integrating crop science, geospatial tools, IoT sensors, and AI/ML algorithms, the system offers real-time, actionable insights to enhance on-farm decision-making. The goal is to improve productivity while promoting biodiversity and protecting natural ecosystems—making precision farming both climate-resilient and nature-friendly.

Building an Intelligent, AI-Ready Knowledge System

Supported by Bharat Jaisinghani and Ankita Jaisinghani, this project focuses on transforming decades of legacy data into a structured, intelligent database system. Designed to integrate historical records with near-real-time data from ongoing and future interventions, the system will house field records, socio-economic surveys, and environmental impact metrics. By enabling advanced analytics and faster decision-making, it will enhance WOTR's ability to scale impact and strengthen outcomes across projects.

Soil Health Stewardship: Capacity Building for Long-Term Agricultural Success

The project, with support from GIZ, India, aims to disseminate knowledge and insights gained throughout the implementation of the ProSoil Project through a range of events, engaging stakeholders. Under this project, in the year 2024-25, capacity building and knowledge sharing trainings were conducted in Mandla, Madhya Pradesh for climate resilient agricultural practices and in Dharashiv, Maharashtra regarding water stewardship.

Sustainable Land and Ecosystem Management in Semi-Arid Regions: Effective Communication and Stakeholder Capacity Building

Supported by ELD- GIZ, this project aims to generate high-quality communication products and build stakeholder capacity to promote Sustainable Land Management (SLM) and its benefits. This includes impact evaluation of best SLM practices, their documentation and dissemination through various platforms and events.

Water, Sanitation, and Hygiene in Dharashiv: Action Research for Sustainable WASH

Supported by Water For People, this action research project addresses critical WASH challenges in Dharashiv, Maharashtra. A comprehensive assessment covering infrastructure, finance, governance, and community behaviours was conducted, supplemented by expert consultations, interviews, and case studies. The project focuses on strengthening community-based institutions, building local capacity, and raising awareness through ongoing WASH programs. A dedicated Centre for Sustainability has been set up to scale sustainable practices across the district, and a water quality study is underway near waste dumping sites in all blocks.

Volumetric Water Benefit Analysis (VWBA) for Interventions Under the Project 'Building Resilience of Rural Communities in Igatpuri of Nashik District, Maharashtra'

Supported by GlaxoSmithKline (GSK), this project in four villages of Igatpuri block, Nashik district, applies the VWBA framework to quantify water benefits from watershed interventions and on-farm water-saving practices. The analysis covers drainage line treatments like check-dams and loose boulder structures, as well as micro-irrigation techniques. Nine water meters were installed to track on-farm usage, and 26 wells are being monitored to assess groundwater recharge. The VWBA approach captures both volumetric and non-volumetric outcomes to inform sustainable water resource management.

Participation in International and National Events

Throughout the year, W-CReS actively contributed to over twenty international and national conferences and forums, strengthening global dialogues on climate change, sustainable land and water management, and community resilience.

Below Are Some Key International Highlights

Conference of Parties (COP 16) – Riyadh, Saudi Arabia

W-CReS participated and contributed to the 16th UNCCD Conference of the Parties (COP16), engaging in key discussions on sustainable land and water management and sharing grassroots experiences. It contributed to various expert panels on land restoration finance, agroecology, gender-transformative approaches, nature-based solutions for drought, and barriers to sustainable land management. In this event, WOTR's case study was presented as one of eight examples in the UNCCD's Flagship Drought Report.

AWS Global Water Stewardship Forum – Edinburgh, Scotland

W-CReS participated in a conference organised by AWS Global Water Stewardship Forum, adding to discussions on water stewardship in the private and public sectors and civil society organisations.

ARA - TLS Knowledge Synthesis Symposium – Bangkok, Thailand

W-CReS presented on "Traditional Ecological Knowledge for Adaptation" at the Adaptation Research Alliance – Tracking, Learning, and Sharing (ARA TLS) Knowledge Synthesis Symposium 2024 (Asia Pacific), organised by Transitions Research.

Global Report on the Economics of Drought – Bonn, Germany

W-CReS participated in the conference organised by the Economics of Land Degradation (ELD) and presented a case study on enhancing drought resilience through Nature-based Solutions in India's semi-arid regions.

> ***Throughout the year, W-CReS actively contributed to over twenty international and national conferences and forums.***

Sustainable Landscapes, Forestry, and Agro-pastoralism – Chaîne Des Puys, France

W-CReS presented on "Human–Nature Interface in the Himalayas: Evidence from Ladakh" at an international conference organised by the International Association of Inhabited Natural Sites, held at the UNESCO World Heritage site, Chaîne des Puys.

Stakeholder Consultation on Gender-Responsive Climate Information Services – Bangkok, Thailand

W-CReS participated in the international workshop on Gender-Responsive Climate Information Services (CIS) in Agri-food Systems, organised by the Evidence Module of the CGIAR GENDER Impact Platform.

International Soil and Water Forum – Bangkok, Thailand

W-CReS participated in the forum organised by FAO, presenting on "Demystifying the Science of Aquifers Using Vertical Electrical Sounding for Community-Driven Sustainable Land and Water Management."

South Asia Regional Consultation on Locally Led Adaptation – Kathmandu, Nepal

W-CReS participated in the conference organised by the Global Centre on Adaptation (GCA) from February 11–15, 2025, presenting on building smallholder farmers' climate resilience through community water stewardship and water use planning.

W-CReS also actively engaged in numerous national events, including

Civil Society Convening on Economic Inclusion – New Delhi, India

W-CReS participated in a workshop organised by The/Nudge Institute at India Habitat Centre, joining a panel discussion on resilience-building through the lenses of gender and climate change.

Science-Policy Dialogue on Groundwater Governance – New Delhi, India

W-CReS participated in the national conference organised by IWMI and CGIAR, contributing to discussions on groundwater governance and science-policy integration.

Water, Energy, Climate and Livelihoods – Anand, Gujarat

W-CReS participated in the national conference on 'Water, Energy, Climate and Livelihoods in India: Strategies for Smallholder Prosperity with Resilience', organised by the IWMI-TATA Program and presented on its experience promoting water security through the Water Stewardship Approach in Maharashtra's semi-arid regions.

Community Institutions and Local Development – Ahmedabad, Gujarat

W-CReS representative contributed to a panel discussion at the workshop on 'Learnings from the Experience of Different Community Institutions Contributing to Development and Advancement of Their Members and Villages', organised by the Consortium for Agroecological Transformations (CAT). Insights on ecosystem restoration and climate-resilient practices through Ecological Restoration (EbA) across rural India were shared.

Catchment Resilience Index Workshop – Hyderabad, India

W-CReS and WOTR participated in a workshop on 'Development of a Catchment Resilience Index for Resilient Basin Development'. The event was jointly organised by ICAR-CRIDA and the International Water Management Institute (IWMI).

State-Level Workshops and Strategic Dialogues on Climate Resilience

Multi-Stakeholder Dialogue on Climate Futures 2047

A two-day multi -stakeholder workshop, "Preparing for Climate Futures 2047: Nature-based Solutions to Enhance Ecosystem Services", was held in Pune on March 6–7, 2025, with support from HSBC Software Development (India) Private Limited. The event brought together 84 stakeholders - practitioners, scientists, policymakers, donors, and community leaders to explore nature-based solutions for sustainable ecosystem restoration. By identifying key challenges and their interlinkages, participants outlined practical strategies to strengthen ecosystem services and livelihood resilience by 2030.

Consultation on Rising Land Surface Temperature and Its Impacts

To better understand the growing threat of heat in rural areas, W-CReS conducted a detailed study on changes in Land Surface Temperature (LST) between 2022 and 2025 in the semi-arid districts of Jalna (Maharashtra) and Narayanpet (Telangana), with support from the Honeywell Hometown Solutions India Foundation. The findings were shared at a dedicated consultation titled "Rising Land Surface Temperature and its Implications for Humans and Natural Ecosystems" held on March 18, 2025, in Pune. The event saw participation from 72 stakeholders, including village representatives, researchers, academicians, policymakers, media, and practitioners—facilitating a dialogue on the urgent need for heat action planning in rural regions.

ECOBARI

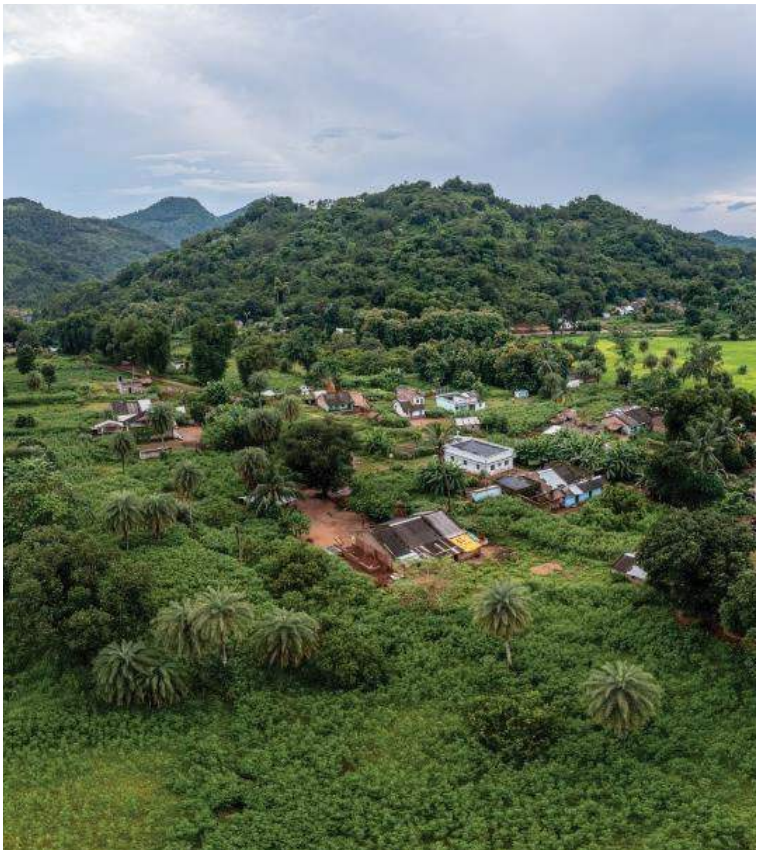
Growing a Community for Climate Resilience & Rural Livelihoods

In the face of rising climate uncertainties, land degradation, and agrarian distress, the question is no longer whether we act, but how we act, and with whom. ECOBARI (Ecosystem-based Adaptation for Resilient Incomes) is a collaborative platform convened by WOTR and seven other founding partners in 2021. It is rooted in the belief that climate adaptation answers lie in collective, evidence-driven action that is as much grounded in an ecosystem's perspective as it is in ensuring livelihood security and sustainability.

Simply put, ECOBARI's guiding belief is straightforward: Healthy ecosystems are the foundation for resilient livelihoods. Our work in FY 2024–25 demonstrated that innovation is not only about high-tech tools; it is also about remembering, reviving and sharing age-old wisdom, understanding grassroots needs, and creating collaborative pathways where scientific insights empower action.

ECOBARI's vision, articulated in its Charter, is unambiguous: Empowered communities sustainably regenerate and manage their ecosystems, conserve biodiversity, derive resilient incomes, and improve their quality of life through nature-based and nature-positive solutions, as they adapt to climate change. Its mission, to be the leading platform to ground EbA at scale through "science–practice–business" partnerships, policy enablement, and resource provisioning.

ECOBARI is not just a platform. It is an ecosystem of various organisations, non-profits, educational institutions and individuals, united by the shared goal of advancing Ecosystem-based Adaptation (EbA) for rural livelihoods across India. Our efforts in the past year reflect how we continue to bridge the three pillars of evidence-action-policy to co-create and scale climate action that is locally relevant and scientifically informed.



Making EbA Accessible: A Guide for Field Practitioners

Ecosystem-based Adaptation (EbA) is a powerful, nature-centric approach to climate resilience. Yet, for many field practitioners, it remains an abstract concept. Recognising this gap, ECOBARI is developing a Field Practitioner's Guide to EbA under the title Simplifying EbA for Field Practitioners and a toolkit. This guide is designed to help NGOs, implementation workers, and rural community leaders integrate ecosystem principles into day-to-day decision-making.

> ***ECOBARI is not just a platform. It is an ecosystem of various organisations, non -profits, educational institutions and individuals***

Laying the Groundwork for Tools and Knowledge Products

With growing interest from donors, governments, and civil society organisations in ecosystem-based approaches, the need for clear indicators and evidence has never been more critical. In the past year, ECOBARI initiated the planning and conceptualisation of an EbA Tool to become a framework of indicators to assess the impact of EbA interventions on community resilience, livelihoods, and ecosystem health. This tool aims to offer practitioners and policymakers a more structured way to measure what matters.

Building Bridges: The ECHO Network and the SAGE Ambassadors Conference

Collaboration lies at the heart of ECOBARI. As in previous years, our partnership with the ECHO Network continued to thrive. ECOBARI is both a consortium member and the implementation partner for ECHO Network's Rural Livelihoods Program. In June 2024, we participated in the SAGE Ambassadors Conference in Bangalore - an inspiring gathering of young researchers and practitioners working at the science-policy-diplomacy interface between India, Denmark and several other countries part of the network. The event not only amplified the value of cross-sectoral dialogues but also affirmed ECOBARI's role as a knowledge bridge between research institutions, international voices and community-led action.

ECHO Network, as one of the founding partners and a steering committee member of ECOBARI, continues to shape our vision for a transdisciplinary, inclusive research-mentor synergy in India.

Storytelling as Strategy: "In Our Nature" Podcast to Cross-Sector Dialogue

If we're going to take on climate change, we need strong allies. One of the more unconventional but impactful initiatives from this year was the launch of In Our Nature, a 6-part podcast series hosted by the ECOBARI team. From October 2024 to March 2025, the podcast explored how ecosystems can be an incredible force in protecting us from climate disaster, if we find ways to help them thrive. It also bridged the understanding of how closely we are connected to the natural world, which is an inseparable part of the human spirit. This series explored climate and ecology through a wide range of topics, including governance, cuisine, and environmental economics.

The series featured candid conversations with farmers, researchers, and adaptation practitioners, exploring what nature-based resilience truly looks like on the ground. Storytelling is a powerful tool for systems change. It humanises data, builds empathy, and invites broader participation. Through In Our Nature, we sought to make EbA feel real,

relatable, and resonant, especially for younger audiences and urban listeners who may feel disconnected from the rural realities of climate adaptation.

Continuing that momentum, ECOBARI convened a live, interactive webinar in 2024 titled: “Communicating Stories of Change: A Conversation Between Media and Development Sector Practitioners”. This session brought together voices from the mainstream media, communications managers in grassroots NGOs and an advertising professional, offering a rare and needed dialogue between those who implement programmes and those who shape public narratives about them. Panelists shared insights on navigating nuance, avoiding extractive storytelling, and building empathy and agency through communication.

The webinar served as a crucial reminder: data alone doesn't move hearts, stories do. And when stories are co-created with dignity and depth, they become a powerful form of innovation in themselves, one that shapes how society understands climate resilience and who we see as its protagonists.

Looking Ahead: Scaling Collaboration, Deepening Impact

As we look to the future, ECOBARI's work is only just beginning. With the impacts of climate change intensifying each year, the need for systemic, locally rooted adaptation strategies will continue to grow. We envision ECOBARI as a dynamic, co-owned platform that enables knowledge sharing, policy influence, and ground-level implementation at scale.

Some of our upcoming priorities include:

- Developing the idea behind the EbA Atlas through well-documented case studies from different ecosystems across India. Keeping scientific rigour in mind and merging it with the common understanding needed for action.
- Continue working on new communication products, including podcasts and other audio-visual outputs.
- Facilitating dialogues among field NGOs, researchers, and community organisations through webinars, trainings, workshops and more.
- Continuing to serve as a trusted resource hub for EbA insights and capacity-building.
- A focused collaboration on saving our trees. ECOBARI envisions building momentum around tree plantations with the underlying ethos of “planting the right trees at the right places, at the right time.”

A Living Collaboration

At its core, ECOBARI is not about any one organisation, tool, or product. It is about co-creating a shared future rooted in the wisdom of our landscapes and communities. It is about recognising that innovation need not always be new, it can be about reconnecting with age-old practices, reinterpreted in the light of new science and technology. Making it possible to converge pathways of action, bearing in mind different groups of people, organisations and institutions.
As the climate crisis continues to unfold, ECOBARI is committed to being a living, evolving collaboration that embodies action grounded in science, inclusive in spirit, and bold in ambition

ECOBARI
COLLABORATIVE FOR RESILIENCE

Publications and Productions

Journal papers

1. **Toward Resilient Development In Rural Area: Some Strategic Recommendations Based On Contextual Findings In Bhokardan Taluka, Jalna**	Marcella Dsouza and Anuradha Phadtare, Swapnil S. Vyas, Yogesh Shinde and Ajit Jadhav	
2. **Critical Climate-Stress Moments For Semi-Arid Farming Systems In India**	Arjuna Srinidhi, Wouter Smolenaars, Saskia E. Werners, Sahana Hegde, Ganesh Rajapure, Miranda P. M. Meuwissen & Fulco Ludwig	
3. **Climate Resilient Development Pathways For Farmer Producer Organizations In Semi-Arid India**	Arjuna Srinidhi, Miranda P. M. Meuwissen, Sandeep Jadhav, Fulco Ludwig, Dada Dadas, Nikhil Nikam & Saskia E. Werners	

Book Chapters

1. **Green Livelihoods As A Nature-Based Solution For Climate Change Mitigation And Adaptation**	Saurabh Purohit, Y. D. Imran Khan, Omkar M. Hande, Krishanmurti & Marcella D'Souza	
2. **Revolutionising Water And Climate Resilience In Semi-Arid Ecosystem: Group Micro Irrigation (Gmi) Approach In Tigalkheda, Maharashtra, India**	Arun Bhagat, Upasana Koli, and Marcella D'Souza	

Book Chapters

3. **Sustainable Soil Restoration: Reviving India's Soils For A Better Future**	Dr. Pratik Ramteke and Dr. Ashok Patra	
4. **Data Analytics For Drought Vulnerability Under Climate Change Scenarios**	Tina Sultana, Sahana Hegde, Taufique Warsi, Khan Tahama, Syed Shams Rizvi, Suryadipta Mukherjee, Sarita	
5. **Ecological Knowledge In The Current Climate Crisis: Case Study Of Mahadev Kolis In Maharashtra, India**	Saurabh Purohit, Omkar M. Hande, Y. D. Imran Khan & Krishanmurti	
6. **Determination Of Site Suitability Of Medicinal Plants Using Geospatial Techniques: Case Study Of Uttarakhand, India**	Neelam Rawat and Saurabh Purohit	
7. **Role Of Glomalin-Related Soil Protein In Carbon Sequestration**	Prachi Nautiyal, Kusum Arunachalam, Saurabh Purohit, A. Arunachalam & Rajiv Kumar Srivastava	
8. **Spatio-Temporal Variability And Trends In Rainfall Associated With Large-Scale Climate Phenomena In Western Ghats Of India**	Sahana Hegde, S. S. M. Gavaskar & S. K. Chengappa	
9. **Enhancing Drought Resilience Through Nature-Based Solutions: A Case Study From India's Semi-Arid Landscapes**	Vijay Solanky, Faraz Rupani, and Saurabh Purohit	

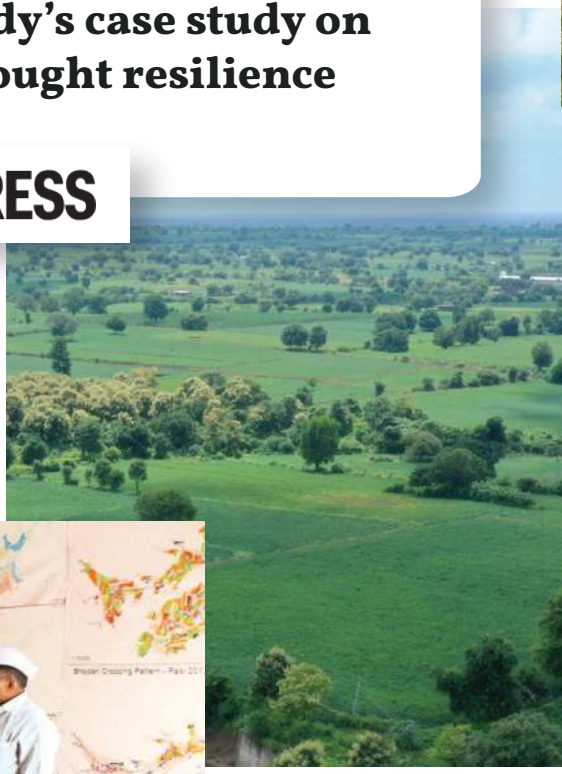
In the Media

Scan for More

Six Maharashtra villages part of UN body's case study on drought resilience

The Indian EXPRESS

How this Pune-based organisation is changing lives, one raindrop at a time.



FRONTLINE

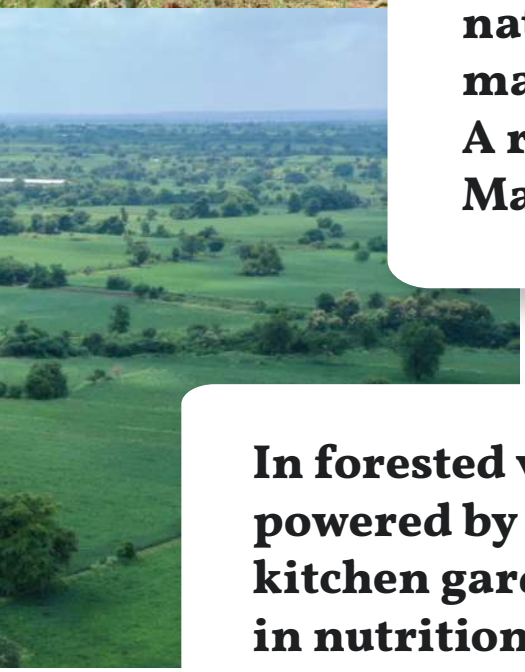
Climate finance needs innovation—and accountability from the wealthy

SCIENCE AND ENVIRONMENT FORTNIGHTLY
Down To Earth

Every Drop Counts: 14 villages in Jalna sharing a common aquifer

THE HINDU

Securing water in a time of climate change through natural ecosystems management: A report to tackle Maharashtra's water crisis



In forested villages powered by solar, kitchen gardens aid in nutrition

MONGABAY
NEWS & INSPIRATION FROM NATURE'S FRONTLINE

Desilting tanks for improving water security and soil health

iS. IndiaSpend

In A Parched Summer, India's Water Stewards Show The Way Out

Funding Partners

Andheri Hilfe

Arteco Coolants

Ashraya Hastha Trust

Atlas Copco

Axis Bank Foundation

Azim Premji Philanthropic Initiatives

Bayer Foundation India

Bharat Rural Livelihoods Foundation

BOSCH Global Software Technologies

Bread for the World

Deutsche Bank

Deutsche Gesellschaft für Internationale Zusamme -narbeit (GIZ) GmbH

Eaton India Foundation

Economics of Land Degradation Initiative

EY Foundation

Genpact

GlaxoSmithKline

Godrej Agrovet

Government of Jharkhand

Grant Thornton

Grundfos Pumps

HDB Financial Services

HDFC Bank Parivartan

Honeywell Hometown Solutions India Foundation

HSBC Software Development (India) Private Limited

India Climate Collaborative

IndusInd Bank

John Deere

JSW Foundation

Kotak Mahindra Bank

Larsen & Toubro

LIC Housing Finance

Mahindra & Mahindra

Mylan Laboratories (A Viatris Company)

National Bank for Agriculture and Rural Development

NOMURA Group

Pernod Ricard India Foundation

Qualcomm Incorporated

R.G. Manudhane Foundation

Rohini Nilekani Philanthropies

Rotary Club of Poona

Rotary Club of Pune Metro Charitable Trust

Standard Chartered Bank

Sun Pharmaceuticals Laboratories

Supraja Foundation

TATA Communications

Tech To The Rescue

The Nature Conservancy

Toyota Kirloskar Motor

Walmart Foundation

Water for People

Wellls Fargo International Solutions

Welt Hunger Hilfe

YES Foundation

Knowledge Partners

Bharati Vidyapeeth Institute of Environment Education and Research (BVIEER)

Central Research Institute for Dryland Agriculture

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

India Meteorological Department

Indian Council of Agricultural Research (ICAR)

Indian Institute of Tropical Meteorology

Mahatma Phule Krishi Vidyapeeth (MPKV)

Norway University

Savitribai Phule Pune University

Tech To The Rescue

The Echo Network

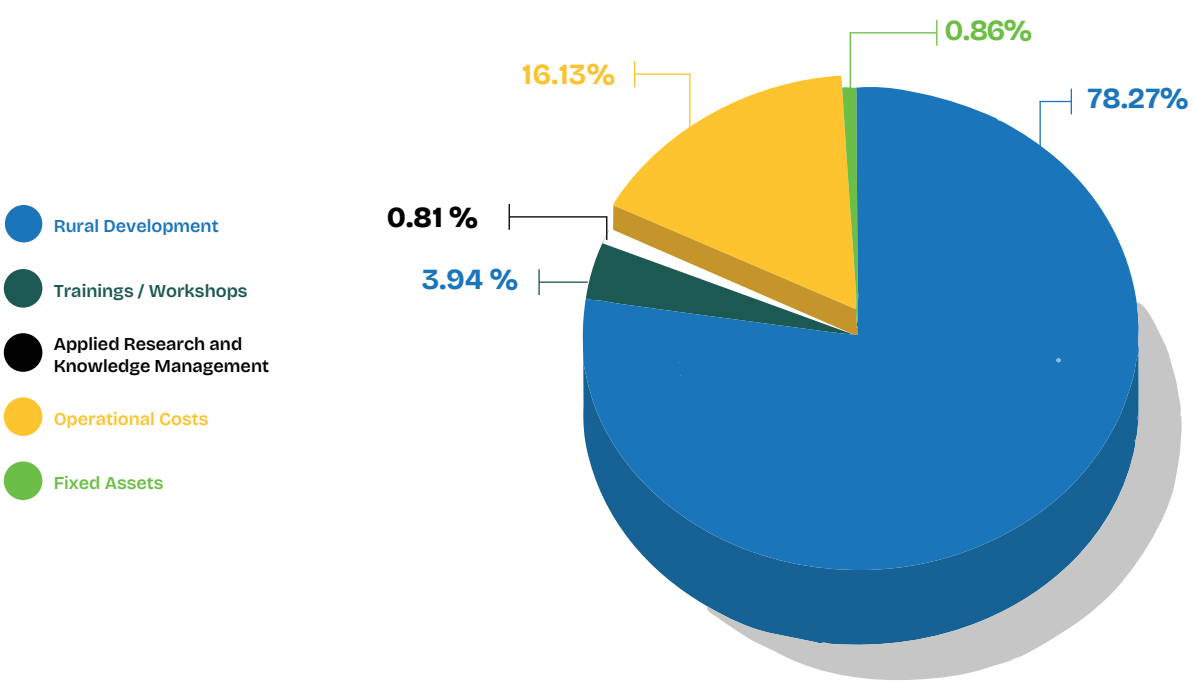
TMG Think Tank For Sustainability

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani

Wageningen University & Research

Overview of Project Expenditure

S. No.	Expenditure	Expenditure in %	Amount (₹)
1	Rural Development	78.27%	1,156,237,507
2	Trainings / Workshops	3.94%	58,189,695
3	Applied Research and Knowledge Management	0.81%	11,932,109
4	Operational Costs	16.13%	238,231,298
5	Fixed Assets	0.86%	12,698,215
	TOTAL		**₹ 1,477,288,824**



₹ 1,51,30,00,000 | Funds additionally secured through community contribution and convergence through various public schemes

WOTR

Rejuvenating Communities & Ecosystems

WOTR is a nationally and globally recognised leader and think tank in rural development. Committed to eradicating the root causes of rural poverty, WOTR champions ecosystem rejuvenation and the strengthening of community resilience to climate change. By enhancing water availability, improving land and agricultural productivity, diversifying livelihoods, empowering women, and bolstering the health and well-being of vulnerable rural communities, WOTR has made significant strides in transforming rural landscapes. The organisation's unique approach brings together a diverse range of stakeholders, including practitioners, academics, researchers, trainers, and policy makers, fostering collaborative efforts to build the resilience of rural communities. In the course of over 3 decades, WOTR has worked in 7,635 villages across 10 states in India, positively impacting the lives of 8.4 million people.

W-CReS

Building Resilient Futures

Initiated in 2007 and set up as an autonomous unit in 2016, W-CReS (the WOTR Centre for Resilience Studies) adopts a collaborative, systems dynamics approach and hosts a transdisciplinary team in climate science, landscape engineering, agriculture, ecology and biodiversity, geo-informatics, hydrology, geology, economics and sociology. The objective of W-CReS is to understand causal relationships and drivers of behavioural change, identify and test effective strategies for change and contribute to capacity building and policy enhancement. W-CReS has formal MOUs with leading national and international research and scientific institutions including ICAR, IMD, and CRIDA among others. Both WOTR and W-CReS work in close collaboration with civil society entities, companies, and the federal and state governments to achieve their objectives.


WOTR
Rejuvenating Communities & Ecosystems
W-CReS
Building Resilient Futures

www.wotr.org