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CSIR-CBRI Technologies Supporting PMAY-G

Building Climate-responsive Rural Housing at Scale

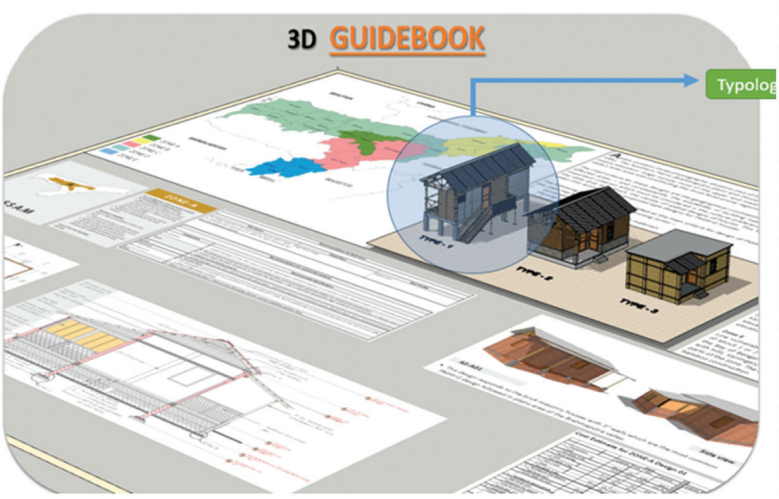
As India advances towards its vision of *Housing for All*, scientific innovation is increasingly shaping the future of rural habitats. The Council of Scientific and Industrial Research (CSIR), through CSIR-Central Building Research Institute (CSIR-CBRI), Roorkee, has emerged as a key technology partner in strengthening Pradhan Mantri Awaas Yojana–Gramin (PMAY-G) by developing affordable, disaster-resilient and climate-responsive housing solutions, which are tailored to India's diverse geo-climatic regions.

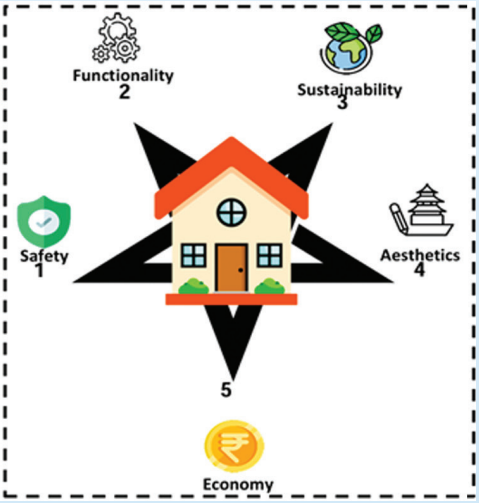
A major milestone in this effort is the adoption of CSIR-CBRI technologies in nearly 2.0 crore PMAY-G houses across all states and Union Territories, including Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Rajasthan, Tripura, Uttar Pradesh and West Bengal. The scale reflects one of the country's largest examples of scientific interventions influencing rural infrastructure development.

At the heart of this initiative is a 3D digital guidebook for PMAY-G, designed to simplify rural house construction while accommodating regional variations. The platform integrates region-specific building typologies, architectural layouts, structural detailing, material estimates, service provisions and 3D visualisation tools. This provides practical guidance to engineers, field functionaries and beneficiaries. The objective extends beyond construction — to create homes that are safer, more sustainable, functional, aesthetically appropriate and affordable.

CSIR-CBRI's contributions to rural housing extend further. The institute has developed more than 250 region-specific, disaster-resilient housing designs, addressing hazards such as earthquakes, cyclones and floods while incorporating local materials to improve affordability and social acceptance.

The impact of these technologies is evident on the ground. Following Cyclone Fani,





States Covered under PMAY-G using CSIR-CBRI Technologies

CSIR-CBRI-supported housing designs in Odisha demonstrated resilience under extreme weather conditions. The institute subsequently trained thousands of engineers and artisans, contributing to the construction of over nine lakh resilient rural houses in the state.

More recently, CSIR-CBRI inaugurated India's first 3D concrete printed rural house under PMAY-G, signalling a new phase in affordable and rapidly deployable rural housing technologies. The innovation combines advanced construction methods with sustainability and disaster resilience, potentially reshaping future housing delivery models in rural India.

By integrating digitalisation, indigenous technologies and climate-responsive design principles, CSIR-CBRI is helping transform rural housing from basic shelter into safe, resilient and future-ready living spaces, reinforcing the role of science in inclusive national development.

Contributed by Science Communication and Dissemination Directorate (SCDD), CSIR, New Delhi.
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Hon'ble Union Minister Dr Jitendra Singh Inaugurates the 4th Lavender Festival 2026

"Lavender has given the small town of Bhaderwah a national identity and a national role in India's economic growth. What was once considered a remote hill town has today emerged as a beacon of India's rural Startup movement," — Dr Jitendra Singh

The two-day event, the 4th Lavender Festival 2026 from 6 to 7 June 2026, commenced at Bhaderwah with the inauguration by Hon'ble Union Minister Dr Jitendra Singh, who is also the Vice President of CSIR, celebrating the remarkable success of the Purple Revolution and the transformative impact of the CSIR Aroma Mission.

Addressing the gathering, Dr Jitendra Singh described Bhaderwah as one of the most successful examples of technology-led rural transformation in the country. He said the Purple Revolution has demonstrated how scientific research can be translated into sustainable livelihoods and entrepreneurship in remote mountainous regions.

The festival, themed "Lavender Goes Global", showcases how science, innovation and entrepreneurship are empowering farmers, startups and rural communities across the Himalayan region. From lavender cultivation and value-added products to startup innovations and industry collaborations, the event reflected the journey of Bhaderwah from a remote hill town to India's leading lavender hub.

"Highlighting the economic impact of the mission, Dr Jitendra Singh, noted that several young entrepreneurs associated with lavender cultivation are earning substantial incomes through cultivation, processing and marketing of value-added products. He said Bhaderwah's model is now being studied and replicated in other Himalayan and northeastern states."

The occasion was graced by CSIR Director General Dr N Kalaiselvi; CSIR-IIIM Director Dr Zabeer Ahmed; BCCI President Mithun Manhas; Prof. VK Singh; CSIR-IICT Director Dr D Srinivasa Reddy; Dr Ajit Kumar Shasany; Dr Suphla Gupta; Dr Saurabh Saran; public representatives; scientists; entrepreneurs; and progressive farmers.

In her address, Dr N Kalaiselvi said the Purple Revolution represents one of the most impactful examples of science reaching grassroots communities. She noted that the initiative has successfully linked laboratory research with rural livelihoods and has emerged as a model for sustainable agricultural development across the country.

Professor VK Singh of IIT Lucknow highlighted the role of science and innovation in driving rural transformation and praised the CSIR Aroma Mission for successfully translating research into livelihood opportunities for farmers. He said the Purple Revolution stands as a model of science-led development, fostering entrepreneurship, value addition and sustainable income generation. He also emphasised the importance of continued collaboration between research institutions, industry and farmers to further strengthen India's aromatic crop sector.

The Lavender Festival 2026 concluded in Bhaderwah on Sunday with stakeholders from the government, scientific community, industry and farming sector reaffirming their commitment to transform the region into a globally recognised centre for lavender cultivation, processing and aroma-based entrepreneurship. Organised by the CSIR-Indian Institute of Integrative Medicine (CSIR-IIIM), Jammu, under the CSIR Aroma Mission, the festival brought together farmers, startup founders, scientists, industry leaders, students and policymakers under the theme "Lavender Goes Global."

The event highlighted the remarkable journey of Bhaderwah from a traditional agricultural region to what is increasingly being recognised as India's Lavender Capital. The second day of the festival featured technical sessions, industry interactions, buyer-seller meetings and presentations by successful entrepreneurs and farmers. Representatives from leading aroma and fragrance companies shared market insights and explored opportunities for strengthening linkages between growers and industry players. Startup founders and innovators also showcased value-added products and discussed emerging opportunities in the lavender ecosystem.

Addressing the valedictory session, Director CSIR-IIIM, Dr Zabeer Ahmed, said the overwhelming response to the two-day festival reflected the growing success of the Aroma Mission and the vision outlined by Hon'ble Union Minister Dr Jitendra Singh during the inauguration of the festival. He said the Hon'ble Union Minister Dr Jitendra Singh's call to take "Lavender Goes Global" beyond a slogan and transform it into a practical roadmap for farmers, entrepreneurs and industry stakeholders would guide future efforts of CSIR-IIIM and its partners. Dr Ahmed noted that the festival had successfully connected farmers, startups, scientists and industry leaders on a common platform and generated meaningful discussions on cultivation, processing, value addition and market expansion. He said the objective of linking cultivation with

"The event highlighted the remarkable journey of Bhaderwah from a traditional agricultural region to what is increasingly being recognised as India's Lavender Capital."

entrepreneurship, innovation and market access had been effectively achieved through the various sessions and interactions held over the two days. Highlighting the festival's theme, he said the vision of taking Bhaderwah's lavender sector to the global stage would require sustained efforts from all stakeholders. While the region has already earned national recognition for lavender cultivation, he said the next challenge is to establish Bhaderwah as an internationally recognised centre for aroma-based industries. He called for detailed documentation of the discussions and action points emerging from the festival so that they could be incorporated into future strategies under the next phase of the Aroma Mission.

Dr Ahmed credited farmers for the success of the lavender movement, describing them as the driving force behind the Purple Revolution in Jammu and Kashmir. He said scientific institutions and government agencies could provide technology, training and market support, but the real transformation had been achieved through the dedication and hard work of local growers. He also outlined future priorities, including improved processing facilities, enhanced distillation systems, value addition, branding and tourism integration to maximise economic returns for farmers.

Additional Deputy Commissioner Bhaderwah, Sunil Kumar Bhutyal, who graced the occasion as the Guest, lauded the partnership between the district administration and CSIR-IIIM and described it as a key factor behind Bhaderwah's emergence as a nationally recognised centre for lavender cultivation and aroma entrepreneurship. He said the collaboration had played a vital role in transforming Bhaderwah into a nationally recognised centre for lavender cultivation and aroma entrepreneurship. Bhutyal attributed the success of the Aroma Mission to the combined efforts of scientists, farmers, entrepreneurs and policymakers. He acknowledged the support and vision of Prime Minister Narendra Modi and Union Minister Dr Jitendra Singh in promoting lavender cultivation as a viable source of income for rural communities and in bringing national attention to Bhaderwah's lavender movement. He emphasised the need to further expand cultivation, strengthen market linkages and increase value-added activities so that local growers could secure better returns. Highlighting Bhaderwah's tourism potential, he said the region offers much more than lavender fields, including scenic landscapes, adventure tourism, horticulture, religious tourism, rich cultural traditions and unique local cuisine. Inviting visitors to return, he urged them to become ambassadors of Bhaderwah and share their experiences with others.

Earlier in the welcome address, Principal Scientist and Nodal Officer of the CSIR Aroma Mission, Dr Suphla Gupta, said the success of the mission is the result of year-round teamwork and continuous engagement with farmers, entrepreneurs, startups and other stakeholders. She noted that the mission extends beyond cultivation and includes processing, value addition, product development, marketing and addressing challenges faced by growers and startups at every stage of the value chain. Dr Gupta encouraged entrepreneurs and exhibitors to learn from their interactions with visitors, industry representatives and fellow stakeholders. She said such exchanges provide valuable insights that can help improve products, business models and marketing strategies. Appreciating the enthusiasm displayed by participants and visitors, she described Bhaderwah as a place that combines natural beauty with immense entrepreneurial potential and urged stakeholders to continue spreading the fragrance

of success through innovation, cooperation and sustained efforts.

A special felicitation ceremony was also held during the valedictory session, where progressive farmers, entrepreneurs, startup founders, industry stakeholders, exhibitors, scientists and officials associated with the successful organisation of the festival were honoured for their contributions to the growth of the lavender sector and the success of the Aroma Mission. The recognitions highlighted the collective efforts of all stakeholders in advancing Bhaderwah's Purple Revolution and strengthening the region's emerging aroma economy. The festival also served as a platform for successful farmers to share their experiences of adopting lavender cultivation and benefiting from the Aroma Mission. Several participants highlighted how lavender has emerged as a profitable alternative to traditional crops, creating new opportunities for income generation and rural entrepreneurship.

Scientists, researchers, startup founders and representatives from the aroma industry participated in the event.

"Our Seas are Bridges Connecting India to Global Prosperity and Strategic Strength" Hon'ble Vice President of India, Shri CP Radhakrishnan at CSIR-NIO

The Hon'ble Vice President of India, Shri CP Radhakrishnan and Hon'ble Governor of Goa, Shri Pusapati Ashok Gajapathi Raju, visited the CSIR-National Institute of Oceanography (CSIR-NIO), research facilities and technologies on 30 May 2026, in Goa.

Addressing scientists, researchers and students at the Institute, the Vice-President said that for Bharat, with a coastline of nearly 11,000 kilometres, the ocean was not merely a resource but a living ecosystem to respect and protect. He observed that India's seas were not boundaries separating the country from the world, but bridges connecting it to global trade, energy security, economic prosperity and strategic strength.

Highlighting India's maritime heritage, the Vice President noted that for centuries the Indian Ocean had shaped India's civilisation, with ancient Indian traders, scholars and navigators building cultural and economic ties across the seas.

Praising the work of CSIR-NIO, the Vice-President said the Institute had remained one of India's premier scientific institutions for nearly six decades. Through its research, innovation and exploration, the Institute was helping Bharat become more self-reliant and future-ready, he added.



"Bharat, with a coastline of nearly 11,000 kilometres, the ocean was not merely a resource but a living ecosystem to respect and protect," – Shri CP Radhakrishnan.

The Vice-President also appreciated the Government's efforts under the leadership of Prime Minister Shri Narendra Modi in strengthening international scientific cooperation. Referring to the Memorandum of Understanding signed between CSIR and the Research Council of Norway, he said the partnership would promote research, innovation, technology development and capacity building. He added that Indian research institutions must continuously learn from globally advanced systems and keep pace with international scientific standards.

Referring to the growing challenges of climate change, rising sea levels, marine pollution, biodiversity loss and microplastics, the Vice President said coastal communities across the world were becoming increasingly vulnerable. He emphasised that development could not come at the cost of nature and remarked that oceanography was no longer limited to scientific exploration, but had become essential for protecting humanity's future and building a sustainable, secure and prosperous world. Stressing the importance of responsible innovation, he said scientific progress must always be guided by compassion, sustainability and responsibility.

Highlighting India's future-oriented initiatives, the Vice President said programmes such as the Deep Ocean Mission, Blue Economy initiatives, Green Hydrogen Mission and renewable energy partnerships reflected a nation thinking boldly about the future.

Referring to India's role during the COVID-19 pandemic, the Vice President said India's scientific advancements had helped not only its own citizens but also many developing countries, reflecting the spirit of "Vasudhaiva Kutumbakam". He remarked

"Praising the work of CSIR-NIO, the Vice-President said the Institute had remained one of India's premier scientific institutions for nearly six decades. Through its research, innovation and exploration, the Institute was helping Bharat become more self-reliant and future-ready."

that while many pursued patents, India chose to serve humanity, adding that if India grows stronger, humanity would be in safer hands.

Addressing young researchers and students, the Vice President urged them to dream fearlessly and work tirelessly. Drawing inspiration from the life of mathematician Srinivasa Ramanujan, he said true excellence often emerged from deep personal interest and dedication to a subject. He emphasised that institutions and senior mentors should encourage and nurture such talent. The Vice-President expressed confidence that the next breakthrough in climate solutions, marine biotechnology, renewable energy or ocean conservation could emerge from the young minds present at the Institute. He also said that one among them might one day lead India's future missions into the deepest oceans of the world.

During the visit, the Vice-President toured various laboratories and the research and technology exhibition showcasing the Institute's major projects and scientific initiatives. He also released a coffee table book titled "A *Diamond Legacy of Oceanographic Excellence*".

Source: PIB

"*Science is for Society, and its Outputs should reach the Masses*" Emphasises Hon'ble Union Minister Dr Jitendra Singh

The Hon'ble Union Minister of State (Independent Charge) of Science & Technology and Earth Sciences, and Vice President CSIR, Dr Jitendra Singh, visited the CSIR-Institute of Himalayan Bioresource Technology (CSIR-IHBT), Palampur (HP), on 28 May 2026 to review its progress. Dr N Kalaiselvi, Director General, CSIR, and Secretary, DSIR, was also present at the occasion.

Dr Sudesh Kumar Yadav, Director CSIR-IHBT, welcomed the dignitaries and the guests. He apprised the work and activities being carried out by the institute and briefed about the Aroma and Floriculture Missions and how they are leading to the improvement of the local economy and ecology.

Speaking on the occasion, Dr N Kalaiselvi emphasised the recent initiatives and technological achievements of the CSIR. She also highlighted the role of CSIR-IHBT in boosting bioeconomy through high-end science. Dr Kalaiselvi lauded the contributions of the institute and wished it grand success in its upcoming endeavours.

In his presidential address, Dr Jitendra Singh complimented the institute on its scientific pursuits. He admired the institute for its path breaking work on Stevia and Tulip and in the promotion of start-ups. He highlighted that the institute has the potential to be the torchbearer of the Himalayan Economy and should strive towards it with the ultimate aim of Viksit Bharat. The Minister emphasised that science is for society

and its outputs should reach the masses. On the occasion, Dr Singh visited the exhibition showcasing products based on technologies developed by the institute. For awareness, the Hon'ble Minister took photographs at the Selfie point of the institute and participated in the efforts being made by the institute towards indigenous Hing production.

During the programme, signing of technology transfer agreements, with M/s Chandigarh Sweets Limited, Mohali; E-Hemp Stores Pvt. Ltd, New Delhi; Praarabdh Society, Mandi, Himachal Pradesh; M/s Kannav Biocreations Pvt. Ltd, Una, Himachal Pradesh; M/s Krishi Rasayan Pvt. Ltd, Kolkata; and Parwaaz Organics, Jalandhar, Punjab, was done. One memorandum of understanding was also signed with Himalayan Women, Awareness & Livelihood (HIMWAL) Society, Dehradun, Uttarakhand.

CSIR-IIIM and TERI Sign MoU to scale up Green Pigment Production Technology

CSIR-Indian Institute of Integrative Medicine (CSIR-IIIM), Jammu, and The Energy and Resources Institute (TERI) have signed a Memorandum of Understanding (MoU) to upscale and optimise the production of an anthraquinone-based pigment from endophytic fungi through fermentation technology. The MoU was signed by Dr Vibha Dhawan, Director General, TERI, and Dr Zabeer Ahmed, Director, CSIR-IIIM, at the TERI Headquarters at the India Habitat Centre (IHC), New Delhi, in the presence of Mr Deepak Kumar and Dr Mayurika Goel from TERI, along with Dr Saurabh Saran from CSIR-IIIM.

Speaking on the occasion, Dr Zabeer Ahmed highlighted the importance of scientific collaborations in transforming laboratory research into scalable industrial solutions and emphasised the role of partnerships in advancing biotechnology-based innovations. Under the collaboration, both institutions will work together to convert TERI's laboratory-scale pigment production technology into a pilot-scale process using CSIR-IIIM Jammu's advanced fermentation facilities and expertise in microbial biotechnology and bioprocess development. The project will focus on scaling up the fermentation process up to 500 litres, optimising key production parameters, improving pigment yield, developing efficient extraction and purification methods, and conducting characterisation and quality assessment of the final product.

TERI has developed the laboratory-scale process using a proprietary endophytic fungus strain capable of producing an anthraquinone-based pigment with potential biological applications. CSIR-IIIM will contribute its expertise in fermentation technology, process optimisation, analytical testing, and scale-up studies. The two-year collaboration will also include a techno-economic feasibility assessment to evaluate the commercial potential of the technology. Both institutions will work towards establishing standardised and reproducible processes to support future industrial production.

Speaking on the occasion, Dr Vibha Dhawan underlined the importance of sharing scientific knowledge, infrastructure, and expertise to address challenges and create impactful solutions through sustainable technologies. The partnership brings together TERI's expertise in sustainable agriculture and biotechnology with CSIR-IIIM Jammu's strengths in fermentation sciences and natural product research, aiming to promote sustainable and science-driven industrial applications.

CSIR-NIScPR and NIAS Sign MoU to Strengthen Collaboration in Science Communication and S&T Policy Research

CSIR-National Institute of Science Communication and Policy Research (NIScPR), New Delhi, has signed a Memorandum of Understanding (MoU) with the National Institute of Advanced Studies (NIAS), Bengaluru, on 25 May 2026. The MoU aims to strengthen collaboration in science communication & public engagement and S&T policy research. This collaboration will also promote joint research projects, exchange of faculty and research scholars, organising joint events and capacity-building programmes.

Dr Shailesh Nayak, Director of NIAS, in his welcome address, mentioned the importance of institutional collaborations for strengthening science communication and the need for joint capacity building programmes. Dr Geetha Vani Rayasam, Director of CSIR-NIScPR, discussed the importance of inclusive science communication, tailoring content effectively for target audiences, and the use of modern technologies to foster public engagement in science. Dr Rayasam further emphasised the relevance of ethical use of AI in communication in the Indian languages.

A brainstorming discussion on "Inclusive Science Communication in the Digital Era: Priorities, Practices and Policies" was organised after the MoU signing ceremony. Prof. DK Srivastava,

Dr Geetha Vani Rayasam, Director, CSIR-NIScPR, discussed the importance of inclusive science communication, tailoring content effectively for target audiences, and the use of modern technologies to foster public engagement in science. Dr Rayasam further emphasised the relevance of ethical use of AI in communication in the Indian languages.

Prof. Sanjay Srivastava, Prof. Rajani MB, Prof. Sisir Roy, Dr Anant Kamath and Dr VV Binoy from NIAS; Dr Geetha Vani Rayasam, Dr Kasturi Mandal, and Dr Paramananda Barman from NIScPR; Dr HS Sudhira from Gubbi Labs and Dr Suryesh K Namdeo, CSP, IISc shared their thoughts in the discussion.

The panellists highlighted the gaps and priorities for strengthening responsible and inclusive science communication and the need for SciComm policies suitable for the Indian context. Major recommendations include encouraging trust in science, training science communicators and journalists, managing misinformation effectively, building a larger community of public intellectuals, strengthening SciComm in schools, popularising citizen science, developing and implementing effective guidelines and promoting interaction between scientists, policy-makers and communicators.

CSIR-CRRI Strengthens Sustainable Urban Road Infrastructure through Strategic Partnerships across NCR

In a series of significant initiatives that are aimed at improving urban air quality and strengthening road infrastructure, CSIR-Central Road Research Institute (CSIR-CRRI), New Delhi, has entered into strategic partnerships with the Governments of Haryana and Uttar Pradesh, as well as the Municipal Corporation of Delhi (MCD). These collaborations focus on road dust mitigation, sustainable road development, scientific road maintenance, and the adoption of innovative technologies for urban infrastructure management across the National Capital Region (NCR).

CSIR-CRRI Signs MoA with Government of Haryana for Cleaner and Greener Urban Roads

CSIR-CRRI signed a Memorandum of Agreement (MoA) with the Government of Haryana on 8 June 2026 for implementing the project — "Standard Framework for Paving and Greening of Urban Roads". The project is to be carried out jointly with the School of Planning and Architecture (SPA), New Delhi, under the guidance of the Commission for Air Quality Management (CAQM). The project is to address road dust pollution — one of the major contributors to particulate matter in NCR cities.

The initiative will focus on developing scientifically designed road cross-sections, integrating greening measures within road corridors, improving maintenance practices through Road Asset Management Systems (RAMS), and promoting innovative road construction technologies. The programme is expected to support Haryana's efforts to create cleaner, safer, and environmentally sustainable urban road networks, which will also contribute to improved air quality across the region.

CSIR-CRRI signs an MoA with PWD, Govt of UP, for NCR-Wide Effort for Sustainable Road Development

Extending the implementation of the CAQM framework, CSIR-CRRI also signed a Memorandum of Agreement (MoA) on 10 June 2026 with the Public Works Department (PWD), Government of Uttar Pradesh, and SPA New Delhi. The project aims to operationalise the CAQM guidelines on paving and greening urban roads across the NCR districts of the state.

This collaborative effort will promote scientifically planned road infrastructure by introducing improved road design standards, dust-control measures through landscaping and greening, systematic maintenance using RAMS, and the deployment of advanced construction technologies. This project is also designed to reduce road dust emissions and improve the resilience of urban transport infrastructure in the state of Uttar Pradesh in the long run by incorporating environmental factors in urban road planning.

CSIR-CRRI signs an MoA with PWD, Govt of UP, for NCR-Wide Effort for Sustainable Road Development

In another major development, CSIR-CRRI and the Municipal Corporation of Delhi signed an MoA on 10 June 2026 for structural assessment of roads, construction quality supervision, and capacity building of municipal engineers and technical staff. Alongside this agreement, both organisations entered into a Technology Management Agreement for the deployment of ECOFIX, an instant pothole repair technology developed by CSIR-CRRI using processed iron and steel slag aggregates.

With a view to make Delhi's roads more robust and maintainable using scientific evaluation and ensuring quality standards. ECOFIX and other green technologies developed by CSIR-CRRI, contribute to the resource conservation and circular economy by enabling the use of industrial wastes for roads' rehabilitation. Further faster repairs, better condition of roads and reduced generation of dust will lead to a cleaner and greener environment.

These two collaborations also show CSIR-CRRI's increasing commitment towards helping evidence based infrastructure development planning and creating smart cities. Through collaboration CSIR-CRRI aims at ensuring that a resilient road infrastructure is available to the population across NCR and it comes along with sustainable development for the people.

R&D

Tourism and human activity push India's tigers towards stress and shape where tigresses choose to breed, finds new CSIR-CCMB study

First multi-reserve study on tigers for over two years shows shrinking spaces for tigresses to breed healthily.

For the first time, scientists have tracked tigers across different parts of India through four seasons over two years to understand how human presence impacts tiger wellbeing. Many previous studies by Dr G Umapathy at the CSIR-Centre for Cellular and Molecular Biology (CSIR-CCMB), Hyderabad, had established that tourism and other anthropogenic activities in tiger

reserves cause stress in tigers. This time, he led the team to systematically assess how human activities affect tiger breeding. The study, published in the Zoological Society of London journal *Animal Conservation*, is the first to combine non-invasive stress and reproductive hormone analyses from tigers across five major Indian tiger reserves: Corbett (Uttarakhand), Tadoba–Andhari (Maharashtra), Kanha and Bandhavgarh (Madhya Pradesh), and Periyar (Kerala).

The study highlights issues for each of these tiger reserves to inform better tiger management. The team analysed 610 genetically confirmed tiger scat samples, including 291 females and 185 males, collected between 2020 and 2023. They measured two key hormone markers in these samples, faecal glucocorticoid metabolites (a biomarker of stress) and faecal progesterone metabolites (an indicator of breeding activity in females). Across all reserves, tigers ranging close to tourism roads and in areas with greater human disturbance consistently showed elevated stress hormone levels.

A particularly striking finding is that tigers in the strictly protected core zones showed higher stress response to human-caused disturbance than those in the multi-use buffer zones. Buffer-zone tigers appear to have habituated to year-round human presence, whereas core-zone tigers register sharp spikes in stress when seasonal

Scat sample collection

A representative picture of tiger tourism

tourism enters these areas. This challenges the assumption that core zones are uniformly low-stress refuges. The effect was most pronounced in Tadoba and Bandhavgarh. "Tigresses prefer to breed in the quiet parts of the forests. However, it is becoming difficult to find such suitable areas. In Tadoba and Corbett, the buffer zones already have high tiger populations. It is concerning if the core areas of the forests also become stressful for the tigresses," said Dr Umapathy, Chief Scientist at CSIR-CCMB. "Not only is the reproductive success of tigers lower under stress, but the young ones will also grow up differently in such conditions."

"This study is a fine example of how molecular biology and physiology can be applied directly to one of India's most important conservation priorities," said Dr Vinay Nandicoori, Director, CSIR-CCMB. "CSIR-CCMB takes pride in housing the Laboratory for the Conservation of Endangered Species (LaCONES), which has grown into a national resource for non-invasive wildlife monitoring. We hope these findings will be useful to the National Tiger Conservation Authority and state forest departments as they continue to fine-tune the management of India's tiger reserves." "We are not arguing against wildlife tourism, which plays a vital role in conservation funding and supports rural livelihoods," said Dr Umapathy. "But our findings make a clear scientific case that the regulation of tourism, including vehicle numbers, safari timings, road density, and the protection of

breeding areas, needs to be informed by what the animals are actually telling us through their physiology."

The study suggests key management recommendations, including strict regulation of tourist vehicle numbers and prevention of vehicle crowding at tiger sightings; reduction of safari duration by approximately one hour in both morning and evening sessions; strengthened management of buffer zones, particularly in Tadoba and Bandhavgarh, to mitigate high anthropogenic disturbances; creation of additional water bodies along non-tourism routes to reduce dependence on roadside waterholes; and continuous, non-invasive physiological monitoring of known tigresses to identify and protect breeding hotspots. The other authors who participated in this study are Aamer Shoel, Vinod Kumar, Gudimella Anusha, and Andre Ganswidt.

Funding & permissions: Supported by SERB, Department of Science and Technology, Government of India (CRG/2019/000348). Sample-collection permissions granted by NTCA, MoEFCC, and the forest departments of Uttarakhand, Maharashtra, Madhya Pradesh and Kerala.

Bioeconomy from the Himalayas *Linking Labs, Land and Industry*

The CSIR-Institute of Himalayan Bioresource Technology (CSIR-IHBT), Palampur (HP), organised a one-day workshop titled "Bioeconomy from the Himalayas: Linking Labs, Land and Industry" in its premises on 10 April 2026.

Dr Sudesh Kumar Yadav, Director CSIR-IHBT, extended a warm welcome to the dignitaries and guests. He apprised them about the activities of the institute and how they are contributing to the development of the bioeconomy in the Himalayan region. He also emphasised various mission programmes of the institute that are directly contributing to the masses and their well-being.

Dr Shiv Kumar Sharma, National Organising Secretary, Vijnana Bharati, was the Chief Guest of the programme. He spoke about the rich legacy of the county and the need for revitalising our heritage and its outreach.

Dr Som Dev Bharadwaj, Former Head, Research Unit, Cancer Hospital & Research Division, Gwalior and Dr Narmada Prasad Shukla, Former Chairman, MP Pollution Control Board, were the Guests of Honour. Dr Som Dev spoke about belongingness and establishing linkages with nature for environmental consciousness. Dr Shukla emphasised the need for conserving biodiversity and tackling the issue of climate change, which is impacting one and all.

During the programme, a memorandum of understanding, under the Smart Village Mission, was signed with CNG Agro Care Private Limited, Kolkata. Two material transfer agreements were signed with M/s Nishant Biotech, Bilaspur, Himachal Pradesh. Also, two technology transfer agreements, one each with M/s Indiyum Foods Pvt Ltd and M/s Bhikhta Biotech, Shimla, Himachal Pradesh, were signed.

The occasion saw the release of a brochure on the Rose Scented Geranium variety, while seeds of aromatic marigold were distributed to the farmers. The workshop brought farmers, experts, scientists, and industrialists on a common platform and provided a forum for discussion, in addition to expert talks. An exhibition showcasing bio-based technologies developed by the institute was also put up. More than 150 participants joined the workshop.

CSIR-NEERI Celebrates World Environment Day

CSIR-National Environmental Engineering Research Institute (CSIR-NEERI), Jorhat, celebrated World Environment Day on 5 June 2026. Dr Rakesh Mishra, Director, Tata Institute for Genetics and Society (TIGS), Bengaluru & former Director, CSIR-Centre for Cellular & Molecular Biology (CSIR-CCMB), Hyderabad, was the Chief Guest and addressed the gathering on this occasion. Dr S Venkata Mohan, Director, CSIR-NEERI and Prakash Kumbhare, Scientist-F, CSIR-NEERI, were also present.

Addressing the gathering on "Environmental Surveillance and One Health," Dr Mishra highlighted the importance of environmental surveillance in protecting public health. He explained that metagenomics, which analyses genetic material present in environmental samples such as wastewater, air and soil, has emerged as a powerful tool for monitoring pathogens, Antimicrobial Resistance (AMR) and ecosystem health. Referring to wastewater surveillance during the COVID19 pandemic, he noted that environmental monitoring helped detect infection trends and viral variants at an early stage, enabling timely public health interventions. Dr Mishra emphasised that antimicrobial resistance is a growing global concern, and environmental surveillance can help track resistant pathogens and emerging health threats. He highlighted national initiatives such as the Alliance for Pathogen Surveillance Innovations (APSI) and the National One Health Mission, aimed at monitoring pathogens and AMR through wastewater, air and other environmental matrices. Emphasising the One Health approach, Dr Mishra stated that human, animal and environmental health are closely interconnected and require coordinated action. He also highlighted efforts to develop an India-specific One Health Index to support evidence-based policymaking and health preparedness.

Dr Mishra further noted that advances in environmental surveillance, genomics, diagnostics and data analytics are creating new opportunities for early detection of emerging health threats. He called for stronger collaboration among

Dr S Venkata Mohan, Director, CSIR-NEERI, delivering the welcome address

Dr Rakesh Mishra, Director, Tata Institute for Genetics and Society (TIGS), Bengaluru & former Director, CSIR-CCMB, addressing the gathering

scientific institutions, government agencies and communities to build resilient surveillance systems for a healthier and more sustainable future. In his welcome address, Dr S Venkata Mohan, Director, CSIR-NEERI, recalled his scientific association with Dr Rakesh Mishra in wastewater epidemiology and genomics for public health applications. He emphasised the need for science-driven solutions and stronger science-policy linkages to address environmental challenges. Highlighting CSIR-NEERI's work in air and water quality management, wastewater treatment, waste valorisation, and eco-restoration, he reaffirmed the institute's commitment to delivering sustainable environmental solutions for society. Dr Shalini Dhyani, Scientist-E, CSIR-NEERI, conducted the proceedings.

On this occasion, a Memorandum of Understanding (MoU) was signed between CSIR-NEERI and TIGS to strengthen collaborative research and innovation. Two White Papers, "Industrial Ecology in the Indian Context" and

Release of the White Paper on "Industrial Ecology in the Indian Context"

'Environmental Health Risk Atlas and Action Framework for the Vidarbha Region', were released. The book "*Fungal Diversity in CSIR-NEERI Nagpur*" was also unveiled. Certificates of Excellence were presented by the Chief Guest to students who participated in the Student Research & Innovation Expo in recognition of their innovative ideas and working science models.

APPOINTMENT

Dr Alka Rao appointed as First Woman Director of CSIR-IMTECH

Dr Alka Rao joined as a full-time Director of CSIR-Institute of Microbial Technology (CSIR-IMTECH) on 11 June 2026, and is the first woman scientist to lead the institute in the last 42 years. Dr Rao, who has more than two decades of research experience, succeeds Dr Souvik Maiti, Director of CSIR-Institute of Genomics and Integrative Biology (CSIR-IGIB), who was holding the additional charge of Director, CSIR-IMTECH since March 2026.

Dr Alka Rao, prior to her appointment as Director, CSIR-IMTECH, was on deputation from the institute since March 2024 to the Food Safety and Standards Authority of India (FSSAI) under the Ministry of Health & Family Welfare and served as the Advisor for the Science, Standards, and Regulation division at FSSAI, New Delhi. A trained protein engineer and a molecular microbiologist, she led critical food safety initiatives, regulatory frameworks, and international policy alignment for the Government of India at FSSAI. She has held the prestigious honour of representing 24 Asian member countries in the Codex Alimentarius Executive Committee twice. Since 2024, Dr Rao has served as India's National Contact Point for the Codex Alimentarius Commission and the World Trade Organisation's (WTO) Sanitary and Phytosanitary (SPS) Enquiry Point. In these capacities, she played a pivotal role in shaping global food standards and aligning India's scientific frameworks with international trade protocols.

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Her research group at CSIR-IMTECH holds an interest in pioneering research resulting in the discovery of rare bacterial glycoenzymes. The successful development of previously unknown enzymatic methods for the S-diglycosylation of proteins and peptides using bacterial enzymes with broad applications in food preservation, antibiotic resistance management, and industrial enzyme production has been the hallmark of her research group.

Dr Alka Rao received her PhD from the International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi and has published over 60 research papers and filed more than 15 national and international patents. She has successfully led multiple scientific projects and has been internationally recognised for her work, including being named as the CSIR "Women Scientist Achiever" for the year 2023. Beyond her laboratory work, she serves as an advisor to government bodies, including the Ministry of Environment, Forests, and Climate Change (MoEF&CC), the Ministry of Health and Family Welfare (MoH&FW), and the Ministry of Education (MoE), among others. A passionate advocate for inclusive STEM education, she also spearheads the Indian Sign Language Enabled Virtual Laboratory (ISLEVL) project, funded by CSIR under the Jigyasa programme, particularly for imparting science education for individuals with hearing impairments. Dr Rao brings a unique blend of scientific rigor, international diplomacy, and high-level regulatory experience. Her leadership is expected to propel the institute toward new global partnerships, drive translational research breakthroughs, and bridge the gap between the scientific community and national policymaking.

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