RIVERS REVISITED

FORUM
River Rejuvenation Platform.

Forum RRP is a global initiative that facilitates and accelerates the rejuvenation of dead river systems. Forum RRP guides companies, communities, cities, and countries in river rejuvenation by aligning nature, technology, and earth system dynamics.

. An IIT Alumni Council initiative .

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FORUM

rejuvenate
restore
regenerate

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Forum River Rejuvenation Platform

Forum RRP advises Companies, Communities, Cities and Countries on accelerating their journey towards river rejuvenation by aligning with the principles of earth systems dynamics and bridging the gaps between nature and technology connecting communities with natural ecosystems

Forum RRP delivers services for the design, execution oversight, and post-implementation monitoring of fluvial ecosystem restoration. These interventions are strategically engineered to reverse the degradation on impaired riverine systems, thereby bolstering their inherent resilience and adaptability capacity against the impacts of climate change and future uncertainty.

The seven stages in a typical Forum RRP project are:

- Preliminary Scientific Assessment & Scoping
- Comprehensive Diagnostics & Study Design
- Resource Allocation & Partners Selection
- Project Financing & Schedule Development
- Project Execution & Implementation Management
- Continuous Project Monitoring & Adaptive Management
- Impact Assessment & Post-Implementation Evaluation

Forum RRP's mandates primarily target organisations demonstrating a commitment of USD 100 million or more to their projects over a decade. Fees for such mandates range from 2% to 15% of the project cost.

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Nalanda Archeology Museum

Dating back several thousand years, the foundational journey of Indian civilisation was deeply intertwined with the evolution of human societies within its watersheds and river catchments. The rivers of India have long been the cradle of culture, economy, and ecological balance, nurturing life and shaping human settlements across millennia.

Since 2000, India has demonstrated remarkable advancement in the emerging sectors of sustainability and regeneration, evolving into a key contributor to global efforts in promoting nature-based solutions and a greener economy. With this broader vision the River Rejuvenation Program has emerged as a critical national priority, seeking to restore the ecological integrity of our rivers, secure water resources, and revive the natural systems that have sustained communities for generations.

This economic revitalisation, when combined with growing research and application of India's rich ancient knowledge systems, offers a powerful approach to regenerative efforts and the revival of earth systems. The Forum RRP reflects this potential, aiming to reverse the degradation of river ecosystems and to contribute meaningfully towards addressing climate change, while pioneering new paradigms in wellness, lifestyle, habitats design, and sustainable economic activity. Such transformation is driven by several factors, including India's expanding young workforce and increasing public awareness of ecological issues, reflected in a growing cultural ethos of sustainability and nature positive living.

Rejuvenating the Legacy - to Lead the Change !!

Rooted in ARNYA or VAN SANSKRITI (Forest Culture), India's profound cultural and spiritual legacy positions it to lead global systems transformation. We are moving beyond mechanistic and extractive technical designs towards a whole systems regenerative approach, one that fosters diversity, adaptability, resilience and long-term sustainability.

Drawing on deep ecological wisdom rooted in traditional Indian practices, our vision for river rejuvenation is inspired by time-honored methods such as sacred groves, agroforestry, and Vedic ecology. These traditions have long promoted conservation, reforestation, and organic farming-all vital for the healthy and renewal of our water systems.

Building on this cultural foundation, one that integrates ethical stewardship, ecological balance, and eco-centric rituals - the Forum RRP seeks to combine these ancient principles with modern scientific and technological advances. Our goal is to pioneer a new model for river rejuvenation that restores rivers, rebalances human needs with natural hydrological cycles, revive ecosystems, mitigate the impact of climate change, and secures a healthier, more sustainable future for generations to come.

The **Forum River Rejuvenation** Platform currently bring together leading scientific, government, non-profits, and for profit organisations:

- **IIT AC Foundation**
- **addGEO Foundation**
- **Central Pollution Control Board (CPCB)**
- **CEDAR**
- **Central University of Himachal Pradesh**
- **CSIR-CSIO**
- **Envirotech**
- **IISc**
- **JNCASR**
- **NIAS**
- **Lifestyle Wellness**

Contact us

to join the consortium

River Rejuvenation Benefits

River rejuvenation through long-term ecological restoration enhances agricultural productivity by stabilizing water availability and improving soil fertility. Natural engineering methods like reforestation and wetland revival reduce erosion, minimize nutrient loss, and support year-round irrigation, directly boosting rural economies and farm incomes. Watershed restoration projects have shown 20 - 40% rise in crop yields, translating into ₹15,000 - ₹30,000 per hectare annual increase in income for farmers.

Recharged aquifers through nature-based interventions reduce dependency on expensive, energy-intensive groundwater extraction. This lowers electricity and diesel costs for irrigation, enabling cost savings for farmers. Sustainable water supply also benefits industries, reducing operational risks and ensuring continuous productivity across sectors dependent on water. Studies in Madhya Pradesh and Maharashtra show annual savings of ₹8,000 - ₹12,000 per farm from lower groundwater extraction costs after restoration.

Restored rivers and ecosystems promote biodiversity, creating opportunities for eco-tourism, fisheries, and community-led conservation enterprises. These generate alternative livelihoods, especially for local and indigenous populations, fostering inclusive economic growth while maintaining the ecological integrity of riverine landscapes and their surrounding catchments The Namami Gange program created over 100,000 jobs in riverbank cleaning, monitoring, and eco-tourism, with each job yielding ₹1.5 - ₹2 lakh/year in income.

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“earth,
the only home
we’ve ever
known”

Rejuvenation Costs

River Regeneration, especially in highly degraded areas, can necessitate substantial financial investment. While restoration costs vary significantly based on the factors like the degree of degradation, local ecological conditions, and the specific restoration techniques employed. As a thumb-rule, it takes 3-5x the value of benefits and resources that got generated from the damage causing activity in the first place, Therefore, proactive conservation is imperative to prevent degeneration.

Rejuvenating severely degraded river ecosystems necessitates active intervention. This often involves measures like native species tree planting in riparian zones (the area along riverbank) and soil regeneration to improve water infiltration and reduce erosion. Studies have reported **costs in the range of INR 400000 - 500000 per hectares**. Based on this estimate rejuvenation of Kshipra would cost about **480-600 Crores for 12,000 hectares for a period of 3 years until 2028 Kumbha**. These costs are influenced by the severity of river ecosystem degradation, local ecological conditions, labor costs, and the specific restoration techniques employed. Therefore, a detailed baseline assessment of the Kshipra catchment is essential to determine accurate cost estimates for rejuvenating this degraded river. The scientific assessment of the baseline status and continuous monitoring of the entire catchment would require additional **10 - 15 Cr. Budget for medium- and long-term implementation will be worked after baseline assessment and analysis and will be communicated later.**

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Being built like

A Movement !!

Forum RRP has been established as an intergenerational movement, a collective force dedicated to restoring and revitalizing our rivers - rather than a conventional business. It is a living ecosystem that welcomes credible partners committed to driving meaningful change. Partners may contribute through time, resources, or financial support, joining a shared mission for a water-secure future. This inclusive approach foster collaboration across generations and sectors, bringing together individuals, communities, organizations, and institutions who are passionate about river health. The initiatives led by our partner organizations receive backing from some of the world's most reputable impact funding institutions, including the MegaFund of the IIT Alumni Council - India's largest social impact fund under SEBI's AIF regulations. Through this powerful network of collaboration, Forum RRP accelerates the adoption of regenerative solutions. By uniting traditional ecological wisdom with modern scientific advancement and leveraging sustainable financial support, the Forum RRP is making a lasting global impact on river ecosystems and fostering a more resilience and sustainable planet.

The Forum River Rejuvenation Platform welcomes as active members

CSR Foundations funded by conscientious business houses

NGOs working in this space

Global advisory firms willing to work pro bono on Forum RRP initiatives

Contact us

to join the consortium

1

Non-profit platform in volunteer-driven regenerative advisory

The Forum RRP is fundamentally structured as a non-profit, volunteer-driven initiative with a clear focus on achieving eco-social impact. The platform has been designed from the ground up for the revitalization of river ecosystem, one micro-catchment at a time, driven by a mission to create positive and sustainable change, rather then pursuing commercial gains. This ensures that resources, including financial investments, are directed towards maximizing the reach and effectiveness of river rejuvenation efforts.

10 +

Sustainability and regenerative ventures on client roster

Forum is already advising and working on new projects which envisage an eventual investment of over USD 100 Billion.

100+

Global technologists, innovators & venture capitalists as backbone

All of whom are alumni of the prestigious Indian Institutes of Technology. Assisted by 10,000+ interns from the Alumni Next Platform.

1000+

Annual rejuvenation target

With an annual river riparian zone and catchment rejuvenation target of 1000 hectares per year, we aspire to walk the talk

Rejuvenation & Restoration requirement

- accurate diagnosis
- adequate budgets
- appropriate science and technology
- accelerating impact strategy
- active project management

Forum RRP has been built ground-up to achieve this functionality.

Mission Mode

Forum RRP – a global advisory and implementation initiative – operates with a mission-driven urgency and an intergenerational vision. It is structured as a dynamic movement focused on tangible outcomes, rather than a conventional business. This approach fosters a fluid and evolving ecosystem where clients and experts collaborate, creating a collective knowledge base that drives transformative regenerative solutions.

1

Self learning and Autonomous

Forum functions as a dynamic, open-source platform, designed to empower river rejuvenation efforts collaborative knowledge sharing and technology. Emphasizing transparency, the Forum RRP does not seek confidential information, nor is any of our expertise restricted. By optimally integrating and blending diverse intelligence, sources-encompassing ecological data (natural intelligence), insights from traditional knowledge systems, technological advancement, and human expertise, we have been able to create a self-learning and autonomous platform. This innovative approach minimizes reliance on pre-formulated hypotheses or subject opinions, harmoniously blending intuitive insights with data-driven analysis to drive effective river rejuvenation outcomes.

2

Non-intrusive

Forum employs a non-intrusive approach to data collection, primarily leveraging ecological principles, geospatial and advanced technologies like geospatial and remote sensing systems. This minimize disturbance to sensitive river ecosystems while gathering curtail information for effective rejuvenation. Through the use of digital twin paradigms, the Forum creates living, virtual replica of river systems, seamlessly integrating data from real world. This enables the platform to extrapolate information across various parameters, offering a comprehensive understanding of complex river basin dynamics. By fusing datasets into open source, standard compliant databases - the Forum's models generate a rich, layered data set which can be randomly accessed through AI tools, enabling a wide range of analysis, simulations, and predictivity modeling for river rejuvenation.

The self-learning Forum RRP platform is rapidly accumulating expertise and generating databases that surpass the capabilities of traditional or manual updated systems. The resulting richness of this accumulated wisdom, knowledge, dataset and related analytics provides panoramic capabilities to the forum.

3 Nature Capital Focus

As the global economy shifts from polluting to regenerative practices is changing capital allocation. As environmentally damaging industries are removed from global stock indices, a new generation of industries dedicated to the planet's rejuvenation capabilities will emerge. This paradigm shift will see significant investment directed towards initiatives like river rejuvenation, transforming waterways from polluted liabilities into thriving, life-giving assets. This focus on natural capital recognizes the economic as well as ecological value of healthy rivers, paving the way for sustainable prosperity.

4 Biodiversity and Nature Infrastructure are the new economic order

As the new economic order embraces Biodiversity and Nature Infrastructure, this Forum platform will be key. It is designed to embed earth and nature intelligence at the heart of its value, acting as a crucial resource. This creates a powerful multiplier effect. The insights gained directly contribute to more effective and scalable river rejuvenation programs, demonstrating the real-world economic and ecological returns of investing in nature.

5 Comprehensive

With Forum, you can be assured that you can unfold profound layers of wisdom and knowledge, meticulously revealing the intricacies of river systems. This allows an organization to move seamlessly from the high-resolution remote sensing data captured at the surface to understanding the deep-seated, underlying causes impacting a river's health. Forum continuously monitors the direct cause-and-effect relationship between actions and their outcomes, driving successful and sustainable river rejuvenation.

In a regenerative approach, the cost and complexity of bespoke solutions continue to rise, while the reach and depth of an open-source knowledge platform expand. This growing collective intelligence drives exponential reductions in the cost of data and related services, making regenerative solutions more accessible and scalable over time.

By cultivating an ecosystem of credible and well-funded project partners, Forum RRP gains unparalleled access to extensive infrastructure facilities and specialized, trained manpower. This enables the cost-effective and timely execution of large-scale river rejuvenation and ecological restoration projects that deliver demonstrable efficacy and impact. Subsequent Impact assessment studies will be carried out to assess and confirm these outcomes, solidifying the success of our river rejuvenation efforts.

A ANALYSE

B BLUEPRINT

C CO-CREATE

A
ANALYSE

The first step in a regeneration exercise is a detailed diagnosis of the status quo - including an assessment of carbon footprint and natural restoration and regeneration potential.

B
BLUEPRINT

The second step is a detailed project report outlining a plan to initiate and sustain a regeneration and restoration program. This includes selection of technology partners and executing contractors.

C
CO-CREATE

The third step is the establishment of a Project Management Unit to oversee execution of the Plan.

FORUM

Diligenced Partner Networks

Startup Ecosystems

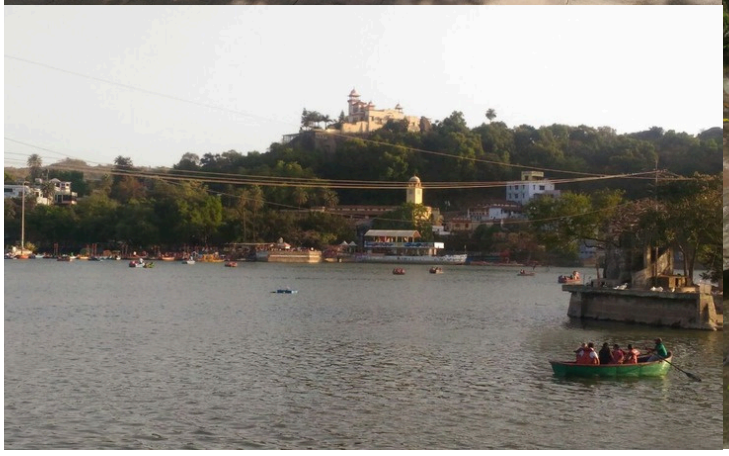
India hosts one of the world's largest and most dynamic startup ecosystems, encompassing startups, mentors, incubators, venture capitalists, and essential service providers such as accountants, lawyers, and IPR specialists. The IIT alumni community stands as a powerful force within this ecosystem, driving innovation and impact. Forum RRP collaborates with hundreds of startups to tackle complex challenges—from remote, non-intrusive automated data collection to advanced simulation models and cutting-edge sensor technologies—accelerating regenerative solutions for a sustainable future.

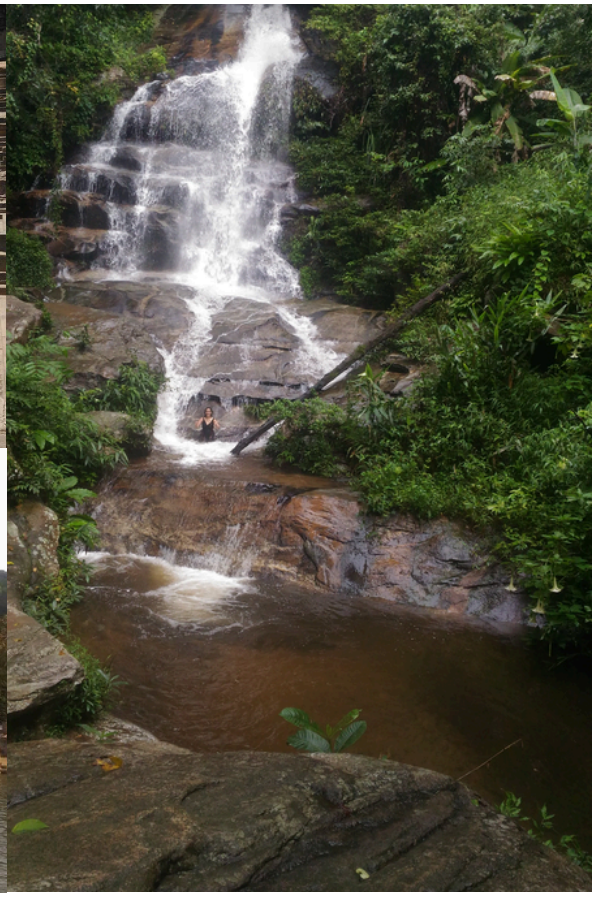
Scientists & Academia

The institute mission of the IIT Alumni Council (www.institute.org.in) is home to over forty thousand IIT alumni, of whom more than one thousand have earned a PhD or equivalent doctoral or postdoctoral education. These include leading researchers in space, climate, environment, biodiversity, telecom, data science, remote serving, AI, and tens of other specialisations.

Industry as Force Multipliers

Partner members of Forum RRP now collectively have access to commercial organisations with over USD 1 billion of specialised equipment. This includes specially retrofitted aircraft, private satellites, proprietary vans etc. The partner base includes companies that have helped build some of the largest street view and mapping platforms in the world.





KSHIPRA

Our Laboratory

FORUM
River Rejuvenation Platform.

Our living laboratory at Kshipra focuses on river rejuvenation through ecological restoration, hydrological modelling and bioengineering. Initiatives. By collaborating with local communities, the forum also aims to restore biodiversity and improve ecosystem health and livelihoods in the Kshipra river basin

Project Objective

Rejuvenation of Kshipra River

The Kshipra River is currently experiencing critically low flow levels and severe pollution. Excessive groundwater extraction has led to the river running dry for 5-6 months, especially during the non-monsoon months. According to the CAG and Madhya Pradesh Pollution Control Board reports, most monitoring points along the river - including key religious ghats - fall under Class “D,” making the water unfit even for bathing. **The Kshipra River Rejuvenation Project aims at revival and rejuvenation of Kshipra River** in the next 15-20 years, with a **short term objective** of **revival of the river channel in the upper catchment** of Ujjain city to be able to have water **during Kumbha 2028.**

Proposed Solutions

Multi-function Multi-Benefit Design

Proposed solutions for the Kshipra River include nature-based bioengineered approaches that follows a **multi-functional, multi-benefit design** simultaneously improving water quality, enhancing biodiversity, supporting livelihoods, and increasing climate resilience for a few decades. The overall rejuvenation plan would span over a period of 15-20 years (next 2 Kumbha till 2040) in three phases, **near term**, **medium term** and **long term**.

Scientific assessment of the baseline conditions would be done for proper diagnosis and development of solutions. After the assessment catchment prioritization would be done for critical catchments to implement the first phase in near term. The solutions for the **near-term interventions** would therefore include wetland creation, aquifer recharge and bio-remediation of **prioritized critical micro-catchments**, **medium-term strategies** such as riparian buffer restoration and groundwater recharge zones, and **long-term measures** like floodplain rewilding and decentralized wastewater treatment.

Proposed Activities

Reconnaissance Survey of about 1 month by the team to identify priority catchments of about 12000 hectares upstream to Ujjain city using available free and open source data. Prioritization of catchments will be done based on the water balance studies, hydro-geology and ecology.

Once the catchments are prioritized, detailed scientific assessment of the catchments will be done using very high resolution digital elevation and satellite/aerial remote sensing data as well as field data on geo-hydrology and aquifers, especially to understand the U-tube structure in next 3 months.

Implementation activities for the near-term (2025-28) plan such as construction of water harvesting sites like crescent ponds, check dams, percolation tanks etc. Forest and riverine restoration in the priority catchments. Shift in cropping patterns from annual to tree based cultivation. Water auditing and water treatment activities with community participation.

Scientific Assessment of the entire Kshipra Basin and scaling up of implementation activities in other catchments of the entire river system in two phases of medium term (2028-35) and long-term (2035-40).

Near term phase: Activities & Outcome

Before Kumbha 2028

With the **near-term (2025-28) solutions** for Kshipra River rejuvenation that include **catchment assessment, surface water diversion, groundwater recharge structures, wetland and pond restoration, afforestation, eco-friendly farming, and community forestry in 12000 plus hectares of upper catchment**. Additionally **waste management, recycling, and treatment plants will address both surface and ground water pollution while river remediation** efforts enhance water quality and overall ecological health of the river. The outcome of the near term activities is to ensure optimal and clean water flow in Kshipra river during **Ujjain Kumbha in 2028**.

Proposed Cost

Reconnaissance Survey Budget: **25-30 lakhs** for field visit and lab analysis for one month for 8 persons at an average cost of 15000 per day.

Scientific assessment of priority catchments using high resolution digital elevation model and satellite/aerial remote sensing data and field observations for 12000 hectares or 120 square kilometers in next 3 months would require **7-10 Cr.**

Implementation activities in the prioritized catchments of 12000 hectares/120 square kilometers would require about **480-600 Cr.** for 12,000 hectares for a period of 3 years until 2028 Kumbha @ **4 - 5 lakhs** per hectare for the 3 years.

Budget for long-term activities in the next 10-12 years would require investment to the tune of **1200-1500 Cr** to revive the entre Kshipra River by 2040 Kumbha.

Proposed Benefits

Near Term Benefits - by Kumbha 2028

With the proposed solutions we are confident, that **Mata Kshipra** will **reappear by 2028 Kumbha** and will **revive and start flowing in its full capacity by 2040 Kumbha**. Economic boost to spiritual tourism, cultural and heritage sites, local entrepreneurship, employment generation. Ecological and environmental restoration, improved water table and water quality, improved soil health and increased resilience to climate change.

Kshipra River Rejuvenation Benefits

Rejuvenation of 12,000 hectares in the upper catchments of the **Kshipra River** near Ujjain can yield long term ecological outcomes.

- **Ecological and Environmental Benefits**
  - Significant **rise in groundwater levels by 5 to 10 meters** due to improved infiltration from rainwater harvesting structures, check dams, and increased vegetation cover.
  - **Soil erosion**, currently estimated at around 15 tonnes per hectare annually, **could be reduced by up to 70%,** enhancing soil health and agricultural productivity.
  - **Surface water storage** would improve dramatically, with up to **15–20 million cubic meters of additional capacity** created through constructed ponds, recharge pits, and percolation tanks.
  - **Vegetative cover** in the region, which is currently less than 20%, **could increase to over 60%** through afforestation, agroforestry, and riparian zone restoration.
  - In terms of **climate benefits, carbon sequestration rates** would increase **from around 0.5 tonnes of CO_2 per hectare** per year to approximately **2.5 tonnes, resulting in the capture of about 30,000 tonnes of CO_2 annually.**

Kshipra River Rejuvenation Benefits

Rejuvenation of 12,000 hectares in the upper catchments of the **Kshipra River** near Ujjain can yield transformative economic outcomes.

- **Economic Benefits**
  - Agricultural output could increase threefold, with farm incomes rising from roughly **₹60 crore annually to ₹180–200 crore** due to improved moisture availability and fertile soils.
  - The integration of horticulture and agroforestry practices would contribute an additional **₹40–50 crore** annually.
  - Fodder availability would grow significantly, adding around **₹30 crore per year**, benefiting livestock-based livelihoods.
  - **Employment opportunities** through wage labor, eco-tourism, nurseries, fisheries, and non-timber forest product (NTFP) collection would expand the local economy **by ₹60–80 crore annually**.
  - Furthermore, the intervention would reduce flood and drought-related damages, saving an estimated **₹25 crore per year.**
  - Cleaner river flows and greener landscapes would also boost **eco-tourism and pilgrimage-related income** from ₹10 crore to **₹25–30 crore annually.**

Kshipra River Rejuvenation
Return on Investment

Rejuvenation of 12,000 hectares in the upper catchments of the **Kshipra River** near Ujjain will provide the following return on investments (ROI).

- **Return on Investments**
  - In total, the economic benefits from the rejuvenation initiative are projected at ₹250–300 crore per year.
  - With an estimated implementation cost of ₹600 crore (₹5 lakh per hectare), the break-even period would be just 2.5 to 3 years.
  - Over a 10-year horizon, the initiative could sequester 300,000 tonnes of CO_2, which is potentially tradable in carbon markets for ₹30 - 40 crore.
  - Additionally, the project would secure drinking water sources for over 100 villages and ensure reliable base flows into the Kshipra River, particularly during dry months.

This makes the rejuvenation of the Kshipra catchment not just an environmental imperative, but a sound investment in regional resilience and prosperity.

Proposed Benefits

Long Term Benefits - by Kumbha 2040

Socio-cultural, Religious tourism boost like Ayodhya and Prayagraj, Ujjain to become the hotspot of spiritual and religious congregation. Ecological integrity of the entire Kshipra River Basin will be restored ensuring high climate resilience to extreme climate events.

Scope and Feasibility

Where Has the Water Gone

Identify the reasons for drying up of river channel at the source. Together with main channel, focus on large tributaries and their role in maintaining the overall flow in the river.

Level of surface and ground water exploitation in the entire catchment for agriculture. Extent of decrease in ground water table in the last 20-30 years.

What is the broad estimate of the water balance of the micro catchment and the entire catchment. Soil Water Assessment Tool (SWAT) for entire Kshipra basin by simulating the quality and quantity of surface and ground water,

SWAT also provides assessment of environmental impact of land use practices. Impact of existing water quality on river flow.

Scope and Feasibility

Catchment Restoration

Mapping the entire catchment area with contours and DEM together with the extent of natural vegetation and deforested lands both in notified as well as non-notified forest areas in the upper catchment

3D map will also identify the natural dendritic drainage/rivulets. Most would have been obliterated due to cultivation but their restoration will expedite river rejuvenation.

Mapping the entire Kshipra river basin from its source to where it merges with Chambal river. Map the total cultivated land as well as river bed and riparian zone encroachments. Mapping of existing dams and check dams.

Delineation of the sub-catchment watersheds. Soil characterization to understand the water holding capacities and propose suitable SMC activities in the entire catchment.

Scope and Feasibility

Surface Water Hydrology

Mapping of the river and stream channels which comprises the surface natural drainage. Mapping of the main river channels from 1st order to 4th order streams.

Mapping of ponds, wetlands and lakes in the catchment both in the riparian zone and beyond.
Identify deeper pools in the river bed that hold water in the lean season & sustain aquatic diversity

Rainfall trends in the catchment in last 25 years. Flooding trends in the floodplain areas.

Stream flow runoff trends in the Kshipra at Ujjain and other places and in any streams feeding into the same

Scope and Feasibility

Groundwater Recharge and Restoration

2d and 3D Mapping of groundwater aquifers and their recharge zones.

Detail understanding of the u tube structure and the geological setting. Need to restore natural vegetation and clearing of natural drainage lines to ensure draining of rain water in the inlet tube.

Identification and mapping of the high recharge zones in the upper catchment This will help us to create systems to accelerate ground water/ aquifer recharge.

Condition of the aquifers – extend to dewatering, and projections of the implications of current use trends for the next twenty -thirty years in the business as usual and conservation use scenarios.

Scope and Feasibility

Riparian and Forest Vegetation Restoration

Identification of native species of grasses, shrubs, and trees in both riparian and upper catchment region for forest regeneration in partnership with farmers and communities.

Riparian zone restoration and conservation. Develop partnership models with riparian farmers and communities to identify, implement and sustain good practices. Every 15-30 meters there can be few rows of vettiver grass to check soil and water run off

Bringing back the denuded areas to natural vegetation. Extent of Community institutions in the forests – FRA Community Forest Rights and JFM Committees.

Community engagement and participation. Awareness and outreach as well as integrate Assisted Natural Regeneration (ANR) forestry activities. Develop Incentive Based mechanisms to implement and sustain changes in landuse

Scope and Feasibility

Agriculture and Landuse

Identify the existing cropping pattern and their role in ground water depletion. Evaluate crops and cropping practices for their soil moisture and erosion control impact, and promote lower water use and less erosive crops & practices

Identify appropriate crops based on the agro-climatic conditions of region and propose relevant Does cultivation follow across the contour or along the contour? Across contour cultivation reduces soil and water run off.

Time series LULC (Land Use /Land Cover) dynamics using machine learning models and remote sensing.

Every 15-30 meters there should be few row of vettiver grass to check soil and water run off.

Scope and Feasibility

Water Quality Assessment

Water quality assessments of surface water in the rivers and groundwater for main channel as well as the tributaries – before they join the main channel

Contribution of industry, urban sewage, and agriculture runoff to the deterioration of water quality

Water quality improvements strategies, such as bioremediation.

Water quality monitoring through IoT sensors for DO, BOD, COD, Radioactive Nuclei, Fecal Coliform, pH, TDS

Near Term Plan

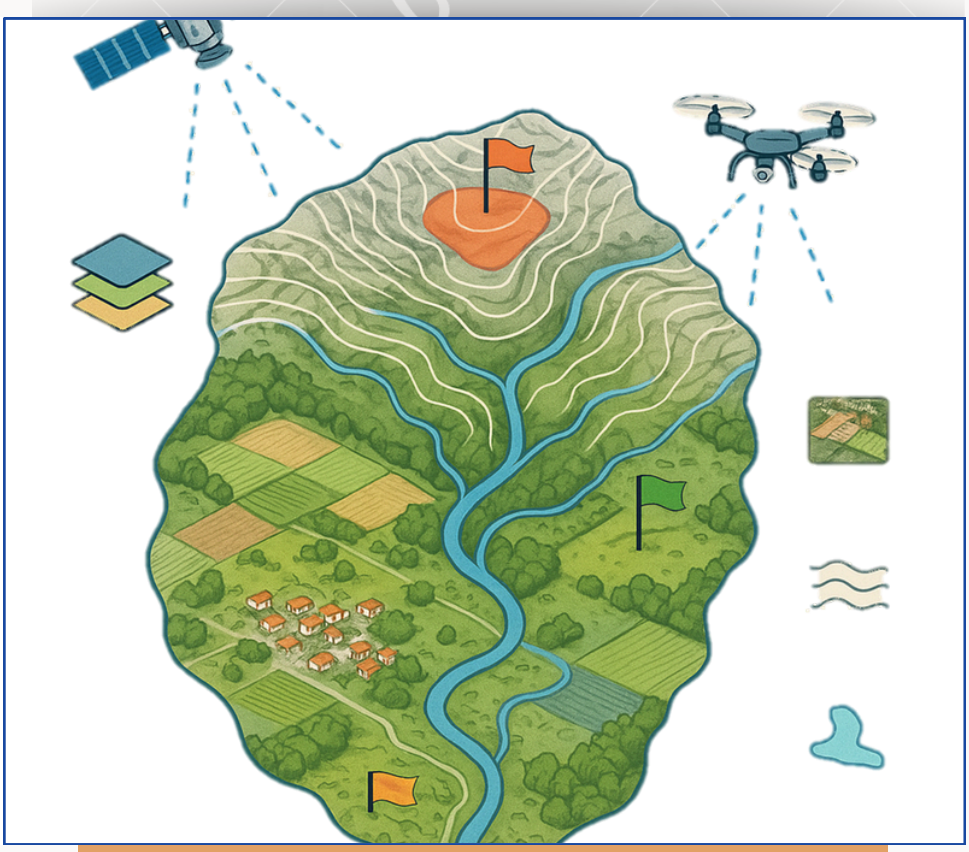
2025-2028

Near Term Activities for River Rejuvenation:

- Baseline Assessment & Catchment Prioritization
- Implementation Activities in first Phase (till March 2028)
  - Check Dam, Recharge Pits and Percolation Tank Construction
  - Pond and Tank Restoration
  - Ground Water Recharge
  - Assisted Natural Regeneration (ANR)
  - Wetland Conservation and Restoration
  - Environmental Friendly Farming Activities
  - Social Forestry and Community Led Initiatives
  - Industrial and Municipal Waste Management and Waste Recycling Strategies in the Catchment Area
  - Water and Waste Water Treatment Strategies
  - River Remediation

Baseline Assessment & Catchment Prioritization

July 2025 - Jan 2026 (6 months)



The proposed activities for the Baseline Assessment include Catchment Mapping and Prioritization, Geological and Landform Analysis, Hydrological, Groundwater and Aquifer Analysis, Forest and Riparian Ecosystem Analysis, Agriculture and Land Use Analysis and Waste Management and Pollution Analysis

Baseline Assessment & Catchment Prioritization Activities Timeline

Baseline and Catchment prioritization will be divided into two categories upper catchment to Ujjain and lower catchment. For Kumbha 2028, implementation activities in upper catchment will be undertaken after one month after the project kick off and getting preliminary assessment from existing data and studies and identified priority catchments

Water Balance Studies will be undertaken to understand the water cycle flow between the biotic and abiotic components. Water budgeting will also be conducted based on the availability of water in each ctahcment.

Farmer sensitization and awareness for transitioning from water intensive crops to tree-based agriculture will be undertaken right at the outset of the project. Every farm would be allocated a certain water budget and auditing needs to be undertaken on a regular basis to ensure that water demand doesn't overshoot the supply.

Baseline Assessment

Entire Catchment information such as watershed, micro-watershed, river and streams, cultivated land, forested and deforested land, aquifers, geomorphology, micro level geology.

River flow, flood frequency, historical changes in the river course, river siltation rate using echo sounding, water table, rainfall, drought, runoff, aquifer recharge status, ground water extraction for multiple usage, ground monitoring network.

Geological, Structural and Tectonic Characterization, Rock and soil analysis, Sediment Dynamics Assessment, Hydro-Geological Characterization, Drainage Basin Morphometric Interpretation, Subsurface Process-Climate Linkage.

Engineering Geological Advice for Intervention Design, Paleo-Environmental Reconstruction for Baseline Conditions, Geological Controls on Contaminant Pathways.

Baseline Assessment

Surface Geophysical methods including electrical resistivity to investigate ground water resources for identification of potential aquifers.

Forest Cover with canopy density, Evapotranspiration, Forest/Vegetation types, Notified and non-notified forest, RoFR land, Riparian Vegetation, Existing Biodiversity.

Existing crops and cropping practices, total cultivated area, river bank encroachments, extent of sand mining, existing land use and land cover, extent of urbanization, existing industrial areas

Existing water quality assessment, pollution sources, extent of pollution, including using mobile units

Catchment Prioritization

Watershed Delineation and Sub-catchment Mapping
Using high-resolution 3D DEM data, delineate the entire Kshipra River basin into watersheds and sub-watersheds to identify hydrological boundaries, drainage patterns, and flow accumulation paths essential for prioritizing interventions.

Slope and Terrain Analysis
Analyze slope gradients, aspect, and elevation zones to determine erosion-prone areas, recharge zones, and potential locations for check dams, recharge pits, and percolation tanks. Steep slopes with poor vegetation need urgent attention.

Land Use / Land Cover (LULC) Change Detection
Use multi-temporal remote sensing imagery to assess changes in forest cover, urban expansion, agriculture, and water bodies. This helps identify degraded zones, encroachments, and areas with high runoff potential or low infiltration.

Catchment Prioritization

Soil Erosion Risk and Sediment Yield Assessment
Combine rainfall data, land cover, slope, and soil types derived from RS-GIS to generate erosion risk maps using models like RUSLE. This supports prioritization of soil conservation structures in high sediment-yielding micro-watersheds.

Water Budget Estimation
Integrate 3D DEMs with satellite-based rainfall, evapotranspiration, and streamflow data to simulate surface runoff, infiltration, and groundwater recharge potential, enabling identification of catchments with low water retention and high flood/drought vulnerability.

Forest Cover and Ecological Condition Assessment
Map forest cover, vegetation density (NDVI), and habitat fragmentation to identify ecologically degraded zones. Prioritize catchments with critical biodiversity loss, low canopy density, and potential for Assisted Natural Regeneration (ANR) and social forestry.

Geological & Landform Analysis
geomorphological context

The Kshipra River's unique geological and geomorphological context, stemming from its origin in the Vindhya Range and flow across the basaltic Malwa Plateau, necessitates a targeted action plan based on comprehensive geological studies for effective rejuvenation. Understanding the river's underlying physical framework is important to designing sustainable interventions that work with its natural processes.

The key components of our geological studies action plan are as follows:

Detailed Geological and Geomorphological Mapping: In-depth mapping of the Kshipra basin, will be conducted by focusing on the prevalence of hard, massive basalt, including its compacted columnar joints. This will define the eroded structural and denudational landforms, clarifying how these influence the riverbed's stability and water interaction.

Structural and Lithological Influence Analysis: To assess how structural, physiographic, and lithological factors dictate the Kshipra's dendritic and rectangular channel patterns and its low sinuosity. This understanding is critical for planning natural channel restoration that aligns with the inherent geological controls.

Sediment Dynamics Assessment: Given the low sinuosity and coarse drainage texture indicating resistant sub-soil material, we will analyze sediment deposition patterns, particularly the formation of lateral and channel bars. This will guide strategies for managing sediment load, controlling erosion, and restoring appropriate riverbed habitats.

Hydro-Geological Characterization: Building on the understanding of the basaltic formations and their compaction, we will investigate how these geological conditions influence groundwater movement and storage. This includes understanding their impact on the river's semi-arid and tropical dry/wet climatic zones, crucial for managing groundwater resources that local communities and ecosystems depend on (e.g., around Dhar, Ujjain, Dewas districts).

Drainage Basin Morphometric Interpretation: Further analysis of the low drainage density (0.35 km/km²) and stream frequency (0.50 km/km²), along with the high mean bifurcation ratio (4.15), will be conducted. This will provide deeper insights into the highly resistant sub-soil material, low relief, and dissected nature of the sub-basin, informing water retention and runoff management strategies.

Subsurface Process-Climate Linkage: The analysis of complex subsurface physical processes, including geological conditions, interact with climatic changes and land use/land cover patterns to influence the overall hydrology of the Kshipra sub-basin. This includes understanding the distribution of soils, vegetation, and groundwater conditions along Kshipra River basin.

Geohazard Identification and Mitigation Planning
Targeted assessments will be conducted to identify potential geological hazards such as zones of active bank erosion, areas prone to rockfalls (especially where columnar jointing is observed), and regions susceptible to landslides. These insights will inform the development of site-specific mitigation strategies aimed at enhancing long-term channel stability and protecting riverbanks from future hazards.

Geological Evidence of Geohazards
Dating the evidence of active tectonics is crucial for understanding the history of past geohazards, such as earthquakes, landslides, and abrupt river course shifts that have shaped the river landscape. Through geological and landform analyses, including trenching, fault scarp mapping, and sediment dating (using techniques such as radiocarbon and optically stimulated luminescence (OSL), we can identify tectonically unstable zones and assess their influence on river morphology. These insights offer a foundational context for sustainable river rejuvenation, allowing interventions to be aligned with the natural tectonic and geomorphic evolution of the region, and avoiding high-risk zones.

Engineering Geological Advice for Intervention Design: The critical input on the engineering properties of local geological materials (e.g., basalt aggregates, soils) for use in any planned restoration structures, such as check dams, bank stabilization works, or constructed wetlands will be crucial to analyse. This ensures the structural integrity and environmental compatibility of all built interventions.

Paleo-Environmental Reconstruction for Baseline Conditions: By analyzing geological records, such as sediment cores from floodplains and oxbow lakes, we will reconstruct the Kshipra’s historical river behavior, flood regimes, and natural ecological states. This paleo-environmental insight will offer critical baseline data to guide the setting of realistic, ecologically sound targets for the river’s long-term rejuvenation

Geological Controls on Contaminant Pathways: By investigating how the Kshipra's distinctive geological structure, especially its basalt fracture patterns and varying permeable layers, influences the transport and natural attenuation of pollutants within the basin's groundwater and surface water systems. Dye-based tracking will be an indispensable foundational technology in this effort. By deploying precise tracers, we can directly visualize and map these hidden, geologically-controlled flow pathways. This lets us pinpoint zones of rapid contaminant migration or natural filtration and quantify the connectivity between pollution sources and the river. This detailed, combined understanding, integrating geological insights with real-time hydrological tracing, will inform the precise location and design of all pollution remediation efforts, optimizing their effectiveness by working with, and leveraging, the river basin's natural geological filters.

Groundwater and Aquifer Analysis

Bringing the Kshipra River back to life truly depends on understanding the groundwater systems that sustain it. The Kshipra is a groundwater-fed river, meaning its flow relies heavily on the underground water supply, which in turn is very much dependent on the monsoon rains. This is evident in its historical origin, often described as emerging "from the womb of the earth," and its current non-perennial state, frequently running dry for months. This drying up highlights the critical role of groundwater discharge in sustaining its flow, particularly as over-exploitation for agriculture, domestic, and industrial uses has severely depleted these vital underground reserves. This dependency, especially in a basalt-dominated terrain where water flows through complex networks of fractures, porous zones, and weathered rock layers, underscores the urgent need for a deeper understanding. The Malwa Plateau has its own unique hydrogeological characteristics, like varying permeability and limited natural replenishment, which means we need to deeply investigate how the aquifers behave, the connections between recharge and discharge, and the overall water quality.

Here's our baseline assessment plan for analyzing the groundwater and aquifers:

Aquifer Typology and Zonation: Our initial focus will be on classifying the various aquifer types present within the Kshipra basin. This involves distinguishing between unconfined aquifers (directly exposed to the surface), confined aquifers (enclosed between impermeable layers), and perched aquifers (localized, shallow water-bearing zones resting above the main water table), all within the basaltic terrain. This classification is essential for identifying critical water-bearing zones, estimating their storage potential, and locating key recharge areas that should be prioritized for conservation and artificial recharge interventions.

Fracture and Lineament Mapping for Groundwater Pathways: Using remote sensing and field validation, we will map structural discontinuities such as fractures, joints, and lineaments to identify preferential groundwater flow paths. This will support the identification of groundwater recharge zones and potential aquifer connectivity between uplands and river valleys.

Aquifer Recharge Studies and Water Balance Assessment: Through monitoring wells and isotopic analysis, we will estimate recharge rates, groundwater residence time, and seasonal water table fluctuations. This is crucial for designing artificial recharge interventions such as percolation tanks, recharge shafts, and check dams in hydrologically strategic locations.

Groundwater Quality and Contaminant Risk Assessment: Systematic sampling and analysis of groundwater for chemical and microbial contaminants will be carried out to understand the extent of pollution from agricultural runoff, untreated sewage, and industrial effluents. Special emphasis will be placed on tracing nitrate, heavy metal, and pathogen transport in relation to aquifer vulnerability.

Subsurface Hydraulic Connectivity with the River: Evaluation of the interactions between the Kshipra River and adjacent aquifers to determine losing, gaining, and disconnected stretches along the river course will be conducted. This will be informed by integrated piezometric monitoring, flow measurements, and tracer studies. The insights will directly inform restoration strategies such as baseflow enhancement.

Aquifer Storage and Yield Capacity Assessment: By conducting pumping tests and hydrogeological modeling, we will determine the safe yield and storage potential of aquifers under current and projected stress. This data will guide sustainable water use planning for both domestic and agricultural needs within the basin.

Climate Resilience and Groundwater Dependence Modeling: The long-term impacts of changing rainfall patterns and land use on aquifer recharge and groundwater sustainability will be modeled. This will help in framing adaptive groundwater management policies that are robust under future climate scenarios.

Community-Based Groundwater Monitoring and Management: The scientific understanding will be integrated with community-level participatory groundwater monitoring programs. This empowers local stakeholders with the tools and knowledge to manage groundwater sustainably and build resilience against seasonal shortages.

Forest and Riparian Ecosystem Analysis

Forest cover mapping of the riparian & micro catchments to assess the extent of forests and density of forest cover in the catchment and riparian zones - using satellite image analysis and high resolution drone imagery.

Forest type and vegetation analysis by undertaking forest and riparian zone surveys and laying forest plots to generate a forest vegetation baseline - including list of species and basic metrics to assess the forest and biodiversity health.

Identify patches of existing natural vegetation in riparian and other zones to prioritise for protection and use as reference for identifying herbs, shrubs, trees native to different ecological niches and zones

Identify the land tenures and ownerships for the forest vegetation patches and areas under community protection

Agriculture and Land Use Analysis

Designing Riparian Buffers for Farmlands
LULC and cropping data near riverbanks inform the design of vegetative buffer zones, helping reduce agricultural runoff, stabilize soils, and improve water filtration in support of river ecosystem rejuvenation.

Agricultural Land Use Planning
Integrating cropping analysis with LULC in river basin plans supports sustainable agriculture, optimized land use, and eco-sensitive zoning, aligning food production with river health and long-term environmental goals.

AI/ML for Cropping Trends and Land Degradation
AI and ML tools analyze long-term cropping trends and land degradation patterns, enabling adaptive agricultural planning, soil conservation, and afforestation strategies for resilient river catchment restoration.

Agricultural Pollution Sources Identification
Agricultural and cropping pattern analysis using LULC data helps identify zones contributing to runoff, fertilizer leaching, and pesticide contamination, guiding targeted actions to reduce river pollution and enhance water quality.

Waste Management Analysis

1. Source Identification and Mapping

· Pollution Source Inventory: Identify point (e.g., industrial discharge, sewage outfalls) and non-point (e.g., agricultural runoff, urban stormwater) sources of pollution.

· Geospatial Mapping: Use GIS tools to map waste generation and drainage networks within the river basin.

2. **Solid Waste Management**

· Segregation at Source: Promote household-level waste segregation into biodegradable, recyclable, and hazardous components.

· Collection and Transportation: Ensure regular and covered waste collection, especially in riverbank settlements.

· Recycling and Composting: Establish decentralized composting and recycling units near high-waste generating zones.

· Prohibition of Dumping: Strict enforcement against illegal dumping of municipal waste along riverbanks or floodplains.

· Agricultural Waste Management

3. Mapping Pollution Hotspots:
Use of remote sensing, GIS and chemical tools helps in mapping high-impact zones such as untreated sewage outfalls, industrial drain discharge points, urban slum clusters, and illegal dumping grounds. This geospatial data provides a visual layout of critical intervention areas.

4. Industrial Effluent Survey using Mobile Environmental Lab:
A detailed inventory and audit of industries (especially red and orange category units) within the catchment is necessary to assess the quantity and composition of effluents being released. This includes on-site inspection of Effluent Treatment Plants (ETPs) and checking for compliance with pollution norms

5. Municipal Waste Flow Study using Mobile Environmental Lab:
Assessment of urban and rural solid waste generation, existing collection efficiency, and treatment/disposal mechanisms (e.g., STPs, open dumping, informal recycling) provides insight into non-point source pollution feeding into the river.

6. Microplastic and Emerging Contaminants:
Special focus must be placed on assessing microplastic contamination, especially from untreated household waste, packaged material, and cosmetic products. These pollutants are persistent and often escape conventional treatment processes.

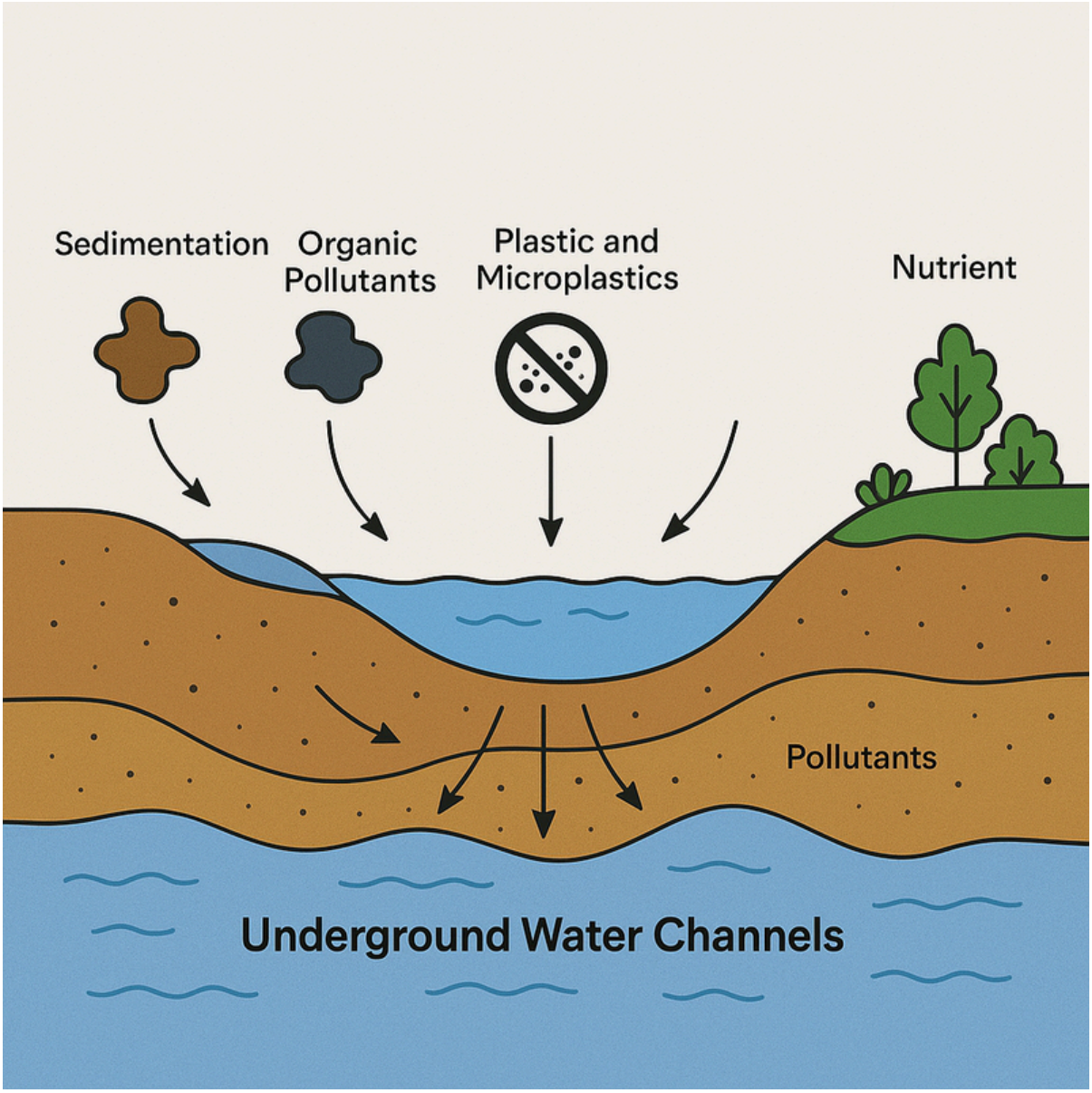
Water Quality Analysis and Addressing Pollutants

Pollutants disrupt natural river ecosystems and interfere with water movement, significantly hindering rejuvenation. Therefore, a core component of our action plan involves thoroughly understanding pollutant types and their specific effects to guide targeted rehabilitation.

Our analysis and interventions will focus on the following key pollutant categories:

1. **Organic Pollutants and Remediation**

Organic pollutants, primarily from sewage, agricultural runoff (pesticides and fertilizers), and industrial waste, contribute to high biochemical oxygen demand (BOD), leading to oxygen-depleted (hypoxic) conditions in river systems. Understanding the natural breakdown processes of this organic matter is crucial. This knowledge directly informs the development and implementation of bioremediation techniques, such as constructed wetlands and biofilters, which naturally purify water by harnessing microbial and plant activity to restore water quality and ecological balance.



2. Heavy Metals
Heavy metals like cadmium, arsenic, mercury, and lead accumulate in riverbeds and sediments, rendering them toxic for aquatic life and the broader food chain. Our strategy involves identifying the precise pollutant load in the sediment to guide targeted in-situ remediation efforts. Techniques like phytoremediation, using specific plants such as Vetiver or Typha, will be employed to effectively reduce heavy metal content, vital for the long-term ecological recovery of river sediments.

3. Plastic and Microplastics
Prevalent in rivers due to human activities, plastic debris and microplastics disrupt aquatic ecosystems and can enter the food chain. While plastics don't degrade quickly, our rejuvenation efforts will include pollution audits and comprehensive clean-up campaigns, coupled with the deployment of floating trash barriers. Emphasizing source reduction policies will be key to preventing further plastic pollution, giving rivers a chance to recover. Although microplastics are harder to remove, ongoing research into advanced water filtration technologies will inform future strategies.

4. Excessive Sedimentation
Excessive sedimentation, stemming from soil erosion due to deforestation, agriculture, and construction, increases turbidity and clogs riverbeds, smothering aquatic habitats. Our rejuvenation efforts will focus on erosion control practices. This includes the restoration of riparian vegetation, strategic implementation of check dams, and broader soil conservation measures to significantly reduce sediment runoff and improve river morphology.

5. Wastewater and Chemical Pollutants
Chemicals from industrial processes and untreated wastewater can severely disrupt the biological oxygen demand (BOD) in rivers, drastically reducing aquatic life. Our action plan prioritizes the treatment of wastewater before it enters the river and the employment of natural water purification systems, such as engineered wetlands. These interventions are critical for improving water quality and contributing directly to comprehensive river rejuvenation.

6. Nutrient Pollution (Nitrates and Phosphates)
Excessive nitrates and phosphates, often from agricultural runoff and sewage, lead to harmful algal blooms that block sunlight and deplete oxygen, devastating aquatic life. Our natural rejuvenation strategies will include implementing riparian buffers, establishing constructed wetlands, and restoring biodiversity within the river system. These measures will naturally help control nutrient levels, restore water quality, and bring the ecosystem back into balance.

Implementation Activities in first Phase

Jan 2026 - March 2028

The proposed activities for the near term phase include construction water recharge structures, afforestation in upper catchment as well as riparian regions, agroforestry and nature friendly farming in the catchment areas, waste and waste treatment activities.

Implementation Activities in first Phase (till 2028)

Check Dam,
Recharge Pits and
Percolation Tank
Construction
Pond and Tank
Restoration
Ground Water
Recharge

Our initial focus will be on multiple actions that directly contribute to increasing water flow and improving the immediate health of the Kshipra River. These activities are designed to make a noticeable difference within the first three years.

Intensified Groundwater Recharge Initiatives: Construct and Restore Recharge Structures: We will prioritize the construction and rehabilitation of key groundwater recharge structures, including Check Dams, Recharge Pits, and Percolation Tanks. Additionally, we will undertake Pond and Tank Restoration efforts in areas identified as critical for groundwater replenishment. The aim is to effectively capture monsoon runoff and facilitate its seepage into the aquifers, thereby enhancing Groundwater Recharge.

Aggressive Water Conservation and Demand Management: Promote Efficient Irrigation: Introduce and incentivize water-saving irrigation techniques like drip and sprinkler systems among farmers to significantly reduce the current heavy reliance on groundwater extraction for agriculture.

Fix Leaks and Improve Urban Water Use: Identify and repair leaking water supply infrastructure in urban areas along the river basin to minimize water loss. Launch public awareness campaigns to encourage responsible domestic water consumption.

I**mmediate Pollution Abatement Measures by Diverting Untreated Sewage:** Implement urgent measures to divert raw sewage, especially from major drains, away from directly entering the Kshipra River. This might involve temporary treatment solutions or re-routing.

Control Industrial Effluents: Work with local industries to ensure immediate, albeit potentially interim, compliance with effluent discharge norms to prevent further contamination.

Riverbank Cleanup Drives: Organize regular community-led drives to remove solid waste and debris from the riverbed and banks, improving immediate water quality and flow.

Initial Riverbed and Bank Restoration:

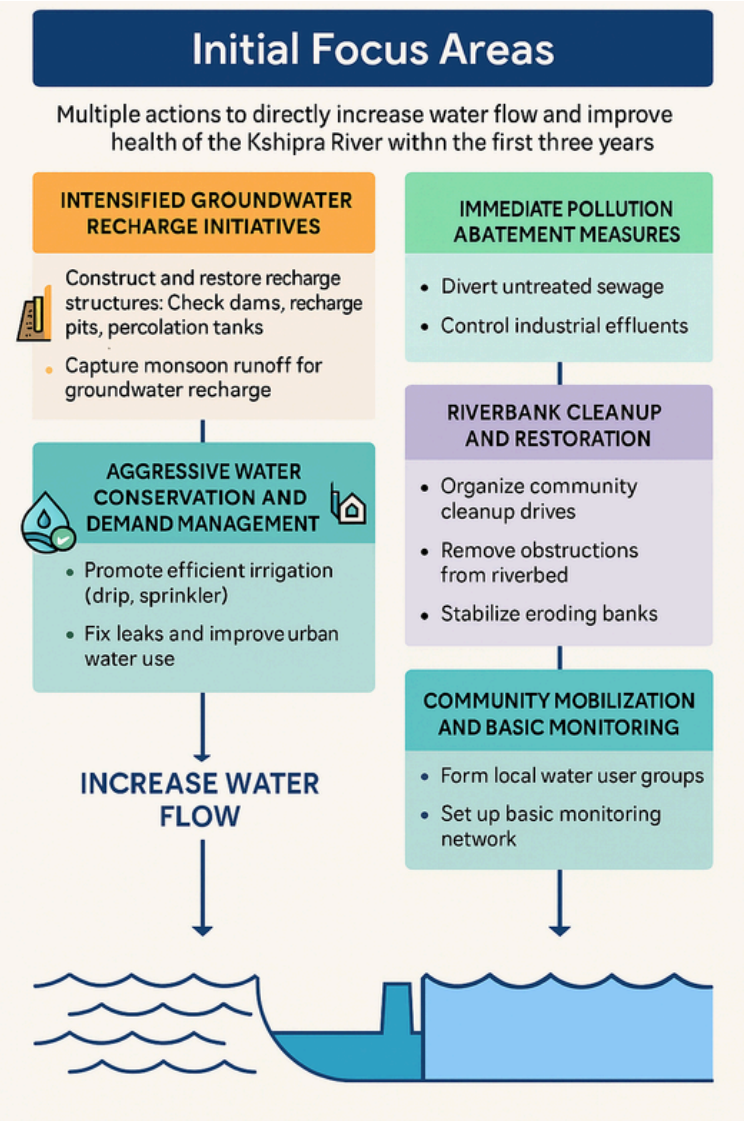
Remove Obstructions: Clear any physical encroachments, blockages, or accumulated silt from the riverbed to facilitate natural water flow.

Stabilize Eroding Banks: Implement simple bio-engineering techniques, such as planting fast-growing native vegetation, to stabilize vulnerable riverbanks and reduce soil erosion.

Community Mobilization and Basic Monitoring:

Form Local Water User Groups: Establish and empower local groups involving residents, farmers, and community leaders to actively participate in water management, conservation, and recharge efforts.

Set Up Basic Monitoring: Install a foundational network of monitoring wells to track immediate changes in groundwater levels and establish basic river flow measurement stations at key points to assess the impact of interventions. Conduct initial rounds of water quality sampling to establish a baseline.



Implementation Activities in first Phase (till 2028)

Observation Wells
Aquifer Health
Digital Elevation Modelling, Flow Routing of drainage, Rock formations and Active Tectonics

Observation Wells: The establishment of a strategic network of observation wells is critical for directly monitoring the Kshipra's subsurface hydrological conditions. These wells will serve as vital sentinels, providing real-time and long-term data on groundwater levels and water quality parameters across the basaltic aquifer system. Regular data collection from these wells will allow us to assess the effectiveness of groundwater recharge initiatives, identify areas of over-extraction, and detect changes in water availability. This direct monitoring is essential for understanding the dynamic interaction between the river's surface water and its supporting groundwater reserves, which is crucial for sustainable water management given the local communities' dependence on these resources.

Aquifer Health Assessment: A comprehensive aquifer health assessment will integrate data from observation wells, pumping tests, and geological mapping to evaluate the overall state of the Kshipra's underlying basaltic aquifers. This goes beyond simple water levels to analyze groundwater quantity, quality, and long-term sustainability. We will assess aquifer storage capacity, recharge rates, discharge zones, and vulnerability to contamination from various sources. Understanding the fractured nature of the basalt is key to predicting contaminant migration and identifying zones prone to rapid depletion. This holistic understanding of aquifer health is fundamental to ensuring the Kshipra's baseflow is sustained and that groundwater remains a viable and clean resource for both the ecosystem and human consumption.

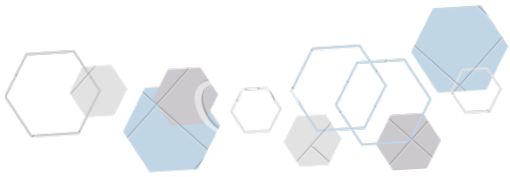
Digital Elevation Modeling (DEM): High-resolution Digital Elevation Models (DEMs) will form the basis for detailed topographical and geomorphological analysis of the Kshipra basin. Derived from satellite imagery, LiDAR, or drone surveys, these models provide precise elevation data, enabling the accurate delineation of watersheds, calculation of slopes, and identification of drainage networks. The DEM will be instrumental in understanding the basin's "hilly and dissected" nature, areas of "low relief," and where "coarse drainage texture" is prevalent due to resistant sub-soil. This allows for precise identification of erosion-prone areas, optimal locations for water harvesting structures, and analysis of how topography influences runoff and sediment transport.

Flow Routing of Drainage: Utilizing the high-resolution DEMs, flow routing of drainage will be performed to meticulously map and analyze surface water pathways across the Kshipra sub-basin. This involves computational modeling to determine flow accumulation, stream order, watershed boundaries, and the precise flow directions of surface runoff. Understanding the dendritic and rectangular channel patterns influenced by structural and lithological factors will be critical. This analysis will not only clarify how water moves across the landscape, but also help predict flash flood risks, identify areas of inefficient runoff, and inform the strategic placement of interventions like riparian buffers and check dams to enhance water retention and reduce erosive forces.

Rock Formations and Mapping:
Detailed mapping of rock formations is the foundational geological study that underpins all other hydrological and geomorphological analyses. For the Kshipra, this involves comprehensive field mapping and remote sensing interpretation of the hard, massive basalt formations of the Malwa Plateau and Vindhyan Range. We will precisely delineate the extent of different basalt flows, identify and characterize compacted columnar joints, fracture networks, and any fault lines. This mapping reveals the inherent geological controls on the river's stability, its channel patterns, and its interaction with groundwater. Understanding the lithological properties (e.g., permeability, resistance to erosion) of these rock formations is crucial for designing stable riverbanks, predicting sediment generation, and implementing nature-compatible solutions for the river's long-term rejuvenation.

Active Tectonics in River rejuvenation:
Active Tectonics investigations have significant influence on river rejuvenation, leading to changes in river courses, incision, capture and the development of terraces. Tectonic activity, particularly uplift and faulting, can disrupt a river's equilibrium state, promoting erosion in its own channel and modifying the topography by creating gorges or narrow valleys in the uplifted blocks. Therefore, active tectonic investigations primarily based on geomorphic features like terraces, fault scarps, and valley profiles can help in understanding the extent and impact of active tectonics on river systems.

Implementation Activities in first Phase (till 2028)

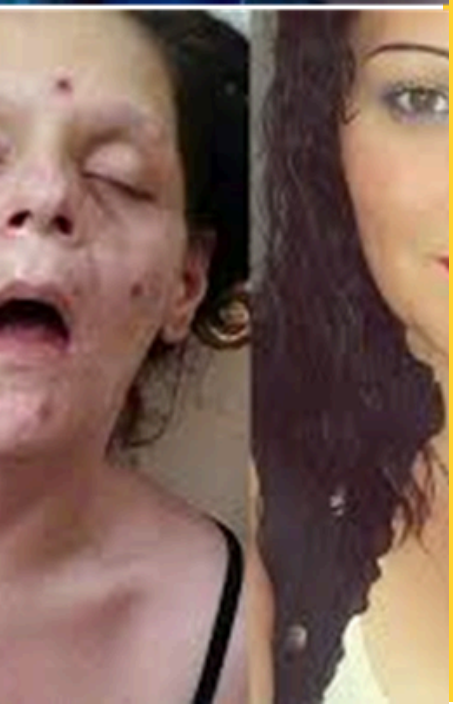


Afforestation Wetland Conservation and Restoration, Social Forestry and Community Led Initiatives

Trees nurture an entire ecosystem of different organisms that form a beautiful network of co-existence and co-creation.

Isolated trees

- Solitary trees, like street kids, have a tough time of it and in most cases perish much earlier than those in a group.
- Planting isolated trees in barren patches cannot create a forest.
- Cutting down all trees except “useful trees” destroys the whole ecosystem

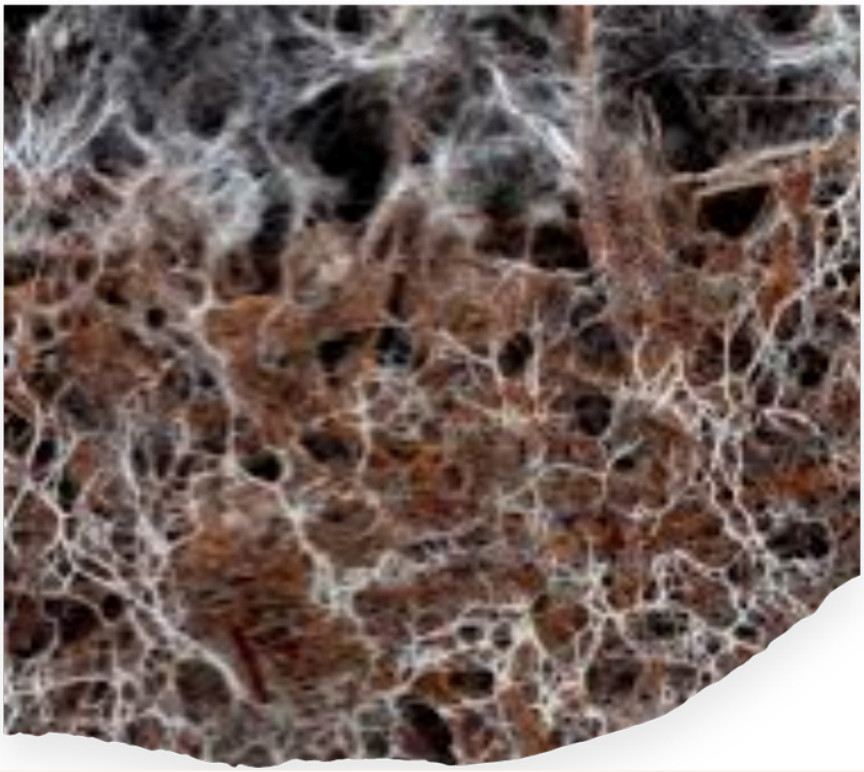


Toxic substances harm humans as well as ecosystems

Our forest rejuvenation strategy and activities in upper catchment

- Suitable planting site selection based on ridge-to-valley planning, prioritizing interventions from ridge lines to riverbanks for effective sediment control and water retention.
- Identification of native multifunctional species aligned to the 3 or 4 canopy storey formation.
- Use native, multi-functional species (deep-rooted, soil-binding, drought-resistant).
- Protect existing rootstock and facilitate natural recovery.
- Introduce silvi-pasture and contour planting in buffer zones.
- Identify and remove invasive species followed by native revegetation.
- Ensure participatory planning, implementation, and benefit-sharing with local communities and forest dwellers.

Clusters of trees to be supported by robust fungal networks



Focus on building the underground fungal networks, or mycelial networks, that are a hidden web of life that connects plants, facilitating nutrient and water exchange, and playing a crucial role in ecosystem health and carbon cycling.

Our forest rejuvenation strategy and activities in riparian areas

- Divide riparian zones into active floodplain, transitional buffer, and upland interface for targeted interventions.
- Prioritize locally adapted, water-tolerant, deep-rooted trees, shrubs, and grasses.
- Encourage multi-tiered vegetation, ground cover, understory, and canopy, for ecological stability.
- Avoid hard engineering and use vegetative bioengineering to protect banks as well as maintain natural flow regimes.
- Use native species that ensure bioremediation of pollutants.
- Use brush layering, live staking, and fascines with vegetative cover.
- Integrate species based on water table fluctuation (e.g., hydrophytes in low zones, mesophytes in transitional areas)
- Systematic removal of toxic invasive species followed by revegetation
- Engage local communities in planning, protection, and benefit-sharing.

Implementation Activities in first Phase (till 2028)

Environmental Friendly Farming Activities

Our environmental friendly farming activities in riparian areas

- Ensure natural as well as organic farming with no chemical runoff into rivers.
- Implement contour farming and terracing to prevent soil erosion.
- Establish vegetative buffer strips along riverbanks using native grasses and trees.
- Adopt agroforestry systems integrating trees with crops for soil and water conservation.
- Use mulching and cover crops to retain soil moisture and improve fertility.
- Avoid farming on steep slopes and restore degraded riparian zones with native vegetation.
- Apply compost and bio-fertilizers instead of synthetic inputs
- Introduce integrated pest management (IPM) ensuring no chemical pesticide are used
- Harvest and store rainwater for irrigation to reduce extraction from river systems
- Encourage use of drip and sprinkler irrigation for efficient water use
- Promote rotational grazing and silvi-pasture in upper catchment livestock zones
- Prevent dumping of livestock waste near water bodies and promote biogas and composting
- Educate farmers on sustainable land and water practices through capacity-building programs
- Integrate farm-level soil and water testing for informed nutrient and irrigation management
- Support farmer cooperatives for marketing eco-friendly produce and sharing resources

Implementation Activities in first Phase (till 2028)

Industrial and Municipal Waste Management and Waste Recycling in the Catchment Area

Our industrial and municipal waste management strategies and activities in catchment areas

- Assess type, quantity, and sources of waste (municipal, industrial, agricultural, biomedical).
- Classify into recyclable, reusable, compostable, and hazardous categories.
- Ensure separation at source for cleaner and higher-value recyclables
- Deploy technologies suited to local context (e.g., MRFs, composting units, e-waste dismantling centers).
- Encourage upcycling, use of refurbished goods, and greywater or byproduct reuse in non-potable applications.
- Integrate Extended Producer Responsibility (EPR) and regulatory incentives to support circularity.
- Strengthen local enterprises and networks for collection, processing, and sale of recyclables.
- Engage stakeholders through training, awareness campaigns, and inclusive planning.
- Implement feedback systems to track performance and support adaptive improvements.
- Integrate circular economy principles into urban and industrial planning frameworks.

Implementation Activities in first Phase (till 2028)

Liquid Waste Treatment Plants, Water Treatment Plants, River Remediation

Our liquid waste treatment strategies and activities

- Upgrade existing STPs to meet effluent discharge norms.
- Build decentralized STPs or phytoremediation systems in unsewered peri-urban/rural areas.
- Industrial Effluent Management:
- Ensure all industries install effluent treatment plants (ETPs) and comply with Zero Liquid Discharge (ZLD) policies.
- Monitor effluents through continuous online monitoring systems.
- Community Participation and Behavior Change
- Conduct awareness campaigns on waste disposal and the link between clean rivers and public health.
- Involve local bodies, youth, SHGs, and religious organizations in river-cleaning drives and waste audits

Our water treatment plants, strategies and activities

- Design treatment stages: aeration, coagulation, sedimentation, filtration, disinfection
- Select plant location near water source with easy distribution access
- Integrate WTP with public water supply infrastructure
- Implement smart monitoring systems (e.g., SCADA) for real-time control
- Ensure energy and resource-efficient operations
- Establish routine operation and maintenance protocols
- Prepare emergency response and contamination management plans
- Let me know if you'd like a version specific to urban, rural, or industrial contexts.

Our river remediation strategies and activities

- Map and document all pollution sources across the river stretch
- Design and construct intercepting drains and diversion structures
- Install aerators, microbial inoculants, or floating treatment wetlands at selected polluted stretches
- Restore natural riverbanks with bioengineering and native plant species
- Monitor flow regimes and adjust upstream reservoir releases to maintain e-flow
- Carry out mechanical or manual desilting in heavily silted zones
- Establish community-led river monitoring and protection committees
- Integrate remediation measures with city sanitation, stormwater, and waste management plans
- Create signage and awareness campaigns about pollution hotspots and restoration efforts
- Link interventions with watershed and catchment management programs

Medium Term

2028-2035

Medium Term Activities for River Rejuvenation:

- River Ecosystem(Geosphere, Biosphere and Hydrosphere) Health Monitoring
- Implementation Activities in second Phase (till 2035)
  - Check Dam, Recharge Pits and Percolation Tank Maintenance and Management
  - Pond and Tank Maintenance
  - Ground Water Recharge
  - Afforestation - Densification
  - Wetland Conservation and Restoration
  - Environmental Friendly Farming Activities
  - Social Forestry and Community Led Initiatives
  - Industrial and Municipal Waste Management and Waste Recycling in the Catchment Area
  - Liquid Waste Treatment Plants
  - River Remediation

Geological and Hydrological Activities

Mid-Term Actions for Expanding Geological-Hydrological Insights and Adaptive River Basin Management

While the first three years of intervention (2025–2028) focus on foundational actions, recharge infrastructure, pollution abatement, bank stabilization, and basic monitoring. The medium phase (2028-2032) is essential for embedding durability, ecological balance, and scientific precision into the Kshipra River Rejuvenation Mission. Given the basin's complex basaltic geology, fractured aquifers, geomorphic variability, and hydrological sensitivity, it is imperative to build upon the short-term groundwork with sustained analysis, adaptive refinement, and integrative planning. Rivers respond over years and decades, not months, making long-term observation, modeling, and course correction critical to ensuring that the river not only revives, but thrives. The mid-term phase of the rejuvenation effort will concentrate on validating and scaling short-term gains, while expanding scientific investigations and embedding community-based governance. Key priorities include:

Refinement of Aquifer Typology and Recharge Modeling: Building on data from observation wells, fracture mapping, and recharge structure performance, a refined, zoned aquifer model will be developed. This model will include estimates of long-term recharge rates, flow paths, and aquifer interconnectivity, particularly in basalt-dominated regions.

Subsurface–Surface Interaction Modeling: Advanced piezometric monitoring and tracer studies will be used to map gaining, losing, and neutral stretches of the river. This will inform baseflow enhancement strategies, especially during non-monsoon months.

Re-Calibration of Recharge and Intervention Sites: DEM-based terrain analysis, combined with sediment dynamics and runoff routing data, will be used to recalibrate the placement and design of recharge pits, check dams, and vegetative buffers, ensuring maximum hydrological efficiency.

Geohazard Risk Zoning: Ongoing tectonic activity studies, combined with slope stability modeling and erosion monitoring, will support the creation of a geo-risk zoning atlas. This will prevent structural development in unstable zones and inform safer long-term intervention design.

Community Stewardship Integration: Strengthening of Water User Groups, introduction of citizen-led water quality monitoring, and training on groundwater budgeting using real-time tools will empower local management.

Forest and Riparian Ecosystem Activities

Afforestation and Regeneration:
Assisted natural regeneration and afforestation in degraded forest and upper catchment areas with native, drought-resilient species. Ridge-to-valley planting approaches by engaging communities through JFMCs and incentivize stewardship with ecosystem-based benefit-sharing mechanisms.

Riparian Buffer Restoration
Restore native vegetation along riverbanks to create protective green buffers. Use water-tolerant species for erosion control, runoff filtration, and biodiversity enhancement. Protect riparian zones through community-led monitoring and designation as eco-sensitive areas under local governance frameworks.

Biodiversity Enrichment and Invasive Species Management
Create biodiversity monitoring plots and engage local youth and research institutions in ecological restoration and long-term ecosystem health tracking. Remove invasive species from riparian and forest zones. Replant with native species to restore ecological balance and support wildlife.

S**oil and Moisture Conservation**
Implement eco-engineering measures like trenches, bunds, and vegetative barriers to reduce runoff and recharge groundwater. Ensure mulching and organic soil treatments in forest fringes. Control grazing intensity to maintain vegetation cover and reduce sediment flow into rivers.

Farming Activities

Promote Sustainable and Organic Farming
Encourage organic and chemical-free farming near riverbanks to reduce agrochemical runoff. Support farmers with training, certification, and market access to transition toward environmentally friendly cultivation practices that protect soil and water health.

Implement Soil and Water Conservation Techniques
Adopt contour farming, vegetative bunds, and mulching to minimize erosion and enhance infiltration. These practices reduce sediment load in rivers while improving moisture retention and soil productivity in catchment and riparian farmlands.

Strengthen Buffer Zones with Agroforestry
Introduce agroforestry systems in riparian buffers using native tree-crop combinations. This enhances biodiversity, prevents encroachment, and offers sustainable livelihoods, while stabilizing riverbanks and reducing non-point source pollution from agricultural fields.

Optimize Water Use and Irrigation Efficiency
Promote drip and sprinkler irrigation systems to minimize water extraction from rivers. Integrate water budgeting and greywater reuse to maintain ecological flows and reduce pressure on freshwater sources in farming landscapes.

Waste Management Activities

Pollution Control Infrastructure Development
Focus on constructing interceptor drains to capture and divert untreated sewage and industrial effluents to appropriate treatment facilities. In parallel, prioritize the establishment of decentralized wastewater treatment systems, particularly in semi-urban and rural areas where centralized systems are not viable. These steps will reduce direct discharge into rivers and improve overall sanitation coverage across the catchment.

Solid Waste Management and Recycling
Develop and operationalize Material Recovery Facilities (MRFs) for efficient waste segregation, recycling, and reduction in landfill burden. Strengthen door-to-door waste collection systems and institutionalize source-level segregation to enhance waste handling at the community level. Special emphasis should be placed on riverbank areas to prevent solid waste from entering aquatic ecosystems.

Microplastic Mitigation and Industrial Compliance
Implement microplastic filtration units at the community scale and designate plastic-free zones along river stretches to reduce microplastic pollution. Enhance regulatory oversight of red and orange category industries through online pollution monitoring systems. Public awareness campaigns and stricter enforcement to ensure sustained compliance and improved water quality outcomes.

Long Term

2035-2040

Long Term Activities for River Rejuvenation:

- River Ecosystem (Geosphere, Biosphere and Hydrosphere) Health Monitoring
- Implementation Activities in third Phase (till 2040 Kumbha)
    - Check Dam, Recharge Pits and Percolation Tank Maintenance and Management
    - Pond and Tank Maintenance
    - Ground Water Recharge
    - Afforestation - Densification
    - Wetland Conservation and Restoration
    - Environmental Friendly Farming Activities
    - Social Forestry and Community Led Initiatives
    - Industrial and Municipal Waste Management and Waste Recycling in the Catchment Area
    - Liquid Waste Treatment Plants
    - River Remediation

Geological and Hydrological Activities

Long-term Activities for Building Climate-Resilient and Self-Regulating River Systems

The long-term phase from 2032 to 2036 will focus on institutionalizing integrated basin management, mainstreaming science into policy, and ensuring long-term sustainability and climate resilience. Key long-term initiatives will include:

Integrated River-Aquifer Governance Framework: A basin-level decision support system will be developed, linking aquifer health, river flow, land use, and rainfall projections. This will support evidence-based allocation of water resources and adaptive planning under changing climate conditions.

Landscape-Scale River Corridor Restoration: Focus will shift toward reviving natural geomorphic features such as floodplains, wetlands, oxbow lakes, and riparian zones, informed by paleo-environmental reconstructions. These ecological buffers will enhance resilience to floods, improve baseflow, and support biodiversity.

Climate Change Impact Modeling on Basaltic Aquifers: Predictive models integrating regional rainfall projections, land use dynamics, and groundwater behavior in fractured rock systems will inform resilient cropping strategies and future recharge planning.

Geological and Hydrological Monitoring: Permanent monitoring stations for groundwater levels, water quality, and tectonic motion (where relevant) will be installed. Local academic institutions will be engaged to operate and analyze data, building a living knowledge base.

Cultural and Knowledge Integration: Long-term stewardship will also involve integrating traditional knowledge of water restoration, river practices, and educational outreach to create an intergenerational river culture centered on sustainability and reverence.

Policy Mainstreaming and Financing Framework: Geological and hydrological insights will be used to inform groundwater extraction regulation, pollution control guidelines, and land-use zoning. A multi-tiered financing framework will be established to ensure continuity beyond project cycles.

Forest and Riparian Ecosystem Activities

Strengthening Riparian Ecosystem Resilience
Expand and protect native riparian vegetation through long-term conservation agreements and eco-sensitive zoning. Create contiguous green corridors to support riverine biodiversity, enhance bank stability, and filter pollutants, fostering a resilient ecological buffer along the entire river stretch.

Forest Landscape Restoration at Basin Scale
Implement landscape-level reforestation and assisted natural regeneration across degraded upper catchments. Prioritize multi-layered, climate-resilient native species to improve soil moisture, reduce siltation, and enhance long-term base flow contributing to sustained river health and hydrological stability.

Biodiversity Monitoring and Invasive Species Control
Institutionalize long-term biodiversity monitoring using participatory and scientific methods. Establish invasive species management protocols with regular mapping, removal, and restoration using native flora, ensuring functional recovery of ecosystems and protection of river-linked biodiversity corridors.

Integrated Grazing and Agroforestry Management
Promote silvi-pastoral systems and rotational grazing to prevent forest degradation. Integrate agroforestry in buffer zones with sustainable fodder and fuelwood models, reducing community pressure on riparian forests while supporting livelihoods and ecological regeneration simultaneously.

Farming Activities

Transition to Regenerative Agriculture
Promote regenerative farming practices such as crop rotation, no-till farming, composting, and cover cropping to restore soil health, increase carbon sequestration, and reduce runoff into river systems over the long term.

Establish Permanent Riparian Buffer Farming Zones
Designate buffer farming zones with low-impact agriculture using perennial crops, native grasses, and agroforestry systems to act as living filters that reduce nutrient and sediment flow into rivers.

Institutionalize Eco-Certification and Incentives
Develop long-term incentive schemes and eco-labels for farmers practicing riparian-friendly agriculture. Link these to payment for ecosystem services (PES) programs that reward farmers for conserving river health and ecosystem services.

S**trengthen Climate Resilience and Water Stewardship**
Promote crop diversification, drought-resilient varieties, and on-farm water storage systems to adapt to climate variability. Foster water stewardship practices to reduce over-extraction and maintain river base flows in changing climatic conditions.

Waste Management Activities

Restoring Ecological Integrity and Catchment Health
Ensure ecological flow through upstream regulation, water budgeting, and tributary and spring rejuvenation. Expand riparian green buffers and reforestation to reduce runoff and sedimentation, enhancing catchment health and sustaining the river's hydrological and ecological integrity.

Institutional Governance and Policy Integration
Establish a dedicated Kshipra River Rejuvenation Authority or inter-agency coordination platform to align policies with urban planning, tourism, and smart city missions. Institutionalize sustainable water governance, cross-sectoral accountability, and integrated development planning at the basin level.

Innovation, Technology, and Community Engagement
Promote bioremediation, constructed wetlands, and microbial treatments through academic collaborations. Enhance public participation via citizen science, environmental education, and mobile-based feedback tools, supported by real-time dashboards and AI-driven water quality forecasting for transparent, data-led river management.








forum RRP.

RRP Team

- **IIT AC Foundation**
- **addGEO Foundation**
- **CEDAR**
- **Central University of Himachal Pradesh**
- **CSIR-CSIO**
- **Envirotech**
- **Indian Institute of Science**
- **JNCASR**
- **National Institute of Advanced Studies**
- **Wellness Lifestyle**

FORUM

Our Thought Leaders

Forum RRP is manned by the world's largest volunteer army in the areas of innovation, river rejuvenation based on the principles of ecological regeneration, biodiversity enrichment, sustainability, soil restoration, and remediation.

C.N.R. Rao

F.R.S. Honorary President & Linus Pauling Research Professor, JNCASR, Bangalore

JNCASR

FORUM

Our Thought Leaders

The innovative and competent professionals are personally passionate about the subject and, in most cases, work for a token honorarium. This enables Forum RRP to provide extremely high-quality services at a substantially lower cost than competing commercial firms, especially firms from the developed world.

C R Babu

Professor Emeritus at the Centre for Environmental Management of Degraded Ecosystems (CEMDE), University of Delhi

Our Thought Leaders

Forum RRP thrives on a global network of expert volunteers who drive river revival, biodiversity, and sustainability, delivering high-impact, cost-effective solutions compared to commercial consultancies.

Sharada Srinivasan

Prof. National Institute of Advanced Studies
and Distinguished Fellow, IIT AC

FORUM

Our Thought Leaders

Distinguished Fellows of IIT Alumni Foundation and scientists from Indian Institute of Science, National Institute of Advanced Studies, Jawaharlal Nehru Centre of Advanced Scientific Research, CSIR-Central Scientific Instruments Organization, Central University of Himachal Pradesh and University of Delhi have joined hands to rejuvenate rivers through Forum RRP.

Shashi Shekhar

Distinguished Fellow iit ALUMNI COUNCIL

FORUM

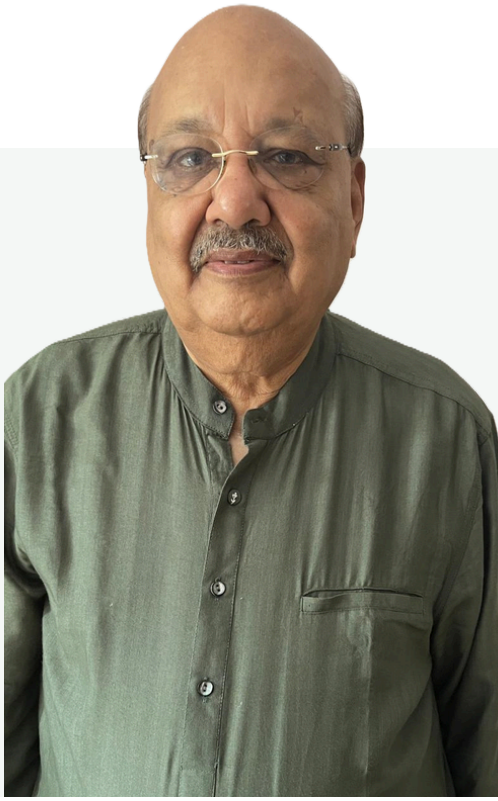
Our Thought Leaders

Globally recognized environmental engineering organizations like Envirotech Instruments grassroots organizations like Centre for Ecology Development and Research as well as regenerative start-up such addGEO Foundation and Wellness Lifestyle who are pioneering regenerative practices in nature-based solutions, ecosystem restoration, holistic health, planet well being, agriculture transformation, nature tech and rural entrepreneurship have come together to form Team RRP.

Shyam Gupta

Life Fellow

iit ALUMNI COUNCIL



FORUM

foundational principles.

FORUM

Grounded in systems thinking, regenerative design emphasizes biodiversity conservation, circular resource management, resilience building, adaptive strategies, stakeholder engagement, and long-term ecological, social, and economic sustainability to restore and enhance natural ecosystems.

1

SYSTEMS THINKING

Multi-functional and Multi-benefit Design

Integrate ecological restoration, flood control, groundwater recharge, livelihoods, and cultural values, ensuring resilient ecosystems, sustainable development, and enhanced community well-being across the landscape. This approach ensure solutions with ecological, social, cultural, and economic benefits simultaneously. Rejuvenated rivers therefore can support fisheries, agriculture, tourism, groundwater recharge, and cultural-spiritual uses.

2

EARTH ETHICS

River Stewardship aligned to Natural Hydrology

The Forum RRP is committed to managing rivers to restore and respect their inherent ecological processes, rather than imposing artificial designs. This involves prioritizing solutions that mimic natural flow, allowing for seasonal variations, and supporting the river's natural purification and biodiversity. It's about recognizing rivers as vital, living systems whose health is directly tied to the well-being of surrounding ecosystems and human communities. This approach emphasizes long-term ecological integrity and resilience, ensuring rivers can sustain life and provide essential services for future generations.

3

BIOSPHERIC NETWORKS

Ecosystem Restoration and Biodiversity Enhancement

Revival of natural habitats by reintroducing native species, and restoring riparian vegetation, improves water quality, ecosystem resilience, and supports diverse life forms that are essential for healthy river systems. These efforts also stabilize banks, reduce erosion, enhance carbon sequestration, and support sustainable local livelihoods through eco-sensitive development.

4

PARTICIPATIVE APPROACH

Community Led Stewardship

The foundation of our river rejuvenation efforts, built on the belief that those who live closest to natural resources are their most effective guardians. Local riparian and catchment communities hold invaluable traditional knowledge and a deep personal connection to their rivers, making their involvement essential. By equipping these communities with resources, training, and the authority to shape decisions, and ability and incentives to sustain micro-changes in landuse practices we foster true ownership and responsibility - transforming passive recipients into active custodians. This approach ensures that river rejuvenation is not only ecologically sound but also culturally rooted, locally meaningful, and sustainable for the long term. Through collective action and strengthened local governance, community leadership secures the future of vital river ecosystems.

5

EARTH'S FRAMEWORK

Geological Foundations for River Rejuvenation

Geology shapes the very foundation of river rejuvenation by defining the natural framework in which rivers flow and evolve. Understanding specific rock types, structural features, and the intricate dynamics of sediment is paramount for designing restoration efforts that work with natural processes. By integrating these geological insights, rejuvenation plans transcend superficial fixes, instead fostering truly stable channels, resilient floodplains, and thriving ecosystems. This holistic approach ensures the creation of robust, self-sustaining river systems that can adapt to environmental changes, delivering enduring benefits for both nature and communities over the long term.

6

WATER SYSTEMS

Hydrological Insights for River Renewal

At the heart of river rejuvenation, hydrology provides the scientific foundation to understand, restore, and sustain healthy river systems. By studying rainfall patterns, catchment dynamics, groundwater interactions, and flow regimes, hydrological analysis maps a river's lifeblood - from source to confluence. This vital knowledge guides interventions that restore natural flow patterns, improve water quality, recharge aquifers, and ensure sustainable sediment transport. Integrating hydrology guarantees that restoration efforts extend beyond the visible surface, deeply connecting with the river's underlying systems. This creates resilient waterways capable of adapting to changing climates and supporting both nature and communities for generations.

7

WATER SYSTEMS

Dye-based Tracking

Dye-based tracking is a valuable tool within hydrological studies that supports river renewal efforts. By introducing harmless dye tracers into water systems, we can visualize and map the hidden pathways of water as it moves through river channels, floodplains, and underground aquifers. This technique reveals how surface water and groundwater interact, identifies points of leakage or recharge, and uncovers flow dynamics that are critical for planning effective rejuvenation. These insights ensure that interventions are well-targeted, sustainable, and aligned with the natural hydrological behavior of the river system.

8

NATURE ALIGNED

Integrated with Natural Cycle and Rythms

Integrating natural cycles such as carbon, nutrient, and water etc., into river rejuvenation implementation design ensures ecological balance, improves soil fertility, support aquatic life, and regulates climate. Aligning with seasonal rhythms such integration ensures sustained flow patterns, managed flood cycles, and regular habitat connectivity, fostering a resilient river ecosystem that regenerates itself through dynamic interactions between land, water, atmosphere, and biosphere.

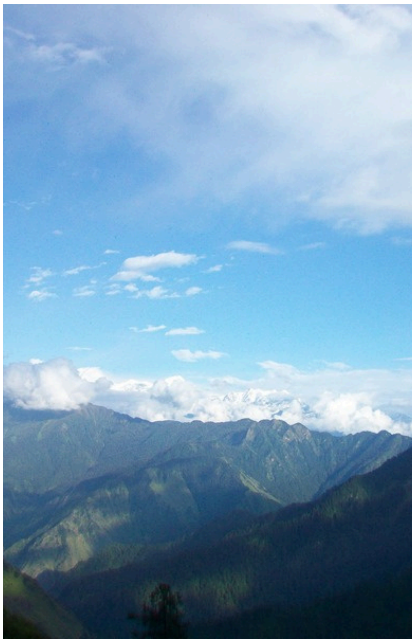
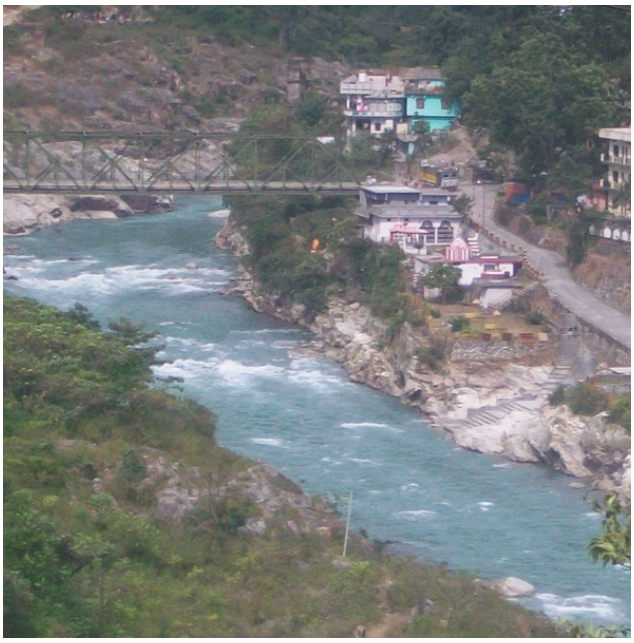
9

RIVER STEWARDSHIP

Long Term Monitoring and Adaptive Management

River rejuvenation involves continuous monitoring, stakeholder engagement, and flexible strategies that respond to ecological changes, climate variability, and socio-economic dynamics. It ensures resilience, sustains ecosystem services, and integrates science, policy, and community feedback to guide interventions over time for lasting impact and sustainable river health.





foundational technologies.

- Earth Observation
- Digital Twin
- Computer Vision
- Bio Engineering
- Geotechnical Modelling and Analytics
- Hydrological Modelling and Analytics
    - Dye based tracking
- Ecological Modelling and Analytics
- Biochemical Remediation

A combination of global, open source, open API (application programming interface), and user-contributed & independently collected data can fundamentally alter the price performance and applicability of the digital twin engine.

1
TECHNOLOGY

Earth Observation

Earth Observation (EO) serves as a cornerstone of regenerative design by leveraging AI and machine learning to analyze Earth's system dynamics. Through continuous monitoring, EO enhances climate models, fills data gaps, and tracks environmental trends, enabling precise predictions and data-driven decision-making. By aligning adaptive management strategies with natural processes, EO strengthens climate resilience, supports ecosystem restoration, and fosters sustainable, regenerative solutions for long-term environmental and societal well-being.

2
TECHNOLOGY

Digital Twin

Digital twin technology is fundamentally different from simulation of a static digital representation. When appropriately handled with relevant and fast-developing AI tools - a digital replica converts to a dynamic digital twin of the real world. This approach can give life to a virtual digital element. The element could be a machine, a person, a town or an entire ecosystem.

3
TECHNOLOGY

Computer Vision

Computer vision helps bring AI and digital twin to life. New photogrammetry tools including hyperspectral imaging can see things which the human eye can not. To give an example from Agritech - a hyperspectral system can not only identify the crop in the field, but it can accurately determine the exact species or variety of the plant. In addition, it can validate the health of the plant in terms of age, time to harvest, hydration level and nutrient deficiency. It can even assess the condition of the soil in terms of organic carbon content and other parameters.

4

TECHNOLOGY

Bioengineering

Combining the ecological principles with engineering practices to restore river health, using natural materials like coir mats, bamboo structures, and native plant species, these bioengineering methods stabilize riverbanks, control erosion, and enhance habitat diversity. They support water quality improvement and flood management while preserving biodiversity. As sustainable, low-impact alternatives to hard infrastructure, bioengineering solutions empower communities to actively participate in resilient, nature-based river restoration efforts.

5

TECHNOLOGY

Geotechnical Modelling and Analytics

Geotechnical modeling and analytics will help to understand the subsurface behavior of riverbanks, floodplains, and their surrounding landscapes. These advanced tools integrate comprehensive data from sources like borehole logs, electrical resistivity tomography (ERT), and pumping test kits, supplemented by field measurements from downhole geophysical loggers, flow meters, and soil property analyzers. This data input enables precise simulation of slope stability, erosion potential, and foundation behavior under diverse hydrological and loading conditions. By leveraging advanced analytics, we can assess the intricate impacts of seasonal flows, sediment load, and anthropogenic activity on soil mechanics and bank integrity. These critical insights are indispensable for designing nature-compatible infrastructure, including stable embankments, effective check dams, efficient recharge trenches, and resilient riparian buffers. Geotechnical analytics ensure that river rejuvenation interventions are structurally sound, highly resilient to climate variability, and tailored to site-specific ground conditions, minimizing risks and significantly enhancing long-term ecological outcomes.

6

TECHNOLOGY

Aquifer Mapping, Modelling and Analytics

Aquifer mapping, modelling, and analytics are cornerstone technologies, critical for sustainable groundwater management and the rejuvenation of river systems. Through advanced mapping techniques, we precisely delineate the extent, depth, and properties of groundwater reserves within their geological context. Hydrogeological modelling then acts as a powerful simulation tool, bringing these maps to life by predicting complex groundwater flow dynamics and assessing their interaction with surface water bodies under various scenarios. Finally, advanced analytics transform vast datasets into actionable insights, allowing us to identify water quality issues, pinpoint optimal areas for managed aquifer recharge, and refine sustainable abstraction strategies. These technologies provide a clear, data-driven understanding of the subsurface, empowering our river rejuvenation efforts with the precise information needed for long-term ecological health and water security.

7

TECHNOLOGY

Dye Based Tracking

Dye-based tracking is a critical hydrological technology that offers insights into river systems, supporting rejuvenation efforts. By introducing environmentally harmless, fluorescent tracers into water bodies, we can precisely visualize and quantitatively map hidden flow pathways, revealing intricate connections between surface waters and underground aquifers. This technique identifies points of leakage or recharge, determines water flow velocities and residence times, and uncovers complex hydrological dynamics often imperceptible by other means. Leveraging specialized sensors and fluorometers, dye tracking provides data-driven intelligence essential for understanding how water moves through a catchment.

8

TECHNOLOGY

Ecological Modelling and Analytics

Ecological modelling and analysis for river rejuvenation involve simulating ecosystem dynamics, assessing water quality, biodiversity, and habitat health to guide restoration efforts. These models integrate hydrology, land use, and climate data to predict outcomes of interventions. By identifying critical stressors, restoration priorities, and long-term ecological responses, they support evidence-based planning. This approach ensures adaptive management, sustainable resource use, and enhances the resilience of river ecosystems in the face of environmental change.

9

TECHNOLOGY

Biochemical Remediation

Biochemical remediation is an advanced approach in environmental science that integrates microorganisms or biological agents with chemical processes to break down, transform, or eliminate pollutants from contaminated environments. Both organic and inorganic pollutants pose significant challenges to river rejuvenation efforts, as their accumulation severely degrades water quality—often rendering rivers into polluted drains or "nalas." Biochemical methods have shown high effectiveness in the recovery and neutralization of such pollutants in a greener and more sustainable manner. Hybrid systems that employ biosorption, bioleaching, and enzymatic degradation offer viable alternatives to conventional treatment technologies, especially for complex and hazardous waste streams. These approaches not only reduce ecological toxicity but also support circular resource utilization and the development of cleaner, low-impact technologies for water and waste management.

Rethinking our Success Paradigms

Companies, communities, cities, countries and catchments represent different organizational structures. Effective partnerships across these entities must be responsible, innovative, sustainable, and equitable, ensuring long-term resilience and shared value at all scales. Rethinking success necessitates a shift from extractive, linear models to a whole-systems approach grounded in regenerative principles and Earth ethics. This paradigm emphasizes resilience, ecological balance, and long-term well-being, prioritizing sustainable, interconnected solutions that restore ecosystems, strengthen communities, and align human progress with the health and stability of the planet.

In the age of social media, any attempt at "washing" will inevitably be exposed, revealing an organization's true core. Transforming this core is neither immediate nor simple. Modifying a structure built on a weak foundation is inherently challenging; instead, a strong, principled foundation must be established. While this requires investment, its success ultimately depends on unwavering leadership commitment.

Regenerative Realignment

Traditional management prioritizes profit over well-being, often neglecting public health and environmental sustainability. Pharmaceutical investments favor cosmetics over critical diseases, while preventive medicine remains underfunded. A regenerative approach, grounded in biospheric network principles, shifts the focus to interconnected ecosystems, circular resource flows, and resilience. Prioritizing biodiversity, ecological equity, and restorative processes fosters long-term planetary health and sustainability. Redefining success requires moving beyond short-term gains to a model that nurtures both people and the planet for lasting well-being.

Externalities

The value of blue-green infrastructure extends beyond conventional economic metrics. More than just stormwater management or urban greening, it enhances biodiversity, improves air and water quality, mitigates climate impacts, and fosters community well-being. By integrating natural systems into urban landscapes, it supports resilience, ecological health, and long-term socio-economic sustainability.

Sensitivities

A company which has malafide intent for its consumers and a callous approach to its employees, stakeholder committees and the environment is unlikely to be a viable business got long, let alone a good corporate citizen.

We sense that the allocation of capital will swiftly shift from companies built on the traditional commercial paradigms to those built for regeneration and restoration.

guiding principles.

image credit : glim. getty images / photo canva

4 guiding principles

of Forum RRP

1

PRINCIPLE

Reintroducing life to the river system

Rooted in ecological integrity, community stewardship, and regenerative design, river rejuvenation need to prioritize restoring natural flow regimes, reconnecting floodplains, and reviving native biodiversity. Pollution prevention, decentralized wastewater treatment, and sustainable land-use practices are essential. Local communities must be empowered as custodians, integrating traditional knowledge with modern science. Nature-based solutions - like riparian buffers, wetlands, and afforestation - should replace hard infrastructure. Policy frameworks must support long-term monitoring, adaptive management, and inter-agency coordination. True rejuvenation goes beyond engineering; it fosters living rivers that nurture both ecosystems and livelihoods, ensuring water security, resilience, and harmony with nature.

2

PRINCIPLE

Nature-Inspired Circularity

River rejuvenation inspired by nature must use closed-loop systems that mimic natural cycles, ensuring water, nutrients, and energy are continuously reused and restored. This approach treats rivers not as waste channels but as living ecosystems. Circular strategies include decentralized wastewater treatment, organic farming, sediment reuse, and greywater recycling. Wetlands and riparian zones function as natural filters, restoring water quality and biodiversity. Local bio-economies - built around sustainable fisheries, eco-tourism, and regenerative agriculture - strengthen livelihoods while respecting ecological limits. By aligning with nature's regenerative loops, circularity fosters resilient river systems that support both human well-being and ecosystem health across generations.

3

PRINCIPLE

Biospheric Energy Resilience

Harness the natural energy flows - like solar, hydrological, and biological cycles to restore river ecosystems. By integrating renewable energy, regenerative agriculture, and nature-based solutions, this approach supports self-sustaining watersheds, reduces ecological stress, and strengthens the river's ability to recover, adapt, and thrive amid changing conditions.

4

PRINCIPLE

Net-Positive Energy Balance

Restore the river systems in ways that generate more ecological and social value than they consume. This involves using renewable energy, enhancing ecosystem services, and reducing energy-intensive interventions. Techniques like gravity-fed irrigation, solar-powered treatment, and nature-based solutions support energy-efficient regeneration. A net positive approach not only revives rivers but also empowers communities, builds resilience, and aligns development with long-term ecological sustainability.


water
abundance.

Reconfiguring Existing Practices

Legislation is rapidly being introduced by countries and governments to help address the environmental issues facing the planet. This is expected to incentivate companies and cities to act more responsibly. A lot more needs to be done - including a country willing to regulate itself at the country level.

Businesses

Water abundance requires businesses to align their entire value chain - from sourcing to production - with regenerative water management practices that replenish rather than deplete freshwater resources. With ESG compliance becoming a regulatory and financial necessity, SEBI's Business Responsibility and Sustainability Reporting (BRSR) framework is guiding India's major companies toward greater water stewardship. By embedding sustainability into operations, businesses can move beyond compliance to foster long-term resilience, efficiency, and shared water security.

Communities

Every system - be it a village, city, or region - must integrate regenerative flows that restore rivers and sustain both human and ecological well-being. River rejuvenation goes beyond superficial fixes; it demands deep transformation through optimized water cycles, watershed restoration, and closed-loop waste and nutrient management. Aligning with nature's hydrological balance builds long-term resilience, reduces dependence on extractive practices, and fosters self-sustaining communities that heal, rather than harm, their surrounding river ecosystems.

Governments

River rejuvenation demands that governments embrace ecological stewardship - not just as administrators, but as guardians of vital freshwater ecosystems. With the power to shape policy, allocate resources, and enforce regulations, they can incentivize watershed restoration, pollution control, and sustainable water management. Yet political pressures often derail long-term ecological goals.

India, however, stands uniquely poised to lead. Rooted in traditional Earth ethics, its cultural values - Ahimsa (non-violence), Vasudhaiva Kutumbakam (the world as one family), and Panch Mahabhuta (the five elements) - embody a profound respect for rivers and natural cycles. Unlike the consumption-driven models of the developed world, India's traditions favor frugality, harmony, and regeneration.

By combining this cultural legacy with scalable, low-cost innovations and community-driven resilience, India can pioneer a global model for river rejuvenation - one that is not only ecologically sound but spiritually grounded and socially inclusive.

our philosophy

Forum RRP's Advisory Services are designed to implement the core philosophies and planet paradigms around river rejuvenation, restoration and resilience as articulated by its consortium members. An overview of the core philosophy of the founding members as articulated by **the Forum** is given herewith.

“We cannot exist in isolation, in Nature, everything is interconnected and linked”

Rivers are not isolated streams; they are the threads that weave together the fabric of life. In nature, everything is interconnected - when a river thrives, the entire landscape breathes again. Rejuvenating a river heals an entire ecosystem - forests, soils, wildlife, and communities

FOCUS

By aligning river rejuvenation efforts with ecological balance, we pave the way for holistic, adaptive solutions that support stability, equity, and long-term sustainability in a changing climate. Recognizing the river’s deep interconnectedness with forests, groundwater, biodiversity, and human settlements enables us to build resilience, enhance disaster preparedness, and reduce risks from floods, droughts, and other extreme weather events.

River rejuvenation is no longer a choice- it is an imperative for ensuring long-term resilience, sustainability, and overall well-being of the planet

Rooted in harmony, balance, reverence, and responsible stewardship, “Earth Ethics” have been the essence of India’s Aranya Culture for millennia. This forest-rooted wisdom, passed down through generations via oral traditions, scriptures, and lived experience, nurtured rivers as sacred lifelines and sustained entire ecosystems. From traditional water harvesting to riparian agroforestry, these regenerative practices ensured the flow, purity, and resilience of rivers. Today, this ancestral knowledge offers a powerful blueprint for river rejuvenation—one that restores not just water bodies, but the ecological and cultural fabric of the land, guiding us toward a regenerative and harmonious future.

And this in turn will require tracing back our roots and systems in river management - that is based on deep understanding of nature’s interconnectedness with a commitment to reciprocity - giving back more than we take

our purpose

The purpose of the **Forum River Rejuvenation Platform** is to bring back the wisdom of the ages into our current lives, and to bring about a world in where we design solutions that integrate environmental, social, and economic well-being aligned with natural cycles, energy flows, and biodiversity interdependencies inherent for keeping the river alive and healthy.

The purpose of the **Forum RRP advisory platform** is to enable companies, communities, cities, counties and countries to inculcate **Stewardship Mindset**, shifting from exploitation to regeneration, ensuring long-term planetary health.

What hope remains for our rivers - and the planet - if we continue with resource-intensive development that disrupts their natural flow and depletes surrounding ecosystems?

The path forward lies in regenerative, low - impact river rejuvenation efforts that restore ecological integrity, support biodiversity, and ensure water security for all. By embracing nature - based, community - led solutions, we can safeguard rivers as living systems - nurturing both people and the planet for generations to come.

"The future of our rivers hinges on redefining prosperity through hydrological and ecological literacy and the integration of indigenous and traditional knowledge"

A sustainable future depends on regenerative, low-impact approaches to river rejuvenation that balance ecological restoration with community well-being and water equity. Reviving rivers through eco-centric models strengthens environmental resilience while supporting livelihoods and long-term hydrological health.

As custodians of our rivers and ecosystems, we are entrusted with their care. Our responsibility is to restore their vitality - ensuring that future generations inherit living rivers that nourish the land and culture, enriched by our stewardship, not diminished by our neglect.


aligned with the
rhythms of nature

Forum RRP

Ecological diversity along river systems is a cornerstone of economic prosperity, fostering resilience, sustainability, and innovation. Healthy, biodiverse rivers support essential ecosystem services - clean water, fertile floodplains, fisheries, and climate regulation - forming the backbone of regenerative local economies. River rejuvenation not only restores ecological balance but also ensures long-term economic stability, enhances communities' adaptive capacity, and promotes equitable access to nature's wealth across generations.

A truly resilient economy flows like a healthy river - diverse, decentralized, and adaptive. River rejuvenation exemplifies this alignment with nature, where prosperity emerges from balanced water cycles, equitable access to resources, and regenerative land and water practices.

By restoring rivers, we restore the natural systems that sustain livelihoods, build climate resilience, and nurture an economy rooted in harmony with the Earth.

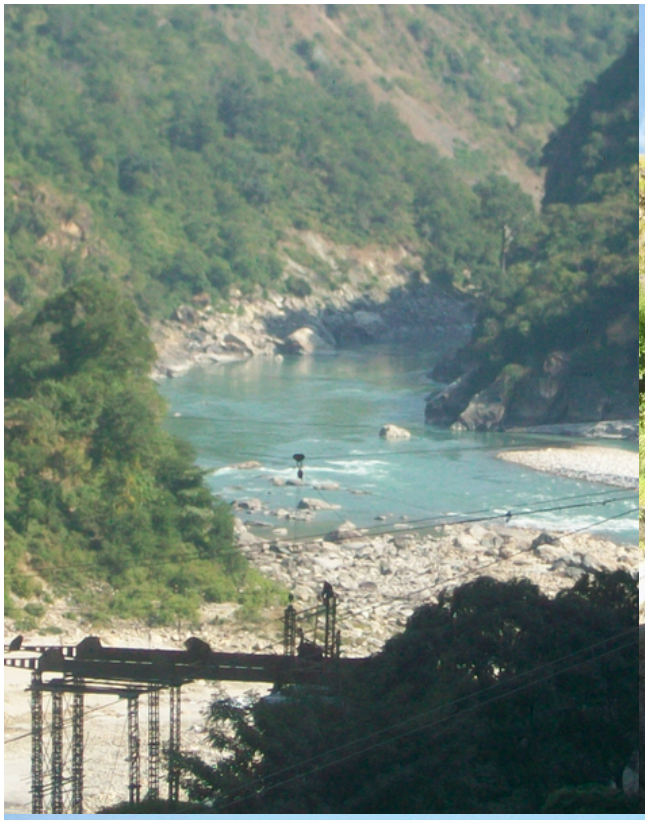
Biodiversity & Ecosystem Services

-the priceless resource

When rivers are degraded, the consequences extend beyond environmental harm - they endanger water security, livelihoods, and human well-being. A regenerative mindset urges us to champion policies and practices that restore riverine ecosystems, embrace nature-based solutions, and embed ecological wisdom in planning. Protecting river biodiversity is no longer a choice but a duty. It is central to securing a sustainable, resilient, and thriving future for generations ahead. Investing in river rejuvenation today safeguards not only ecological health but also ensures long-term prosperity, climate stability, and a living planet that continues to nourish all life.

Biodiversity and ecosystem services are not just environmental concerns - they are the foundation of life, economic stability, and planetary resilience. The air we breathe, the water we drink, and the food we consume all depend on the intricate balance of natural systems that sustain human and ecological well-being. These resources are priceless yet often undervalued in traditional economic models.

Protecting river ecosystems ensures a thriving, sustainable future through regenerative policies and nature-based solutions.



Real change happens when we recognize ourselves as an extension of Earth, not separate from it. By embracing this regenerative identity, we shift from exploitation to stewardship, aligning human actions with nature's cycles.

This mindset fosters sustainability, resilience, and a thriving future where we are party to the transformation and actively restore and regenerate the planet.

In nature, true transformation begins from the bottom up - where the smallest components of the ecosystem initiate change. It is the microbial life restoring soil health, the sediments reshaping flow paths, and native plant roots reestablishing ecological balance that spark larger renewal. Like nature's own design, resilience in a river system emerges from the ground level, as tiny organisms, water channels, and soil systems adapt, reconfigure, and assume renewed functions. These foundational shifts ripple outward, ultimately reviving the entire riverine landscape. Just as in nature, lasting rejuvenation of rivers is rooted in empowering the most elemental forces of change.

As small-scale shifts accumulate, they drive system-wide change, fostering sustainability, resilience, and resource stewardship.

The key to meaningful river rejuvenation lies in empowering the smallest elements of the ecosystem - soil microbes, native grasses, local water channels - to reconfigure and renew their roles. When these foundational components are restored and allowed to thrive, they trigger a cascading effect of regeneration, gradually transforming the entire river system. It is through these micro-level innovations that a collective shift toward a more resilient and regenerative riverine future becomes possible.

team RRP.

Team Lead

Prof C N Rao
Prof C R Babu
Mr Shashi Shekhar
Mr Shyam Gupta

Team Members

Dr Anil Gautam
Dr Ajit Kumar Vidyarthi
Dr Balbir Singh
Dr C P Rajendran
Mr Chetan Agarwal
Ms Christina Watson
Dr Debashish Roy
Dr Deepak Pant
Dr Jaishri Sanwal Bhatt
Dr Jyoti Joglekar
Dr Tejpal Singh
Dr Yogita Shukla

FORUM

Prof C N R Rao Receiving Bharat Ratna from the then President Hon Pranab Mukharjee

prof c n r rao

> If India has to become a global leader, it must be through science. There is no other way. Excellence cannot be imported; it has to be built with passion, hard work, and a deep commitment to knowledge.

Bharat Ratna, Prof. C.N.R. Rao is the Honorary President and Linus Pauling Research Professor at the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), and Honorary Professor at the Indian Institute of Science (IISc), Bengaluru. A global authority in solid state and materials chemistry, He is an author of over 1800 research papers and 56 books. He has received honoris causa doctorate degrees from 85 universities including Purdue, Bordeaux, Banaras, Calcutta, Delhi, IITs (Bombay, Kharagpur, Kanpur, New Delhi, Guwahati), IISERs (Bhopal, Kolkata, Mohali, Pune), Assam Royal Global University, KL University, Vijayawada, Northwestern, Notre Dame, Novosibirsk, Oxford, Stellenbosch, Temple, Université Joseph Fourier, Grenoble, Uppsala, Wales, Wroclaw, Caen, Liverpool, St. Andrews, Canberra, Taiwan and Desikottama from Visva-Bharati.

prof c n r rao

Scientific Vision and Leadership

Prof. Rao is a Fellow of leading scientific academies including the Royal Society (London), U.S. National Academy of Sciences, and academies of Russia, France, Japan, China, and the American Philosophical Society. He is also a member of the Pontifical Academy of Sciences and a Foreign Fellow of the Academia Europaea, the Royal Society of Canada, and the Chinese Academy of Sciences. He is a distinguished visiting professor of the University of California. Prof. Rao's lifelong dedication to science & nation-building continues to inspire generations of researchers across the globe.

Prof. Rao has received various medals, honours and awards, mention may be made of the Marlow Medal of the Faraday Society (1967), Bhatnagar Prize (1968), Padma Shri (1974), Royal Society of Chemistry (London) Medal (1981), Padma Vibhushan (1985), Honorary Fellowship of the Royal Society of Chemistry, London (1989), Blackett Lectureship of the Royal Society (1991), Einstein Gold Medal of UNESCO (1996), Linnett Professorship of the University of Cambridge (1998), Centenary Medal of the Royal Society of Chemistry (2000), Hughes Medal of the Royal Society for original discovery in physical sciences (2000), Karnataka Ratna (2001), the Order of Scientific Merit (Grand-Cross) from the President of Brazil (2002) and the Somiya Award of the International Union of Materials Research (2004).

He is the first recipient of the India Science Award by the Government of India and received the Dan David Prize for science in the future dimension for his research in Materials Science in 2005. He was named Chemical Pioneer by the American Institute of Chemists (2005), Chevalier de la Légion d'Honneur by the President of the French Republic (2005) and received the Honorary Fellowship of the Institute of Physics, London (2006) and of St. Catherine's College, Oxford (2007). He received the Nikkei Asia Prize for Science, Technology and Innovation in 2008 and was awarded the Royal Medal by the Royal Society (2009) and the August-Wilhelm-von-Hoffmann Medal by the German Chemical Society (2010). He received the Ernesto Illy Trieste Science Prize for materials research in 2011 and was Albert Einstein Professor of the Chinese Academy of Sciences in 2012.

The President of India conferred the title Bharat Ratna in 2014. The Emperor of Japan bestowed the Order of the Rising Sun, Gold and Silver Star in 2015. He was conferred the highest award for materials research, the von Hippel award by the Materials Research Society, in 2017. He is the first Asian to receive this award. The Centre for Advanced Materials of Ras Al Khaima has conferred the First Sheikh Saud International Prize for Materials Research (2019), Karnataka Science and Technology Academy Lifetime Achievement Award in STEAM (Science, Technology, Engineering, Agriculture & Medicine); Eni Award 2020 Edition of the Energy Frontiers Prize, SMC Lifetime Achievement Award-2022, M P Varghese Award (2023), Chirantan Rasayan Sanstha (CRS) Lifetime Achievement Award 2023, Chemist of the Century by Indian Chemical Society, 2024, Nagarjuna Award from Hindu Research Foundation (2024), Distinguished Fellow from International Engineering and Technology Institute,

Leadership positions:

- **Chairman, Scientific Advisory Council to the Prime Minister (1985–89, 2004–14)**
- **President, TWAS and Indian National Science Academy**
- **Founder-President, Chemical Research Society of India and Materials Research Society of India**
- **President, International Union of Pure and Applied Chemistry (1985–97)**
- **Director, Indian Institute of Science (1984–94)**
- **Chairman, Scientific Advisory Committee to the Cabinet (1997–98)**
- **Albert Einstein Research Professor (1995–99)**

With Prof. Whitesides and Prof. Langer at the Dan David Award function, Tel Aviv (2005)

C N R R A O

J N C A S R

These quotes encapsulate Prof Rao's life's mission of nation development.

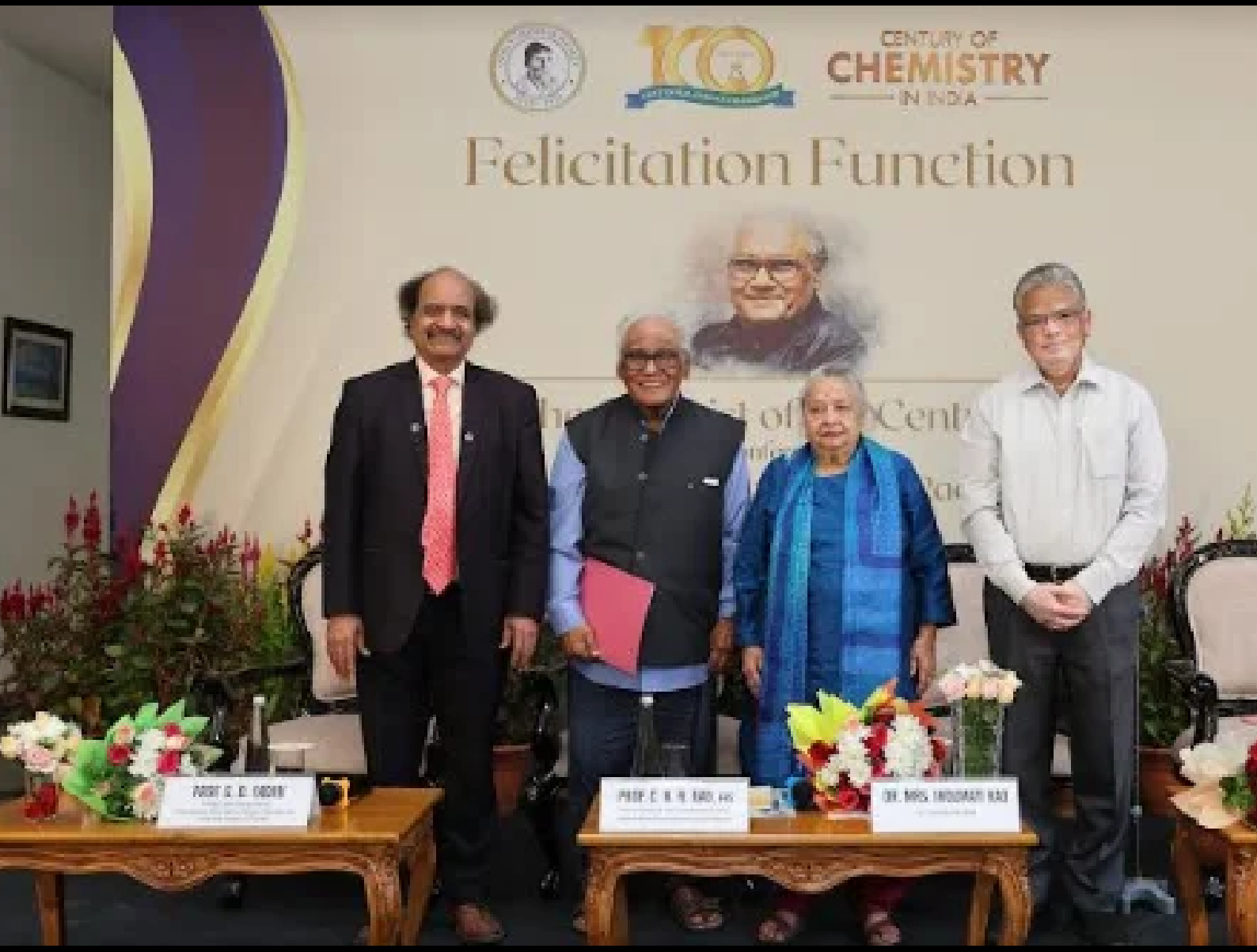
A nation that does not respect science and scientists cannot progress meaningfully in today's world.

Science is not just a profession, it's a way of life. It teaches you humility, perseverance, and the joy of discovery. We need to ignite the scientific temper in every young mind and nurture curiosity beyond classrooms and textbooks.

Never stop learning. The thirst to gain more knowledge should never come to an end. Always gain fresh insights, don't hesitate to ask the right questions. The future of India depends on how well we educate our youth in science and encourage them to think critically and creatively.

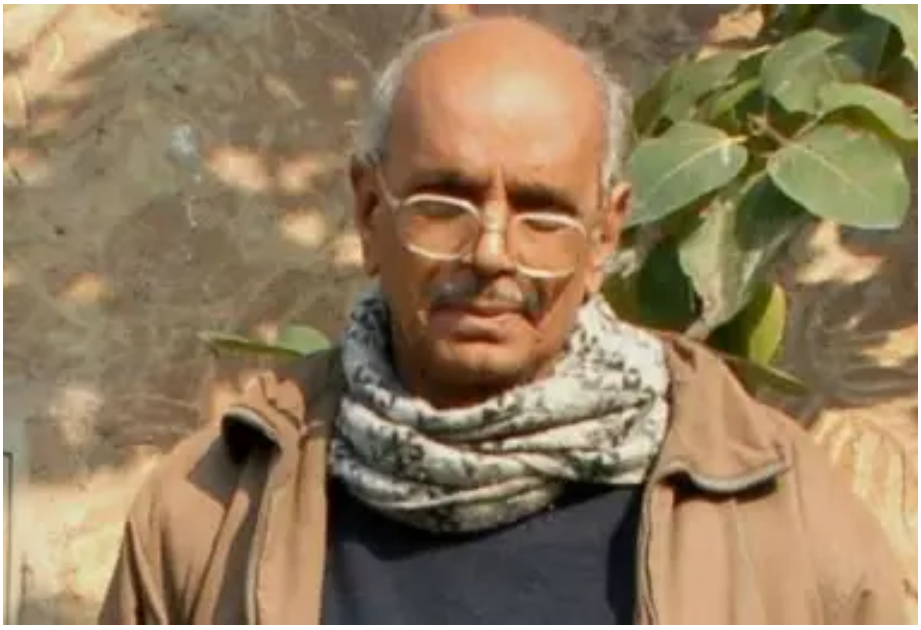
I am not here to create just more graduates, but to help create minds that will question, explore, and innovate. Scientific research is not about quick results, it is about perseverance, failure, and the eventual joy of discovery.

Money cannot buy scientific excellence. What we need is a culture that celebrates original thought and fearless inquiry. We must create an India where doing science is as respected as doing business or politics



Dr C N Rao Felicitated by Indian Chemical Society

prof c r babu



> **Ecological restoration is not just planting trees; it's about reviving entire ecosystems and the web of life they support.**

Prof. C.R. Babu is one of India's most respected ecologists and environmental scientists, widely recognized for his pioneering work in biodiversity conservation, ecosystem restoration, and sustainable environmental management. Currently, he serves as the Professor Emeritus at the Centre for Environmental Management of Degraded Ecosystems (CEMDE), University of Delhi, and is Chairman of the Executive Committee of the National Biodiversity Authority, Government of India. He is also associated with the National Green Tribunal (NGT) as an expert in ecological restoration and wetland conservation. With a distinguished academic career spanning over five decades, Prof. Babu has led groundbreaking initiatives in ecological engineering, particularly in restoring degraded lands, wetlands, and urban ecosystems. He played a pivotal role in formulating the Yamuna Biodiversity Park, Aravalli Biodiversity Park, and Northern Ridge Ecological Restoration Project in Delhi as models of urban ecological rejuvenation and public engagement with nature.

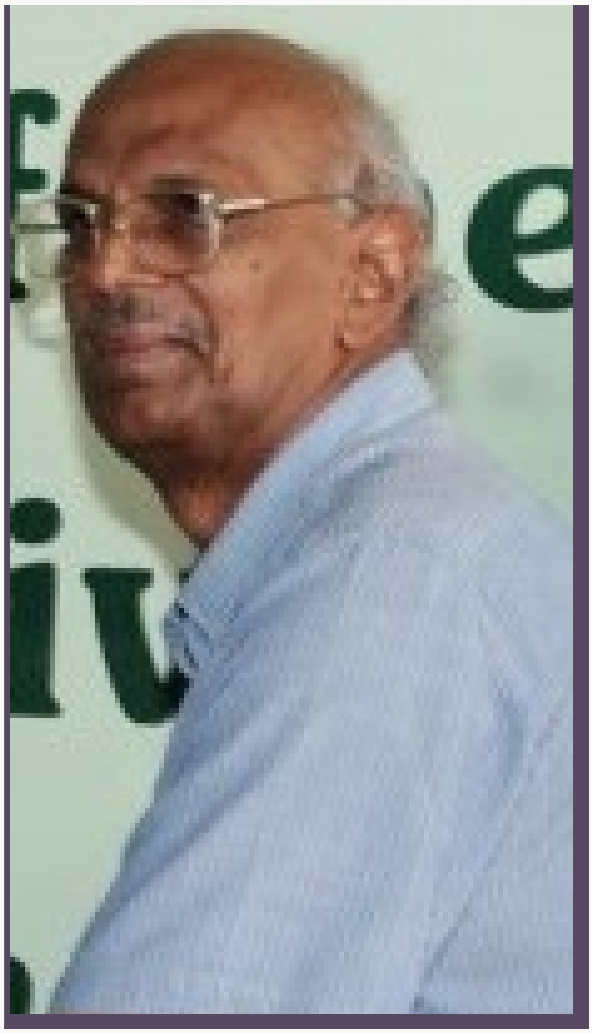
prof c r babu

Ecology and Biodiversity

A former Pro-Vice Chancellor of the University of Delhi, Prof. Babu is widely published in peer-reviewed journals and has guided numerous PhD scholars. His research bridges the gap between science and public policy, focusing on how ecological principles can solve real-world problems such as pollution, land degradation, and biodiversity loss. Prof. Babu continues to inspire and mentor the next generation of environmental leaders, advocating for an ecological civilization rooted in native biodiversity, ecosystem integrity, and community-based stewardship.

Prof. Babu has been a key advisor to several national and international bodies, including the Ministry of Environment, Forest and Climate Change (MoEFCC), and has contributed significantly to India's policies on invasive species management, ecological restoration, and natural resource conservation.

In recognition of his service, he has received multiple awards and honors, including the Padma Shri from the Government of India.



C R BABU

CEMDE

These quotes encapsulate Prof Babu's life's mission of ecological restoration and nature rejuvenation.

Biodiversity parks in urban landscapes are not luxuries, they are essential lungs and learning spaces for sustainable living.

Invasive alien species are silent destroyers of our native biodiversity; managing them is central to true environmental protection.

Restoration is a long-term commitment; nature takes time to heal, and our patience must match her pace. The success of biodiversity conservation lies in using native species, respecting ecological history, and involving local communities.

Wastewater, if treated ecologically, can become a resource—feeding wetlands, sustaining biodiversity, and healing rivers.

Science must serve society, especially the environment. Ecology, when applied thoughtfully, can transform degraded land into thriving ecosystems.

Prof C R Babu with IIT Alumni Council Team

IIT AC

Strategic Vision, Leadership and Outreach

FORUM
River Rejuvenation Platform.

iit ALUMNI COUNCIL

IIT AC

IIT AC RESEARCH INSTITUTE

ABC

Impact Snapshot

100 City Chapters

500 Council Members

50K Alumni Members

5+ years of Unique Outreach

The IIT Alumni Council Foundation, established in 2019, serves as the global nodal body for alumni from all 23 IITs, uniting over 50,000 volunteers and 500+ council members. With a vision to harness the intellectual and technological prowess of IITians for nation-building, the Foundation launched a ₹21,000 crore Social Initiative Fund to support deep-tech startups, social impact ventures, and CSR-led innovations. It leads task forces in AI, quantum computing, biotech, and green energy, and introduced the AMAT AI platform for sustainable materials development. Through partnerships with CSIR, DRDO, and industry leaders, it fosters innovation ecosystems driving India's self-reliance and global leadership.

IIT AC FOUNDATION

The IIT Alumni Council Foundation (IIT AC Foundation), established on 15th August 2019, is a not-for-profit organization that serves as the global nodal body representing alumni of all 23 Indian Institutes of Technology (IITs).

With the guiding belief that IIT alumni are a strategic national asset, the Foundation aims to mobilize this influential and globally dispersed community for advancing India's technological leadership, socio-economic development, and global stature. The Foundation functions through a structured framework consisting of four mission arms - Foundation, Fund, Institute, and Forum - each addressing distinct aspects of nation-building such as philanthropy, finance, innovation, and policy dialogue.

At its core, the Foundation envisions the creation of a robust, tech-enabled ecosystem that brings together alumni expertise, capital, research institutions, and industries to solve complex national challenges. It has identified six frontier technology areas critical to India's future: artificial intelligence, quantum computing, nuclear technology, biotechnology, digital finance, and green energy.

Dedicated task forces comprising IIT alumni experts have been deployed to build capacities, form public-private partnerships, and accelerate deployment in these domains.

One of the Foundation's flagship initiatives is the creation of a ₹21,000 crore Social Impact Fund, which aims to drive investments into deep-tech startups, CSR-aligned innovation, and scalable social ventures. It has incubated and supported startups in areas like electric mobility, drones, vaccine research, advanced materials, and indigenous payment systems.

The Foundation also plays a significant role in policy advocacy, strategic foresight, and technology diplomacy, engaging with national agencies like DRDO and CSIR, stock exchanges, and global corporates to foster collaborative models for innovation.

By integrating alumni talent, institutional research, and industrial strength, the Foundation is working towards a self-reliant, technologically sovereign, and socially inclusive India. It stands not just as a support system for IIT graduates but as a catalyst transforming India into a global innovation powerhouse.

shashi shekhar

> Sustainable water governance begins with empowering local communities and putting the control of water in the hands of those who are directly associated and connected to them. By promoting water budgeting, crop pattern reforms, and integrating surface and groundwater planning, we can move beyond infrastructure-heavy solutions, rivers must be treated as living ecosystems, and not merely as engineering challenges.

Shri Shashi Shekhar, is a geology graduate from Patna University and joined the Indian Administrative Service in 1981 and was allotted Tamil Nadu Cadre. He held various positions as an IAS, of which the important ones were Managing Director of Mineral Development Corporation, Sugar Department, Collectors of Pudukkotai and The Nilgiris Districts, Senior position in Municipal & Water Deptt, Transport and Urban Infrastructure financing, Ministry of Power as Joint Secretary. He was also appointed as the first Director General of Bureau of Energy Efficiency. Post retirement he is focusing on promotion of solar power, IT based solution for power sector including RE integration, Zero Emission mobility, green hydrogen etc. He advises the Principal Scientific Advisor on sectors like water, green hydrogen, smart grid, biodiversity, river rejuvenation etc. He is also on the Board of Rally for River initiative of Sadguru, where he contributed significantly to the concept of Cauvery Calling.

shashi shekhar

Strategic Vision and Leadership

Shri Shashi Shekhar is retired IAS of Tamil Nadu Cadre. With a career spanning 35 plus years in Indian Administrative Services until his retirement in 2016, he has contributed immensely to the government policies and actions. He has presented a number of papers in international forums on power sector and climate change and prepared the 12th Plan draft document of the Ministry of New & Renewable Energy. Later as Additional Secretary, Ministry of Environment & Forest and also as Chairman of Central Pollution Control Board, he dealt with subjects like Environment Clearance, River Pollution abatement, Wetland Development, Coastal Regulatory Zone etc.

During his tenure as Secretary, Ministry of Water Resources, River Development & Ganga Rejuvenation, he initiated far reaching reforms in the water sector. He highlighted the need to understand riverine ecosystem before undertaking any water resource development projects. He underlined the importance of Ground Water given that it contributes 64% of the total irrigated area but depleting very rapidly. He laid emphasis on water budgeting, water accounting and its efficient use by changing the cropping pattern.

dr jyoti joglekar

Computer Vision and
Artificial Intelligence

“

Technology can invariably generate money.
But money cannot always buy technology

Dr Jyoti Joglekar has been researching stereoscopic imaging, photogrammetry and hyperspectral imaging for over twenty years. As a Professor of Computervision and AI - and an active participant in the National Geospatial Program - she has had a ringside view of developments in this sector. Her papers have been published by several Tier 1 journals and her research papers and patents form the foundation of the Forum GSP technology stack. Her book “Internet of Things” is the prescribed textbook on IOT in both several IITs and IIITs. She is a consultant to ISRO and has worked on Chandrayaan 1.

Prof Joglekar with IIT Ropar DIrector Prof Sarit Das and Dean Industry on signing of MoU for geospatial technologies in agritech. IIT Ropar is also the selected institution for the Agritech initiative under the Cyberphysical systems mission. Since the signing of the MoU in November 2024, IIT Ropar has invested Rs 145 crores in the area. This includes a state of the art HPC from Nvidia. Prof Joglekar is a visiting faculty to several colleges and institutions on geospatial technologies. She also carried out the 2024 National Geospatial Program training workshop in Mumbai.

dr jyoti joglekar

Professor of
ComputerVision and AI.

Dr Jyoti Joglekar holds a Bachelor of Electrical engineering from Walchand College of Engineering Sangli, a Master of Computer Engineering from Mumbai University and a PhD in Satellite Image Analysis from IIT Bombay.

She has presented her research work in several International conferences of repute such as the International Society of Photogrammetry and Remote Sensing (ISPRS). Technology developed by her was an important constituent of some of the core data analysis applications developed with Chandrayaan-1 data by SAC, ISRO, Ahmedabad. She has over 25 publications in international journals and international conferences of repute. She is a reviewer of reputed international journals such as IEEE Transactions on Geoscience & Transactions on Remote Sensing (TGRS), IEEE letters, IEEE Access, IET etc. She has been honored as Fellow member of IETE (Institute of Electronics and Telecommunication Engineering) and is a Life Fellow on Computer Vision and Imaging AI at the PanIIT Institute. She is a member of the Board of Studies, Department of Computer Engineering, Mukesh Patel school of Technology, NMIMS, Mumbai, the Department of Information Technology, Cummins College of Engineering, Pune and Science college at SVU.

She has undertaken sponsored research for NESAC, DoS, Meghalaya in the area of image acquisition and processing using Swarm of Autonomous UAVs (Drones) for various surveillance and mapping operations that deploy holographic imaging techniques. She isthe Principal Investigator (PI) and focal officer for TDP (Technology Development Partner) research projects with NESAC, ISRO. She played a role as an expert for funded DST-RFBR research projects. She has been invited as an expert speaker in various Quality Improvement Programs (QIP), faculty development programs (FDP) and STTPs, short term training programs in various institutions of repute such as IIT Bombay and engineering institutes of Mumbai University. She won the second prize for her paper presentation at in INAC-4 conference by ISSE and ISRO held at SAC, ISRO, Ahmedabad in September 2019. She is an active member of the SIH Innovative Product Drive Ecosystem and has mentored three of the students' winning teams in Smart India Hackathon (SIH) 2018 and 2019. She is an active research volunteer with IIT alumni Council since April 2020

Prof Joglekar chairing meeting with Distinguished Fellow - Public Policy - Dr Mahesh Uppal, Life Fellow - Decision support - Sanjay Nagi and GNSS Volunteer Tarun Mohan on policy intiatives and interventions. Subsequently the GoI brought in the new Geospatial policy allowing the entry of private platforms in the sector and removed all restrictions on data collection. The GoI recently announced the GNSS framework for automated toll collection in commercial vehicles.

addGEO

Biodiversity, Regeneration and Earth Observation

FORUM
River Rejuvenation Platform.

addGEO Foundation
UNRAVELING EARTH'S INTUITIVE INTELLIGENCE

addGEO

UNRAVELING EARTH'S INTUITVE INTELLIGENCE

Our mission from day one is Environment, Climate and Geospatial thought and action leadership fostering adoption of regenerative development practices by building harmony between the physical, digital and quantum with nature and earth (GEO) intelligence as the seminal strength.

Impact Snapshot

05 Regenerative Design Projects at work

15 Action research and community capacity building initiatives

02 Living Laboratories in Aravali and Himalayas

3+ years of Unique Explorations

Building regenerative design projects in the Aravali and Himalayas requires deep ecological understanding and sensitivity. In the Aravali, efforts focus on rewilding degraded landscapes, water conservation through johads and contour trenching, and climate-responsive architecture using local stone and lime. In the Himalayas, the priority is stabilizing fragile slopes, reviving traditional timber and stone construction, and integrating passive solar heating for extreme winters. Biodiversity restoration, community-led afforestation, and sustainable tourism initiatives play a crucial role. With scientific methods, ecosystem and permaculture principles integrated with modern technologies guiding these projects ensures not only the restoration of ecological balance but also empower local communities through sustainable development and cultural preservation.

DR YOGITA SHUKLA

ADDGEO FOUNDATION

addGEO Foundation is scientific and technical research organization, started in 2021 with the aim to simplify science for communities and grassroot organisations while making nature and earth intelligence at the core of decision making.

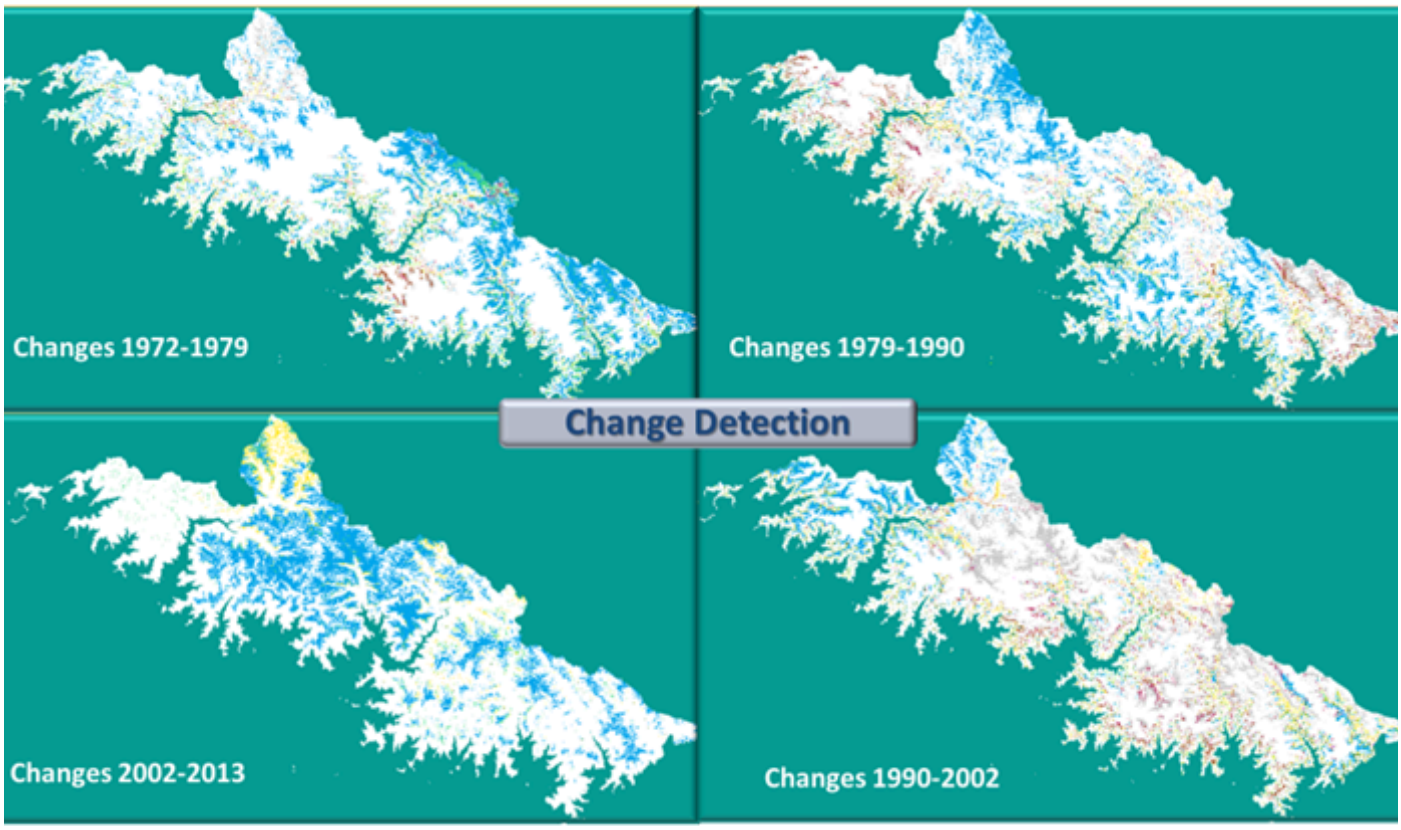
Dr Yogita started this foundation to make science accessible to all. By linking science, technology, traditional knowledge and ancient wisdom of Yoga, her focus through this foundation is to build harmony between natural ecosystems and human systems for regenerative and healthy living.

addGEO Foundation provides scientific knowledge and strategic solutions in environment, climate and geospatial science domain. Through their robust scientific research, these solutions capture the dispersed environmental, climate and geospatial information and streamline these to ensure regenerative ecosystems.

addGEO conducts scientific research to decode environment and earth systems dynamics and deliver decision ready climate and nature smart resilient solutions to policy makers, user organisations and grassroots communities.

The foundation is developing models of regenerative design for ecological restoration in Shivalik range of Uttarakhand as well as Aravali range of Rajasthan. Integrating the traditional ecological wisdom of natural regeneration and restoration with modern technologies of sustainable development, addGEO foundation is aiming to heal degraded landscapes while fostering biodiversity, resilience, and community well-being using scientific methods. Our research focuses on integrating climate-responsive restoration techniques with remote sensing and GIS-based monitoring and enhancing carbon sequestration through afforestation and biodiversity enrichment.

Our regenerative design experiments focus on highlighting the effectiveness of nature-based solutions, community involvement, and sustainable land management in addressing ecological degradation. Our research will further enhance these efforts by incorporating climate-responsive regeneration and restoration techniques, RS and GIS-based monitoring, and strategies to improve biodiversity and ecosystem services. The fundamental focus of our design experiments is to bring back the natural cycles and rhythm in action by blending the traditional ecological knowledge and modern scientific methods.

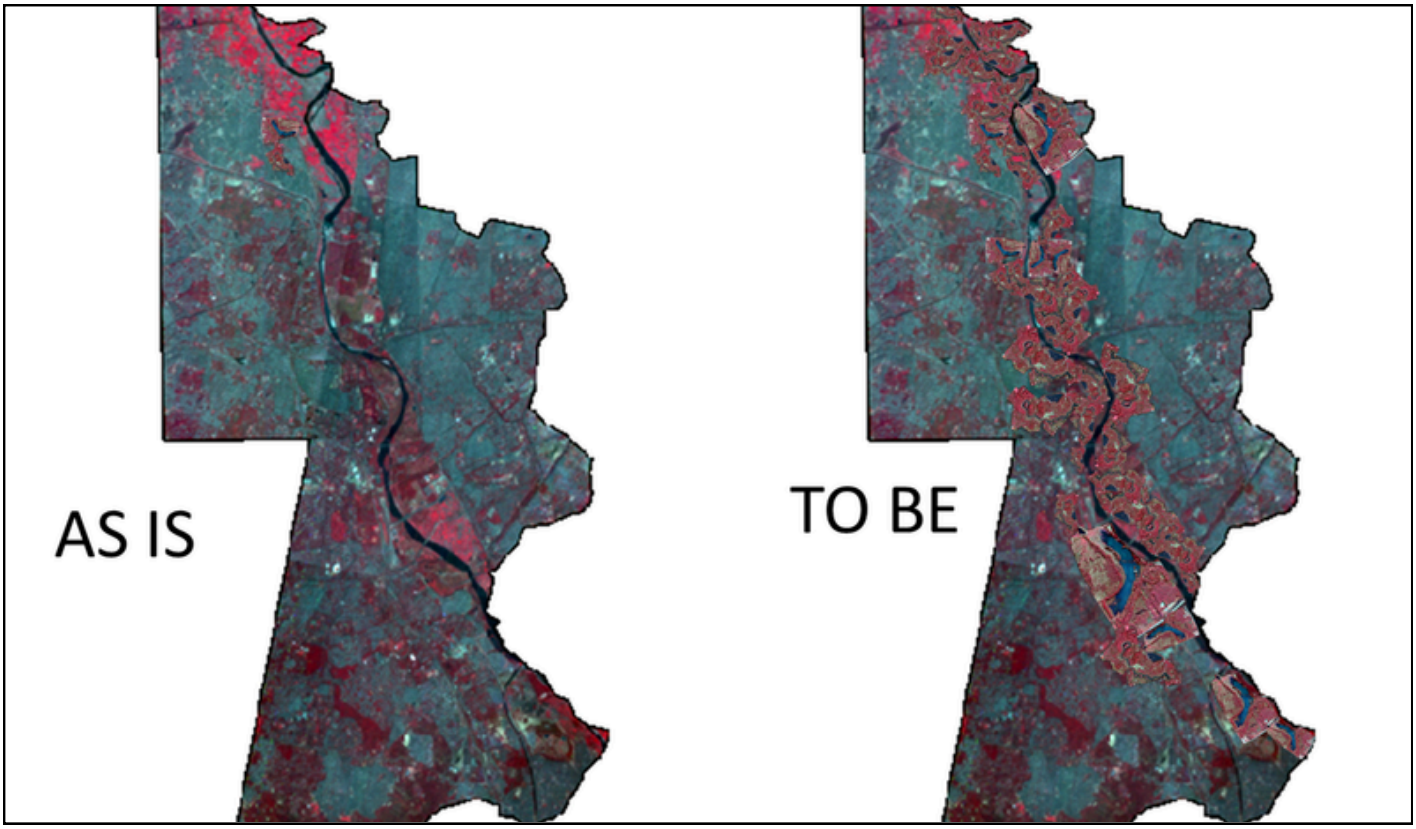


High Altitude Himalayas - Uttarakhand

CLIMATE SMART MOUNTAIN SOLUTIONS

addGEO Foundation is building technology powered sustainable climate smart solutions to successfully build resilience, adaptation, and mitigation of the possible impacts of climate variability in high altitude western Himalayan region.

- Baseline data from multiple sources and preliminary assessment of climatically vulnerable areas at multiple spatial scales
- Thematic spatial information generation through collation of data from multiple research centres and create new data from latest satellite data and data collected from drones and field
- Geospatial Modelling and Analytics at multiple scales
- Vulnerability Indices
- Climate Smart Decision-Making Solutions



Yamuna Biodiversity Park

CLIMATE SMART RIVER REJUVENTION SOLUTIONS

addGEO Foundation, together with Yamuna Biodiversity Park has taken up the study to understand and quantify the ecological benefits of wetland restoration on the banks of Yamuna and build scientific solutions towards rejuvenation of Yamuna River. The study focuses on creating a scientific assessment of how wetland restoration can revive the ecological integrity of floodplains of the Yamuna River, reviving the associated riverine ecosystems. The study is using satellite remote sensing to measure, quantify and assess the changes in the wetland ecosystem and develop ecosystem health indices (EHI) using satellite images, AI, GIS and ground-based observations on biodiversity and ecosystem functions. With the help of time series satellite data from multiple sources, restored stretches will be compared with the unrestored reaches, across different parameters of biodiversity, ecosystem functions and spectrum of services such as water filtration, flood buffering, carbon sequestration and habitat provisioning these healthy wetlands contribute to the urban river systems. This evidence-based study is designed to shift wetland restoration from just being an aspirational conservation gesture, to a mainstream, data-driven, evidence based scientific solutions towards Delhi's climate-resilience.

Dr Yogita Shukla at 6TH GLOBAL ECONOMIC SUMMIT 2017

dr yogita shukla

> Civilizations that aced the art of managing water not just quenched their lands but also nurtured their economies – wherever water flowed with ecological wisdom, prosperity followed. New technologies need to enhance the wisdom of natural systems further and therefore they should come as friends to share their knowledge and not project their dominance and arrogance.

Dr Yogita Shukla is a multidisciplinary scientist-practitioner with core passion towards research, environmental stewardship, regenerative living and geospatial information. Linking science, technology, traditional knowledge and ancient wisdom of Yoga, she is now working towards fostering harmony between natural ecosystems and human systems for regenerative and healthy living.

dr yogita shukla

Vegetation and Remote Sensing Science

Yogita is a vegetation and remote sensing scientist with a MSc in Environmental Science and a PhD in Space Sciences specialising in Remote Sensing from the Indian Institute of Remote Sensing (IIRS) Dehradun as a Research Centre of the University of Pune, India.

Yogita has a diverse experience of over 26 years in Environment, Climate and Geospatial Information Science focusing on Biodiversity Enrichment, Ecological Regeneration, Natural Resource Management, Energy Management, and Rural & Urban Development.

She is now working towards building regenerative systems with a holistic focus and linking diverse disciplines as a SciencePrenuer. Yogita is familiar with all aspects of remote sensing for the assessment of forest and ecosystem health to biodiversity conservation, rural and urban development.

dr yogita shukla

Our culture and civilization - **the āraṇyasanskriti** - was deeply rooted in the wisdom of the nature, where rivers and forests were more than a place. They were revered as living, breathing entities that nourished body, mind, and spirit. Along their banks, our ṛishis meditated on the cosmos, immersed in the rhythms of flowing water and nature's abundance. In this communion with the natural world arose profound realization of **Prāṇo Virāt!** which means Life is immense. Rejuvenating our rivers is not just an ecological act, but a return to this timeless reverence that sustains all life.

This deep alignment brought true liberation, where we find our highest freedom, not in separation, but in harmony with the vast rhythms of existence.

It is in the flowing grace and timeless rhythm of rivers that we glimpse the Infinite - where fear dissolves, and we resonate with the very consciousness of creation.

The more and more I explore and understand our Vedic systems, the more and more I realise that they have a profound scientific understanding behind them. Somewhere down the line, we lost the scientific temper, and what remained are the rituals that resulted in our knowledge systems, culture, and tradition being branded outdated, non-relevant, and inferior to modern knowledge systems.

Dr Yogita Shukla at United Nations World Geospatial Information Congress in 2022

YOGITA SHUKLA

ADDGEO FOUNDATION

These quotes encapsulate Dr Shukla's life's mission of regenerative development.

Nature operates through balanced cycles, regenerative processes, and interconnected ecosystems

Investing in regenerative practices, circular economies, and ecological stewardship ensures long-term stability. When we work with, rather than against, nature, we unlock its potential for abundance, balance, and renewal, securing a thriving world for future generations. Aligning with nature's intelligence enables the restoration of ecosystems, enhancement of biodiversity, and the development of self-sustaining economies.

By observing and integrating natural regenerative principles, we can contribute to a world where resources are used responsibly, energy flows efficiently, and ecosystems thrive

By aligning with Nature and Earth's inherent intelligence we can ensure our planet's long-term sustenance. This shift is not just an ethical obligation - it is a necessity. Only by working in harmony with Earth's intelligence can we secure a prosperous, regenerative future.

Rivers carry not just water, but the sacred pulse of life itself, inviting us to connect, reflect, and awaken to something far greater than ourselves.

Dr Yogita Shukla with Bhutia Tribals in High Altitude Uttarakhand

Dr Yogita Shukla with Tribals in Tripura

CPCB

Environment & Pollution

FORUM
River Rejuvenation Platform.

CPCB

BRIDGING THE GAP BETWEEN RESEARCH AND PRACTICE

CEDAR envisions itself as the bridge between research and practice to facilitate socially just and equitable natural resource management in the Himalaya and elsewhere. Our mission is to foster awareness and understanding of the Himalayan and other ecosystems through trans-disciplinary knowledge generation and dissemination.

Impact Snapshot

20 restoration of over

350 Polluted river stretches restored

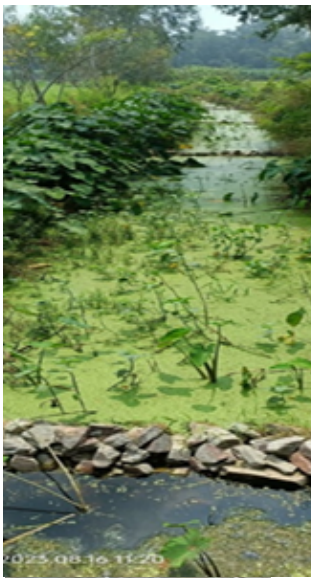
51+ years of Unique Experiments

The Central Pollution Control Board (CPCB) is India's apex statutory organization under the Ministry of Environment, Forest and Climate Change (MoEF&CC), established in 1974 under the Water (Prevention and Control of Pollution) Act and later entrusted with powers under the Air (Prevention and Control of Pollution) Act, 1981. It serves as the national authority for coordinating, monitoring, and advising on matters related to pollution prevention and environmental protection.

CPCB formulates standards for air, water, and noise quality, oversees waste management regulations, and implements National Ambient Air Quality Monitoring and Water Quality Monitoring programs. It guides State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs) in enforcement and compliance, ensuring uniformity across states.

DR AJIT KUMAR VIDYARTHI

CENTRAL POLLUTION CONTROL BOARD



The Central Pollution Control Board (CPCB) is India's premier statutory organization for environmental protection and pollution management, operating under the Ministry of Environment, Forest and Climate Change (MoEF&CC). Established in 1974 under the Water (Prevention and Control of Pollution) Act, and later empowered under the Air (Prevention and Control of Pollution) Act, 1981

CPCB serves as the national authority for pollution control, environmental monitoring, and policy guidance. Its mandate extends across the prevention, control, and abatement of air and water pollution, the development of environmental standards, coordination with State Pollution Control Boards (SPCBs), and the integration of scientific and technological innovations for sustainable environmental governance.

CPCB provides scientific, technical, and policy support for implementing environmental laws in India. It formulates National Ambient Air Quality Standards (NAAQS), Effluent and Emission Standards, and Waste Management Rules under the Environment (Protection) Act, 1986. The Board operates a countrywide network of pollution monitoring stations, compiles data, and publishes reports to assess compliance and environmental trends.

It also assists the MoEF&CC in policy development and supports state agencies in implementing pollution control measures, capacity building, and enforcement. CPCB's laboratories are accredited for testing air, water, and soil quality parameters and provide evidence-based support for environmental litigation and decision-making.

Through an evolving mix of scientific research, regulatory enforcement, data-driven governance, and public participation, the Central Pollution Control Board has become a cornerstone of India's environmental governance framework.

CPCB's key initiatives include NAMP and CAAQM for air quality monitoring, NWMP for water assessment, waste and e-waste regulation, GRAP for NCR pollution control, and digital systems like Parivesh and OCMMS for transparency. CPCB's efforts resulted in improved air and water quality, enhanced industrial compliance, strengthened waste regulation, and increased public environmental awareness through digital tools and nationwide capacity-building initiatives. As the nation moves toward Net Zero and sustainable development, CPCB's role is increasingly pivotal in aligning national pollution control efforts with global environmental goals.

Origin of River Gambhir

National Water Quality Monitoring Programme (NWMP)

Covering over 4,000 monitoring stations on major rivers, lakes, and groundwater sources, this initiative supports the Namami Gange Mission and the National River Conservation Plan (NRCP) by identifying polluted stretches and recommending interventions.

dr ajit kumar vidyarthi

> **Environmental leadership is not about enforcing limits; it is about expanding possibilities – where science meets sensitivity, industry meets accountability, and rivers flow cleaner because policy, people, and purpose align toward a shared ecological consciousness.**

·Dr. A.K. Vidyarthi, is a distinguished Director/ Scientist 'F' with over 25 years of service at CPCB. Presently he is posted as Regional Directorate (Central), CPCB, Bhopal. His educational qualification include BE (Civil) , ME (Civil Engg with specialization in Environmental Engineering) and Ph.D. (Environmental Engineering). ·His efforts towards achievement of Zero Liquid Discharge (ZLD by Pulp & Paper and Distillery sectors received remarkable recognition, including praise from the Hon'ble Prime Minister during the episode of "Mann Ki Baat" broadcasted in 2016.

dr ajit kumar vidyarthi

Environmental Engineering

Dr Vidyarthi's core expertise include (i) Industrial Process and Environmental Management (ii) Water Quality Management (iii) River Rejuvenation (iv) Sewage and Effluent Treatment (v) Solid Waste Management (vi) Industrial Clusters Management & (vii) Environmental Regulation and Policy. Presently, he is quite instrumental in formulation of rejuvenation plans for river Kahn (Indore). Further environmental management plan of Sangaria industrial area and augmentation/ upgradation of CETPs at Jodhpur has also been initiated. In addition to that, he has launched participatory programme of ULBs for MSW management to utilize co-processing capacity of Cement industries.

During his tenure at CPCB he successfully led 'Namani Gange' Programme. He has played a pivotal role in formulation and implementation of rejuvenation plans for Ganga basin rivers namely Kali-East, Varuna, Assi, Morwa, Basuhi and Hindon . In this endeavour he developed and implemented charters in major industrial sectors, namely Pulp & Paper, Sugar, Distillery, Textile, and Tannery. His efforts led to reduction in effluent generation and corresponding decrease in BOD pollution load from grossly polluting industries (from the year 2017 to 2024).

Constructed Wetlands

AJIT VIDYARTHI

CENTRAL POLLUTION CONTROL BOARD

These quotes encapsulate Dr Vidyarthi's life's mission of environmental remediation.

True rejuvenation begins when science becomes service—when every clean river and restored ecosystem reflects humanity's capacity to innovate responsibly and care deeply.

Pollution control is not enforcement alone, it's empowerment through awareness, partnership, and innovation that transforms industries into stewards of the environment. Zero Liquid Discharge is not merely a technical milestone; it's a symbol of industrial consciousness and collective commitment to water security.

Every river we restore writes a new chapter of accountability and proof that development and ecology can coexist through informed, participatory action.

Environmental governance is strongest when it listens to data, to rivers, and to the communities who depend on them for life and dignity. Regulation becomes transformation when it inspires industries to lead sustainability, not just comply with it.

Sustainability is not a target; it's a culture of mindful growth where technology, governance, and empathy converge for a resilient planet.

Tertiary drain (Takia drain) showing the rock filters

aTertiary drain (Takia drain) showing aquatic plants between the filters

Secondary drain showing rock filters and plants

Constructed Wetland

Takia drain before the development of Constructed Wetland

Takia drain after the development of Constructed Wetland


in harmony
with nature

CEDAR

Ecological Research

FORUM

River Rejuvenation Platform.

CEDAR

BRIDGING THE GAP BETWEEN RESEARCH AND PRACTICE

CEDAR envisions itself as the bridge between research and practice to facilitate socially just and equitable natural resource management in the Himalaya and elsewhere. Our mission is to foster awareness and understanding of the Himalayan and other ecosystems through trans-disciplinary knowledge generation and dissemination.

Impact Snapshot

04 Multidisciplinary research and practice areas

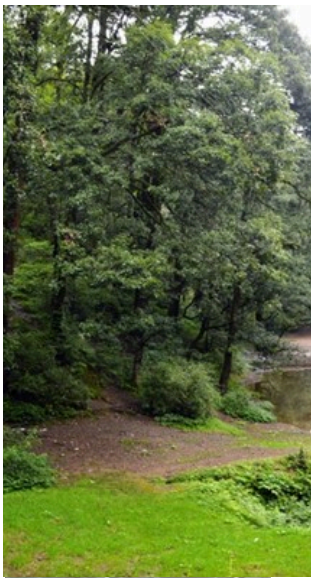
20 Projects Implemented

19+ years of Unique Experiments

CEDAR is a research and action institute focused on sustainable mountain development, particularly in the Indian Himalayas. Its work addresses critical issues like forest ecology, water security, urban sustainability, and climate resilience. CEDAR's research on spring revival, forest carbon and hydrology, and other ecosystem services has informed state policies and community practices. It actively collaborates with local governments, communities, and academic institutions to promote evidence-based conservation and livelihood solutions. Through citizen science, youth engagement, and policy advocacy, CEDAR bridges traditional knowledge and modern science, creating scalable models for ecological restoration and sustainable development in fragile mountain ecosystems. Its work spans forest ecology, spring revival, urban sustainability, and climate resilience. Landmark initiatives in forest hydrology and ecosystem services have shaped policies and community practices.

CHETAN AGARWAL

CENTRE FOR ECOLOGY DEVELOPMENT AND RESEARCH



The Centre for Ecology Development and Research (CEDAR), established in 2006 with a registered office in New Delhi and operation base in Dehradun, is a leading environmental research and action institution focused on promoting sustainable development, particularly in the Indian Himalayan region.

Registered under the Societies Act, CEDAR bridges the gap between scientific research, community engagement, and policy advocacy, combining ecological insight with participatory approaches. Over the past two decades, it has built a strong reputation for its interdisciplinary work in forest ecology, water resource management, climate change adaptation, and sustainable livelihoods.

CEDAR collaborates with state and central government agencies, academic institutions such as Kumaun University and HNB Garhwal, NGOs, and international development partners to implement practical, community-led ecological interventions. The organization's core focus lies in three interconnected areas namely, ecology, sustainable livelihoods, and policy research. Its research spans Himalayan forest dynamics, water springs, biodiversity, and climate resilience, while its fieldwork actively involves local communities in bamboo-based livelihoods, ecotourism models, agroforestry, and decentralized water conservation.

CEDAR has led and supported several high-impact projects, including the HI-AWARE collaborative research in the Upper Ganga Basin, which brought attention to spring-shed rejuvenation and gender-inclusive climate adaptation. The organization has also contributed to the scoping and policy design for forest ecosystem services in Uttarakhand and Himachal Pradesh, supported by GIZ. CEDAR's work on ecotourism and environmental education has led to the development of innovative tools like mobile flora apps and folklore-inspired bird guides, strengthening nature-linked community enterprises.

CEDAR has pioneered the integration of digital tools and geospatial technologies with grassroots ecological knowledge. By using 3D terrain models, KoBoToolbox, and the PEAS framework, it effectively implements and evaluates environmental projects. Its research outputs and policy briefs have shaped forest governance, wetland conservation, and climate adaptation strategies. Through partnerships with institutions like IFSD, CEDAR continues to expand its systems-based, community-driven impact across multiple Himalayan states, and in the Haryana Aravallis.

Mahakali river - Uttarakhand

Transboundary rivers of South Asia (TROSA) Phase-2: Rivers, Rights and Resilience

CEDAR is implementing the TRISA phase 2 project in the Mahakali river basin in Uttarakhand on the Indo-Nepal border, with IUCN India. The primary activity is to assess options for strengthening climate resilient livelihoods of communities living in the Mahakali basin,in 13 villages as well as support improved and inclusive management of transboundary river ecosystems and biodiversity protection. This will be achieved by strengthening leadership of civil society, especially women, indigenous people, and youth, to influence government and private sector on water governance across the basin.

chetan agarwal

> **Natural forests and grasslands play an important role in maintaining water quality and lean season flows. Organizing and incentivising farmers to protect, regenerate and plant vegetative patches in the river basins particularly in the riparian zones is a key element in river restoration.**

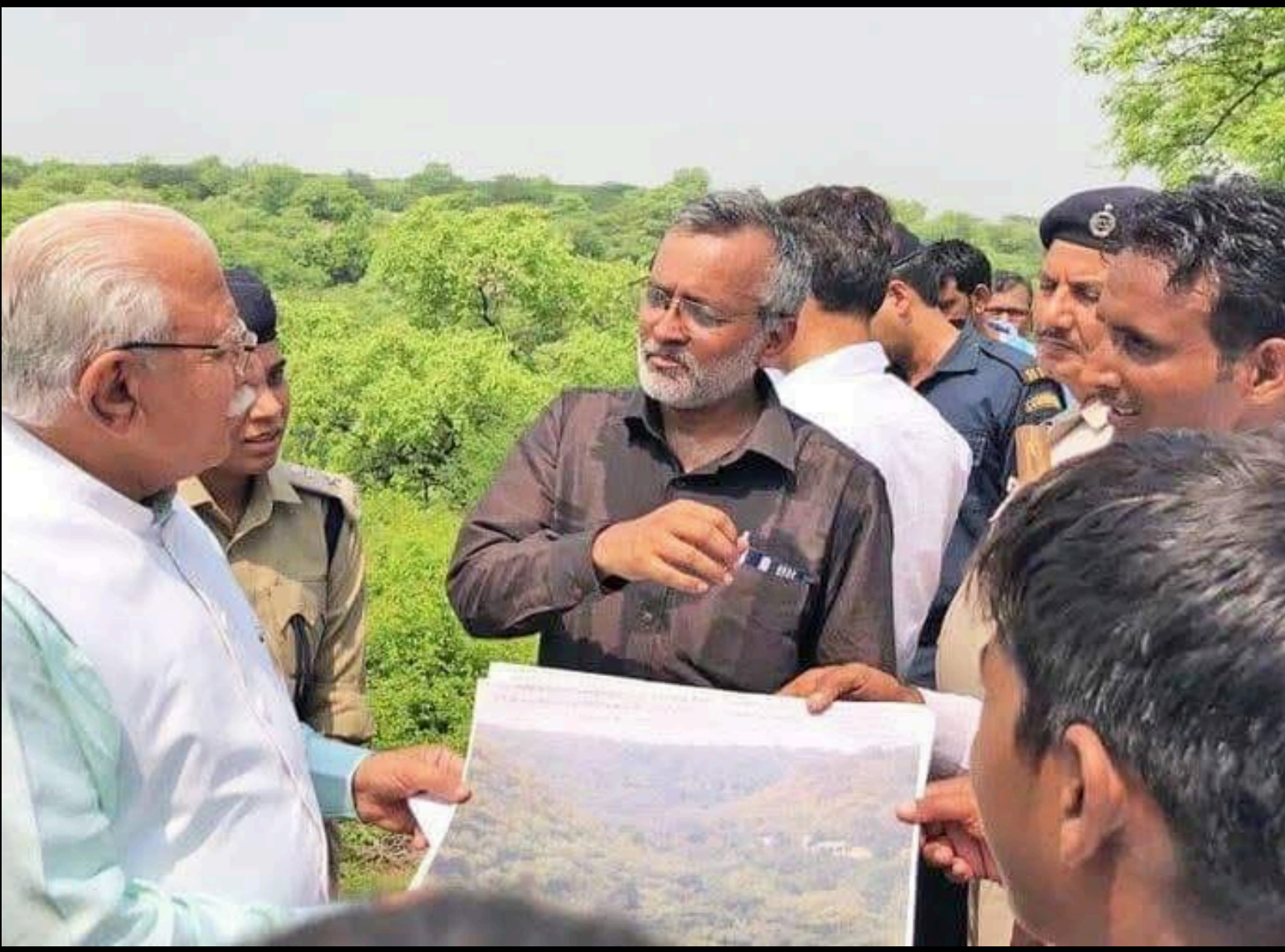
Mr Chetan Agarwal specializes in water, forest and environmental policy analysis, with an emphasis on pro-poor approaches, especially in the context of securing forest watershed services and adapting to climate change. He has expertise in promoting management for ecosystem services including forest watershed services and biodiversity at multiple scales and using diverse instruments including zoning, institutions and incentive systems and cost benefit analysis.

chetan agarwal

Environmental Policy

Mr. Agarwal is a seasoned environmental policy analyst with over two decades of experience in water, forest, and climate-related policy, with a strong focus on pro-poor and community-based approaches. He has worked extensively on Payments for Environmental Services (PES) in India (Himachal Pradesh, Madhya Pradesh), the USA, Vietnam, and Laos, with projects designed to secure sustainable upstream water sources and downstream flow for drinking and irrigation, particularly through community-managed systems. He has served as an expert member of the State Expert Appraisal Committee (SEAC), Delhi (2021-2024), and leads assessments for water and forest sustainability in Haryana and Gurgaon.

Mr. Agarwal has led large-scale feasibility studies on PES, mainstreamed environmental services into district-level planning, and developed participatory PES agreements. His field experience spans the Aravallis, Western Himalayas, and central Indian tribal regions, where he has implemented watershed and drinking water security assessments. In addition, he has contributed to policy review efforts for the MoEF/JICA, DFID-India, GIZ, and the World Bank



Mr Chetan Agarwal briefing then CM haryana, Shri Manohar Lal Khattar about the Mangar Bani sacred grove in the Haryana Aravallis, adjacent to Delhi

Mr Chetan Agarwal in discussion with volunteer teachers on Aravalli forests

Mr Chetan Agarwal planning a forest baseline survey in the damdama Aravallis

Mr Chetan Agarwal with interns from IIT Delhi Management program

Mr Chetan Agarwal monitoring groundwater levels in the Aravallis foothills during a forest and hydrology study

CSIR-CSIO

Scientific & Industrial Instruments

FORUM
River Rejuvenation Platform.

CSIR-CSIO

CSIR-CSIO

ENHANCE QUALITY OF LIFE OF THE CITIZENS OF INDIA THROUGH INNOVATIVE SCIENCE & TECHNOLOGY

Central Scientific Instruments Organisation (CSIO), a constituent unit of Council of Scientific & Industrial Research (CSIR), is a premier national laboratory dedicated to research, design and development of scientific and industrial instruments. It is a multi-disciplinary and multi-dimensional apex industrial research & development organization in the country to stimulate growth of Instrument Industry in India covering wide range and applications.

Impact Snapshot

08 Centres of Excellence

88 Patents Granted

102 Transfer of Technology in last 10 years

66+ years with Unique Innovations

CSIR–CSIO is a premier national laboratory driving innovation in precision instrumentation. With a legacy of pioneering research, it has significantly contributed to strategic sectors including healthcare, agriculture, aerospace, and defense. Notable projects include the development of non-invasive bilirubinometer for neonatal care, portable vision-testing devices, and AI-based smart stick for the visually impaired. In defense, CSIO has designed optical periscopes and sighting systems for tanks and submarines. Its soil nutrient analyzer supports precision agriculture, while IoT-enabled water quality monitoring systems enhance environmental surveillance. These innovations reduce import dependency, support Atmanirbhar Bharat, and empower industries and communities. CSIO also fosters R&D through academic-industry partnerships and human resource development initiatives. CSIO's translational research benefits industries and society alike, from rural health diagnostics to advanced metrology solutions.

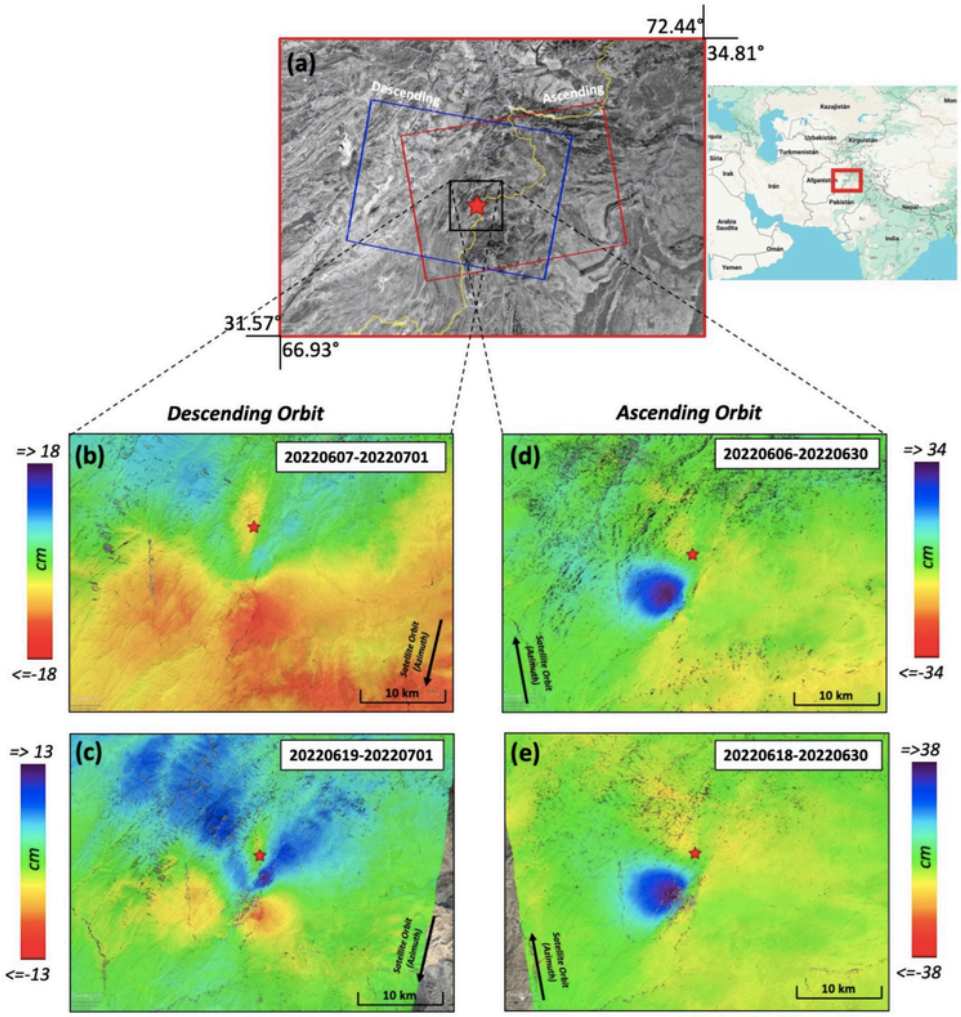
T E J P A L S I N G H

C S I R - C S I O

Established in October 1959, CSIO was chartered to stimulate the growth of indigenous instrument industry in the country through development of contemporary technologies and other scientific & technological assistance. Initially located at New Delhi, CSIO moved to Chandigarh (the City Beautiful).

CSIO Campus (spread over an area of approximately 120 acres) comprises of Office Buildings, R&D Laboratories, Indo-Swiss Training Centre and a Housing Complex. An austere four-story building and the accompanying workshops were inaugurated in December 1967.

Another four-story block was added in 1976 for housing R&D Divisions,Library, etc. During mid-eighties, the laboratory buildings and infrastructural facilities were modernized in order to gear the Institute towards taking up development projects in challenging and emerging areas of technology.



Earthquake activity captured by satellites

A trail of river in the past

Exploring earthquake faulted landscapes in Mongolia

Key projects

Active tectonics and Drainage development in the Nahan Salient, NW Sub-Himalaya. (Department of Science and Technology, New Delhi).

Surface deformation in earthquake regions using conventional InSAR and PS-InSAR techniques: a case study of the 1999 Chamoli and 2001 Bhuj earthquakes. (European Space Agency).

Spatial and Temporal patterns of active tectonic deformation in the Beas River through Morphometric analyses and Fluvial Terrace studies (Science and Engineering Research Board, New Delhi).

Integration of space based SAR(BIG) data with ground based information for an improved near real time assessment and monitoring of seismic hazard (DST, New Delhi and British Council under the UKIERI program).

Surface Topography and kinematics of active faulting in the Sub-Himalaya close to Chandigarh: Implications to infrastructure development and seismic hazard for a proposed smart city (Ministry of Earth Sciences, New Delhi).

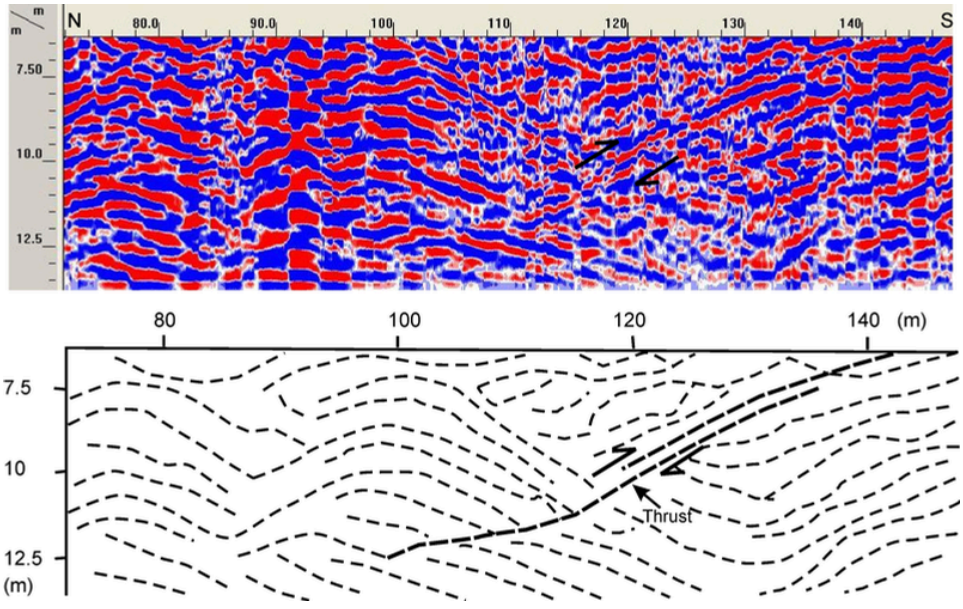
Localization of surface deformation zones using space borne InSAR and ground investigations in an active sector of the Sub-Himalayan region (DST, New Delhi and Italian Ministry).

A comprehensive geomorphic anomaly investigation over Sutlej basin, India. (ISRO-SAC, Ahmedabad).

Geodetic and Morphotectonic Characterization of the Karakoram Fault Zone: looking into the implications of active tectonics for seismic hazard (ISRO).

Exploring thy river:Archives and Evidences

River archives as seen in the field



As seen using instruments, data acquisition, and analytics

Science Outreach

Dr Tejpal Singh with his team and collaborators in the field.

Dr Tejpal Singh with experts and participants of the the International workshop
“REMOTE SENSING FOR CRUSTAL DEFORMATION STUDIES”
04-05 Dec., 2023.

dr tejpal singh

> Rivers are the lifeline of our society. The water is the life blood. Let's join hands for their rejuvenation and restoration towards a more sustainable future for us on the earth.

Dr Tejpal Singh is part of the Intelligent Machines and Computing Systems division at CSIR-CSIO in Chandigarh. He leads the Seismological Observatory which is connected to the National Seismological Network of the Ministry of Earth Sciences, Govt. of India. The lab which is part of the CSIR network contributes through scientific and technological interventions towards various scientific and societal problems. The lab at Chandigarh contributes towards various aspects of earth and environment, public safety, groundwater, climate change, water security, agriculture, disaster management and to various other strategic sectors of national importance.

dr tejpal singh

Earth and Environment Scientist

With an experience spanning over more than 2 decades, Dr Singh has successfully carried out several projects for various departments and ministries of the Govt. of India. He has also worked on various international projects supported by the European Space Agency, British Council (UK) and more recently with the Italian ministry of foreign affairs and international cooperation (MAECI).

Dr Singh is actively working on cutting edge science to delineate ground deformation by the integration field surveys and space based datasets to realise a high degree of spatial and temporal coherence.

His work on one side finds applications in identifying subtle ground movements or rapid subsidence caused by depleting ground water levels in the plains of Punjab, western India whereas on the other side he is able to capture the ground deformation patterns due to earthquakes eg. Afghanistan (2022).

His contributions touch scientific and societal aspects which include earthquake hazard, groundwater depletion and flood hazard. With a strong background in geology and tectonics, he is seeing an increasing role of changing climate in shaping the landforms and erratic weather patterns. Most of his works are centered around the evolving river networks. He has been mentor to several PhD and post-graduate students who are carrying on the good work done with him at national and international forums. They are contributing to addressing critical global challenges and working towards a more sustainable world.

Dr Tejpal Singh receiving the Young Scientist Award (Earth System Science) 2006, Indian Science Congress Association.
Presented by Dr A P J Abdul Kalam Hon'ble President of India.

Dr Tejpal Singh conducting a session at the International workshop
"OBSERVING GROUND DEFORMATION FROM SPACE AND IN THE FIELD"
16-19 Dec., 2024

DR TEJPAL SINGH

CSIR-CSIO

These quotes encapsulate Dr Singh's life's mission of environmental rejuvenation.

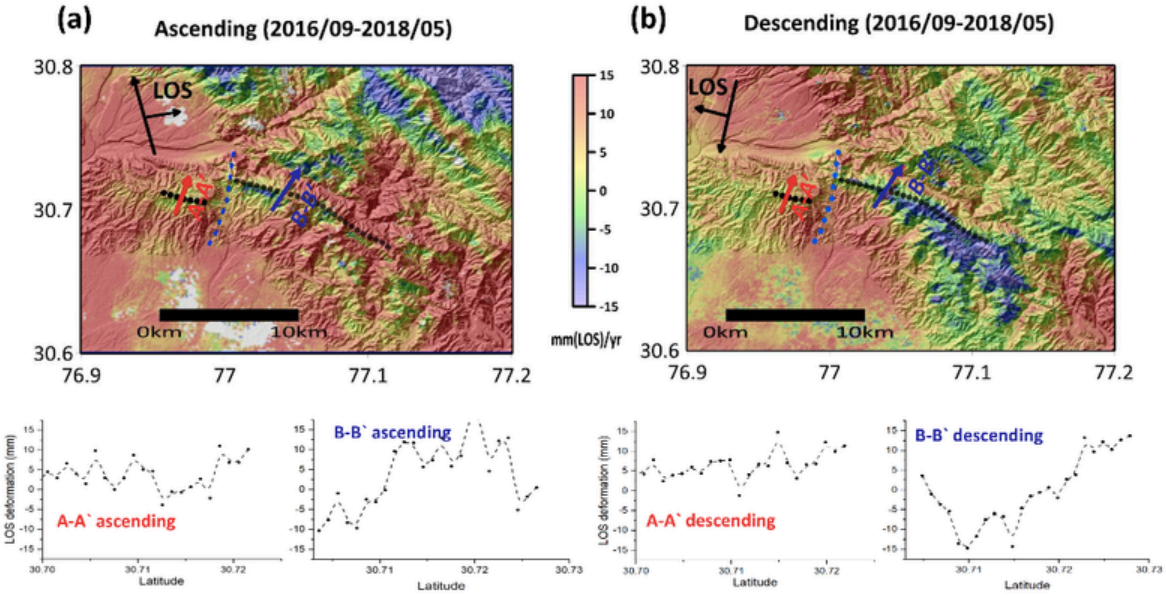
Earth is a very unique system. And the uniqueness owes itself to the water on it. "Our Blue Planet".

Rivers are where we live.
Rivers have helped us civilize, cities have thrived on their banks, trade has flourished, abundant water for agriculture and industry.
Once the river is lost, civilizations vanished. The case of the mighty River Saraswati, which is linked to the rise and fall of the Indus Valley civilization. And may more across the world.

A warming climate is already posing challenges to our water and food security.

Rivers are the life line of the earth.
As an earth scientist, I see these life lines respond to the dynamism of the earth. Sometimes the rivers shift very swiftly like we see in the Kosi (almost every years), whereas at other times the shifts are spread over millions of years (unknown and undetected).

Beware!
Groundwater is a precious yet finite resource. Relentless extraction can permanent destruction of aquifers and irrevocable land subsidence.



Slow Ground Deformation observed from space

Tectonic Landscape in the Himalaya


nature
inspired.

CUHP

Pollution & Waste Management

FORUM

River Rejuvenation Platform.

CUHP

CENTRAL UNIVERSITY OF HIMACHAL PRADESH

The Central University of Himachal Pradesh envisions becoming a premier institution of higher learning that is inclusive, sustainable, and committed to excellence in teaching, research, and public engagement. Guided by the principles of equity and innovation, the university strives to provide quality and inclusive education to all sections of society, foster interdisciplinary and multidisciplinary research, and nurture socially responsible, environmentally conscious, and ethically grounded individuals. Through the empowerment of students with knowledge, skills, and values, and through collaboration with national and international institutions, CUHP aims to contribute meaningfully to national development and global understanding.

Impact Snapshot

45 Research Projects Implemented

22 Academic Centres and Labs Developed

60 Community Engagement and Outreach

12+ Years of Unique Experiments and Innovation: Department of Environmental Sciences, CUHP

For over twelve years, the Department of Environmental Sciences at the Central University of Himachal Pradesh has led pioneering work in environmental research, education, and community engagement. Through unique, interdisciplinary experiments, the department has addressed real-world challenges in Himachal Pradesh's ecologically sensitive landscapes. Its work spans climate-resilient agriculture, watershed restoration, waste management, and biodiversity conservation, blending scientific innovation with grassroots impact. Laboratory research on green chemistry, phytoremediation, and lithium-ion battery rejuvenation has led to patent filings, while projects on ecosystem health and land use have informed national policy. The department has trained thousands through field camps, workshops, and community outreach, fostering environmental leadership. Its evolving model as a living laboratory exemplifies a twelve-year commitment to sustainability, innovation, and regional relevance.

DR DEEPAK PANT

CENTRAL UNIVERSITY OF HIMACHAL PRADESH

As part of his commitment to applied environmental science, regenerative development, and sustainable waste management, Dr. Deepak Pant actively leads field-based learning, hands-on scientific investigation, and public engagement programs. Students and faculty are seen participating in a community outreach program on source-level waste segregation and circular economy awareness.

Students and researchers under the guidance of Dr. Pant conducting a biomedical waste segregation and audit study at a waste management facility. This aligns with his research interests in hazardous and plastic waste valorization, as well as chemical-biological hybrid methods for detoxification. The study aimed to evaluate the volume, type, and risks associated with discarded medical plastics and identify feasible pathways for recycling and safe disposal—a direct extension of his patented technologies and innovations in plastic-to-paint and selective degradation processes.

Microplastic Survey and River Health Assessment

During this hands-on field activity, students collected sediment and water samples from a Himalayan stream to assess microplastic contamination—a growing threat to aquatic ecosystems and human health. Under Dr. Pant's mentorship, the team explored methods to identify plastic fragments and map their flow through surface and groundwater systems. This aligns with his research on plastic degradation and environmental monitoring, bridging geospatial data and environmental chemistry.

Patent Innovations and Technological Contributions

Dr. Deepak Pant has made significant strides in environmental technology through the development of five granted patents and several novel techniques addressing plastic waste, e-waste, and biomedical waste management. His innovations include a selective degradation reactor for plastic conversion, a process for deriving antifungal solutions from CD waste, and green methods for metal extraction from e-waste and lithium-ion batteries.

Notably, his invention of a column reactor for synthesizing cyclic carbonates and a reactor system for separating polycarbonate and aluminum layers from optical discs showcases his commitment to circular economy principles and low-impact recycling methods. These patented technologies have positioned him at the forefront of sustainable innovation, earning national recognition including awards from the Hon'ble President and Vice President of India.

dr deepak pant

> Observing an object can lead to a range of interpretations - from the worst to the most insightful. Sometimes, explanations may seem flawed or confusing at first, but they can evolve into something novel or even groundbreaking. It's a journey from confusion to clarity, often marking the beginning of invention

Prof. Deepak Pant is a multidisciplinary environmental scientist, innovator, and academic leader whose core passion lies in sustainable chemistry, environmental stewardship, waste and pollutant remediation and the circular economy. With over two decades of experience in scientific research, policy advisory, and capacity building, he has persistently worked at the intersection of modern science, traditional knowledge systems, and geospatial intelligence. As a proponent of regenerative development, Dr. Pant's work harmoniously blends green chemistry, microbial remediation, and holistic environmental management. Drawing from both cutting-edge technology and the ancient wisdom embedded in nature-based solutions, he is committed to fostering synergies between human systems and natural ecosystems for a healthier, more resilient future.

dr deepak pant

Environmental Innovation and Regenerative Systems Science

Dr. Deepak Pant is an environmental scientist and chemist with a Ph.D. in Coordination Polymers and over 23 years of academic and research experience. With deep expertise in environmental chemistry, solid waste management, and green technologies, he has led cutting-edge projects in e-waste management, microbial remediation, and resource recovery using hybrid chemical-biological systems.

Dr. Deepak Pant has been the recipient of two of India's most prestigious national honors for his groundbreaking contributions to environmental innovation and sustainable technology. In 2017, he was conferred the Visitor's Award for Best Innovation by the Hon'ble President of India in recognition of his pioneering work in green chemistry and waste-to-resource technologies.

Dr. Deepak Pant has successfully led a range of innovative research projects focused on environmental remediation, waste valorization, and green chemistry, with a total funding worth over ₹10 crores from various national and state agencies. His ongoing projects include the rejuvenation of used lithium-ion batteries using a gel-based recycling process (NMHS-MoEFCC), utilization of biomass ash in collaboration with Starwire India Vidyut Pvt. Ltd., and a major Indo-UK collaborative project on earthquake hazard quantification and resilience building.

He also serves as a consultant for air quality restoration plans in seven non-attainment cities in Himachal Pradesh (HPPCB), and is currently engaged in lightning monitoring studies with ISRO Hyderabad. His completed projects span green chemical recycling of polycarbonate plastics (SERB-DST), chemical and biological extraction of metals from e-waste (State Biotech Program, Uttarakhand), metal recovery from spent lithium-ion batteries (DBT), utilization of waste glass for plastic degradation (UCOST), natural radiation monitoring in the Lesser Himalayas (BARC), and development of value-added products from plastic waste (HP SCSTE).

His interdisciplinary work spans the domains of environmental science, sustainable materials, geospatial applications, and traditional knowledge integration. Dr. Pant has actively contributed to innovations in plastic recycling, battery rejuvenation, green solvent development, and biosorption processes. Currently, he is dedicated to developing regenerative systems that emphasize ecological harmony, carbon management, and the transition from linear to circular economies by linking science, indigenous knowledge, and practical technology for sustainable rural and urban development. These impactful projects reflect Dr. Pant’s dedication to leveraging science and technology for ecological restoration, sustainable resource management, and societal benefit.

In a workshop with Nepal police at Kathmandu and nearby, with our UK and Taiwan colleagues. Sustainability and disaster are counterparts of each. If we plan properly, there should be less disaster.

Visitor's Award

The following year, in 2018, he was awarded the 8th National Award for Technology Innovation by the Hon'ble Vice President of India, under the Ministry of Chemicals and Fertilizers, for his outstanding achievements in technological innovation related to waste management and resource recovery. These accolades highlight Dr. Pant's leadership in advancing science and technology for environmental sustainability at the national level.

8th National Award for Technology Innovation

DR DEEPAK PANT

CENTRAL UNIVERSITY OF HIMACHAL PRADESH

“Turning waste into value is not just science, it’s a responsibility to future generations.”

Whether it’s a discarded battery or a river choked with plastic, every pollutant is a challenge waiting for a sustainable solution

Water treatment is more than purification, it's a sacred act of restoring balance. In cleansing water, we cleanse ourselves, honoring its spirit as the source of life, healing, and renewal. Every drop reclaimed is a prayer answered, for the Earth, and for the soul.

Innovation must serve both society and the soil; true progress lies in healing what we pollute.

From microplastics to toxic metals, every drop of polluted water speaks of our negligence. Yet, within this truth lies a powerful call, to respect, restore, and renew our lifelines. Water remembers everything; it's time we listen, act, and reclaim its purity for the planet and all life.

Books and Academic Contributions

Dr. Deepak Pant has authored and edited over 15 books spanning topics in environmental science, waste management, green chemistry, and analytical techniques. His notable works include Electronic Waste Management, Pharmaceutical Waste Management, and Waste Bioremediation (Springer Nature). He has also contributed significantly through training manuals like HPLC and UV Spectroscopy in Quality Control and practical chemistry guides for undergraduate and postgraduate students. His edited volumes, such as Recent Trends in Environmental Science and Carbon Management and Advances in Carbon Capture and Utilization, reflect his commitment to advancing knowledge and solutions in sustainable science and technology.

Research Publications

Dr. Deepak Pant has an extensive publication record with over 60 peer-reviewed research papers, including 17 as sole author, published in reputed national and international journals. His research spans across solid waste management, green chemical recycling, microbial remediation, electronic and biomedical waste detoxification, and carbon management. Many of his papers appear in high-impact journals such as Waste Management (Elsevier), Bioresource Technology, Environmental Science and Pollution Research, and Hydrometallurgy. His recent work also focuses on water pollution and the emerging threat of microplastics, particularly in Himalayan rivers and streams. He has contributed to studies identifying microplastic contamination in flowing water bodies, its ecological risks, and potential remediation strategies. These findings support policy frameworks for pollution monitoring and reinforce the need for integrated waste-water management. His work reflects a strong interdisciplinary approach and commitment to practical, scalable environmental solutions.

Dr. Deepak Pant participated in a panel discussion at National Dong Hwa University, Taiwan, on the theme of sustainable environment and disaster resilience. He shared perspectives on integrating green technologies, environmental remediation, and traditional knowledge systems to address climate challenges and enhance community resilience. His insights focused on the importance of interdisciplinary solutions for environmental sustainability and disaster risk reduction.

E-waste Awareness Programme to promote responsible disposal and sustainable recycling practices. The initiative focused on educating participants about the environmental impacts of e-waste and the need for circular solutions.

ENVIROTECH

Environmental Technology

Envirotech

We Care *for* Better Air

FORUM

River Rejuvenation Platform.

ENVIROTECH

WE CARE FOR BETTER AIR

Our vision is to be a global leader in indigenous air quality monitoring solutions, safeguarding public health and the environment through innovation, research, and sustainable practices.

Our mission is to develop and deliver advanced, reliable, and affordable air pollution monitoring systems tailored to the needs of Indian and developing countries. To build national self-reliance in environmental instrumentation through R&D, partnerships, and local manufacturing. To foster environmental awareness, education, and policy support through data-driven science and inclusive collaboration.
To empower communities, industries, and governments to take informed action for cleaner air and a healthier future.

Impact Snapshot

10+ Indigenous Instruments developed

07 7 SAARC Countries equipped with air monitoring labs and trained under UNEP-supported Envirotech programs.

100+ Hands-on Training to build India's environmental instrumentation workforce.

44+ Years of Impact in Clean Air Innovation

Over the past four decades, we have spearheaded several pioneering initiatives in air quality monitoring. It developed India’s first indigenous emission monitoring system in the 1980s, enabling enforcement of the Air Pollution Act. Landmark innovations like PM10 & PM2.5 samplers, created with CSIR-NEERI and IIT Kanpur, laid the foundation for India's ambient air quality standards, followed by first-of-their-kind PM1 and heavy metal samplers. In collaboration with national institutes, Envirotech introduced bioaerosol and odour monitoring technologies and led noise mapping projects with CSIR-CRRI. It played a key role in protecting cultural heritage by initiating air quality monitoring at Ajanta–Ellora, and extended its work to public health, sponsoring the development of the Ayurvedic remedy Kamadgiri for dust-related illnesses. Internationally, it strengthened air monitoring infrastructure in 7 SAARC countries under UNEP, while domestically, it built capacity through 100+ hands-on trainings. Its commitment to innovation was recently recognized by the Government of India through DSIR accreditation for its in-house R&D centre.

SHYAM GUPTA

ENVIROTECH INSTRUMENTS

Envirotech Instruments Pvt. Ltd. was established in 1982, inspired by the vision and values of the late Dr. G.D. Agarwal—an eminent environmental scientist, former Member Secretary of the Central Pollution Control Board, and Professor of Environmental Engineering at IIT Kanpur. His lifelong dedication to environmental protection, particularly the ecological sanctity of the River Ganga, laid the spiritual and scientific foundation for Envirotech's mission. In fact, his final act of tapasya for the Ganga became a profound symbol of his commitment to India's natural heritage.

Envirotech was founded with a focused mission: to build indigenous capabilities in air pollution assessment, control, and management. At a time when India lacked emission monitoring technology and the Air Pollution Control Act had just come into force, the company filled a critical gap by developing the country's first indigenous stack emission monitoring system, enabling industries to comply with new environmental standards and implement control measures. Over the decades, Envirotech has remained at the forefront of innovation in India's air quality monitoring. It collaborated with CSIR-NEERI to develop a respirable dust sampler (PM10), followed by India's first PM2.5 sampler based on USEPA standards. As awareness of finer particulates grew, it developed PM1 and heavy metal samplers with IIT Kanpur and IIT Delhi.

More recently, it introduced a six-stage bioaerosol sampler with CSIR-NPL and is developing an odour monitoring system with IIT Jodhpur. Under the Uchhatar Avishkar Yojana, Envirotech is also partnering with IIT Delhi and IIT Madras to co-develop affordable, real-time sensor systems for ambient air monitoring.

To test and refine its technologies, Envirotech undertook extensive fieldwork and consultancy projects, including EIA studies and industry collaborations. With CSIR-CRRI, it led noise mapping initiatives in Goa, identifying urban hotspots and mitigation strategies. A major study with cement industries and the MP Pollution Control Board in the Rewa–Satna region introduced the concept of mixing heights into India's EIA framework for the first time, supported by the development of a monostatic SODAR system.

Addressing health impacts of air pollution, Envirotech sponsored Ayurvedic research at Gramodaya Vishwavidyalaya, resulting in the herbal formulation 'Kamadgiri', successfully trialed in Gujarat and Rajasthan. It also published "The Dusty Dawn", a collection of citizen essays on dust-related illnesses, in collaboration with PRIYA.

Its commitment to heritage conservation began after a case study on protecting Da Vinci's Last Supper from air pollution prompted it to engage the Archaeological Survey of India. This initiative led to the installation of air monitoring systems at Ajanta–Ellora and other major heritage sites.

Envirotech has collaborated widely with IITs, CSIR labs, and NPL, organizing national workshops on topics like dispersion modelling, industrial planning, and environmental law. It has conducted 100+ hands-on training programs across India, partnered with TERI University, and built air monitoring infrastructure in all SAARC nations under a UNEP-funded initiative, training local experts.

Now recognized as a knowledge institution, Envirotech actively contributes to BIS committees, and its work features in the Handbook on Metrology (Springer). Its in-house R&D centre has been formally recognized by the Department of Scientific and Industrial Research (DSIR), Government of India—affirming its leadership in innovation, environmental stewardship, and national service.

shyam gupta

> Present day crises is essentially a conflict due to misunderstanding the definition of development which essentially should improve the physical, biological, cultural, social and economic environment. Any improvement in these would lead to improvement in quality of life, peace and tranquility.

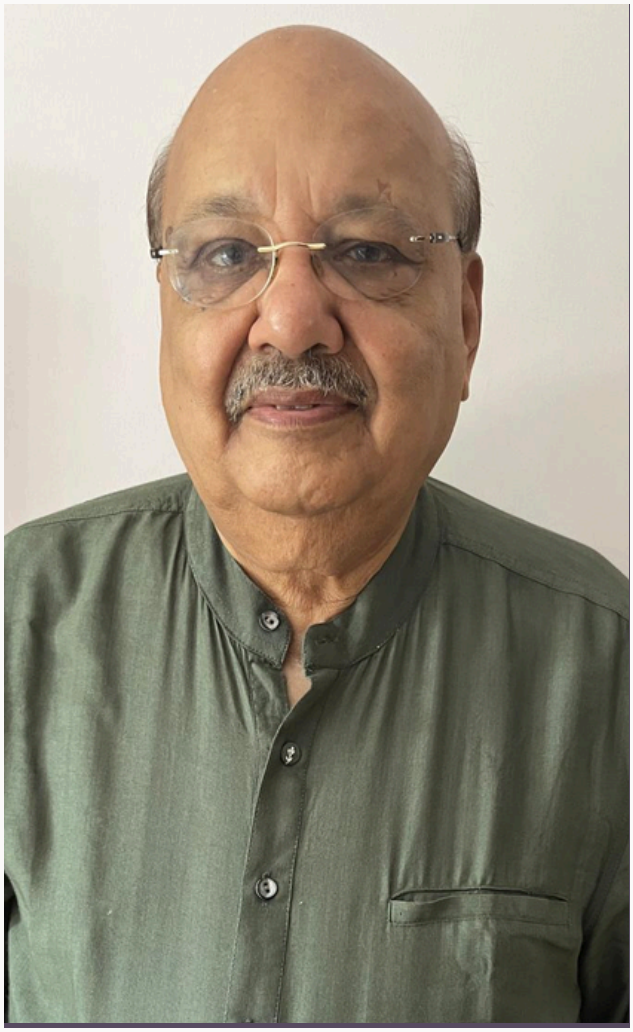
Shri SK Gupta is an entrepreneur and recognised as a pioneer for his efforts to produce India's own indigenous air pollution monitoring instruments in the early 80's. He has made an important contribution to organising the air pollution monitoring activities on a large scale across India. He initiated hands-on training courses on air monitoring to develop competence and confidence in personnel.

shyam gupta

Environmental Engineering

He has been working actively with national academic and research institutions for developing indigenous capabilities and infrastructure in India. He worked closely with the late Prof. GD Agrawal to ensure uninterrupted flow in Mother Ganga and developed a deep understanding of the protection, conservation, and rejuvenation of Rivers. He is presently the Chairman of Envirotech Instruments Pvt Ltd, which is the largest producer of air quality monitoring systems in India. He is the Founding Secretary of the Delhi chapter of the Indian Association for Air Pollution Control.

He is also the founder and mission advisor of Global Council of environment and health Inc,working to ensure clean air for every global citizen to save their lives. In recognition of his expertise, he was appointed a member of the Commission for Air Quality Management for Delhi and adjoining areas of NCR constituted by Govt of India. Shri SK Gupta is a Civil Engineer from II TKanpur, an avid reader, traveller, designer with a knack for exquisites. He has deep interest in protecting culture, traditions and environment.



SHYAM GUPTA

ENVIROTECH INSTRUMENTS

These quotes encapsulate Mr Gupta's life's mission of environmental rejuvenation.

Simple living can only be the basis of sustainability. With simple living, resources available on planet earth can sustain us completely.

Traditional reverence for nature and constant innovation are essential for growth of a society.

Building indigenous solutions for clean environment is not just a matter of technology, it is a responsibility to protect lives, restore our rivers, and preserve the sanctity of our environment for future generations.

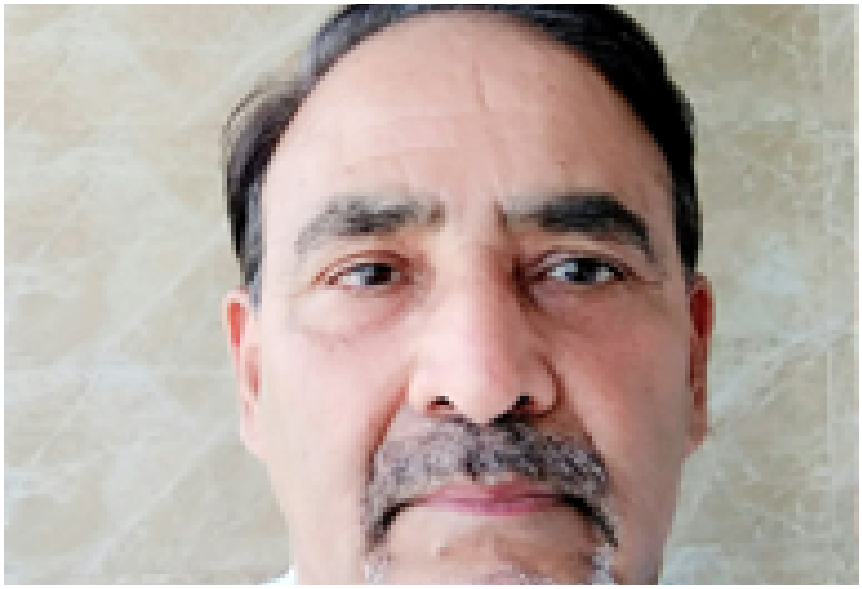
True progress lies in harmonizing innovation with tradition, where science protects the breath of life, and culture nurtures our rivers, air, and the timeless spirit of the land.

Deepest values for any devout religious person are simplicity and reverence for nature.

ABC

To develop and master monitoring techniques, Envirotech undertook several monitoring assignments from Industries and also to test its own hardware

dr balbir singh



> When science aligns with sustainability, it becomes a force for transformative change – advancing cleaner industries, resilient ecosystems, and a healthier planet for future generations.

His work is recognized through prestigious fellowships including the CSIR Junior and Senior Research Fellowships, and a Research Associate role at HBTI Kanpur. Dr. Singh is also an accredited EIA Coordinator and Functional Area Expert by the National Accreditation Board for Education & Training (NABET), Quality Council of India (QCI). His credentials cover critical environmental domains such as air and water pollution monitoring, prevention and control, and solid and hazardous waste management. With four research publications in national and international journals, Dr. Singh maintains a strong scientific foundation while applying it practically to industry needs. His career reflects a lifelong commitment to environmental sustainability, regulatory compliance, and technological advancement for cleaner industrial development in India.

dr balbir singh

Environmental Science & Engineering

Dr. Balbir Singh is a distinguished environmental scientist with over four decades of expertise in analytical chemistry, environmental monitoring, and sustainable industrial practices. Currently serving as President at Envirotech Instruments Pvt. Ltd., New Delhi, he brings extensive experience in technical marketing, product development, training, and laboratory calibration. Dr. Singh holds a Ph.D. in Analytical Chemistry from Aligarh Muslim University (AMU), where he also completed his M.Phil., M.Sc., and B.Sc. (Hons.), all with first-class academic distinctions. He further expanded his qualifications with a Post Graduate Diploma in Management from IGNOU.

Dr. Singh began his professional journey as a Senior Scientist at Envirotech Consultants, where he played a pivotal role in environmental monitoring and the preparation of EIA/EMP reports. He later joined MECON Limited, a Government of India undertaking, where he served for 30 years and superannuated as General Manager of the Environmental Engineering Laboratory in 2017. At MECON, he led the Environmental Engineering Section across key sectors, including Oil & Gas and industrial infrastructure, contributing significantly to pollution control and sustainability strategies.

dr anil gautam

> Sustainable water futures depend on bridging science with community wisdom, restoring ecosystems with equity, and making every drop count in the face of a changing climate. In a climate-uncertain world, safeguarding water resources through resilience, restoration, and inclusive adaptation is no longer a choice, it is a necessity.

Dr. Anil Kumar Gautam is a distinguished environmental scientist with over 25 years of professional experience in groundwater, environmental quality, and pollution management. He currently serves as the Head of the Environmental Quality Monitoring Group at People's Science Institute (PSI), Dehradun, a position he has held since 2006. His journey with PSI began in 2002 as a Research Scientist, followed by his role as Program Manager from 2004 to 2006. Prior to this, he worked as an Environmental Scientist at Banwasi Sewa Ashram, Sonebhadra, Uttar Pradesh, from 1996 to 2002.

dr anil gautam

Environmental Science

Among his significant publications are studies on fluoride mitigation, bio-monitoring of rivers, air pollution and health impacts, and water quality assessments in ecologically sensitive Himalayan wetlands. He is also credited with manuals on benthic macroinvertebrate-based water quality assessments, and has authored and co-authored over a dozen policy-informing reports. Dr. Gautam's efforts have been nationally recognized. He received the Environment Conservation Honour by Tarun Bharat Sangh in 2019 and led PSI's award-winning initiatives such as the "BHUJAL BADHAO PEYJAL BACHAO" campaign (which was featured in the Limca Book of Records) and the spring revival programme in Nagaland, which won the prestigious Earth Care Award.

Professionally, he is actively engaged in national environmental governance. He serves as a member of the State Ganga Rejuvenation Committee (Uttarakhand), the Working Group Committee at NIH Roorkee, the Indian Himalayan River Basin Council, and networks such as the Arsenic and Fluoride Action Network, Springshed Consortium, and the India Rivers Forum.

dr anil gautam

Environmental Science

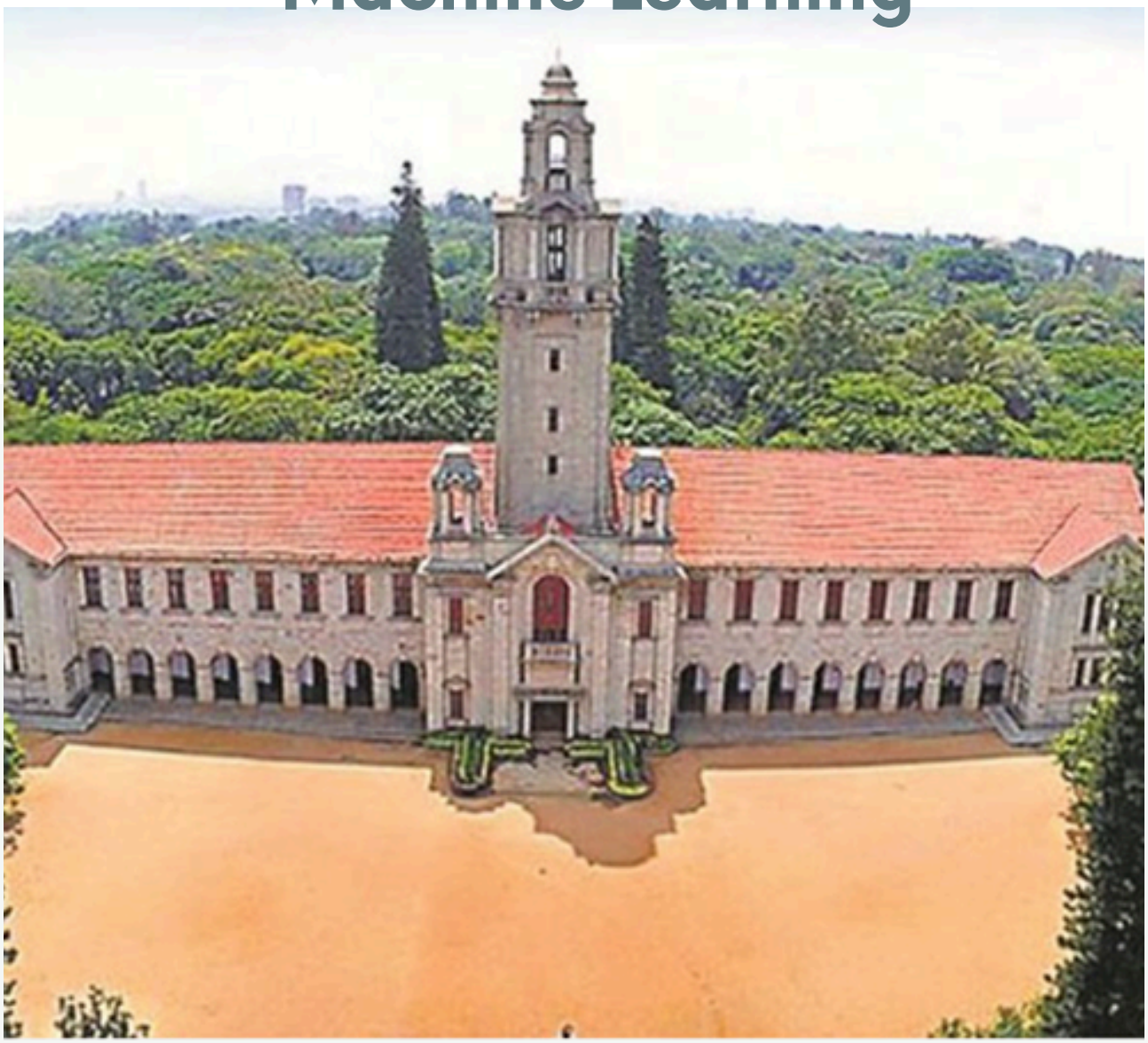
Over the past two decades, he has led or contributed to more than 30 significant environmental research and implementation projects across India. Notable among them are the Atal Bhujal Yojana in Haryana (2021–2025), early warning systems for extreme rainfall in Dehradun, revival of shallow aquifers in Gwalior, and springshed development in the Himalayan region. His work spans critical areas such as air and water quality monitoring, noise mapping, EIA studies, fluorosis mitigation, sanitation-groundwater linkages, and climate change adaptation.

Dr. Gautam has collaborated with a range of national and international institutions including USAID-India, University of Birmingham, Ministry of Housing and Urban Affairs, DST (India), Dutch Research Council, WaterAid UK, WWF India, Frank Water, Arghyam Foundation, and several IITs. He has supervised community-based programs in over nine Indian states and contributed to infrastructure development and training in SAARC nations under UNEP.

He has played a central role in knowledge dissemination through 100+ training workshops, mentoring about 40 postgraduate students and guiding four Ph.D. scholars from institutions like IITs, IIFM, Xavier Institute, Doon University, and SPJIMR. His extensive research has been published in peer-reviewed journals and reports, including contributions to international conferences and policy manuals such as the Handbook on Metrology.

IISc

Artificial Intelligence and Machine Learning



FORUM
River Rejuvenation Platform.

INDIAN INSTITUTE OF SCIENCE
भारतीय विज्ञान संस्थान

IISc

INDIAN INSTITUTE OF SCIENCE

IISc aims to be among the world's foremost academic institutions through the pursuit of excellence in research and promotion of innovation by offering world-class education to train future leaders in science and technology and by applying science and technology breakthroughs for India's wealth creation and social welfare. Pioneering advanced research, fostering innovation, and nurturing scientific talent, IISc drives India's technological growth, policy leadership, and global recognition.

Impact Snapshot

1K Patents and Industry Collaborations

60K Trained Scientists and Engineers

100K Peer Reviewed Publications

44+ years of Unique Research

Since its establishment in 1909 by Jamsetji Tata, the Indian Institute of Science (IISc), Bangalore has been a cornerstone of India's scientific and technological advancement. It has consistently ranked as India's premier research institution, known for producing cutting-edge science, pioneering engineering research, and shaping national policies. IISc has contributed significantly to strategic sectors such as space, defense, nuclear energy, cybersecurity, artificial intelligence, and climate science. IISc has catalyzed innovations in aerospace, materials science, nanotechnology, biotechnology, and sustainable energy. Its faculty and alumni have played key roles in establishing national institutions like ISRO, DRDO, and BARC. Through interdisciplinary centers such as CiSTUP, Robert Bosch Centre for Cyber-Physical Systems, and the Centre for Brain Research, it continues to tackle complex societal challenges. IISc's incubation ecosystem has led to the birth of several deep-tech startups, making it a critical node in India's innovation economy.

DR DEBASHISH ROY

IISC BANGALORE

Founded in 1909 by Jamsetji Tata in collaboration with the Government of India, The Indian Institute of Science (IISc), Bengalurustands as the country's premier institution for advanced scientific research and higher education.

Spanning a lush 440-acre campus, IISc has consistently driven excellence in doctoral training, interdisciplinary research, and technology-led innovation. With over 40 academic departments and research centres, the institute focuses on areas ranging from artificial intelligence, quantum computing, nanotechnology, brain sciences, climate studies, to sustainable energy systems.

Landmark initiatives like the Centre for Nano Science and Engineering (CeNSE), Quantum Research Park, and Interdisciplinary Research Clusters reflect its leadership in emerging technologies. IISc plays a crucial role in India's innovation ecosystem through entities like the IISc Innovation Council and ARTPARK, which incubate deep-tech startups in AI, robotics, aerospace, and medical devices. Collaborations with global tech giants such as Google, Amazon, Intel, Bosch, and national agencies like ISRO, DRDO, and CSIR further fuel high-impact research and industrial partnerships.

Its recent expansion into medical sciences—with the Tata IISc Medical School, Bagchi - Parthasarathy Hospital, and partnerships like the Interdisciplinary Centre for Nutrition and Health with Tufts University - marks a new chapter in public health innovation. IISc has achieved significant scientific breakthroughs, including advances in nanobot control, sustainable pigment production, and data-driven smart city systems. Ranked consistently as India's top research institution by NIRF and among the top 250 globally by QS (2025), IISc remains a beacon of scientific excellence.

Its legacy is built not just on academic rigor, but on a forward-looking vision to integrate science, technology, and societal needs, making it a vital force in shaping India's self-reliant and globally competitive future. The institute also prioritizes sustainability through its green campus, solar initiatives, and ecological restoration efforts. Its enduring legacy lies in fostering scientific excellence, enabling self-reliance, and shaping India's journey as a knowledge power.

dr debashish roy

> **Life is like the river, sometimes it sweeps you gently along and sometimes the rapids come out of nowhere.**

Dr. Debashish Roy is a distinguished scholar in the field of computational mechanics, currently serving as a Senior Professor (HAG Scale) at the Indian Institute of Science (IISc), Bangalore, within the Department of Civil Engineering. He also holds the prestigious role of Convener at the Centre of Excellence in Advanced Mechanics of Materials, a pioneering initiative supported by ISRO, reflecting his leadership in advanced mechanics research.

dr debashish roy

Artificial Intelligence and Machine Learning

With an academic journey rooted in excellence, Dr. Roy earned his B.E. (Hons) from Jadavpur University in 1988, followed by a Master's degree with Distinction from IISc in 1992, and a Ph.D. from the same institution in 1995. His postdoctoral research took him to renowned institutions in Austria and Germany, including the University of Innsbruck and the Weierstrass Institute for Applied Analysis and Stochastics in Berlin. Dr. Roy has held several academic and research positions across leading institutions worldwide. These include appointments at IIT Kharagpur, the University of Manchester Institute of Science and Technology (UMIST), and the University of Aberdeen in the UK, where he was an Honorary Chair Professor.

Dr. Roy's has 175 peer-reviewed journal publications, five published books, one patent, and numerous keynote and plenary lectures at international conferences. Among his many honors, Dr. Roy has received the INSA Young Scientist Award (2000), the INAE Young Engineer Award (2001), and the ICCES Distinguished Achievement Medal (2014). He is also a Fellow of the Indian National Academy of Engineering and has been a Distinguished Visiting Fellow of the Royal Academy of Engineering, UK.

DR DEBASHISH ROY

IISC BANGALORE

These quotes encapsulate Dr Roy's life's mission of using AI and ML for environmental rejuvenation.

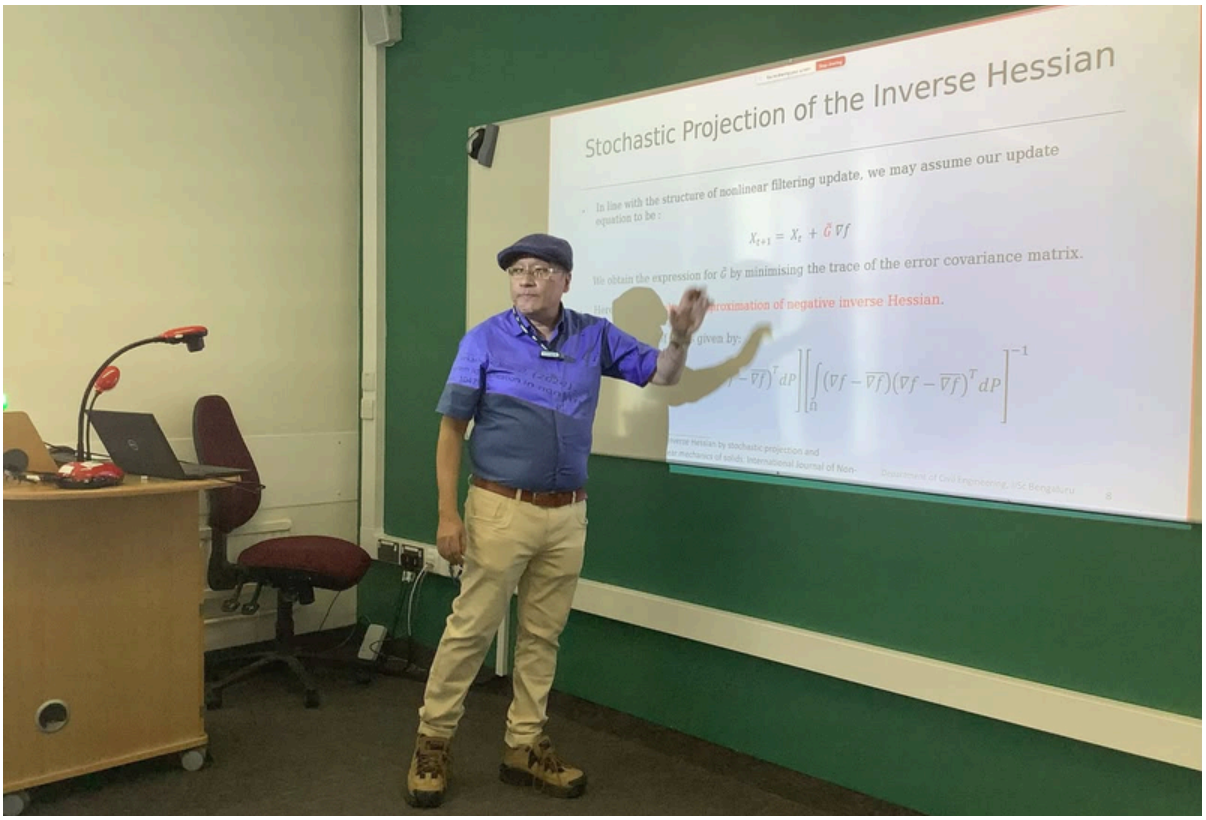
Rivers are nature's song - a dynamic symphony of flow, change, and resilience. With the power of Artificial Intelligence and Machine Learning, we can now decode this song more deeply than ever before.

In the waves of change, we discover resilience, adaptability, and purpose. Each shift challenges our comfort but reveals new horizons. It is not in still waters but in life's turbulence that we truly learn to steer toward our true direction. With AI and ML as our compass, we decode complexity, adapt with precision, and navigate uncertainty, transforming data into insight and disruption into opportunity for a smarter, more sustainable future

Rivers don't ask for permission to flow and with AI and ML, we learn to flow with them, following their paths, understanding their pulses, and designing systems that respect their rhythm while securing human and ecological resilience.

The river always finds a way, adapting, shifting, and flowing through every challenge in its path. With AI and ML, we can now trace this resilience, model its behaviors, predict its future courses, and support decisions that align with its natural intelligence. Technology doesn't control the river, it helps us understand and move with its wisdom.

Flow like a river with purpose and direction, live like the ocean with depth, vastness, and infinite possibilities within.



Dr Debashish Roy giving lecture at the University of Bath

Dr Debashish Roy visiting the University of Bath


Canva

JNCASR

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH, BANGALORE

Geological and Hydrological Dynamics of River Catchments

FORUM
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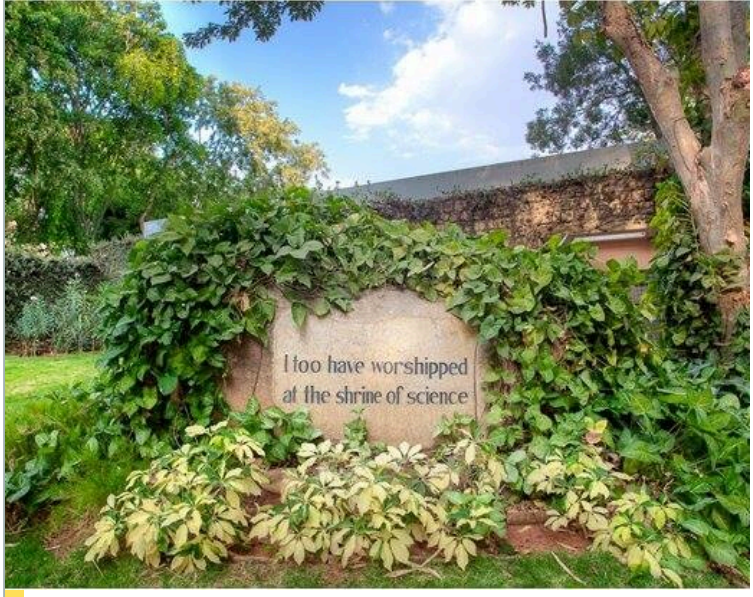
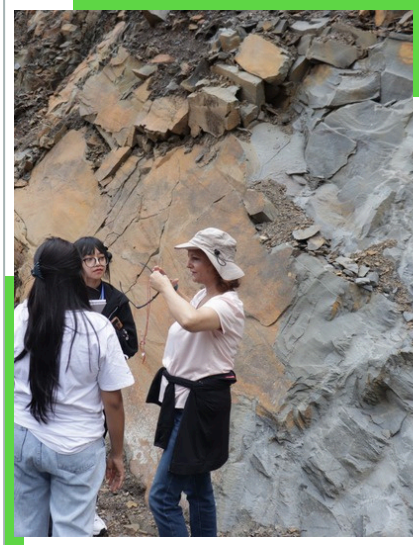
JNCASR



JNCASR

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH (JNCASR)

The Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), established in 1989 by the Department of Science and Technology, Government of India, and nurtured under the visionary leadership of Bharat Ratna Prof. C. N. R. Rao, stands as a testament to the pursuit of knowledge and its application for the greater good. awaharlal Nehru Centre for Advanced Scientific Research (JNCASR) is a multidisciplinary research institute situated in Bangalore, is an institution where curiosity drives scientific inquiry, aiming for both new knowledge and practical applications.



Field Training Activities

Students working at GSU Lab

To be a globally recognized institute in scientific research and education, fostering a vibrant ecosystem where curiosity-driven inquiry meets innovation. JNCASR promotes interdisciplinary collaboration and envisions a future where our contributions significantly advance fundamental scientific understanding and provide solutions to complex societal challenges, shaping a more sustainable and resilient world.

The Geosciences Unit

The Geosciences Unit at JNCASR excels at blending deep, curiosity-driven research with practical applications, including critical areas like environmental sustainability. The unit focuses on long-term climatic changes, active tectonics, disaster management, and advanced studies of natural aquifers, with recharging groundwater as one of our major objectives. We also leverage geological information, transforming it into data suitable for machine learning to derive new insights. We firmly believe that addressing complex challenges such as river rejuvenation demands interdisciplinary approaches and advanced scientific studies, both of which are fundamental to our mission and the work we do.

Outreach Activities

Tracing the Evidence of Old River Chenal's in the Higher Himalaya

Our current research builds upon this legacy, focusing on the past hydroclimatic changes, mapping buried river systems, and contributing to the sustainable rejuvenation of critical freshwater sources and aquifers. We emphasize field-based investigations that revealed how active faulting, accelerated erosion, and geomorphic disturbances alter natural drainage systems. These studies brought to light critical processes such as river course migration, anomalous meanders, natural blockages forming lakes, and the creation of flatlands along tectonically active belts, offering a geoscientific lens to understand how rivers are shaped, obstructed, and eventually rejuvenated over time. GSU is committed to understanding Earth's surface processes and climate systems and their role in sustaining hydrological systems. A core focus of our research is to reconstruct past monsoon patterns and investigate how climates have evolved over time. We Pay special attention to extreme events like floods and droughts, which have long shaped the course and character of rivers across the Himalaya and the Indian Peninsula. By combining evidence from ancient geological archives with advanced climate modeling, our researchers explore how global and regional climate shifts influence monsoon rainfall. These insights are crucial for guiding the sustainable management of river basins in the face of accelerating climate change.

Fieldwork training session in the mountains of Nagaland

Impact Snapshot

400 PATENTS AND INDUSTRY COLLABORATION

900 TRAINED SCIENTISTS AND ENGINEERS

9K PEER-REVIEWED PUBLICATIONS

36+ years of Unique Scientific Achievements

With over thirty years of research experience, JNCASR fosters a dynamic environment that encourages collaborative research across diverse scientific units and with leading institutions globally.

We engage in science outreach to inspire young minds and the wider community by making science accessible and relevant, including areas such as hydrology, groundwater conservation, and river sustainability. Through immersive education programs, we aim to foster a culture of scientific inquiry that empowers future scientists and citizens to understand, protect, and restore vital natural systems.

DR JAISHRI SANWAL BHATT

JNCASR

Fieldwork in Central Europe

Fieldwork in the Higher Himalaya

The Geosciences Unit (GSU) at JNCASR has a deep-rooted legacy, established in 1995 as the Geodynamics Unit by Professor K.S. Valdiya - a true pioneer in geology. The unit work focuses on identifying tectonically sensitive zones across the Indian subcontinent, including regions vulnerable to earthquakes, landslides, and sudden terrain shifts that directly impact river courses and watershed stability. Prof. Valdiya's influence extended further, notably through his seminal work on the ancient Saraswati River. The work on prehistoric River Saraswati combined geological, geomorphological, and archaeological evidence to trace the buried paleo-channel of this once-mighty river.

Crucially, the work strongly advocated for utilizing and reviving the desiccated floodplains of the Saraswati for groundwater recharge, sustainable agriculture, and ecosystem restoration, principles that directly inform present-day river rejuvenation efforts. The GSU work uniquely blends geological science with ancient Indian texts, underscoring the profound link between land, water, and culture. This rich, interdisciplinary study continues to inspire ongoing research at the GSU, especially in projects focused on paleo-river systems, monsoonal evolution, and the rejuvenation of dried or buried river channels, where geology serves as a tool for discovery and for sustainable development and cultural renewal.

GSU integrates its expertise in geomorphology, long-term climatic changes, and geochemistry to address contemporary challenges related to river basin management, climate resilience, and sustainable freshwater systems We are conducting regenerative design experiments to demonstrate the power of nature-based solutions, active community involvement, and responsible hydrological stewardship, particularly through effective aquifer recharge and broader water resource management, in reversing hydrological decline. Our research will enhance this work significantly through the addition of climate-responsive regeneration and restoration techniques.

Fieldwork in Western Ghats

Projects

Principal Investigator

Department of Science and Technology, New Delhi

1. Multidisciplinary Study of Karsts and Caves: Implications for Holocene Hydro-Climatic Reconstruction and Sustainable Clean Water Resources in the Central Himalaya
2. Long-term Climate and Moisture Variability in the Diverse Precipitation Regimes in the Indian Himalaya: Using speleothems as a Proxy.
3. Holocene Climate Changes and Tracking the Impact of Anthropogenic Activity in Wular Lake in Kashmir Himalaya: Appraisal of Human Influence.
4. Assessing the earthquake history and climatic variation in Kumaun and Garhwal Himalaya using the Lake Core and Speleothems

C**ouncil of Scientific and Industrial Research, New Delhi**

5. Quaternary climatic changes in Lahaul-Spiti, Himachal Pradesh

Co-Principal Investigator

Board of Research in Nuclear Sciences (BRNS), Mumbai

6. Evaluation of tsunami hazard for the eastern seaboard of India
7. Multidisciplinary Study of Structure, Vibrational and Elastic Properties of Natural Hydroxyapatites with carbonate and actinides Substitutions.

The Habitat Trusts

8. Conserving the Overlooked Subterranean Cave Habitat: A Sustainability Approach in Andaman and Nicobar Islands in Collaboration with Salim Ali Centre for Ornithology and Natural History (SACON)

Dr. Jaishri Sanwal Bhatt honoured with "She for STEM" award for her exceptional contribution to the area of STEM.

dr jaishri sanwal bhatt

Fieldwork in Alps, near Salzburg , Austria

> **Rivers carry not just water, but the memory of landscapes, the pulse of climate, and the story of civilizations. In their revival lies our resilience.**

Dr. Jaishri is a renowned geoscientist specializing in Holocene climate, seismicity, and water systems across diverse Indian landscapes. She leads major national and international projects and integrates geological data with traditional knowledge for river rejuvenation and sustainable water management. A dedicated science communicator, she has represented India globally and was recently honored with the “She for STEM” award for her exceptional contributions to STEM and inspiring women in geosciences.

dr jaishri sanwal bhatt

Geological Sciences

As part of her commitment to nurturing the next generation of geoscientists, she has been regularly organizing Young Scientists' Meetings to inspire early-career researchers to connect deeply with nature, land, and rivers. These meetings are conducted in association with the C.N.R. Rao Education Foundation and the UNESCO TWAS Central & South Asia Regional Partner (TWAS-CASAREP), JNCASR. The initiative aims to foster interdisciplinary dialogue, scientific curiosity, and a strong sense of environmental stewardship among young minds.

Dr. Jaishri holds lifetime memberships in several prestigious scientific societies. Her research focuses on the Himalayan region, Gangetic plains, Indian coastlines, and the Andaman Islands, where she uses sedimentological, speleothem, and paleoseismic records to decode Holocene climatic variability, earthquake recurrence, and tsunami hazards. She has led several national and international projects funded by DST, BRNS, and CSIR, including studies on Karst systems, lake and cave archives, and climate-human interactions.

Dr. Jaishri is also widely recognized for her science outreach, having published in leading journals and engaged in public communication on the geological importance of caves and sustainable water systems. She has represented India at international platforms in Austria, Canada, China, Germany, Laos, Turkey, Poland, Malaysia, Nepal, and the United States.

In the context of river rejuvenation, Dr. Jaishri contributes deep expertise in structural geological mapping, reconstructing paleo-hydrological regimes, understanding river-aquifer interactions, and using geological archives to define baseline conditions for ecological restoration. Her work emphasizes the integration of scientific data with traditional ecological knowledge to guide nature-based and culturally rooted water management strategies.

Dr. Jaishri was recently honored with the prestigious "She for STEM" award by the Hon'ble Governor of Uttarakhand. This recognition was conferred in appreciation of her outstanding contributions to the fields of STEM, as well as her dedication to inspiring young minds, particularly women in the geosciences.

Dr. Jaishri's recognition stands as a testament to her impactful scientific research, field-based education, and continued commitment to science outreach and environmental stewardship.

Fieldwork in the Carpathian Mountains in Central Europe

DR JAISHRI SANWAL BHATT

JNCASR

These quotes encapsulate Dr Bhatt's life's mission of river rejuvenation.

A river is not just a flow of water, it is a breathing thread of life that stitches land, people, and time together. To revive it is to mend the fabric of the Earth itself.

Let the river flow free, and it will return what generations lost, not just water, but wisdom.

A rejuvenated river is not just water returned, but a future reborn.

Reviving a river is not just science, it's an act of memory, movement, and hope.

A healthy river is a silent agreement between land, water, and people.

During the third summit on Disaster Management, JNCASR, Bangalore

NIAS

Advanced Research Studies

FORUM
River Rejuvenation Platform.

NIAS

NIAS

NATIONAL INSTITUTE OF ADVANCED STUDIES

National Institute of Advanced Studies (NIAS) was conceived and founded in 1988 by the late Mr. J. R. D. Tata, who sought to create an institution to conduct advanced multidisciplinary research. NIAS stands out for its unique interdisciplinary approach, integrating science and technology, philosophy, social issues, and leadership studies. Its research teams comprise experts from natural sciences, social sciences, humanities, and the arts, working collaboratively to address complex challenges facing India and the global community with insight, sensitivity, and innovation.

Impact Snapshot

04 Interdisciplinary Schools

1K Peer-reviewed Publications

150 Interdisciplinary research projects executed

37+ years with Unique Research

The National Institute of Advanced Studies (NIAS), addresses complex challenges across science, society, and strategy, ranging from urban governance and education reform to climate resilience and conflict resolution. Notable projects include human-elephant conflict mitigation adopted by Karnataka and Tamil Nadu, the NIAS-EGT programme for gifted education, strategic studies on nuclear policy and space security, and urban policy research shaping Bengaluru's development. Its climate research has contributed to global platforms like COP. Through cutting-edge research, PhD programs, and public outreach, NIAS strengthens India's intellectual and sustainable development leadership.

C P RAJENDRAN

NIAS

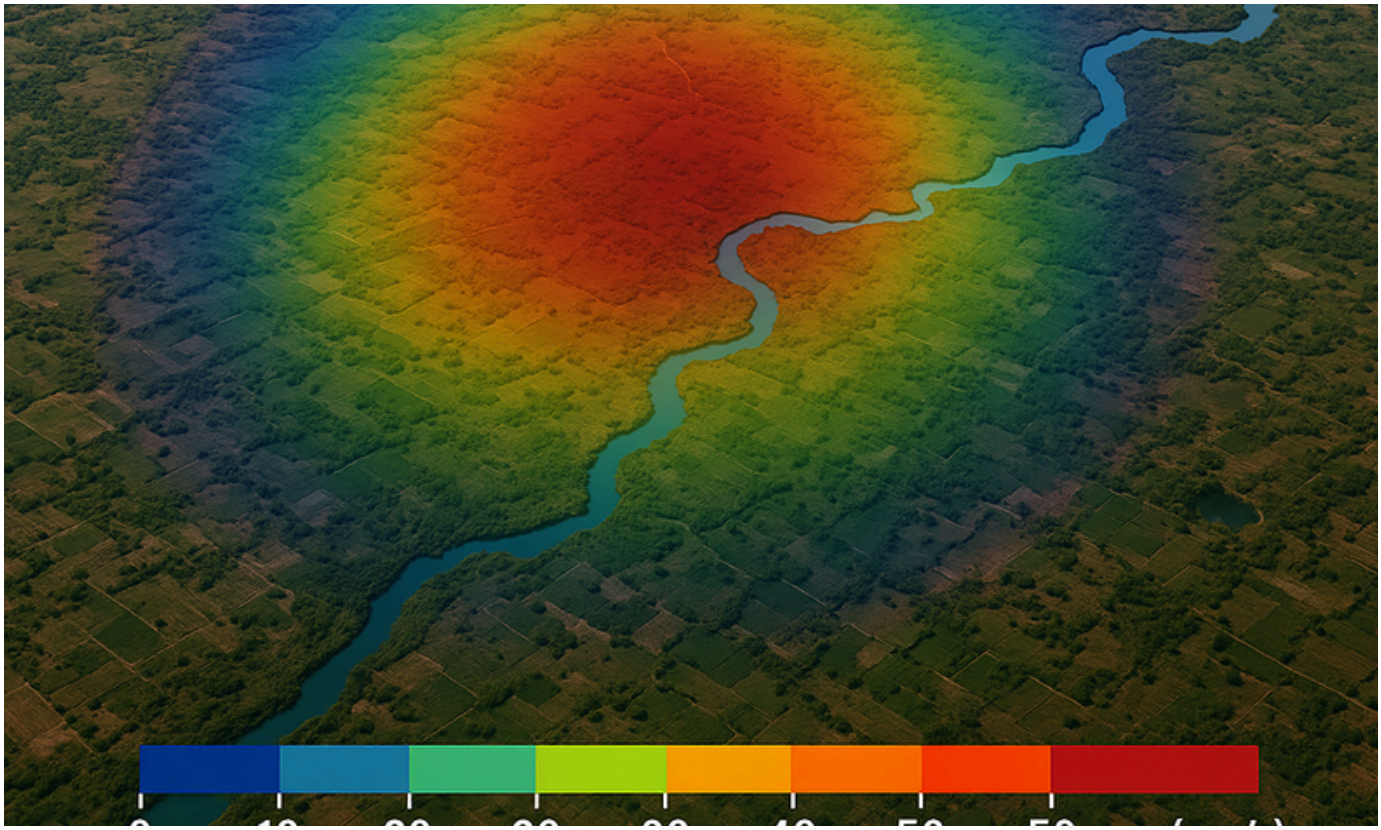
The National Institute of Advanced Studies (NIAS), established in 1988 by the vision of the late J.R.D. Tata, is an interdisciplinary research institute located within the Indian Institute of Science (IISc) campus in Bengaluru. Operating under the aegis of the Tata Trusts, NIAS was conceptualized to bridge the gap between the sciences and the humanities, promoting holistic and integrative thinking to address complex national and global challenges.

Over the years, NIAS has emerged as a unique institution where academic excellence meets policy relevance, with its research encompassing a wide range of domains, including strategic and security studies, science and technology policy, conflict resolution, philosophy, cognition, energy, environment, heritage, and education.

The institute's work is often aimed at informing governance and decision-making processes while retaining a strong foundation in academic scholarship. Through publications, consultations, and stakeholder engagement, NIAS continues to play a vital role in shaping debates around India's developmental and strategic priorities.

NIAS functions through its dedicated schools - such as the School of Conflict and Security Studies, the School of Humanities, the School of Social Sciences, and the School of Natural Sciences and Engineering - which reflect its transdisciplinary ethos. It is also involved in several government-supported projects, especially in nuclear and space security, national innovation systems, and educational reforms. Its notable projects include research on India's nuclear deterrence and strategic posture, educational assessments in rural India, climate and sustainability modeling, and policy foresight for India's energy transitions.

The institute has undertaken more than 300 research studies and published extensively in peer-reviewed journals, policy reports, and monographs. The institute is known for organizing high-level roundtables, dialogues, and national conferences that bring together thought leaders from academia, government, civil society, and industry. Moreover, In recent years, the institute has expanded its engagement in emerging areas such as digital governance, space security, environmental ethics, and neurocognitive modeling, reinforcing its commitment to foresight-driven research.



Project Narmada

This project focuses on the damage caused by earthquakes to medieval masonry monuments and how it intersected with military conflict, thereby informing perceptions of urban upheaval and abandonment in the Indian architectural landscape. While premodern earthquake activity has been identified by those working on masonry structures in the vulnerable region of the Himalayas, a vast swathe of central India classified as “low risk” has unfortunately fallen into the blind spot of seismological studies. Extending the investigation to damaged monuments in the Malwa region of central India, an intra-plate context subject to isolated seismic events, can elucidate the survival of certain temple clusters and provide historical clarity regarding why, when, and where temples were destroyed, damaged, rebuilt, or abandoned. The site of Oṁkāreśvara-Māndhātā serves as a valuable test case in the Narmadā fault zone, as it hosts extensive remains of massive stone temples and fortifications that attest to varying degrees of damage: many have been reduced to large piles of rubble, some have been damaged and rebuilt, while others lie partly collapsed in disrepair. We focus on collecting evidence of earthquake damage in the Narmada Valley in Madhya Pradesh and modelling ground motion intensity through masonry structures, and trying to model peak ground velocity.

Project Andaman

Our Andaman studies, funded by the Ministry of Earth Sciences, Government of India, focused on active tectonics using the campaign GPS data from the Andaman Islands. The campaign-mode acquisitions at Port Blair showed that the site started to subside between 2003 and 2004. In addition, during this period, the horizontal displacement has altered its orientation to match that observed during the co-seismic event of 26th December 2004. This short-term subsidence can be modelled as slip in the up-dip section of the fault, equivalent to an earthquake with a moment magnitude of 6.3. Previously, slow slip was believed to occur at intermediate depths, roughly 35–55 km, but simple models of deformation at this single site suggest slow slip at much shallower depths. The GPS-observed subsidence aligns roughly with the subsidence recorded by tide gauge data. Campaign GPS data from 1996 to 2000 indicate uplift during the inter-seismic period for Port Blair, corroborated by field observations of micro-atoll emergence. The pre-earthquake subsidence recorded in Port Blair, therefore, has global implications as a precursor signal of major earthquakes, at least along some subduction zones.

Project Himalayas

Our project work, funded by the Ministry of Earth Science, discovered new evidence for a major earthquake from a trench across the base of a 13-m-high scarp near Ramnagar at the Himalayan Frontal Thrust. The exposed section revealed four south-verging fault strands and a back thrust offsetting a broad range of litho-units, including colluvial deposits. Age data suggest that the last significant earthquake in the central Himalaya probably occurred between CE 1259 and 1433. While evidence for this rupture is clear, stratigraphic clues imply an earlier event, tentatively dated between CE 1050 and 1250. If the hypothesis of two earthquakes is correct, then the successive ruptures may have happened in close succession and been sourced from adjacent segments that overlapped at the trench site. The ruptures identified in the trench closely match the damaging earthquakes of 1255 and 1344 that occurred in Nepal. The present findings suggest that the frontal thrust in the central Himalaya may have remained seismically quiet for approximately the last 700 years. Given this long period of apparent inactivity, a great earthquake may be overdue in the central Himalayan region.

Dr C P Rajendran, receiving National Geoscience Award, 2011, conferred by Department of Mines, Govt. of India and presented by Shri Hamid Ansari Hon. Vice President of India

dr c p rajendran

> Rivers have life and sound and movement and infinity of variation, rivers are veins of the Earth

Dr CP Rajendran is an adjunct professor at the National Institute of Advanced Studies (NIAS), Bengaluru, and also serves as an honorary consultant at the Centre of Excellence on Advanced Mechanics of Materials, Department of Civil Engineering, Indian Institute of Science (IISc), established under Professor Debasish Roy. Recognised for his contributions to geosciences, he completed his postdoctoral studies at the University of South Carolina, U.S., after earning a PhD from Cochin University. In India, he focused on complex questions related to earthquake hazards. He began his career at the Centre for Earth Science Studies (CESS), Thiruvananthapuram, shifted later to the Indian Institute of Science (IISc) and the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru.

dr c p rajendran

Geological and Earth Sciences

Dr Rajendran established an international reputation in assessing earthquake hazards from active faults. His studies in active tectonics and tectonic geomorphology have demonstrated how geologically constrained models of earthquake generation could effectively address questions of earthquakes' spatial and temporal recurrence patterns and their long-term forecast. Although his initial focus was on the earthquakes of continental interiors, far removed from active plate boundaries, he branched out to include the Indian plate boundary regions of the Himalayas and the Andaman-Nicobar.

He initiated these studies in India when such new approaches were barely practised, and these efforts have led to new insights into Himalayan earthquakes, the subduction tectonics of the Andaman-Nicobar region and continental interiors of India, presented in the widely cited papers.The Government of India recognised his contributions to geoscience by conferring him the prestigious Ramanujan Fellowship and the National Geoscience Award for excellence in research.

Dr Rajendran, explaining the evolution of the landscape of the Rann of Kutch, the source region of the 1819 earthquake, which blocked a tributary of the Indus River, in a field training programme (2019).

C P RAJENDRAN

These quotes encapsulate Dr Rajendran's life's mission of river rejuvenation

Don't allow rivers to die. Conserve them, they will conserve you.

Eventually, all things merge into one, and a river runs through it and runs over rocks from the basement of time

A river seems a magic thing. A magic, moving, living part of the very earth itself

The river is asking for space, allow it to run its course

A river is time in water; as it came, still so it flows, yet never is the same.

A good river is nature's life work in song.

Delivering a talk at a training programme on earthquake studies at the CSIR-CSIO, Chandigarh (2023)

with Prof. Sudhir Jain, who was the Vice Chancellor of BHU and Director of IIT Gandhinagar during a fieldwork in the Chamoli (Himalaya) earthquake (1999)

WELLNESS

Planet and People Well Being

FORUM

River Rejuvenation Platform.

WELLNESS LIFESTYLE

CONNECTED TO SELF, OTHERS & EARTH

Wellness Lifestyle's mission is to equip individuals and communities with holistic, integrative tools and personalized guidance to foster lasting well-being. Their vision is to normalize authentic connectedness to self, others, and the planet making holistic wellness a lived reality embedded in everyday environments. By fostering self-responsibility, collective care, and regenerative, nature-embedded living, Wellness Lifestyle seeks to normalize a culture of proactive, inclusive, and joyful well-being for both people and the planet.

Impact Snapshot

18 Wellness Restreats

120 International and National Workshops

500K Individuals Impacted Globally

10+ years of Unique Healing

Wellness Lifestyle focuses on authentic living, deep interconnectedness, and harmony with the Earth form the foundation of human well-being. Its mission is to empower individuals and communities to take charge of their holistic health by integrating physical, mental, emotional, and spiritual dimensions. Drawing from ancient wisdom such as Ayurveda, Yoga, and Traditional Chinese Medicine, alongside modern wellness science and diagnostics, the initiative offers personalized, sustainable lifestyle solutions rather than one-size-fits-all prescriptions. through experiential learning programs including global retreats, workshops, and certification courses participants are guided toward meaningful and lasting shifts in lifestyle. The organization promotes wellness as a form of infrastructure, embedded not only in individual practice but also in the design of homes, workplaces, and communities.

CHRISTINA WATSON

WELLNESS LIFESTYLE

The Wellness Lifestyle Organization, led by Ms. Christina Watson, is a visionary initiative that integrates holistic well-being, hospitality excellence, and ecological consciousness into transformative wellness experiences.

With over two decades of experience in the global luxury wellness and hospitality sectors, Christina has built a unique framework that bridges curative care, preventive health, and progressive lifestyle design. Her philosophy centered around "Cure, Correct, Prevent, and Progress" guides the organization's core offerings, which include personalized wellness consultations, therapeutic lifestyle interventions, and holistic support for physical, mental, and emotional wellbeing.

The organization is committed to the belief that wellness is for everyone, regardless of health status, age, or background, and actively works to make its approach inclusive and accessible. Christina's expertise spans concept-to-completion development of wellness spaces, where she designs and operationalizes environments for rest, healing, and mindfulness rooted in local culture and sustainability.

The Wellness Lifestyle Organization is as much about people as it is about place, it cultivates high performance, compassionate teams through continuous learning and professional development in wellness services. Equally important is its commitment to eco-social sustainability, with projects designed to reflect environmental stewardship, cultural respect, and community engagement. The organization also positions itself at the intersection of wellness and innovation, exploring the fusion of ancient healing wisdom with emerging healthcare technologies and diagnostics.

Wellness Lifestyle Organization stands out as a powerful catalyst for both personal and planetary transformation. By merging the science of health with the art of hospitality, and embedding it in a framework of social responsibility and ecological harmony, it sets a benchmark for what true wellness can mean in today's world. Whether through curative support, lifestyle transformation, sustainable retreat development, or community well-being initiatives, the organization offers a comprehensive and compassionate path toward thriving in mind, body, and spirit.

christina watson

> True wellness place uplifts its people, community, and environment, thriving through genuine care, connection, and positive local impact.

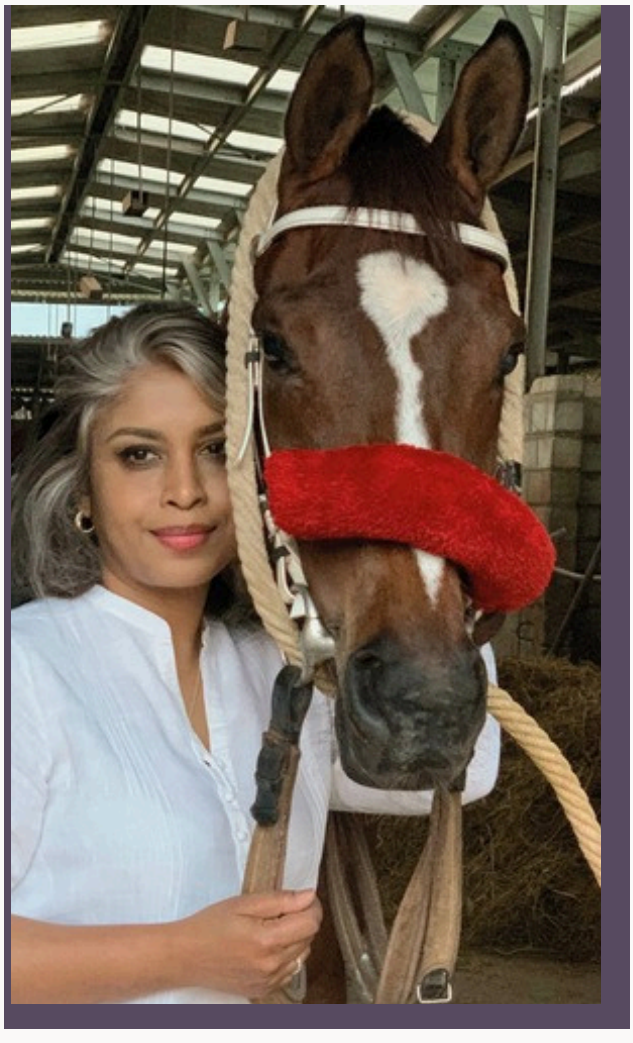
Ms. Christina Watson is a globally recognized expert in wellness and holistic health, known for integrating holistic well-being, hospitality excellence, and ecological consciousness into transformative wellness experiences. Her distinguished leadership journey includes impactful roles at premier institutions such as The Oberoi, Mandarin Oriental, and most notably, Vana Wellness Retreat, where she was instrumental in shaping its international reputation for excellence in integrative wellness.

christina watson

Wellness and Holistic Health

Christina Watson is a global wellness consultant and hospitality expert with over 20 years of experience. She specializes in designing transformative wellness spaces, leading sustainable health initiatives, and mentoring teams. As founder of Wellness Lifestyle Organization, she integrates healing, ecology, and community to create inclusive, high-impact wellness ecosystems. She is widely respected for her ability to conceptualize and operationalize immersive healing environments, mentor high-performing wellness teams, and design strategies that bring together ancient wisdom and contemporary health science to serve diverse populations and evolving wellness needs.

Christina's expertise spans concept-to-completion development of wellness spaces, where she designs and operationalizes environments for rest, healing, and mindfulness rooted in local culture and sustainability. Her work at Vana, contributed to the creation of Vanaveda, a pioneering platform that bridges wellness with social responsibility and ecological sustainability, reflecting her deep commitment to community-driven and environmentally aligned health solutions.



These quotes illustrate Christina's conviction and

A wellness establishment in whichever form, however big or small, cannot exist in isolation. Genuine care and engagement with its residents, team, community and environment play an essential role. Its authenticity and success also lie in making the neighbouring communities and its immediate environment better off than before.

This, to me, is a mark of a true wellness place or a destination.

What we do to nature comes full circle.
Harm it, and we harm ourselves.
By healing it, we heal ourselves.

Beyond the confines of studies and statistics exists the essence of creating a one-of-a-kind wellness facilitating model. It envisages a community not just as it is but as it could be. It demands an unwavering conviction against all odds, willingness to break free from the ordinary and challenge the norms, all with a touch of altruism.

implementation partners.

FORUM

1. Prakruti Prerna Foundation
2. Dholakia Foundation
3. TotalStart


Canva