विज्ञान एवं
प्रौद्योगिकी मंत्रालय
MINISTRY OF
SCIENCE AND
TECHNOLOGY
सत्यमेव जयते

DEPARTMENT OF SCIENCE & TECHNOLOGY · GOVT. OF INDIA

Technology Enabling Centre

University of Ladakh

TECHNOLOGY PORTFOLIO

2026



Bridging technology sources and Ladakh's communities — sourcing, adapting and deploying solutions built for a high-altitude, cold-arid world.

WHO WE ARE

An ecosystem for technology *in the Himalayas*



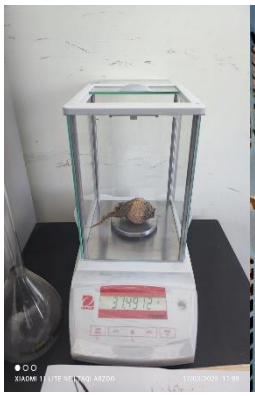
The Technology Enabling Centre (TEC), University of Ladakh, is part of the national network of Technology Enabling Centres established by the Department of Science and Technology, Government of India.

Our role is to act as a bridge between technology sources — research institutes, universities, innovators and industry — and end-users in underserved regions. We identify region-specific problem statements, source appropriate and de-risked technologies, facilitate their transfer and adoption, strengthen the local innovation ecosystem and enable commercialisation.

The Centre's focus is on providing an enabling ecosystem, process and support system — connecting researchers with institutes, national laboratories and industry.













10
technologies in development, field validation or transfer

13
formal industry and institutional connects

3
patent filings (2 filed, 1 in pipeline)

16
regional technology gaps mapped

WHERE WE FOCUS

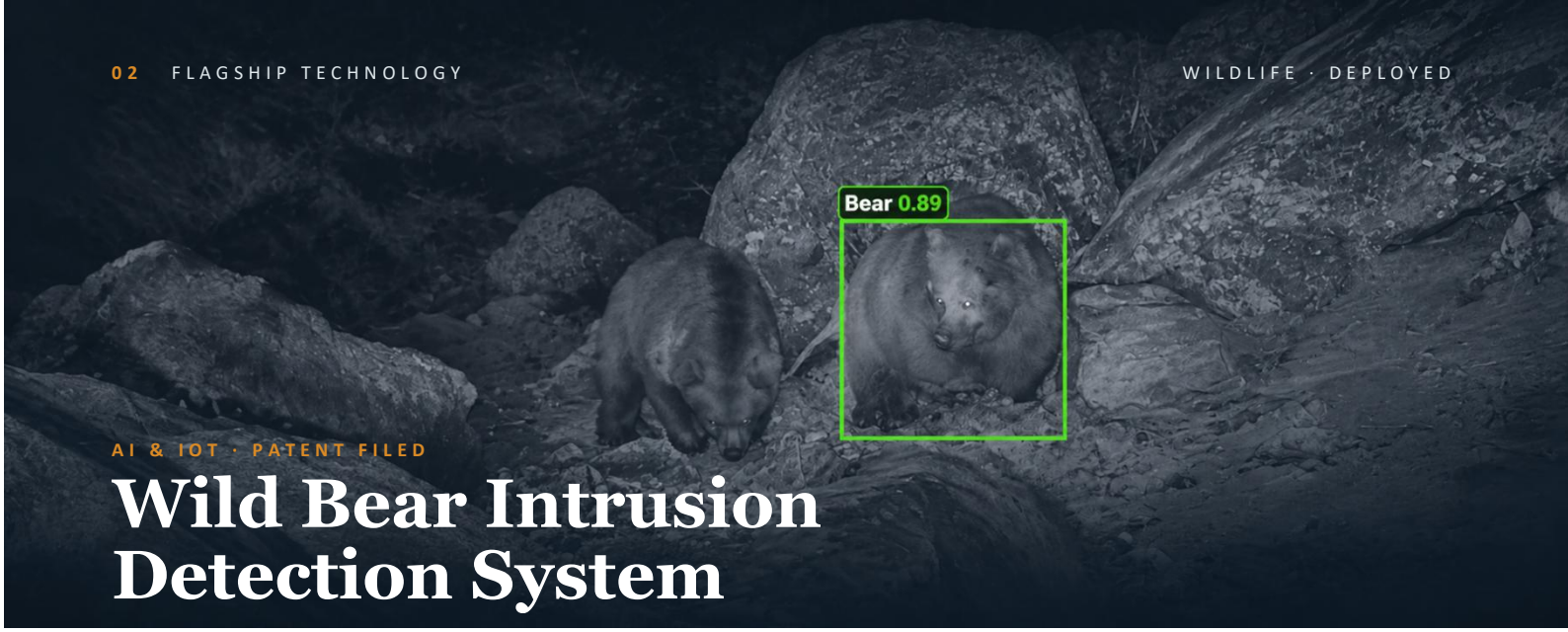
Agriculture & post-harvest
Storage, drying and shelf-life for apricot and vegetables.

Wildlife monitoring
AI camera networks that reduce human–wildlife conflict.

Disaster resilience
Early warning for floods, landslides and black ice.

Energy & enterprise
Off-grid solar systems and support for local start-ups.

> "Ladakh faces problems for which no technology is being developed elsewhere in the country — extreme cold, isolation, thin cellular coverage. Our work starts from those problems.



AI & IOT · PATENT FILED

Wild Bear Intrusion Detection System

LAUNCHED · 7 OCTOBER 2026

Launched by the Hon'ble Lieutenant Governor, UT Ladakh, Shri Vinai Kumar Saxena

Selected for formal launch at the Wildlife Week Celebration 2026 in Leh, in the presence of the Chief Secretary, UT Ladakh, the Hon'ble Vice Chancellor, University of Ladakh, and the Chief Wildlife Warden. The product was launched digitally at the click of a button through a TEC-built launch system.



THE PROBLEM

Himalayan brown bears increasingly raid crops, livestock and settlements in Kargil and Zanskar. Reactive systems gave communities no early warning of bear presence.

WHAT TEC DID

- Re-engineered the iHub DivyaSampark (IIT Roorkee) prototype to run entirely on DC solar power, off-grid — no inverters.
- Moved it into a splash-proof field enclosure; advanced the system from **TRL 4 to TRL 6**.
- Filed a patent — Application No. 202611007306.
- Integrated the AI model with the UoL WildWatch backend for alerts and live video.

IN THE FIELD

Capt. Vikram Batra Transit Camp, Drass
First deployment · under active monitoring

BRO Camp, Shargole
Recorded a real brown-bear intrusion in live conditions

Tashistondey, Rangdum, Zanskar
Installed at the request of WWF after the launch


Ladakh

The Earth News 3

LG Saxena launches AI system to detect brown bear intrusions, tackle human-wildlife conflict

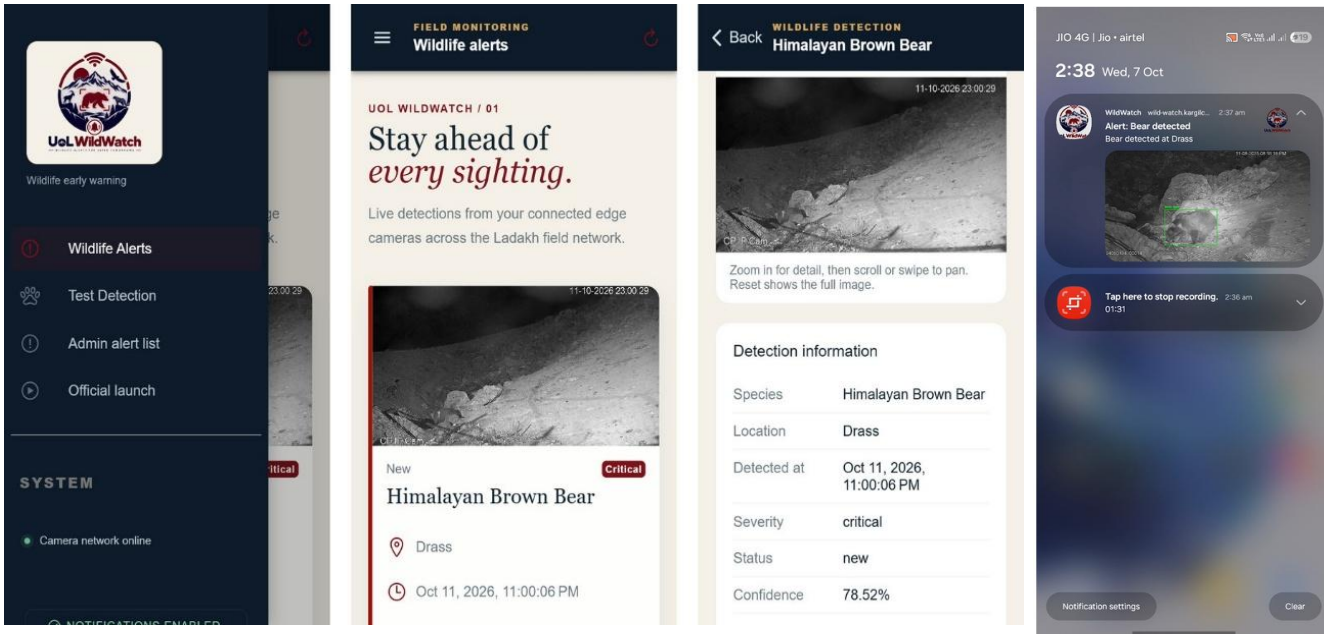


Next step: formal technology transfer to the Wildlife Department, UT Ladakh, for wider deployment across bear-conflict zones.

UOL WILDWATCH

Every sighting, *in your pocket*

The UoL WildWatch app and backend turn camera detections into alerts that researchers, wildlife officials and guards can receive, review and act on — while freeing the off-grid Jetson Nano camera units to focus on detection.



Alerts list and detection details · push notification on a phone: "Alert: Bear detected · Drass".

Real-time alerts

Sign in with Google or a mobile one-time code. New detections appear instantly with species, location, severity and image.

Push notifications

One detection from the camera reaches every registered phone and browser — no message lists to manage on the device.

Live camera view

One stream from the Jetson, relayed to many viewers by a central media server. Saves battery and processing in the field.

Cloud image store

Detection images are saved centrally instead of being cleared from local storage — ready for model retraining.

Field station control

Drass, Shargol and Zanskar nodes each have a page with live feed and remote router and node reboot.

Admin oversight

Administrator views of all alerts and control over which alerts appear in the public list.

How an alert flows JETSON CAMERA DETECTS → WILDWATCH BACKEND STORES → APP UPDATES PUSH SENT IMAGE ARCHIVED

WATCHING THE LAND

Early warning for a *fragile landscape*

PROTOTYPE IN PROGRESS

Black-Necked Crane Population Monitoring

A solar camera network with on-device AI (YOLO26) that counts cranes and detects feral-dog threats near nests. A graph neural network in Leh merges counts into one de-duplicated estimate. LoRa links keep it working without internet, where cellular coverage is thin.

PROPOSAL SUBMITTED · DPR UNDER WAY

AI Off-Road Vehicle Detection

Cameras with YOLOv8 detect vehicles straying into marshland and breeding grounds, and alert duty officers with vehicle type, GPS location, time, photo and licence plate. Referred by the Wildlife Warden, Leh.







Flash-flood damage in Kargil · RAKSHAK early-warning siren · landslide sensor nodes at Kutropi

AGREEMENT SIGNED

Flood Prediction & Early Warning

With ClimMaTech (IIT Mandi): radar/ultrasonic water-level sensors, AI models linking rainfall to surges, RAKSHAK sirens and the Agaah alert app — all solar-powered for sub-zero, off-grid sites. A site assessment with IIT Mandi is being planned.

TRL 9

Landslide Monitoring & Warning

By Intiot Services (IIT Mandi Catalyst): tilt meters, inclinometers, piezometers and rain gauges with solar data loggers and sirens. Validated at Kutropi; in discussion with UT Ladakh to protect routes such as NH-1.

KARGIL TEST SITE IDENTIFIED

De-Icing for Black-Ice Roads

A de-icing technology proven in Manali and Kufri, sourced through TEC Punjab with Kennen Automation and Solutions. Presented to the Deputy Commissioner, Kargil; field testing is planned for the coming winter.

FROM HARVEST TO WINTER

Keeping Ladakh's harvest *through the winter*

COMPLETED · TRANSFERRED

Modern Root Cellar

A passive, low-energy cellar for vegetable storage and mushroom cultivation, built on the Kargil Campus and formally transferred to the Department of Horticulture, Kargil in July 2025 for farmer adoption.

93% less post-harvest loss **4.2–5.4°C** through winter
<5% weight loss





TECHNOLOGY TRANSFER AGREEMENT

Hybrid Solar Dryer

Ladakh grows 62% of India's apricots, yet 40–60% go to waste. With GTEC, GITAM University, TEC is building a modular dryer with automated temperature and moisture control to replace slow, dusty sun-drying.

62% of India's apricots **15–20 days** for open sun-drying today

TRIALS ONGOING

Edible Coating

A sericin–chitosan–aloe film that slows ripening of apricot, at about ₹1.5 per kg. Being trialled with the Chemistry Department.

TRL 5/6 · FIELD-TESTED

Anti-Freezing Water Supply

Circulates water between 0.3°C and 0.7°C to stop freezing without insulation. Winter-tested at Sakti and Leh.

BUILDING CAPACITY

Start-ups, patents *and regional needs*

START-UP ASSISTED

New Kargil Food Processing Unit

TEC visited the unit and identified gaps in apricot-jam texture, juice consistency, local lab testing, marketing and scaling. TEC built a QR-enabled website for direct sales and recommended printing the QR on packaging.

PATENT FILED

Rilung Organics

A patent has been filed for its sea-buckthorn herbal tea — free of microplastics and sugar. The product was recommended for patent assistance by the Hon'ble Vice-Chancellor at Ladakh Ideathon 2024, Kargil Edition.



Technology Transfer Agreement for the Hybrid Solar Dryer, signed between GTEC, GITAM and the University of Ladakh, 10 January 2025.

INDUSTRY & INSTITUTIONAL CONNECTS

Thirteen formal connects with universities, IIT-incubated companies, government departments and research bodies — for technology sourcing, transfer, testing and problem-statement identification. Patent filings are managed through IPMagnitude, with lab validation from Guru Nanak Dev University.

PATENTS

Sea-buckthorn Herbal Tea	FILED
AI & IoT Bear Intrusion Detection	FILED
Managing maggots in onion (apricot oil cake)	PIPELINE

TECHNOLOGY GAPS MAPPED, 2026

Gathered from EDI, the Department of Industries & Commerce, progressive farmers and local entrepreneurs.

COLD CHAIN · FRUIT PROCESSING · SHELF-LIFE · DAIRY · PACKAGING · PASHMINA & WOOL · HANDLOOM · HANDICRAFT & STONE · DIGITAL FABRICATION · COLD STORAGE · WINTER WATER · ROAD DE-ICING · SOLAR O&M · OFF-GRID ENERGY · WASTE · TESTING & CERTIFICATION

WHAT'S NEXT

Work in progress *and the road ahead*

TRL 8–9 · COMMERCIALISED | FIELD TRIALS IN LEH | ANIMAL HUSBANDRY DEPT ON BOARD

"Surbhi" Enzyme Feed Supplement for Livestock

A fibrolytic enzyme rich in cellulase and xylanase, developed by Dr. Sachin Mandavgane, VNIT Nagpur, under DST support. Sprinkled on dry fodder, it loosens fibre bonds so animals digest more of the tough roughage they live on through Ladakh's long winters. Commercialised through a VNIT-incubated start-up and available on GeM.

35% → 65% dry-matter digestibility of dry roughage **2.5 g** per head per day **≈ ₹1** per head per day

PROGRESS SO FAR

- **22 Oct 2026 —** TEC reviewed NDDB pilot trials on four dairy cows at Stok and Choglamsar, Leh. Within 20 days dung firmed up, foul odour disappeared and animals were more active. Milk yield and fat need longer feeding to show change.
- **6 Nov 2026 —** Meeting with the Animal and Sheep Husbandry Departments, UT Ladakh, and MAFSU. The Chief Animal Husbandry Officer consented to field trials on the Department's farms.

WAY FORWARD

- VNIT to supply enzyme samples for preliminary testing on Department farms.
- Protocol to be customised for Ladakh — alfalfa fed dry and unchopped, dry fodder for about eight months.
- Enzyme activity at sub-zero temperatures to be studied, including trials in the Pashmina region.
- Joint visit to Department sites after TEC's PAG meeting on 13 Nov 2026; Leh trial data to be shared in writing.

COLLABORATION INITIATED | WITH CSIR-CMERI

Mechanical Sea-Buckthorn Harvester

Sea buckthorn grows wild across Ladakh, but hand-picking its thorny branches causes heavy losses in a harvest window of only about three months. A TEC survey found harvesting tools exist abroad but not in India. On DST's advice, TEC met Dr. Partha Das, CSIR–Central Mechanical Engineering Research Institute, on 30 October 2026.

UNDERSTANDING REACHED

- No ready-made tool exists; a new prototype will be developed. Plants differ in size and type across Ladakh, so the device must be customisable for each area.
- Development at CSIR-CMERI's Centre of Excellence for Farm Machinery, Ludhiana, building on its fruit-picking and saffron-harvesting work.
- TEC to provide field and site links, run testing and field trials — 7 to 8 trials over several seasons, about three years — and lead commercialisation and dissemination.

WAY FORWARD

- CSIR-CMERI to submit a Pre-Project Report with the proposed prototype and cost by head.
- TEC and CSIR-CMERI to pitch jointly to the UT Administration, Ladakh, and other funding agencies.
- Joint project proposal under suitable Government calls: development at CSIR-CMERI, implementation in Ladakh by TEC.

MILESTONES

22 Oct 2026
Surbhi trial review with VNIT and NDDB

30 Oct 2026
Harvester talks with CSIR-CMERI

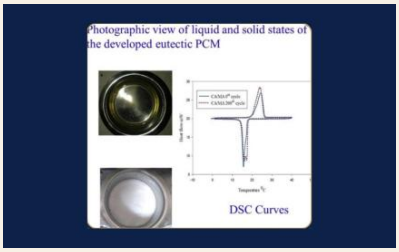
6 Nov 2026
Animal Husbandry Dept agrees to trials

13 Nov 2026
PAG meeting, then joint site visit

09 · LOOKING AHEAD

Technologies Identified for Development and Support, 2026–27

Patented technologies TEC-UoL has identified to adapt and support for Ladakh over the coming year.



1. Low-Temperature Phase Change Material

Patent No. 412428

Need: Rooms lose the warmth of heater and sun within minutes after dark.

Solution: A capric–myristic acid eutectic melting near 20.9°C, set in walls and floors to store heat and release it through the night; also for winter greenhouses.

To adapt: Encapsulation; sizing to a room's night-time heat loss.



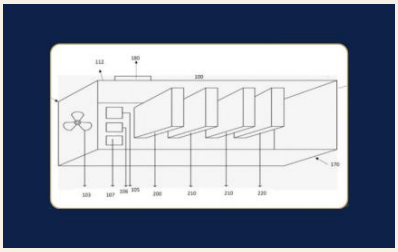
2. Machine-Vision Fruit Grading

Patent No. 518857

Need: Apple and apricot leave the orchard ungraded, lowering price and spoiling stores.

Solution: Automatic, non-destructive grading of internal and external fruit quality at intake.

To adapt: Train the model on apple, apricot and sea buckthorn.



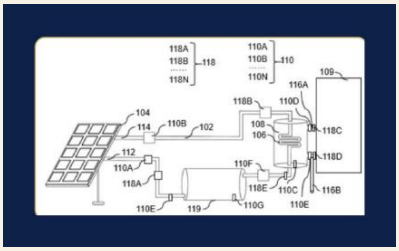
3. Solar Air-Pollutant Filter

Patent No. 557980

Need: Bukharis in sealed winter rooms cause smoke exposure and falling oxygen.

Solution: Portable solar-powered filter (pre-filter, HEPA, activated carbon) with sensing and display.

To adapt: Add oxygen and CO sensing with alerts; room-scale enclosure.



4. Solar PV-Heat Water Heating

Patent No. 586541

Need: Hot water for hostels and campuses relies on carried fuel or an uncertain grid.

Solution: Heats water with waste heat drawn from PV panels, cooling them and raising their output.

To adapt: Freeze protection: drain-back or glycol circuit, insulated runs, winter mode.



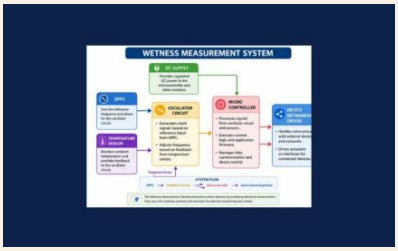
5. Pedal-Powered Organic Waste Shredder

Patent No. 388730

Need: Organic waste at kitchens, monasteries and tourist villages has no processing, often no power.

Solution: Bicycle-driven shredder feeding compost bins, with sensors and a participation app.

To adapt: An insulated or warmed digester stage for winter.



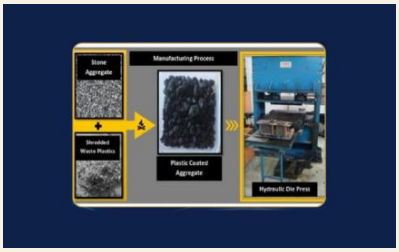
6. Surface Wetness Sensor for Black Ice

Patent No. 302230

Need: Black ice forms on winter roads with no warning to drivers.

Solution: Capacitive sensor measuring surface water to the millimetre over a wide temperature range; usable at Leh and Kargil airports.

To adapt: Add surface temperature and ice logic; road-hardened casing; driver alerts.



7. Plastic–Aggregate–Bitumen Roads

Patent No. 198254

Need: Freeze–thaw breaks roads while tourist plastic waste has no sink.

Solution: Plastic-coated aggregate for stronger, water-resistant pavement; proven on Indian roads.

To adapt: Trial sections over two winters; local mix design; collection with municipal committees.



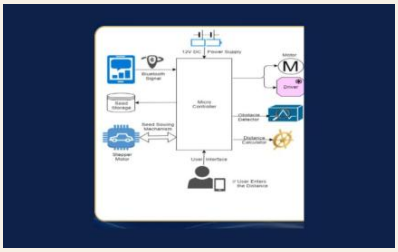
8. Water Recycling & Regeneration System

Patent No. 598370

Need: A cold desert of ~100 mm rainfall, with contaminated groundwater in Leh and Kargil towns.

Solution: Building-scale unit that filters drawn water and recycles used water back to service.

To adapt: Filters matched to assayed contaminants; drop the atmospheric-water stage; insulation and winter bypass.



9. Low-Cost Automated Seed Sower

Patent No. 567898

Need: A short sowing window, scarce labour and hand-sowing that wastes seed on small terraces.

Solution: App-controlled 12 V DC sower with even spacing and obstacle detection; runs from a solar-charged battery.

To adapt: Calibration for barley, wheat, peas and fodder; terrace chassis; cold-start battery.

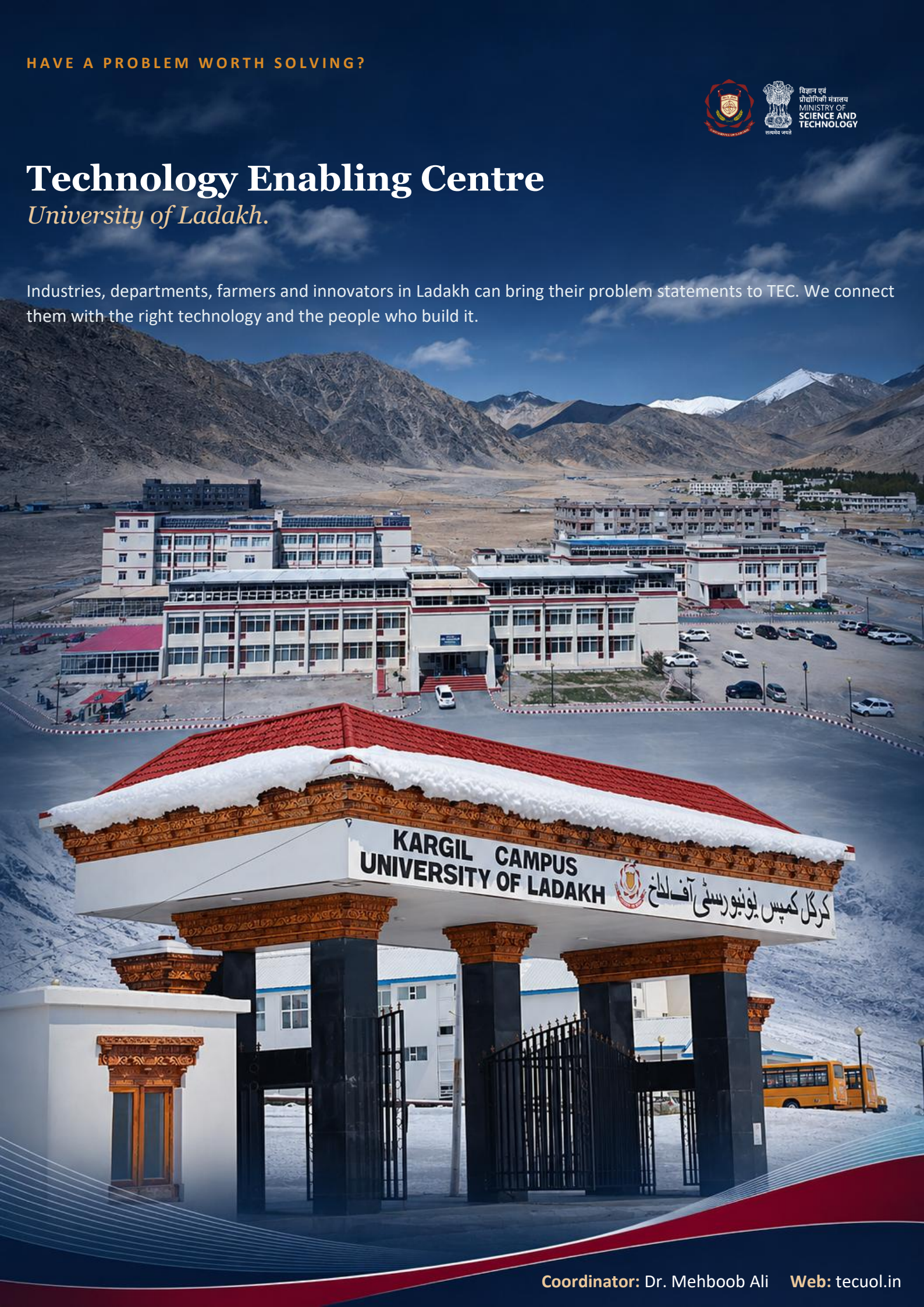
HAVE A PROBLEM WORTH SOLVING?

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Technology Enabling Centre

University of Ladakh.

Industries, departments, farmers and innovators in Ladakh can bring their problem statements to TEC. We connect them with the right technology and the people who build it.



Coordinator: Dr. Mehboob Ali **Web:** tecuol.in