EvK2CNR



Annual Report 2025


EvK2CNR
RTY TO WELCOME

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About EvK2CNR

Mission & Legacy

Founded in 1989 from the visionary collaboration between Professor Ardito Desio and mountaineer Agostino Da Polenza, EvK2CNR is a leading association dedicated to high-altitude scientific and technological research. For over 35 years, our work has focused on the critical regions of the "Third Pole" , the Himalayas and Karakorum, contributing to the global understanding of climate change and sustainable mountain development.

Geographical Scope & Operational Model

Our activities span the world's most significant mountain ranges, including the Hindu Kush, Karakorum, Himalayas, the Alps, and key regions in Africa and South America. We maintain a constant operational presence in Nepal, Pakistan, and Tibet. The cornerstone of our infrastructure is the Pyramid International Laboratory-Observatory, a unique research facility we established and manage at 5,050 meters on the Nepalese slopes of Mount Everest. This strategic asset enables continuous, high-quality environmental monitoring in one of the planet's most sensitive and extreme climates.

Scientific Impact & Recognition

Our interdisciplinary research has led to groundbreaking discoveries in Earth and Environmental Sciences, Human Physiology, Anthropology, and eco-efficient technologies. We are dedicated to producing robust, long-term data on climate variability and its impacts, evidenced by over 600 international peer-reviewed publications, including in prestigious journals such as Nature.

A flagship initiative is the SHARE project (Stations at High Altitude for Research on the Environment). Developed in cooperation with UNEP, the WMO, and a network of Italian and global universities, SHARE highlights our role in advancing global climate science through a dedicated high-altitude monitoring network.

Commitment to Sustainable Development

Beyond core research, EvK2CNR actively engages in ecology and international cooperation. In partnership with the Italian Ministry of Foreign Affairs and the Italian Agency for Development Cooperation (AICS), we design and implement projects that protect fragile ecosystems, conserve biodiversity, and promote resilient, sustainable development for local communities. Initiatives such as "Water for Development" and "Glaciers & Students" demonstrate our holistic approach to linking scientific knowledge with concrete actions for environmental preservation and socio-economic growth in mountain regions.

EvK2CNR
Mission and Vision

Our Vision

EvK2CNR envisions a future where the world's mountain regions and their communities thrive in harmony with their environment. We strive for a model of sustainable development where cutting-edge scientific knowledge directly informs the protection of fragile ecosystems, the preservation of unique cultural heritage, and the enhancement of resilience for populations facing global environmental change.

Our Mission

For over 35 years, our mission has been to:

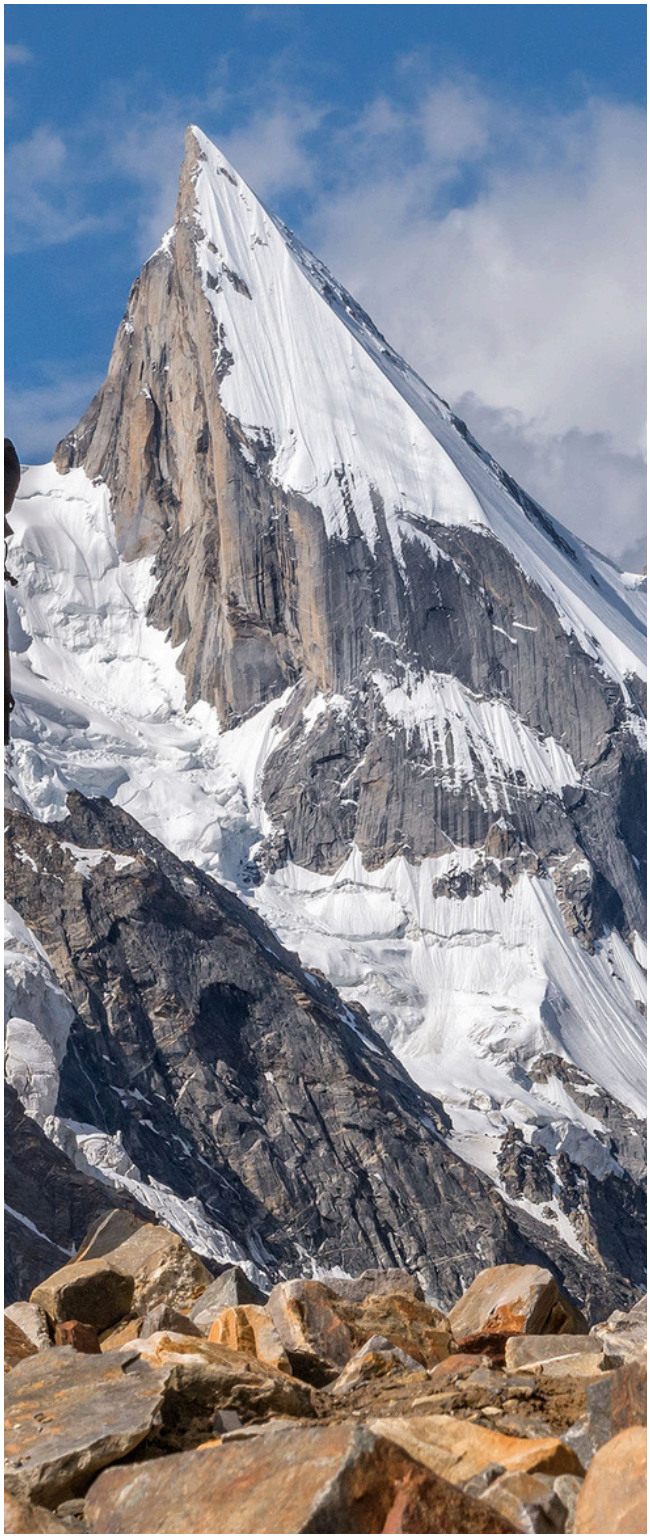
- Advance Science: Conduct high-altitude research to understand mountain ecosystems and quantify global change.
- Promote Sustainability: Turn research into strategies for resilient mountain communities and livelihoods.
- Protect Heritage: Safeguard natural resources and cultural heritage through integrated conservation and development.

Our Impact

By bridging the gap between pioneering science at the "Third Pole" and concrete on-the-ground cooperation, EvK2CNR turns knowledge into a powerful tool. We empower local institutions, inform international policy, and provide the insights necessary for the enhanced stewardship of our planet's most vulnerable and vital high-altitude regions.



EvK2CNR President’s message



Dear Friends, Members, and Partners,

With the publication of this Annual Report, I wish to share with you the summary of another intense and significant year for our Association. 2025 was a year of science, cooperation, and awareness-raising, which further confirmed that **investing in research and the sustainable development of mountains is not a choice, but an urgent necessity for the entire planet.**
Our commitment to scientific research and conservation began immediately with a strong signal: EvK2CNR was at the forefront of contributing to the launch of the **International Year of Glacier Conservation,** as called for by UNESCO and WMO. In Geneva, our researchers brought unique data and expertise, presenting crucial scientific evidence on the health status of glaciers. To reinforce this message, in January we organized a conference in Islamabad with the Asian Development Bank, focusing on pillar projects such as **the inventory of Pakistan's 13,032 glaciers,** Asia's largest freshwater reserve: a fundamental scientific undertaking to understand the region's water resources.

A true highlight of 2025 was the **launch of the Spantik Lab project, which transformed the Chogo Lungma Glacier into a veritable open-air laboratory for climate study**. Its strength lies in its dual nature, both scientific and educational: alongside data collection using cutting-edge technologies, the mission integrated on-the-ground training programs for local students and researchers, building lasting capacity.

Our research also resonated on global scientific platforms, from ESA's Living Planet Symposium, where we presented unpublished data, to biodiversity monitoring in Nepal's Sagarmatha National Park. In geophysics, the upgrade of the seismological station at the Pyramid, in collaboration with OGS, allows us to precisely monitor seismicity in a glacial environment. **This is a step towards the regeneration of that unique and irreplaceable facility, open to researchers worldwide, which will continue in 2026 thanks to the renewed agreement with the DSSTTA-CNR.**





Our commitment, however, also materializes in the lives of communities. In the Pakistani Thalle Valley, we are implementing an **ecotourism facility that combines modern comfort, traditional architecture, and environmental sustainability—a replicable model**. In November, the training course desired by Gilgit-Baltistan to form certified Local High-Altitude Mountain Guides concluded, carried out in collaboration with Italian Alpine Rescue and Guides. It is the symbol of a thirty-year journey towards sustainable development, combining economic growth with ecosystem protection.

This course is not an isolated action, but the latest piece of a twenty-year strategy built on environmental governance, active conservation, strategic scientific research, and community empowerment. Thanks to the "Water for Development" project, we inaugurated new laboratories and strengthened existing ones, and activated training courses on geospatial technologies, equipping new generations with tools to face climate challenges.

Global dialogue and awareness-raising were central. Our presence at the WMO Executive Council, the prestigious "Tamgha-e-Pakistan" award conferred upon me by President Zardari, and the "Ambassador of Pakistan Achievement Award" received by Maurizio Gallo, **testify to the importance of the work carried out over these years.** We participate in events like Cortalp 2025 because we believe in the power of creativity to raise awareness among young people.

2025 was therefore a year rich in challenges and achievements. On this occasion, I invite you to join us in recognizing the importance of mountains, not only as precious ecosystems but as vital resources for our planet's sustainability. **Let us continue to work together to protect them, so that the beauty and resources of the mountains may continue to thrive "among the mountains, for the mountains."**

Agostino Da Polenza
President, EvK2CNR Association


EvK2CNR

EvK2CNR and DSSTTA-CNR New Agreement

EvK2CNR and the Department of Earth System Science and Environmental Technologies (DSSTTA–CNR) have renewed and reinforced their collaboration through an agreement supporting scientific, technological, and logistical activities. The partnership advances DSSTTA–CNR research programs at the Pyramid International Laboratory in Nepal and across the Karakorum–Hindu Kush region, focusing on Earth Sciences and Environmental Medicine, including studies on climate, atmosphere, glaciology, meteorology, hydrology, biodiversity, and environmental health.
The collaboration also addresses the implications of these studies for climate change mitigation and adaptation, with particular attention to the socio-economic development of mountain communities.

Key Highlights

- **Strategic Partnership for High-Altitude Research**: The agreement consolidates cooperation between DSSTTA–CNR and EvK2CNR in support of scientific activities at the Pyramid Laboratory, the Khumbu Valley, and the Hindu Kush–Karakorum region.

- **Technical and Logistical Support for Field Missions**: EvK2CNR will provide organizational, logistical, and technical support for expeditions, including transport of scientific equipment, access to research facilities, and field assistance.

- **Research on Climate and Mountain Environments:** The collaboration aims to enhance understanding of climatic and environmental processes in high-mountain regions, contributing to mitigation and adaptation strategies for vulnerable mountain ecosystems.

This agreement reflects a shared commitment to advancing scientific knowledge in high-altitude environments by combining CNR's scientific leadership with EvK2CNR's logistical expertise and long-standing presence in the Himalaya–Karakorum region.

EvK2CNR International Frameworks and Collaborations

THE UNITED NATIONS GENERAL ASSEMBLY RESOLUTIONS

August 3rd, 2009 – (n. 64/222) on Sustainable Mountain Development – EvK2CNR climate change activities' mention
August 5th, 2013 – (n. 68/307) on Sustainable mountain development – EvK2CNR

UNEP (United Nations Environment Programme)

February 19th, 2007 – accreditation of EvK2CNR to the Governing Council

UNEP –ABC (Atmospheric Brown Cloud) Program

October 21st, 2003 – designation of EvK2CNR as partner

UNEP – CCAC (Climate and Clean Air Coalition to Reduce Short Lived Climate Pollutants)

February 15th, 2013 – designation of EvK2CNR as non-State Partner in the Climate Clean Air Coalition to Reduce Short-Lived Climate Pollutants

WMO – GAW (Word Meteorological Organization – Global Atmosphere Watch)

- December 17th, 2007 – recognition of the ABC-Pyramid station as contributing station in WMO Global Atmosphere Watch network
- September 8th, 2010 – upgrade of the regional GAW station ABC-Pyramid to Global GAW
- October 31st, 2010 – upgrade of the regional GAW station Mt. Cimone to Global GAW station

ECOSOC designation of EvK2CNR in Roster since 2008

WMO – SPICE (Solid Precipitation Intercomparison Experiment)

(in final report International Organizing Committee for the WMO Solid Precipitation Intercomparison Experiment- Davos, Switzerland June 17th -21st, 2013) – participation of EvK2CNR in the Solid Precipitation Intercomparison Experiment (SPICE) through the SHARE automatic weather stations (AWSs) installed on Forni Glacier (Italy) and at Pyramid Inter- national Laboratory Observatory (Nepal)

ICIMOD – The International Centre for Integrated Mountain Development

Member as Maijor Group Organization since 2005


EvK2CNR

EvK2CNR Projects

SHARE and the Pyramid Observatory Laboratory

SHARE: Stations at High Altitude for Research on the Environment

Mission

The SHARE project (Stations at High Altitude for Research on the Environment) aims to foster continuous scientific observation in key high-mountain regions. Its work is vital for enhancing knowledge on both regional and global climate change patterns.

Objectives & Implementation

The primary objective is to improve understanding of mountain climate variability through high-quality, long-term data. SHARE has implemented a global observation network to monitor various parameters: atmospheric composition, meteorology, glaciology, hydrology, water resources, biodiversity, and human health. Project activities include planning mitigation and adaptation strategies for climate change.



The Pyramid – International Laboratory

Is the flagship facility of SHARE, located at 5,050 m a.s.l. in Sagarmatha National Park (Nepal). Active since 1990, this high-altitude laboratory supports the international scientific community by offering a base for studies on the environment, climate, human physiology, and geology. The main research fields include Earth Sciences, Environmental Sciences, Medicine and Physiology, Anthropology, and the development of new technologies.

1 Technical Mission to the Nepal Climate Observatory–Pyramid (NCOP): System Regeneration and Infrastructure Enhancement



Executive Summary

In November 2025, EvK2CNR executed a comprehensive technical and maintenance mission to its flagship high-altitude laboratory, the Nepal Climate Observatory – Pyramid (5,050 m a.s.l.), and its associated valley network. The mission's primary objective was the continued technological regeneration of the facility and the revitalization of the SHARE (Stations at High Altitude for Research on the Environment) monitoring programs. Activities focused on critical hardware upgrades, system integration, and the reinforcement of data acquisition and telemetry chains, ensuring the long-term stability and scientific relevance of one of the world's premier atmospheric and geophysical observatories.

Mission Activities – Technical Upgrades

1. Seismic Station (EVN) Enhancement

In collaboration with engineers from the National Institute of Oceanography and Applied Geophysics (OGS), significant upgrades were implemented at the EVN broadband seismic station:

- Logger Replacement: The legacy data logger was replaced with a modern unit, enhancing performance and providing advanced analog-to-digital conversion capabilities for improved signal fidelity.
- Extended Dynamic Range: An additional accelerometer was integrated into the system. This sensor expands the station's recording range to capture high-amplitude, near-field seismic events without saturating the primary, highly sensitive seismometer, thereby eliminating signal distortion on the main channel.
- Infrasound Monitoring: A multimicrophone infrasound sensor array was installed to record acoustic waves in the very low-frequency spectrum (near a few Hz). This addition enables the discrimination between true tectonic seismic signals and local noise generated by cryogenic dynamics (e.g., glacier movement, serac collapse) and geomorphological processes (e.g., landslides).
- Telemetry Redundancy: A wireless telemetry link was successfully tested and configured as a full backup system for data transmission between the EVN station and the Pyramid laboratory. This creates critical redundancy, increasing system resilience against harsh environmental conditions that can compromise physical cable connections.

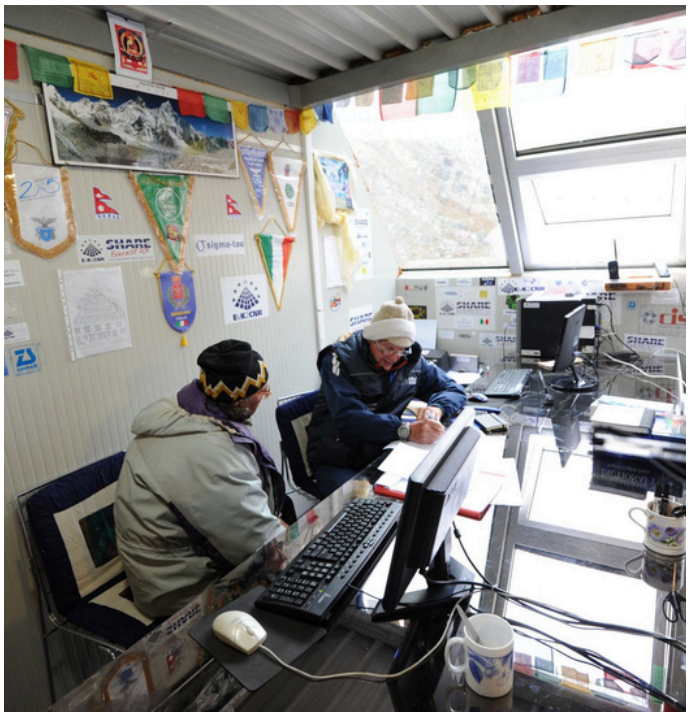




2. Reactivation and Modernization of Pyramid (NCOP) Core Systems

- Aerosol Monitoring (Grimm Spectrometer): The data acquisition system for the Grimm aerosol spectrometer was migrated from an obsolete workstation to a new, robust mini-industrial fanless computer running a Windows 11 operating system.





A specialized software compatibility environment was implemented to facilitate communication between the modern OS and the instrument's legacy control software, restoring stable operation and reliable telemetry to the EvK2CNR Geoportal Server:

- GNSS Station: A new master GNSS (Global Navigation Satellite System) receiver was installed, utilizing the existing antenna to maintain the precise, unchanged geodetic reference point. The system is fully integrated into the Pyramid network for continuous data streaming.
- Local Data Hub: The newly installed mini-industrial computer also serves as a local data hub, managing telemetry from peripheral stations (e.g., Pheriche AWS) and providing an on-site data backup before transmission to the central Geoportal Server.

3. Instrumentation Logistics and Maintenance Cycle

Several key instruments were decommissioned and prepared for shipment to Italy for calibration and servicing, ensuring continued data quality and instrument longevity:

- Cimel sun-photometer (CE318-T).
- Vaisala integrated automatic weather station (AWS) and supplementary pyranometers.
- Sulfur dioxide (SO_2) analyzer.

4. Laboratory IT Infrastructure Overhaul

The internal data management infrastructure at the Pyramid was upgraded to increase reliability:

- A new AWS server, based on a mini-industrial fanless computer running Windows 11, was installed and configured, establishing stable telemetry for all connected stations.
- A secondary workstation running Windows 10 was set up as a standby system, providing backup and a testing environment for software compatibility.



5. Valley Network Maintenance and Optimization
Everest Webcam (EWC): The system was reactivated and recalibrated following a major snow event (>100 cm) related to late monsoon precipitation and cyclonic activity. Standard operational status and image quality were restored:

- Lukla AWS: Telemetry was restored by replacing the faulty radio modem. A migration from the current NCELL provider to the more reliable NTC cellular network is planned to improve connectivity stability.
- Namche Bazaar AWS: The aging battery bank was replaced with a higher-capacity unit, with plans to install a new protective battery enclosure in the near future.

Collaboration and Capacity Building

A post-mission meeting was held at the premises of the Nepal Academy of Science and Technology (NAST). EvK2CNR researchers briefed NAST members on all mission activities. NAST demonstrated a dedicated project room within its facility, allocated for EvK2CNR's use. This space, configurable as a conference room and a technical/scientific activity area, represents a valuable asset for training, meetings, and fostering permanent collaborative scientific activities in Kathmandu.

Conclusion

The mission successfully achieved its goals of technological refreshment and infrastructure consolidation at the NCOP-Pyramid. By implementing system redundancies, modernizing data acquisition platforms, and performing essential maintenance, EvK2CNR has ensured the continuity and enhanced the robustness of unique long-term datasets related to atmospheric composition, climate, and geophysics in the High Himalayas. This work underpins the Observatory's ongoing critical role in global climate observation networks and regional environmental research.

2 OGS (National Institute of Oceanography and Applied Geophysics), Mission to the Nepal Climate Observatory – Pyramid

Executive Summary

The IO.EVN seismic station at the EvK2CNR Pyramid was activated in May 2014 with the installation of a Broad Band seismometer. After 10 years of operation, the objectives of this mission were: i) to update and upgrade the station; ii) to restore and upgrade the existing GNSS station; iii) to establish a new WiFi bridge connection for the IO.EVN and GNSS stations while maintaining the old Ethernet over AC power line connection via the IO.EVN power cable as a backup.

The upgrade of the seismic station involved replacing the datalogger with an eight-channel model, allowing for the integration of both an accelerometer and an infrasound acoustic sensor alongside the existing velocimeter. The GNSS station had been inactive for three years due to an irreparable failure of the original Leica receiver. Two new receivers were installed on the same existing antenna to keep the antenna's phase center unchanged. Given the deformation rate of the area, this intervention also had an urgent character.





EvK2CNR Projects

SHARE and the Pyramid Observatory Laboratory

SHARE: Stations at High Altitude for Research on the Environment

Mission Overview

From October 27 to November 17, 2025, OGS conducted a crucial technical mission at the EvK2CNR Pyramid Observatory. The primary objectives were to modernize the seismic station (IO.EVN), reactivate and upgrade the permanent GNSS station, and enhance data transmission systems. After delays due to adverse weather, the team reached the Pyramid on November 7 for five days of intensive work.

Key Achievements

1. Seismic Station (IO.EVN) Modernization

- Upgraded Data Acquisition: The old 3-channel digitizer was replaced with a modern 8-channel Güralp AFFINITY digitizer. This allows for the integration of additional sensors.
- Enhanced Sensor Array: The existing reliable Güralp CMG-3ESPC broadband velocimeter was retained. Two new sensors were integrated:
  - A Güralp Fortis force-balance accelerometer (3-component).
  - A Lunitek Hermes differential pressure sensor for infrasound monitoring (low-frequency acoustic waves).
- Immediate Improvement: Preliminary data shows a more efficient system with corrected timing issues that had affected earthquake location accuracy in recent years. The new sensors successfully recorded a regional Mw 4.4 earthquake on December 4, 2025.



2. GNSS Station Reactivation and Upgrade

- Restored Critical Monitoring: The GNSS station, inactive for three years due to an unreparable receiver fault, was successfully restored. This is urgent for monitoring the area's crustal deformation. Dual-Receiver Installation:
- Two new receivers were connected tothe existing, fully functional Leica AT504 choke-ring antenna (preserving the phase center):
  - A commercial Stonex SC2200 multi-constellation receiver.
  - A cost-effective OGS LZERO NET prototype receiver, developed in-house.
- Enhanced Capabilities: The new setup enables multi-constellation tracking aligned with IGS standards, raw data acquisition, and paves the way for future services like real-time centimeter-precision positioning (RTK) and detailed crustal deformation analysis.



3. Infrastructure and Data Transmission

- A new WiFi link was set up for seismic and GNSS stations, keeping Ethernet-over-power as backup.
- Configured VPN remote management for GNSS receivers.
- Solved technical issue with LZERO NET receiver's encrypted access through remote support and memory card update.

Conclusion and Outlook

The mission met all technical goals, enhancing the Pyramid Observatory's monitoring infrastructure. The modernized IO.EVN station is now a multi-parameter hub, and the reactivated GNSS station provides high-quality geodesy data. Future work will focus on infrasound and GNSS data analysis, calculating deformation velocities, and integrating with other systems. All processed data will be available via the EvK2CNR web platform.

3 Ecological Survey of Apex Predators and Prey Dynamics in Sagarmatha National Park: A 15-Year Reassessment



Executive Summary

In November 2025, under the scientific coordination of EvK2CNR, a targeted ecological field survey was conducted in Sagarmatha National Park (SNP), Nepal. This mission constituted a critical long-term follow-up to the pioneering research initiated in 2004 on the park's large carnivore community, with a specific focus on the endangered snow leopard (Panthera uncia). The primary objective was to reassess the status and interrelationships of the snow leopard, its main wild prey—the Himalayan tahr (Hemitragus jemlahicus)—and potential competitor species such as the Tibetan wolf (Canis lupus) and common leopard (Panthera pardus). This research, requested by the communities of the Khumbu, addresses fundamental questions in conservation biology regarding predator-prey dynamics in a simplified, high-altitude ecosystem and provides essential data for evidence-based park management.



Scientific Background and Rationale

High-altitude ecosystems like SNP represent simplified trophic structures where the population dynamics of apex predators are tightly coupled with the availability of a narrow spectrum of wild prey. Previous research by the EvK2CNR-associated team (2004–2010) documented the establishment of a snow leopard population in SNP following its presumed local extinction in the late 20th century.

This recolonization was followed by a documented predator–prey cycle: a rapid initial increase in snow leopard numbers correlated with a significant decline in the Himalayan tahr population, the cat's primary wild prey, leading to increased livestock depredation and a subsequent decline in the predator population itself.

The absence of confirmed snow leopard signs during an independent survey in September 2021 raised significant conservation concerns. This mission was therefore justified to determine: (i) the current presence/absence of a breeding snow leopard population, (ii) the status of the Himalayan tahr population, and (iii) whether the system's carrying capacity for a resident large carnivore has been irreversibly compromised, potentially requiring intervention.





Research Objectives

The specific scientific objectives of the November 2025 survey were:

1. To verify the contemporary presence of the snow leopard, Tibetan wolf, and common leopard within the park through systematic sign surveys.
2. To quantify the population size, structure (sex/age classes), and distribution of the Himalayan tahr for comparison with historical baseline data (2004–2010).



3. To assess the feasibility of the park's current prey base to support a viable snow leopard population and model potential scenarios involving the possible reintroduction of alternative prey species (e.g., bharal, Pseudois nayaur).
4. To document the presence and group structure of other key mammals, such as the rhesus macaque (Macaca mulatta).





Methodology

The survey employed standardized, replicable methodologies to ensure direct comparability with historical datasets:

- Large Carnivore Sign Transects: A 140-kilometer pre-established itinerary, regularly surveyed from 2004 to 2008, was re-walked at elevations between 3,500 and 4,500 meters above sea level. All signs of presence (scats, pugmarks, scrapes) for snow leopard, common leopard, and Tibetan wolf were recorded and georeferenced. Supplemental auditory surveys (wolf howling sessions) were conducted to detect the presence of wolf packs.
- Ungulate Population Census: Himalayan tahr groups were systematically located, and their numbers, sex, and age class composition were recorded using direct observation. This data allows for a direct comparative analysis of population trends and demographic structure over a 15-year interval.
- Contextual Data Collection: Incidental observations of other potential prey (livestock, musk deer) and non-target species (rhesus macaque) were documented to provide a holistic view of the mammalian community.





Research Team

The field mission was led by Prof. Sandro Lovari (Maremma Natural History Museum, Italy). He was assisted by Dr. Lorenzo Lazzeri (University of Siena) and supported locally by Research Assistant Mr. Birkha "Lalu" Gurung. Prof. Francesco Ferretti and Dr. Niccolò Fattorini (University of Siena) provided remote scientific support and data analysis expertise.

Preliminary Implications and Expected Outcomes

The data collected during this intensive field campaign are currently under analysis. The findings will directly inform:

- Conservation Status Assessment: A definitive update on the snow leopard's status in SNP, clarifying if the population is extant.
- Understanding Trophic Cascades: Insights into the long-term predator-prey dynamics in a high-altitude, human-influenced system.
- Evidence-Based Management: Scientific recommendations for SNP authorities, including monitoring strategies, prey population enhancement, and habitat management measures to support a self-sustaining apex predator population.

Conclusion

This mission reinforces EvK2CNR's long-term commitment to biodiversity conservation research in the Khumbu region. By revisiting a key study system after a 15-year interval, the association is generating a unique longitudinal dataset that is vital for testing ecological theory and for crafting effective, adaptive management strategies to preserve the ecological integrity of Sagarmatha National Park in the face of ongoing environmental and anthropogenic changes. The results will be disseminated through a peer-reviewed journal publication and shared with managing authorities.

EvK2CNR Projects

Water 4 Development

W4D

Mission

"Water for Development" project aims to enhance climate adaptation and ecosystem resilience in the fragile context of Gilgit-Baltistan Province, Pakistan.
Its overarching goal is to contribute to sustainable and inclusive development in mountainous regions.

The project was implemented by EvK2CNR in collaboration with UNDP and funded by the MAECI through the Italian Agency for Development Cooperation (AICS).

The partners and stakeholders include:
Gilgit-Baltistan Government Level:

- Department of Agriculture, Wildlife and Fisheries
- Environment Protection Authority (EPA)-GB
- Disaster Management Authority (DMA) - GB

Academia:

- Karakorum International University
- University of Baltistan

Community Level:
Rural communities of Gilgit, Hunza, Nagar, Shigar, Khaplu, and Skardu (total of 200 communities).

Beneficiaries:
Direct: 1,400 individuals
Indirect: 800,000 individuals



The project is based on 4 integrated objectives:

1. Water Resources and Disaster Risk Management: Monitoring glaciers and the impacts of climate change while sharing data with local authorities and universities.
2. Improvement of Agriculture and Livestock Quality: Establishing phytopathology and zooprophylaxis laboratories in collaboration with the Department of Agriculture.



3. Promotion of Sustainable Tourism: Developing a community-based approach for environmental conservation and job creation, in partnership with the Department of Tourism.
4. Sustainable Management Capacity: Training and awareness campaigns for institutions and communities in the management of natural resources and mountain ecosystems.

Expected Outcomes

1. Enhanced monitoring of glaciers and water resources for drinking and agriculture.
2. Increased capacity for sustainable management of agri-food supply chain.
3. Introduction and adoption of criteria and practices for sustainable local tourism management.
4. Strengthened capacities of local authorities and communities in implementing policies for the sustainable management of mountain ecosystems.



EvK2CNR Projects

Water 4 Development

1
OUTCOME

Monitoring of glaciers and water resources is improved for drinking and agri-food purposes

W4D

Activity 1.1: Improving glaciological and hydrogeological research, focusing key climate and environmental challenges through monitoring of glaciers and lakes

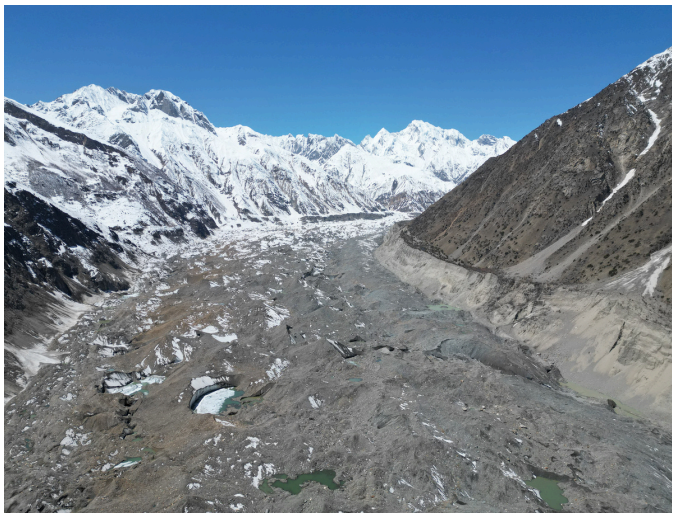
1.1.1 Stakeholder Engagement: Key stakeholders, including Karakorum International University (KIU) and local communities, were engaged through regular meetings to plan field activities for glacier monitoring in 2025/2026.

1.1.2 Glaciological Data Analysis & GLOF Monitoring: Satellite remote sensing (Sentinel-1 and Sentinel-2) and machine learning techniques were used to monitor Shispar Lake and improve Glacial Lake Outburst Flood detection, offering a promising approach for real-time hazard monitoring.

1.1.3 Automatic Weather Station (AWS) Network: The AWS network in Gilgit-Baltistan was expanded and maintained, with new stations installed in the Arandu and Chogo Lungma valleys. Regular visits ensured data collection, although some stations need updates.

1.1.4 Ancillary Data Acquisition: Various climate and hydrological datasets were acquired and validated. Field activities included UAV surveys on the Chogo Lungma and Tippuri glaciers, ablation stake measurements, and GNSS installations to support glacier analysis.

1.1.5 Glacier Melt Model Development: A glacier melt model was successfully developed and calibrated for Passu Glacier, showing strong agreement with field measurements. Reanalysis datasets (ERA5, HAR v2) were identified as the best precipitation inputs for mountain regions.





1.1.6 Glacier Volume Model Calibration: Ice-thickness estimation methods (GlabTop2 and OGGM) were validated on Chiantar Glacier, showing consistent spatial patterns. The workflow was extended to Chogo Lungma and Baltoro glaciers, establishing a foundation for basin-scale volume estimation with quantified uncertainty.



Activity 1.2: Geoportal and Data Management

1.2.3 Geoportal Updates: The EvK2CNR Geoportal was updated with a new interface, a mandatory Data Usage Policy, and quick-access map groups. A new Land-Cover Map of the Thalley Valley was produced for ecotourism support.

1.2.4 User Gap Analysis: An analysis identified key barriers to user data uploads: complex interfaces, data quality concerns, and format issues. Corrective measures include training, clear guidelines, and a formal review step.

1.2.5 Thematic Database Design: Work progressed on designing new thematic databases to better integrate and manage field, lab, AWS, and GIS data for publication via the Geoportal.

Activity 1.3: Field Infrastructure and Community Engagement

1.3.4 Community Agreement: A formal agreement was signed with the Arandu community, ensuring respectful collaboration for research on Chogo Lungma Glacier while protecting local rights, resources, and traditions.

1.3.5 & 1.3.6 AWS Installation & Maintenance: Three new AWS and one hydrometric station were installed near Chogo Lungma Glacier. Maintenance across the network identified needs for sensor upgrades (particularly at Pissan and Passu/Shishpar stations) and highlighted the importance of regular visits and community cooperation for sustainability.



EvK2CNR Projects

Water 4 Development

Activity 1.4: Capacity Building and Training

1.4.5 KIU Laboratory Refurbishment: The Glaciology Lab at KIU was fully refurbished and equipped with key instruments (drone, snow corer, portable AWS, workstation, software), establishing a dedicated center for research and training.

1.4.6 Training Needs Assessment (TNA) & Planning: Feedback from a 2025 training session (rated excellent by 87% of 29 participants) informed the 2026 plan, which will focus on AWS operation and climate data analysis.

1.4.7 Field Site Selection: Chogo Lungma Glacier was selected as the primary field site for 2025/2026. Activities include comprehensive monitoring using AWS, UAV surveys, and ablation stakes. Passu Glacier and Hinarche Glacier (Bagrot Valley) are additional targets for 2026.



Activity 1.5: Technical Training

1.5.1 & 1.5.2 Training Implementation: Training modules on GIS, the Geoportal, remote sensing, and data ethics were developed. A successful three-day in-person training at KIU equipped 27 students with practical geospatial skills for environmental monitoring.

1.5.3 Ongoing Support: Participants continued to seek guidance after the training, indicating strong engagement and the establishment of valuable collaborative relationships.



Activity 1.6: Risk Management Needs Analysis

1.6.1 Hydrogeological Risk Assessment: Discussions with GB-EPA highlighted a critical gap: the lack of a centralized database and comprehensive hazard maps for landslides and GLOFs. The project dentified the need to integrate glacial lake levels, precipitation, and land deformation data to develop effective early warning systems.

2 OUTCOME

Increased capacity for sustainable management of the agriculture and livestock value chain

Activity 2.1: Strengthening Water Laboratories & Capacity Building





2.1.4 Stakeholder Engagement & Planning: Multiple coordination meetings were held with EvK2CNR, Italian experts, Karakorum International University (KIU), and local sectoral stakeholders to prioritize field sampling and align technical approaches. Plans were made for specialized training and an online seminar, fostering strong international collaboration.

2.1.5 Laboratory Strengthening & Procurement: Following a comprehensive needs assessment, essential equipment and consumables for the Water Quality Lab were procured. Concurrently, the KIU laboratory was refurbished to meet ISO 9001 standards, positioning it as a key regional resource center.

2.1.6 ISO 9001 Certification Process: The process for ISO 9001 certification of the Water Quality Lab was initiated, involving a management system assessment and the development of a roadmap. A detailed, guideline-aligned questionnaire was also designed to standardize future field data collection in the region.

2.1.7 Staff & Stakeholder Training: A Training Needs Assessment (TNA) identified key knowledge gaps. Multiple training sessions were conducted, covering contaminants, analytical techniques, and the operation of newly installed lab equipment (e.g., portable multimeters, spectrophotometers, FTIR for microplastic analysis) for students, staff, and local technicians.

2.1.8 & 2.1.9 Field Sampling & Laboratory Assessment: Extensive water sampling was conducted at 11 sites across Gilgit-Baltistan. Laboratory assessments revealed two major concerns: 1) widespread microbiological contamination (E. coli, faecal enterococci) in drinking water sources, and 2) the pervasive presence of microplastics in both water samples and local fish. These findings underscore significant public health and environmental risks.

EvK2CNR Projects

Water 4 Development

Activity 2.2: Establishment of a phytopathology laboratory and training for men and women

2.2.4 Stakeholder Coordination: A series of meetings throughout the year with EvK2CNR, international experts, the University of Baltistan Skardu (UOBS), and the Agriculture Department ensured alignment on procurement, training plans, and collaborative research. These sessions finalized equipment lists, addressed challenges like internet connectivity for online training, and planned science-based solutions to support local agriculture and fruit export certification.

2.2.5 Laboratory Procurement & Setup: A joint Italian-Pakistani evaluation defined the needs for the new Phytopathology Lab at UOBS. The lab, designed for diagnosing fungi, bacteria, and viruses, will focus on microbiological, serological, and molecular techniques. Cost-effective procurement of essential equipment and reagents was completed to enable early disease diagnosis and support farmers and technicians.

2.2.6 Training Needs Assessment & Implementation: A Training Needs Assessment (TNA) identified key local crop diseases and farmer challenges, shaping a comprehensive training program. This included online seminars and a pivotal four-day practical session at UOBS (September 2025) for 45 participants (22 female, 23 male). The training combined theory, field surveys for symptom recognition and rapid testing, and hands-on lab work in pathogen isolation and molecular diagnostics (e.g., DNA extraction, PCR). In total, 69 students (34 female) participated in various phytopathology trainings in 2025.

2.2.7 Planning for 2026: Based on a 2025 review highlighting increased phytosanitary threats from climate change and invasive species, plans for 2026 were developed. The focus will be on strengthening the new laboratory's diagnostic capacity, expanding surveillance networks, and continuing advanced training to build local resilience against plan diseases and biosecurity risks.





Activity 2.3: Establishment of a zoo-prophylaxis laboratory and training for men and women staff





2.3.4 Stakeholder Consultations: Meetings were held with the University of Baltistan Skardu (UOBS), the Livestock and Dairy Development Department, and directors of the Central Karakorum and Deosai National Parks. Discussions identified gaps in veterinary infrastructure and surveillance, prevalent diseases (e.g., FMD, brucellosis, rabies), and challenges in wildlife conservation and zoonotic disease transmission. These sessions aligned training objectives and research priorities for the new Zooprophylaxis Laboratory.

2.3.5 Laboratory Equipment Procurement: Essential equipment for the Zooprophylaxis Laboratory was procured and officially handed over to UOBS, establishing a dedicated facility for research and training on zoonotic disease prevention.

2.3.6 Training Needs Assessment & Capacity Building: A Training Needs Assessment (TNA) informed the design of targeted training. This included a two-day online session on parasitology (31 participants) and a pivotal four-day in-person training at UOBS in September 2025. The hands-on program for 55 participants (32 female) from UOBS, livestock services, and national parks covered the One Health approach, field sampling techniques (faecal, blood), and laboratory diagnostics (e.g., coprology). In total, 86 participants (46 female, 54%) were trained in 2025.

2.3.7 Field Sampling & Laboratory Work: The September training included practical field visits to farms in Skardu and Shigar, where participants collected faecal and blood samples. Subsequent lab analysis using techniques like flotation and the McMaster method identified parasites (e.g., gastrointestinal nematodes, Fasciola hepatica), providing hands-on experience in disease surveillance and diagnostics.

EvK2CNR Projects

Water 4 Development

Activity 2.4: Promoting and supporting the use of laboratory services for male and female farmers

2.4.1 Development of Awareness Materials: Informational leaflets and brochures were created to educate farmers in Gilgit-Baltistan on best practices for livestock management. Key topics included breed selection for higher milk yield, balanced nutrition, timely vaccination, regular deworming, and proper housing and water management to improve overall animal health and productivity.

2.4.3 Media Campaigns: A targeted media campaign was launched to promote the services of the newly established Phytopathology, Zooprophylaxis, and Water Quality Laboratories. Using social and print media, the campaign raised awareness among farmers about plant pathogens, zoonotic diseases, and water contaminants. The goal was to ensure farmers know about and can access these vital diagnostic services, directly linking scientific research to practical, on-farm applications. Campaign examples were shared on official social media platforms.



Activity 2.5: Support for the Extension Services of the Department of Agriculture GB in disseminating laboratory analysis results and promoting services among local farmers



The collaboration with extension services was initiated to translate the diagnostic results from the new laboratories into practical benefits for farmers. In September 2025, consultative meetings with the Agriculture Extension and Livestock Development departments identified communication gaps, leading to the creation of a Memorandum of Understanding (MoU). This partnership facilitates the dissemination of laboratory results to the farming community, enabling timely interventions and promoting sustainable agricultural practices.

3 OUTCOME

Criteria and best practices for sustainable tourism value chain management are introduced and adopted at the local level

Activity 3.1: Technical assistance for the GB Dept. of Tourism's adoption of criteria and best practices for sustainable management of the tourism sector

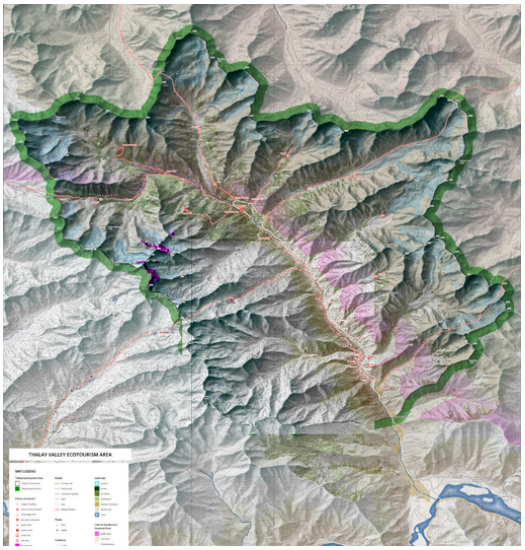
3.1.4 Criteria and Best Practices Report: The activity analyzed adventure tourism trends and developed a framework for sustainable management. It identified key tourist segments and international trends, including the growth of experiential travel. Best practices for sustainability were outlined, emphasizing integrated planning, ensuring community benefits, promoting cultural heritage, and minimizing environmental impact. Recommendations included adopting frameworks like GSTC criteria and ISO 21401 certification to guide ecotourism development, particularly in the Thalley Valley.

3.1.5 Stakeholder Engagement: A series of meetings were held throughout the year with the Tourism Department GB, EPA, UNDP, and local communities. Key outcomes included strong community support in Thalley Valley, with locals offering land for a model guest house. Collaboration focused on creating a tourism workforce database, planning sustainable infrastructure, and advancing high-altitude guide training towards international accreditation.

3.1.7 Planning and Preparations: Following community consultations, the site for the Model Guest House was confirmed in Thalley Valley. The University of Baltistan's Department of Tourism and Hospitality Management (DoTHM) led comprehensive environmental, social, and economic assessments for the project. Preparations also included organizing events for World Tourism Day.

3.1.8 Ecotourism Training Workshop: A two-day workshop at the University of Baltistan in October 2025 brought together faculty, students, community members, and government stakeholders. The training focused on sustainable destination planning, waste management, community engagement, and digital marketing, equipping participants with practical tools to promote a regenerative tourism model that benefits local communities and preserves the region's natural and cultural heritage.





EvK2CNR Projects

Water 4 Development

Activity 3.3 Establishment/rehabilitation/improvement of ecotourism facilities/services in GB

3.3.1 & 3.3.2 Site Survey and Feasibility Study: A comprehensive survey identified Thalley Valley, accessible from the Skardu-Khaplu road, as a high-potential ecotourism destination. The study focused on enhancing the existing Dunsa community campsite into a multi-purpose ecotourism facility. The proposed model includes upgrading accommodation (8 rooms + 20 tent spaces), building an interpretive center, and integrating sustainable systems (solar energy, waste management) using local materials and designs.

3.3.5 Stakeholder Consultation: Multiple meetings with the Thalley community secured strong local support. The community confirmed the availability of communal land for the facility and agreed to the proposed sustainable development plan.

3.3.6 Final Design and Specifications: Detailed designs were developed for the Dunsa facility, emphasizing seismic resilience, traditional architecture, and eco-friendly features. Plans include photovoltaic panels, rainwater harvesting, efficient waste management, and landscape integration to minimize environmental impact.

3.3.8 & 3.3.9 Trail Mapping and GIS: Several historical and new hiking trails were identified and mapped, including the Chinkang La and Thalay La routes, to diversify trekking options. GIS mapping of trails, settlements, and land use supports tourism promotion and sustainable land management.

3.3.10 Tourism Facility Assessment: Surveys of key tourism points identified improvement needs: upgrading the CKNP Biodiversity Lab, revitalizing the underused Hussainabad Broq guesthouse through a community-hotel partnership, and enhancing the Chillum Display Centre in Deosai National Park into a functional wildlife information center. These upgrades aim to enrich the visitor experience and strengthen conservation outreach.





Activity 3.4: Information and outreach to mountain village communities (gender inclusive) to provide accommodation and tourism services in line with the sustainable tourism criteria developed during the project

3.4.2 Ecotourism Conference: EvK2CNR and UoBS organized the conference "Transforming Tourism: Ecotourism, Sustainability, and Community-Led Development" in Skardu. The event brought together government officials, community members, academia, and NGOs. Key discussions focused on sustainable tourism trends, the conservation role of protected areas (CKNP, Deosai), and community mobilization. A central vision was presented for developing Thalley Valley as a model ecotourism destination that empowers local communities and preserves cultural and natural heritage.

3.4.3 Economic Empowerment of Women: A concept was developed to leverage the growing tourism sector to create formal economic opportunities for women in Thalley Valley. The plan, set for implementation in 2026, aims to link women-led agribusinesses and handicraft producers directly to tourism value chains. It proposes providing selected women entrepreneurs with training in business skills, product value addition, marketing, and customer service, along with financial support and market linkages to local guesthouses. This initiative seeks to ensure tourism growth directly benefits local women, reduces economic leakage, and fosters sustainable community development.





Activity 3.5: Training activities of local operators in the ecotourism value chain for men and women. At least two courses dedicated to sustainable tourist facilities/services management are planned

3.5.1 Preparation of Training Manuals: Comprehensive manuals for mountaineering and adventure training were drafted. They cover critical topics including high-altitude medicine (managing hypoxia, HAPE, HACE), physical preparation, rescue techniques, hygiene, and the use of satellite communication devices (Garmin inReach, Thuraya). These materials establish essential safety protocols and best practices for high-altitude activities**.**

3.5.2 Training Courses for Tourism Service Providers: In collaboration with KIU and the Tourism Department GB, specialized training sessions were held for professional guides, porters, cooks, and hospitality staff. The curriculum focused on sustainable tourism practices, local culture and environmental preservation, tourism laws, communication skills, and business development. The program concluded with evaluations and a certification ceremony, recognizing the participants' enhanced skills. This initiative is a key step in professionalizing the local tourism workforce to responsibly manage the region's growing visitor numbers.

4 Local authorities and communities' capacities to implement policies and practices for sustainable management of mountain ecosystems are strengthened

OUTCOME

Activity 4.1: Gender-inclusive training and capacity building of government officials on policies and best practices for sustainable management of mountain areas

4.1.1 Training on Sustainable Practices: In December 2025, a two-day training session in Islamabad was held for government officials from various Gilgit-Baltistan departments (Water, Disaster Management, EPA, Agriculture, Tourism). The training focused on sustainable development policies, monitoring & evaluation (M&E), integrated water resource management, and climate-smart agriculture. The goal was to enhance technical and policy capacities for climate resilience and sustainable planning in the region.





CONCLUSION

Lessons Learned from 2025 Activities

- **Community Engagement:** Successful projects, like in Thalley Valley, depend on transparent planning, local buy-in, and clear benefit-sharing. Supportive communities are key.
- **Gender Balance:** Promoting inclusive training led to 37.8% female participation across programs.
- **One Health Approach:** The integrated approach linking human, animal, and environmental health proved effective for zoonotic disease management.
- **Infrastructure & Maintenance:** Consistent stakeholder communication is crucial for facilities. Reliable climate data depends on assigning clear local responsibility for regular AWS maintenance.
- **Capacity Building:** Technical training in GIS, plant pathology, water quality, and ecotourism is fundamental for long-term success.

Way Forward for 2026

- **Infrastructure:** Initiate construction of the Thalley Valley ecotourism guesthouse.
- **Field Missions:** Conduct glaciological research in the Spantik/Arandu region and hands-on training missions for the newly established laboratories.
- **Monitoring:** Strengthen AWS maintenance with local institutional responsibility and quarterly visits.
- **Capacity Building:** Continue advanced technical training across all project areas (phytopathology, GIS, water quality, zooprophylaxis).
- **Systems:** Extend disease surveillance systems for livestock and wildlife and focus on implementing climate-smart strategies.

EvK2CNR Projects

High Altitude Guides Course

Mission

The "High Altitude Guides Course" is a professional training initiative launched to elevate the standards of mountain tourism in Gilgit-Baltistan, Pakistan. Promoted and funded by the Gilgit-Baltistan Tourism Department and coordinated by EvK2CNR, this two-year advanced training course (2023-2025) aims to develop a new generation of highly skilled, internationally recognized high-altitude guides. The ultimate goal is to provide top-tier services to expeditions and trekking groups, fostering sustainable and high-quality mountain tourism in a region of unparalleled mountaineering heritage.

Context & Rationale

Gilgit-Baltistan, with its iconic peaks like K2 and Nanga Parbat, offers breathtaking landscapes and vast protected areas. However, the professional skills of local staff, such as trekking guides and high-altitude porters, do not meet international standards or market demand, especially compared to nearby Himalayan regions. To bridge this gap and meet the needs of expeditions, the GB government has launched a project to professionalize key roles and integrate Pakistan into the global mountain guiding network.



Implementation & Strategy

EvK2CNR, having won the competitive tender, implemented a rigorous programme based on international benchmarks:

Selection: 35 Pakistani nationals under 35 years of age with proven mountaineering experience were admitted.

Standard & Instruction: The course is structured to meet international alpine guiding platforms, delivered by certified International Alpine Guides.

Curriculum: The training addresses critical knowledge and skill gaps through specific modules:



- Professional Attitude & Communication: Fostering the guide–client relationship and establishing English as the basic language for communication.
- Technical Mountaineering Skills: Enhancing skills in climbing, glacier travel, rope techniques, orientation, emergency handling, first aid, and high-altitude health.
- Equipment & Environment Expertise: Developing proficiency in using specialized gear and instilling knowledge for protecting the mountain environment, including waste management and ecology.
- Policy & Heritage Knowledge: Building a strong understanding of local tourism policy, Pakistan's mountain geography, climbing history, and cultural heritage.

Strategic Framework for Professionalization

To ensure long-term impact and systemic change, a dedicated working group has established a comprehensive forward strategy:

- Standardization of training programs.
- Partnerships with International Alpine Guide Associations (e.g., UIAGM).
- Development of specialized training modules.
- Creation of a certification system for High Altitude Porters (HAPs).
- Establishment of a monitoring and evaluation system.
- Building a sustainable business model for the guiding community.
- Promotion of Pakistani guides on international platforms.
- Integration of environmental awareness and ethical tourism practices.

EvK2CNR Projects

High Altitude Porters Course



Expected Outcomes

Upon completion, the project is designed to achieve the following transformative outcomes:

- A new professional class of Pakistani high-altitude guides, trained to the highest international safety, technical, and service standards.
- Enhanced quality and reputation of Pakistan's mountain tourism sector, making it more competitive and attractive for international expeditions.
- Formal steps towards international recognition for Pakistani guides, facilitating their integration into the global UIAGM network.
- A strong strategic foundation for the ongoing professionalization of the entire local mountaineering community.
- Strengthened local economy through the creation of skilled, sustainable employment opportunities within the tourism value chain.




EvK2CNR

EvK2CNR Projects

SPANTIK Lab Project : Mountain Laboratory for Climate Research

SPANTIK Lab

Mountain Laboratory for Climate Research

Context & Rationale

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Executive Summary

In July 2025, EvK2CNR successfully coordinated the multidisciplinary SPANTIK Lab expedition to the Arandu Valley and the Spantik Glacier in the Karakorum, Pakistan. The goal was to understand glacier dynamics and atmospheric processes in a sensitive mountainous region. The use of advanced monitoring technologies provided a useful dataset for improving remote sensing analyses and melt models. The expedition highlighted EvK2CNR's commitment to international scientific collaboration and capacity building with Pakistani institutions, including the Karakorum International University and the Global Change Impact Studies Centre.



SPANTIK Lab Expedition: Advancing High-Altitude Cryosphere and Environmental Research in the Karakorum



Expedition Team

- Maurizio Gallo (EvK2CNR)
- Francesca Da Polenza (EvK2CNR)
- Davide Fugazza, Cecilia Almagione, Anees Ahmad (University of Milan)
- Gianpietro Verza (EvK2CNR)
- Luca Di Liberto (CNR)
- Jacopo Gabrieli, Paolo Conz, Nicolas Guyennon (CNR)
- 2 Karakorum International University Professors
- Qurat-ul-Ain Ahmad (GCISC/MOCC)

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Scientific Activities and Methodologies

The field campaign integrated glaciological, meteorological, and environmental monitoring to characterize the Spantik Glacier system comprehensively.

EvK2CNR Projects

SPANTIK Lab Project : Mountain Laboratory for Climate Research

Logistics

The field team comprised researchers from EvK2CNR, the National Research Council of Italy (CNR), the University of Milan, and Pakistani partner institutions. Following coordination in Islamabad and Skardu with the EvK2CNR Pakistan office, the team mobilized equipment–including solar power systems, autonomous weather stations (AWS), and drones–to the base of operations. A critical logistical engagement with the Arandu community council secured local support and permissions, ensuring the project's alignment with community interests and UNDP guidelines.



1 Glaciological Investigations

Mass Balance: Multiple ablation stakes were installed on the glacier tongue and remeasured after a 9–10 day interval to quantify surface melt rates.

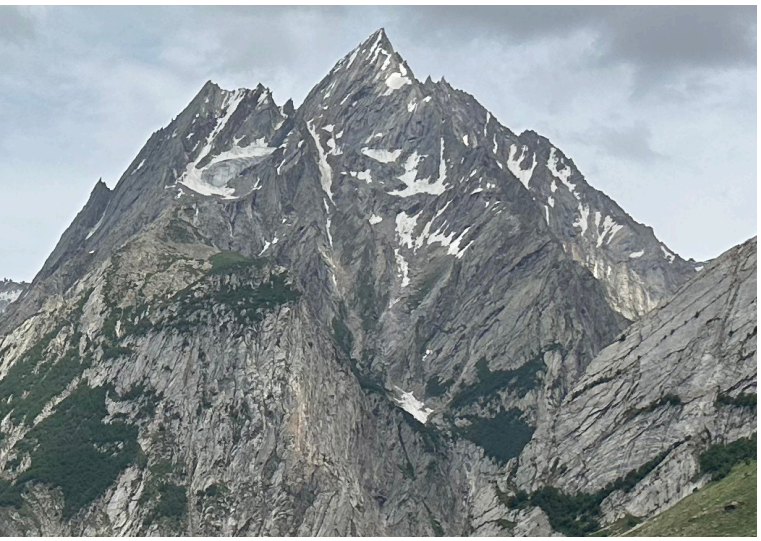
Geophysical & Geodetic Surveys: Unmanned Aerial Vehicle (UAV) flights equipped with optical and thermal cameras were conducted over the glacier terminus and central ablation zone. These surveys enabled high-resolution photogrammetric mapping, cross-sectional analysis, and thermal profiling. The data are pivotal for deriving digital elevation models (DEMs), assessing ice thickness variations (supporting GPR validation), and analyzing glacier dynamics.



2 Meteorological and Hydrological Monitoring Network

A tiered network of automatic weather stations (AWS) was installed along an altitudinal transect:

- **Arandu Village Site:** A full AWS measuring temperature, humidity, pressure, wind speed/direction, solar radiation, and precipitation.
- **Intermediate Camp** (Lateral Moraine): An AWS with sensors for temperature, humidity, pressure, solar radiation, wind, rain, snow level, and soil temperatures at 5 cm and 25 cm depth; an additional compact station on the glacier.
- **Base Camp** (Glacier Surface): A compact station recording key surface energy balance parameters.
- **Hydrometric Station:** A radar-based water level sensor and a conductivity/temperature probe were installed on the Arandu bridge, for continuous discharge estimation and hydrochemical tracing of meltwater origins, essential for understanding basin-scale hydrology.



3 Advanced Atmospheric & Environmental Research

A significant achievement was the deployment and testing of innovative systems for high-altitude environmental monitoring:

- **ARES (Autonomous Remote Environmental Station):** This sophisticated station, powered by a bifacial photovoltaic system with lithium iron phosphate (LiFePO4) battery backup, was installed for long-term, autonomous operation. Its instrumentation suite includes:
  - A dual-channel UV spectrometer for ozone (O_3) measurement (resolution: 0.5 ppb).
  - A microAethalometer (model MA350) for Black Carbon (BC) concentration (range: 0–1,000 µg/m^3).
  - An EPA-compliant laser scattering sensor for Particulate Matter (PM_1, $PM_{2.5}$, PM_{10}).
  - A non-dispersive infrared (NDIR) sensor with thermal correction for carbon dioxide (CO_2) (accuracy: ±1 ppm).

- **IHEMS (Indoor Health and Environment Monitoring System):** This integrated system was tested for simultaneous monitoring of ambient pollution (PM, BC, CO_2) and physiological parameters of researchers (via wearable devices measuring SpO_2, ECG-derived HRV, respiration rate, and skin temperature), assessing the human-environment interaction in extreme conditions.

EvK2CNR Projects

SPANTIK Lab Project : Mountain Laboratory for Climate Research





Preliminary Outcomes

All deployed systems were successfully installed, tested, and confirmed operational. Initial data retrieval from existing stations validated system integrity. The collected multidisciplinary dataset is fundamental for:

- Cryosphere Science: Calibrating and validating glacier melt models and satellite-derived products to accurately quantify the Spantik Glacier's mass and area changes.
- Climate and Atmospheric Physics: Investigating long-range pollutant transport to high altitudes, studying aerosol-cloud-precipitation interactions, and quantifying the direct radiative forcing of Black Carbon on glacier albedo and ablation.
- Hydrology: Establishing a baseline for understanding current and future water resource availability from glacierized catchments.

Conclusion

The SPANTIK Lab expedition marks a significant step in establishing a long-term, integrated observatory in Karakorum. It exemplifies EvK2CNR's model of conducting cutting-edge, technology-driven research while strengthening international partnerships and contributing to the global knowledge base on climate change impacts in high-mountain Asia. The data acquired will be processed and analyzed throughout 2025-2026, forming the basis for peer-reviewed publications and informed climate adaptation strategies.


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MONCLER

EvK2CNR Projects

Assessment of Indoor Air Pollution and Respiratory Health in the Thalay Valley

Introduction & Scientific Background

Air pollution, a complex mixture of hazardous substances originating from anthropogenic and natural sources, constitutes the foremost global environmental health risk and a leading cause of premature mortality and disease. While outdoor pollution sources in remote mountainous regions are often limited to activities such as agricultural residue burning, indoor air pollution (IAP) represents a critical and growing public health concern, particularly in developing nations. IAP arises from the indoor combustion of solid fuels for cooking and heating, releasing harmful pollutants including fine particulate matter (PM) and carbon monoxide (CO). Scientific evidence robustly links both acute and chronic exposure to air pollutants with a broad spectrum of pathologies, primarily respiratory and cardiovascular diseases, and cancers. Recent World Health Organization (WHO) assessments further correlate exposure with adverse outcomes such as type 2 diabetes, neurodegenerative disorders, and systemic inflammation.





Objectives and Methodology

In July 2025, EvK2CNR conducted a preliminary study in six villages of the Thalay Valley to examine IAP exposure and its correlation with respiratory health. Under the guidance of Prof. Annalisa Cogo and Dr. Guia Tagliapietra, 92 subjects (age: 12–84 years) were enrolled.

The method integrated environmental and clinical assessments:

- Health Evaluation :Respiratory function tests and questionnaires on respiratory symptoms and comorbidities.
- Environmental Assessment Measurement of room dimensions and calculation of a ventilation index based on doors and windows; documentation of fuel types and stove use.
- Pollutant Monitoring: Measurement of indoor CO concentrations in three conditions: near the fire source, in the dining room, and in the bedroom.

Logistics

The field team comprised researchers from EvK2CNR, the National Research Council of Italy (CNR), the University of Milan, and Pakistani partner institutions. Following coordination in Islamabad and Skardu with the EvK2CNR Pakistan office, the team mobilized equipment – including solar power systems, autonomous weather stations (AWS), and drones – to the base of operations. A critical logistical engagement with the Arandu community council secured local support and permissions, ensuring the project's alignment with community interests and UNDP guidelines.

EvK2CNR 2025 Events

Meeting, Conference, Side Event, Press Conference

EvK2CNR Side Event "Enhancing Glacier Knowledge to Improve Water Resource Assessment"

Official Launch International Year of Glaciers' Preservation

January 21, Geneva – WMO Headquarters

An high-level launch event organised by UNESCO and the WMO aimed to raise worldwide awareness, stimulate action, and attract funding for the preservation of glaciers.

Asian Development Bank (ADB) and EvK2CNR Meeting

January 22, Islamabad – ADB Headquarters

A delegation from the EvK2CNRAssociation, including President Agostino Da Polenza, a group of field researchers and technicians, and Pakistani staff, met with the ADB Pakistan Country Director, Emma Fan, and her staff.

World Glacier Day and World Water Day Events:

March 21–22, Milan and Rome

- European Glacier Governance Manifesto Signing & Workshop (University of Milan)
- MiResearcher Davide Fugazza delivered a keynote speech on "The Importance of Glaciers and Research on the Third Pole" at the WMO/Aeronautica Militare symposium "Closing the Early Warning Gap Together", showcasing work in the Karakorum and the Water for Development and Spantik Lab projects.
- At the Accademia dei Lincei conference, Guglielmina Diolaiuti and Jacopo Gabrieli presented flagship research projects like Ice Memory and Glaciers & Students.



Awarding of the Tamgha-e-Pakistan honor to Agostino Da Polenza

March 23, Islamabad

On March 23, Agostino Da Polenza, President of the EvK2CNR Association, was awarded the "Tamgha-e-Pakistan," the highest civilian honor of the country, by the President of the Islamic Republic of Pakistan, Zardari. The ceremony was also attended by the Italian Ambassador, H.E. Marilina Armellin. This recognition represents a tribute to EvK2CNR's decades of commitment in scientific research, environmental conservation, and sustainable development in the mountainous regions of northern Pakistan. It further strengthens the ties between the two countries.



Milan Design Week 2025: EvK2CNR showcased its innovative design connection through two main stories:

April 9, Milan

- The Miamina Armchair, originally designed in the 1980s, was highlighted for its legacy, including an ultra-light version used in the EvK2CNR Pyramid Lab on Everest in 1990, demonstrating design's adaptability to extreme environments.
- Engineer Maurizio Gallo received the "Gran Becca d'Oro" lifetime achievement award, alongside the late Gioachino Gobbi, recognizing their past collaboration in designing the Twin Gate carabiner, blending high-mountain exploration with innovative design.

The ADB (Asian Development Bank) invited EvK2CNR to organize a thematic exhibition during its annual meeting

May 4–8, Milan – Allianz MiCo Centre

In collaboration with the University of Milan, the exhibition, composed of seven panels, illustrated the crucial role of mountains in maintaining global environmental balance.

EvK2CNR 2025 Events

Meeting, Conference, Side Event, Press Conference

EvK2CNR Association Scientific Council Meeting

May 5, Bergamo – EvK2CNR Headquarters

During the inaugural meeting of the Scientific Council, was presented an ovrviewof completed, ongoing, and future projects, including SEED, G&S, W4D, Spantik Lab, and Air 4 Development, which focus on glaciers, water resources, air quality, and sustainable development in Pakistan. The revitalisation of the Pyramid Laboratory in Nepal was also discussed. During the meeting, the importance of producing high-quality scientific data was highlighted as a key element for the Association's activities.

79th Executive Council of the World Meteorological Organization (WMO) Side Event "The Cryosphere of the 'Third Pole'"

June 17, Geneva – WMO Headquarters

The presentations highlighted key contributions from EvK2CNR's network and collaborators:

- Cutting-edge Infrastructure: The Pyramid GAW station provides vital atmospheric data; new projects like the Spantik Lab will autonomously monitor the Chogo Lungma glacier. The Ice Memory project will also archive ice cores from the Third Pole.
- Long-term Scientific Legacy: Over 30 years of glaciological observations in the Himalayas and Karakorum offer an essential dataset for understanding glacier dynamics.
- From Data to Action: Research addresses the ethical implications of climate change, exploring how scientific evidence can promote ethical awareness and stimulate collective actions against glacial hazards.

EvK2CNR at the Living Planet Symposium 2025: New Technologies and AI for Studying Pakistani Glaciers

June 24, Wien

The Living Planet Symposium 2025 (LPS25), one of the most significant international events organized by the European Space Agency (ESA) dedicated to Earth observation and its applications in combating the climate crisis, is currently underway in Vienna. Among the key participants, EvK2CNR collaborators presented innovative studies on Pakistan's glaciers and the evolution of the snow cover in High Mountain Asia, confirming the Association's active role in glaciological research.



EvK2CNR at the International Mountain Conference

September 14–18, Innsbruck

The International Mountain Conference (IMC) 2025, is a global meeting point for the scientific community dedicated to mountain ecosystems. EvK2CNR Association was represented by three researchers from the University of Milan (UNIMI), ready to present some of the results from the "Water for Development (W4D)" project, funded by MAECI through AICS.

Dr. Davide Fugazza (UNIMI-EvK2CNR) responsible for chairing the Focus Session "Remote sensing to capture the dynamics of mountain cryosphere." Blanka Barbagallo, a UNIMI PhD student, gave an oral presentation titled "Integrating remote sensing and ground-based observations for glacier melt modeling in remote high-altitude regions." Cecilia Delia Almagioni, also a UNIMI PhD student, presented a poster titled "Snow cover variability and trends over Karakorum, Western Himalaya and Kunlun Mountains: Insights from MODIS (2001–2024) and Reanalysis Data."

EvK2CNR 2025 Events

Meeting, Conference, Side Event, Press Conference

Maurizio Gallo receives the “Ambassador of Pakistan Achievement Award” for his dedication in the fields of climate change and disaster management in Pakistan

October 14, Rome – Pakistani Embassy

The head of EvK2CNR activities in Pakistan, Maurizio Gallo, was awarded the prestigious “Ambassador of Pakistan Achievement Award” by the Pakistani ambassador in Rome, HE Ali Javed and by Advisor to the Prime Minister , Dr. Syed Tauqir Hussain Shah. This esteemed recognition highlights Gallo’s outstanding commitment and the achievements of EvK2CNR in promoting environmental protection, sustainable management of protected areas, and training professionals in the alpine sector within Pakistan.



Two-day Workshop and a conference on Ecoturism in Pakistan

October 15-17, Pakistan, Skardu

The two-day Workshops and the conference focused on "Transforming Tourism: Ecotourism, Sustainability, and Community-Driven Development," were co-organized by EvK2CNR, the University of Baltistan Skardu, the Italian Agency for Development Cooperation (AICS), the GB Parks and Wildlife Department, and the UNDP. The workshop and conference aim to enhance skills in sustainable destination development and promote responsible ecotourism practices within the Gilgit-Baltistan region.

12th International Conference of the Italian Remote Sensing Association

October 12-14, Milan

EvK2CNR presented different projects, including a digital model of the Chogo Lungma glacier and research on long-term glacier albedo variations in Pakistan.


EvK2CNR

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EvK2CNR Collaborators

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Vittore Verratti SHARE – Università di Chieti
Sandro Lovari SHARE – Università di Siena
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Luca Pelliccioli W4D – UniMI

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Jacopo Melada W4D
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Cecilia Delia Almagioni W4D
Michele Di Biase W4D

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Maria Teresa Melis W4D – Breathing Karakorum SHARE
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- Università degli Studi di Cagliari
- Università degli Studi "G. d'Annunzio" Chieti – Pescara
- Università Ca' Foscari Venezia
- UNIVPM – Università Politecnica delle Marche
- Politecnico di Milano
- Università degli Studi di Trieste
- CNR-ISP
- CNR-ISAC
- Université Grenoble Alpes
- CNES – Centre national d'études spatiales

National, International and supranational Institutions:

- Ministero degli Affari Esteri e della Cooperazione Internazionale
- Agenzia italiana per la cooperazione allo sviluppo
- United Nations Development Programme (UNDP)
- UN Environment Programme (UNEP)
- FAO – Mountain Partnership
- World Meteorological Organization (WMO)
- ICIMOD – International Centre for Integrated Mountain Devlopment

Pakistani and Nepali Institutions, Universities and Pakistani Organizations

Ministry of Climate Change and Environmental Coordination (Pakistan)
Pakistan Meteorological Department
Government Of Gilgit Baltistan
Gilgit-Baltistan – Environmental Protection Agency
Karakorum International University Gilgit-Baltistan (KIU)
University of Baltistan
Nepal Academy of Science and Technology (NAST)
Tribhuvan University, Kathmandu

Others:

Regione Sardegna
Aeronautica Militare
Club Alpino Italiano – CAI
Proambiente
Moncler


EvK2CNR

We thank you for your continued support in our efforts to contribute to the mountains' health !

EvK2CNR

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