Muhammad Ubaid Khan

GIS Analyst & Remote Sensing Researcher · Rawalpindi, Pakistan
mubaidk8@gmail.com · (+92) 306-9834923 · LinkedIn · GitHub · Geosphere Consultants

PROFESSIONAL SUMMARY

GIS Analyst and Remote Sensing Researcher specializing in glacial lake outburst flood (GLOF) risk, permafrost degradation and SAR/InSAR deformation monitoring in the Hindu Kush–Karakoram–Himalaya. Completed the Pakistan Meteorological Department GLOF-II internship, is first author of a GLOF susceptibility, hazard and risk manuscript, and co-authored a permafrost InSAR paper targeting Remote Sensing (MDPI). Founded and leads Geosphere Consultants, with 10+ independent geospatial projects delivered. Works across Google Earth Engine, Python, ArcGIS Pro, QGIS and MintPy, from satellite data processing and machine-learning classification to AHP-based hazard modelling and publication-quality cartography.

PROFESSIONAL EXPERIENCE

Pakistan Meteorological Department (PMD) | *GIS / Remote Sensing Intern* *Islamabad, PK · Jun 2025 – Aug 2025*

- Selected for a 3-month internship on the GLOF-II national disaster risk reduction programme; received the official PMD completion certificate.
- Modelled flood susceptibility and updated glacial lake inventories using multi-criteria evaluation, AHP weighting and hydrological terrain analysis on Sentinel-1/2 data.
- Delineated hazard zones by integrating InSAR deformation trends with GLOF, landslide and seismic risk layers, with outputs integrated into national DRR frameworks.
- Processed multi-source satellite data for precipitation anomaly detection and extreme-weather mapping in support of early warning.

Geosphere Consultants | *Founder & Freelance GIS Analyst* *Rawalpindi, PK · 2022 – Present*

- Founded and lead an independent consultancy delivering remote sensing, InSAR, LULC, DEM, hazard susceptibility and custom Google Earth Engine solutions for academic and institutional clients.
- Deliver 10+ projects spanning LULC change detection (2000–2024), crop monitoring, biomass estimation, glacier and water-security assessment, and cadastral mapping.
- Publish interactive flood susceptibility and GLOF risk dashboards (Python: Folium, Plotly, Dash; GEE Apps) on GitHub and LinkedIn.

National Disaster Management Authority (NDMA) | *GIS / Remote Sensing Intern* *Pakistan · 2024*

- Supported disaster risk assessment through satellite-based geospatial analysis and GIS mapping.

Land Administration Projects | *Cadastral Mapping Specialist* *Pakistan · 2023 – 2024*

- Executed RTK-GNSS cadastral surveys and GIS digitisation to produce legally accurate parcel maps linked to land record databases.
- Applied RTK-GIS field methods for spatial data collection and ground-truth validation across multiple cadastral projects.

RESEARCH & PUBLICATIONS

Regional-to-Site-Scale Sentinel-2 Assessment of GLOF Susceptibility, Hazard, Exposure, Vulnerability and Risk in Northern Pakistan (2017–2025)

First author · Manuscript in preparation for submission · 2026

- Compiled a 2,756-lake glacial lake inventory by fusing Sentinel-2 water extraction with the PMD GLOF-II inventory, benchmarked against PMD 2024 data (IoU, Cohen's κ).
- Built an AHP susceptibility model (consistency ratio 0.034) and ran H-E-V-R assessment at three priority sites using breach-discharge modelling and discharge-scaled HAND corridors.
- Demonstrated that susceptibility differs from risk: Attabad (3,343 persons exposed) was the only High-risk site; Bashqar Gol (~16,000 m^3/s peak) was Moderate with 38 exposed.

Spatiotemporal Permafrost Degradation & Ground Surface Deformation via Multi-Temporal InSAR

In press · 2024 – 2025 · Target: Remote Sensing (MDPI) · 3 Canadian co-authors · Supervisor: Dr. Shoaib Rashid Saleem

- Built a Permafrost Probability Index in GEE (MODIS, ERA5-Land, SRTM; AHP weights LST 30%, elevation 25%, ERA5 20%, snow 15%, aspect/slope 5% each): Sporadic 41.3%, Discontinuous 52.8%, Continuous 0.9% across Hunza-Nagar.
- Processed 285 Sentinel-1 pairs by SBAS-InSAR (ASF HyP3 GAMMA, MintPy v1.6.2), obtaining LOS velocities of −41.35 to +96.16 mm/yr.
- Quantified temperature–deformation coupling (Spearman r = 0.310) and annual displacement trend (R^2 = 0.587); linked results to GLOF, landslide and seismic layers.

Cotton Crop Classification in Punjab & Sindh (1985–2025) Using Landsat Time Series and Multi-Feature Machine Learning

Manuscript in preparation · 2026

- Five-year-benchmark cotton mapping with RF, SVM, XGBoost, CART and MLP classifiers, with NDVI/EVI/NDWI phenology and environmental-driver analysis.

Spatiotemporal Analysis of Smog–Precipitation Interaction in Lahore, Pakistan (Winter 2023–24)

Manuscript in preparation · 2024 – 2025 · Independent research

- Quantified a 36.2% winter rainfall deficit with mean PM2.5 of 115 µg/m^3 and an NO_2–rainfall Spearman r = −0.879 (MODIS MAIAC, Sentinel-5P, CHIRPS, ERA5-Land).

All manuscripts are available upon request.

RESEARCH & CONSULTING PROJECTS

Flash Flood Impact Assessment on Orchard Farms, Pishin District, Balochistan *2025 · Completed*

- Mapped 25 years of flood frequency from 1,032 Landsat and 267 Sentinel-1 scenes, identifying 675.4 km^2 of high-vulnerability hotspots.
- Classified orchards with Random Forest (OA 89.0%, κ 0.872) and SVM (OA 86.4%); AHP index of 8 parameters placed 68.1% of peanut farmland at High–Very High risk.
- Trained RF, XGBoost and neural-network models (R^2 0.9959, 0.9991, 0.9999), with HAND and TWI contributing 86% of importance.

Glacier Melt, Water Security and Climate Adaptation Pathways, Skardu, Gilgit-Baltistan *2026 · Ongoing*

- Measured a 5.34% glacier extent increase (2000–2024) and a 52% fall in glacial lake count; LSTM discharge model reached NSE 0.937 on held-out 2022–2024 data.
- Scored Skardu 76.6/100 on a Water Poverty Index and projected 4.4–6.0% discharge increases by the 2050s under CMIP6 SSP2-4.5 and SSP5-8.5.

Soil Erosion Susceptibility Mapping Using RUSLE and GIS, Khyber Pakhtunkhwa *2024 · Completed*

- Mapped decadal erosion risk (2015–2024) with all RUSLE factors (R, K, LS, C, P) derived from satellite rainfall, DEM, land cover and soil data.

Above-Ground Biomass & Carbon Stock Assessment, Malakand Division, KPK *2023 – 2024 · Completed*

- Predicted biomass and carbon stock dynamics from Sentinel-2 and Landsat using Random Forest and SVM in GEE.

Hydrothermal Alteration Mapping for Cu–Au Exploration, Gilgit District *2026 · Ongoing*

- Applying ASTER SWIR (Bands 4–9) band ratios and PCA with SRTM lineament extraction and GIS weighted overlay to map Cu–Au prospectivity across a 9,635 km^2 district.

Spatiotemporal Dynamics and Change Detection of Chickpea Cultivation, Thal Region, Punjab *2026 · Ongoing*

- Applying multi-temporal Landsat and Sentinel-2 classification and change detection to chickpea extent, related to rainfall and temperature drivers.

Additional Projects *2022 – 2024 · Completed*

- Rangeland carrying capacity (Upper Dir & Swat); wheat area monitoring (Chakwal vs. Gujranwala); LULC change detection and urban expansion mapping (2000–2024).

RESEARCH FOCUS

GLOF risk assessment · Glacier and glacial lake monitoring · Permafrost degradation · SAR/InSAR surface deformation · Glacio-hydrology and water security · Climate change in the HKH · Flood susceptibility, risk and vulnerability · Multi-hazard assessment · Agricultural monitoring and crop mapping

TECHNICAL SKILLS

GIS & Cartography: ArcGIS Pro, ArcMap, QGIS 3.x, ArcGIS Online, geodatabase design, spatial analysis, publication-quality cartography, scientific figure production

Remote Sensing & Image Analysis: Google Earth Engine (JavaScript and Python API), ENVI, SNAP, supervised and machine-learning classification, change detection, time-series analysis, spectral indices (NDVI, EVI, SAVI, NDWI/MNDWI, NDBI), ASTER SWIR band-ratio/PCA analysis, accuracy assessment (OA, Kappa)

SAR & Deformation Monitoring: Sentinel-1, ALOS PALSAR, SBAS-InSAR, DInSAR, ASF HyP3 GAMMA, MintPy

Hazard, Hydrology & Cryosphere: GLOF susceptibility and H-E-V-R assessment, glacial lake inventories, glacier and snow monitoring, permafrost modelling (PPI), flood susceptibility, terrain hydrology (HAND, TWI, flow accumulation), RUSLE erosion modelling, AHP multi-criteria evaluation

Climate & Atmospheric Data: ERA5-Land, CHIRPS, MODIS (LST, snow cover, MAIAC AOD), Sentinel-5P TROPOMI, CMIP6 scenario analysis, SRTM, MERIT Hydro

Programming & AI/ML: Python (NumPy, Pandas, Rasterio, GeoPandas, Matplotlib, Scikit-learn, XGBoost, Folium, Plotly, Dash), Google Colab, Random Forest, SVM, XGBoost, MLP, LSTM

Field Techniques: RTK GPS/GNSS surveying, ground-truth validation, field data collection

Reporting: Scientific manuscript and technical report writing, Microsoft Office, LaTeX (basic)

EDUCATION

BS in GIS & Remote Sensing | *IGEO, PMAS-Arid Agriculture University Rawalpindi* *2023 – 2027 (Expected)*

- **CGPA: 3.5/4.0** · **Supervisor: Dr. Muhammad Amin**

Intermediate (Pre-Engineering) | *Board of Intermediate & Secondary Education, Pakistan* *2020 – 2021 · 75%*

Matriculation (Biology / Science) | *Board of Secondary Education, Pakistan* *2019 – 2020 · 80%*

CERTIFICATIONS, TRAINING & AFFILIATIONS

- Pakistan Meteorological Department – Internship Completion Certificate, GLOF-II Project *2025*
- NDMA National Disaster Expo – Participation & Recognition Certificate *2025*
- AgriSAT Pak-China Project – Management Team Certification, Satellite Agricultural Monitoring *2025*
- IPAC, 2nd International Precision Agriculture Conference – Certificate of Participation *2025*
- Aridian Literacy Society – Active Member & Certified Volunteer, Management Team *2024 – Present*