Protecting the world's cultural heritage from geological and environmental threats

Engineering geology, rock mechanics, geohazard science and sustainable mitigation for UNESCO World Heritage properties, rock-cut monuments and historic towns — from rapid assessment to long-term conservation.

89	30	45	370+	15
heritage sites investigated	countries on four continents	years of field and research experience	scientific publications and books	international awards and honours

WHO WE ARE

PANGEA SAS is an Italian SME based in Viterbo that brings academic-grade geoscience to the protection of cultural heritage. We support governments, heritage agencies, UN organisations, NGOs, research institutes and private companies in understanding, monitoring and mitigating the natural threats — landslides, rockfall, erosion, floods, earthquakes and climate change — that endanger monuments and the communities around them.

The company is led by Prof. Claudio Margottini, whose four decades with ENEA, the Geological Survey of Italy (ISPRA), UNESCO and the University of Florence form the scientific core of PANGEA's practice.

WHY PANGEA

Science-led, decision-ready
Peer-reviewed methods translated into designs, priorities and budgets clients can act on.

Proven in difficult environments
Afghanistan, Syria, Iraq, North Korea, Ethiopia, the Andes and the Arabian desert.

Low-impact, sustainable mitigation
Minimal, reversible interventions that respect authenticity and landscape.

An unmatched institutional network
UNESCO Chair (Univ. of Florence), IAEG Italy, ICOMOS, International Consortium on Landslides.

CLIENTS & PARTNERS

UNESCO (Paris, Kabul, Amman, Beijing) · Royal Commission for AlUla (RCU) · French Agency for AlUla Development (AFALULA) · National Agency for Cultural Heritage Preservation of Georgia · European Commission · International Atomic Energy Agency · ICCROM · ICOMOS · Italian Ministries of Environment and of University & Research · City of Paris · EFS-Saudi EMCOR · THEOS · Municipalities of Bagnoregio and Riomaggiore · F I D I M Italia · Arriola & Fiol arquitectes

What we do

Six integrated service lines cover the full life cycle of a heritage site at risk — from the first field survey to the works on the ground and the monitoring that follows.

01

Geohazard & risk assessment

Landslide, rockfall, erosion, flash-flood and seismic hazard for monuments, rock-cut sites and historic towns; multi-risk ranking and condition assessments for site managers.

02

Engineering geology & rock mechanics

Geomechanical characterisation of weak rocks and soils, kinematic analysis and 2D/3D numerical modelling (FEM/FDM) of slopes, cliffs, caves, niches and foundations.

03

Monitoring & remote sensing

Satellite and ground-based radar interferometry, laser scanning and UAV photogrammetry, infrared thermography, tiltmeters and early-warning networks.

04

Mitigation design & urgent works

Low-impact consolidation — anchoring, interventions from the underground, drainage, ecosystem-based solutions — from concept and feasibility to supervision of emergency works.

05

Environment, climate & energy

Environmental and strategic impact assessment, climate-change adaptation, management of natural resources, geothermal and renewable energy.

06

Strategy, training & project management

Management plans, UNESCO nomination and Global Geopark dossiers, expert peer review, capacity building, international conferences and multimedia outreach.

Our approach: proactive geosciences

Aswan Declaration, 2019

1 · Understand
Geology, geomorphology, archives and the site's own history of instability.

2 · Measure
Field surveys, laboratory testing and non-invasive monitoring.

3 · Model
Numerical models and risk scenarios that rank priorities.

4 · Act
Minimal, reversible works drawing on traditional knowledge.

TYPICAL ENGAGEMENTS

- Condition assessment
- Rapid hazard assessment
- Feasibility & design
- Monitoring plans
- Expert evaluation of projects
- Management plans
- UNESCO & Geopark dossiers
- Training courses

Selected projects

Most recent engagements, 2019–2026

Year	Client	Project	Country
2026	UNESCO Kabul	Monitoring plan for the leaning Minaret of Jam (WHS)	Afghanistan
2026	Municipality of Riomaggiore	Expert evaluation of the "Via dell'Amore" conservation project (WHS)	Italy
2026	Arriola & Fiol arquitectes	Geological investigation for the rehabilitation of Testaccio, Rome	Italy
2025	FIDIM Italia	Sustainable rockfall mitigation, Bisentina Island (Lake Bolsena)	Italy
2023–24	RCU	Hegra Condition Assessment — conservation plan for the ancient settlement (WHS)	Saudi Arabia
2023–24	AFALULA / RCU	Khaybar rockfall risk and mitigation, AlQamus and AlNizar villages	Saudi Arabia
2023–24	AFALULA / RCU	Stabilisation design for a large rock block above a Nabataean well, Hegra	Saudi Arabia
2023–24	UNESCO	Geotechnical proposal for stabilising the Western Buddha Niche, Bamiyan	Afghanistan
2023	UNESCO	Water-infiltration conservation plan, Dambulla, Degaldoruwa, Galadadeniya	Sri Lanka
2022	EFS-Saudi EMCOR	Ashar Valley rockfall hazard, risk and sustainable mitigation	Saudi Arabia
2021–22	AFALULA / RCU	Rockfall investigation and mitigation, Dadan, Hegra and AlUla Old Town	Saudi Arabia
2021–22	THEOS	Hydrological and hydraulic study of Qurh, AlUla Oasis	Saudi Arabia
2020–21	AFALULA / RCU	Rapid hazard assessment; Khaybar UNESCO Global Geopark roadmap	Saudi Arabia
2019–23	NACHP Georgia	Survey, monitoring and urgent works: Vardzia, Vani Caves, Uplistsikhe, Sabereebi, David Gareja	Georgia

A GLOBAL PORTFOLIO OF HERITAGE SITES

Middle East & Arabia

Hegra, Dadan, AlUla, Khaybar (KSA) · Petra Siq (Jordan) · Maaloula (Syria) · Hatra (Iraq)

Central & South Asia

Bamiyan, Jam, Herat, Shahr-e-Zohak (Afghanistan) · Lumbini, Kathmandu Valley (Nepal) · Dambulla (Sri Lanka)

Caucasus & East Asia

Vardzia, Katskhi Pillar, David Gareja (Georgia) · Koguryo tombs (DPRK) · Seokguram (Korea) · Bayannuur (Mongolia)

Africa

Lalibela, Aksum obelisk (Ethiopia) · Hawara, Valley of the Kings (Egypt) · Antananarivo (Madagascar) · Drakensberg

Americas & Pacific

Machu Picchu (Peru) · Akapana, Tiwanaku (Bolivia) · Orongo and the Moai, Easter Island (Chile)

Europe & Italy

Civita di Bagnoregio, Pompeii, Norchia, Cinque Terre (Italy) · Alhambra (Spain) · Choirokoitia (Cyprus)

FLAGSHIP

Bamiyan, Afghanistan

UNESCO emergency consolidation of the Buddha niches after their 2001 destruction; commended by the President of Italy.

FLAGSHIP

Vardzia, Georgia

Hazard assessment, monitoring and conservation of the rock-cut monastery; Europa Nostra Award 2021.

FLAGSHIP

AlUla, Saudi Arabia

Five-year multi-site programme for RCU and AFALULA across Hegra, Dadan, Khaybar and the AlUla Oasis.

Prof. Claudio Margottini

Legal Representative and Scientific Director

Engineering geologist and Full Professor (National Scientific Qualification, 2017) with more than 45 years at the intersection of geoscience and cultural heritage. After directing divisions of earth sciences and extreme events at ENEA and serving as First Researcher at the Geological Survey of Italy (ISPRA), he led UNESCO interventions at Bamiyan, Jam, Lalibela, Aksum, Petra and the Koguryo tombs, and the Italian ground-radar monitoring of Machu Picchu.

From 2016 to 2020 he was Scientific and Technological Attaché at the Embassy of Italy in Cairo. He has advised the European Commission's Framework Programme, the Italian Ministry of Environment and the IAEA on seismic safety, and chaired the international panel that evaluated €700 million of research-infrastructure proposals for Italy's National Recovery Plan.

CURRENT ROLES

Co-founder, UNESCO Chair on Geo-Hydrological Hazards, University of Florence

President, IAEG Italian National Group (2023–2027)

Professor of Engineering Geology, Galala University (Egypt); Adjunct Professor, NRIAG

Associate, OGS — National Institute of Oceanography and Applied Geophysics

Chair of the Scientific Committee for the conservation of Civita di Bagnoregio cultural landscape

Member ICOMOS/IAEG/AGI/AIGAA/ISRM and Chamber of Geologists

RECOGNITION

2025	Honorary Citizenship of Bagnoregio	**2021**	Europa Nostra Award, Vardzia project	**2021**	Fukuoka Award, International Consortium on Landslides
2019	PROSE Award, Encyclopedia of Engineering Geology	**2010**	Commendation of the President of Italian Republic, Bamiyan	**2005**	Benemérito of Machu Picchu, INC Peru

SCIENTIFIC NETWORK

PANGEA experts works with a stable network of universities and agencies: University of Florence, ISPRA, OGS, Politecnico di Torino, University of Modena and Reggio Emilia, the International Consortium on Landslides (former Vice-President), ISSMGE TC301 and Blue Shield Italy. Editorial boards: *Landslides* (Springer), *Encyclopedia of Engineering Geology*.

SELECTED PUBLICATIONS

Sustainable Conservation of UNESCO and Other Heritage Sites Through Proactive Geosciences, Springer, 2023 (eds.)

After the Destruction of Giant Buddha Statues in Bamiyan, Springer, 2014 (ed.)

Weak rocks in the Mediterranean region: threats and mitigation for rock-cut heritage, *Engineering Geology*, 2022

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