

# NEREUS: Web-sessions: Education/training in the space sector: New trends/partnerships/opportunities

7th November 2022

Raffaella Brumana (GEOMATICS)

**POLIMI - GICARUS LAB ABC**

MULTI-SOURCE MULTI-SCALE GEOSPATIAL  
INFORMATION AND DATA INTEGRATION for the  
BUILT ENVIRONMENT UNDER THREATS&HAZARD  
IN THE EDUCATION & TRAINING

What are the challenges for education/training in the space sector?





# CONCEPT OF BUILT ENVIRONMENT WITHIN EDUCATIONAL CHALLENGES

**Built environment** is progressively intended in an extended meaning, as the result of the **integration** of **natural environment and resources together with anthropic artefacts and all the human traces stratified across the time, i.e.:**

- **anthropic-cultural-landscapes** and their **artefacts**
- historical and archaeological sites
- riverbed - anthropic basins
- urban areas

Such **complex context** need needs integrated approach of data acquisition, data processing, data management

- ❑ to understand **complex phenomena hazards and pressures at different scales as the climate change**
- ❑ to **guarantee material authenticity and unicity** saving of the stratified traces, as vehicle for the intangible values,
- ❑ to **improve the comprehension of transformation to support sustainable processes in the future being.**



## Networks & Platform

- ❖ **Copernicus Academy** (POLIMI, R. Brumana → Marco Gianinetto)
- ❖ **GEO** - Group on Earth Observations and the Sustainable Development Goals (POLIMI -PHD proposal)
- ❖ POLIMI is Lombardy Region- Associated Member of **NEREUS**
- ❖ **ECTP** platform (PB PPP - E2BA-ECTP)

## Funded Projects (among others)

- ❑ **VIGIE-2020/654** EU tender - "Study on standards, methodologies and guidelines for 3D digitisation of cultural heritage", [Shaping Europe's digital future](#) Shaping Europe's digital future Coordinator CUT (Cyprus)
- ❑ **ENERGIC OD 620400**, 2014-2017, European NEtwork for Redistributing Geospatial Information to user Communities - Open Data CIP-ICT-PSP-13-7Theme 2 - Digital content, OD creativity. Polimi PI R. Brumana, in charge for GEOPANAPP implementation, Multisource OD-GOD access&semantic profiling. **Awarded by the EC-ICT Radar Innovation.**
- ❑ **GE20** - 2012-2014, FP7-2011-NMP-ENV-ENERGY-ICT, GE20, "[Geo-clustering to deploy the potential of EEB across EU](#)" (Head: CSTB, R. Brumana Polimi) GA 285501
- ❑ **FORMAT-EO** ([FORmation of Multi-disciplinary Approaches to Training in Earth Observation](#)). Funded ERASMUS IP project (years 2013-14 12 days);
- ❑ **Partnered Research Training Initiative 'New Paradigm / New Tools'**, Canada **SSHRC** (Social Sciences and Humanities Research Council, Canadian Government, Polimi Scientific responsible and Executive Committee) 2016-2021





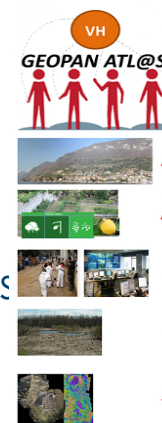
# ENERGIC OD - IT Virtual Data Hub (CNR-IIA) and GeoPan Atl@s APP development for Multi-temporal Hydrogeological and Seismic Risk Data Management on Built Environment and Landscape (POLIMI)



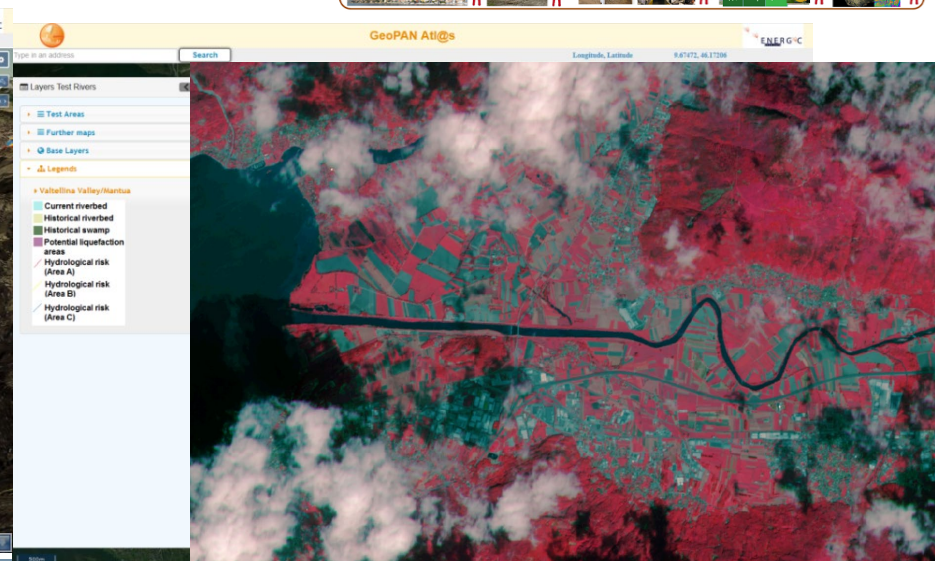
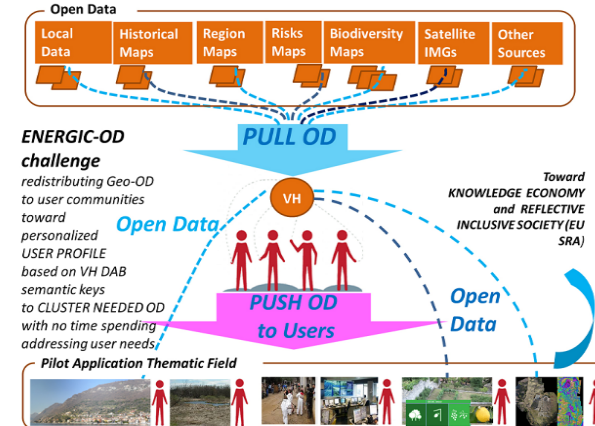
European NETwork for Redistributing Geospatial Information to user Communities – Open Data

## GeoPAN Atl@s APP using GEOSS-DAB – VIRTUAL HUB:

- developed for geologists- derive changes in riverbed for seismic classification purposes & planning purposes and Hydro-geologic risk analysis
- Time series analysis with multi-source data (GIS open data, Sentinel 2, historic maps in this case)–



### ENERGIC-OD PULL and PUSH SCENARIO



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Link GEOPAN APP

<http://geoserver.atlas.polimi.it/examples/servlets/Geopan/D/www/it.html>

<http://geoserver.atlas.polimi.it/examples/servlets/Geopan/dashbord/production/Introduction.html>

## **POLIMI Gicarus LAB ABC ai GdL (Gruppi di Lavoro) GEO Italy**

*Multi-temporal OPEN DATA data access using VH (i.e. RS Satellite Data, S2, Lidar, EuMetsat, EEA, in situ HR data microDrone orthoimage)*

### **I. Dissemination**

- Co-operate with GEO ITALY network and all the partners/subjects to the dissemination of the possible impact of the GEO activities on the Built Environment domain

### **I. Building Capacity**

- Organization of a Doctoral Course for PhD Candidates 5 cfu – PHD Summer WEEK 2017 within the POLIMI dABC PhD (with the support of the GEO ITALY network organization).
- Provisional Title: GEO societal challenge and impact Built Environment: Multi-temporal, Satellite and On Site multi-spectral for Cultural Heritage and Built Environment, BIM-GIS

## **II. Specific Thematic Field of Interest: EO monitoring using satellite and ground data**

- Built Environment, Landscape, Archaeo-landscape, Riverbed, Coastal Zones and Ports ICWM, Mountain areas
- Biodiversity, agriculture, desertification, semi-arid zones
- Climate change resilience, Built Environment & Cultural Heritage



*What are the challenges for education/training in the space sector?*

*Do you think that your programmes/activities can offer your students good matchmaking with the market needs?*

*How do you see the involvement of students in the Earth Observation/space sector? What is the level of interest in terms of number and performance?*

*Where do you see the role of raising awareness in engaging more and more students to follow this career path?*



POLIMI-ABC Education Programmes/activities -  
involvement of students in the Earth Observation/space  
sector

POLITECNICO DI MILANO – **AUIC School** (Architecture, Urban  
and Construction Engineering (**Rank 7<sup>th</sup> 2021**)  
**MSc-Arch Master of Science**

❑ BEI Architecture Built Environment interiors ENG  
→ course of PRESERVATION STUDIO + ADVANCED SURVEY AND  
REPRESENTATION TECHNIQUES

→ **WS on Earth Observation and Land (+Landscape CH)**  
**Degradation using Copernicus Data (n. 55 student per year)**

❑ Landscape Architecture. Land Landscape Heritage  
→ course of **ENVIRONMENTAL ANALYSIS AND LANDSCAPE MAPPING**

❑ **Thesis (MSc Graduation - Architects/Urban Planner)** on  
Earth Observation and Land-Landscape Degradation  
using Copernicus Data under climate change pressures





What is the level of interest in terms of number and performance?

# WS ON CLIMATE CHANGE - LAND(SCAPE) DEGRADATION (LD)

PhD Thesis Marzia Gabriele !!! 1st Woman Arch EO theses



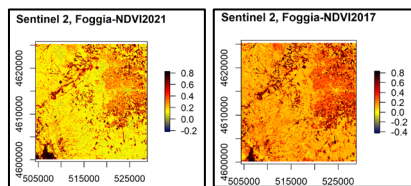
## WS ON CLIMATE CHANGE - LAND(SCAPE) DEGRADATION (LD) + SATELLITE DATA – COPERNICUS PROGRAMME NDVI ANALYSIS & ON-SITE LD GROUND DATA VALIDATION

Climate change  
EO webinars on land  
degradation

### Basilicata Region



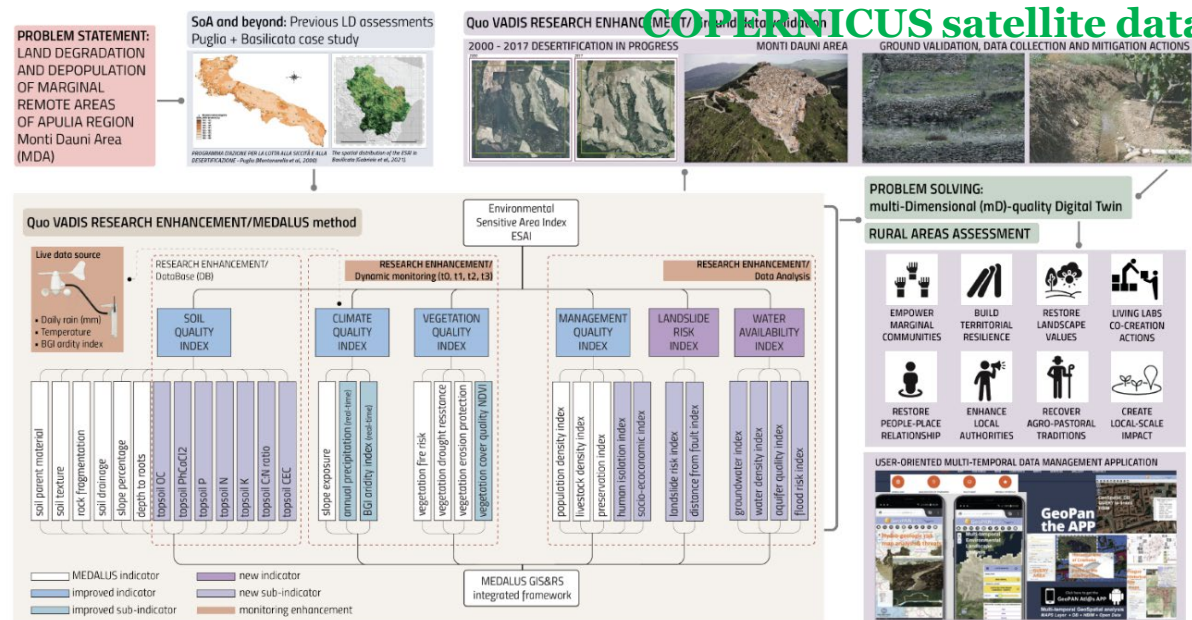
Validating NDVI differencing thresholding methodology in Basilicata Region, Italy (Gabriele et al., 2021)



Foggia (Apulia, Italy) LD NDVI investigation in GEE

### Digital Twin

Earth  
Observation  
assessment  
toward  
mitigation  
Semi-real-time  
investigation  
Remote  
Sensing  
COPERNICUS  
(RS) data to  
measure and  
monitor Land  
Degradation  
indexes



Multi-Dimensional Geospatial hub targeted to Rural Areas  
LD/EO digital TWIN to measure and monitor  
Environmental, Ecosystem & Socio Economic  
Indicators (GEE code implemented) Apulia Region



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# PhD Thesis Marzia Gabriele -> 1<sup>st</sup> Architect Woman Thesis on EO!!!

What are the challenges for education/training in the space sector and Raising awareness in engaging more and more students to follow this career path?

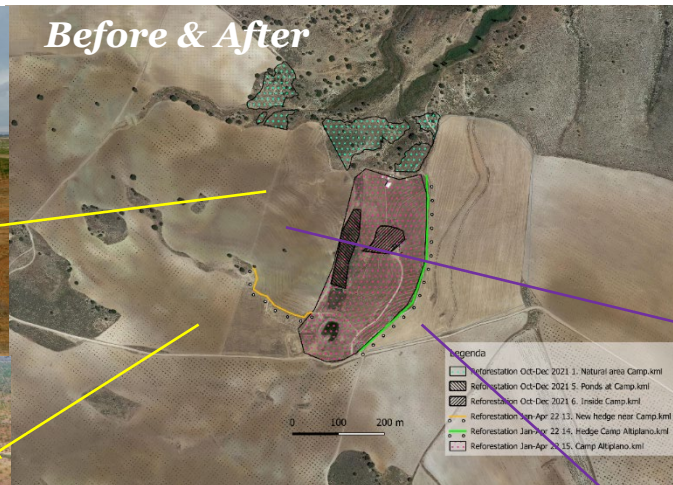
## WS ON CLIMATE CHANGE - LAND(SCAPE) DEGRADATION (LD)

### SATELLITE COPERNICUS NDVI ANALYSIS to ON-SITE LD GROUND DATA VALIDATION & MONITORING REGENERATIVE AGRICULTURE

- MultiScale data Integration
- MultiDimensional Digital Twin

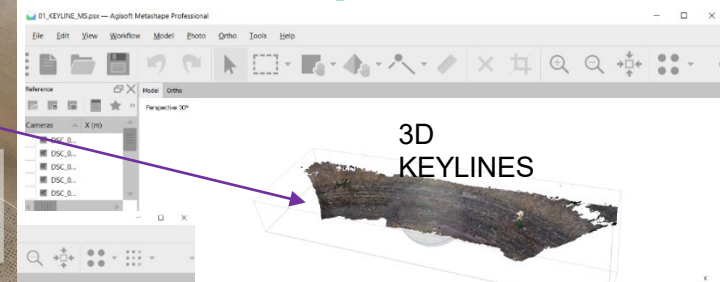
**CASE STUDY – LESSON LEARNT**  
**Camp Altiplano, Murcia Region (Spain)**

**RE-GENERATIVE ON COURSE EXPERIMENT**

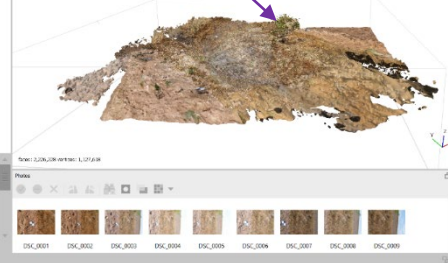


Remote Rural Areas;  
LD Restoration and  
Mitigation strategies;  
Regenerative Agriculture;  
Landscape changes

*Photogrammetric&RS data acquisition to monitor the performance of the experimental degraded landscape and restoration techniques*



SWALES



 Metashape



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 ecosystem  
restoration  
camps



Climate-KIC



**POLIMI PHD Course** - ABC DEPARTMENT DOCTORAL  
PROGRAMME (150 candidates)

Multi-Temporal, Multi-Source, Multi-scale Mapping  
Modelling and Remote Sensing Monitoring for Built  
Environment, Cultural and Archeological Heritage, and  
Landscapes

- 051256 - CULTURAL HERITAGE AND BUILT ENVIRONMENT  
SURVEYING, MODELLING AND MONITORING

**Marzia Gabriele Success Story**  
FROM MSc. Graduation to PHD GRANT



## PHD Course - Built Heritage and GEO- challenging issues. Multi-temporal MONITORING Multi-source and Multi-scale Geospatial Remotely sensed Information

### Lecture themes

- Threats and SDGs – SEA RISING & Cultural heritage
- Multiscale Multi-Temporal Geospatial data
- Scale - complexity of 3D quality model
- Sea Rising Application - River Centa Flooding Albenga Flooding Impact
- ***EO satellite images, Copernicus Sentinel 2, DigitalGlobe EUMETSAT and Map Integration***

**Case Study – The archeological site of S. Clemente in the flooding area of the Centa River (Albenga) - the multi-scale multi-temporal EO approach required to manage challenging global and local issues**





# EO Cultural Heritage & climate change pressures monitoring

## DOCUMENTATION & MONITORING

### Albenga

EO MED areas,  
cultural heritage  
rainfall and Climate Change  
Pressures → in cooperation  
with

Prof. Philippe Pergola

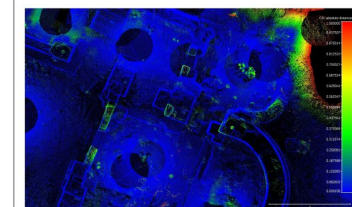
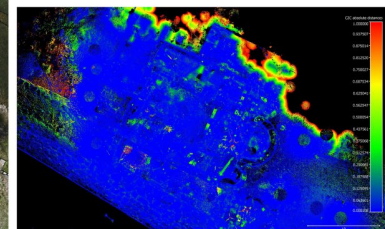
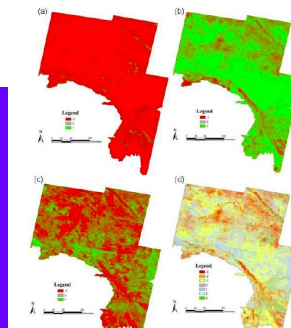
MMSH -Université d'Aix-  
Marseille

Directeur de Recherche Laboratoire  
d'Archéologie

Médiévale et Moderne en Méditerranée  
LA3M - UMR 7298



**Paleoriverbed (Centa River)  
Archaeological Area San  
Clemente (EO+UAV+LIDAR  
Monitoring campaigns 2017-  
on course)**



San Calocero - Albenga

Rilievo Fotogrammetrico e Laser Scanner  
Anno 2015 - Anno 2017

Confronto nuvole di  
Punti - Anno  
2015/2017

Data	Tavola
2015/2017	
Scala	
-	



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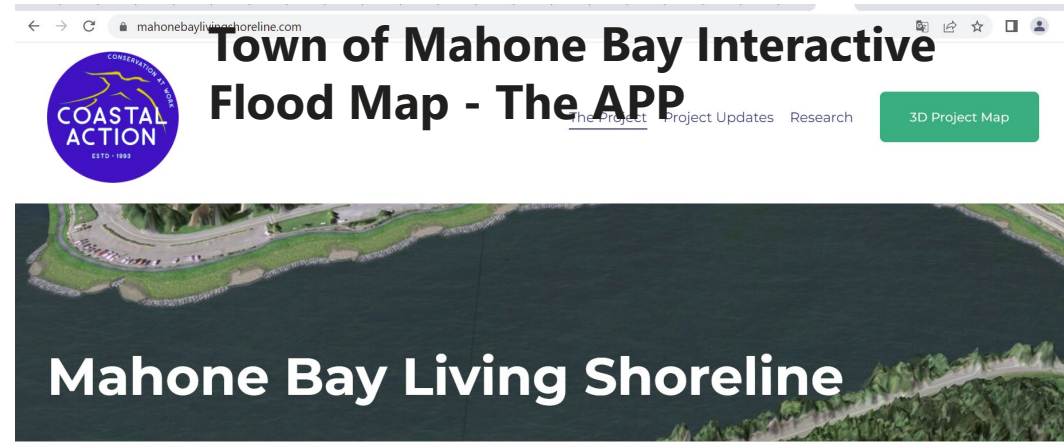


Albenga, martedì 13 ottobre  
Sala conferenze del Seminario vescovile - via Galileo Galilei 36

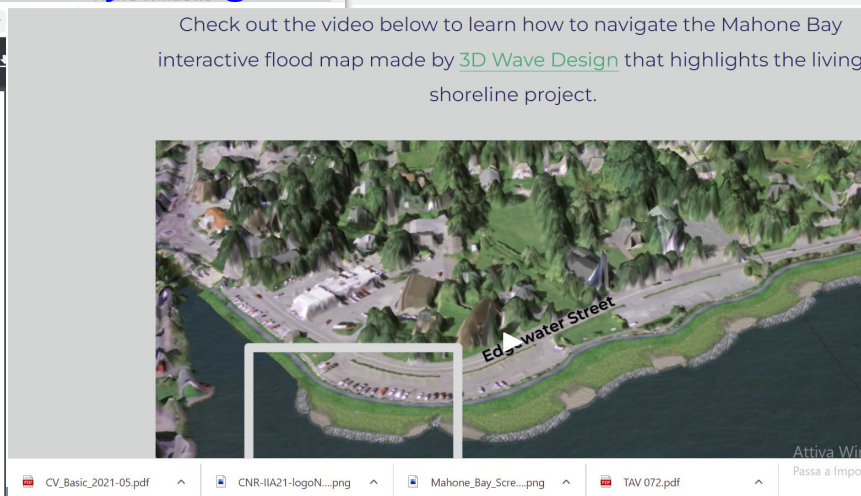
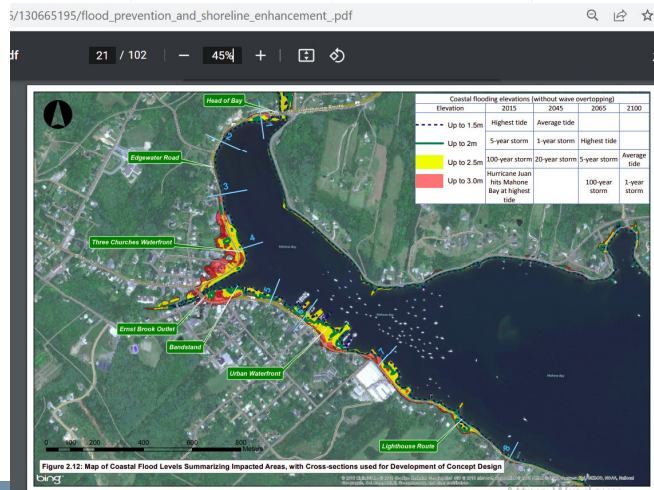
San Calocero 2015  
Il Campagna di scavo in Concessione ministeriale al  
Pontificio Istituto di Archeologia Cristiana:  
Bilanci e prospettive per una ricerca di lunga durata



Rising awareness – New Jobs across the world (Halifax, CA)  
 REMOTE SENSING – data > analysis > climate impact –  
 monitoring toward mitigation : ONG& CAMPS  
 EXPERIENCES across the world



<https://3dwavedesign.com/MahoneBayLivingShoreline/version-1-0-8/>



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<https://www.mahonebaylivingshoreline.com/>

# PARTNERSHIPS/OPPORTUNITIES

Future HE calls we'd be very interested to foster Advanced Digital Skill and Training developing partnerships (i.e. CUT Cyprus, *EO4GEO – GISIG, KIC-EIT, ALTOPLANO CAMP*)

**DIGITAL-2022-SKILLS-03-SPECIALISED-EDU**

**Advanced Digital Skills (DIGITAL-2022-SKILLS-03) - Horizon call**

**OTHERS**  
**To be added**



**THANKS FOR YOUR  
ATTENTION!**

