Cultural Landscape risk Identification, Management and Assessment (CLIMA)

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Frascati, 13 November 2015
ANTHROPIC AND NATURAL HAZARDS

Cultural heritage ravaged by urban sprawl, floods, war, earthquakes, climate change, agricultural activity, soil processes, water infiltration…

C.L.I.M.A

The project aims to promote highly interdisciplinary research, based on a soil-oriented approach, to develop effective tools for the authorities responsible for cultural landscape preservation.
C.L.I.M.A Web Portal

WebGIS platform integrating:
- Remote Sensing technologies
- Archaeological and environmental baselines

Mapping, diagnostic and monitoring of risk factors affecting archaeological remains and cultural landscapes

Vulnerability and warning maps
Project analysis input data

- Identification of main risk factors addressing cultural landscape sites
- EO methods and EO data processing chain addressing each specific risk factor
- Ground-based RS methods for mapping of buried and exposed structures
- Innovative ground RS tool for the monitoring of lateral and vertical soil disturbance (agriculture)
Scientific approach

• Soil Erosion and land movement → surface deformation, active slope instabilities and subsidence
• Land cover/ Land change → Land use and vegetation monitoring
• Mapping and detection → Surface features analysis and ortho-images
• Ground soil erosion tool (in-situ gamma spectrometry) → erosion risk assessment
• Ground-based (MAG, ERT, GPR) → archaeo-geophysical survey

Processing techniques associated to natural and human pressures

*Applications of Remote Sensing in Archaeology: Surface and sub-surface feature detection over UNESCO World Heritage sites and archaeological sites in Italy using optical and radar data, N. Dore et al., 2009
**Remote Sensing techniques in archaeology. From Space to Ground investigation through the microwaves spectrum: SAR and GPR detection, J. Patruno et al., 2010

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Periodic risk maps (monthly update for rapid response)
- land use change
- vegetation increase or reduction
- soil erosion maps
- velocity maps …

Features detection maps (multitemporal analysis)

High-resolution maps on archaeological indicators:
- anomalies
- soil marks
- cropmarks…

Cultural heritage management and monitoring using remote sensing data and GIS: The case study of Paphos area, Cyprus, Agapiou et al., 2015

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Case studies

Roman town of *Falerii Novi* (Italy)

Greek-Roman town of *Nea-Paphos* (Cyprus)

Roman *Antonine Wall* (Scotland)

@Google Earth

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**Falerii Novi (Italy)**

**The site**

<table>
<thead>
<tr>
<th>Foundation</th>
<th>241 BC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation state</td>
<td>City walls are conserved. The urban area is totally buried.</td>
</tr>
<tr>
<td>Archaeological evidences</td>
<td>Roman rural Villas, many paved stretches of the Via Amerina, with tombs on the both sides.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>Buried remains</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Exposed remains (physical damage)</td>
</tr>
<tr>
<td>Biomass accumulation</td>
<td></td>
</tr>
<tr>
<td>Soil erosion</td>
<td>Structures’ stability</td>
</tr>
<tr>
<td>Land movement</td>
<td></td>
</tr>
</tbody>
</table>
# The site

<table>
<thead>
<tr>
<th>Foundation</th>
<th>End of 4th Century BC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation state</td>
<td>A large portion of the archaeological area is still unexcavated</td>
</tr>
<tr>
<td>Archaeological evidences</td>
<td>Buried structures, palaces, fortresses, theatre and tombs</td>
</tr>
</tbody>
</table>

**Hazard**

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<tr>
<td>Agriculture</td>
<td>Buried remains</td>
</tr>
<tr>
<td>Urban pressure</td>
<td>Expansion towards archaeological area</td>
</tr>
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<td>Soil erosion</td>
<td>Structures’ stability</td>
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<td>Land movement</td>
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*Remote Sensing for Archaeological Applications: Management, Documentation and Monitoring, Hadjimitsis et al., 2011

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The site

**Foundation**
AD 140

**Conservation state**
The turf built rampart and ditch structure itself survive as an upstanding monument across much of its length

**Archaeological evidences**
Buried forts, fortlets, marching camps and roadways, most unexcavated.

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</thead>
<tbody>
<tr>
<td>Agriculture Pasture</td>
<td>Buried remains, earthwork features</td>
</tr>
<tr>
<td>Scrub, forestry, burrowing</td>
<td>upstanding sections of the wall</td>
</tr>
<tr>
<td>Soil erosion</td>
<td>Structures’ stability</td>
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<tr>
<td>Land movement</td>
<td></td>
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Dissemination

Maximise the value of research outcomes by promoting their transfer to individuals and organisations outside the immediate research community.

Future objective

Significant advances in our understanding of archaeological cultural landscapes across the broader research community, the public authorities and the society.
Thank you!