Quantifying change in an agrarian landscape. Application of multicriteria models in the archaeological study of Medellin (Badajoz, Spain) and its territory.

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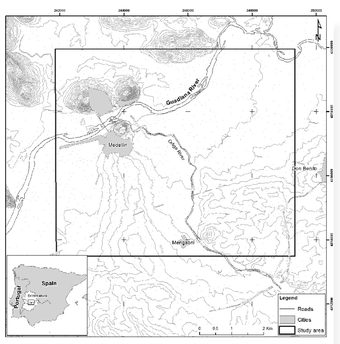
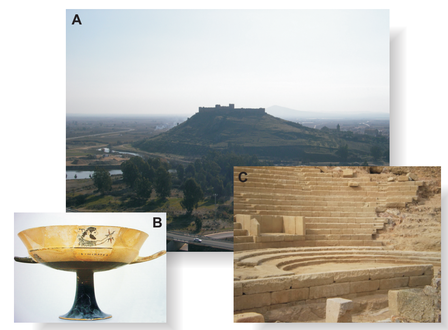


Location of the study area in the Iberian Peninsula

1.-OBJETIVES

From Prehistory to Modern times, Medellin is a great significance historical site in the structuring of the human landscape of the middle Guadiana basin. This poster shows one side of a regional research project focused on the reconstruction of this long change process. An alluvial environment like this has undergone severe changes, both of natural and anthropogenic origin. This challenge raises the need of a multidisciplinary work, combining data provided by geomorphology, archeology and the study of documentary sources. The proposal is to develop a multi-criteria model, conceived as an ideal strategy for effectively integrating and processing all these data. this model will provide a tool to assess the potential risk to the conservation of archaeological heritage. In addition it will help in the understanding of how human settlement developed through history.



A.-View of the Medellin Castle over the historical ford of the Guadiana River
B.-Evidence of colonial Greek contacts in the First Iron Age: kylix found in one of the burials from the Medellin necropolis (middle of the VI century B.C)
C.-View of the Roman theatre of the *Colonia Metellinensis*

2.-METHODS

Workflow for the elaboration of the model consist in weighing, separately/independently, several factors that may impact in the preservation of archaeological record. Subsequently through local spatial analysis techniques, interdependence relationships and join effect of these layers is assessed. It provides a unified potential instability gradient that can be then cross-evaluated with data resulting from archaeological survey.

During process a series of initial raster maps were combined as independent variables to obtain the outputs that could be classified in basis of a decision matrix. The whole process involve sequential steps were different geographic information (DTM, geomorphology, land uses and archaeological information) was added. For each step a decision matrix was designed to assess how the output was interpreted.

Decision matrixes

Potential instability (P.I.)

+Slope -	+ Cut Resistance - 1	2	3	4	5
1	3	2	2	1	1
2	4	3	2	1	1
3	4	4	3	2	2
4	5	4	3	3	2
5	5	5	4	3	3

P.I. Value	Interpretation
1	Very high
2	High
3	Medium
4	Low
5	Very low

The highest potential instability occurs where the maximum slope (5) joins materials of very low resistance like alluvial plains or terraces (5), then P.I. = 1 (Very high).

Stability Scenarios (S.S.)

- P.I. +	Land Uses Impact US1	US2	US3	US4	US5
1	5	2	2	1	1
2	5	3	2	2	1
3	5	4	3	3	2
4	5	4	4	3	2
5	5	5	4	4	3

S.S Value	Interpretation
1	Very high stability
2	High stability
3	Medium stability
4	Low stability
5	Very low stability

The most unstable scenarios are those where land uses involve drastical transformations (US1) and, at the same time, are the most instables (P.I.=5). It has been considered that the US1 catgegory completely transfoms the landscape independently on the value of P.I.

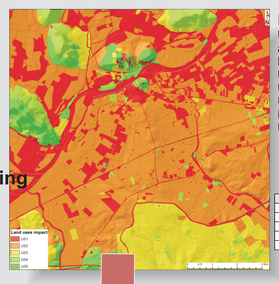
Morphodynamical Environments

- S.S. +	+ Morphodynamics - 1	2	3	4
1	2	2	1	1
2	3	2	2	1
3	4	3	2	2
4	5	4	4	3
5	5	5	5	5

Morphodynamics Value	Interpretation
1	Very dynamic environment
2	Dynamic environment
3	Low dynamic environment
4	Very low dynamic environment

Land use impact

Based on data captured from 1:50000 cartography updated and revised by direct observations in the area and photointerpretation. It express their capacity of soil protection against erosive factors and the impact according to the alteration of terrain.

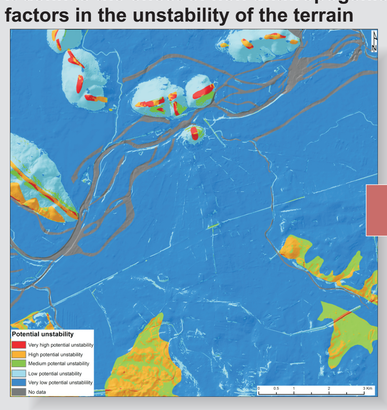


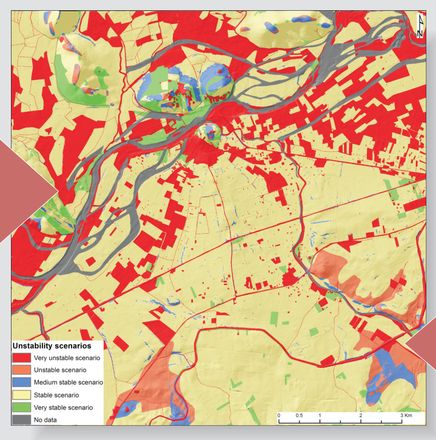
Land uses categories
US1 - Antropized areas (urban areas, infraestructures). also includes river surfaces and irrigated crops with a high transformation impact (Rize).
US2 - Irrigated crops.
US3 - Unirrigated crops.
US4 - Unirrigated crops with a very low transformation impact and seminatural areas.
US4 - Natural areas

Land Use	Impact
US1	Very high
US2	High
US3	Medium
US4	Low
US5	Very low

Potential unstability

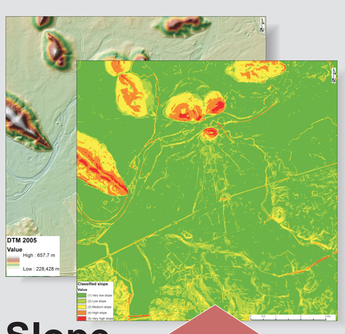
It defines the effect of non-anthropogenic factors in the unstability of the terrain





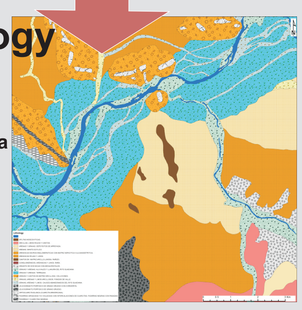
Slope

Slope is derived form the DTM produced by the National Orthophotography Plan with a spatial resolution of five meters.

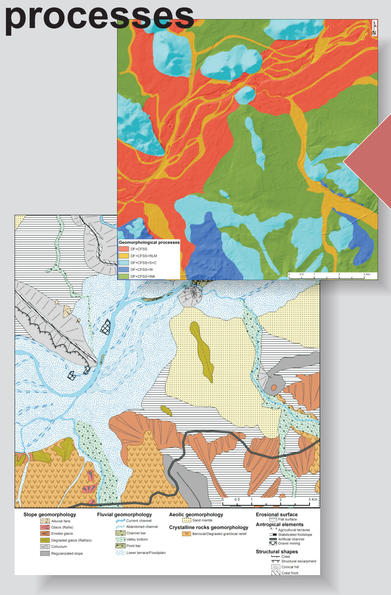


Lithology

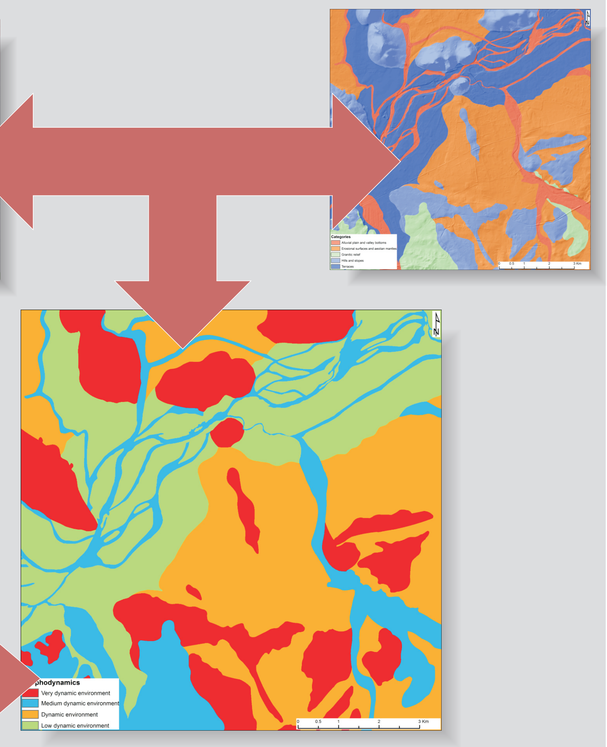
Categories have been defined according to a geomecanic point of view, quantifying rock resistance to erosion



Geomorphological processes



Physiographic units



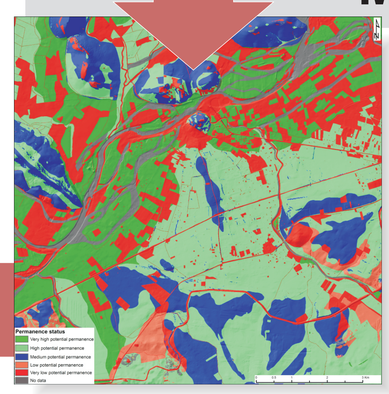
Definition of stability scenarios

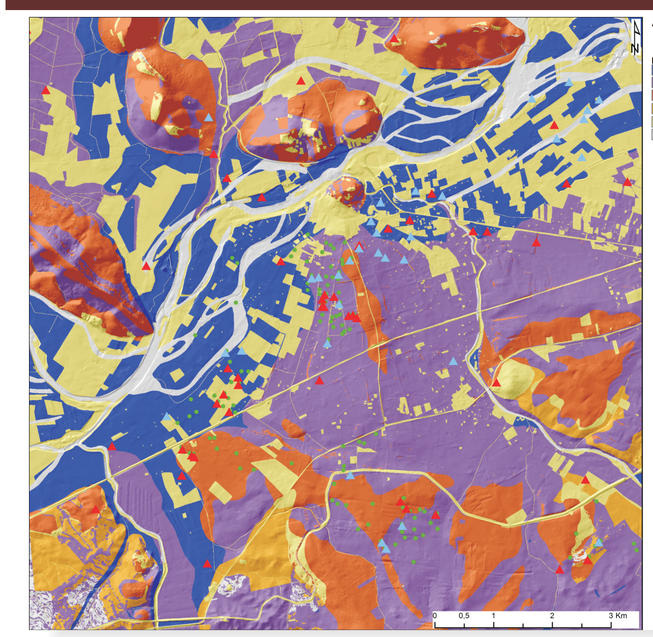
Morphodynamic process

Final result reflects the weight of slope and morphodynamic in the model, assigning to alluvial plain high stability levels. These values are strongly modified by land use in areas affected by irrigation crops demanding terrain leveling. This impact is particularly severe in the right side of the Guadiana River. Another increasing threat reflected in the model is the urbanization process in many agricultural plots, and the development of infrastructures. In residual reliefs this risk is fostered by high slope values together with a low vegetation covertures.

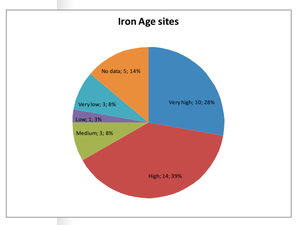
3.-RESULTS

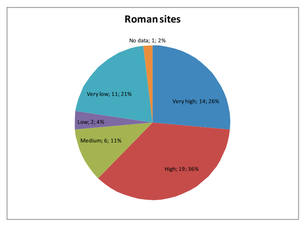
Archaeology





The layer corresponding to archaeological remains integrates every settlement evidence, from Prehistoric to post-medieval times. This is the result of combining previous published reports with our own intensive systematic survey.





In a complex and changing geographic environment like Medellin area, the model allows firstly to weigh in detail the degree of reliability of data provided by archaeological surface survey and a better planning of future work.
We can preliminarily assess the relationship between archaeological sites and the permanence status map. This result may vary depending on further adjustments of the model, as well as on new data for characterization of survey finds. As a whole it reveals that most of the protohistoric and Roman sites known in the study area are located on high or very high permanence status areas. The main difference shown is that there is a significative group of Roman cases in areas with greatest risk for preservation. It reflects the overall trend in other categories due to the higher count of sites of this chronology.

4.-ACKNOWLEDGES

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5.-REFERENCES

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MAPA PENDIENTES

MAPA LITOLOGÍA

MAPA INESTABILIDAD POTENCIAL

MAPA UNIDADES FISIOGRÁFICAS

MAPA PROCESOS GEOMORFOLÓGICOS

MAPA USOS DEL SUELO

MAPA ESCENARIOS INESTABILIDAD

DINÁMICA HIDROGEOMORFOLÓGICA

MAPA STATUS DE PERMANENCIA

MAPA SITIOS ARQUEOLÓGICOS

FINAL OUTPUT