

II CONFERÊNCIA NACIONAL DE GEODECISÃO

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Politécnico de Setúbal
ESCOLA SUPERIOR
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Integrated monitoring system and management support – Study case Herdade da Contenda

Sistema integrado de monitorização e de apoio à gestão e decisão – Caso de estudo
Herdade da Contenda

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Outline

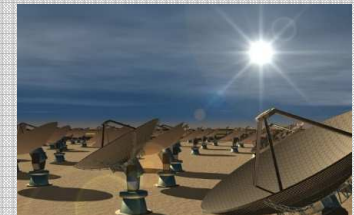
- Introduction
- Objective
- Study case
- Methodology
- Results
- Preliminary Conclusions



Introduction



- The Square Kilometre Array (SKA) will be the largest Global science project of the next two decades, a sensor network dedicated to radioastronomy.
- The SKA main objective is to solve main astronomy, astrophysical and cosmological questions, such as the capacity of reveal the birth of the first galaxies, detect collisions between black holes and collect proves of planets formation in other solar systems.
- In the framework of Portuguese participation in the project, a site with the perfect conditions was suggested in Alentejo, the Herdade da Contenda.
- The characteristics of the ionosphere and the troposphere, the physical characteristics of the site including climate and subsurface temperatures, infrastructure costs, including power supply and distribution, operation and maintenance costs and the long term sustainability of the site as a radio quiet zone.



Geographical Information Systems (GIS)



- GIS is usually used to manipulate, data acquisition and cartography which auxiliate in decision making.
- GIS is usually used to environment land analysis through multi criteria evaluation approach.
- In order to provide an application with the purpose of being adapted to different sites and areas given the possibility of modifying the source code, an open source application was developed under GIS open source software.

Objective



- In order to decide the best site to SKA installation, the previous version of the integrated environmental monitoring application (Teodoro et al. [2015]) was improved with a new tool which will help in the SKA decision, minimizing the landscape ecosystem impact.
- Python language was used.
- Open source environment: QGIS software.
- The application incorporates several methods which allows the map creation such as:
 - Forest fire risk maps
 - Erosion risk maps
 - Groundwater vulnerability maps
 - Land Use Land Cover (LULC) visualization
 - Normalized Difference Vegetation Index (NDVI) maps
 - Bioclimatic Index
- The information provided by the application has an important role in decision making.

Teodoro, A., Duarte, L., Sillero, N., Gonçalves, J.A., Fonte, J., Gonçalves-Seco, L., Pinheiro da Luz, L.M., e dos Santos Beja, L.M.R. (2015). An integrated and open source GIS environmental management system for a protected area in the south of Portugal, Proc. SPIE 9644, Earth Resources and Environmental Remote Sensing/GIS Applications VI, 96440U.

Study case Herdade da Contenda (HC)

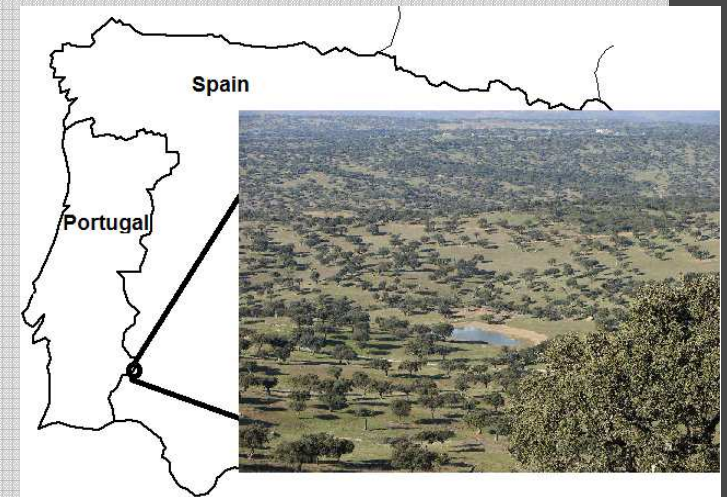
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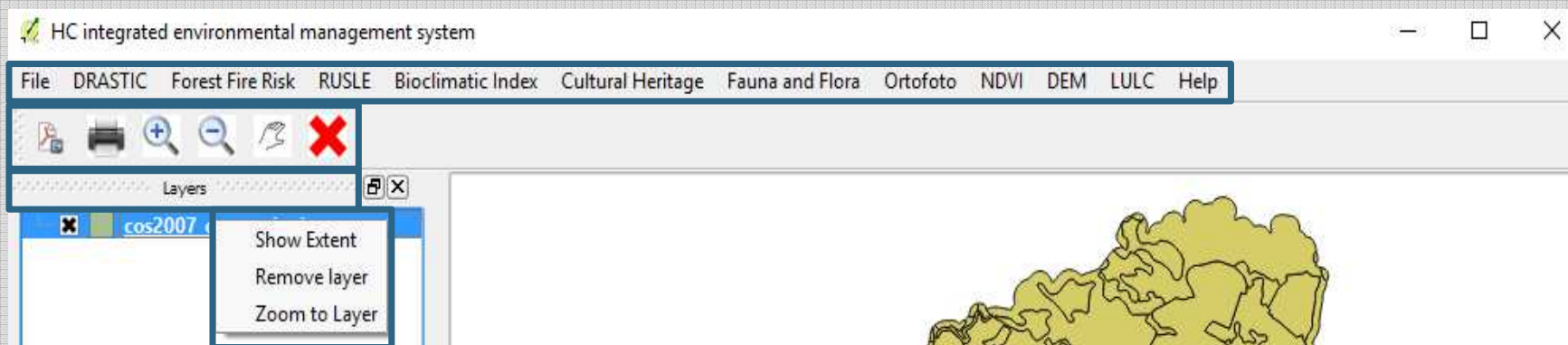
- Protected zone, National Hunt zone and Forestry Perimeter with an area of 12 000 ha where **5270 ha** in Portuguese side.
- Western part of the Sierra Morena, in the municipality of Moura, Beja district, Portugal.
- HC area is classified as 12% Ibero-Mediterranean with *Quercus ilex* predominance and 88% as Submediterranean × Iberomediterranean.
- The HC climate are humid and sub-humid.
- Given the **protected** status of the site it was decided that there was the **need** for a **decision helping tool** allowing for informed decisions with minimal impact on the local ecosystem and landscape.
- Protected area zoning is a decision-making issue that inherently requires the evaluation of multiple land attributes according to multiple objectives.



Methodology



- Five buttons under a standard toolbar and twelve menus: File, DRASTIC, Forest Fire Risk, RUSLE, Bioclimatic Index, Cultural Heritage, Fauna and Flora, Ortofoto, Normalizes Difference Vegetation Index (NDVI), DEM, LULC and Help.
- Several methods and functionalities.



Methodology - Geodecision



- The created maps can be used as input files in the **decision making tool (Geodecision)** to help to identify the sites adequated to the SKA implementation.
- HC is a protected are, so several criteria must be defined.

NDVI DEM LULC Geodecision Help



Methodology



- HC is a protected area, so several criteria must be defined.

	MUITO BAIXO	BAIXO	MÉDIO	ALTO	MUITO ALTO
RISCO DE INCÊNDIO FLORESTAL (%)	<117.79	[117.79; 125.85[[125.85; 254.76[[254.76; 359.50[≥359.50
RISCO DE EROSÃO (TON KM ⁻² ANO ⁻¹)	<2.33	[2.33; 4.78[[4.78; 8.27[[8.27; 14.61[≥14.61
DECLIVES (%)	<12.53	[12.53; 19.50[[19.50; 27.08[[27.08; 36.15[≥36.15

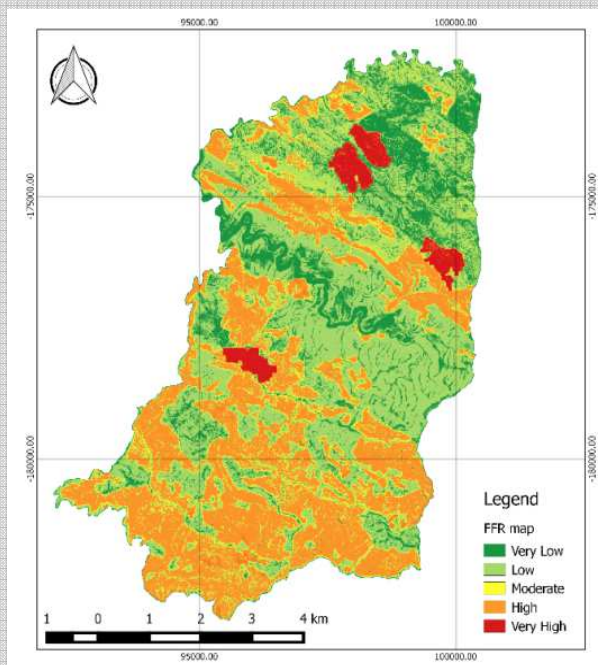
WEIGHTS	FOREST FIRE RISK	EROSION RISK	SLOPE
SCENARIO	3	2	1

Results

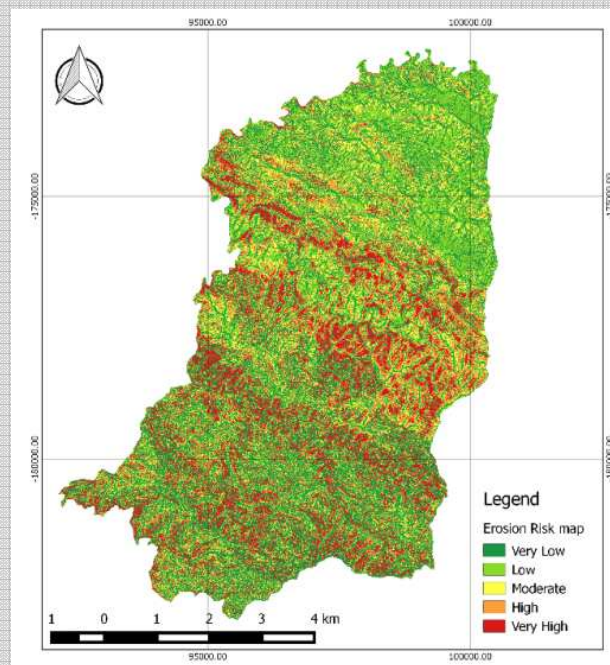
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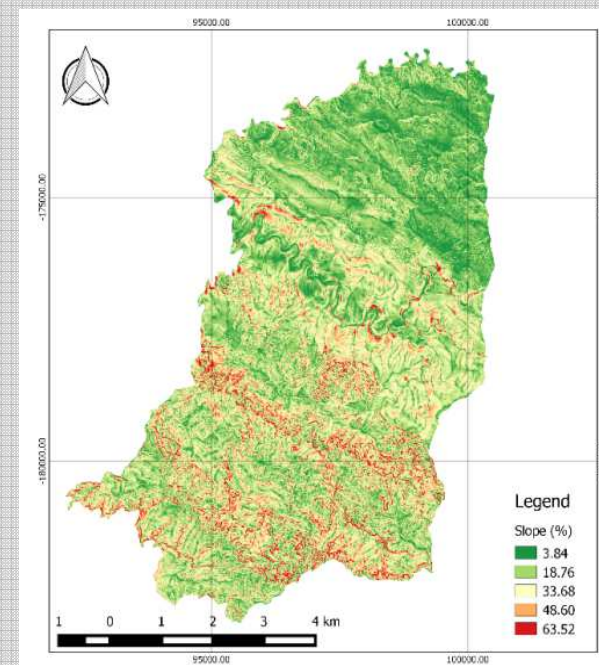
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Forest fire risk map



Slope map



Erosion risk map

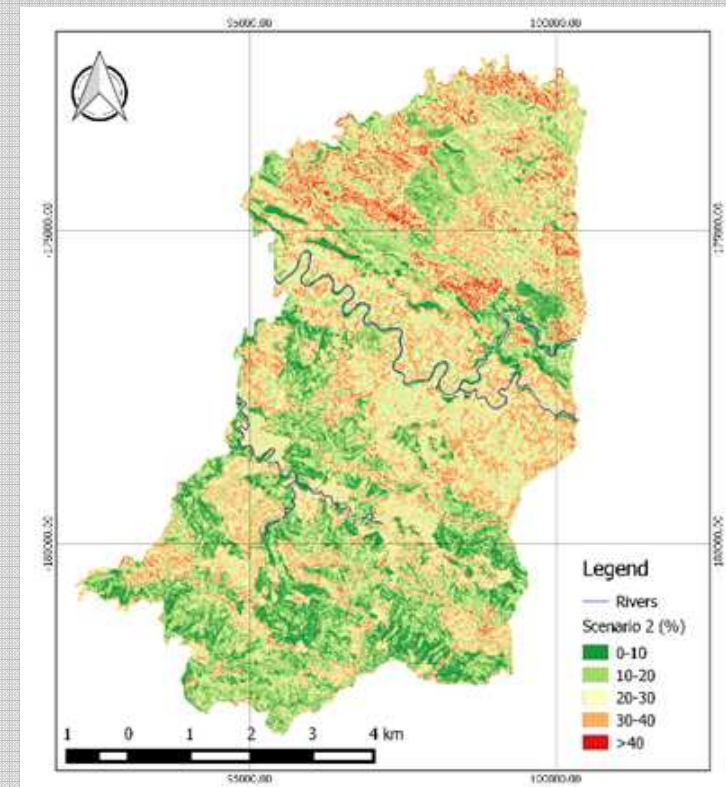
Results



- 56% of the HC area are classified with low or very low forest fire risk and it is located in central area (Ribeira do Murtigão) and in the North.
- High and Very high forest fire risk areas correspond to 2.2% and 32.6% of the HC area.
- According to burnt areas history, with a total of 24 hours, occurred in 2001 and 2002, so these areas are classified with very high risk and they are also in central and north zone.
- Areas with very high forest fire risk are related with areas with high slope values. These zones are located in the south of HC.
- The very high risk zones of forest fire risk map are consistent with the zones of the map provided in Plano Gestão Florestal do Perímetro Florestal da Contenda (PGFPFC), which are located in the south of HC.
- In the north of HC the risk is low.

Results

- 38.4% of HC zones are classified with low or very low slope values and they are located in the north of HC.
- 13.9% of HC zones are classified with high erosion risk and are located in central area and south HC.
- The results obtained showed that 4.89 km² of the total area is located in the north of HC and presented the sites more adequated to the installation.
- Different scenarios can be tested.



Preliminary conclusions



- The authors intend to implement new and improved tools with new approaches and methods in some maps, such as the forest fire risk map, where other variables can be incorporated.
- The application developed can be improved and modified, adapting to other protected/natural areas. It is open source and free, it can be easily incorporated with other spatial information.
- The future decision must be taken into account after two more steps: the environmental impact (latrines, carnivores, reptiles, etc) and the infrastructure access (cost strategy, roads).

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THANKS FOR THE ATEMPTION

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