

# Remote Sensing for Disaster Risk Reduction in Semi-Arid Regions

CHARLOTTE SAUNDERS<sup>1&2</sup> & RICHARD TEEUW<sup>1</sup>

1) JARIC; The National Imagery Exploitation Centre, RAF Brampton, Huntingdon, PE28 4YG email: Charlotte.Saunders@port.ac.uk  
 2) 2) Geohazards Research Centre, School of Earth & Environmental Sciences, University of Portsmouth, Burnaby Building, Portsmouth. PO1 3QL.

## Introduction:

With the threat of climate change set to increase the frequency of higher intensity events, it is becoming more important to map areas which may be at risk from natural hazards for disaster risk reduction (DRR). High resolution remote sensing (RS) data may produce the best results, however they are very expensive and not easily accessible for developing countries.

Over recent years, much research has been carried out with regard to mapping hazards using various RS data. There has however, been little advancement in mapping vulnerability from moderate resolution sensors.

It is therefore the aim of this research to develop methodologies for extracting more accurate vulnerability assessments from free or low cost RS data by adapting methodologies developed from expensive higher resolution data. The resulting risk maps can then feed into DRR plans.

## Study Area:

The Vera Basin in south-east Spain is an ideal location for developing such methodologies as it has already been intensively studied, has good RS coverage and is susceptible to various geohazards. A second study area will be chosen to test the models produced.

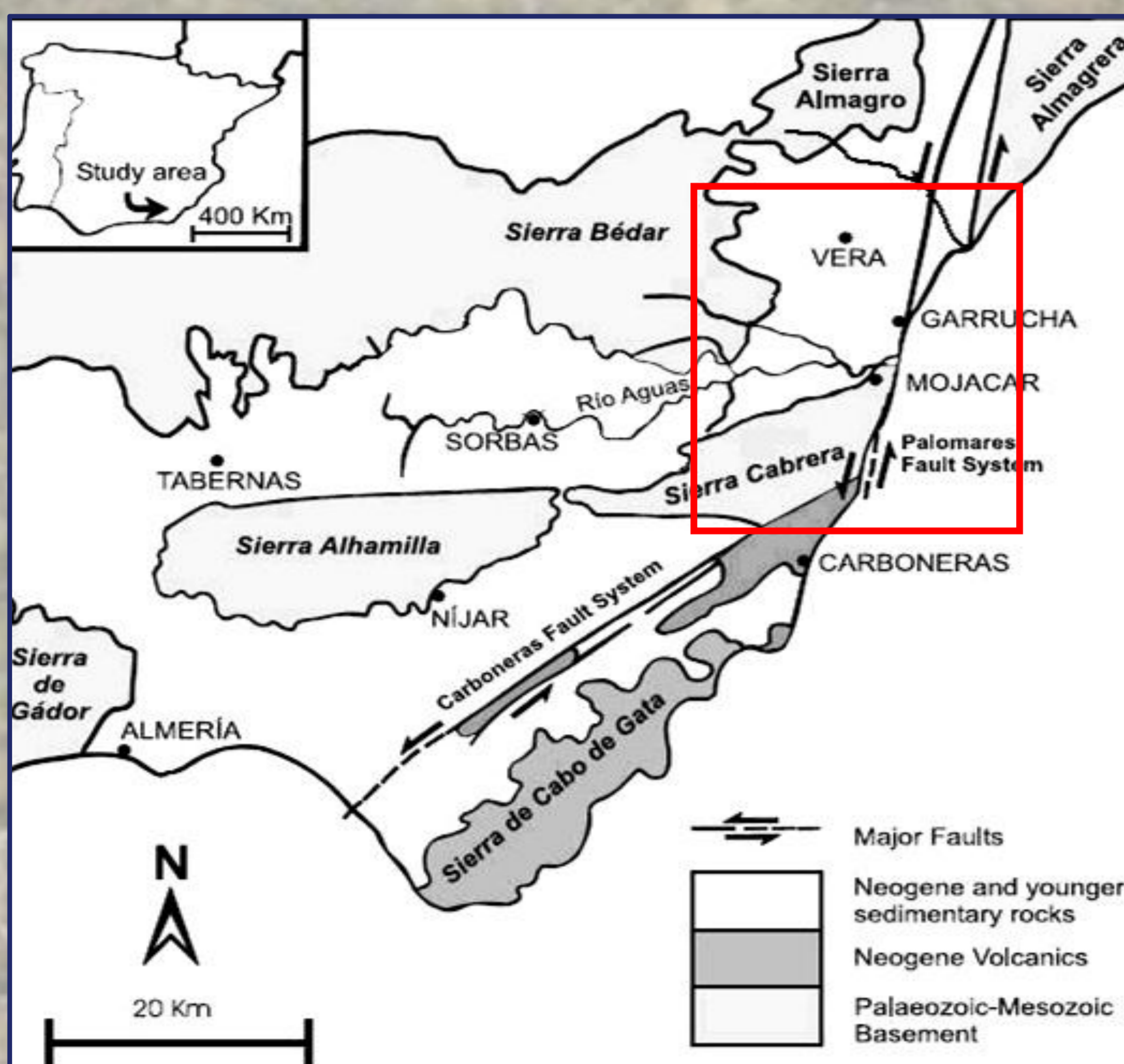


Figure 1: Overview map of SE Spain showing the Vera Basin (red square). Source: Adapted from Griffiths et al. 2002.

## Methodology:

Geohazard mapping for DRR is a multi-step process whereby hazard (the probability of occurrence of a potentially damaging phenomenon) and vulnerability (a measure of the potential damage that a geohazard can cause) are assessed and assigned an intensity rating (IR) in order to calculate the overall risk for a particular location (below). Their relationship is defined in Figure 2.

The methodology uses various RS exploitation techniques, producing vast amounts of data. A geographic information system (GIS) is used to manage and analyse these results using multi-criteria analysis.

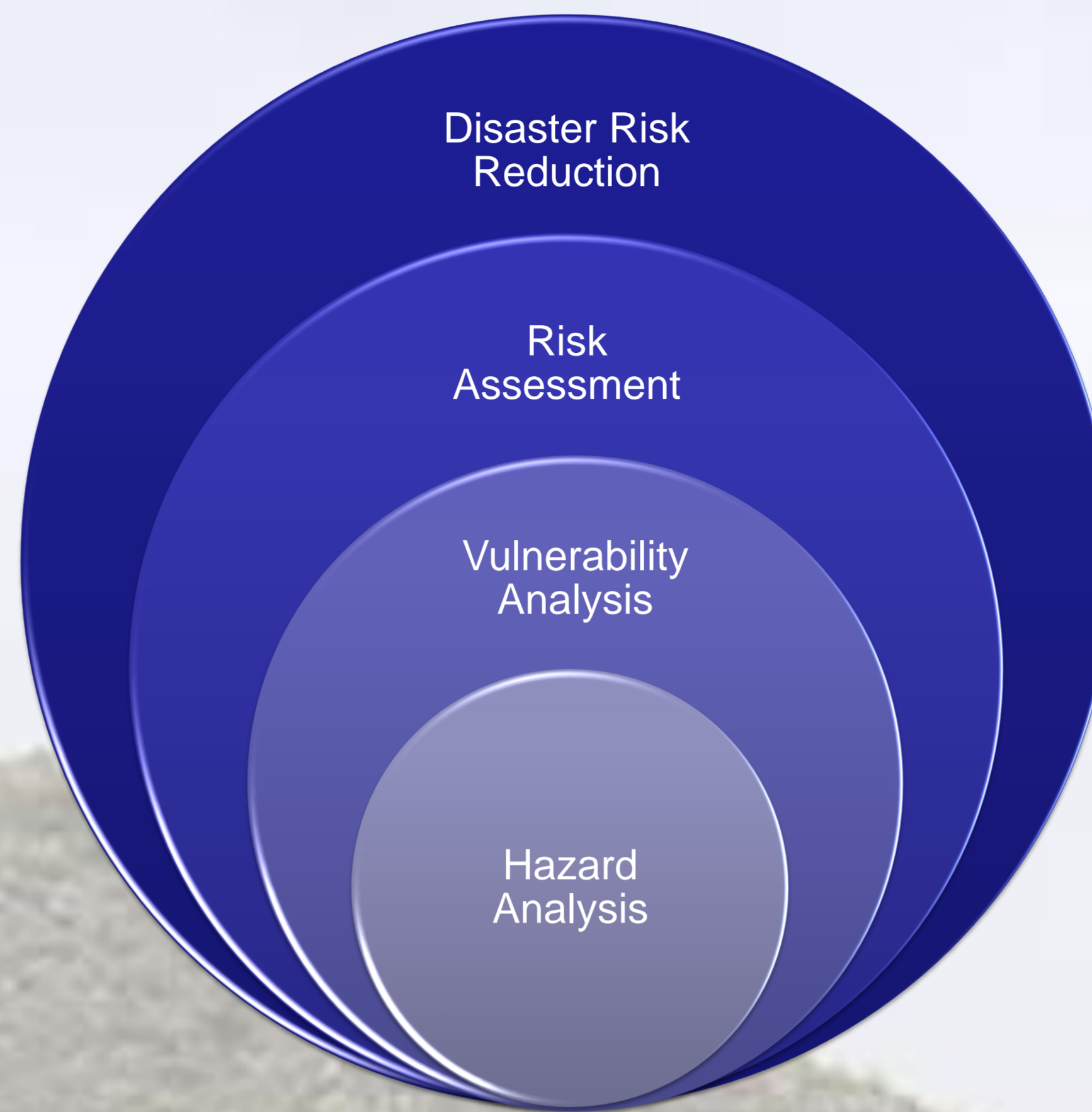


Figure 2: Interrelationship between the different elements for DRR

$$\text{Hazard}_{IR} \times \text{Vulnerability}_{IR} = \text{RISK}$$

## Vulnerability:

Defining vulnerability is not simple. Geotechnical engineers, geologists and insurance companies (to name a few) all have their own slant on this subject and define it in many different ways. One common aspect however, is the use of physical elements at risk. However, for detailed vulnerability studies, much more detail is required.

Figure 3 outlines a first attempt to model vulnerability. This not only takes into account the physical environment, but also economic and cultural aspects. In addition, resources that might be utilized after such a hazard (for disaster recovery and reconstruction) are considered. Clearly, not all of these elements will be obtainable from imagery.

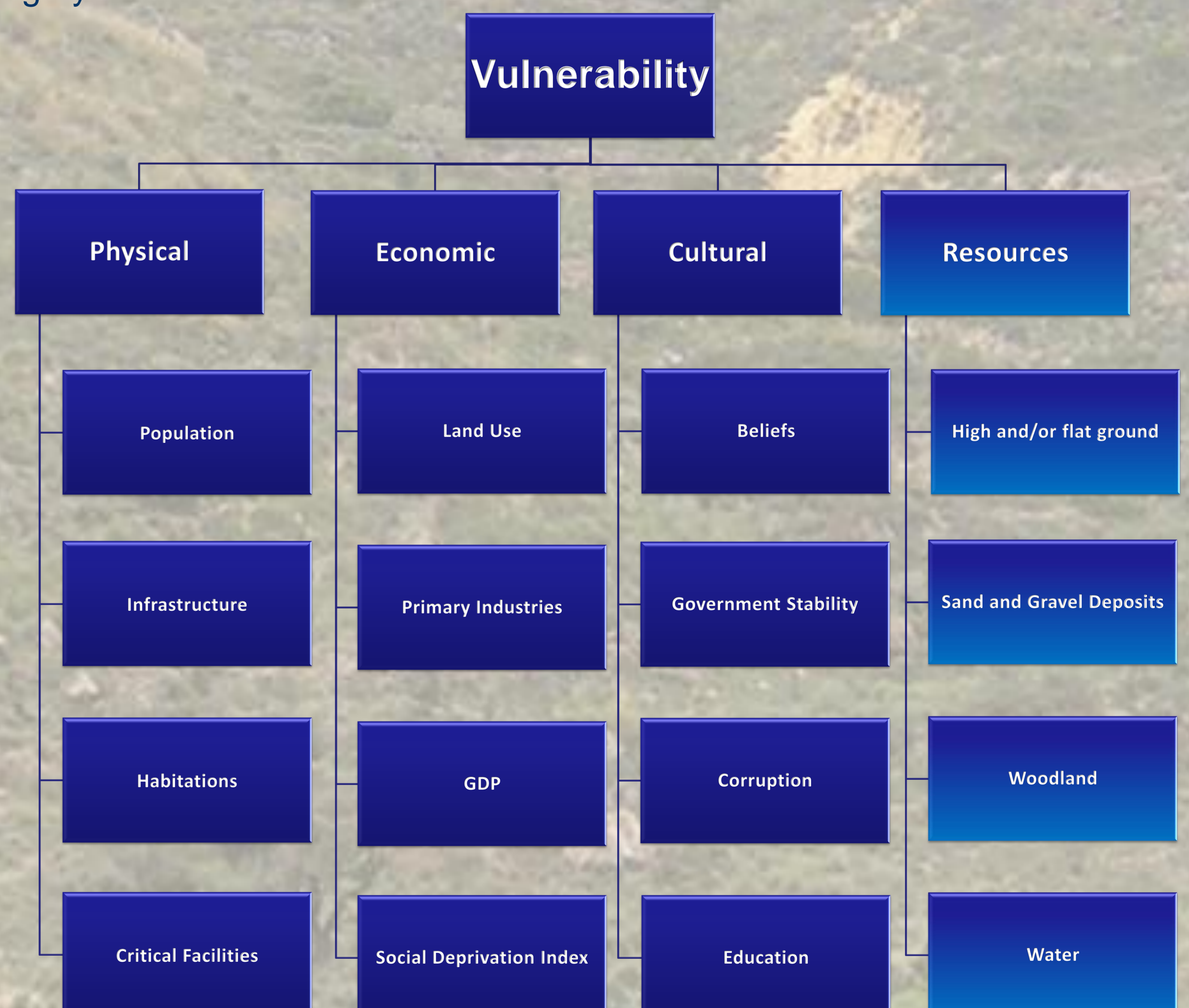


Figure 3: Modelling vulnerability. With focus on Resource Mapping

## Further Work:

Analysis has already been carried out on Landsat and ASTER data. Initial results showed that at a sub-regional level, these could prove useful for defining areas that require further analysis with higher resolution datasets. As not all vulnerable elements will be discernable from imagery, the initial part of this study will focus on the development of resource mapping, specifically aimed at DRR.0

## Reference:

Griffiths, J.S., Mather, A.E. & Hart, A.B., 2002, Landslide susceptibility in the Rio Aguas catchment, SE Spain, *Quarterly Journal of Engineering Geology and Hydrogeology*, vol.35, pp9-17