



Identification of potential asbestos roofs with WorldView 3 images with pixel and object oriented techniques: a case study in Italy

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Asbestos is the general name of a group of Mg, Ca, Fe silicate minerals (amphiboles and serpentines) characterized by a peculiar fibrous structure.

Asbestos containing materials (ACM) have been used in Italy and in many countries all over the world to produce a wide variety of commercial products. The reason is the peculiar and unique chemical and physical properties of this group of minerals, that include thermal and electrical resistance, extreme thermal stability, tensile strength, strong and flexible fibrous structure. They are also chemically inert. A huge amount of asbestos cement in Italy was produced in corrugated or flat sheets or tiles for roofing civil and public buildings, industrial, commercial and agricultural structures.

In 1992 the Italian Government Law n. 257 stated the ban for ACM production and use due to the serious consequences on health of exposure to asbestos fibers. However, asbestos cement roofs are still widely diffused in Italy and represent a huge amount of ACM still present in life and working environments.

Therefore, a methodology for the identification of AC roofs could be very useful for local authorities to map asbestos surfaces on their territory and adopt proper monitoring policies or removal actions.

In this work a multispectral image acquired by WorldView 3 has been used to compare different processing techniques for the potential asbestos roofs identification. The study area is the city of Modena in the northern part of Italy.

First of all, a GIS (Geographic Information Systems) protocol has been defined for the characterization and mapping of asbestos roofs, through the integration of remote sensing data and territorial information. Potential buildings of interest have been firstly screened through the intersection of different thematic layers in a GIS environment (volumetric units, buildings, etc.). Secondly, information obtained by remote sensing images has been used to obtain a classification of the roofs of the selected buildings with two different approaches.

The first is a pixel-oriented approach. The WV image has been classified with a Spectral Angle Mapper (SAM) algorithm based on ground truth region.

The second is an object oriented approach. The image has been first divided into several significant objects with a multispectral segmentation and then a nearest neighbour classification has been performed.

The two approaches have been compared in order to identify their potential and critical aspects.

The information collected by both classification approaches has been included in the GIS geodatabase combining the building information already available with the map of asbestos roofs providing a useful tool for removal strategy planning.

As a future development these approaches will be applied to different kind of remote sensing data such as Hyperspectral images or Ortho images in order to define the most appropriate technique for the identification of AC roofs depending on input data, territorial context and auxiliary information.