REMOTE SENSING FOR ENVIRONMENTAL MONITORING, ENERGY EFFICIENCY, AND DISASTER MANAGEMENT

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Environmental monitoring is performed by different techniques in different contexts: assessment of land use/cover change for desertification, land reclamation, soil sealing or urban sprawl; analysis of water quality for inland and open waters; surface lithology mapping. Long-term change detection studies exploit also declassified satellite imagery.

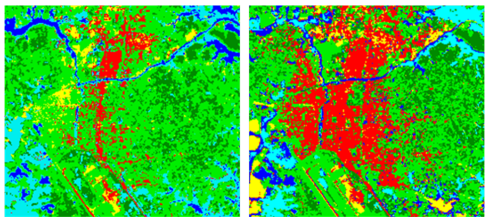

Fig. 1. Urban growth (red) over cultivated land (green) between 2000 and 2009 in Bangladesh, (Bitelli et al. 2013).

Furthermore, satellite multispectral data are used to detect the effects of salt water intrusion in coastal areas, by assessing the vegetation health status in natural areas potentially damaged. Salinization of aquifer influences plants inducing a photosynthetic properties and coverage changes. By comparing statistically the spectral responses of vegetation in the red and infrared channels, the most stressed areas can be identified.

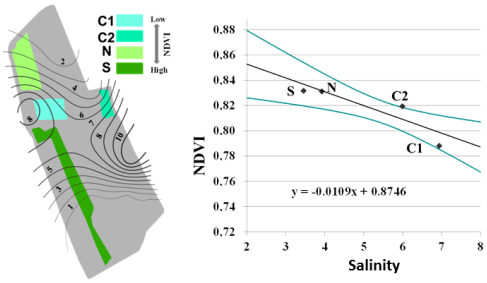

Fig. 2. Relationship between average salinity and NDVI values from WorldView-2 satellite image of a pinewood - Ravenna, Italy, (picture by Barbarella).

Energy efficiency applications in urban environments concern the use of airborne thermal imagery for the mapping of energy losses of buildings and in the implementation of practices for energy efficiency and reduction of CO2 emissions (EnergyCity European project; ChoT). The final data, derived from a complex image processing workflow, are used in energy models to flow into a Decision Support WebGIS. Urban Heat Island (UHI) phenomenon is addressed by using satellite imagery, whilst Solar Energy potential is analysed integrating different data in GIS.

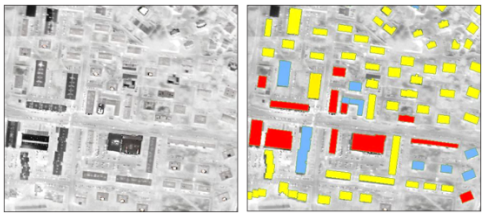

Fig. 3. Energy losses of buildings in urban areas: from original nocturnal thermal image to the use of processed data in a Decision Support WebGIS, (Bitelli et al. 2015).

In the event of a disaster, the availability of high-resolution multispectral satellite images, along with radar data, allows to realize in a short time and with a good level of precision the mapping of large areas, for emergency management and for damage assessment in a GIS environment. Local data can be acquired by UAV. Significant experiences that have been carried by the research team on various areas of the world concern floods, fires, tsunamis, landslides and earthquakes, in the latter case with the possibility of obtaining a first evaluation of the level of buildings damage.

Fig. 4. Bam earthquake (2003): buildings damage mapping through object-based classification of high resolution satellite imagery, (Gusella et al., 2005).

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PRIN2005: Analisi, comparazione e integrazione di immagini digitali acquisite da piattaforma aerea e satellitare. PI: G. Bitelli.

PRIN2007: La Geomatica a supporto delle azioni di Governo del Territorio. PI.: M. Barbarella.

PRIN2008: Mapper - Procedure di acquisizione ed elaborazione di dati multisorgente per il supporto alle emergenze. PI: G. Bitelli.

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SIR 2014 (MIUR). ChoT – The challenge of remote sensing thermography as indicator of energy efficiency of buildings. PI: E. Mandanici (2015-2018).

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