

MONITORING DESERTIFICATION USING EO TECHNOLOGIES: EXPERIENCE OF THE ESA DUE DESERTWATCH PROJECT.

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Desertification is the degradation of land in arid, semi-arid, and dry sub-humid areas. It is caused primarily by human activities and climatic variations. Desertification does not refer to the expansion of existing deserts. It occurs because dryland ecosystems, which cover over one third of the world's land area, are extremely vulnerable to over-exploitation and inappropriate land use. Poverty, political instability, deforestation, overgrazing, and bad irrigation practices can all undermine the land's productivity. Over 250 million people are directly affected by desertification. In addition, some one billion people in over one hundred countries are at risk. These people include many of the world's poorest, most marginalized, and politically weak citizens.

Combating desertification is essential to ensuring the long-term productivity of inhabited drylands. Unfortunately, past efforts have too often failed, and around the world the problem of land degradation continues to worsen. Recognizing the need for a fresh approach, 179 governments have joined as of March 2002, the United Nations Convention to Combat Desertification. This Convention aims to promote effective action through innovative local programmes and supportive international partnerships. The treaty acknowledges that the struggle to protect drylands will be a long one - there will be no quick fix. This is because the causes of desertification are many and complex, ranging from international trade patterns to unsustainable land management practices. Real and difficult changes will have to be made, both at the international and the local levels.

The desertification and land degradation risk in the north Mediterranean areas is receiving growing attention by the international community, as testified by the numerous national European projects on the subject carried out during the past few years. Many of them, such as LADAMER, GeoRange, DeSurvey, MODULUS, MEDALUS and RIADE, put a lot of emphasis on the exploitation of the EO data for the purpose of assessment and monitoring. The DesertWatch ESA DUE project, recently successfully completed, aimed at developing an integrated information system tailored on the specific user needs, built on the technological transfer of the most significant results of the related research projects.

The DesertWatch Information System, developed in the course of the project, is a user-friendly integrated Software remote sensing tool for monitoring desertification. Automated processing algorithms were included in order to enable non-specialised users to operate the system and produce the necessary information in all areas with comparable accuracy. The DesertWatch Information System can monitor up to 11 desertification related parameters, ranging from simple georeferenced indicators (e.g.: urban sprawl, irrigated areas, forest fires, vegetation abundance and health, soil erosion, etc.), to complex models which can simulate future scenarios of desertification and risk maps. A comprehensive demonstration phase has been carried out for testing the processing chain results over vast areas of Italy, Turkey and Portugal using data covering for the last 20 years. Most indicators were based on automatic generation of a land cover map with about 12 classes which, appropriately post-processed via GIS analysis, enable to obtain the necessary indicators. The

algorithms implemented for the automated land cover classification combine the strengths of the most sophisticated data processing tools, including fuzzy-logic automated training tool, multispectral multiscale image segmentation and data fusion. Validation results based on photointerpretation and field campaign indicate classification accuracy ranging from 80% to 90%. Due to the need of producing long data archives for the demonstration phases mainly Landsat images have been selected. Moreover, MERIS data have been used for the purpose of scaling-up a Landsat-based algorithm for the assessment of land degradation using water efficiency index. In the last project development phase, the system has been installed at the user premises in the various Host Institutions selected on the Project participating countries and has been successfully operated by the local stakeholders for producing updated products and indicators for several months.