SENTINEL-BASED AZORES REGIONAL FOREST INVENTORY

The Azores Regional Forest Inventory is a fundamental regional tool for supporting forest management and spatial planning policies in the Azores.

The challenge

The Azorean Regional Forest Inventory constitutes the core tool for forest planning and management and also the most accurate and reliable official Land Use / Land Cover map in the Azores Autonomous Region (Portugal), being widely used by local and regional authorities for supporting both spatial planning and forestry policies purposes.

The current Azorean Regional Forest Inventory was produced in 2007 by the DRRF (Forest Regional Department) staff through the combination of Geographical Information Systems (GIS) based on-screen photointerpretation of high spatial resolution aerial imagery (with a minimum spatial unit of 1 hectare) and exhaustive field campaigns for survey and validation. As the overall cost of this methodological procedure is very high (in both human, logistics and data resources) and time consuming, the periodic update of this cartographic product is not performed as frequently as needed for spatial planning and forest management purposes.

The space based solution

Satellite remote sensing has shown to be an appropriate tool to assess and monitor large-area forest attributes with reasonable accuracy levels. The use, integration and combination in the current Forest Inventory's methodological procedure of free-of-charge USGS/NASA (Landsat 8 multispectral data) and Copernicus remote sensing data provided by Sentinel-1 (C-band SAR) and Sentinel-2 (multispectral) sensors will significantly improve the regional decision-support system and successfully contribute to develop a more suitable and cost-effective operational system for mapping, inventorying, monitoring, assessing and managing natural (both native and invaded) and production forest areas in the Azores.

For this purpose, a remote sensing-based operational framework is being developed in order to: (1) accurately map Azorean forest areas through semi-automatic supervised classification; (2) detect changes in forest cover (by applying change detection algorithms); and (3) assess vegetation greenness and moisture status by computing and comparing several spectral indices (e.g. NDVI, SAVI, EVI, NDWI).

Benefits to Citizens

The development and implementation of a Remote Sensing-based forest monitoring operational framework able to support decision-making in spatial planning and to strengthen law enforcement by public authorities, will constitute an important step towards an effective promotion of cost-effective forest management and land use sustainability awareness amongst decision-makers, landowners/managers, further stakeholders and the general public. In fact, the development of a forest management approach strongly supported by an effective assessment of current resources, by the detection and monitoring of the most

The woody invasive species Pittosporum undulatum is a major threat for nature conservation in the Azores and requires appropriate management (about 24 thousand hectares). *Source: DRRF*

Thematic Area	Region of Application	Sentinel mission used	Copernicus Service used	Usage Maturity Level
AGRICULTURE, FOOD, FORESTRY AND FISHERIES	AZORES ARCHIPELAGO	S1 S2	–	3

relevant forest changes and land-use trade-offs might be able to mitigate the main negative ecological (e.g. loss or degradation of native vegetation areas, increase of areas invaded by alien plant species) and socio-economic impacts (e.g. loss or degradation of production forest; increase of bare soil and impervious areas). This operational framework will be fully aligned with multisectorial regional, national and EU policies related to Forestry Planning and Management, Land-use Management, Invasive Alien Species control, and Nature Conservation. It will also strongly contribute for all 3 strategic priorities of the first pillar of the Azores Research and Innovation Strategy for Smart Specialization: "Agriculture, Livestock and Agroindustry".

Cryptomeria japonica is the most relevant man-planted forest species in the Azores with approximately 12,400 hectares.
Source: DRRF

" The systematic use of Copernicus Sentinel data will improve significantly the canopy classification accuracy and update frequency of the Azores Regional Forest Inventory."

Anabela Isidoro,
Regional Director at DRRF

Outlook to the future

With the expected increase of available data, there will be a growing need for cloud-based data storage and processing services. The Copernicus Data and Information Access Services (DIAS) might be in the future the most suitable platform to implement this operational framework, in order to combine this information with further valuable data produced by DRRF (namely field surveys and UAV campaigns), therefore, fostering the implementation of a powerful multi-source decision-support system.

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