Sentinel-based Evolution of Copernicus Land Services on Continental and Global Scale

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Copernicus is a European Earth Observation (EO) programme headed by the European Commission (EC) in partnership with the European Space Agency (ESA) for the better understanding of the state and changes of our planet. Copernicus provides six operational services on the earth's main sub-systems (i.e. Land, Atmosphere, Oceans) and on cross-cutting processes (i.e., Climate Change, Emergency and Security). These services are largely based on EO satellite data, which will rely on the fleet of ESA's Sentinel satellites. The Copernicus Land Monitoring Service provides EO-based spatial information related to bio-geophysical variables and Land Cover/Land Use (LC/LU) characteristics as well as their changes over time. The related services are reflected in a Global, pan-European (Continental), Local Component, and an In-situ Component.

The Horizon2020 project, "Evolution of Copernicus Land Services based on Sentinel data" (ECoLaSS), which will be implemented from 2017-2019 aims at developing innovative methods, algorithms and prototypes to improve and invent future pre-operational Copernicus Land services from 2020 onwards, for the pan-European and Global Components. ECoLaSS will make full use of dense Sentinel time series of optical (S-2, S-3) and Synthetic Aperture Radar (SAR) data (S-1). Rapidly evolving scientific as well as user requirements will be analyzed in support of a future pan-European roll-out of new/improved Copernicus Land Monitoring services, and the transfer to global applications. This paper will describe the ECoLaSS concept, explain the current status of Copernicus Land services, the envisaged methods for their production and present first analyses and examples.

Service requirements assessment will be performed involving the main Copernicus Land stakeholders and users, and will thus steer methodological developments, such as: (i) Sentinel-1/-2/-3 time series integration, (ii) time series pre-processing methods, (iii) thematic classification and (iv) change detection from time series analysis, and (v) the development of an incremental update methodology for the Copernicus Land High Resolution Layers (HRLs). These methods will be applied on test sites, located both in Europe and Africa, prior to a prototyping phase. Larger demonstration sites representing various bio-geographic regions were selected to implement the following innovative prototypes: (i) indicators and variables from high spatial and temporal resolution data, for both the Continental and Global Component products; (ii) incremental update strategies for the main pan-European products (i.e. the HRLs); (iii) improved permanent grassland identification; (iv) crop area and crop status/parameters monitoring; (v) further novel LC/LU products. Finally, the main target to assess/benchmark all operational products in view of their innovation potential and technical excellence will be performed, leading to a strategy for an operationalization framework for a future pan-European roll-out of improved or newly developed Copernicus Land Monitoring services.

ECoLaSS will promote the innovation potential of new land monitoring services and applications to diverse user communities. The project will thus contribute to a growing "Copernicus Economy" by boosting (new) Copernicus Land Services and value-added applications (Downstream Services). It is expected that such new services will provide a variety of inter-linkages with other LC/LU projects, and bring new opportunities for a wide range of dedicated applications to the market from 2020 onwards.