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Digital twin technology used for assessment of ecosystems state in a climate change conditions in Romania

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Biodiversity and ecosystems monitoring and services evaluation are part of all major European and international policy making initiatives and actions, the GEO BON, UN SDGs and the EU green deal are probably the most important. Following the prepare-design-demonstrate approach of the EU climate change adaptation mission, after the mapping and assessment of ecosystems and their services process (MAES) implementation in Romania by our team through project Demonstrating and promoting natural values in support of decision-making processes in Romania - Nature4Decision-Making - N4D, we have focused on developing a set of remote sensing based indicators for assessing ecological conditions adapted to ecosystems, for five study cases one for each biogeographical region in Romania (alpine, continental, steppe, panonic, marine Black Sea). The analysis was performed in respect of the general objective of Exploitation of Satellite Earth Observation data for Natural Capital Accounting and Biodiversity Management - EO4NATURE project, to develop state-of-the-art concepts and standardized methods for addressing environmental challenges related to climate change. The specific objectives directly address the goals related to the Horizon EU mission like answering the ecosystem monitoring needs by integrating Copernicus Sentinel and other satellite data for deriving useful information for ecosystem assessment (ecosystem condition, ecosystem services). The developed framework can be used for a large amount of past, present and future EO data organized in data cubes to evaluate time series of indicators variability and to conclude for physical, chemical, composition, structural, functional and inter-ecosystemic states to express the vulnerability and resilience of ecosystems. The obtained results from EO4NATURE are part of main scientific and research initiative from Romania based on Competence Center for Climate Change Digital Twin Earth for forecasts and societal redressment: DTEClimate.