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# The impact of landscape and land use changes on the critical zone and society: the Belmont Forum ABRESO project

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The stable presence of humans in the Alps dates back to the Bronze Age and peaked in the mid-19th century, deeply shaping the landscape and allowing the co-evolution of numerous plant and animal species. Since the 1950s, socio-economic changes have led to the gradual depopulation of mountain areas, and the consequent abandonment of traditional agro-pastoral activities. The rupture of the long-established balance between man and nature has triggered a process of transition, further exacerbated and accelerated by climate change. The Belmont Forum project ABRESO (Abandonment and rebound: Societal views on landscape and land-use change and their impacts on water and soils) started in 2021 and aims at advancing the understanding of mitigation and adaptation strategies to environmental change, through an international partnership involving five countries (the United States, France, Italy, Japan and Taiwan). Italy contributes to the project with three case studies: Gran Paradiso National Park, Val Grande National Park and the Tesino highlands are investigated in the Italian Alps. Using an interdisciplinary approach, the project aims to study the impact of the abandonment of traditional activities on ecosystem services provisioning, such as biodiversity conservation and soil sustainability, as well as the actual perception of the ongoing environmental changes by different stakeholders and its subsequent integration into local land management practices and policies. The land use and land cover change occurring due to land abandonment can have profound implications in the critical zone (CZ), inducing changes in soil, vegetation, carbon fluxes and water resources. This project integrates the natural and social sciences approaches to study the evolution of ecosystems in response to these factors. More specifically, advanced techniques that integrate Earth Observation, biogeochemical analyses and socio-economic investigation are used in the Italian sites to understand in which extent geo-biophysical and social landscapes reciprocally interact. The environmental variables collected for ecosystem monitoring and to study and upscale the ongoing dynamics in the CZ include snow cover and phenology parameters, soil organic carbon, and land use change maps extracted from time series of satellite imagery,

validated via in situ measurements. Then, the observed processes will be compared to the perception of different stakeholders (local population, policy makers, tourists, business keepers, etc.) to unveil new insights into the way land use change in the mountain areas influence and is influenced by the local land management practices and policies.