

# Mapping and modeling of ecosystem services in protected mountain areas

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Mountain ecosystems provide a number of vital services for people and society, such as biodiversity, water resources, carbon sequestration, and recreation. However, they are extremely vulnerable to different kinds of impact therefore their future capability to provide these services is determined by changes in socio-economic characteristics, land use and climate. Differences in exposure to these changes may lead to widely varying causes of their vulnerability across different landscapes which should be taken into account in decision making. Here we use a combination of different bio-geophysical GIS data, model estimates and expert assessment to evaluate the supply and demand of ecosystem services. The capacity of landscapes to provide services is assessed on a relative scale ranging from 0 to 5 and an ecosystem services matrix-based mapping approach is applied to reveal the spatial and temporal variation of both supply and demand.

The approach was applied in case study area located in Rila National Park, Bulgaria. It includes the area Seven Rila Lakes which is one of the most spectacular parts of Rila Mountain and includes lake ecosystems which are fragile to any kind of impact. Although, there are very well preserved natural ecosystems, the area is under increasing anthropogenic impact in recent years which leads to increasing awareness of the environmentalists and caused serious discussions on the landscape management of the area. Land cover data obtained by visual interpretation of aerial photographs from 1988 and 2010 were used to reveal the landscape heterogeneity of the area and the land use changes for this periods. InVEST model was applied to quantify regulation and habitat services such as carbon sequestration and biodiversity, while the cultural services were assessed by expert based survey. The results of the study are used to prepare recommendations

and management measures for the new management plan of the national park which should be operational by next year.