

Publication

Snowmaking in a warmer climate: an in-depth analysis of future water demands for the ski resort Andermatt-Sedrun-Disentis (Switzerland) in the twenty-first century

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Rising air temperatures threaten the snow reliability of ski resorts. Most resorts rely on technical snowmaking to compensate lacking natural snow. But increased water consumption for snowmaking may cause conflicts with other sectors' water uses such as hydropower production or the hotel industry. We assessed the future snow reliability (likelihood of a continuous 100-day skiing season and of operable Christmas holidays) of the Swiss resort Andermatt-Sedrun-Disentis throughout the twenty-first century, where 65% of the area is currently equipped for snowmaking. Our projections are based on the most recent climate change scenarios for Switzerland (CH2018) and the model SkiSim 2.0 including a snowmaking module. Unabated greenhouse gas emissions (scenario RCP8.5) will cause a lack of natural snow at areas below 1800-2000 m asl by the mid-twenty-first century. Initially, this can be fully compensated by snowmaking, but by the end of the century, the results become more nuanced. While snowmaking can provide a continuous 100-day season throughout the twenty-first century, the economically important Christmas holidays are increasingly at risk under the high-emission scenario in the late twenty-first century. The overall high snow reliability of the resort comes at the cost of an increased water demand. The total water consumption of the resort will rise by 79% by the end of the century (2070-2099 compared to 1981-2010; scenario RCP8.5), implying that new water sources will have to be exploited. Future water management plans at the catchment level, embracing the stakeholders, could help to solve future claims for water in the region.

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