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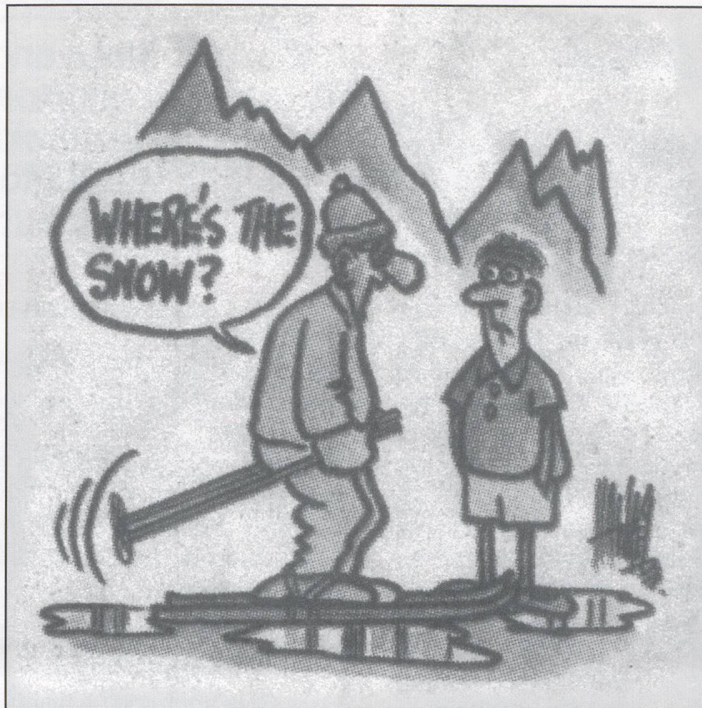
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Climate change is threatening the economic viability of many alpine regions, as snow becomes less plentiful and avalanches and mudslides more common. In response, alpine countries are working together to see what can be done to preserve these areas.

Many alpine areas depend on winter tourism for their survival. There are more than 40,000 groomed ski slopes in the Alps, covering about 1,000 square kilometres. They attract millions of skiers every year and more than 10,000 ski lifts and mountain railways have been built to accommodate them.

But increasingly global warming is threatening the existence of these resorts, and those who depend on them for their livelihoods. Alpine countries have responded by trying to learn about how the environment is changing and what they can do about it. The result is the "Cartesian" project, which is supported by both the public and private sector. It's a computerised system that can simulate the effects of the climate on an alpine region, and provide guidance as to how communities need to respond. "We have to find a balance between nature protection and economic growth," says Hans-Caspar Bodmer, from the Swiss Federal Institute for Forest, Snow and Landscape Research, who heads the project in Switzerland.

He says the drastic decline in alpine farming has left alpine regions no choice but to depend on tourism. "I think tourism is very important because it might be the only basis for survival in the Alps."

The Cartesian system, which is being presented to the public after two years of research, makes use of cutting-edge technology, including satellite imagery and 3D models. The brainchild of Jeroen Aarts of the Netherlands, the system, he says, has shown that ski resorts can no longer carry on as before. "Either the ski resorts face large problems or they change their habits," says Aarts. "They can't only aim at winter tourism but at summer tourism. We provide methods for creating a vision for the future."

A specialist in satellite imagery, Aarts has worked closely with Swiss researchers, tourist operators and resorts in Switzerland, France and Austria on the project.

"We say: 'Well, you have a resort now, but if you think about the future, the economy is changing, the climate is changing, we know exactly what is happening based on our images.' How should they adapt their resorts to face these kinds of changes? Should they invest more in summer tourism, or more in eco-tourism? We're trying to provide some of these answers," Aarts adds. One of the answers concerns snow cover. A case study was done in Veysonnaz in canton Valais. Satellite images of the area were scanned every couple of weeks over a 12-month period to determine the extent of snow

cover. "We can then show a resort where there is reliable snow cover and where there isn't," Aarts explains. "You can say something about snow duration in certain spots. If you want to construct a new ski lift for instance, the snow duration maps can be used to detect the most suitable places for a new ski lift."

The system also rates susceptibility to natural hazards including avalanches and mudslides and provides information on changes to the landscape over the past 100 years. Fed into a computer, the data can be weighted using various criteria including environmental, social and economic factors, and sustainable development.

"This project is not a step by step guide," says Bodmer. "We want to show people that if they think more laterally, more integrally, they'll probably find better solutions. I think it's important to develop a participative process so that all people, all the stakeholders, can be involved, and can work together to find a solution suitable for everyone."

One partner in the project is the giant tour operator in Germany, Tui. It has a vested interest in ensuring that the Alps remain attractive, and has created an eco-label to encourage resorts to manage themselves better. It rates resorts on everything from accessibility by public transport to the environmental impact of its activities.

"In Holland, our research shows that of the one million Dutch who go skiing every year, 27 per cent are very interested in the eco-label," says Aarts.

As far as Switzerland is concerned, Bodmer says the Cartesian system has come at the right time. "The discussion between the tourist industry, business interests and nature conservationists is already very intense and actually very fruitful."

And that discussion is set to intensify. The latest scientific study has found that there'll be little if any snow at Swiss ski resorts lying below 1,500 metres above sea level in the coming decades, affecting 40 per cent of all ski resorts in the country.

(Article supplied by Swiss Radio International <swissinfo.org>)