

**Zeitschrift:** Swiss review : the magazine for the Swiss abroad  
**Herausgeber:** Organisation of the Swiss Abroad  
**Band:** 34 (2007)  
**Heft:** 3

**Artikel:** Climate change : will palm trees soon flourish in Switzerland?  
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**DOI:** <https://doi.org/10.5169/seals-907558>

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## Will palm trees soon flourish in Switzerland?

Global climate change also affects the climate in Switzerland. An extensive study of global warming in our country forecasts "serious consequences" and "major damage". Melting glaciers are a particular concern. Even so, the Federal Council and Parliament are adapting their climate policies at snail's pace.

By Rolf Ribi

The beautiful image in the advert could hardly have been more controversial. It depicted a powerful off-road vehicle against the backdrop of a snow-white glacier. Who ever thought of combining a 600-horse-power, polluting "king of the road" with a frozen world threatened by increasing carbon dioxide levels? "I witness the effects of climate change first hand," says geologist Jürg Meyer. "As an alpinist and mountain guide, I can see dramatic changes in the mountains."

Climate and environmental policies are currently right at the top of the political agenda in Switzerland. The Swiss have realised that temperatures and rainfall have changed in recent times, and that heat waves and water shortages are increasingly common occurrences in the summer, as are a lack of snow and flooding in winter. And the politicians appear to be accepting that the key factor driving climate change in Switzerland and elsewhere in the world is the rise in carbon dioxide (CO<sub>2</sub>), which acts as a greenhouse gas in the atmosphere, thereby warming the planet.

### Facts about global warming

There are a number of facts about the change in climate that has occurred in Switzerland:

- In the 20th Century, the average temperature rose by 1.6 degrees Celsius in western Switzerland, by 1.3 degrees in German-speaking areas and by 1 degree in the southern Alps. That is far more than the worldwide increase of 0.6 degrees over the same period.
- The record-breaking summer of 2003 was the starker evidence so far of climate change in Switzerland. In the summer months from June to August, the mean temperature was more than five degrees higher than the average for the last 140 years. Meteorologists in Mesocco in southern Grisons

registered a Swiss all-time high of 41.5 degrees.

- In the three autumn months of 2006, Switzerland was more than one degree warmer than in the previous record autumn of 1987 and more than three degrees hotter than the average temperature in the years 1961 to 1990.
- The winter of 2006-7 was the warmest in central Switzerland since records began in 1864, with temperatures about 3.1 degrees over the average from 1961 to 1990.

The climatic changes being witnessed in Switzerland mirror global changes. Over the course of the 20th Century, mean global temperatures rose by 0.6 degrees. Researchers predict that temperatures around the world will climb by a further 0.8 to 2.5 degrees by 2050, and be somewhere between 1.4 and 5.8 degrees higher than 1990 levels by the end of the 21st Century. The amount of carbon dioxide in the atmosphere is currently almost 30 percent higher than at any other time in the past 650,000 years, while global emissions are currently increasing by 3.2 percent every year.

### The climate in the year 2050

What will conditions be like in Switzerland in 2050? This question was addressed by the OCCC, the body advising the Federal Government on climate change, which has now presented its findings. More than a hundred scientists and other experts have done their meteorological calculations to see what climate Switzerland can expect to have by the middle of the century, and they have made what they term a "realistic" prediction. Their report states that by 2050, average temperatures in Switzerland will be about two degrees higher than today in the autumn, winter and spring, and almost three degrees higher in the summer. "By 2050, the temperatures in Zurich will be similar to those currently experienced in Sion in Val-

ais given slight global warming, they will be similar to those in Magadino in Ticino in the case of moderate global warming, and similar to those experienced in Turin in Italy if there is strong global warming," the report says.

The report goes on to say that rainfall will increase by about 10 percent in the winter and decrease by 20 percent in the summer. "We must expect a rise in extreme rainfall, flooding and mudslides, especially in winter, but also in the summer," it says. "The incidence of summer heatwaves and possibly also droughts will generally increase."

Global warming will also have an effect on the Swiss countryside and its flora and fauna. Trees and other vegetation will grow at higher altitudes, and more and more indigenous species of plants will die out, while plants and animals from warmer regions will spread into Switzerland. An increase of just 1.5 degrees could threaten the edelweiss with complete extinction. Global warming has already brought change to Switzerland. Wild palms now bloom in Ticino, and in Valais the Scots pines are being replaced by oak trees. Martin Grosjean of Berne University considers it "perfectly conceivable" that palm trees will one day grow and flourish in central Switzerland.

The following are the key points that the OCCC report makes about the effects on tourism, agriculture, water supplies and energy:

### Major effect on tourism

Global warming has far-reaching implications for tourism. Between now and 2050, the snow line will rise by 350 metres. Low-lying ski resorts will rarely have sufficient snow. Ski-based tourism is under threat in the Vaud and Fribourg Alps, in Ticino and in central and eastern Switzerland. Skiing areas in Valais and Grisons will be less affected. In areas where winter sports die out, many hotels and transportation companies will be forced to close down. Heavy rain and other extreme weather patterns could damage or close roads and other transport routes. Shrinking glaciers will spoil the beauty of the alpine landscape. Areas at altitudes over 2000 metres will get more snow than they do now, which will benefit the local resorts, although it will also increase the risk of avalanches.

Warmer summers would encourage people to take their holidays in the cooler Al-

pine air. The summer peak season could also be extended. Alpine health and beauty holidays will be more attractive. Tourism is not only affected by climate change; it is also one of the key perpetrators of it, especially through personal transportation.

### More risks for farmers

A moderate rise in temperature of two to three degrees could prove favourable for agriculture. The growing season would be longer, the number of frost days would diminish, grain, fodder, vegetable and grape harvests would increase. But more summer sun would also mean more drought damage and crop losses for farmers, not to mention too little water for irrigation.

Farmers must therefore protect themselves against the greater risks, for instance by using new varieties or changing crops, and improving pest control and water management. "If average temperatures go up by five degrees, the Emmental valley could be used for rice-growing," says Environment Minister Bruno Oberle.

### The effects on water supplies

Rain and melting snow and glaciers currently provide Switzerland with plentiful supplies of water. Climate change would de-

crease the available water in the summer and autumn. An increasing number of summer heatwaves could reduce the flow of water in medium-sized or even larger rivers in central Switzerland to wintertime levels. Groundwater reserves in valleys will diminish considerably in late summer and the autumn.

The potential for flood damage will grow. Experts are predicting more frequent and more severe flooding primarily in winter in central areas, the Jura, the foothills of the Alps and Ticino. However, "Climate change will mean that the available water supplies will not be able to satisfy the demand at all times and in all areas." Water consumption will have to be managed, and better flood protection put into place.

### Changes in the energy sector

As a result of the climate change, less energy will be required for heating in winter, while more will be needed for refrigeration in summer. That will shift the emphasis in energy consumption from fuels to electricity. In terms of electricity production, global warming has a negative impact on hydroelectric and nuclear power. Less water means that less hydroelectric power can be generated, while warmer river water re-

stricts production at nuclear power plants because it is less effective for cooling.

Increased demand for CO<sub>2</sub>-neutral energy sources favours the use of renewable energy. Although this only accounts for 3 percent of electricity supplies at present, it could be increased to 10 percent by 2035 and even more by mid-century. This creates a potential for small hydroelectric power plants, wind farms, biomass fuel, geothermal energy and solar power.

### The experts' conclusions

The Swiss scientists behind the OCCC report reached a number of clear conclusions:

- "The greatest contribution towards solving the climate problem would be to drastically cut emissions of greenhouse gases. There is simply no alternative."
- "Our actions today will determine the climate of the future and the massive associated socio-economic costs beyond 2050." In the second half of the 21st Century, climate change will "have serious consequences and create major damage" in Switzerland.
- Nevertheless, "Switzerland has a long tradition of adapting to natural dangers". Flooding, landslides and rock falls have al-



The Trift glacier in the Bernese Alps taken from the same place on 30 June 2004 (left) and 30 June 2005 (right). Switzerland's glaciers continue to melt. Measurements taken between 2004 and 2005 showed that 84 of the 91 observed glaciers



had receded. The most dramatic melting was seen along the tongue of the Trift glacier, which had receded by 216 metres. The second largest shrinkage was recorded on the Aletsch glacier (cover photo), which receded by 66 metres.

ways shaped our landscape and influenced our attitudes towards it. "Our country will continue to have the financial means and the technological know-how to adapt to climate change."

### When glaciers melt

Climate change in Switzerland has two key natural elements: the gradual shrinking of its glaciers, which has been observed for years, and the melting of the permafrost in the high Alps.

A famous folk song from the Bernese Oberland begins "In Grindelwald den Gletschern by". Glaciers are an integral part of the Swiss sense of home, as well as an attraction for tourists. Glaciers cover 3 percent of the country's land mass and store the equivalent of the average annual rainfall in the form of ice and snow. They are crucial to the water cycle. In cold and rainy years, they store water as snow and ice, and in hot, dry years they supply water to lowland regions. "If this compensatory function can't be guaranteed any longer, it will lead to severe water shortages," says glacier expert Wilfried Haeberli.

Switzerland's glaciers halved in size between 1850 and 1970, and they had shrunk further still by the year 2000. "Only about a quarter of today's glaciers will be left by 2050," predicts Professor Haeberli. He says that only one thing is to blame for this: the rise in temperature. According to the OCCC researchers, many small and medium-sized glaciers will have disappeared by the second half of the century, and in the absence of effective climate protection measures even most of the large glaciers will melt towards the end of the century. If that happens, little water will flow down even the major Alpine rivers anymore.

A third of the upland areas of Switzerland at 2500 metres and above are permanently covered in ice and snow. "Warm winters have a destabilising effect on permafrost areas with steep rocky slopes," says Daniel

Vonder Mühll, a geophysicist. One possible consequence of this is an increase in the number of rock falls.

### The slow pace of political change

The greenhouse gas carbon dioxide is the main cause of global warming. The CO<sub>2</sub> law enacted by Parliament in 2000 is the centrepiece of Swiss climate policy. The law demands an "incentive" tax on fossil-based fuels, specifically a CO<sub>2</sub> tax on petrol and diesel if voluntary measures fail to bring the economy round.

The Federal Council decided on this approach as far back as 1990, and yet centre-right politicians, business lobbyists, homeowners and automobile associations have blocked the CO<sub>2</sub> tax time and again. By 2005, it became clear that voluntary measures would not suffice, and the Federal Council demanded a CO<sub>2</sub> tax on fuels. By the end of the following year, both the National Council and the Upper Chamber had finally given their approval too. As a result, a CO<sub>2</sub> tax of CHF 0.06 per litre will be levied on heating oil from 2009, increasing to CHF 0.09 the year thereafter.

When the Upper Chamber passed the bill on the CO<sub>2</sub> tax on heating oil, coal and natural gas fully two decades after the Federal Council's initial efforts, the move was heralded as an "historic" step. And yet the Swiss approach to climate policy is good in many ways. The tax makes fuels more expensive and encourages consumers to use less fossil-based energy. It rewards investment in insulation for buildings and heating systems incorporating heat pumps and wood-burning, solar and geothermal energy. The revenues generated by the incentive tax on fuels are redistributed equally between the Swiss people (in the form of a CHF 50.00 credit on their health insurance premiums) and the economy. "The tax sets an example for future policymaking on environmental and energy issues," wrote the *NZZ* newspaper.

And the incentive tax on petrol? Transport lobbyists and the economy have managed to block it to the present day. Instead of imposing a CO<sub>2</sub> tax of this kind, the Government introduced the so-called "climate cent" (a surcharge of CHF 0.015 on every litre of petrol and diesel purchased) in 2005. The annual revenues of about CHF 100 million from the climate cent flow through a private foundation into domestic and for-

eign projects aimed at reducing greenhouse gas emissions. It has not had any perceivable effect on petrol consumption. In the transport sector at least, Swiss climate policy has failed thus far.

### Precious time has been lost

"Switzerland has done nothing to improve climate protection since the end of 2002," complains Patrick Hofstetter, a climate expert at WWF Switzerland. So it's hardly surprising that Switzerland has failed to meet its legal and contractual climate targets. Following the world climate summit in Tokyo, Switzerland pledged to reduce its carbon dioxide emissions by 8 percent over 1990 levels by 2012. The CO<sub>2</sub> law demands a 10-percent reduction in carbon dioxide by 2010.

Today the Federal Council is forced to concede that although its transport and energy policy and the voluntary measures taken by industry have kept greenhouse gas emissions at 1990 levels, it has not been able to push them below this mark. "Switzerland will not meet its statutory Kyoto targets," says ETH professor Eberhard Jochem. "Precious time for action and investment has been lost." Decisive action on climate protection is desperately needed. Switzerland is one of the world's worst CO<sub>2</sub> polluters, ranked sixth overall (behind the United States, Canada, Australia, Germany and Denmark) in terms of per-capita CO<sub>2</sub> emissions.

### "We only have this one planet"

"In the best-case scenario, greenhouse gas emissions would be cut drastically and worldwide and global temperature rises would be limited to two degrees," says environmental and climate physicist Fortunat Joos from the University of Berne. ETH professor Willy Tinner is not concerned about the ecosystems, which have always adapted over time. "I'm only worried about the people who depend on those ecosystems," he says.

Probably the most poignant comment was made by Swiss astronaut Claude Nicollier, who had four opportunities to look down on Earth from space on board the space shuttle. "I love our planet," he said. "I love life and I wish that our descendants will be able to enjoy a healthy and harmonious existence for millions of years to come. Earth is the only home we humans have."

#### DOCUMENTATION

Klimaänderung und die Schweiz 2050 (Climate Change and Switzerland in 2050). Advisory Body on Climate Change (OCCC), Berne 2007. Report available for downloading (in German) as a PDF document from [www.occc.ch](http://www.occc.ch). Individual copies can be ordered from OCCC/ProClim, Schweizerische Akademie der Naturwissenschaften, Schwarzerstrasse 9, CH-3007 Berne Reports by the UN's Intergovernmental Panel on Climate Change: [www.ipcc.ch](http://www.ipcc.ch). Public information: [www.doku-zug.ch](http://www.doku-zug.ch)