



eurac
research

DOSSIER
**CLIMATE CHANGE
AND THE
CONSEQUENCES
FOR SOUTH TYROL**

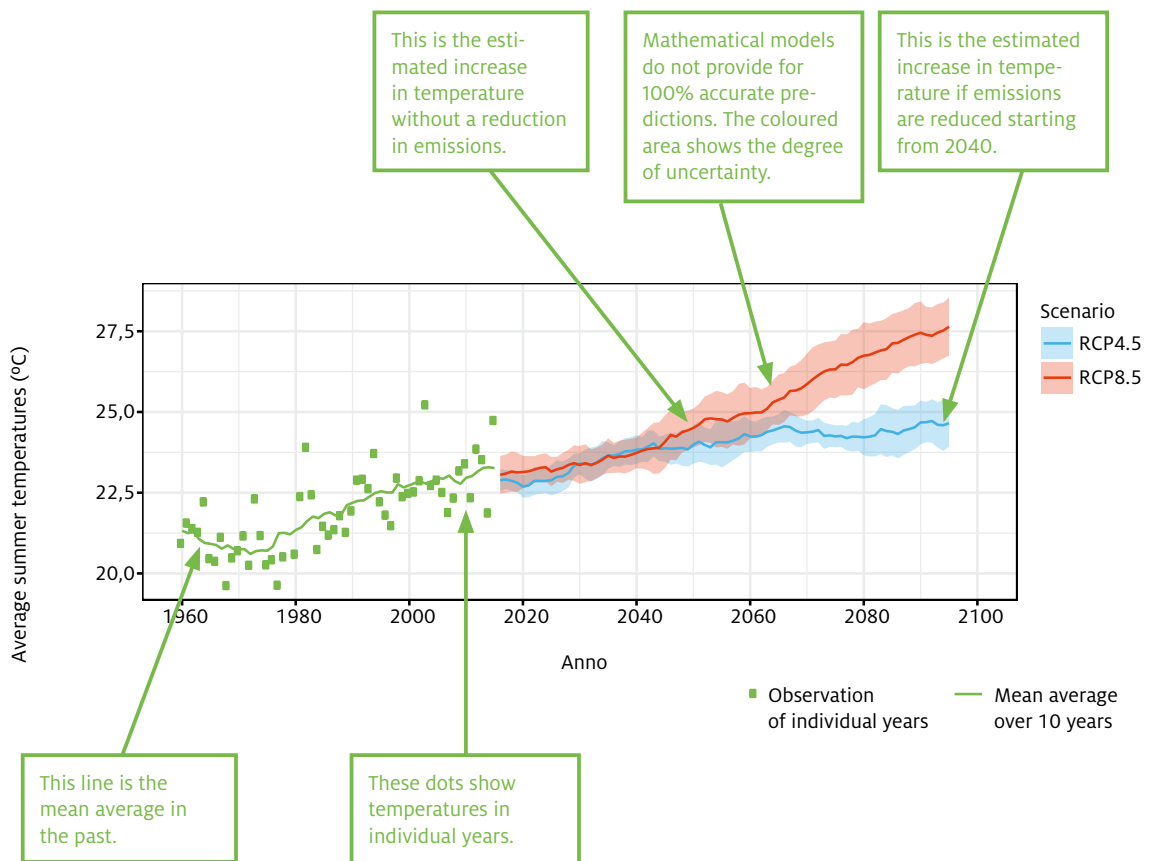
April 2018

The following dossier provides the most important findings of the 2018 South Tyrolean Climate Report. The complete report can be found at www.eurac.edu/Klimareport (in German) or at www.eurac.edu/rapportoclima (in Italian).

How has the climate in South Tyrol changed?

Climate change in South Tyrol is clearly apparent in our increasing temperatures: since the 1960s the annual average temperature has risen by 1.5°C. During summer periods, the temperature in Bozen-Bolzano and Brixen-Bressanone has risen by as much as 3°C. According to the most pessimistic scenario, we can expect a further increase in temperature during the summer periods of up to 1.5°C by 2050 or possibly as

much as 5°C by 2100. Another notable factor is the rise in the number of tropical nights (nights during which the temperature remains above 20°C). During the 1960s in Bozen-Bolzano you could count them all on the fingers of one hand; in 2015 alone there were a record 29 such nights. By the end of the century, the number of tropical nights could rise to as many as 60 per year. There has also been a significant decrease of days with a minimum temperature of below 0°C, even in mountainous areas. The municipality of Sexten-Sesto recorded 200 such days in 1960; today they have fallen to 160 and by 2040 there may be no more than 140.



According to the most pessimistic predictions, the summer temperatures may rise 5°C by 2100.

How does warming affect the environment?

Along with the changes in temperature, there has been a change in the amount of precipitation and other natural phenomena. Between 1983 and 2006 the glaciers in South Tyrol have lost a third of their size. There is less snow and the permafrost is thawing, resulting in unstable mountain slopes, as seen at the Kleine Gaisl in the Sextener Dolomites in 2016. Another, less obvious example is the impact on animal and plant life. Over the past 20 years plants and animals have moved their living space to higher altitudes to escape rising temperatures, while new species are settling in the lower regions. Parasites and tiger mosquitos are spreading ever more rapidly. The blackbird and the redstart can now be found above the tree line, while the grey heron now hibernates in South Tyrol. Furthermore, the forests below 700m must contend with invasive species such as the *Robinia* (black locust). For now, this results in the presence of a wider variety of species up to 2,000 metres, but in the long run those species already living at high altitudes will not be able to survive.

Can an increase of temperature of just a few degrees really wreak havoc on ecosystems?

Yes, because any change results in complex chain reactions and inevitable feedback effects. Perhaps this is easier to see in its effect on our society. Take water,

for example. Apples and grapes now grow at higher altitudes due to the increase in temperature, resulting in a larger production area. Currently, 60% of irrigation is used for fruit orchards. As summers become increasingly drier, it is easy to imagine that the water required for intensive farming and for meadowland will increase significantly. Today water is consumed at a rate of 14 cubic metres per second for irrigation during the month of June. In 30 years provincial experts estimate that this will have increased to 16 cubic metres per second. At the same time there is less and less available water: it is very likely that the agrarian and energy sectors will come into conflict with each other in the future over the prioritisation of water usage.

How reliable are these predictions?

No mathematical model can predict the exact future of the climate. There are many complex interrelationships and influences at play. Nevertheless, trends can be deduced from long-term data collection of temperature changes, soil humidity and precipitation. Climate predictions are made on the basis of such data. The better the data, the more robust the predictions. Thanks to the work of the meteorological stations of the hydrographical office of the Autonomous Province of Bozen-Bolzano, we now have reliable data dating from the last 50 years in South Tyrol (20 years in relation to natural risks). Furthermore, our research institutes constantly add valuable information from the analysis of satellite data and other precise instruments. We can assume that temperatures will continue to rise in the future. It is more challenging for scientists to predict other phenomena, such as precipitation, but trends are also emerging in relation to this issue.

What other trends are emerging?

Due to the higher temperatures, there will be less snow and more rain. It is estimated that at an altitude of

1,500m there will be 80-90% less snow by 2100. This means that there will be increasingly less water available during the summer months. Summers are becoming drier and warmer. The heat accelerates evaporation, both through plants and from the soil. Furthermore, there is a chance that summer precipitation will decrease. Apart from a few localised exceptions, this means that rivers will have less water during the summer months. Since 1957 the amount of water in the river Etsch-Adige has decreased by 20% during the summer months.

There will be 80-90% less snow in 2100 at an altitude of 1,500 metres.

But during the winter of 2017/18 there was a lot of snow—much more than usual. How can scientists claim to predict our weather in 80 years' time, when they are not certain about the weather next week?

Climate and weather are two different things. One snow-rich winter or an unusually cool summer are not enough to cast doubt on the reality of climate change. Based on temperature, the winter 2017/18 was completely in line with other winters. Temperatures in South Tyrol were average; however, they were extremely high in other parts of the world. In the north of Greenland a temperature of 6°C was recorded in February 2018, 20°C higher than what is usual for that

time of the year. Cape Town was running out of water due to heat and drought, while in Australia temperatures of above 40°C caused tarmac to melt in the streets. Therefore, from a global viewpoint, the winter 2017/18 was unusually warm.

Will nature be more hostile to us in the future?

That's not the right question to ask. Let's look at it differently. Experts agree that extreme events such as strong downpours will become more commonplace. There will therefore be more flooding in residential areas, particularly if sewage systems are not able cope with the amount of water. The mudslide which blocked a train in the Oberpustertal-Alta Pusteria during the summer of 2017 or the flooding in Bozen-Bolzano during April of the same year are only a taste of what we can expect in the future. Despite these events, we continue to cover ever more soil with roads, parking lots and buildings, meaning rainwater can no longer reach the soil. Sealing the surfaces in this way accelerates the warming of the atmosphere and pushes our canalisation and infrastructure to the limit.

Extreme events such as heavy rain are becoming more frequent.

Aren't these doom and gloom scenarios a bit exaggerated?

Unfortunately not. Even in the most optimistic case, if humankind stopped producing greenhouse gases immediately, it would be too late to stop climate change. For a second time in a row the most recent risk report of the World Economic Forum has called climate change one of the most significant global risks, on

a par with social injustice. Today there is a higher amount of greenhouse gases in the atmosphere than at any other time in the past 800,000 years. Eighty percent of this warming is man-made by burning fossil fuels and through industrial processes.

There is little industrialisation in South Tyrol. Does this mean we are less responsible for climate change?

South Tyrol produces up to 5.3 tons of CO₂ emissions per inhabitant; in Italy the average is about 7 tons. Two factors are working in our favour:

1. We have very few industrial complexes that use fossil fuels, and
2. We are making good use of renewable energies – particularly biomass and hydro-electric power, which means that we can satisfy our electrical needs almost without emissions.

However, this does not mean that we can rest on our laurels.

Why not? What are the relevant sources of emission in South Tyrol?

Traffic, including transit traffic on the Brenner motorway, amounts to 44% of our entire emissions. Traffic emissions are therefore higher than the Italian average. Second is the production of thermal energy: 36% of emissions are the result of heating in old houses and inefficient heating systems. Third is the agrarian sector, contributing 18% of the emissions, particularly through methane and nitrous oxide, which is also higher than the Italian average. This does not even account for the so-called 'grey emissions', which are being pro-

duced outside our provincial boundaries, but which relate to products we consume, such as clothing, food, telephones and other technical devices. It is precisely because South Tyrol has little industry that many of our goods are imported.

What emissions are we responsible for if we also take the 'grey emissions' into consideration?

Based on calculations of the Agentur für Energie Südtirol – KlimaHaus/Agenzia per l'Energia Alto Adige – CasaClima, with grey emissions taken into account, every citizen produces the equivalent of 7.5 tons of CO₂. This means we are anything but a good example. Much depends on how you calculate these emissions. Take the production of milk as an example. If we accounted for all emissions related to the production of milk either inside or outside the province and included energy use and milk transportation in the total, then this sector alone would be responsible for more emissions than the entire agrarian sector put together.

If all the greenhouse gases that are created in the production of milk were accounted for, then this sector alone would be responsible for more emissions than we allocate to the entire agrarian sector.

There are too many initiatives focussing on nature protection in our province.

It's true we do a lot. However, it is still not enough to slow down climate change and to reduce our emissions. If we wanted to reach the goals of the climate plan, we would have to reduce emissions by 30% by 2050. When it comes to developing measures to prepare for climate change and its consequences, we are just at the beginning of the process. For years, the international scientific community as well as the EU have been recommending the combination of climate protection and climate adaptation as part of a comprehensive strategy that includes all sectors: traffic, tourism, the hydroelectric industry, spatial planning, etc.

What's missing in South Tyrol's environmental policy?

Energie-Südtirol-2050/Energia-Alto Adige-2050, a climate plan published in 2011, is a basic strategic instrument. There are action plans at local level and initiatives such as the KlimaHaus Certification and the Green Mobility Programme (which sponsors electric mobility) that should be lauded. However, according to the "Strategia Nazionale di Adattamento ai Cambiamenti Climatici" (National Strategy for Climate Change Adaptation), all regions should develop corresponding plans for climate adaptation.

Tasks of South Tyrolean Policymakers:

- Translate the Paris Agreement into concrete instruments at the local level, reassessing the climate plan "Energie-Südtirol-2050" (Energy-South Tyrol-2050)

- Draft an encompassing climate adaptation strategy
- Integrate climate protection and climate adaptation measures into laws and specialised plans, especially into the provincial law for spatial planning and the agrarian sector, the plan for water use, the plan for dangerous zones and the provincial forestry plan
- Add climate adaptation to the Sustainable Energy Action Plans (SEAP) in force in municipalities
- Appoint a Sustainability Officer whose job will be to coordinate measures in various areas, oversee implementation and evaluate progress.

In which sectors in South Tyrol do we need to take urgent action? And how?

First and foremost there is water management. It is extremely important to reduce our consumption of water. It is also paramount to reduce the emissions created by traffic and tourism. Ideally, all sectors need to be aware of increased challenges posed by natural disasters. All these issues represent new challenges, but also potential opportunities.

Tasks of the Most Important Sectors

<i>Conserve Water</i>	Examples: allowances according to need rather than set quotas / more drip irrigation / more and more precise systems to survey soil humidity and related adaptations of the irrigation systems / more precise seasonal predictions
<i>Reduce Traffic Emissions</i>	Examples: more reliable and coordinated public transport / less and more expensive parking / more infrastructure for cyclists and pedestrians / more subsidies for cars with electric, hybrid and hydrogen engines and an extension of related service stations / add environmental costs to motorway tolls

Reduce Tourism Emissions

Examples: subsidies for tourist arrivals and departures via public transport, including better links to airports / more initiatives to entice tourists to leave their cars behind, such as rental electric vehicles and the closure of mountain passes / more KlimaHotels and BioHotels / certificates such as the Green Star, Green Globe and Earthcheck for the most sustainable companies

Climate change is a major challenge, but it contains plenty of new opportunities.

How can climate change spell opportunities for tourism?

Less snow in the winter has caused some fear for those working in traditional winter tourism resorts. While the number of skiers has declined slightly, the number of snow cannons has increased five times between 1995 and 2015 making the creation of artificial snow increasingly environmentally unsustainable. However, climate change has also resulted in increased environmental awareness, and this is an opportunity for two reasons: First, it facilitates the promotion of new tourist experiences, for example, cycling tourism with E-bikes or the traditional "Sommerfrische". According to our studies, it is likely that the ratio between winter tourism and summer tourism (so far 40%-60%) will change. In 2080 tourists in summer could reach 77% of the total amount. Secondly, it motivates us to reconsider tourism as a whole: to introduce more natural, climate-friendly offers such as holidays on a farmstead (agritourism), certification along environmental criteria and initiatives supporting the increased use of public transport.

What can an individual do? How can one not become disheartened faced with such large and unavoidable phenomena?

First, we have to become aware of our high greenhouse gas emissions and how much energy we use – every family needs to know how much it spends before it can come up with a plan of where to save. The CO₂ calculator of the Agentur für Energie Südtirol – KlimaHaus/Agenzia per l'Energia Alto Adige – CasaClima (http://casaclima.co2-rechner.de/it_IT/) enables us to establish our eco footprint and to detect areas where we can conserve energy. A flight from Verona to Palermo increases our footprint by 0.5 tons. Those who prefer vegetarian food and who consume local and seasonal food improve their climate footprint by 0.2 tons.

NATURE

SOCIETY



● Rising snowline

● Higher temperatures

● Less snow and more rain in the winter

● Melting glaciers

● Receding permafrost

● Higher evapotranspiration

◆ More artificial snow

◆ Less ski sports

◆ More summer tourism

◆ More wood from deciduous trees and less from conifers

● More landslides

● Migration of plants and animals to higher altitudes

◆ More frequent disruptions of roads and railway lines

◆ Earlier harvesting of fruit and wine

● Warmer lakes

● More water in the rivers in the winter and less in the summer

◆ More conflicts over water: energy production, agriculture, fisheries and tourism fighting for a scarce commodity

● More frequent thunderstorms

● Earlier blossoming, longer vegetation periods

◆ More irrigation

◆ Orchards and vineyards at higher altitudes

● More flooding

● More adaptable species, known as generalists

◆ More diseases and inconveniences as a result of ticks and mosquitoes

● More fungi and parasites

◆ More urban flooding

◆ More frequent heat waves