MANAGEMENT SUMMARY:

Climate change in Switzerland

Indicators of driving forces, impact and response

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Abstracts

Human activity is changing the climate, and indicators show that Switzerland is particularly hard hit by climate change. Using selected examples, this report describes Switzerland's contribution to climate change (greenhouse gas emissions and their sources), the observed state of the climate and its expected future development, and the impacts of climate change on natural systems, society and the economy. It also presents the main policy responses and measures on emissions reduction and climate change adaptation.

Keywords:
Climate change, greenhouse gas emissions, climate policy, impacts, emissions reduction, adaptation, indicator, Switzerland.

Menschliche Aktivitäten führen zu einer Veränderung des Klimas. Indikatoren belegen, dass die Schweiz vom Klimawandel besonders stark betroffen ist. Dieser Bericht beschreibt anhand von ausgewählten Beispielen den Beitrag der Schweiz zum Klimawandel (Emissionen von Treibhausgasen und deren Quellen), den Zustand des beobachteten Klimas und seine erwartete, zukünftige Entwicklung sowie die Auswirkungen des Klimawandels auf die natürlichen Systeme sowie Gesellschaft und Wirtschaft. Ebenso werden die wichtigsten politischen Antworten und Massnahmen in den Bereichen Emissionsverminderung und Anpassung an den Klimawandel vorgestellt.

Stichwörter:
Klimawandel, Treibhausgasemissionen, Klimapolitik, Auswirkungen, Emissionsverminderung, Anpassung, Indikator, Schweiz.

Les activités humaines modifient le climat. Les indicateurs montrent que la Suisse est particulièrement touchée par les changements climatiques. Ce rapport décrit, à l'aide d'exemples choisis, la contribution de la Suisse à ces changements (émissions de gaz à effet de serre et leurs sources), les observations concernant l'état du climat et son évolution future attendue, ainsi que les effets des changements climatiques sur les systèmes naturels, la société et l'économie. Il présente également les principales réponses et mesures politiques dans une optique de réduction des émissions et d'adaptation aux changements climatiques.

Mots-clés :
changements climatiques, émissions de gaz à effet de serre, politique climatique, effets, réduction des émissions, adaptation, indicateur, Suisse

Le attività antropiche provocano un mutamento climatico e, come dimostrano gli indicatori, la Svizzera ne è particolarmente colpita. Sulla base di una selezione di esempi, il presente rapporto illustra il contributo della Svizzera ai cambiamenti climatici (emissioni di gas serra e loro fonti), lo stato del clima osservato e l'atteso sviluppo futuro nonché gli effetti dei cambiamenti climatici sui sistemi naturali, la società e l'economia. Sono inoltre presentate le principali risposte del mondo politico e le misure adottate negli ambiti della riduzione delle emissioni e dell'adattamento ai cambiamenti climatici.

Parole chiave:
cambiamenti climatici, emissioni di gas serra, politica climatica, effetti, riduzione delle emissioni, adattamento, indicatore, Svizzera.

Summary

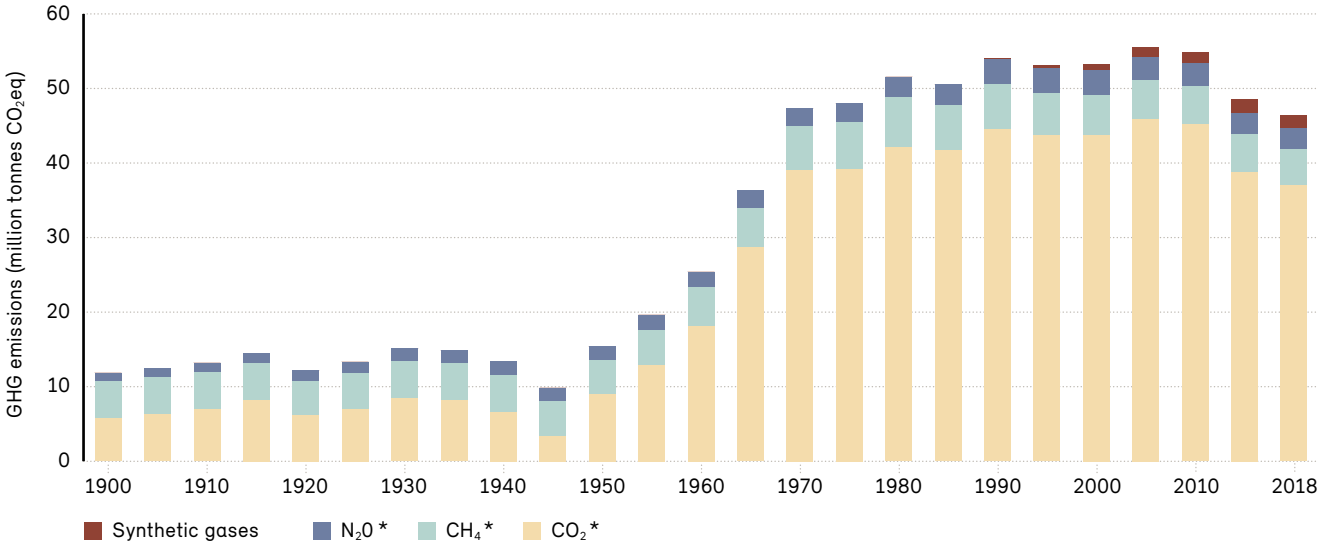
Human influence on climate through the emission of greenhouse gases is considered to be the main cause of global warming observed since 1850. In Switzerland, energy consumption is the biggest single source of CO_2 emissions. The national greenhouse gas inventory records a sixfold increase in CO_2 emissions between 1900 and 2018. The sharpest rise took place between 1945 and 1970, and emissions have remained at a high level ever since. This trend is primarily due to strong economic growth and a rapid increase in road traffic.

Switzerland's overall greenhouse gas emissions have fallen slightly since 2005, totalling 46.4 million tonnes of CO_2 equivalent in 2018 (see Figure 1). However, this number does not include all emissions attributable to Switzerland. Taking into account the global impact of Swiss consumption, around 70 % of greenhouse gas emissions in 2015 were generated abroad.

The average temperature in Switzerland has increased by around 2 °C since pre-industrial times. This is about twice the average global temperature rise. The five warmest years in the measurement series 1864 – 2019 were all recorded after 2010. Heatwaves, more hot days and nights, and shrinking snow cover on the Swiss Plateau are all evidence of climate change. Heavy precipitation events have also become more intense and more frequent.

Figure 1: Total greenhouse gas emissions

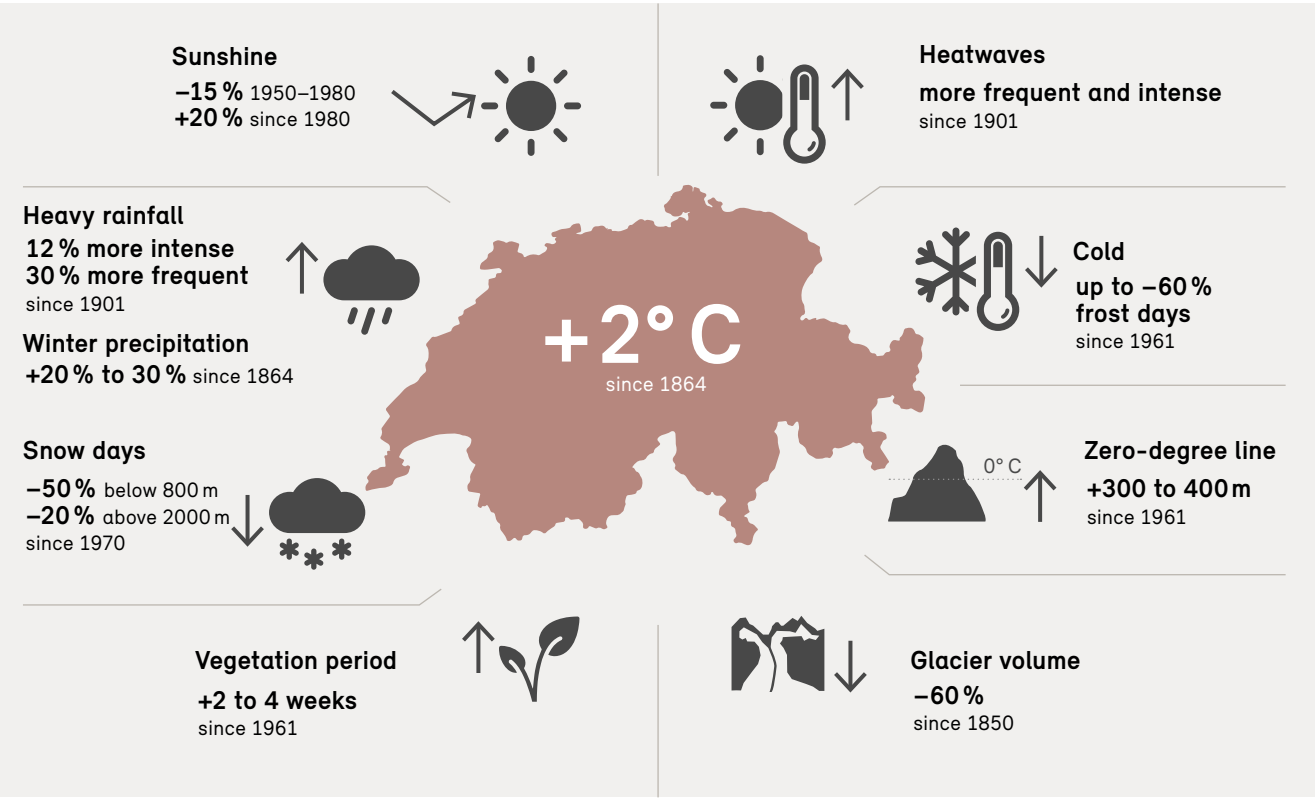
Switzerland's domestic CO_2, CH_4 and N_2O emissions and emissions of synthetic gases (HFCs, PFCs, SF_6 and NF_3), in CO_2 equivalents, 1900 – 2018.



* The FOEN revised the pre-1990 emissions figures at the time of publication of this report. It made the simplifying assumption that N_2O emissions from agriculture were half as great in 1900 as in 1990, and applied linear interpolation between the two.

Source: FOEN

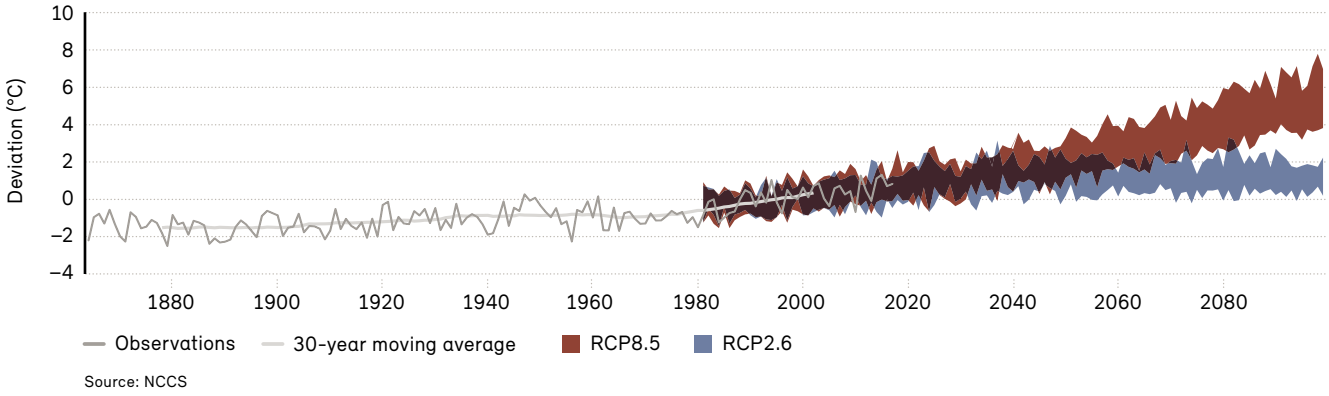
Figure 2: Changes in the Swiss climate observed to date (2019)



Source: NCCS

Switzerland's future climate will depend largely on the development of global greenhouse gas emissions. If emissions can be massively reduced over the next few decades (RCP2.6), the latest Swiss Climate Scenarios (CH2018) suggest that Switzerland will be 2.1 – 3.4 °C warmer by the end of the century, compared to pre-industrial levels. However, if greenhouse gas emissions continue to rise (RCP8.5), the average temperature in Switzerland could increase to 4.8 – 6.9 °C above pre-industrial levels by the same date (see Figure 3). According to this pessimistic scenario, average summer precipitation would decrease by 25 % by the middle of the 21st century (and by up to 40 % by the end of the century), while heavy precipitation events would be 10 % more frequent (20 % by the end of the century). Heatwaves would also increase markedly in intensity and frequency. However, with concerted climate change mitigation measures, around half of the potential impact on Switzerland's climate would be avoided by 2060, and two thirds by 2100.

Figure 3: Measured and projected annual mean temperature over Switzerland, 1864 – 2100, as a deviation from the reference period 1981 – 2010



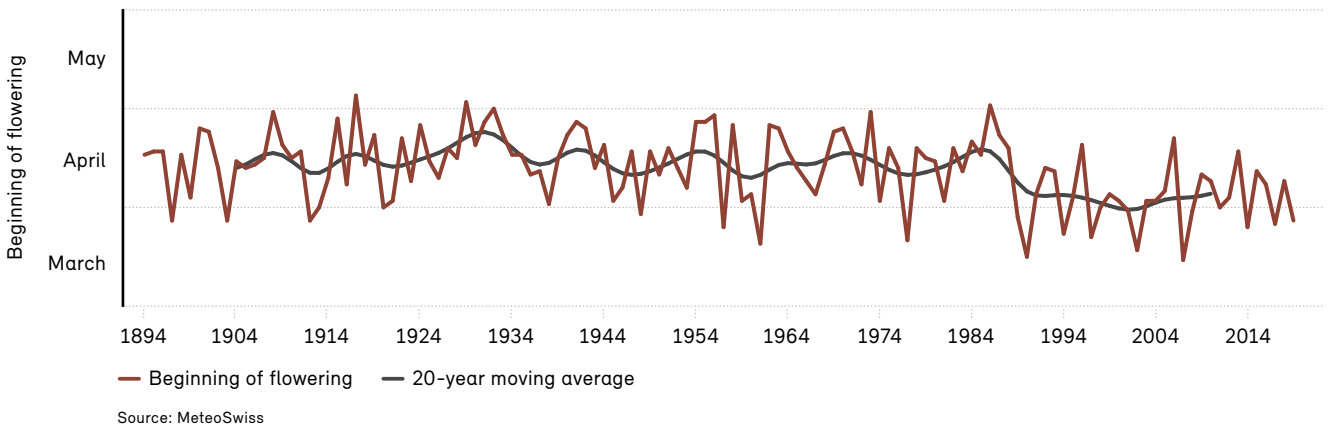
Source: NCCS

The effects of climate change are becoming more and more visible, especially in glaciated areas. Swiss glaciers have been gradually retreating for over a century, and in the past ten years the loss of volume has accelerated to an average of 2 % per year. It is conceivable that only a few residues of glaciers will remain in the Alpine region by the end of this century. This is already the case with smaller glaciers: the survey of the Pizol glacier was stopped in 2019 due to its small remaining area.

Since measurements began in the 1960s, the temperatures recorded in Switzerland's larger watercourses have been on the rise. Although cooling water discharge is partly responsible for this trend, climate change is a major factor as well. Significant changes are also observable in flora and fauna. For example, a number of plant species throughout Switzerland are sprouting and blooming earlier (see Figure 4). Of the nine years between 1951 and 2019 in which spring started 'very early', seven have occured since 1990.

Figure 4: Beginning of cherry tree flowering in Liestal

Date on which a particular cherry tree in Liestal (canton of Basel-Landschaft) started to bloom, 1894 – 2019. The grey line represents the 20-year moving average.

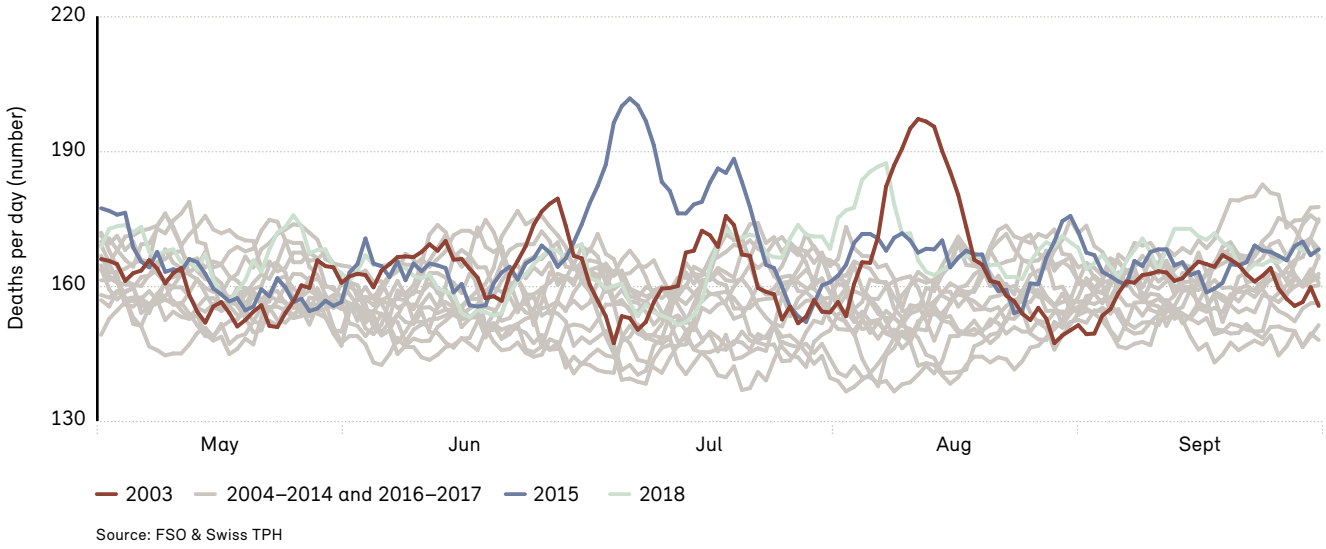


Source: MeteoSwiss

Climate change also has an impact on society. Heatwaves place strain on the human body. They can cause dehydration and the impairment of heart and lung function, leading to an increase in emergency hospital admissions. Old people and infants are particularly at risk. In Switzerland, 975 more people died during the hot summer of 2003 than in a normal June to August period. Increased mortality rates were also recorded in the summers of 2015 and – to a less extreme degree – 2018 (see Figure 5).

Figure 5: Number of deaths per day during the warm season, 2003 – 2018

Deaths in Switzerland between May and September. Smoothed lines based on the seven-day mean values (three days before and three days after the plotted value). Absolute values, not adjusted for population growth between 2003 and 2018.



Source: FSO & Swiss TPH

For the second commitment period under the Kyoto Protocol, Switzerland aims to reduce its greenhouse gas emissions by 20 % by 2020 relative to 1990 levels. However, the latest available data from the national greenhouse gas inventory, for the year 2018, suggests that Switzerland is in danger of missing this target. Under the Paris Agreement, Switzerland aims to cut its emissions by 50 % by 2030. It has also announced plans to reduce them to net zero by 2050. If it is to meet these targets, it will need to step up its efforts significantly.

The main basis for emission reduction measures is the CO_2 Act. The buildings programme, for example, has enabled a reduction of around 0.5 million tonnes of CO_2 per year since 2010 (as at 2017). The programme, which is partly funded through the CO_2 levy, promotes energy-efficient renovation and the replacement of fossil-fuel heating systems, among other things. The parliament adopted the revised CO_2 act on September 25 2020. Under the act, emissions are to be reduced by at least 50 % relative to 1990, by 2030.

Due to the inertia of the climate system, climate change would carry on even if greenhouse gas emissions were to be stopped immediately. Switzerland must therefore prepare for the foreseeable effects in good time. In 2012, the Federal Council adopted a strategy for adaptation to climate change, aimed at minimising risks, exploiting opportunities and increasing Switzerland's adaptability to climate change. In the water sector, for example, the goal is to achieve a supply-oriented, sustainable system of water management. The Confederation is promoting implementation of the adaptation strategy by means of the 'Adaptation to climate change' pilot programme.

It also set up the National Centre for Climate Services (NCCS) in 2015 to support the ongoing development and application of climate change mitigation and adaptation

measures. The NCCS is a network whose members[1] pool climate services and make them available via the platform *www.nccs.ch*. A key element is dialogue and partnership-based development of climate services by producers and users. This report is an example of the collaboration and exchange of expertise between the various institutions and actors involved in dealing with climate change.

1 *www.nccs.admin.ch/members-and-partners*

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Total greenhouse gas emissions. Source: Greenhouse gas inventory of Switzerland, Federal Office for the Environment. 2020 submission

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Measured and projected annual mean temperature over Switzerland, 1864 – 2100, as a deviation from the reference period 1981 – 2010. Source: NCCS (ed.) 2018: CH2018 – Climate Scenarios for Switzerland. National Centre for Climate Services, Zurich. 24 pp. ISBN 978-3-9525031-0-2

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