David N. Bresch, Professor for Weather and Climate Risks, Institute for Environmental Decisions, ETH Zurich / MeteoSwiss

The new Swiss Climate Scenarios CH2018
Implications for (spatial) planning

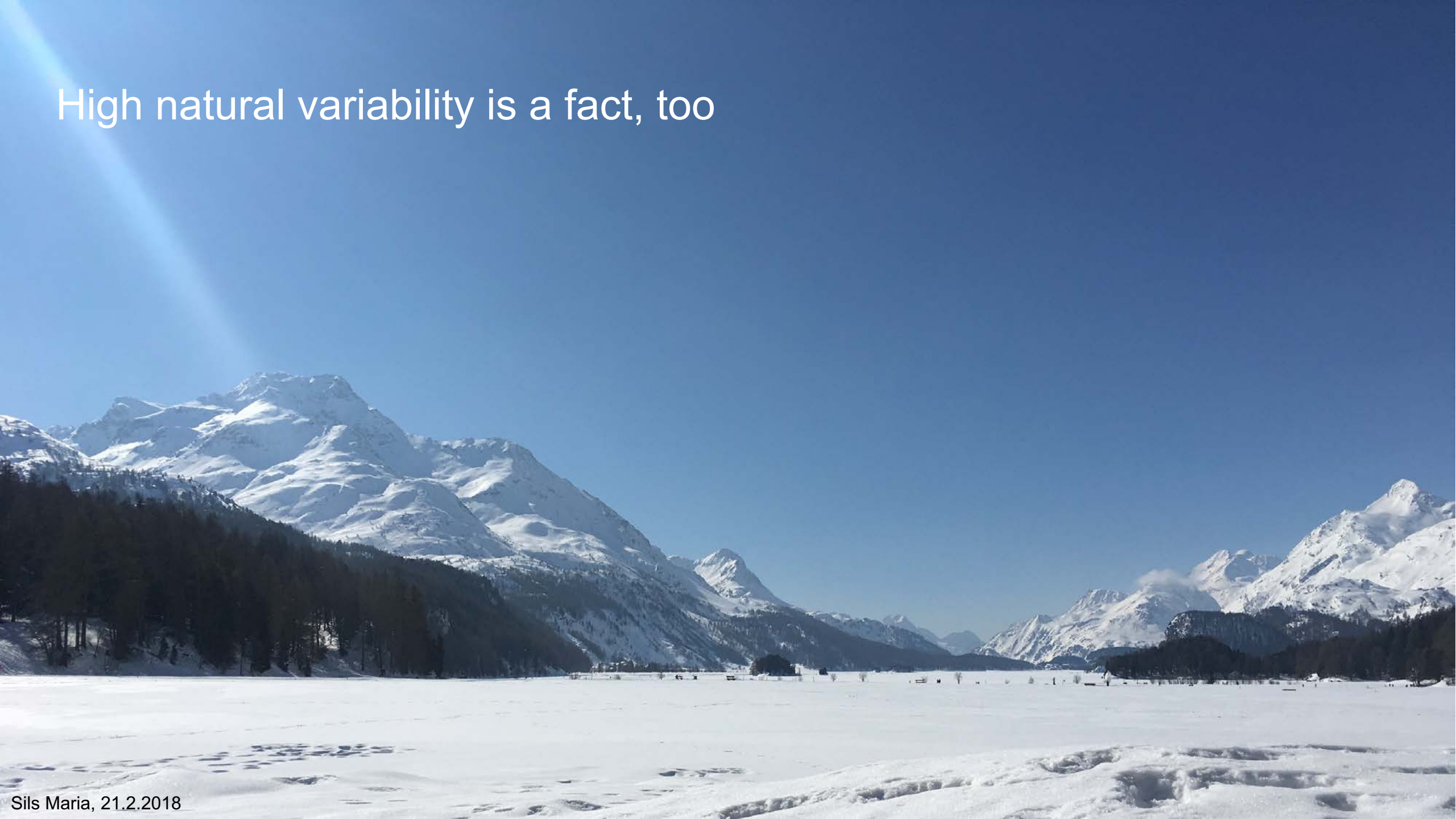
How do we make sure that weather and climate information is adequately considered in decision-making?

www.wcr.ethz.ch

Climate change is a fact

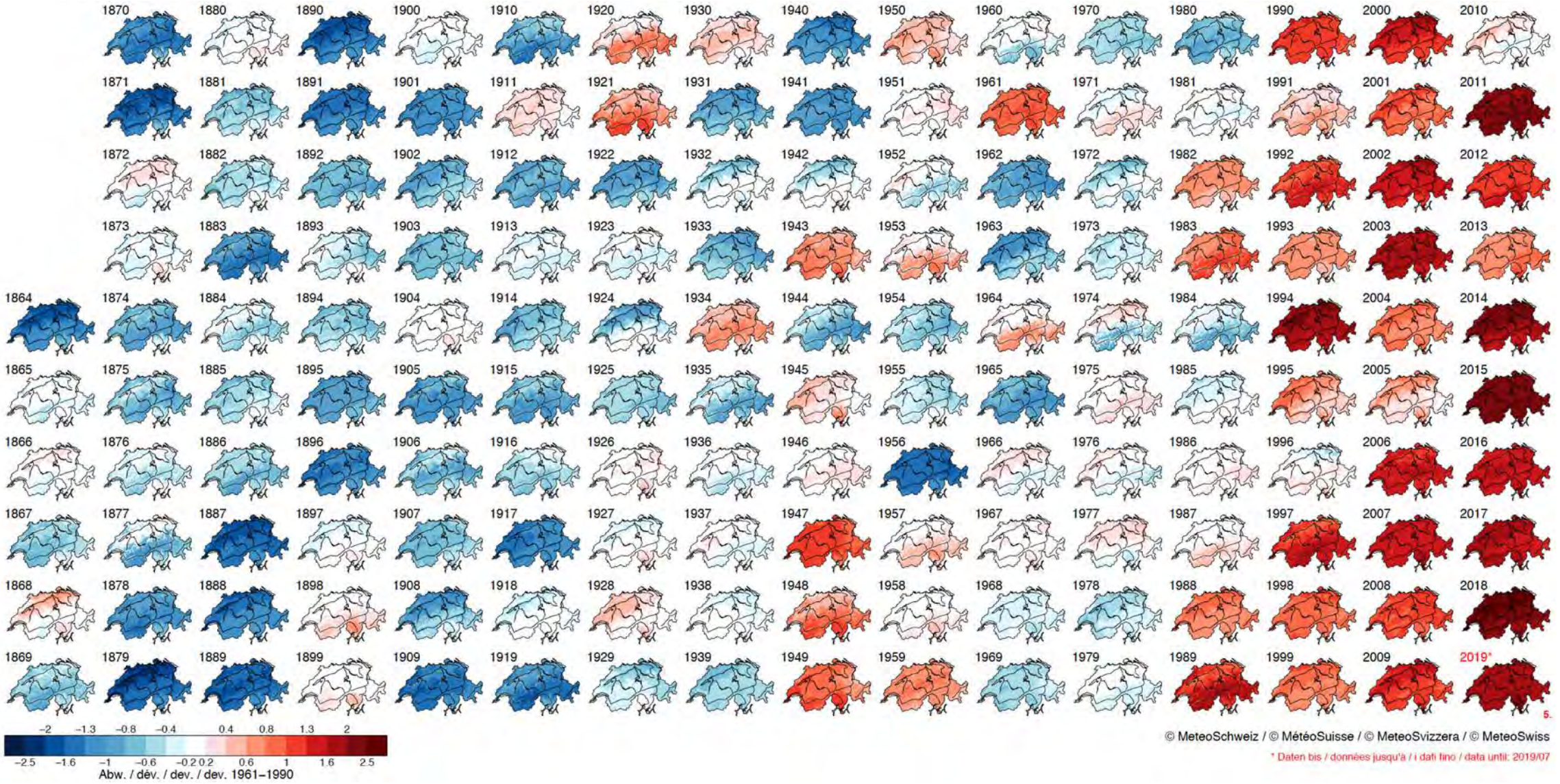
Ftan, 1.1.2017

High natural variability is a fact, too



Sils Maria, 21.2.2018

It is getting warmer in Switzerland



New Swiss Climate Scenarios– CH2018

CH2007

CH2011

CH2018

Switzerland 2060 (business as usual)

Dry
Summers

Heavy
Precipitation

More
Hot Days

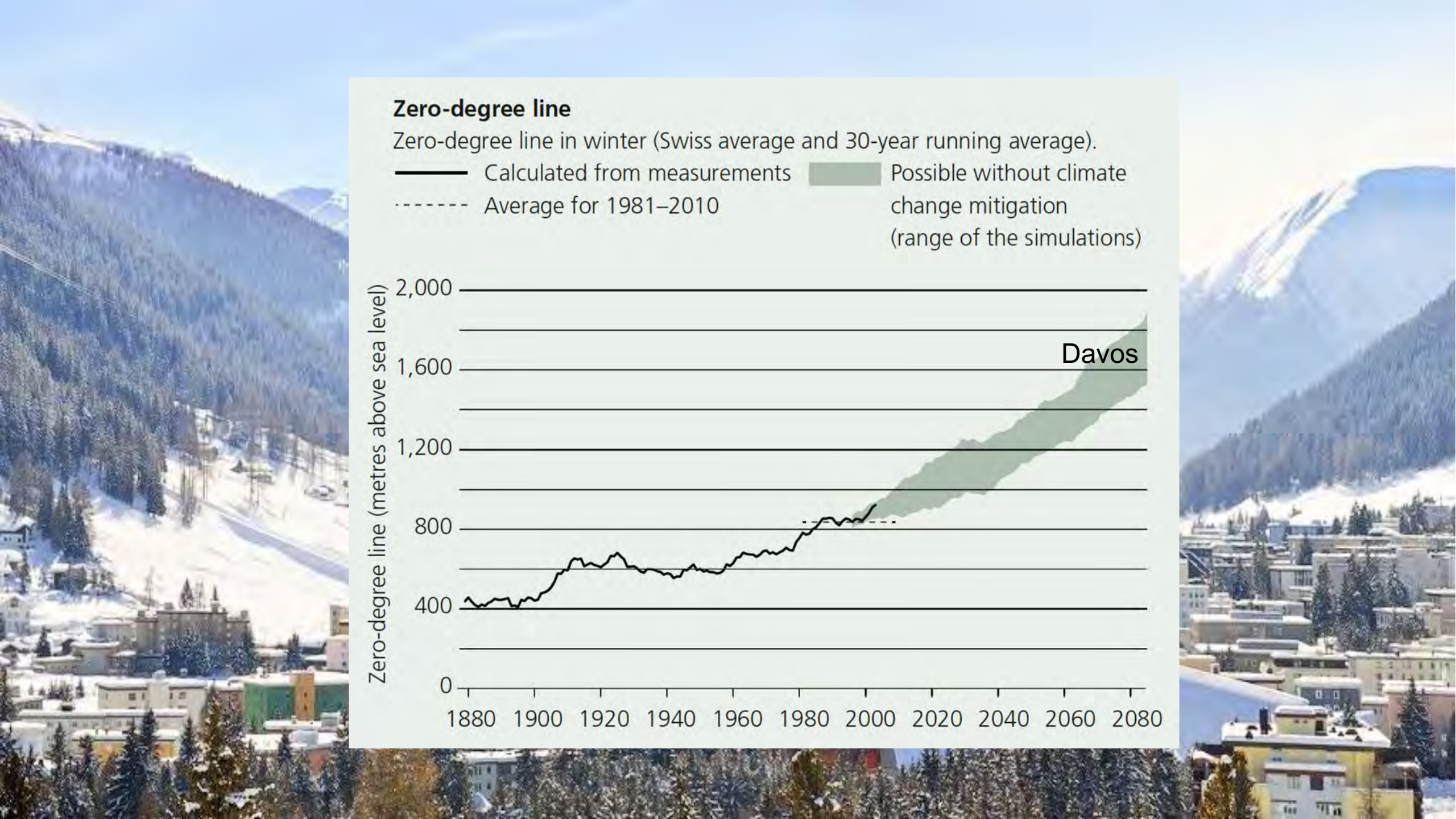
Snow-scarce
Winters

Snow-scarce Winters

Increase in elevation of zero-degree line

Snow becomes a rarity

Snow-scarce Winters

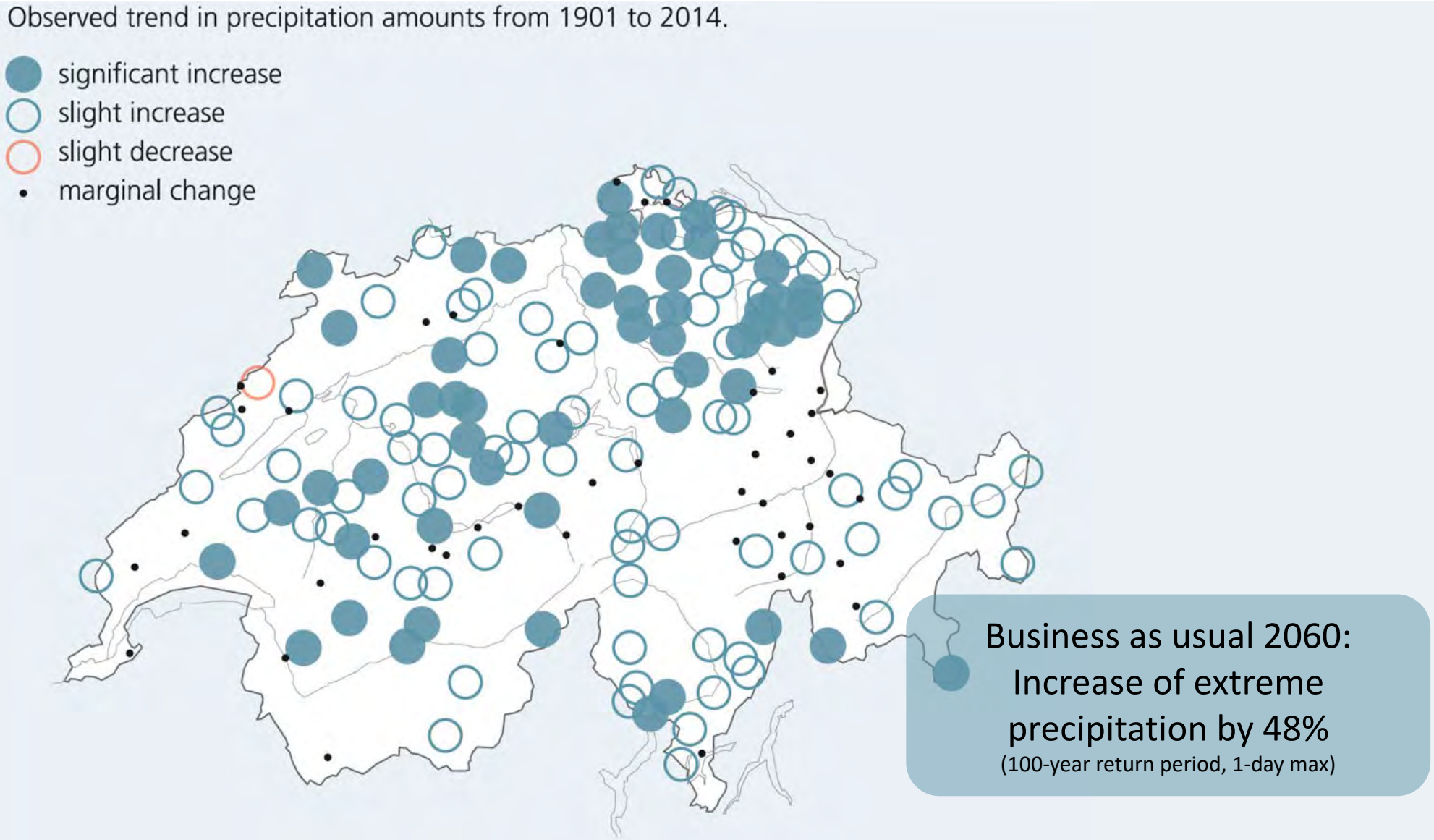

Zero-degree line
Zero-degree line in winter (Swiss average and 30-year running average).
Calculated from measurements
Average for 1981–2010
Possible without climate change mitigation (range of the simulations)
Zero-degree line (metres above sea level)
2,000
1,600
1,200
800
400
0
1880
1900
1920
1940
1960
1980
2000
2020
2040
2060
2080
Davos

Heavy Precipitation

Heavy Precipitation

Extremes intensify

31 to 0 for Trend in Heaviest Single-day Precipitation



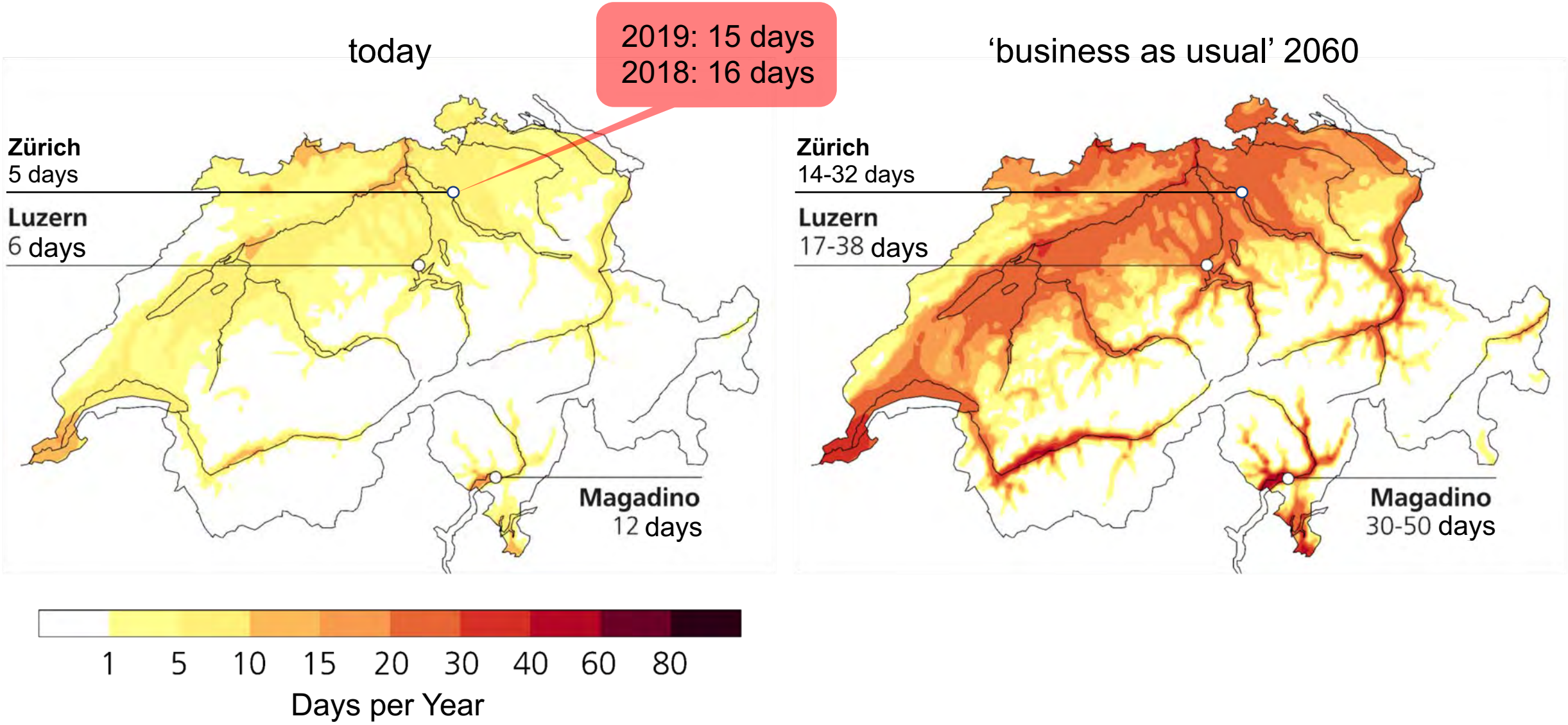
Business as usual 2060:
Increase of extreme precipitation by 48%
(100-year return period, 1-day max)

More intense Heat Waves

3-5 times more Hot Days

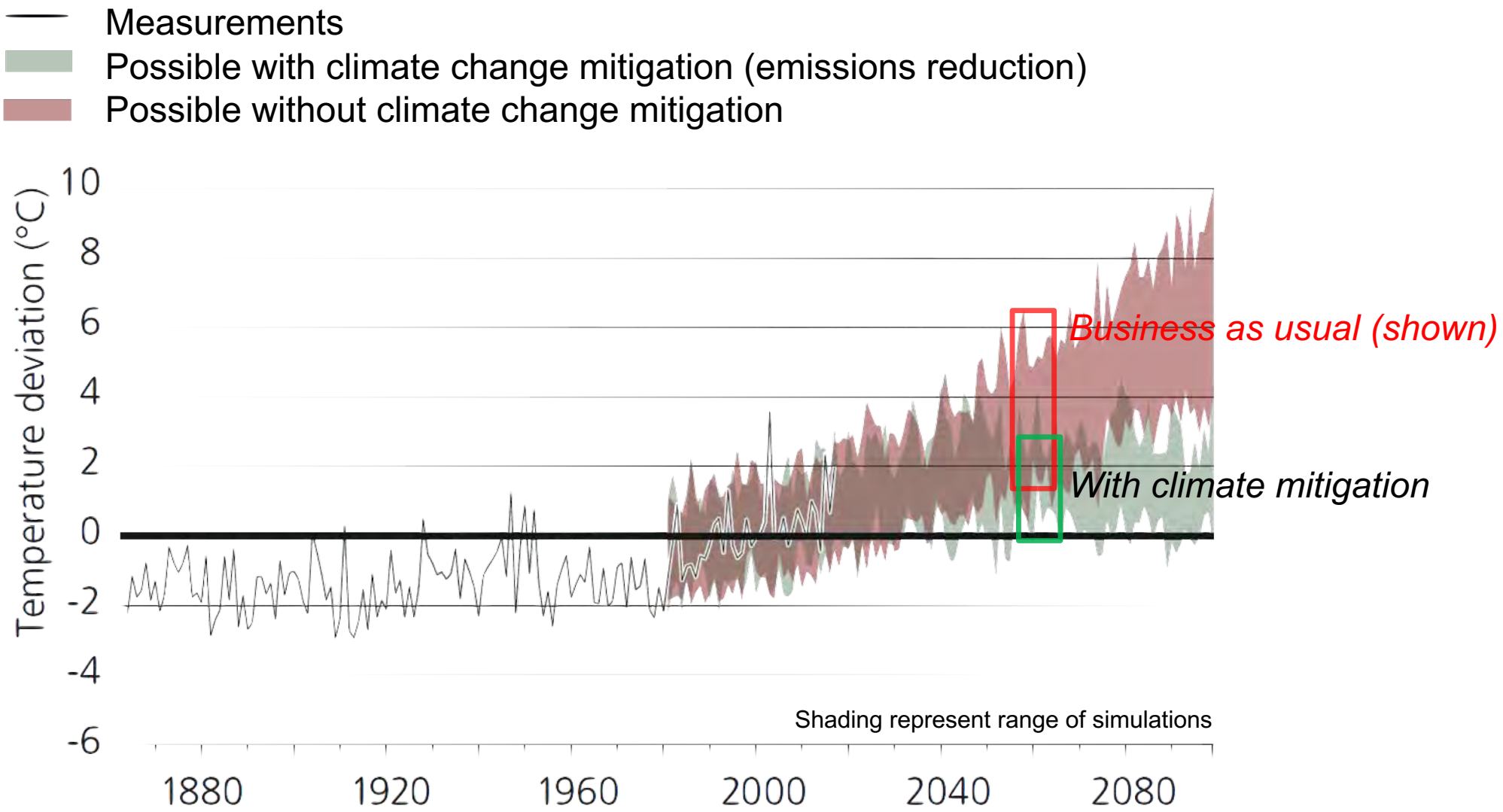
More
Hot Days

Substantially more Hot Days (days warmer than 30° C)



CO_2 emissions reduction would reduce two thirds of warming

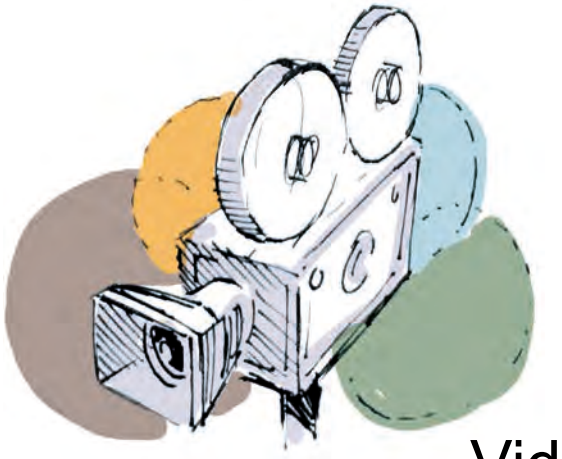
Deviation of average Swiss summer temperature from the mean in the period 1981 to 2010



CH2018 Products www.nccs.ch

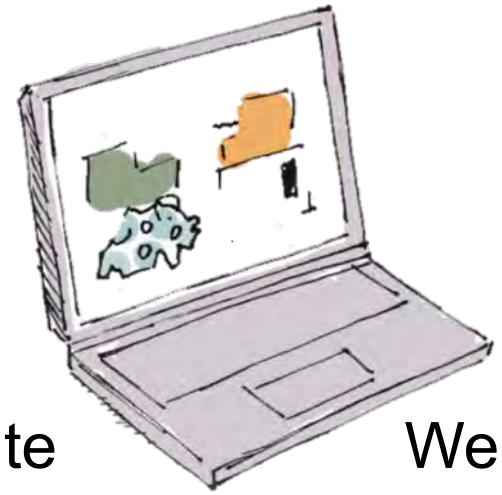
Technical Report

Broschure



Videos

Website



Webatlas

Data

Survey

Scribbles by zeichenfabrik.ch

Fact: If you switch on the heat, water begins to boil (thermodynamics)

Uncertainty:
Where turbulence will occur is (very) hard to predict – if possible at all...

And: Regarding impacts, it‘s the weather, not the climate, that matters first and foremost.

→ *Weather Risk* is the guiding concept

[Weather] Risk

The “effect of uncertainty on objectives”[1]

risk = **probability** x **severity**

expected utility

risk = hazard x exposure x vulnerability

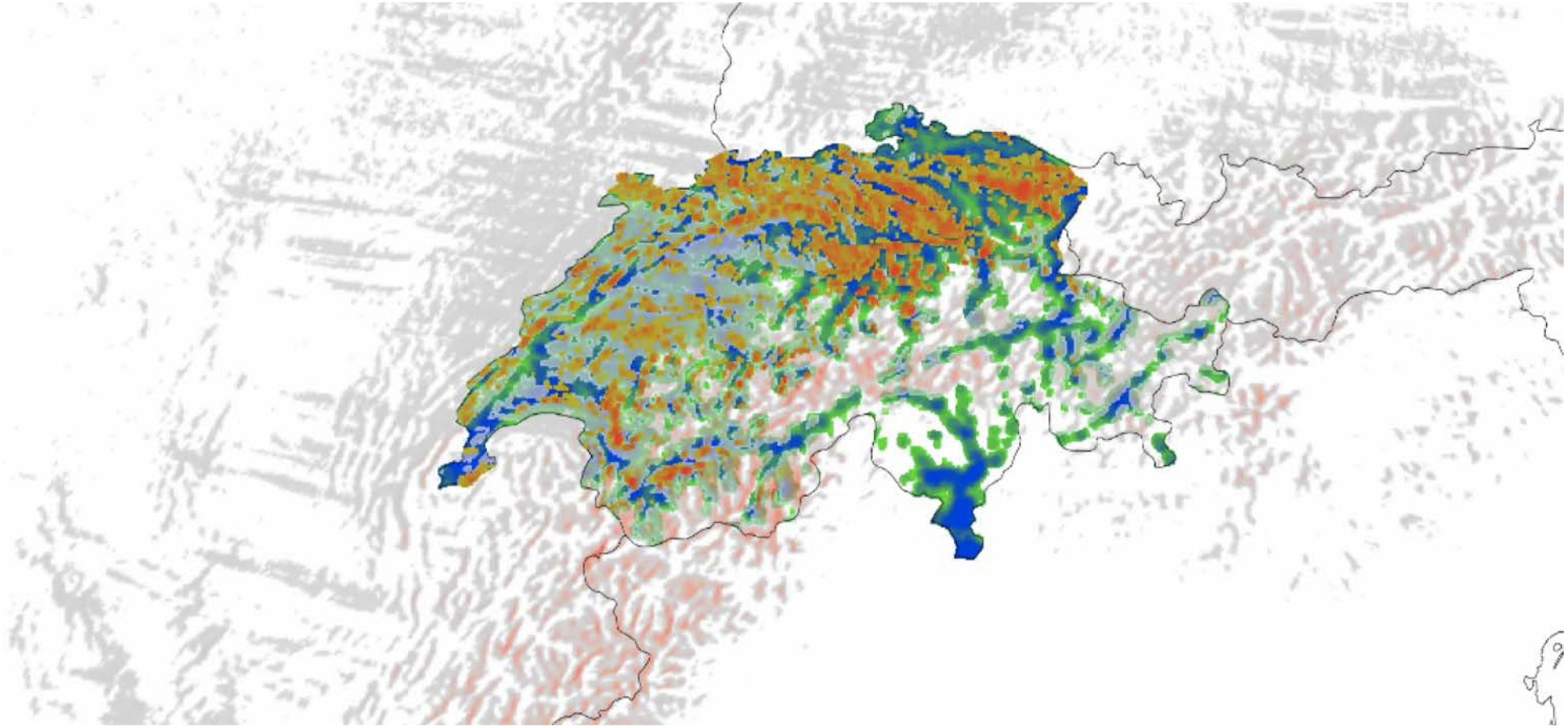
= (**probability** x intensity) x exposure x vulnerability

severity

[1] … a positive or negative deviation from what is expected [ISO 31000]

Illustration: IPCC AR5

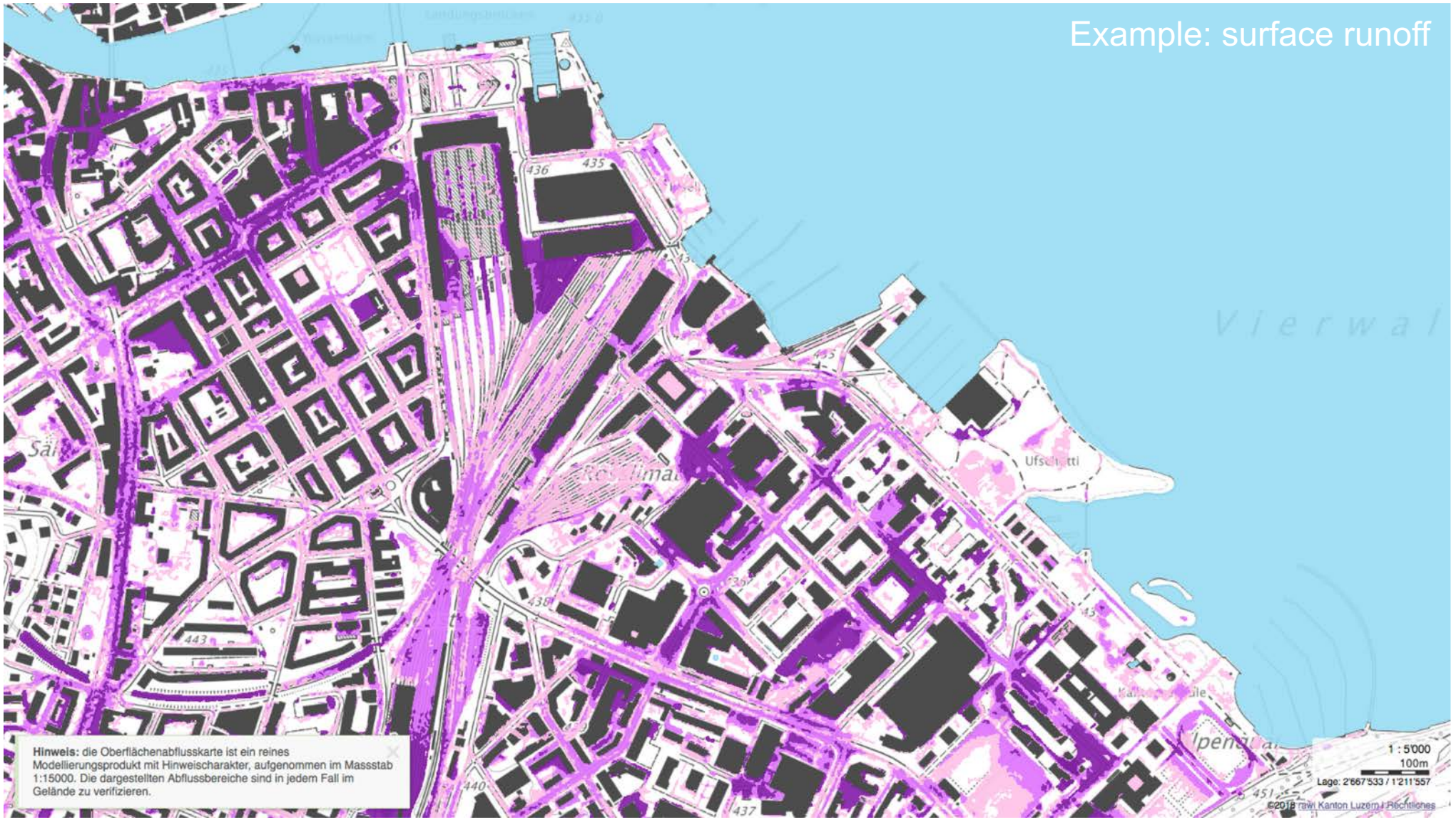
3 January 2018, Winter storm Burglind
High-resolution impact simulation (1km)



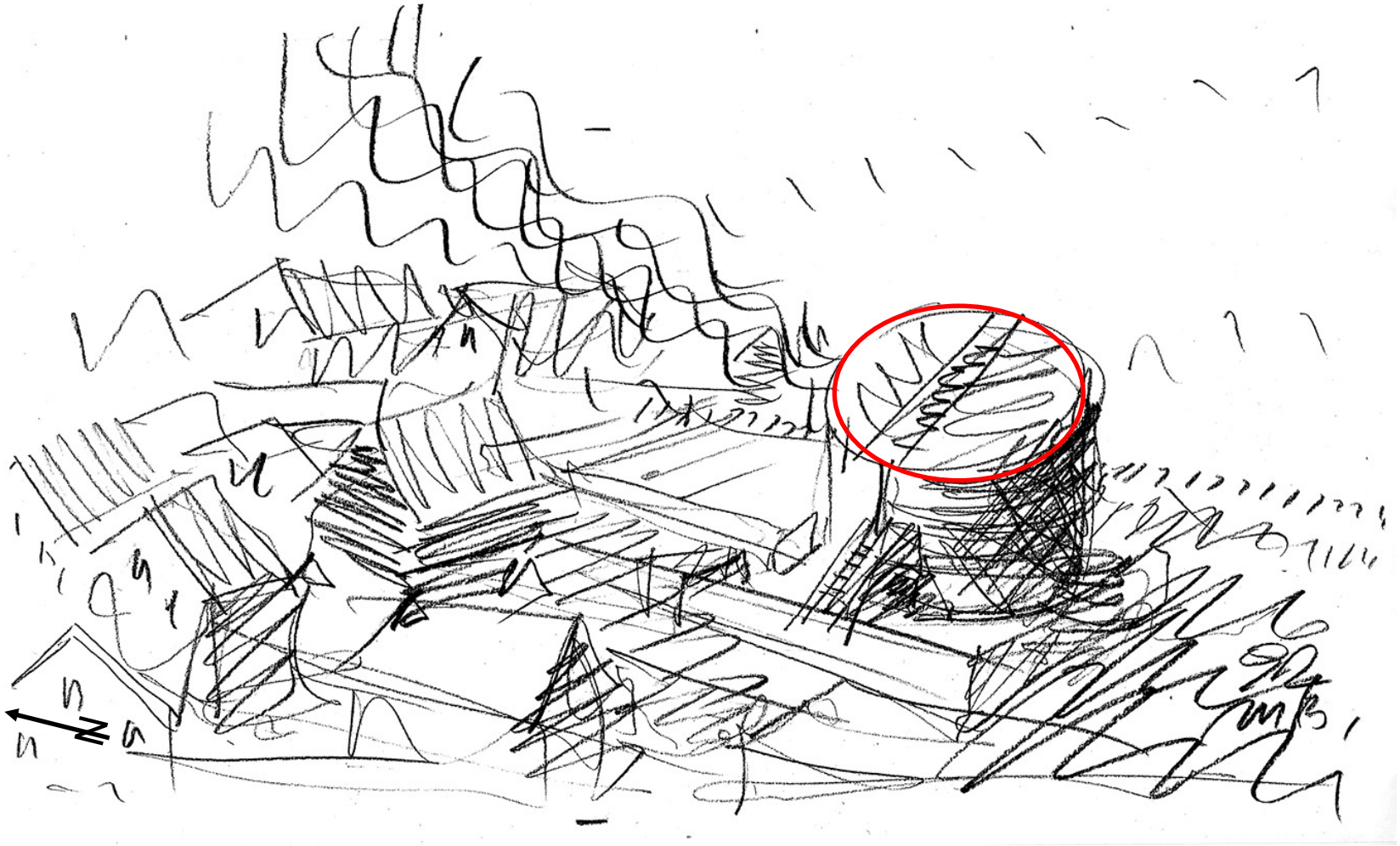
Based on COSMO (1 km), MeteoSwiss. green-blue: exposure, orange-red: risk – here simulated damage

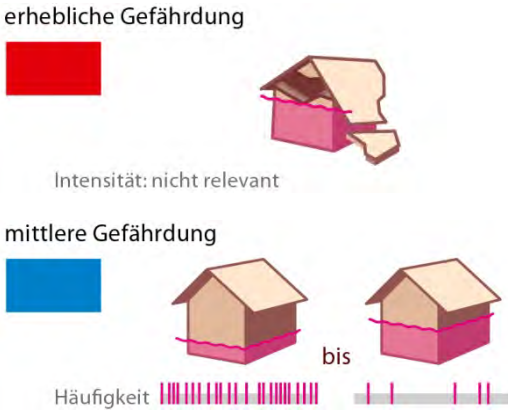
https://vimeo.com/252035164 based on open-source and -access impact model https://github.com/CLIMADA-project/climada_python (Aznar-Siguan & Bresch, 2019)

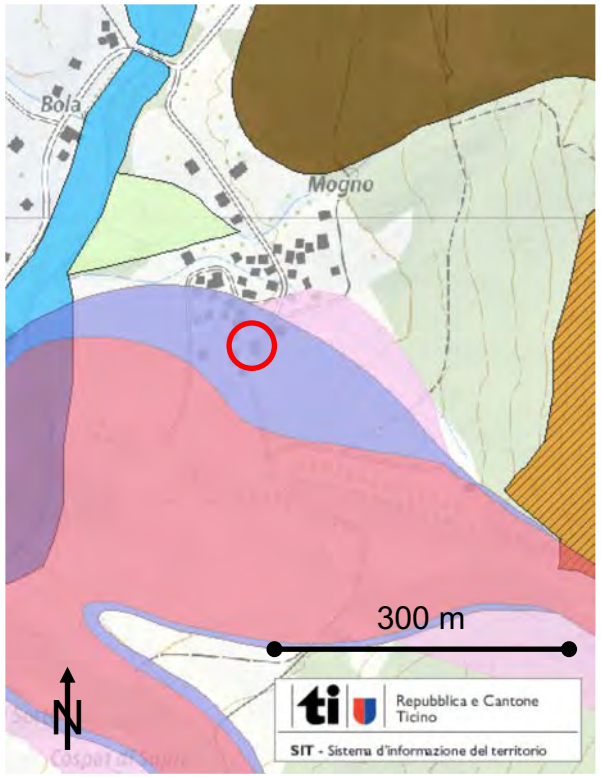
A hazard map is not a risk map



Risk-adequate planning and buildings: Robustness







Mario Botta, Mountain church Mogno/TI, erected 1992-1996, after avalanche 1986

http://www.sitmap.ti.ch/index.php?ct=pericolie

Mario Botta, Mountain church Mogno/TI

erected 1992-1996, after avalanche 1986

Densification … accumulation of Risk

Spillway tunnel Thalwil

[1] http://www.thalwil.ch/dl.php/de/5a7c1c37a896a/Pras_Thalwil_Infoveranstaltung_HWE.pdf

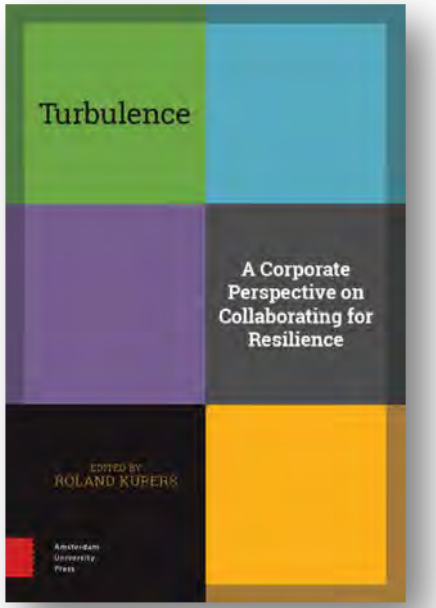
Bild Google

Linthwerk – Nature-based adaptation[1]

[1] https://www.linthwerk.ch/index.php/organisation/10-das-neue-linthwerk

[Weather and Climate] Resilience – more than bouncing back

The capacity to survive, **successfully adapt and prosper** in the face of change and uncertainty related to disturbances, whether they be caused by resource stresses, societal stresses and/or acute [weather and climate-related] events.[1]



[1] Bresch et al., 2014, in: Turbulence, Amsterdam University Press
https://oapen.org/download?type=document&docid=477310

Risk-adequate planning and buildings: Resilience against heat

Frank Lloyd Wright, Taliesin West, gebaut 1937 in der Wüste von Arizona

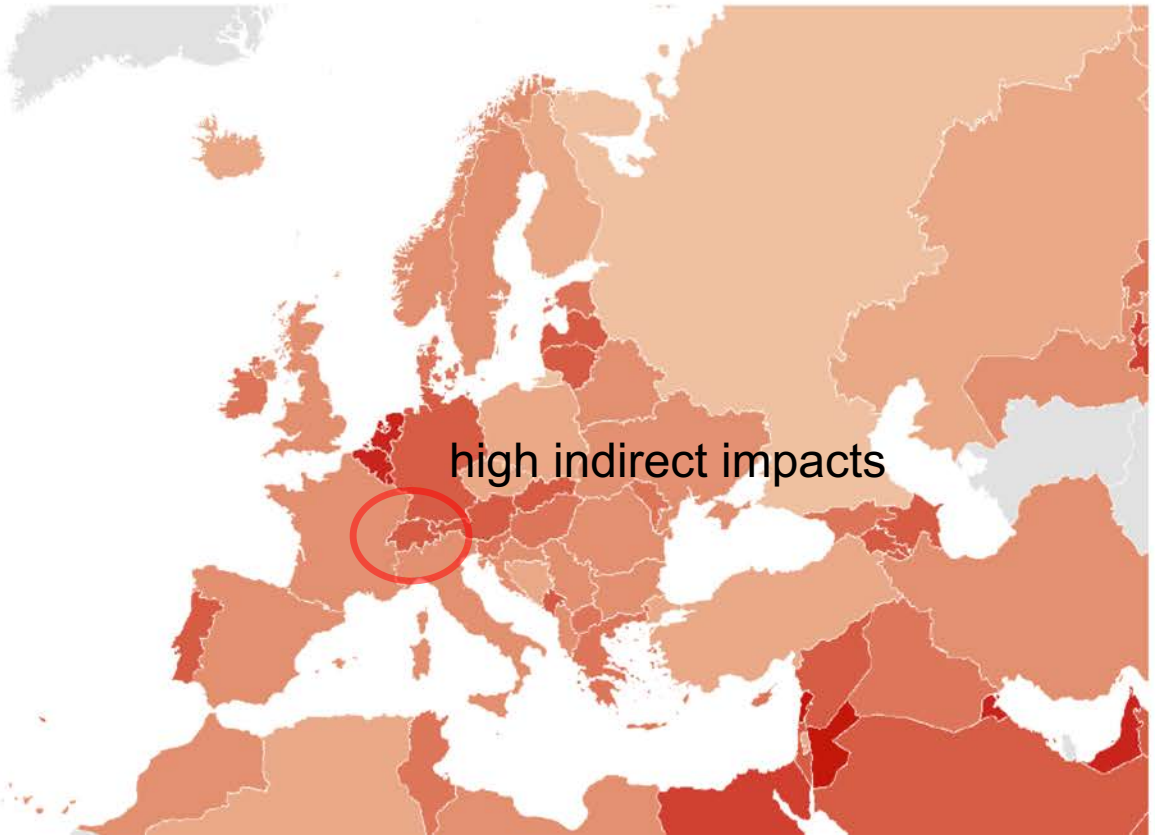
Three key points

- From robustness to resilience, from fail-safe to safe-fail
- Dialog is key, collaboration among all actors, co-design of solutions
- With CH2018, we do have the fact base in our hands

  → mandatory to take this knowledge into account in spatial planning processes

Perspectives of climate impact

ND-GAIN Index[1] (direct impacts)



TCI Index[2] (networked impacts)

[1] https://gain.nd.edu/our-work/country-index [2] https://www.sei-international.org/mediamanager/documents/Publications/Climate/SEI-WP-2016-07-Introducing-TCI-Index.pdf
ND-GAIN: [University of] Notre Dame Global Adaptation Initiative, TCI: [Stockholm Resilience Institute] Transnational Climate Impacts Index