

Climate change impacts in mountain ecosystems and adaptation strategies in the Aosta Valley

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Environmental Protection Agency of Aosta Valley (ARPA VdA)



Project : Agile Arvier



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Open Gov Lab

Green Lab

Digital Lab

Social Innovation Lab

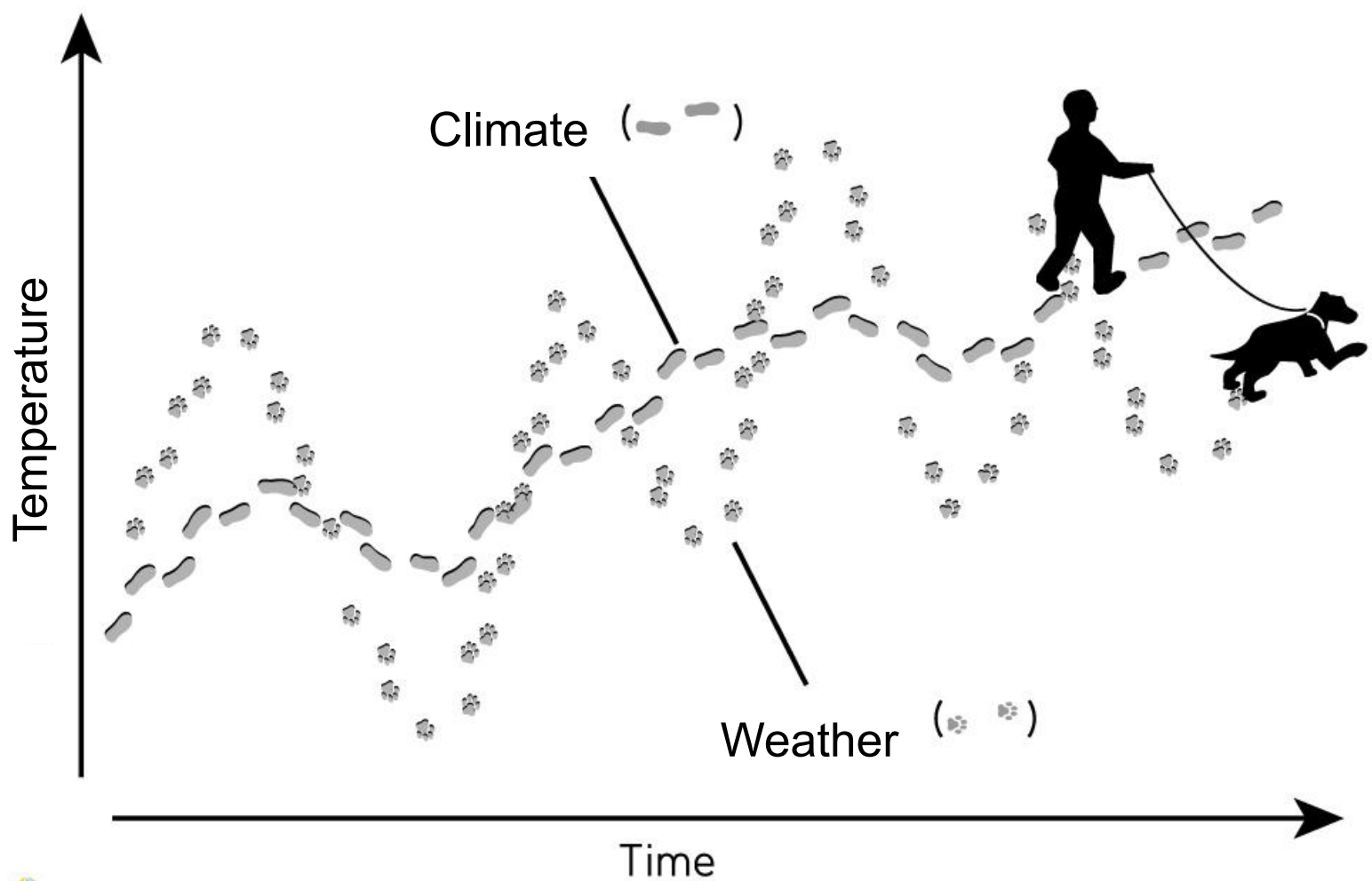
Education Lab

Green Lab

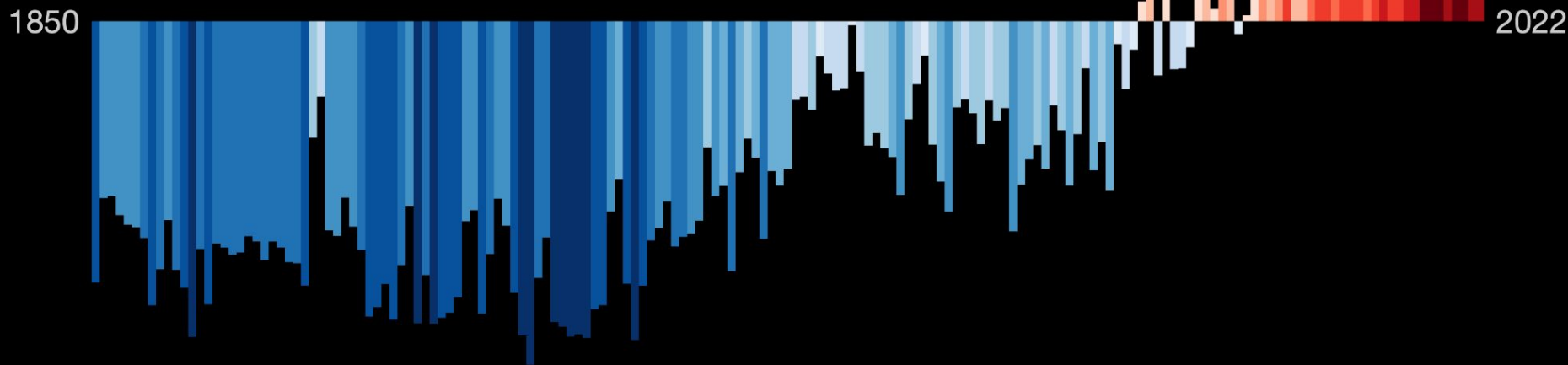
- Climate change impacts on mountain ecosystems
- The use of water resources for a more sustainable smart agriculture
- Forest carbon fluxes and ecosystem responses to climate change
- Permafrost monitoring
- Remote sensing applications to monitor the high mountain glaciers
- Scientific dissemination



1. Climate change



Global temperatures have increased by over 1.2°C



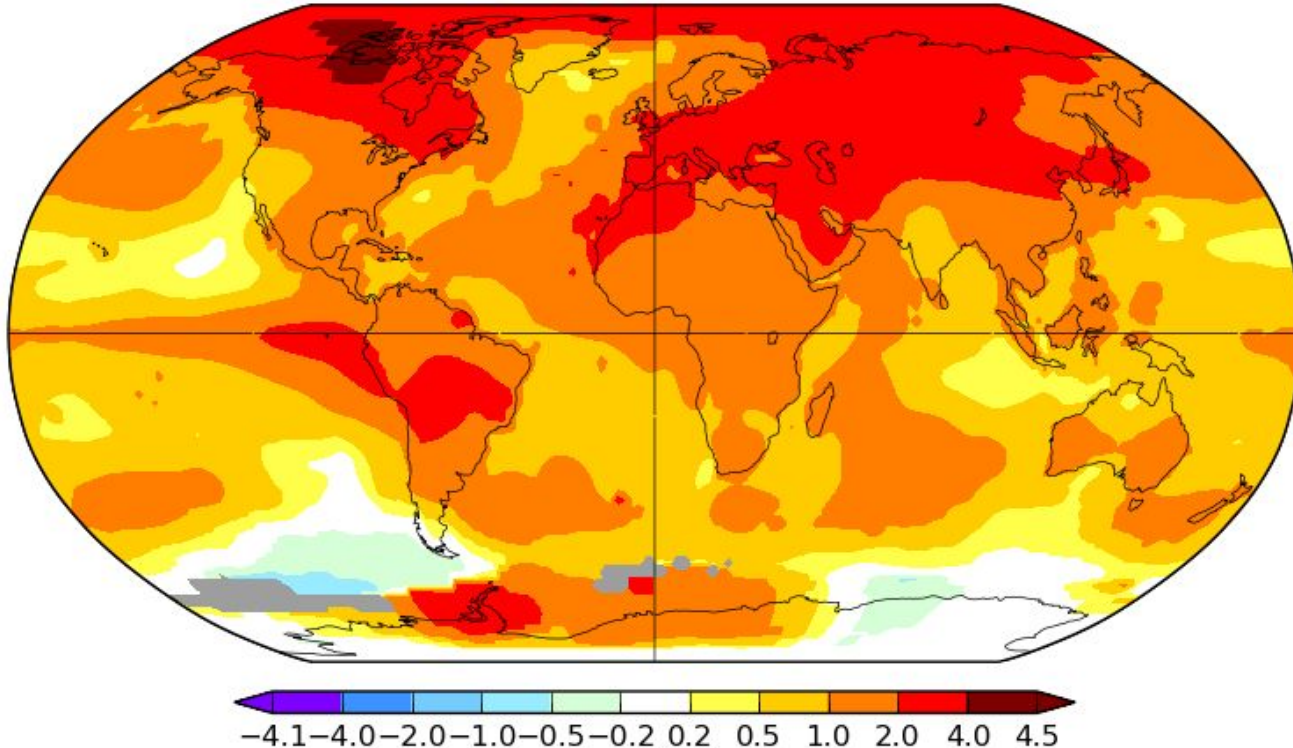
Is it global? YES



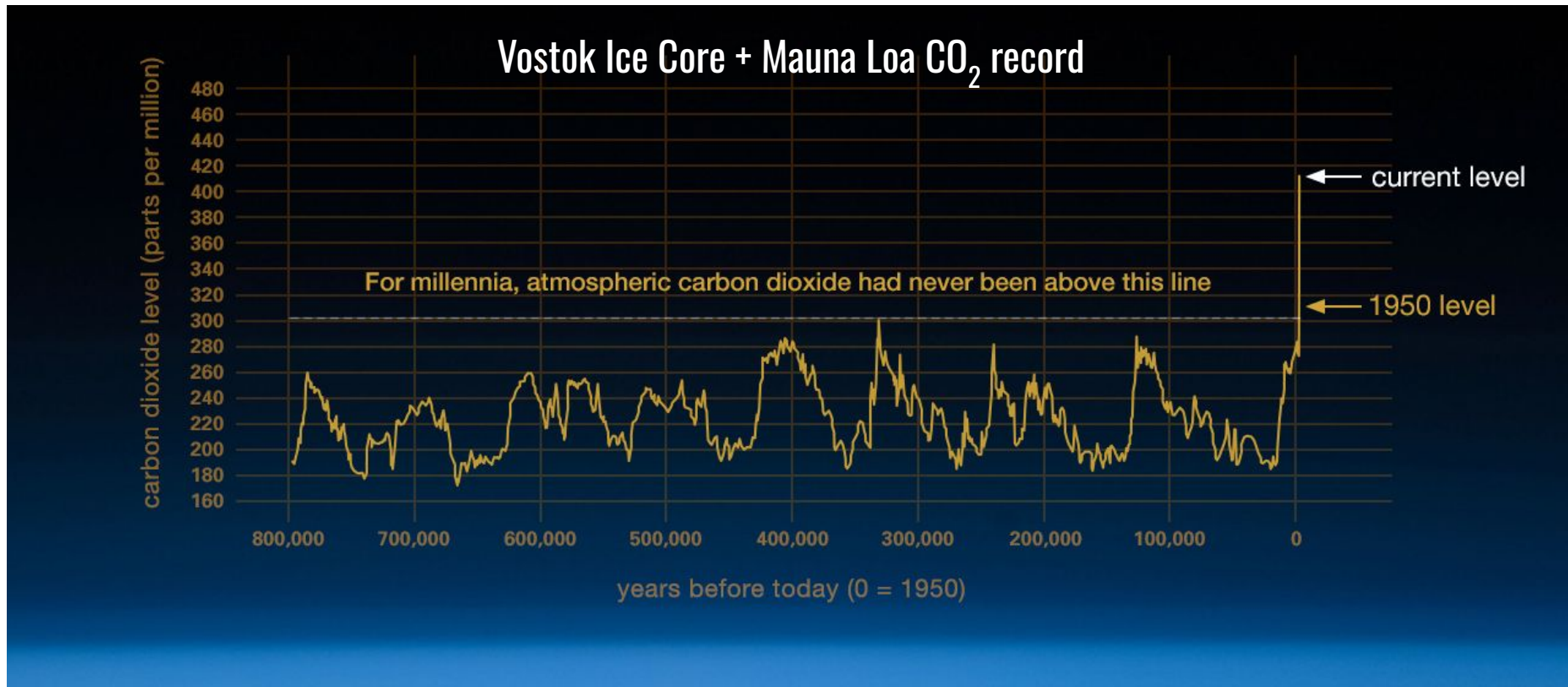
Annual J-D 2023

L-OTI(°C) Anomaly vs 1951-1980

1.18



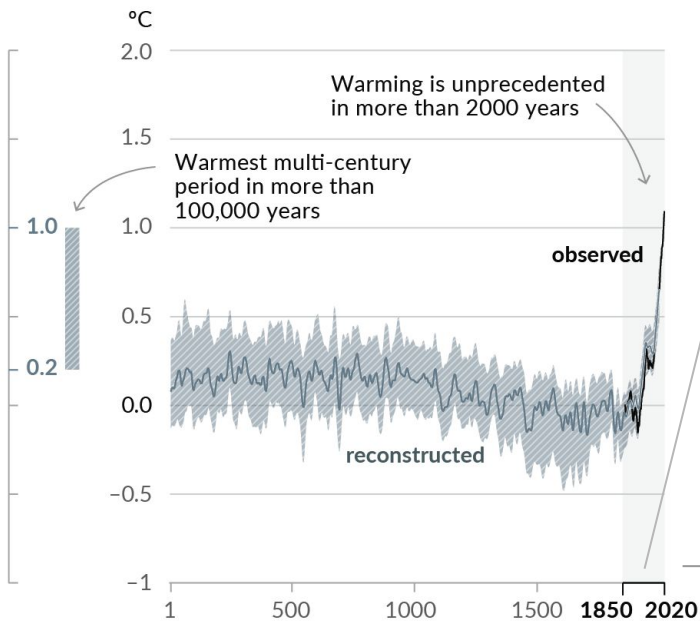
Is this impact human-induced? YES



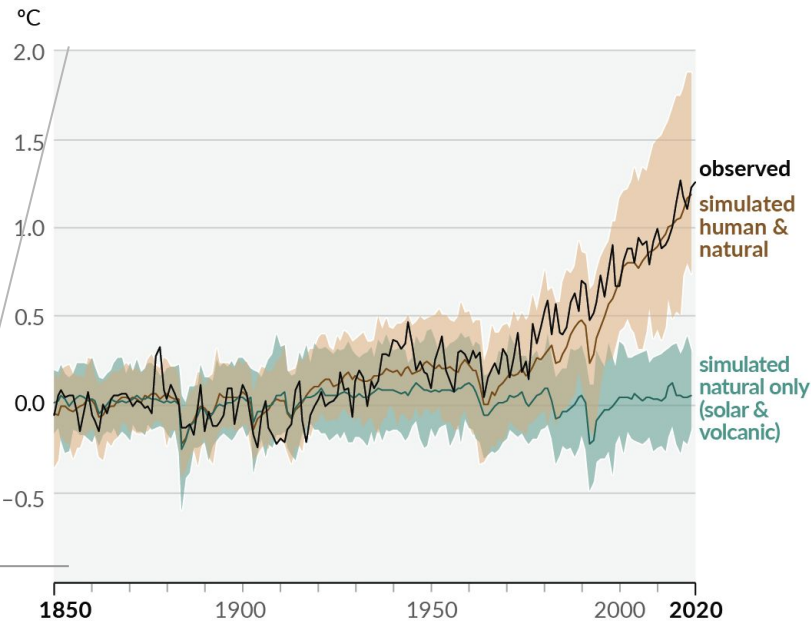
Is it our responsibility? YES

Changes in global surface temperature relative to 1850–1900

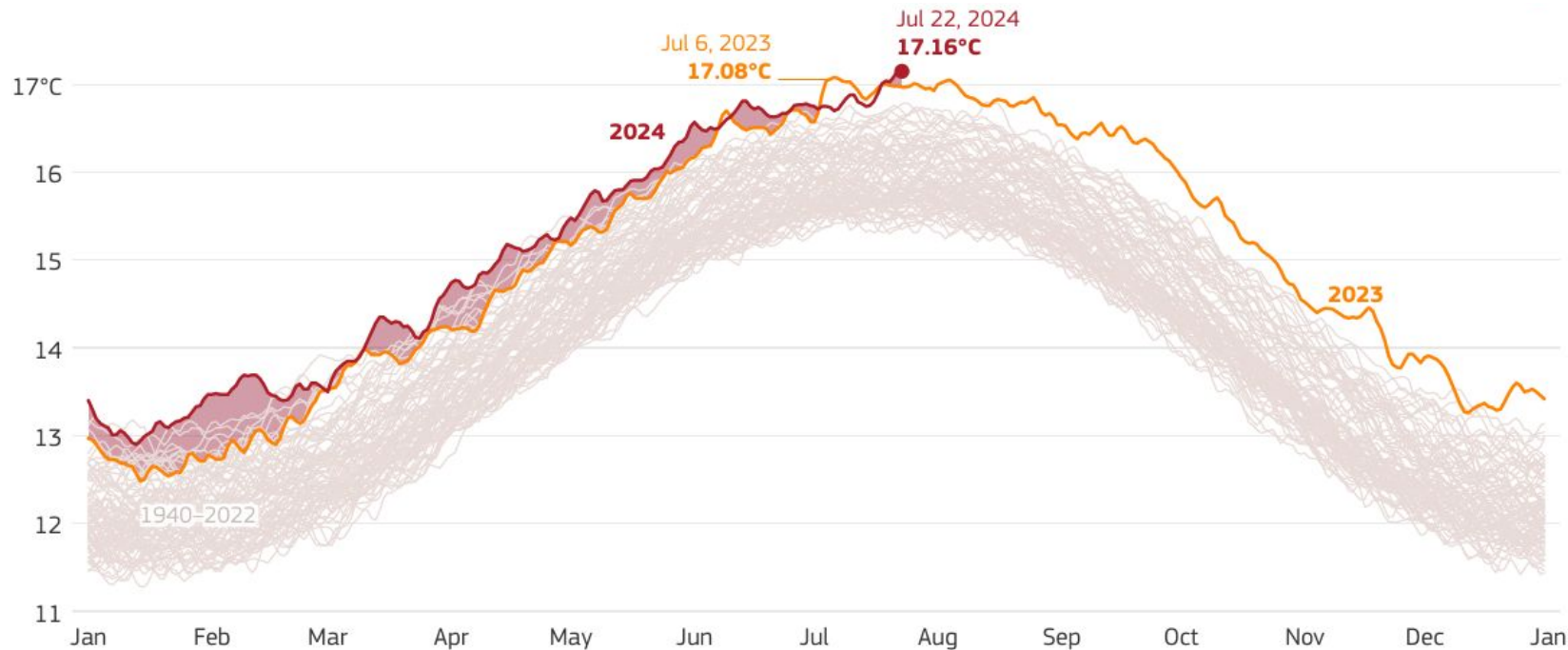
(a) Change in global surface temperature (decadal average) as **reconstructed** (1–2000) and **observed** (1850–2020)



(b) Change in global surface temperature (annual average) as **observed** and simulated using **human & natural** and **only natural** factors (both 1850–2020)



What's going on in 2024?



Data for 2024 shown up to 23 July. Data for 23 July 2024 is preliminary

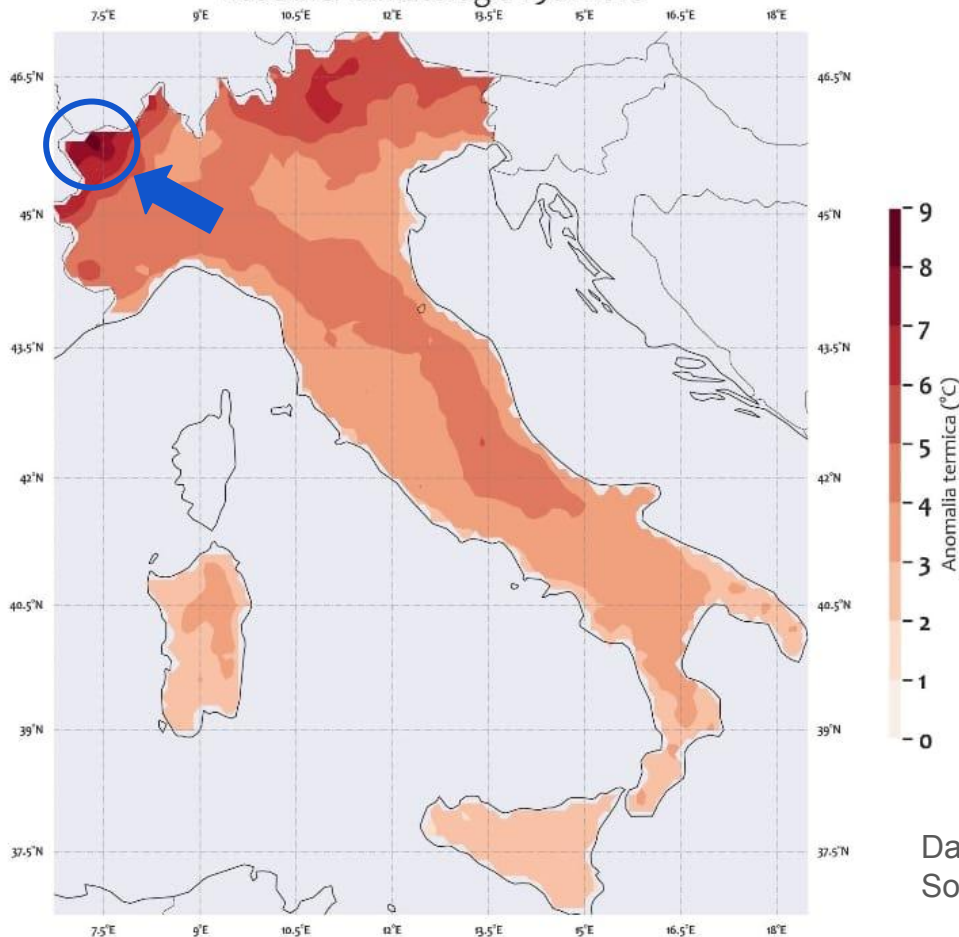
Data source: ERA5 • Credit: C3S/ECMWF



PROGRAMME OF
THE EUROPEAN UNION



Febbraio 2024 - Anomalie termiche delle temperature medie.
Baseline: climatologia 1981-2010



**Temperature is
warming faster
with the increase
of altitude**

Data Analyst&graphic: Lorenzo Arcidiaco: @LArcidiaco
Source: ERA5 Land <https://cds.climate.copernicus.eu/>

What's happening in the Aosta Valley: **Temperatures**



Mountains are warming faster than other regions of the planet:

St. Christophe
+0.58 [°C/dec]

Vs.

+0.2 [°C/dec]
Global mean

Temperatura media - annuale - Saint-Christophe

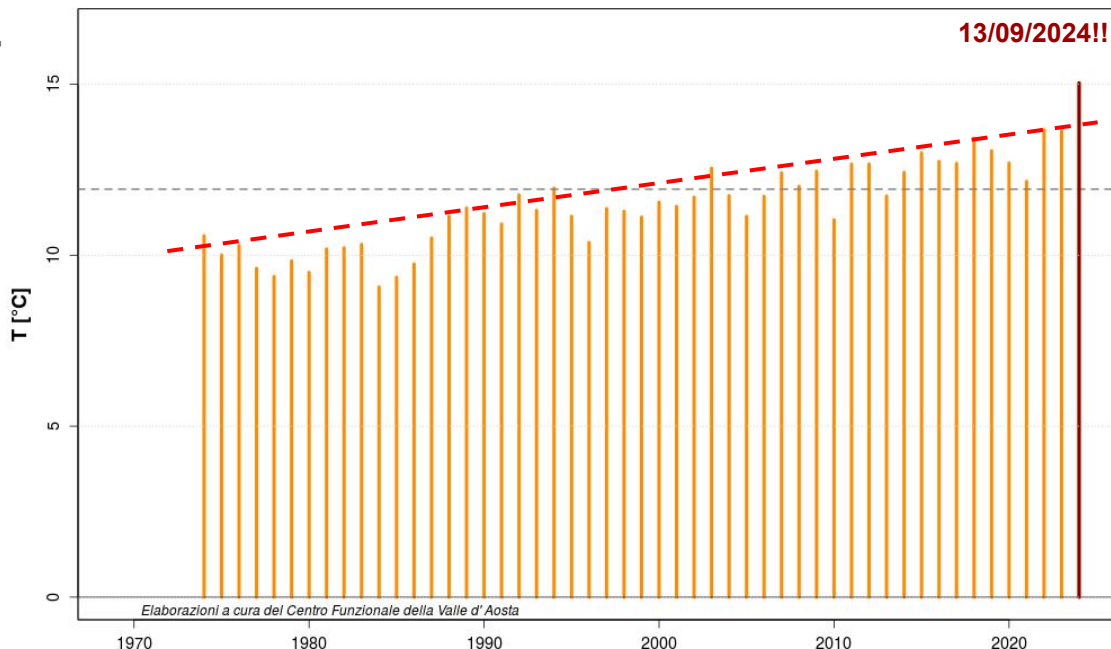


Grafico aggiornato al 13/09/2024

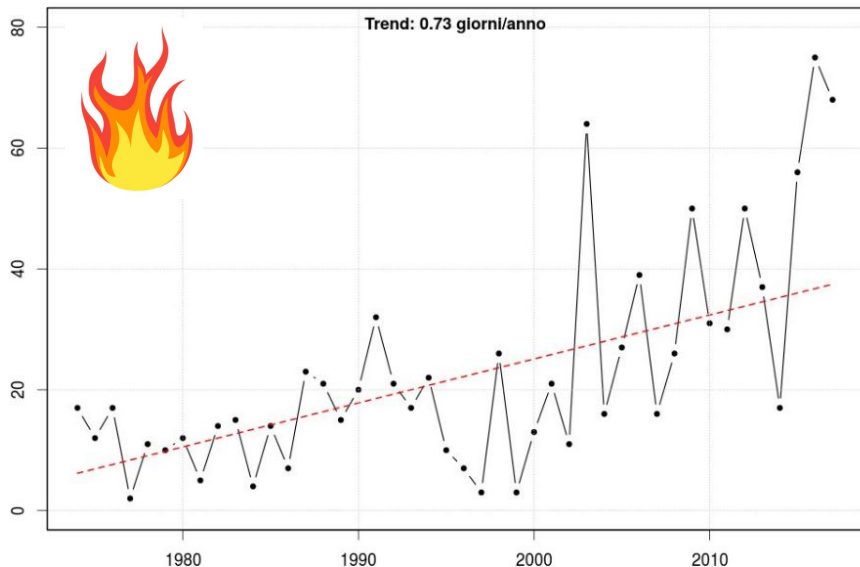
Temp media annuale (max = 15 °C) valore medio 1991-2020 (11.9 °C) anno 2024 (15 °C)



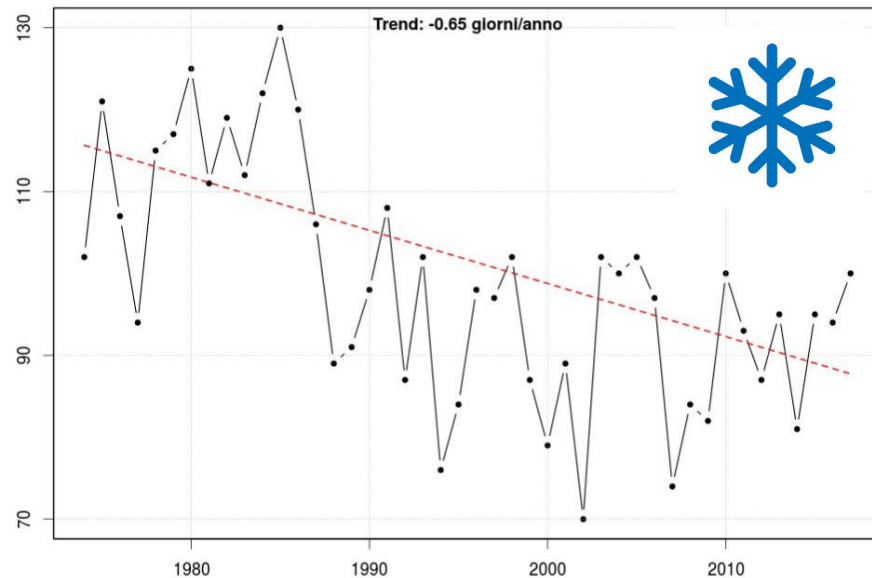
What's happening in the Aosta Valley: **Temperatures**



Giorni Tropicali [$T_{max} > 30^{\circ}\text{C}$] St.Christophe (1974 - 2017)



Giorni di gelo [$T_{min} < 0^{\circ}\text{C}$] St.Christophe (1974 - 2017)



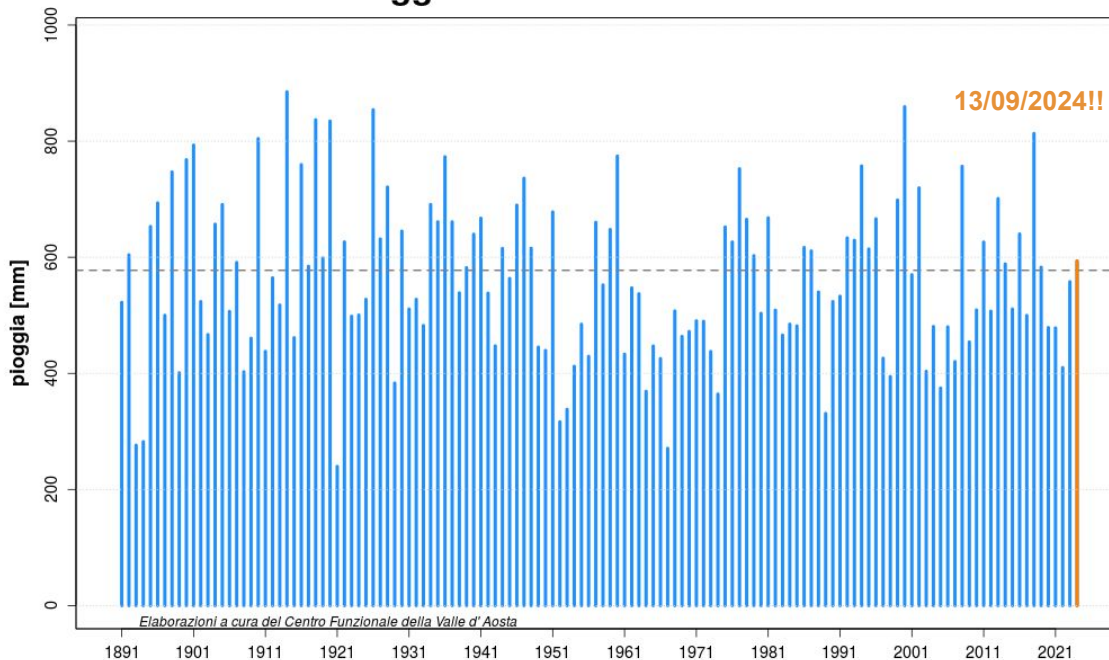
What's happening in the Aosta Valley: Precipitations



In historical precipitation records,
no significant trends are observed

... however

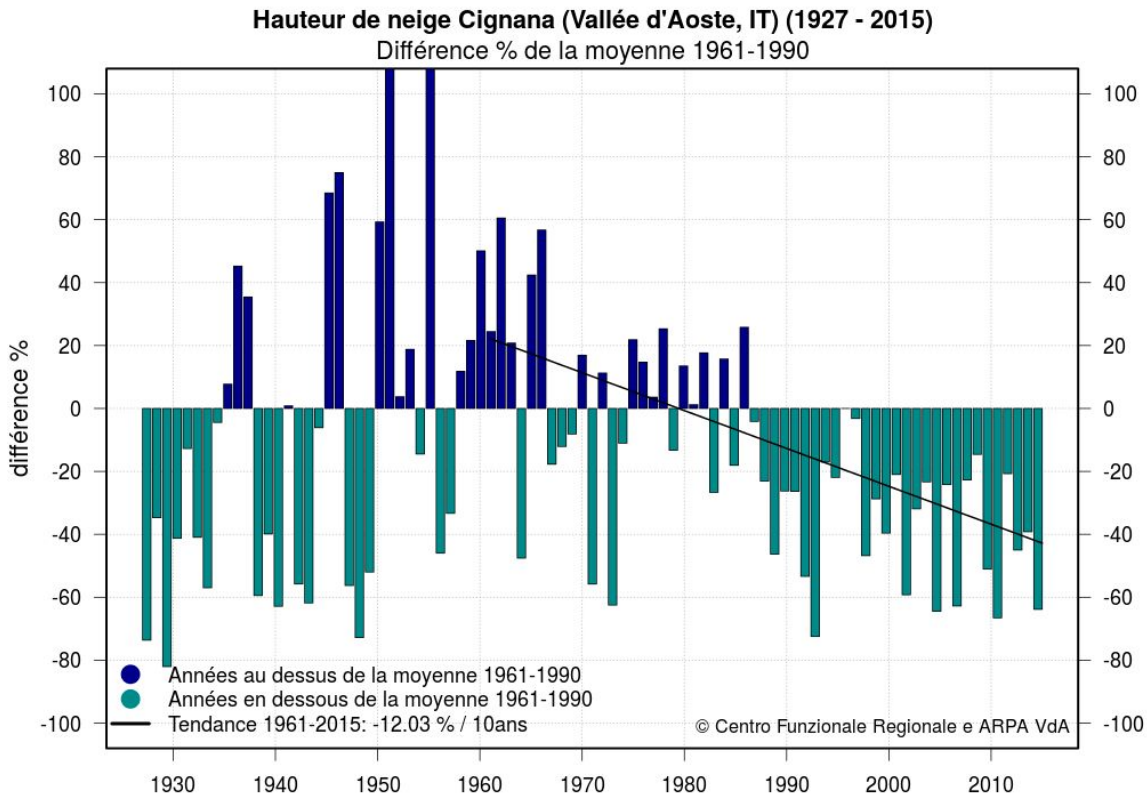
Pioggia totale - annuale - Aosta



What's happening in the Aosta Valley: Snow precipitations

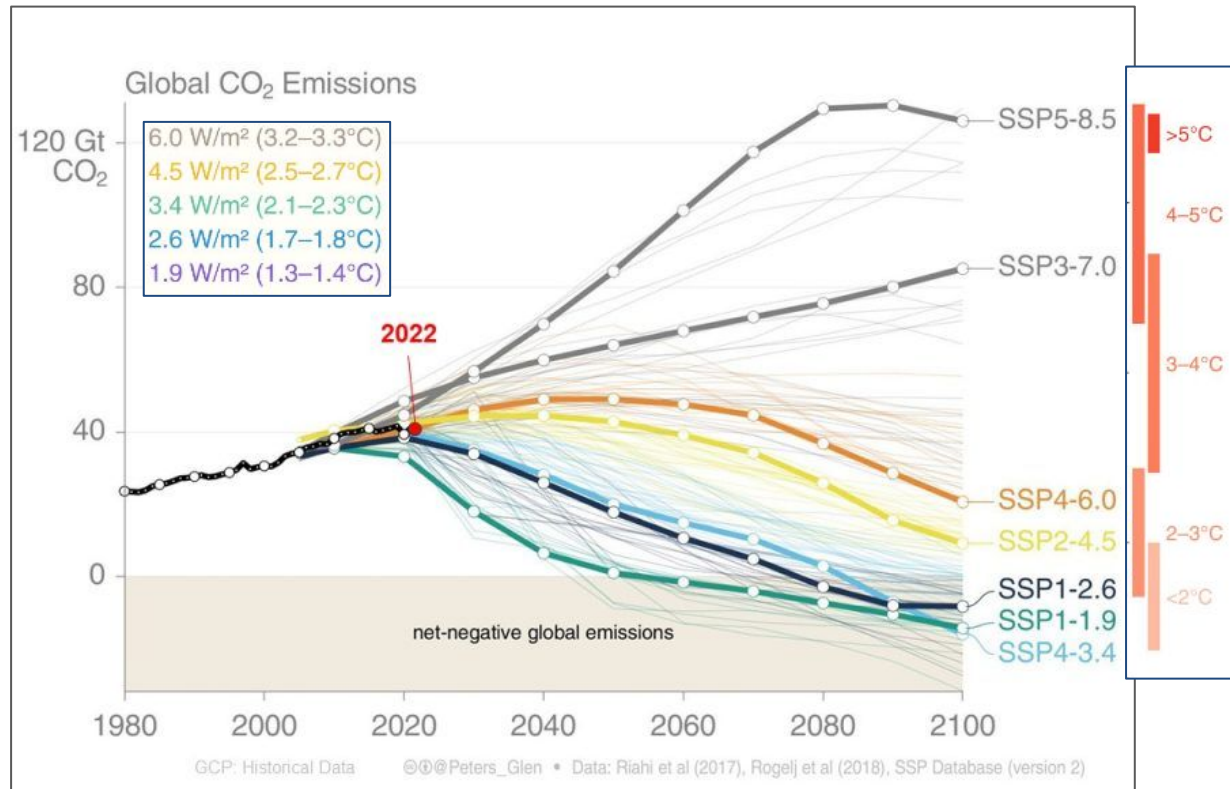


The impacts on snowfall
are significant



2. Climate pathway scenarios

What the future holds for us: **scenarios**



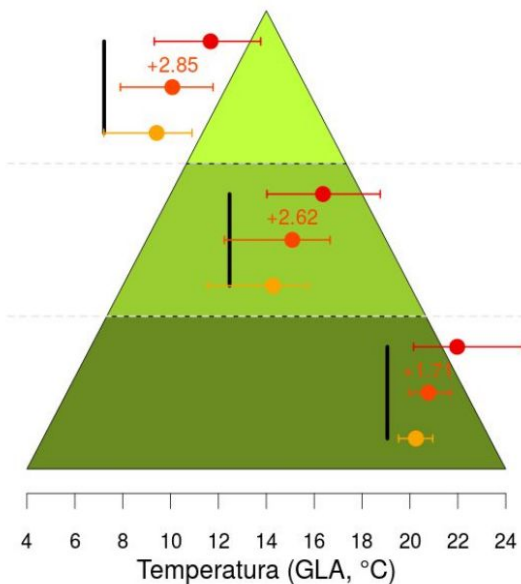
SSP: shared socioeconomic pathways

What the future holds: **climate scenarios in the Aosta Valley**

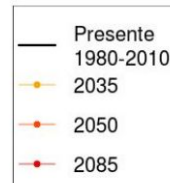
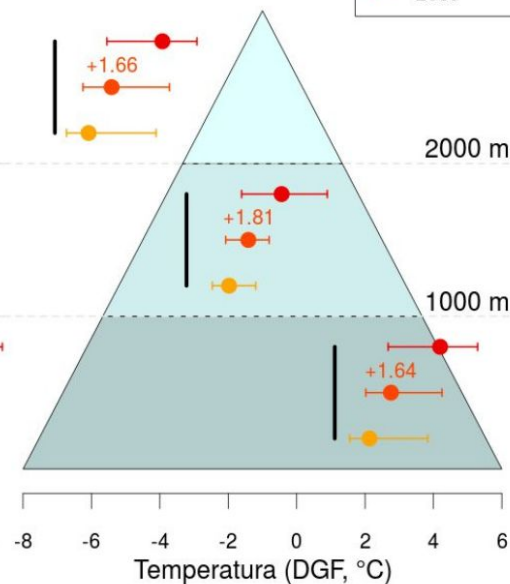
© ARPA VdA source: CH2018 Project Team (2018)
CH2018 - Climate Scenarios for Switzerland. National Centre for Climate Services



Estate (GLA)



Inverno (DGF)



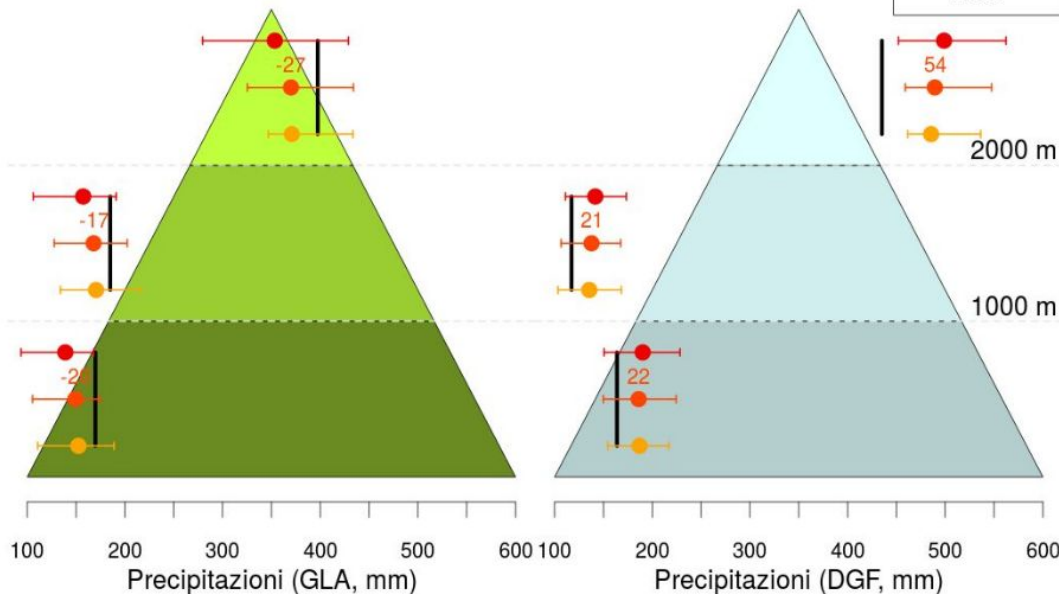
The altitude of the 0°C isotherm will rise in both summer and winter... it is already happening

What the future holds: **climate scenarios in the Aosta Valley**

© ARPA VdA source: CH2018 Project Team (2018)
CH2018 - Climate Scenarios for Switzerland. National Centre for Climate Services

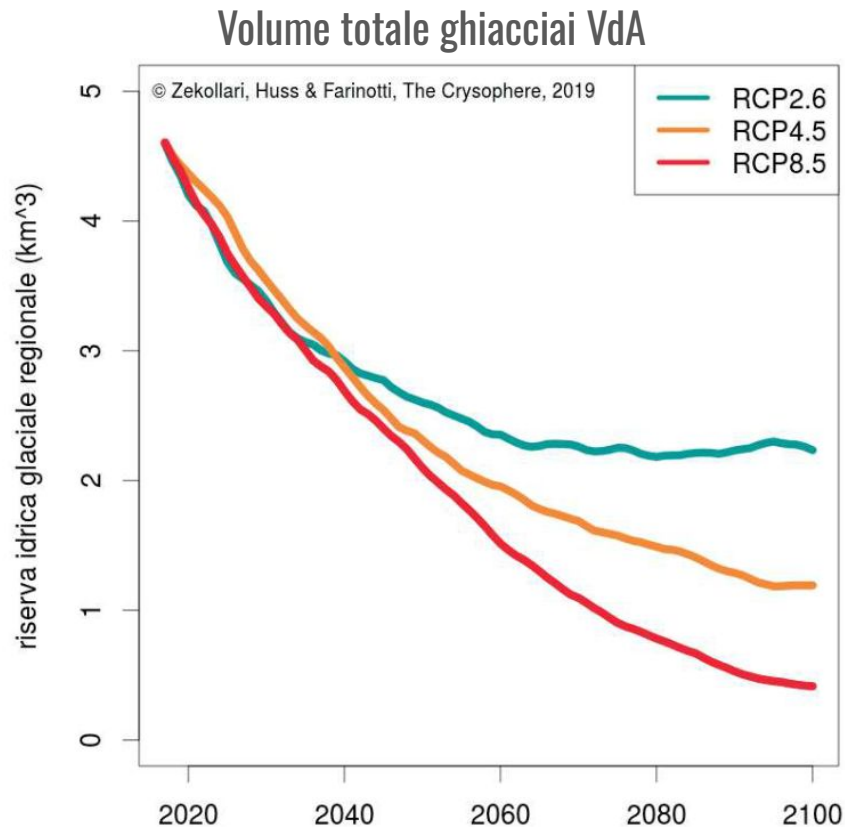
Estate (GLA)

Inverno (DGF)

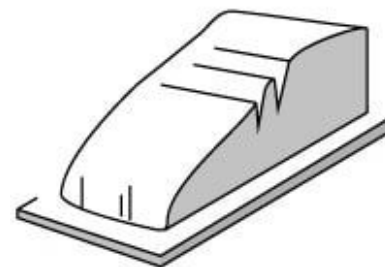


It won't rain less, but the seasonality of precipitation will change... it is already happening.

What the future holds: **climate scenarios in the Aosta Valley**

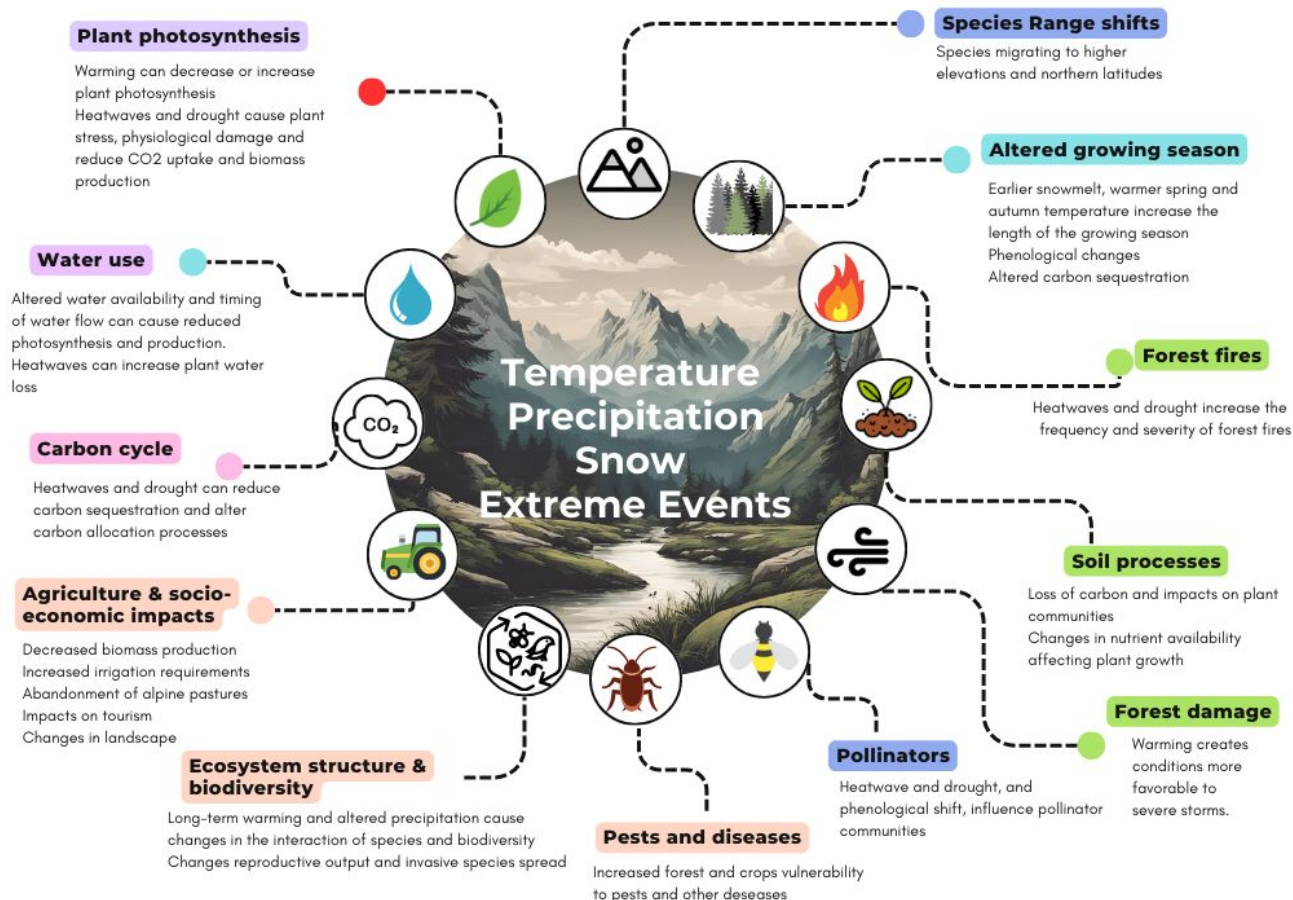


Significant reduction in
glacial contribution



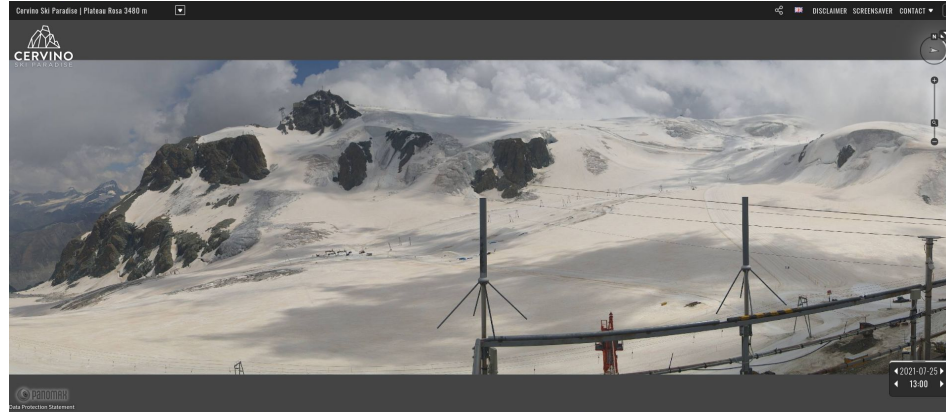
3. Impacts

The impacts on ecosystems:

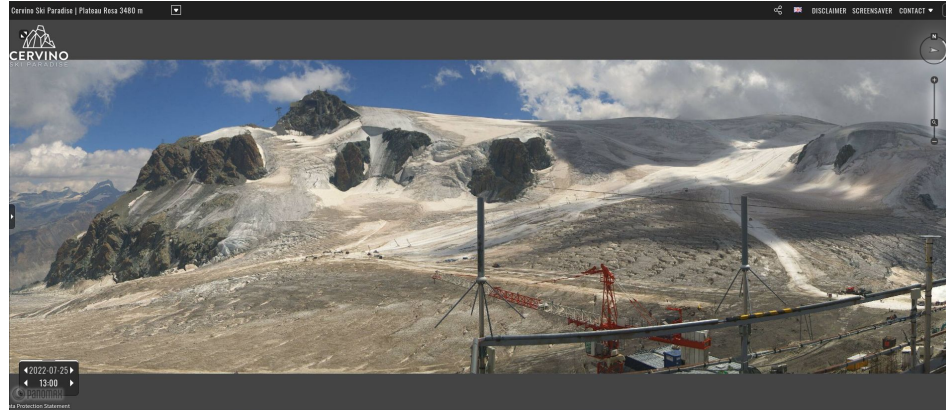


What the future holds: 2022 was an example of it

25 July 2021

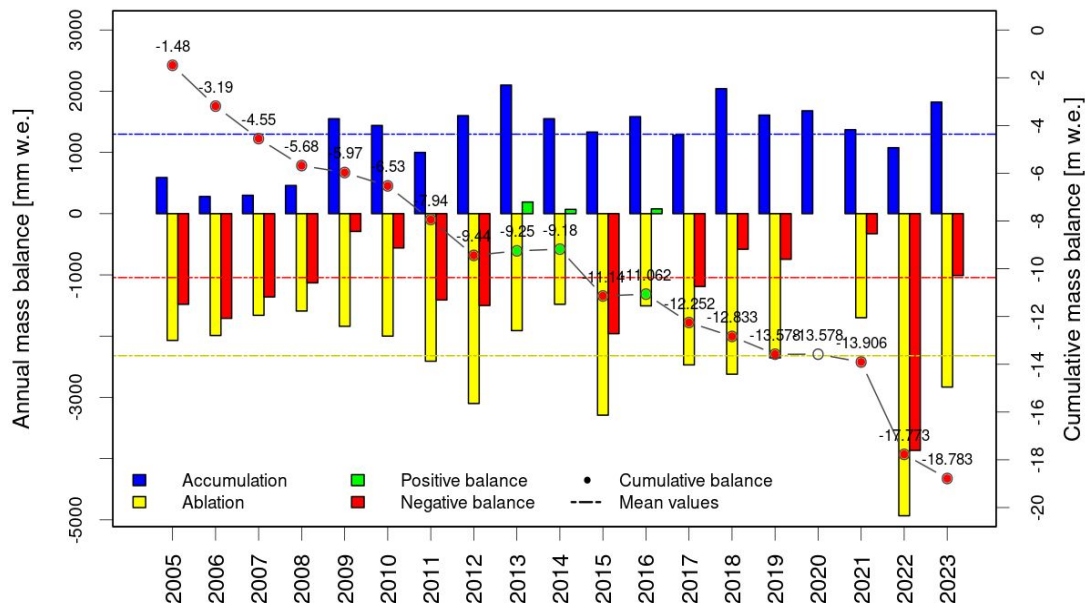


25 July 2022



What the future holds: 2022 was an example of it

Rutor: Mass Balance



Mont Blanc
(Colle Major 4750 m)

Summer 2022:
Tmax 11.5°C;
18 days with T > 0°C;
11 consecutive hours with T > 0°C

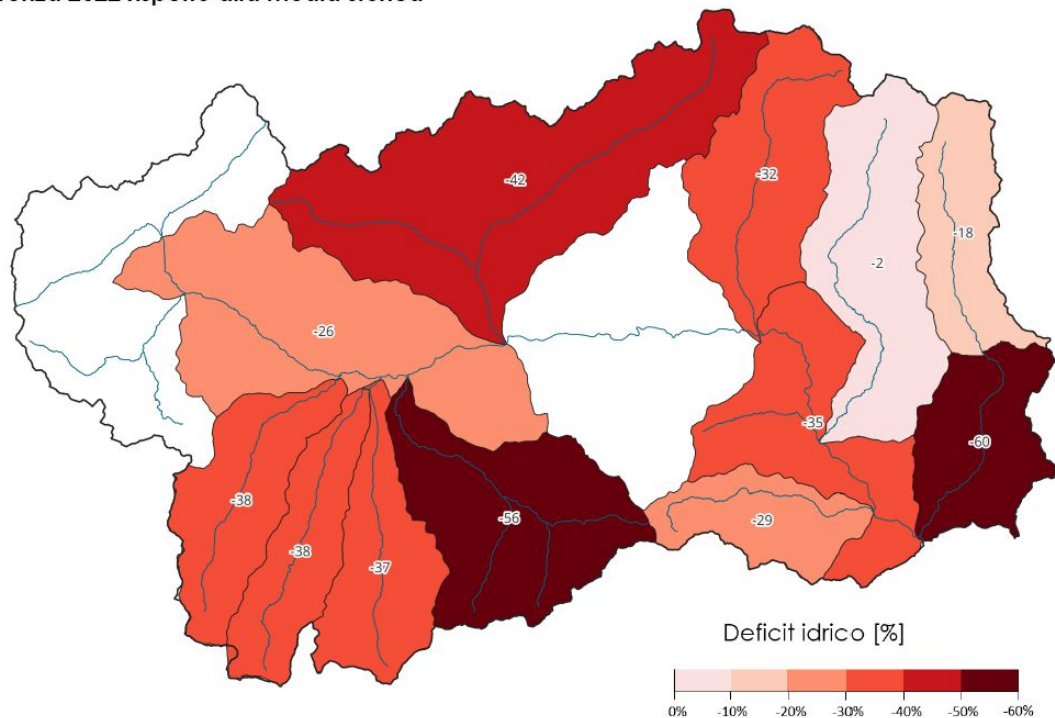


What the future holds: 2022 was an example of it

Water Availability: Flows in Watercourses

MARZO – SETTEMBRE

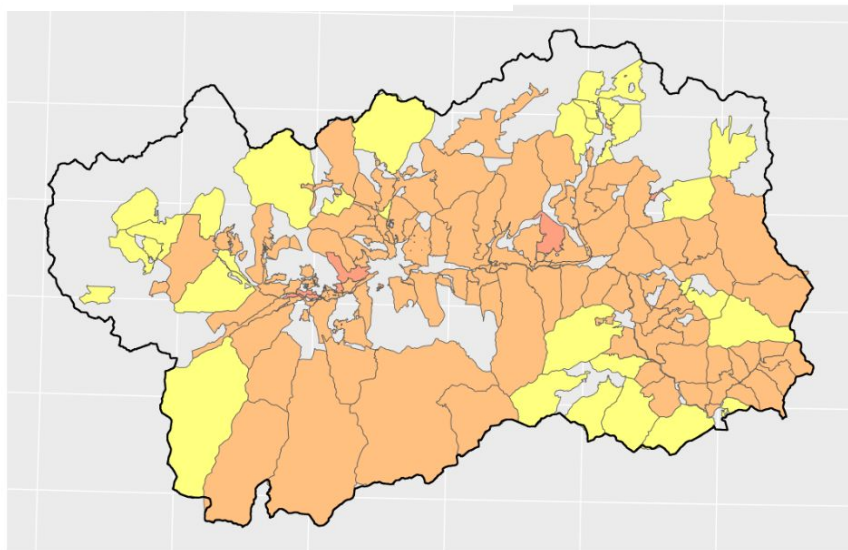
Differenza 2022 rispetto alla media storica



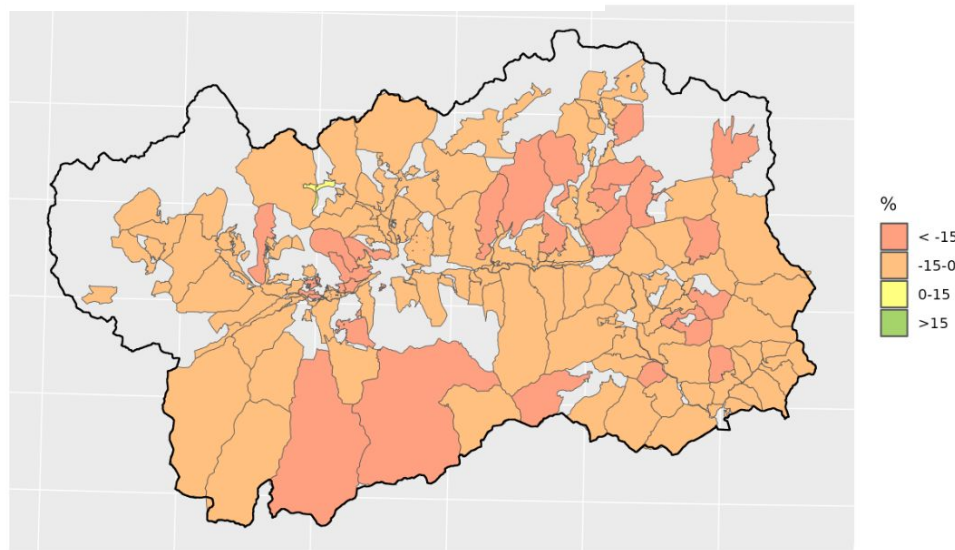
What the future holds: **2022** was an example of it

Productivity of Grassland-Pastures

Anomaly (%) Productivity: july 2022



Anomaly (%) Productivity: august 2022



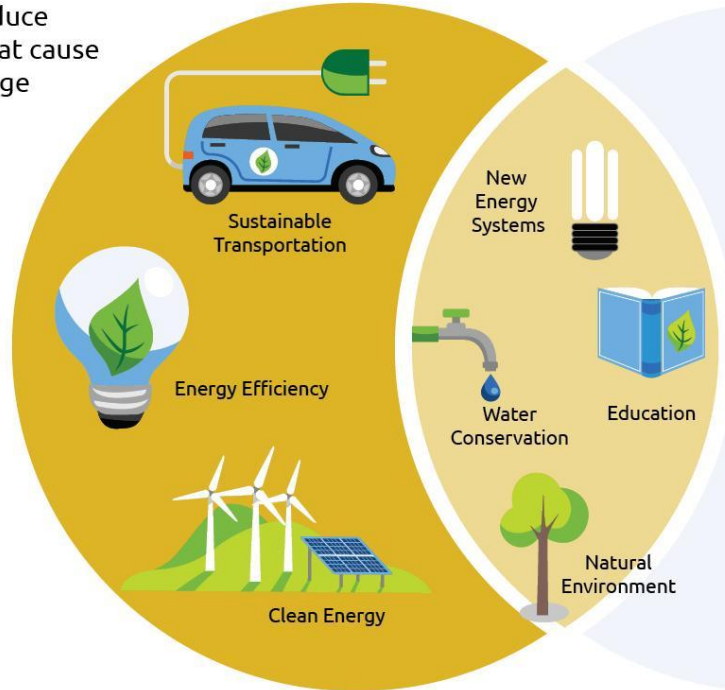
What can we do?

4. Mitigation & Adaptation!

What can we do?

Mitigation

Action to reduce emissions that cause climate change



Adaptation

Action to manage the risks of climate change impacts



Regional solutions: mitigation & adaptation!

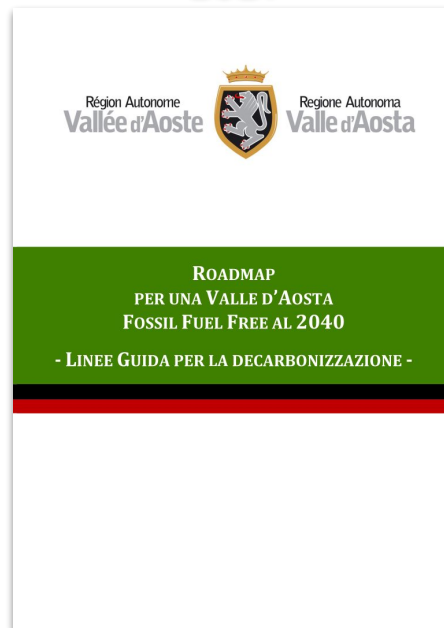
2019



2019



2021



2022



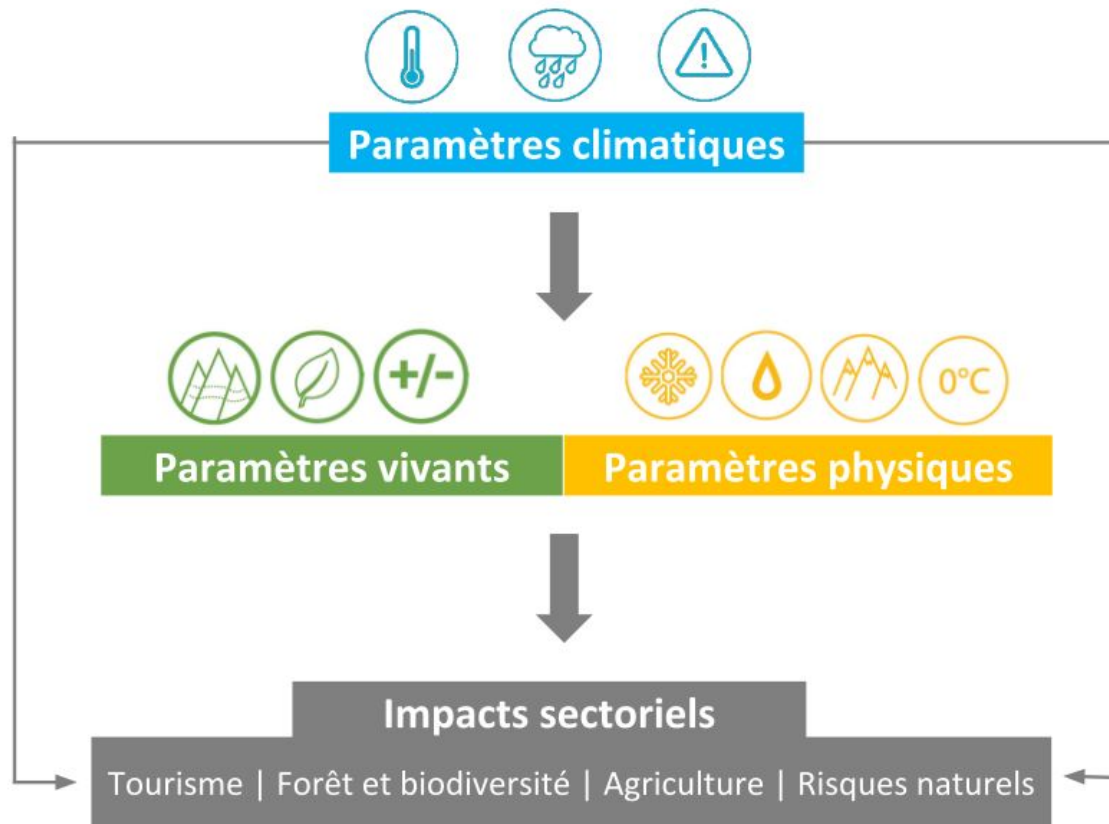
Région Autonome
Vallée d'Aoste



Regione Autonoma
Valle d'Aosta



2019 - Rapport Climat



2021 - Roadmap for implementing decarbonisation strategies

Observation and Monitoring

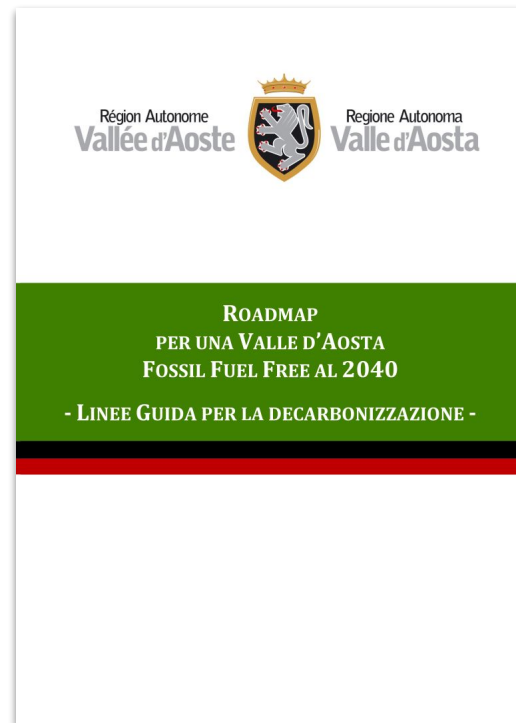
Data Analysis

Greenhouse Gas Inventory and Sectoral Analysis

Engage Sector Experts and Local Communities

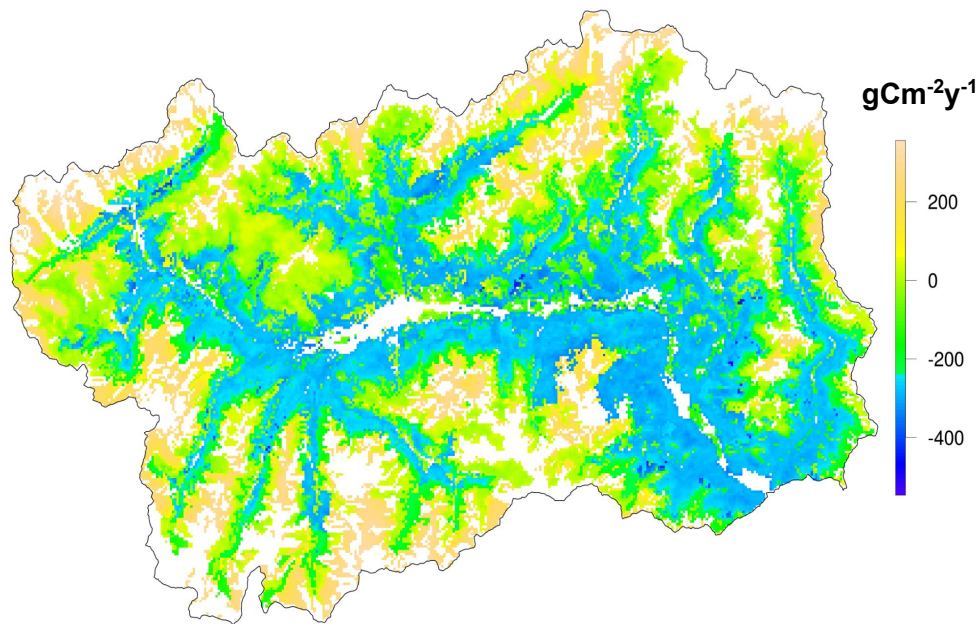
Collaboration: Realistic and Sustainable Strategies

Development of Mitigation Measures



2021 - Roadmap for implementing decarbonisation strategies

CO₂ Absorption in the Aosta Valley



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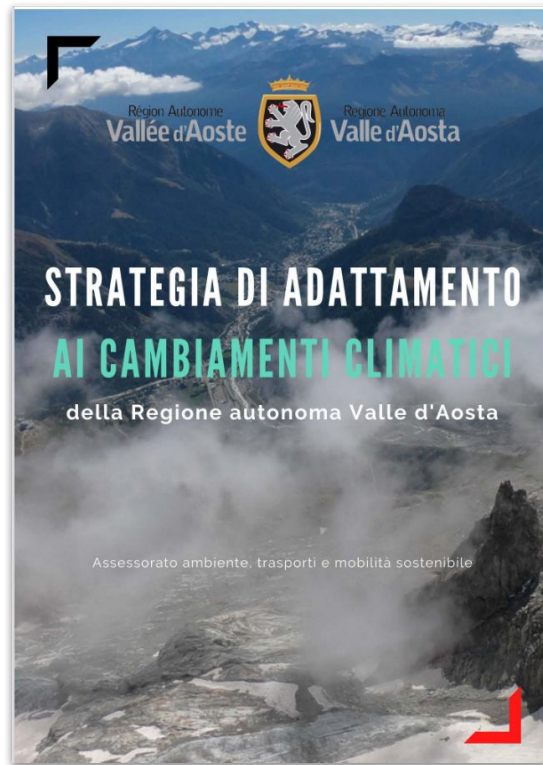
"Bilancio delle emissioni dei gas ad effetto serra per l'intero territorio della valle d'aosta. Anno di riferimento: 2017"

"Roadmap per una Valle d'Aosta Fossil fuel free al 2040, linee guida per la decarbonizzazione"

"Galvagno et al (2023). Eddy covariance flux data for supporting local CO₂ emissions reduction strategies. In preparation"

2022 - Climate Change Adaptation Strategy

- **Minimize** the risks of climate change and **reduce** the vulnerability of the territory and socioeconomic sectors;
- **Protect** the health and safety of the population, **preserve** biodiversity and natural resources;
- Increase the **adaptive capacity** of society, the economy and the environment;
- Take advantage of possible **opportunities** arising from climate change;
- Ensure the coordination of **actions**, enhance transparency, and promote the achievement of **adaptation goals** on a regional scale;
- Define a **long-term vision** for a climate-resilient regional territory that takes into account future scenarios.



2022 - Climate Change Adaptation Strategy

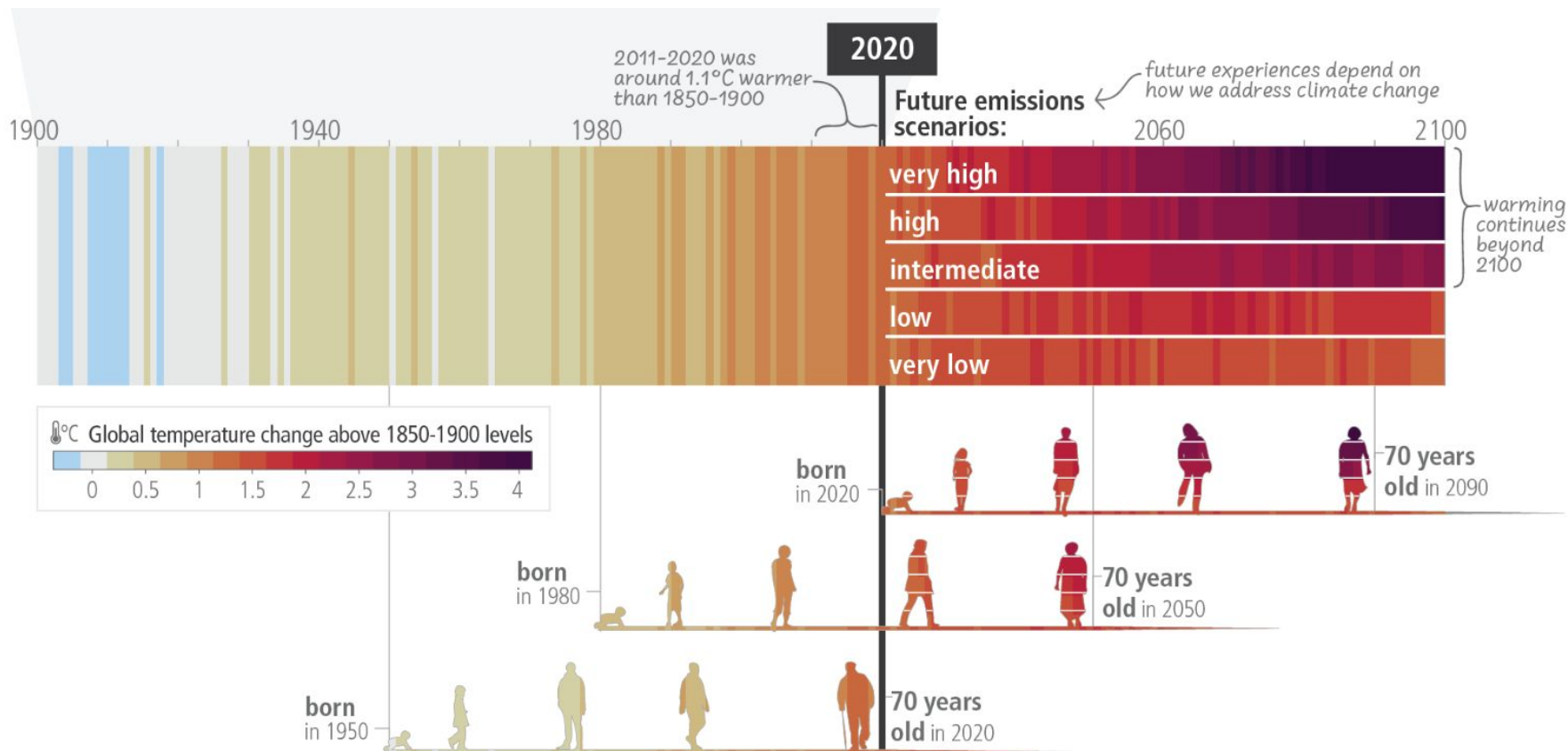
Sectors of the Strategy



Priority and Cross-Cutting Challenges



The Role of Young People



The Youth COP of Aosta



Thank you!

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