

In 2017, Switzerland ratified the Paris agreement and committed to reduce its carbon emissions by half by 2030 (from 1990 levels), including carbon offsets abroad. Switzerland also announced an indicative objective to reduce its emissions by 70%-85% until 2050 (from 1990 emissions), including offsets abroad. **Studies that describe the existing solutions, their combined potential and the possible pathways to achieve such objectives are uncommon.** Among the most influential solution-oriented approaches is **Project Drawdown** that describes 100 science-based climate solutions. More recently, **Future Earth** published its **Exponential Climate Action Roadmap (ECAR)** (Falk et al., 2018) in collaboration with others (Project Drawdown, Stockholm Resilience Center, WWF, etc.). This

initiative gives solutions (mainly from Drawdown) that could potentially achieve the overall goal of halved global CO<sub>2</sub>-eq by 2030 and subsequently until 2050 (Rockström et al., 2017) in line with Paris agreement objectives. In Switzerland, initiatives that cover a large range of solutions also exist, like the **Climate Master Plan** from Climate Alliance Switzerland (2006 and 2016), Swiss Academies' report (2016). Others focus on specific aspects, e.g. on energy (ETH Zurich, Swiss Cleantech). **The Glacier Initiative** seeks carbon net zero by 2050. For reaching net zero more science-based knowledge on the reduction potential of climate solutions is needed. The poster considers what the key elements and scope of a Swiss roadmap to net zero could be.

## Which solutions?



**Built Environment**  
The cities of the world and the buildings and infrastructure that comprise them account for a significant percentage of human energy use, mostly for heating and cooling.



**Electricity Generation**  
The power sector currently accounts for around 40 percent of annual greenhouse gas emissions to the atmosphere, making it the highest-emitting sector.



**Food**  
Agricultural production, as well as food preparation, consumption, and waste, are responsible for a major share of greenhouse gas emissions today.



**Land Use**  
Protection and restoration of forests and wetlands, as well as the production of perennial timber and biomass crops, can sequester significant amounts of carbon.



**Materials & Waste**  
The ways in which humans partner with materials result in significant greenhouse gas emissions throughout the life cycle of the products that meet our daily needs.



**Oceans**  
Oceans are critical in regulating the Earth's climate and are also disproportionately impacted by changes in atmospheric greenhouse gases.



**Transportation**  
Transportation produces 7 gigatons of carbon dioxide-equivalent greenhouse gas emissions annually, which is around 14 percent of all emissions.

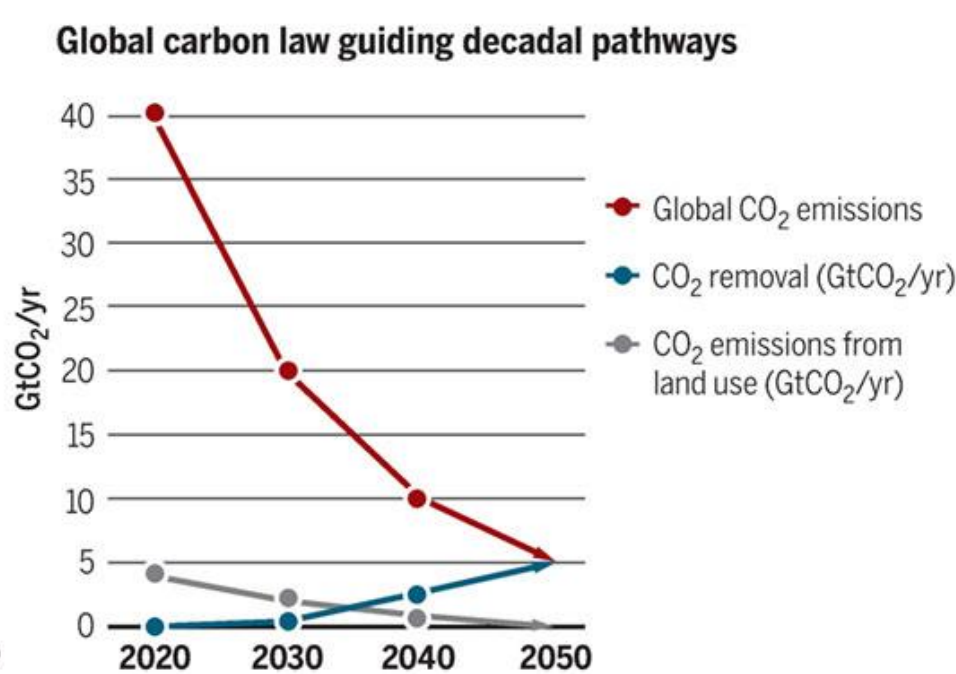
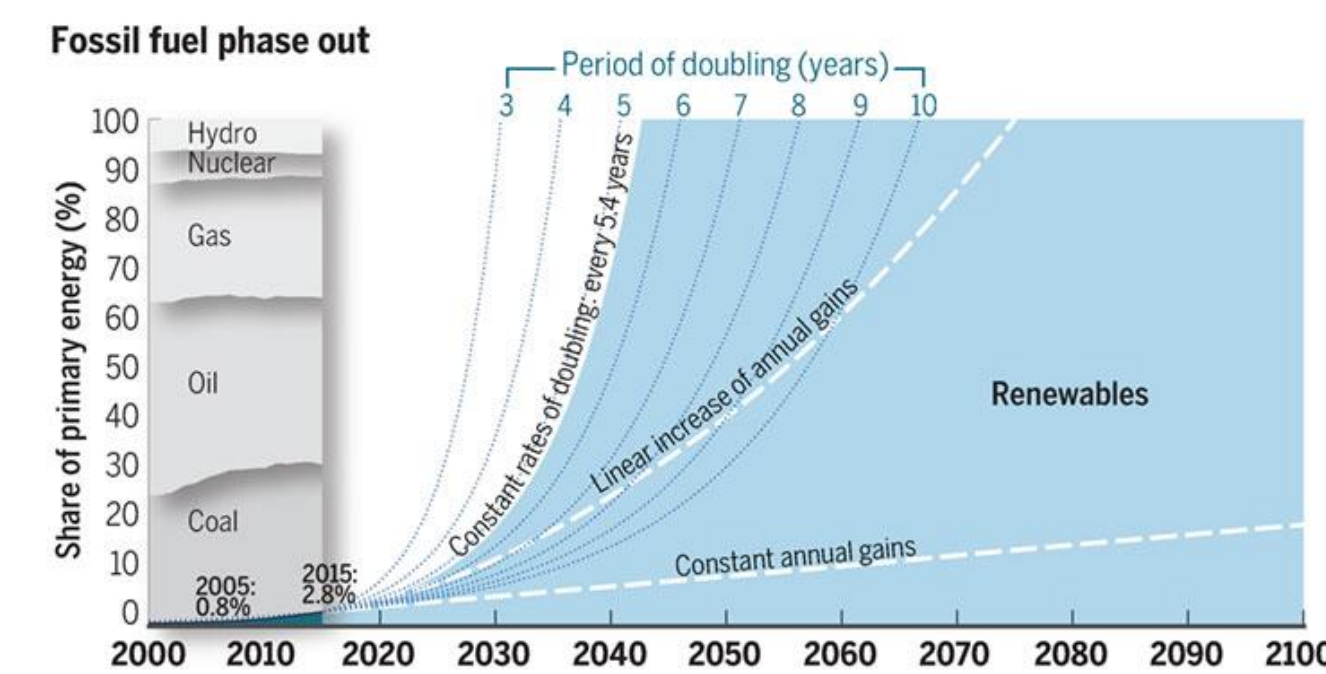
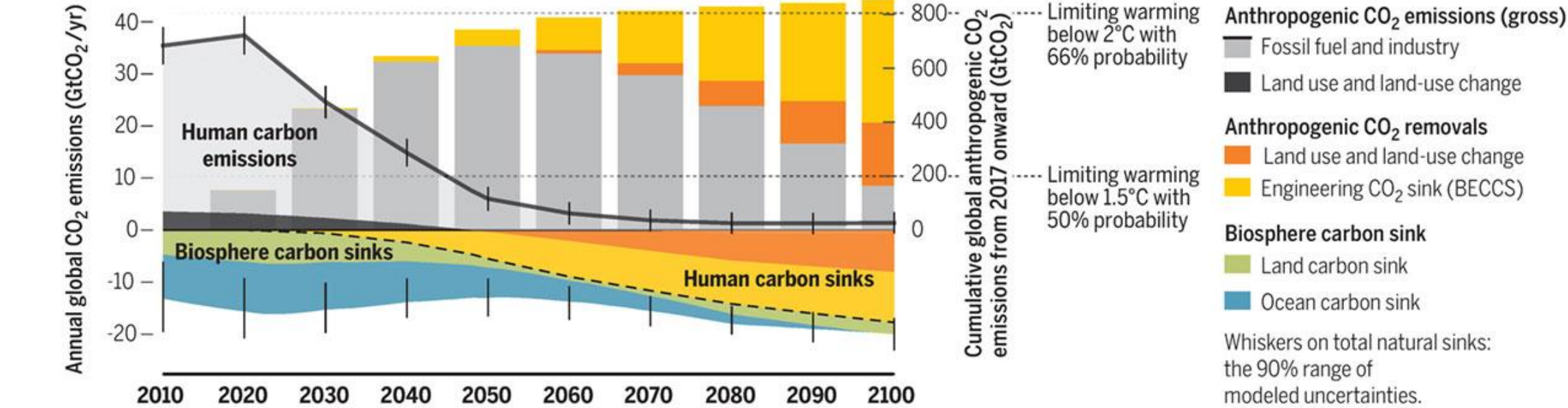


**Women & Girls**  
Key areas of gender equity such as education and voluntary family planning are basic human rights that also have an effect on fertility rates and population growth.

## Why an exponential path?

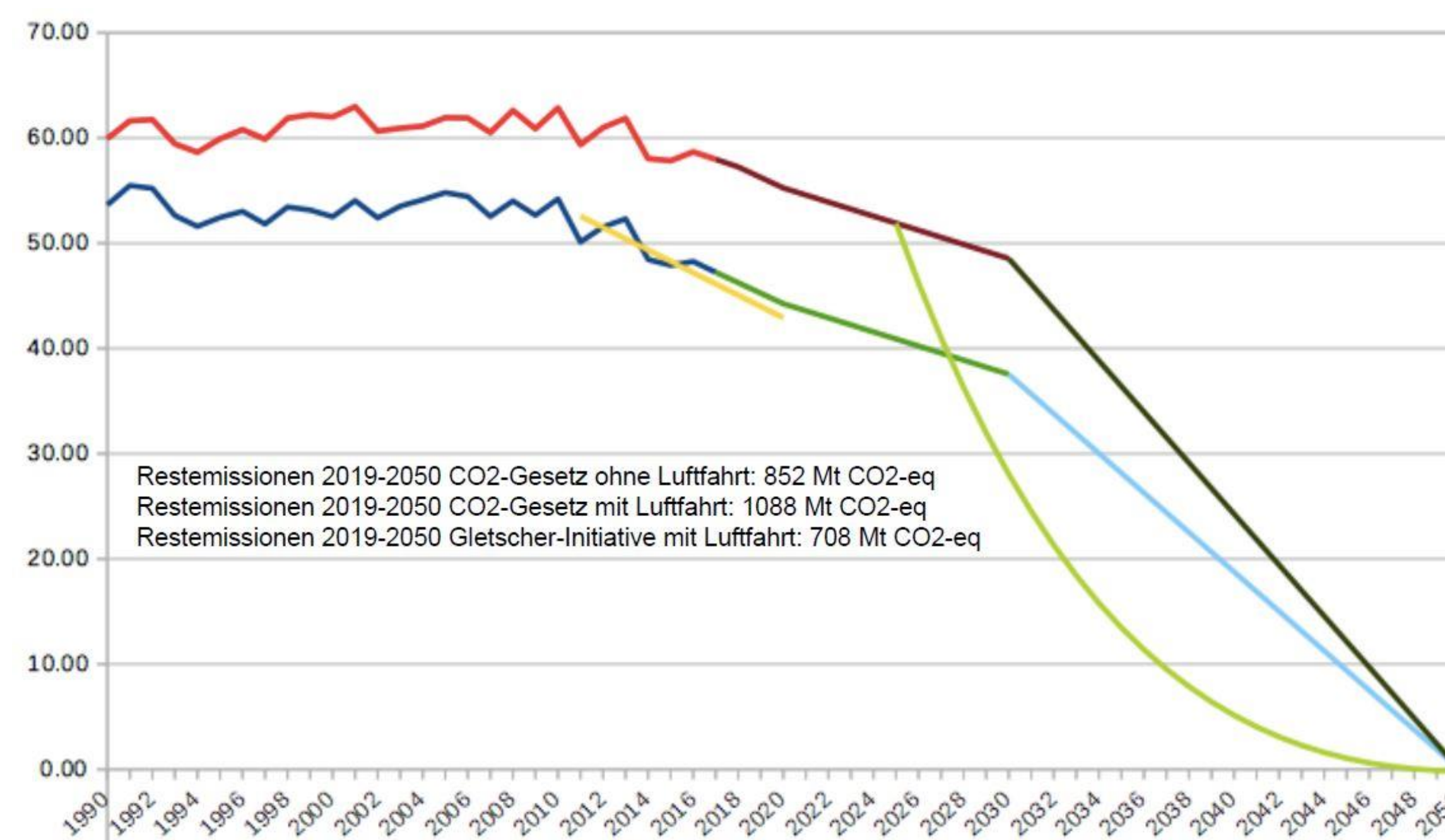
### A global carbon law and roadmap to make Paris goals a reality

#### Decarbonization pathway consistent with the Paris agreement



Rockström, J., Gaffney, O., Rogelj, J. et al. 2017. A roadmap for rapid decarbonization. Science, Volume 355 Issue 6331

## Which pathway for Switzerland?



— Total ohne Luftverkehr  
— Total inkl. Luftverkehr (inkl. stratosphärische Em.)  
— CO<sub>2</sub>-Gesetz 2011-2020  
— CO<sub>2</sub>-Gesetz 2021-2030 (UREK-S-Mehrheit ohne Luftfahrt)  
— CO<sub>2</sub>-Gesetz 2021-2030 (UREK-S-Mehrheit, Luftfahrt gleich bleibend)  
— CO<sub>2</sub>-Gesetz 2031-2050 (ohne Luftfahrt)  
— CO<sub>2</sub>-Gesetz 2031-2050 inkl. Luftfahrt (bis 2030 gleich bleibend)  
— Gletscher-Initiative

## What scope?

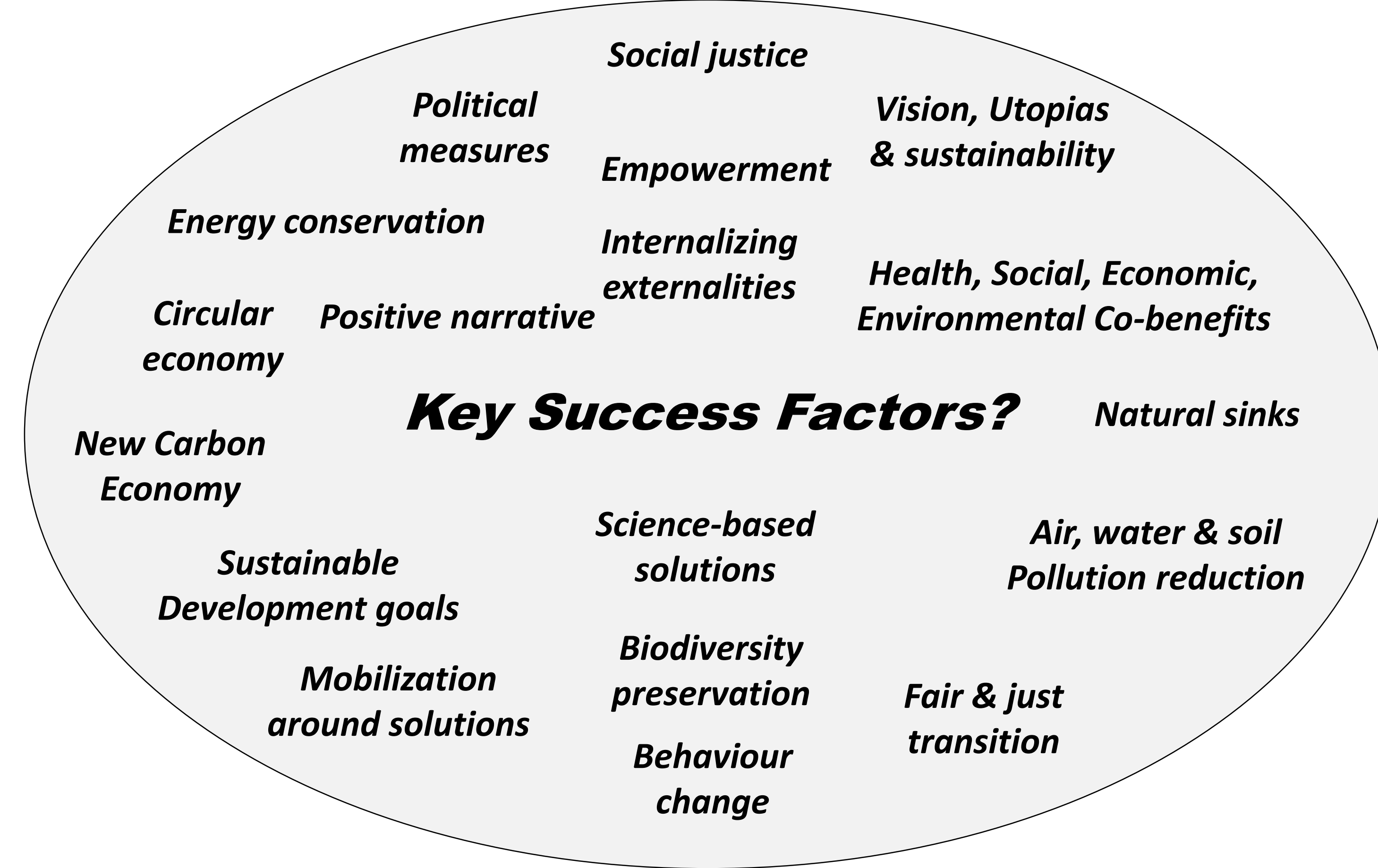
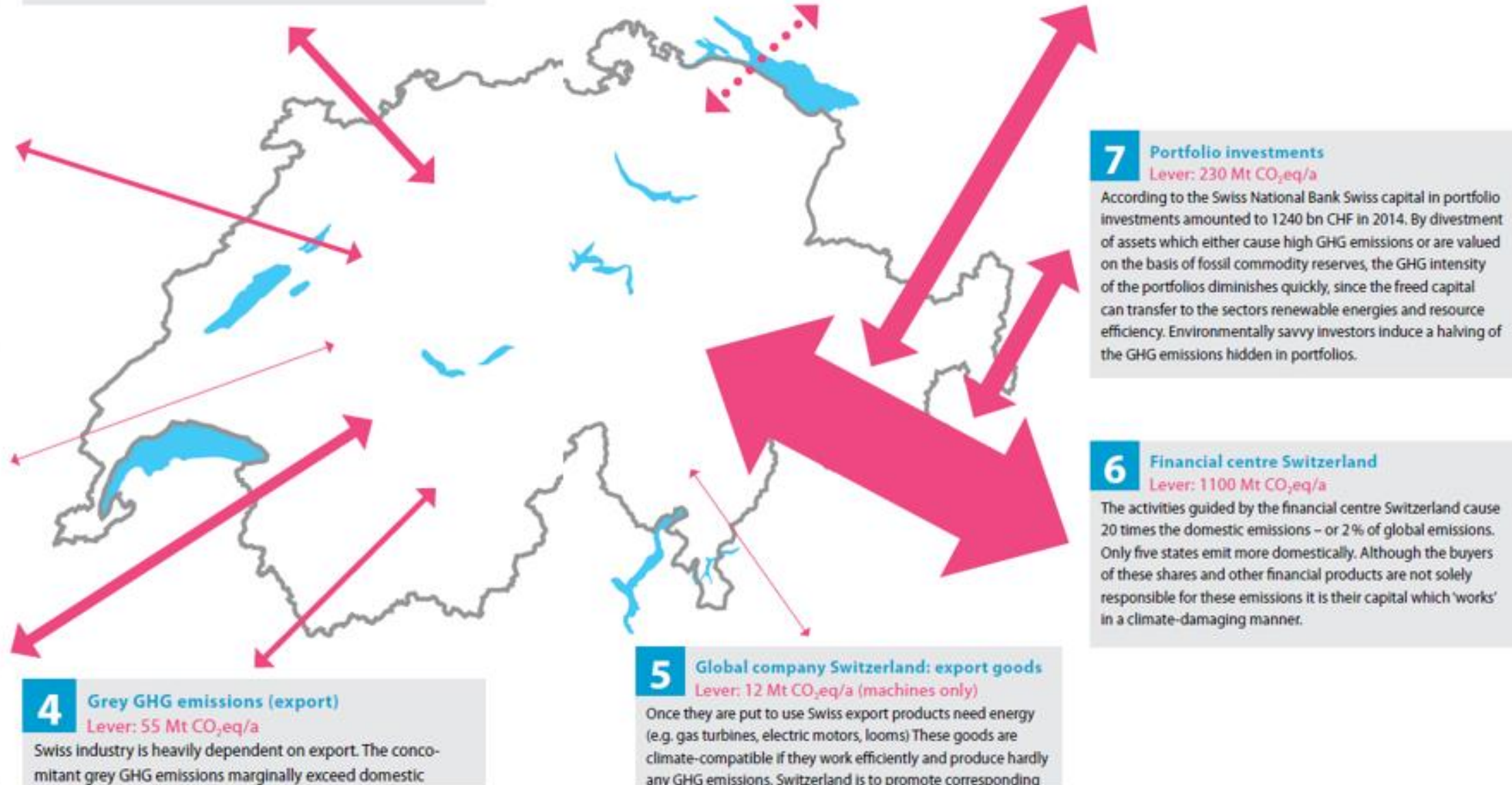
The climate-relevant, partly overlapping sectors have a nationwide, or even global frame of reference. Intervening here has a clear effect: these are the climate levers of Switzerland. In order to reach the global target of net-zero GHG emissions the tonnage related to each lever must rapidly decrease, aiming for zero. What is strikingly effective are the cross-border levers: In terms of climate levers, Switzerland belongs to the G20, partly even to the G8.

- 1 Domestic emissions**  
Lever: 50 Mt CO<sub>2</sub>/a  
The inventory consists of nationwide CO<sub>2</sub> from fossil energies as well as other GHGs like methane, laughing gas and fluorinated carbons. These emissions have declined only marginally over the last years; however, the Swiss government expects them to be 20% lower by 2020. The Kyoto Protocol, the Paris Agreement and the CO<sub>2</sub> law set the framework. Besides the climate, energy and agricultural policy on a national level, the cantonal energy legislation and the municipal practice are decisive for reaching the targets.
- 2 International aviation (from Switzerland)**  
Lever: 10 Mt CO<sub>2</sub>/a (including water vapour and nitrous oxide at cruising altitude)  
There is next to no regulation for the climate impact of aviation. The amount of kerosene tanked in Switzerland is increasing annually. The passenger numbers are rising even more: we fly roughly twice as much as our neighbours. Although the international aviation authority ICAO is endeavouring to set up global compensation rules and a minimal efficiency standard, only national measures can decrease the rapidly rising demand.
- 3 Grey GHG emissions (import)**  
Lever: 110 Mt CO<sub>2</sub>/a  
The majority of all the goods consumed in Switzerland are produced abroad. The CO<sub>2</sub>-heavy electricity import is number

**10 Climate protection abroad**  
Lever: 100 Mt CO<sub>2</sub>/a  
Switzerland produces roughly 1% of the GDP of all industrialised countries. It should contribute to the implementation costs of the Paris Agreement to the same extent – annually about 1 billion CHF for emission reductions and adaptation costs. This means quadrupling the climate contributions using extra funds which are generated proportionally by polluters: existing instruments (e.g. auction/minimal price of emission certificates, partially earmarked CO<sub>2</sub> levy) and new means (e.g. flight ticket levy, financial transaction tax, import/consumption levy).

**9 International investment regulation and incentives**  
Lever: hard to quantify  
Should investment shadow CO<sub>2</sub> costs be priced in for investment decisions in coal infrastructure be impeded or prevented? Should shadow CO<sub>2</sub> costs be priced in for investment decisions? Being on the board of development banks, the OECD, the International Aviation Organisation (ICAO) and elsewhere, Switzerland takes part in the decision process in such questions.

**8 Direct investment**  
Lever: 270 Mt CO<sub>2</sub>/a  
According to the Swiss National Bank direct investments with Swiss capital amounted to 1447 bn CHF: almost 40% of which are in the industrial sector. Often these are foreign engagements of Swiss companies or companies with their headquarters in Switzerland. Here more transparency and duty of care come into focus: they are to secure the sustainability of investments and reduce the climate footprint.



**Alexandra Gavilano**  
CO<sub>2</sub> Pyrolysis LLC // Research Scientist, WOCAT and CDE, University of Bern  
alexandra.gavilano@gmail.com  
linkedin.com/in/alexandra-gavilano-76a5086a

**John Moorhead**  
President Drawdown Switzerland  
Co-founder Climate Action Accelerator  
Mobile: +41 79 342 8252  
Email: jmoorhead@drawdown.ch