ETH zürich

Office of the President

ETH Zurich strives for Net Zero by 2030

Climate change requires rapid and determined action.

ETH Zurich set the goal to reduce its greenhouse gas emissions to Net Zero by 2030. This document lays out what climate neutrality means for the University and how it aims to achieve that goal. The ETH Community is invited to help determine the path and the speed of this task as a joint responsibility.

White Paper, September 2022

What does Net Zero by 2030 mean? And how is ETH Zurich dealing with this target?

As a leading university of science and technology, ETH Zurich is determined to make a critical contribution towards ensuring that the volume of greenhouse gas emissions does not exceed the amount that can be extracted from the atmosphere. To this end, social and technological developments as well as economic and political incentives will be pursued even more vigorously.

When Switzerland signed the Paris Agreement on climate change in 2015, it committed itself together with many other countries to take action for stabilising global warming at 1.5 degree Celsius above preindustrial levels. To achieve this goal, greenhouse gas (GHG) emissions must rapidly decline to the point where overall, new GHGs are no longer emitted to the atmosphere. Net Zero means that any GHGs that are emitted can be absorbed through human-made carbon sinks like afforestations, managed forests and soils, or can be extracted again from the atmosphere using other negative emission technologies.

By embedding the Net Zero goal in its Strategy and Development Plan 2021–2024,[i] ETH Zurich has positioned itself as a trailblazer in decarbonization. To achieve this goal, it utilises its scientific expertise in areas of relevance to society, intensifies research activities as well as technology and knowledge transfer, fosters talent recruitment, and addresses the management of combined crises – including climate, biodiversity, energy, and food – in the training of its students.

ETH Zurich has set itself the goal of achieving Net Zero in its own operations by 2030. The target is to reduce its GHG emissions by at least 50 percent compared to the benchmark year 2006. As such, ETH Zurich complies with the requirements stipulated in the «Federal Administration's climate package».[ii] To achieve this target, ETH Zurich relies on 1) reduction of GHG emissions, 2) replacing technologies causing GHG emissions and enhancing their efficiency, and 3) innovations in the domain of negative emission technologies. Emissions that cannot yet be avoided by current means are compensated for the time being. The combination of reduction, replacement, and efficiency gains as well as negative emission technologies developed and advanced by ETH Zurich will allow the University to phase out of compensating emissions after 2030.

ETH Zurich wants to achieve the Net Zero goal with its own capacities. It is conscious of the profundity of the transformation that this will require: It assesses the costs and risks of inaction as high. At the same time, it acknowledges that the joint effort to achieve Net Zero by 2030 will create many opportunities for social and technological innovations in its operations and for developing solutions to foster a climate-friendly science, economy, and society. ●

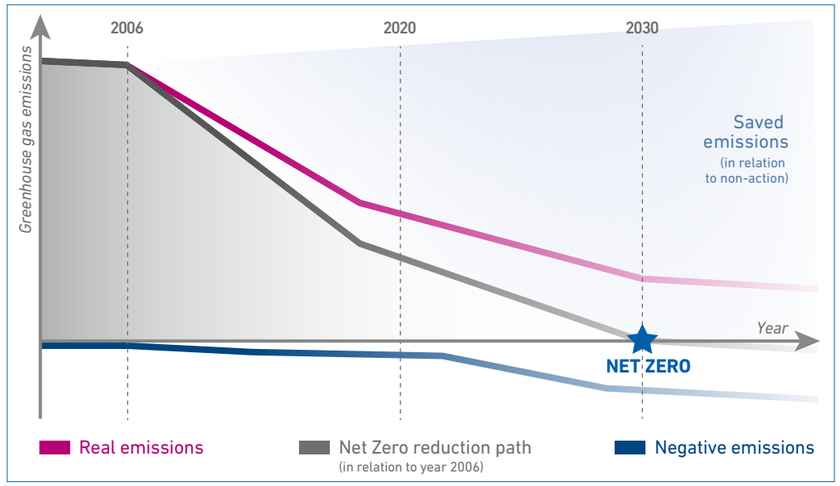

Figure 1: Reduction path over time showing actual and negative emissions in the framework of ETH Net Zero.

ETH Zurich has options for reduction measures that can be implemented rapidly, allowing the University to considerably reduce its GHG emissions by 2030 compared to the benchmark year 2006. Tackling easily implementable emissions reductions is a high priority for ETH Zurich.
However, reductions alone will not suffice to achieve Net Zero. Technological measures in the field of negative emission technologies will also be required. ETH Zurich is working on new negative emission technologies that should be increasingly ready for deployment from 2030 onwards.
Therefore, remaining emissions are being compensated for the time being. The aim is to enable ETH Zurich to operate without compensations after 2030.

«ETH Zurich strives for Net Zero by 2030.» White Paper, September 2022.

This document is based on the internal white paper «ETH Net Zero», which was produced between February and June 2021 by a working group from all areas of ETH Zurich. It brought together 20 ETH members from the areas of research, teaching, student body, operations, finance, commissions, administrative units, and personnel and organisational development. This document is a shortened version and has been revised and updated with support from the Office of the President, Campus Services and Corporate Communications.

Cover picture: The solar mini-refinery on an ETH building produces CO_2-neutral fuels from sunlight and air.

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Hallmarks of climate neutrality at ETH Zurich

In order to reduce its emissions to Net Zero, ETH Zurich primarily focuses on the emissions caused by its own operations. However, in the coming years, an emphasis will be placed on reducing indirect emissions caused by power purchases and by externally sourced services such as construction, procurement of hardware, travel, laboratory practices, or financial investments. No concrete intermediate goals have been formulated yet, and measures are still being developed. In this area, the innovative spirit and engagement of the entire ETH Community will be needed.

ETH Zurich has already achieved significant success in reducing emissions from its energy supply. For example, the investments made so far in the anergy grid at Hönggerberg halved the demand for fossil fuels. With the expansion of the geothermal probe field, ETH Zurich becomes even less dependent on oil and gas. Nevertheless, considerable emissions continue to be caused by construction activity, energy consumption, provision of infrastructure, procurement of laboratory equipment, devices, machines, tools, and ICT components, as well as business travel, commuting, and catering.

The University is creating the conditions for achieving the Net Zero goal with a three-pronged approach.

1. **Behaviour:** ETH Zurich eliminates GHG-intensive processes and structures through emissions reduction.
2. **Technology:** ETH Zurich improves the efficiency of processes and structures by technical means and is switching to processes that are less GHG-intensive.
3. **Innovation:** Negative emission technologies, especially for carbon storage, are used to capture near-unavoidable residual emissions.

Climate change is a challenge for the whole of society. Accordingly, ETH Zurich continues to actively share its expertise with political, corporate, and societal stakeholders.

On its path to climate neutrality[iii], the University will be focusing particularly on measures in the following areas.

A) Buildings, infrastructure, ICT, and procurement

Efforts are concentrated around the ETH Campus, operations, and the behaviour of all ETH Community members. The GHG footprint is reduced in the areas of buildings (heating, cooling, electricity), commuting, campus mobility, business trips (including air travel), catering, procurement, and information and communication technologies. Clearly formulated federal requirements and awareness campaigns support the pursuit of the Net Zero activities in all areas of operations.

B) Teaching, research, and knowledge transfer

Many ETH researchers are working hard to develop solutions for managing combined crises. Regarding climate issues, they support the consistent implementation of a reduction path in their teaching, research, and knowledge transfer. For example, the range of courses will be expanded from 2023 to include a CAS in Climate Innovation. ETH spin-offs showcase high-profile technological developments and entrepreneurial success stories.[iv] The ETH Campus itself offers a great opportunity for «living labs» to test and realise advanced approaches in the areas of data collection, new technologies or incentives for behavioural changes.

C) Financial investments

Asset management at ETH Zurich follows a structured cash-flow approach. The University is supported in assessing the sustainability of its investments by sustainability analysis and reporting provided by the Global Custodian. In addition to strictly financial criteria, these reports take into account environmental, societal, and governance criteria.

With modern financial and controlling instruments and promising new financial products, the portfolio can be developed even more consistently to include only strictly sustainable investments. Setting up a dedicated ETH climate fund would create interesting possibilities.

Moreover, a goal of the ETH Foundation is to invest all of its assets sustainably. The Foundation regularly establishes whether new, sustainable investment solutions are being offered in the defined asset pool and replaces products that are not yet sustainable on an ongoing basis. ●

Adaptive solar facade on the House of Natural Resources

© ETH Zurich / Alessandro Della Bella

Examples: Business travel, sustainable campus, and catering

Behavioural changes are an important component of the path towards ETH Net Zero. The University has gathered experience in various activities over the past years and has engaged in national and international networks.

- **Business travel:** ETH Zurich played a leading role in launching the Roundtable of Sustainable Academic Travel in 2018, designed to reduce emissions caused by business travel; in 2019, it was a key participant in the foundation of the Swiss Network for Sustainable University Business Travel. Moreover, the ETH air travel project «Stay grounded, keep connected» involves more than 70 partners in other universities and industry. Already before the coronavirus pandemic, ETH Community members had committed themselves to reducing air travel by 15 percent by 2025. Moreover, this behavioural change is supported by discussions within and between organisational units, by decision-making aids for business travel, by CO_2 calculators and by adapting rules about travel expenses and other regulations.[v]
- **Sustainable Campus:** Since 2006, ETH Zurich has been collaborating with other universities in the framework of the International Alliance of Research Universities[vi] and the International Sustainable Campus Network[vii]. These partnerships have produced a set of guidelines for sustainability on campus. Applied in practice to local conditions, their real-life expression can be seen, for example, in the developments at ETH Hönggerberg and ETH Zentrum.[viii]
- **Sustainable gastronomy:** Another area in which ETH Zurich has had a long-standing engagement with student and staff consumers as well as with its catering partners is that of climate- and resource-saving food service offerings. The Climate Programme for catering, which emerged from a student initiative and living lab research project dating back to 2013, was created in 2018. It was updated in 2022 to include expanded sustainability goals considering further ecological as well as additional social, ethical, and health aspects.[ix]

Creating transparency: How ETH Zurich measures and verifies its emissions

To achieve its goal of becoming a climate-neutral university, ETH Zurich monitors and reports on its progress. In this process, all GHG emissions are taken into consideration in accordance with the Greenhouse Gas Protocol[x] and disclosed as CO_2-equivalent emissions. Emissions produced and controlled by ETH Zurich itself (Scope 1 and 2 emissions) are recorded comprehensively and compared against the baseline year of 2006. Scope 3 emissions are listed in an initial GHG accounting based on data from 2017. By creating this transparency with respect to indirect emissions, ETH Zurich can take specific groups of goods and related activities into consideration even more closely in its Net Zero activities.

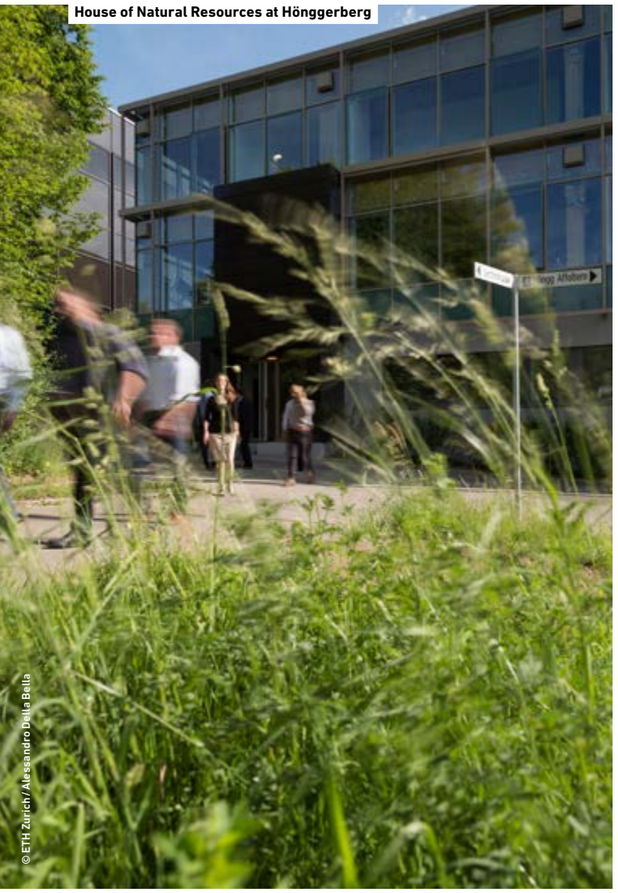
To create a homogenous and comparable data basis for monitoring and reporting, ETH Zurich considers emission types in accordance with the Greenhouse Gas Protocol (cf. Figure 4 on the last page).

Scope 1 emissions arise from sources within the overall ETH operations, such as University-owned power plants or vehicle fleets. At ETH Zurich, these mainly relate to gas at Campus Hönggerberg, oil and coolants, or internal transportation using its own vehicles. ETH Zurich was able to reduce its oil and gas consumption for heating and cooling of buildings by about 52 percent between 2006 and 2020 through the commissioning of its Anergy network at Campus Hönggerberg.

Scope 2 emissions stem from the production of energy purchased from external providers. This mainly involves electric power and district heating that ETH Zurich purchases from EWZ and ERZ. Scope 2 emissions were reduced by about 12 percent between 2006 and 2020, even though student and staff numbers increased during that period (cf. Figure 2). ➔

Scope 3 emissions encompass all remaining emissions that are not or only partially controlled by ETH Zurich. The University first calculated its Scope 3 emissions in accordance with the Greenhouse Gas Protocol guidelines in 2019 in an internal GHG accounting report based on data from 2017. The total Scope 3 emissions from this first analysis were about 140'000 tCO_2eq (±10% uncertainty margin) and were associated with 12 groups of goods (cf. Figure 3). The groups associated with the largest GHG emissions were buildings and infrastructure (28'000 tCO_2eq), laboratory equipment (24'000 tCO_2eq), business travel (18'000 tCO_2eq), and scientific apparatuses, machines, and tools (16'000 tCO_2eq). These groups together account for about 60 percent of ETH Zurich's Scope 3 emissions. The remaining groups each account for less than 10 percent of Scope 3 emissions.

With a detailed listing and accounting of Scope 3 emissions, ETH Zurich creates transparency and expands its earlier reporting on GHG emissions.[xi] It remains to be determined which groups of goods should be taken into consideration for defining targets and measures related to ETH Net Zero. Thanks to its solid data basis, ETH Zurich will pursue and substantiate emissions in reference to its Net Zero target in a transparent manner. ●



House of Natural Resources at Hönggerberg

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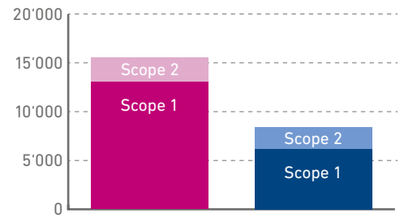
Scope 1 and 2 emissions 2006 and 2020 (tCO_2eq)



	2006	2020
Scope 2 tCO_2eq	2'550	2'237
Scope 1 tCO_2eq	13'025	6'194

Figure 2: Reduction of Scope 1 and 2 emissions at ETH Zurich by about 46 percent since 2006 (data-base 2020, including vehicle fleet data for 2019).

Scope 3 emissions in 2017 (tCO_2eq)

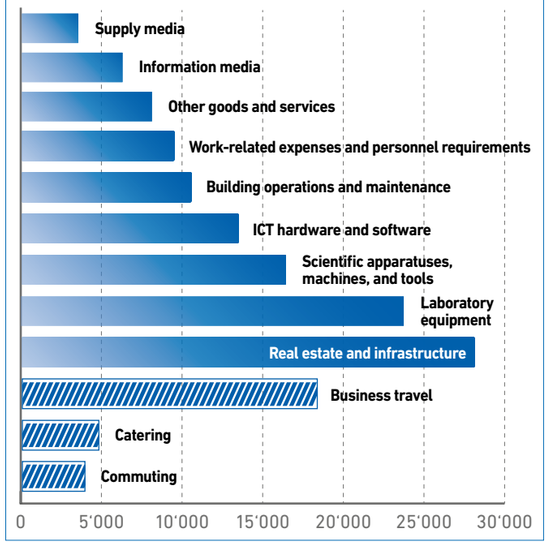


Figure 3: Results of Scope 3 GHG accounting in 2019 with absolute values, uncertainty margin ± 10 % (based on 2017 data). Hatched bars are used to distinguish groups of goods for which a different methodological approach was used.

Methodology of Scope 3 accounting
The first Scope 3 accounting was based on a combination of two methodological approaches. On the one hand, monetary expenditures («spend-based») on various goods and services were multiplied by the GHG intensity of the respective industry sectors, based on environment-related input and output tables (environmental IOT). On the other hand, physical activity data was collected for specific emissions sources (commuting, business travel, and catering) and multiplied by emissions factors that had been determined via life cycle assessment data.

Together on the path to Net Zero

ETH Zurich is convinced it can achieve its Net Zero target by 2030: Current knowledge, based on research insights and institutional practice, is sufficient to enable action. Joint engagement on campus benefits from the University's collaboration with local, national, and international partners and coalitions of like-minded individuals. The quest for solutions across professional and sectoral boundaries raises the chances of success in achieving societal change.

ETH Zurich has set itself the Net Zero target based on its own convictions and an awareness of the far-reaching consequences of climate change. It is also in line with the mandate of the legislature as specified in the Federal Council's «Federal Administration's climate package» of 3 July 2019.

Financial prioritisation and investments for a climate-neutral ETH Zurich will be necessary. For example, ETH Zurich has invested around 40 million Swiss Francs in the anergy grid at Hönggerberg in the last 10 years.

For ETH Zurich, the target of Net Zero by 2030 is a joint effort of research and institutional practice. This will also bring a cultural change at all levels of ETH Zurich. Concrete measures for a climate-neutral ETH will be designed and implemented in close cooperation between the Executive Board, the central administrative units, the departments, the extra-departmental teaching and research institutes, the centres of competence, and the students. The exchange with other universities and networks of higher education institutions (swissuniversities, IARU, ISCN, IDEA League, etc.) makes it possible to learn from each other.

New projects of the ETH Domain (ETH Zurich, EPFL, PSI, WSL, Empa, Eawag) in the areas of biodiversity, climate neutrality, building technologies and energy transition will be funded between 2023 and 2026 with about 30 million Swiss Francs; this will provide fertile ground for ambitious and future-oriented research and action.[xii] They also offer donors interesting investment opportunities.

ETH Zurich has enormous potential to fulfil its societal goal: Students, staff, and alumni are ambassadors and multipliers who can, with their knowledge, expertise, competence, and constructive mindset, initiate and disseminate change in society and the economy.

The effects of climate change are now tangible and palpable. Sustainability is the central topic of this decade: ETH Zurich aims to seize this challenge as an opportunity. Its Net Zero target is part of more comprehensive efforts. The incorporation of Net Zero and climate protection goals into the constitutions of the City of Zurich and the Canton of Zurich offers new framework conditions and opportunities. The corporate and industrial sectors are undertaking numerous measures.[xiii]

On the international level, too, ETH Zurich has embedded its Net Zero target into joint initiatives. In 2021, it became a signatory to the global «Race to Zero campaign».[xiv] As such, it has joined the effort for rapid and fair emissions reductions in all areas in line with the Paris Agreement, including transparent plans for action and realistic goals that are achievable in the short term. An ETH Zurich Net Zero action plan is currently under development. This will be a flexible planning tool with which ETH Zurich can position itself in a changing environment and make a contribution without losing sight of the overarching goal: the entire University's systematic development for a climate-neutral future.

«Where the future begins» – ETH students, researchers, staff, and alumni are doing everything in their power to ensure that the University lives up to its own standards, including its quest to achieve Net Zero emissions. ●

«Striving for a climate-neutral ETH Zurich is a must.»

Joël Mesot, ETH Zurich President

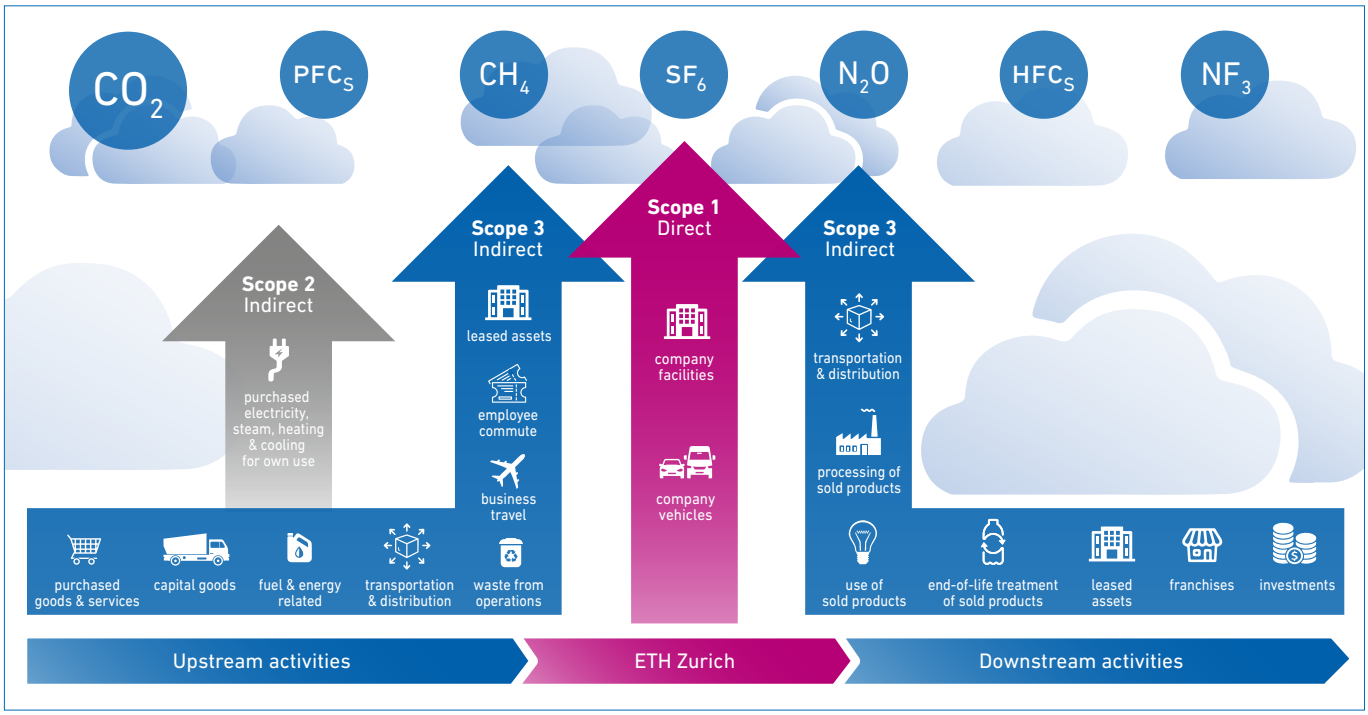


Figure 4: GHG emissions are separated into Scope 1, 2, and 3 emissions in accordance with the Greenhouse Gas Protocol.
The greenhouse gases CO_2, CH_4, N_2O, HFC_S, PFC_S, SF_6, NF_3 are offset and generally listed in tonnes of CO_2 equivalents (tCO_2eq).

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[i] ETH Zurich Strategy and Development Plan 2021-2024: https://ethz.ch/content/dam/ethz/main/eth-zurich/portraet/Strategie/ETH_SEP_21-24_EN_Web.pdf
[ii] Media release Klimapaket Bundesverwaltung, 3.7.2019: https://www.admin.ch/gov/de/start/dokumentation/medienmitteilungen.msg-id-75697.html
[iii] Terms such as climate neutrality can be vague and require clarification. Glossaries and articles like these provide orientation: https://racetozero.unfccc.int/wp-content/uploads/2021/04/Race-to-Zero-Lexicon.pdf ; https://www.klimafakten.de/meldung/die-grosse-begriffsverwirrung-bei-klimazielen-klimaneutral-co2-neutral-voellig-egal
[iv] ETH Spin-offs: https://ethz.ch/en/industry/entrepreneurship/explore-startup-portraits-and-success-stories/uebersicht-eth-spin-offs.html
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[vi] International Alliance of Research Universities: https://www.iaruni.org/sustainability
[vii] International Sustainable Campus Initiative: https://international-sustainable-campus-network.org/
[viii] Developing a campus: https://ethz.ch/en/campus/development.html; https://ethz.ch/content/dam/ethz/main/campus/campus-entwickeln/bauprojekte/richtlinien/allgemein/2021_01_RL_Nachhaltigkeit.zip
[ix] ETH Sustainable Gastronomy: https://ethz.ch/sustainable-gastronomy/
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[xii] Media release ETH Board, 15.7.2022: https://ethrat.ch/en/eth-board-develops-strategic-areas-in-the-fields-of-sustainability-and-dialogue-with-society/
[xiii] Media release economiesuisse, 10.7.2022: https://www.economiesuisse.ch/de/artikel/mit-tatendrang-zum-klimastandort-schweiz?utm_
[xiv] Race to Zero – Universities and Colleges: https://www.educationracetozero.org/home