It's The Integral, Stupid!

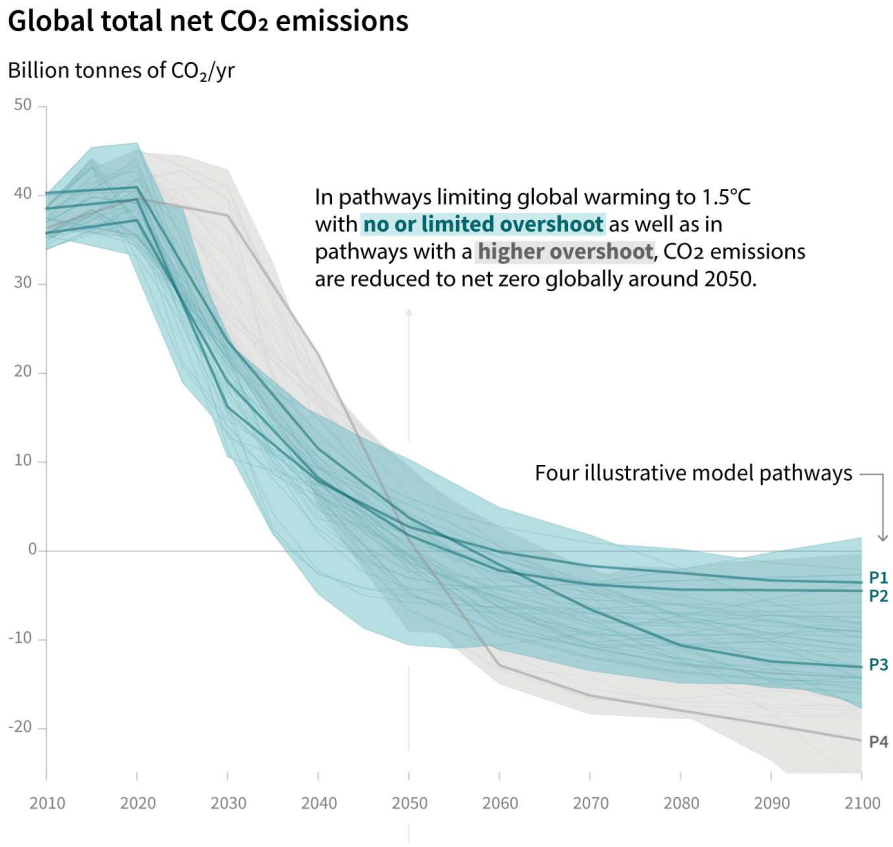
- ANNA KNÖRR -

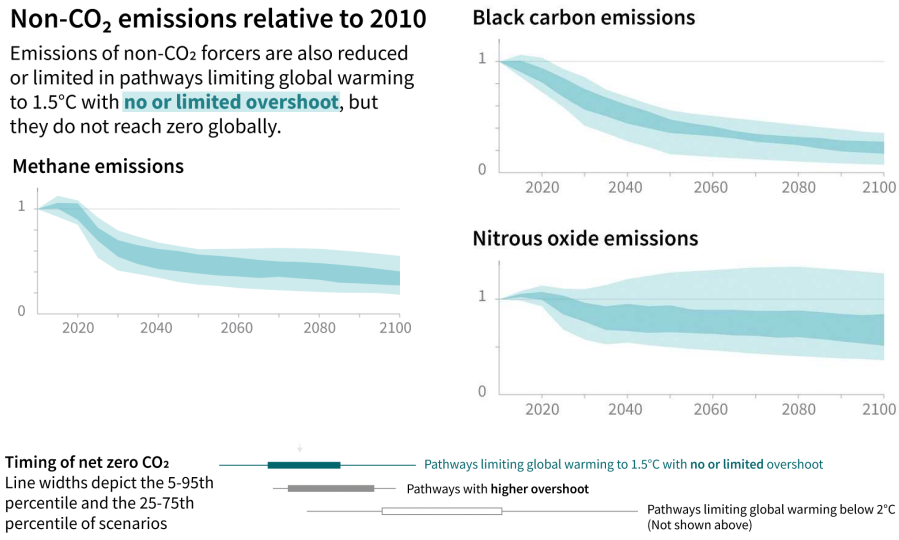
What integral? And more importantly: Are you calling me stupid?!

No, calm down. And now that I've got you reading, let me focus your attention straight on the following figure. Please take a very careful look.

Global emissions pathway characteristics

General characteristics of the evolution of anthropogenic net emissions of CO_2, and total emissions of methane, black carbon, and nitrous oxide in model pathways that limit global warming to 1.5°C with no or limited overshoot. Net emissions are defined as anthropogenic emissions reduced by anthropogenic removals. Reductions in net emissions can be achieved through different portfolios of mitigation measures illustrated in Figure SPM.3b.





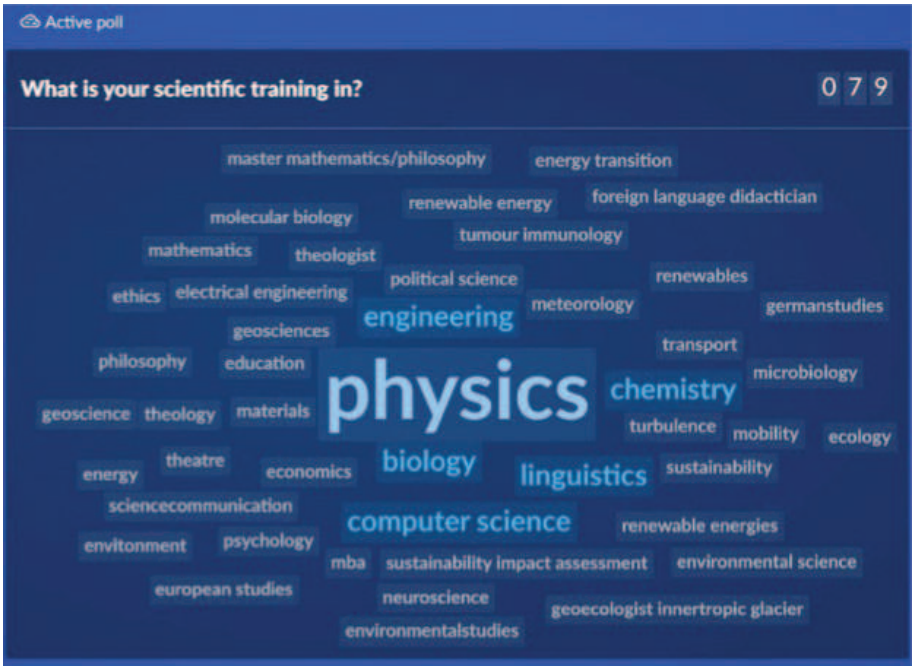
Source: IPCC Special Report on Global Warming of 1.5°C

Consider the 4 different pathways: three in blue, one in grey. They all achieve the goal of limiting global warming to 1.5°C as proclaimed in the Paris Agreement. How are they similar and where do they differ? With respect to CO2 emissions, the 1.5°C goal necessitates achieving global net zero by 2050 in all 4 cases. But clearly, the longer you delay reducing emissions, the steeper this descent must become. And more incisive measures after 2050 will be imperative, as well. P4 in grey tells the tale.

Essentially, it's a simple calculus problem: Humanity's interest lies in reducing the absolute amount of emissions, i.e. the integral under the curve. It makes no sense to start with small easy steps and postpone difficult ones with more significant impact.

These facts are easy to grasp. But who is actually waking up to what this integral means in practice? Who is grasping the fact that we need to act? Unsurprisingly, it seems to be the physicists [1]. On the next page, you will see what the attendance of an online Scientists4Future meeting in June 2020 looked like.

[1] Of course, it's not only physicists. But as a physics student, I have to be biased, don't I?



This is not an uncommon picture. In fact, physicists at ETH are also moving towards action. In HS20, Prof. Niklas Beisert, who normally works on symmetries in quantum field theory including string theory, decided it was time for common sense. Together with the department management board he initiated a working group, pragmatically named "D-PHYS CO2 AG" with members from all institutes and levels – professors, PhDs, technicians, students. The aim was straightforward: Investigate the status quo of CO2 emissions at D-PHYS, brainstorm what measures the department can undertake to reduce its footprint and summarize these in a guideline document.

This document is being finalized as I write. Topics covered include travelling and videoconferencing, operational emissions and incentives for sustainable research, education and outreach as well as reporting. We give an overview of what courses of action peer universities like Cambridge, Yale or Harvard are taking and what data we have available concerning ETH, gathered thanks to programs such as the ETH Air Travel Program by our Mobility Platform.

But now, you may be asking: A document?! The world does not need another document! Precisely, thanks for asking. Indeed, the aim of this paper lies not in its 47 pages of writing, but in

the implementation of its content. In July, we presented our draft to the department board and at the next DK (departmental conference) on 2nd October the department as a whole will discuss its implementation. We hope that D-PHYS will acknowledge our constructive approach to the issue at hand: analysing the status quo, looking facts in the face and providing clear guidelines to reducing our footprint for real. As scientists, we want to make sure our community can continue to thrive in the future. Let's help build that future now.

In this sense, the completion of the AG document is, in fact, much rather a first step in what needs to be a cultural change, not only at D-PHYS but ETH departments overall. We can and must fulfil our responsibility of being a role model when it comes to translating scientific realizations into societal change. Institutions like ETH rightfully enjoy such a high reputation. Young children all around the country aspire to become part of this community; adults of diverse ages and backgrounds put much confidence in what ETH communicates, how we act and the decisions we make. Our behaviour must be both inspirational and symbolic as well as fact-based and effective.

To conclude, I can attest that actively engaging with the topic of sustainability has helped me get rid of cognitive dissonance, at least in part. I'm talking about the fact that we all know more or less about global warming and that our current lifestyles are incompatible with stopping this trend. But in the rush of everyday life, the facts just don't sink in; we stick to our habits. Every time I talk to fellow students or professors about these issues helps me become more conscious of this situation. It helps me be more honest, look in the mirror and change my behaviour. So, if you've made it all the way till here, why don't you promise me one more thing:

"What is sustainable science?"

Think about it. Discuss it. For the love of science.

Want more info? Contact ***aknoerr@student.ethz.ch***