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Why don’t we hear what science tells us about the climate crisis?

We usually not only rely on institutions to generate scientific knowledge, but also to process and communicate it in forms that we can easily digest. Citizens rely on the media—newspapers, books, blogs, documentaries—to translate scientific knowledge for them. Politicians rely on agencies, civil service, and research staff to advise them on complex topics. But when it comes to climate change, biodiversity loss, and environmental degradation, due to the nature of our institutions and the pace of change both in our ecosystems and our knowledge about them, if we keep relying on these institutions, we easily miss the fundamental character of the challenge and the magnitude and swiftness of change that is required to prevent catastrophe on a civilizational level.

Hence we should take the time to step back from our routine and have a closer look at what science tells us about the climate crisis—and why we tend not to hear it.

The scientific process

First, let me briefly summarize the process in which scientific knowledge about climate change, biodiversity loss, and environmental degradation is produced. It can be roughly divided into three stages which I'll characterize in reverse order:

1. As laypeople, we are most familiar with models and predictions aiming to guide political decision-making and inform public discourse, e.g. the reports and recommendations of the UN's IPCC. They are the distillation of thousands of studies and academic papers collected, evaluated, and summarized over multiple years. This distillation is then reviewed, revised, and approved on an intergovernmental, i.e. political level. As such, it represents the most conservative assessment of our current situation: it necessarily lags significantly behind the the latest scientific research, and it represents a politically negotiated lowest common denominator—a subset of all that science can tell us. In addition, being subjected to political approval creates a strong incentive to remain politically neutral, leading to particularly careful framing and phrasing of results and recommendations.
2. The studies and papers that go into these outputs are produced in a fairly standardized scientific process. Following specific research programs in disciplines like climate science, sustainability studies, and policy research, data is analyzed, models are constructed, and predictions are derived. The results then go through a peer review process before being published in well-respected academic journals. On the one hand, this process makes sure that methods and results are meticulously scrutinized before being presented to a wider audience. On the other hand, due to scientific division of labor and academic incentive structures around publishing and peer reviews, published results usually don't deviate from current scientific paradigms or question fundamental assumptions. At the same time, the process is very time-consuming. Taken together, this makes it hard for mainstream science to deal with rapid, fundamental change and the possible paradigm shifts required to understand it.
3. The raw data, working hypotheses, and personal interpretations that are the precursors of peer-reviewed studies and papers haven't gone through this process of validation yet. Thus they are not widely accepted as scientific knowledge and may have to be taken with a pinch of salt. But at the same time, they are both much closer to what happens in nature and society right now and less shaped by institutional bias. Thus they are often our best first guess about what is happening, and in times of rapid, fundamental change may be our only guide to timely action.

Let me now outline what the current state of discussion is at each of these stages.

IPCC reports

The reports of the IPCC which represent the politically palatable and carefully presented minimal scientific consensus on climate change are updated every 5–7 years. Between these general assessment reports, special reports on specific topics are published, the latest one on preventing the global temperature from rising more than 1.5 °C above pre-industrial level.
Its key points are:

- Hitting only the target of a 2 °C temperature rise that was agreed in Paris in 2015 would lead to drastic long-term effects like the complete die-off of coral reefs, total dry-up of regions in Middle East and Africa, multiple ecosystem collapses, and hundreds of millions of premature deaths.
- Holding the rise to 1.5 °C avoids the worst effects but will, in the long term, *still* result in large-scale drought, famine, heat stress, species die-off, and loss of habitable land, throwing more than 100 million people into poverty.
- Even full implementation of the contributions submitted by nations in the Paris Agreement would lead to a warming of about 3 °C by 2100, and more afterwards, with effects much worse than in the other scenarios.
- Meeting the 1.5 °C target is possible but would require deep emissions reductions and "rapid, far-reaching and unprecedented changes in all aspects of society". Global net carbon emissions would need to fall by about 45 percent by 2030, reaching 'net zero' around 2050. As of now, these necessary changes aren't appropriately reflected in any national climate policy.

Because of the conservative character of the IPCC's work, it leaves out more advanced approaches that try to make key uncertainties about the future behavior of the climate system explicit and reframe the discussion in terms of existential risk-management. Its modeling treats temperature rise and the accompanying ecological effects in a largely linear way and mentions feedback loops and possible abrupt changes primarily as additional risks, the probability of which remain uncertain.

Peer-reviewed studies

Recent peer-reviewed studies and papers go beyond what is included in the IPCC reports. They often deal with more limited subject areas than the IPCC reports, but include more advanced approaches like complex adaptive system modeling.
A key result of these studies is that even if carbon emissions were drastically reduced as proposed by the IPCC, several reinforcing *feedback loops* either already are or will be

triggered *below* a temperature rise of 2 °C. These include

- the melting of polar ice caps, which reduces the reflection of sunlight and thus amplifies temperature rise,
- the thawing of the tundra, releasing as yet unknown quantities of carbon and methane, a greenhouse gas (GHG) much more potent than carbon,
- drought and loss of rainforests, already making them a carbon source instead of a sink.

The studies show that these feedback loops are highly unlikely to be stopped once they are triggered, even if we stopped emitting GHGs completely, constituting so-called *tipping points*. They also show that their compound effects are beyond anything the IPCC predicts: Even if we stayed within the emission targets of the Paris accord, the loops would lead to a much higher temperature rise, probably far beyond 3 °C, and much earlier than the IPCC expects.
While accurate predictions are near impossible due to the nonlinear behavior of the climate system, the worst-case scenarios foresee a so-called hothouse earth situation where conditions become unbearable for complex life in general.
Feedback loops, tipping points, and the unpredictable risks they create make policies that rely on delayed mitigation, i.e. future compensation of excessive emissions by as yet unavailable technologies like large-scale carbon capture, untenably risky—we simply might not get to the point in time where we could deploy them.
In addition to the topic of climate change, which is the sole focus of the IPCC, studies of biodiversity loss show that we are already in the *sixth mass extinction* in the history of earth. The current rate of species extinction is 1,000 to 10,000 times higher than in the last 65 million years. At this rate, 200 species are going extinct every 24 hours, leading to a loss of 50% all species by 2050—and the rate is accelerating. As paleontologists know from fossil evidence, earlier mass extinctions ended with a loss of 75–95% of all species, which is where we are headed in the long run.
At the same time, loss of fertile soil, droughts, and desertification are *already* creating additional risks for food safety and reducing habitable areas not only for humans, but for countless other species. These issues are not restricted to, but most pressing in the Global South, whose populations are already among the most vulnerable on earth.
Naturally, policy recommendations based on these conclusions are even more radical than the ones proposed by the IPCC: They propose to reduce emissions much quicker, replacing the target date of 2050 for ‘net zero’ with country-specific dates between 2025 and 2030. The required efforts—massive shifts in lifestyles, cuts in consumption, and redirection of investments—are seen as a necessity for survival, not an option for a brighter future.

The leading edge

At the leading edge of science, things again look different. Most recent data and interpretations not yet filtered through the publishing process show that even the worst-case scenarios of the IPCC and most peer-reviewed studies are not pessimistic enough—the tundra thaws faster and more permanently, arctic ice melts quicker, and tipping points are closer than previously assumed.

Also, weather conditions and food security might be even more fragile than formerly thought. Increased intensity and frequency of El Niño events will bring famine to the Global North in the near term, a recent study predicts: At a temperature rise of 1.5 °C, heat waves like the one experienced in 2018 will occur two out of three years there; at 2 °C, they will occur every year. A re-run of the Global Famine of 1876–78, the worst environmental disaster in known history, then seems virtually certain.

In addition, if results from different disciplines are reviewed together, e.g. about abrupt temperature and sea level rise, accelerating biodiversity loss and desertification, food insecurity, forced mass migration, and social instability, pessimistic scenarios become both much more likely and more threatening than when the results are analyzed in isolation. This has led scientists from different fields to dramatic conclusions, e.g. the view that *social collapse* in the near-term is inevitable, *civilizational catastrophe* is likely, and *complete extinction* of humanity is at least possible.

Thus when speaking for themselves, many scientists increasingly express shock and distress, up to the point where some of them shift the focus of their work from conventional research to discussing ways of dealing socially and emotionally with impending and potentially unavoidable disaster.

The recommendations that follow from these conclusions are necessarily the most radical ones. They focus not on ways to stop or mitigate further climate change, but on avoiding the very worst outcome (extinction) while fostering resilience and “deep adaptation” to the virtually certain or probable outcomes (collapse and catastrophe).

Why don’t we hear what science tells us?

If this is the spectrum of scientific results and recommendations, the latter ranging from far more ambitious climate policies to a complete change of how we organize society, why is it that politics and society seem unable to grasp and adopt them?

The reason, I think, goes deeper than ideology and interests: the *incentive systems* of the involved institutions (science, media, politics, and consumer markets) make it near impossible to process and communicate these results and recommendations in a timely and effective way.

In *science*, the processes and practices responsible for much of its success in the 20th century now work against a timely and comprehensive understanding of the scope and consequences of climate change, biodiversity loss, and environmental degradation, especially when combined with efforts to remain politically neutral. The care and meticulousness with which

arguments and conclusions are worked out and presented make it less likely for early warnings to be widely circulated and accepted. The voices sounding them get filtered out, only to be incorporated into mainstream science much later, when the time to react appropriately has already been significantly reduced.

This has happened with almost all aspects of climate science, from the discussion of humanity's contribution to global warming to the topic of feedback loops and tipping points, and will probably happen again with even more pessimistic accounts—if there is enough time for it to happen. Scientists skeptical about that are already withdrawing, stepping out of science to focus on personal consequences from their findings.

The *media*, for a long time, failed to recognize how scientists couch their warnings, once they enter the mainstream, in technical and probabilistic terms evolved from the described incentive system. Hedging, i.e. expressing tentativeness and caution, was understood not as a linguistic strategy and resource in academic discourse, but as a sign of uncertainty. Thus "high confidence" did not get translated into "they are sure", while "medium confidence" did get translated into "they are not sure".

As mainstream science became clearer in its messaging, the media followed suit. This lead to a wave of articles, books, and documentaries with increasingly robust warnings about the consequences of failing climate policies, feedback loops and tipping points, and the ongoing mass extinction. But since the press still chiefly follows mainstream science's trajectory, alarm bells from the leading edge still go widely ignored and are almost exclusively talked about on social media. This makes them even more suspicious to journalists who readily lump them in with conspiracy and fringe theories. Thus, scientists expressing dwindling hope for humanity still don't get headlines.

For a long time, the *political* debate about climate change has been distorted by special interests trying to obfuscate the scientific consensus on its causes, consequences, and political solutions. But the problems go further. The agencies and staff supporting political decision-making, on the one hand, mainly work from the IPCC's conservative results and recommendations—no wonder, since that is what it was created for. More advanced research or media coverage tends to get less of the attention it deserves.

The incentive system of professional politics, on the other hand, makes sure that the IPCC's warnings are "balanced" against other priorities, first and foremost the palatability of possible measures to a constituency ignorant that the alternatives are collapse, catastrophe, and extinction. That there are always IPCC scenarios that contain delayed mitigation can make this trade-off seem rational nonetheless.

Above all, the incentive system of professional politics creates a continuous demand for short-term decision-making. This increases pressure, produces small-scale solutions that distract attention from the real challenge, and favors outsourcing of knowledge processing to supporting resources, reinforcing the disproportionate influence of conservative recommendations.

As *consumers*, finally, we are constantly distracted from the direness of the situation not only by the impression that the economy is still running without major disruption. We are also blinded by the constant suggestion that our current lifestyle is without alternative, and that we need even more of everything to be happy, comfortable, and successful. Companies driven by short-term interests are making sure that conflicts with our own long-term interests stay hidden, exploiting our bias to discount uncertain long-term risk compared to certain short-term cost.

All of this means that what science tells us remains, for most of us, so abstract and far away from everyday experience that we only become receptive to it with conscious and continuous effort. Only when heat waves and dried-up rivers enter our experience in the Global North do we really *feel* that something dangerous might be going on. But come winter, and everything is forgotten again.

This is why only the permanent disruption of "business as usual", the continuous subversion of our institutions' incentive systems provides a path forward and a chance to really hear what science tells us. From the publishing process of mainstream sciences and the priorities of the press to the ways politics is conducted and consumer attention is controlled, we need to intervene at leverage points in these systems to break current patterns and create space for a meaningful conversation.

This includes public interventions as well as person-to-person dialogue with journalists, politicians, and fellow citizens. It means taking the time to explain our current situation, and making the time to let the truth about it sink in so deeply that it is strong enough to break our behavioral patterns.

Then, and only then, will we really hear what science tells us about the climate crisis—and have a chance to react with purpose, meaning, and a prospect of success.