PLOS CB Press Release Questions

1. What was already known, and what question(s) were you attempting to answer?
Human behaviour has a significant impact on a wide range of complex systems, including ecosystems, social networks and the climate. On the flip side, these systems also impact human behaviour, making them coupled human-natural systems, which can exhibit novel behaviour. It is known that human behaviour is a driver of climate change, but in climate models, the impact of climate change on human behaviour is often neglected. In our study, we developed a simple model that captures the salient features of both the social and climate system, and investigated the impact of social mechanisms on the dynamics of climate change. Our research question could be stated as “How do behavioural phenomena such as social norms and social learning, and climate variables such as the cost of mitigation and current temperatures, separately and together affect the overall dynamics of a socio-climate model?”.

2. What is the most important finding of your study?
The rate at which individuals learn socially about climate mitigation strategies is strongly influential on climate outcomes, with the ability alone to vary peak climate change by over 1 degree Celsius. On the whole, social norms (whether they enforce or deter from climate change mitigation) do not work in our favour. They act against the onset of mitigative behaviour, even when it is strongly justified by rising temperatures, and do not significantly speed up the transition to an emission-free world when mitigative behaviour becomes the norm. Finally, optimal intervention pathways involve an initial increase in social learning, followed by a reduction in mitigation costs.

3. What are the larger implications or potential practical applications of your findings?
Mathematical models that incorporate feedbacks between the human and natural systems can help inform policy of optimal interventions. Our socio-climate model indicates that an increase in social media and other campaigns to raise awareness (e.g, climate marches, international reports), should ideally be followed by governmental and other incentives to reduce carbon emissions.

4. Based on your findings, what are the next steps for this research?
Our study uses a relatively simple model to gain qualitative insights of the impact of salient social phenomena, though it is interesting that even a very simple climate model can capture projected climate change that more complex models have produced. Future studies should further develop socio-climate models to include more intricate details, and assess how they change climate change forecasts, if at all. More realistic models including various heterogeneities and structures that characterize real populations will be useful to inform scenarios for climate trends over the coming decades, and for implementing policies that can mitigate climate change. It would also be very useful to examine case studies where greenhouse gas emissions have decreased, such as in countries like Sweden and Romania, and examine the social conditions under which this took place.

5. Could you please provide a short, 1–2 sentence quote describing the most exciting aspect of the study, keeping in mind a non-expert reader?

“Feedbacks within and between the human and climate system will determine the effectiveness of climate change interventions. Mathematical models provide a tool to explore these feedbacks and their effect on the overall socio-climate system.” (Thomas Bury, lead author)

“Mathematical models that capture social dynamics and their interaction with climate trends will become increasingly used in climate research”(Chris Bauch, collaborating author)

“There are pathways for humans to mitigate climate change, but processes driving behaviour and norms at the individual and societal level will be essential to all of them, and our longstanding work on coupled human-environment systems applied here to climate change is providing direction in this regard.” (Madhur Anand, senior author)