Draft release: Anand et al

Something as simple as chatting with your neighbours about their new energy-efficient home renos can, if scaled up, affect climate change predictions, a new University of Guelph study reveals.

Using a new model that couples human behaviour to climate systems, Canadian researchers including a U of G ecologist have discovered that social processes affect climate change predictions, a finding that may hold out a way to stem or even reduce global warming.

Environmental sciences professor Madhur Anand, who heads the Global Ecological Change & Sustainability Laboratory, worked with colleagues at the University of Waterloo to develop a new mathematical model that, for the first time, accounts for social learning in climate predictions.

Their results appear in a paper published in *PLOS Computational Biology*.

Anand said human behaviour affects many natural systems including climate, and that climate systems in turn affect behaviour. But social processes are often neglected in climate models, she said.

“Climate change is a human-made problem. That’s very well-understood by scientists,” she said. “But we’re stuck in terms of uptake of that knowledge and response. We’ve established the science of climate change and understand many of the impacts. But what do we need to do slow it down?”

The researchers believe much of the answer lies in coupling climate change models with social learning, to model how learning from others affects our opinions or actions, combined with other mitigation strategies. This comes from almost a decade of interdisciplinary work Anand has now undertaken with her collaborator Prof. Chris Bauch (Waterloo), on what they call “coupled human-environment systems.” “We’ve studied everything from pest management to forest sustainability to human disease spread and found that human behavior is key,” Anand says.

For the study, they combined a common climate prediction model with a new human behaviour model to look at interactions.

They found that social learning about mitigation strategies, such as hearing a friend has bought a new hybrid car or switched to a plant-based diet, can influence social norms in ways that ultimately affect climate outcomes.

Anand said the rate of social learning is key. If social learning is low, with only a few people attempting to mitigate carbon emissions, it will take longer to alter social norms and in turn alter climate change predictions.

If more people become mitigators through social learning such as attending town hall meetings, taking courses or talking with neighbours “the faster the population will switch, and that will have a direct effect on reducing CO2 emissions.”

Using the model to simulate steps needed to hold global warming to 1.5 degrees Celsius over pre-industrial levels as called for last fall in a special report by the Intergovernmental Panel on Climate Change (IPCC), the team found that low social learning would ultimately fall short of the target.

Higher social learning is required to bring this target within reach.

Anand said the socio-climate model suggests the best approach combines high social learning with novel mitigation measures such as government regulation or new technology development. For example, when widespread media coverage of last year’s IPCC report was followed by the announcement of Ottawa’s new carbon tax on fuels – and rebates -- in provinces and territories lacking emissions pricing plans, including Ontario.

Lead author Thomas Bury, a University of Waterloo graduate student, said, “Our socio-climate model indicates that an increase in social media and other campaigns to raise awareness, such as climate marches and international reports, should ideally be followed by governmental and other incentives to reduce carbon emissions,” in a press release issued by the journal.

Anand said the team’s simulation also highlights the need to consider climate actions and outcomes as far as five decades from now. “If humans only think about the impacts of their behaviour on today or even tomorrow, we will never achieve the 1.5-degree target. As a society, we need to get used to thinking 50 years into the future with climate change.”

The model also found that social variables are far more important than geophysical factors -- soil or plant respiration, surface heat reflectivity -- for meeting IPCC warming limits. That result was not unexpected, said Anand, but “it was surprising to see it captured so clearly and unequivocally.”

Referring to human interactions, from word of mouth to social and traditional media, she added, “By looking at unique aspects of humans, maybe we can tap into these aspects to lead to the dramatic and widespread change that is urgently needed.”