Climate Modeling and Climate Justice

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Talk Outline

- Introduction: types of justice
- Justice in the context of climate change
- Intersections of justice and science
- Example studies
- Some additional considerations

Types of Justice

- *Distributive*: fair share and access to benefits and resources
- *Procedural*: creating and implementing decisions consistent with fair, neutral, impartial procedures that include those most impacted by the process and consequences
- *Retributive*: reciprocal treatment, where harm done equals similar harm in response
- *Restorative*: (alternative to retributive): repairing harms done with consideration for promoting recovery and healing

Three Dimensions of **Climate** Justice

- Uneven exposure to climate impacts across countries and communities within countries

- Communities—those often already socially, politically, economically disadvantaged—that have contributed the least to anthropogenic climate change are most impacted

- Policies, in terms of benefits and costs, are unevenly distributed across sectors and communities, which can compound already existing inequalities

Unequal exposure

Heat waves and distribution of heat across urban communities: increased vulnerability, documented harms, and expose for low-income, elderly, and BIPOC.

Impacts of **drought** and **desertification**: women in rural Global South communities will disproportionately experience increased vulnerability and harm due to water scarcity.

Sea level rise: small and large island nations face disproportionate rise rates from projected SLR by over 30 percent for some nations.

Unequal burden

Water and **food scarcity** increases: extreme weather is a driver of water and food scarcity, especially in areas experiencing desertification and without state-of-the-art infrastructure.

Energy transition disruptions: already existing economic inequalities compounded by poorly designed global avenues for adoption of green technology (coal is cheap).

Climate **migration**: by 2050 it is estimated that climate migration from Latin America, sub-Saharan Africa and SE Asia will grow to 143 million displaced by climate impacts.

Forcible **dislocation** because of loss of lands (SLR).

Unequal distribution

Reliance on **fossil fuels** tends to be higher in low-income communities—mitigation policies such as carbon tax trickle down, and disproportionately impact those already economically disadvantaged

Coal mine reclamation policies have legal loopholes allowing for mine abandonment, pollution, and ignoring of obligations to workers

EV **subsidies** to those who can afford them and have access to charging stations (same with renewable energy subsidies)

Great Wall of Lagos: sea wall to **protect** against inundation, etc. for luxury locations, with redirection of sea water to economically disadvantaged areas

National **insurance** rates based on risk, and high risk areas tend to be those where low-income communities are built

Inequality in the science

- **Distributive** injustice: Distribution of funding for research, access to super computing facilities (3.8 percent to Africa; 78 to GN for research on Africa)

- **Procedural** injustice: Decisions on metrics, and significance, for targets, research priorities, experimental designs, etc.

- **Knowledge** injustice: exclusion and marginalization in the development of knowledge considered to be a representation of the “objective” body of knowledge (inequality in knowledge generation and the perspectives represented in resulting knowledge products)

How science can inform justice studies

- **Modeling** can be used to help unpack conditions for what is just:
  - Investigating implications of targets for mitigation, intervention, adaptation
  - Defining boundaries between what is just and unjust for reduced harm
  - Detection and attribution studies to quantify loss and damage

The Paris Agreement Temperature Target

Relying on a temperature target for Paris Agreement is inadequate for characterizing other climate risks, which have inequal impacts…

Sadai et al. (2022) demonstrate that even with slowed warming, long-term sea level rise will be unjust (distributive injustice concerning the spatial and temporal distribution of SLR for Small Island States

Used models in Antarctic case study to demonstrate the uneven spatial fingerprint of AIS contributions to SLR, even under slowed warming projections

Global mean temperature is not consistent with the goal of avoiding dangerous anthropogenic interference in climate system (long-term climate responses to even under 2 degree temperature increase)

Constraining Earth System Boundaries

Justice defined by considering what is needed to avoid significant harm for non-human species, Earth system stability, future generations, current generations

Modeling was used to quantify the boundaries for a safe and just Earth system (assessments of tipping points and declines in Earth system functions)

Assessing the levels of earth system change that can lead to widespread exposure to significant harm

Looked at climate, biosphere, water, nutrients, aerosol pollution, additional pollutants) ESMs for investigation of tipping points leading to significant harm indicate a needed temperature target of around 1 degree (this is the JUST boundary, more strict than SAFE)

Attribution for Loss and Damage

Wehner and Sampson (2021) took attribution statements about the increase in precipitation during Hurricane Harvey (2017) from CC and translated using model to statements about flooding and associated damages.

The use of this storyline attribution analysis using models demonstrated that the anthropogenic climate change attribution—in terms of economic cost of the event—for flooding and damage was 13 billion dollars.

Additionally work can provide insights into how these damages and costs were inequal in their distribution in the Houston area.

Event attribution studies that can be translated into impact attribution studies (with loss and damage funding implications) disproportionately focused on global North.

What about modeling?

Decisions about model development, configuration, experimental design, application, and accessibility can be consistent with, or inconsistent with, the principles and concerns for justice.

Need for increased transparency around decisions, much greater inclusivity and access, and diversification of instruments, priorities and applications, and products to promote greater degrees of justice in climate modeling.

CESM and Climate Justice Task Force

The CESM Community, including SSC, have approved the development of a task force to tackle issues lying at the intersection of justice and climate science.

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THANK YOU!

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