



JULY 2019

## Global Inequality and Climate Change

### Overview

Understanding the causes of economic inequality is critical for achieving equitable economic development. However, despite commonly-heard claims that the poor will be worst hit by a changing climate, there exists little quantitative evidence on who will be hit hardest and on what economic impacts have already been felt. Building on past work linking economic growth and temperature change, new Stanford research provides insights into the consequences of the warming we have already experienced showing that inequality between countries has likely increased as a result of climate change.

### Points for Policymakers

Evidence is growing that changes in climate can affect the fundamental building blocks of economic production—reducing agricultural output, lowering labor productivity, and harming human health. Because poorer individuals or countries often lack resources for climate protection or are already located in regions with hot temperatures, climate change could affect the poor disproportionately. New evidence shows that this is the case:

- ▶ *Climate change has likely increased the economic inequality between the richest and poorest countries by approximately 25%, as measured by per capita Gross Domestic Product (GDP). The increase in inequality is primarily due to the relationship between temperature and economic growth, with warming increasing growth in cool countries like Norway, while decreasing growth in warm countries like India.*



- ▶ *While inequality between countries decreased over the past 50 years, global warming has slowed that trend.* Poorer countries' GDPs are likely lower today than they would have been in the absence of global warming, while the northernmost wealthy countries' GDPs have likely increased with warming.
- ▶ *The global warming caused by fossil fuel use has likely exacerbated the economic inequality associated with historical disparities in energy consumption.* Poor countries essentially have a double disadvantage: in addition to not sharing equally in the direct benefits of widespread energy access, many poor countries have been significantly harmed by the climate change associated with wealthy countries burning fossil fuels for their energy production.
- ▶ *Low-carbon energy sources have the potential to provide substantial development benefits.* In addition to the primary benefits of increased energy access, low-carbon sources also offer the potential to curb warming-induced growth penalties.

## Background

Inequality is a serious challenge both within and between countries. The richest 10% earn up to 40% of global income with the bottom 10% earning just 2-7%. Where a person lives plays a large role in determining their income and whether they are among the world's richest or poorest. Reducing inequality is important for efforts to eradicate poverty and advance sustainable development because of its linkages to poor health, lower education achievements, increased violence and crime, and other negative impacts on societies.

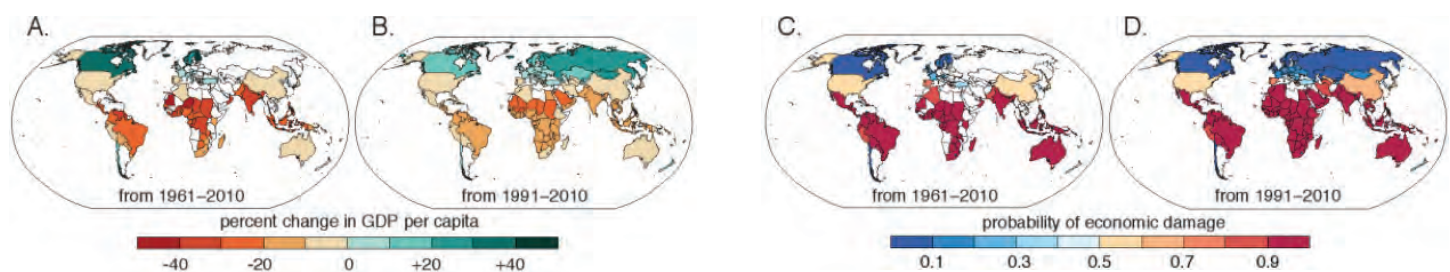
In recognition of the importance of tackling inequality, international efforts have been launched across development institutions and economic forums. In 2015, "deepening income inequality" topped the World Economic Forum's (WEF) Global Agenda list of challenges facing the world and WEF has continued to emphasize the issue in articles and reports. The United Nations Sustainable Development Goal (SDG) 10 is dedicated to inequality, specifically "reduce inequality within and among countries" citing that economic growth alone is not enough to reduce poverty if it is not inclusive.

## Country-Level Economic Impact of Historical Global Warming

**A.** The median impact on country-level per capita GDP across the >20,000 realizations of the world without anthropogenic forcing, calculated for each country over the 1961-2010 period.

**B:** As in A, but for the 1991-2010 period. Differences in the presence/absence of countries between the 1961-2010 and 1991-2010 periods reflect differences in the availability of country-level economic data. Differences in the magnitude of country-level values between the 1961-2010 and 1991-2010 periods reflects the influence of accumulation time on the net accumulated economic impact.

**C and D:** The probability that historical anthropogenic forcing has resulted in economic damage, calculated as the percentage of the >20,000 realizations that show a decrease in per capita GDP relative to the counterfactual world without anthropogenic forcing.



Crafting effective solutions to inequality requires a sound understanding of root causes and contributing factors. Understanding the impact of historical warming on economic inequality is of particular interest. For most poor countries it is very likely that per capita GDP is lower today than it would have been in the absence of global warming. Given that wealthy countries have been responsible for the vast majority of historical greenhouse gas emissions, any clear evidence of associated climate change contributing to inequality also raises critical questions of international justice. As the international development community seeks to address the underlying causes of global inequality, it will be critical to continue to build on our understanding of global warming's impacts on economic development.

### About the Authors

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This brief is based on the paper “Global warming has increased global economic inequality” published in the *Proceedings of the National Academy of Sciences*, May 2019. [www.pnas.org/content/116/20/9808](http://www.pnas.org/content/116/20/9808)

