Projecting Civil Conflict Across Future Climate Change and Socioeconomic Scenarios

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Project Overview and Methods

Objective: Generate estimates of future conflict burdens and violent events through 2100 over a range of socio-economic and climate change scenarios.

- **Empirical relationships**
  - Known predictors of civil armed conflict: economic growth, population size, and educational attainment
  - Feedbacks (economic growth and armed conflict)
  - Other drivers (food security and civil instability)

- **Projecting correlates of civil conflict**
  - Socioeconomic and climate change scenarios
  - Modeling indicators of civil conflict using the Global Change Assessment Model (GCAM)
    - Food prices, oil exports, international monetary transfers due to climate policies

- **Simulating future conflict burdens**
  - Propensity for civil conflict under different socioeconomic development pathways
  - Refinement of simulation model through the inclusion of new parameters (e.g., food prices)
  - Explore potential effects of climate change and emissions mitigation policies
Modeling Challenges

- Difficulties establishing empirical causal mechanisms
  - Causal pathways differ across regions or time
  - Many interactions across small-scale events
  - Data quality (which metrics, accuracy of reporting)

- Direct causal pathways from climate change to conflict are unlikely
  - Case studies to develop theory and explore indirect pathways
    - Climate change $\rightarrow$ changes in agricultural yields $\rightarrow$ changes in food prices $\rightarrow$ low-level violent conflict $\rightarrow$ civil conflict
  - Microanalysis of event data to support theory

- Interpreting and applying these results
  - Improve theory linking climate change impacts and civil conflict
  - Inform decision making
    - Probabilistic in nature – in the real world an event will occur or it will not
    - Scenario analysis framework to test theories; range of future outcomes
SSP Narratives

**SSP1: Sustainability**
- Good progress towards sustainable development
- Stabilizing population
- Decreasing income inequality
- Early MDG achievement
- Low resource intensity and fossil fuel dependency
- Strong int’l governance and local institutions
- Well managed urbanization
- Environmentalism

**SSP2: Middle of the Road**
- Current trends continue
- Moderate population growth
- Slowly converging incomes between industrialized and developing countries
- Delayed MDG achievement
- Reductions in resource and energy intensity at historic rates
- Environmental degradation

**SSP3: Fragmentation**
- Rapid population growth
- Slow economic growth
- Failing to achieve MDG
- High resource intensity and fossil fuel dependency
- Low investments in technology development and education
- Unplanned settlements
- Weak int’l governance and local institutions

**SSP4: Inequality**
- Increasing inequality within and across countries
- Effective governance controlled by a small number of rich global elites
- Most of populations with limited access to higher education and basic services
- Energy tech R&D made by global energy corporations
- Low social cohesion

**SSP5: Conventional Development**
- Rapid economic development
- Stabilizing population
- Consumerism
- High fossil fuel dependency
- Eradication of extreme poverty and universal access to education and basic services
- Highly engineered infrastructure and ecosystems
Projections of Civil Conflict
SSP Population and GDP

Baseline probability of conflict along the SSPs varies with population and GDP/capita
- All scenarios show a declining trend due to increasing income throughout the century
- Forecasted incidence of conflict is higher in SSP3 than in SSP5, due to more rapid population growth and slower economic development
The inclusion of educational attainment has a strong effect on the probability of civil conflict:

- Low education levels outweigh the effects of increasing income.
- Low education scenarios show increasing propensity for conflict.
- The effect of education increases the spread across scenarios.
Regional Distribution of Conflict, 2013
(Model Projections, Including Education)
Regional Distribution of Conflict
SSP 1 and SSP 3, 2020

Probability of peace
- 0-50%
- 50-70%
- 70-80%
- 80-90%
- 90-95%
- 95-100%
Regional Distribution of Conflict
SSP 1 and SSP 3, 2040
Regional Distribution of Conflict
SSP 1 and SSP 3, 2060

Probability of peace
- 0-50%
- 50-70%
- 70-80%
- 80-90%
- 90-95%
- 95-100%
Food Security and Civil Conflict

- **Empirical relationship**
  - Definition of food security
  - Theoretical basis
    - Price shocks may be more important than gradual changes
  - Data
    - Multiple sources, a lot of missing data
    - Inconsistencies across data sets (types of commodities, units, time scale)

- **Projecting food security, multiple potential drivers**
  - Socioeconomic development pathways
    - Modeling challenges – producer vs. consumer prices
  - Climate change
  - GHG mitigation policies
    - Bioenergy, aorestation
Expenditures on Maize/Income

2005
(Historic Data)
Expenditures on Maize/Income

2050

(No climate impacts)
Expenditures on Maize/Income 2100
(No climate impacts)
On-going and Future Research Directions

- Income transfers from climate policies
  - GDP per capita is a robust predictor of conflict
  - Potentially large transfers from climate policies
  - Effect of delay (accession) for developing countries

- Climate change impacts
  - Effects on agricultural yields on food security
  - Causality? Climate change as an indirect driver of conflict
    - Agricultural impacts $\rightarrow$ malnutrition $\rightarrow$ educational attainment $\rightarrow$
    $\rightarrow$ labor productivity $\rightarrow$ income $\rightarrow$ conflict