Projecting Conflict and Cooperation under Climate Change Scenarios

IMPACTS World 2017

Elisabeth Gilmore
Department of International Development, Community, and Environment
Clark University, Worcester, MA, USA

Håvard Hegre and Kristina Petrova
Department of Peace and Conflict Research
Uppsala University, Uppsala, Sweden

Jonathan Moyer and Drew Bowlsby
Pardee Center for International Futures
University of Denver, Denver, CO, USA

Linkages beyond conflict and climate

- **Will climate lead to a more violent world? What are the paths of climate to conflict?**
- These pathways are often conditional (ie agricultural conflict)
- A number of moderating factors such as governance, adaptive capacity, institutions
- Conflict can increase vulnerability to climate
- Conflict can emerge as a result of mitigation and adaptation policies (land use arguments)

Forecasting conflict

- Has a long academic legacy and also has been controversial
- Statistical and data-mining examples
  - structural: “models of correlates of conflict (e.g. GDP/capita, population, education, infant mortality rate, etc…)” to investigate if trends of conflict reduction will continue with mitigation and adaptation policies
  - Short-term early warning models: often machine-learning with auto data (twitter observation as conflict predictor) (lacks inclusion of all actors)
  - ABM and game theory: attempts to investigate the mechanisms
  - Expert elicitation (interviews)

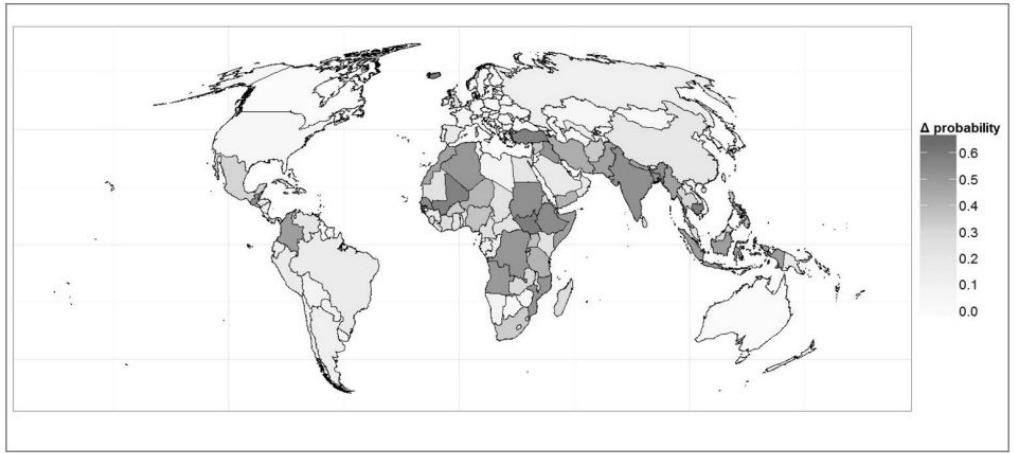
4 Projects explored here:

a) Projecting conflict along the SSPs;
b) Using conflict modeling to inform the SSPs;
c) Improving the coupling of conflict and governance modeling and IAMs; and
d) Coupling short-term models to capture near-term, sub-national, disaggregated violence with the long-term forecasts.

Projecting conflict along the SSPs

- Makes projections for armed conflict according to Uppsala data: population, gdp per capita, educational attainment, years since conflict, years since independence
- Predictions of population and education from IIASA and OECD
- Assesses how these change in each SSP and the outcomes

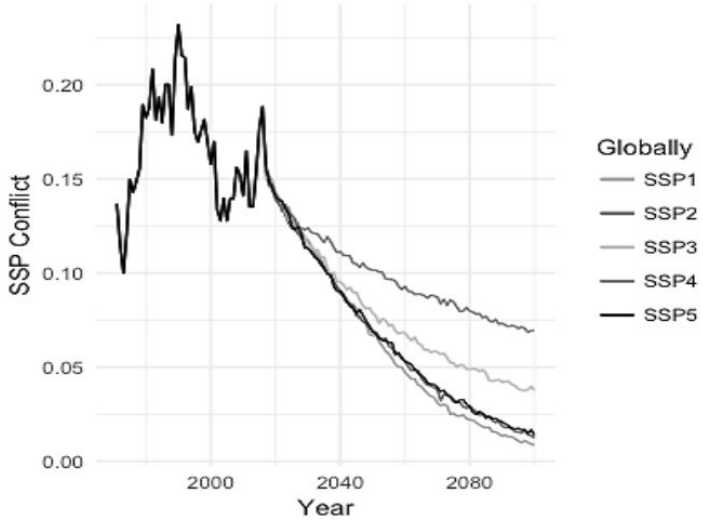
Figure 1: End-of-century differences in estimated conflict risk between SSP1 and SSP3. Darker shades indicate larger reductions in absolute conflict risk by shifting from a regional fragmentation scenario (SSP3) to a sustainable growth scenario (SSP1). There is insufficient historical data for South Sudan and North Korea.



Conflict modeling to inform the Shared Socioeconomic Pathways

- Conflict predictions based on GDP per capita
- Optimistic economic growth means optimistic conflict projections
- Conclusion: not meaningful since they miss political constraints
- Explores other models- loses classification power in the 2000s

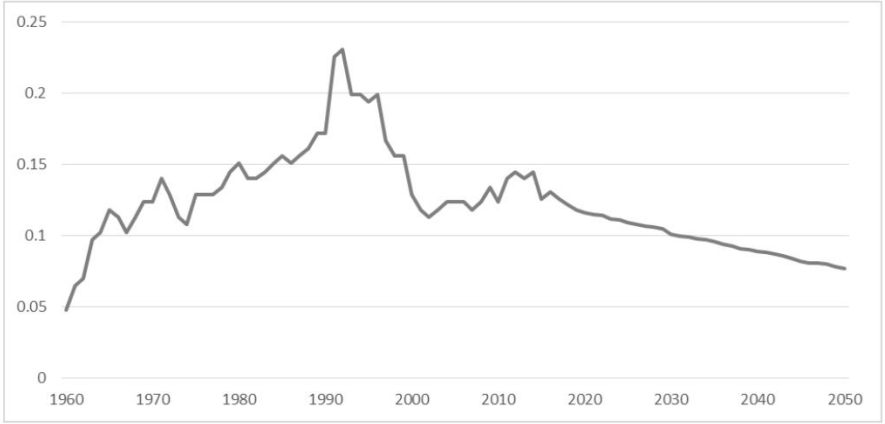
Figure 2. Observed (1970-2016) and predicted (2017-2100) incidence of internal armed conflict globally for each of the five SSPs, operationalize by means of the OECD-ENV GDP projections and the IIASA population projections. In order of highest to lowest conflict risk, SSP4, SSP3, SSP5, SSP2 and SSP1.



Couple with IAMs

- Looks at International Futures (IF) and GCAM
- IF incorporates a lot more political elements in their forecasting (unclear how this model works though)
- Uses IF model to forecast through 2050
    - Illustrates decreasing risk due to development and shifts towards democracy

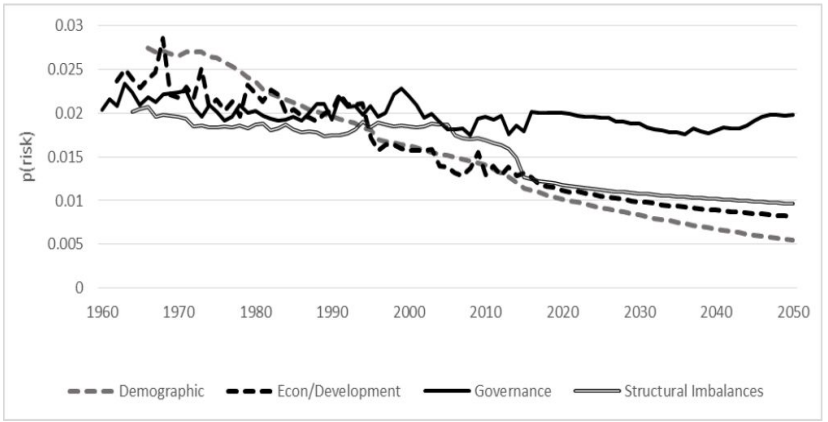
Figure 4. IFs Global Forecast for State Failure Internal War Index, aggregated by simple average, historical data: consolidated events, maximum magnitude



Couple with IAMs

- Figure to the right shows risk of ‘anacratic regimes’
- 2 ways to incorporate GCAM:
  - Effects of armed conflict on GDP along 5 SSPs -> implications of those GDPs on GHGs
    - Conflict slows economic growth and hampers adaptation and mitigation efforts
  - Conflict risk from changes in economic performance (e.g. mitigation costs), oil production and revenues, potential financial transfers for carbon permits”

Figure 5. Long-term Global Risk of Conflict for Conceptually Distinct Models (aggregated by average)



Recs, Challenges, and Opportunities

- Improve synthesis and understanding of climate-conflict pathways across scales
- “Expand the modelling of governance and other elements of state fragility and failure as an important intersection of climate policy and conflict”
- Improve our understanding of this complexity
- “Explore the indirect links between climate change, conflict, and cooperation.“
- “Improve the integration of the forecasting models and results with decision and policy□making needs”
    - Provide policy suggestions that won’t exacerbate conflict risks

Discussion Questions

- What do we think about the credibility of conflict models?
- What is the most promising way to link conflict studies with GCAM? How do we make sure this is done in a responsible way?
- Is it more effective to:
  - Use GCAM to identify risks (analyze outputs)
  - Use GCAM to explore impacts of conflict (Adjust inputs)
- Overall thoughts on linking conflict and climate?
- Risks of using these kinds of models?
- Other opportunities for it?

Table 1: Summary of drivers for long-term forecasting model in IFs system

Model	Inputs (i.e. drivers)
Internal War Magnitude Inspired by Goldstone et al. (2010) (SFINTLWARMAG)	• Regime type (polity 21-point scale) • Trade Openness • Gross Domestic Product • Youth Bulge
Demographic (SFDEM)	• Infant Mortality • Population (logged) • Youth Bulge Pop (15+)
Economic/Development (SFECONDEV)	• GDP/cap (logged) • GDP/cap Growth • Life Expectancy
Governance (SFGOV)	Polity broken into 6 categories: • Full Autocracy (< -8) • Partial Autocracy (-6 to -4) & Partial Autocracy (-5 to 0) • Partial Democracy (1 to 3) & Partial Democracy (4 to 6) • Full Democracy (> 7)
Structural Imbalances (SFIMBAL)	• Polity v. GDP/cap • Life Expectancy v. GDP/cap • Youth Bulge Population (15+) v. Polity

Results Alternative Models

Figure 3. Moving decade AUROC scores for five distinct models and Goldstone et al. (2010)

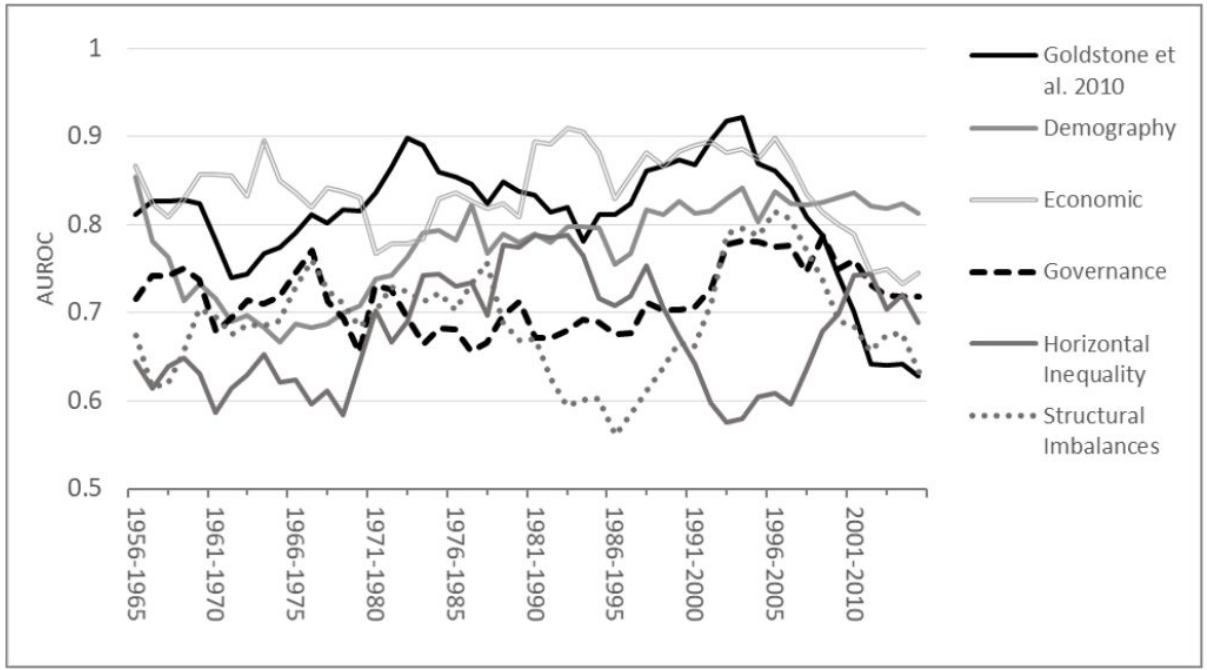


Figure 7. Risks Broken Out by Region for Governance Model (aggregated by average w/5-yr moving average)