

Conflict in a Warming World: How Climate Shocks Impact Rebel Demands and Peace Agreement Outcomes

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1 Introduction

As climate change becomes more severe and its effects more frequently observed, its impact on global conflict is increasingly important. This paper explores how climate shocks influence rebel demands and violence, and whether these changes are reflected in peace agreements. Climate shocks, acting as threat multipliers, worsen vulnerabilities in conflict areas, increasing demands for scarce resources like water and land.

Not only are the demands for redistribution or influence on management of resources increasing, but the salience of these demands grows for all sides in the conflict, making these topics more likely to be added to the core topics of peace talks.

Using geospatial climatological and conflict data, this study tests two main hypotheses: 1) Climate shocks will increase rebel demands for climate-related resources. 2) These increased demands will lead to more provisions for water, land, and resources in peace agreements. The research employs difference-in-differences and panel linear regression methods allowing us to isolate the effects of climate shocks on rebel activity and assess whether these demands are addressed in peace agreements. The findings provide key insights into how climate pressures shape conflict and how we can expect conflicts to evolve in a future of worsening climatic conditions. It is reasonable to assume that any effects found now will be smaller than what we can expect under unmitigated global warming. Therefore, the effects observed with existing data are substantively significant, as they likely represent a conservative estimate of future impacts. These insights are crucial for understanding the dynamics of conflict and for informing conflict resolution strategies in a warming world.

2 Key Findings and Recommendations

This study highlights several key findings regarding the interplay between climate shocks, rebel demands, and peace agreement provisions:

Climate Shocks Escalate Rebel Demands:

- The analysis shows that climate shocks influence rebel demands over time, with water and natural resource demands increasing as resource depletion worsens.

- This suggests a cumulative effect, where prolonged scarcity heightens the urgency and frequency of demands.

Incorporation of Resource Provisions in Peace Agreements:

- Natural resource demands lead to more provisions for natural resources. However, water and land reform demands do not lead to more provisions in a clear way. The results show a slight trend where land reform demands are weakly associated with more provisions, while water-related demands are weakly linked to fewer provisions.
- This concerning trend indicates that, aside from natural resources, escalating demands from rebels for climate-related resources are not adequately met by corresponding provisions in peace agreements.
- This inadequacy is particularly notable for water scarcity, indicating a potential weakness in peace processes. Unmet water needs may lead to continued conflict and instability.

Long-term Impact of Climate Factors on Conflict Dynamics:

- The impacts of climate shocks on rebel demands and subsequent peace agreements are immediate and can have long-lasting effects.
- These effects can get more severe over time, underscoring the importance of considering climate variables as fundamental factors in conflict resolution strategies.

Based on these findings, the following recommendations are proposed:

Integrate Climate Considerations in Peace Processes:

- Policymakers and mediators should incorporate climate-related issues into peace negotiations and agreements.
- Resource management provisions should be explicitly included and prioritized to address the evolving resource-related needs of conflict-affected populations.
- This integration is essential as climate events are becoming more frequent and severe.

Foster Resilience and Invest in Climate Adaptation:

- Develop programs that enhance the resilience of communities affected by both climate and conflict. Ensure that experts on environmental matters and representatives from environmental NGOs are present at peace talks. Ensure that any funding also covers environmental impact assessments, and that core infrastructure related to water supply is governed and managed equitably.
- Promote sustainable resource management and agricultural practices.
- Ensure equitable access to vital resources like water and land.
- Improve water management systems.
- Invest in infrastructure that can withstand extreme weather events.

Promote Inclusive Dialogue:

- Engage diverse stakeholders, including marginalized communities, in the peace process.
- Ensure that the voices of those most affected by climate shocks are heard.
- This inclusivity can lead to more effective and sustainable conflict resolution strategies.

3 Contribution

Existing research has established that climate shocks exacerbate resource scarcity, disproportionately affecting already vulnerable populations (Jones et al., 2017; DeNicola et al., 2015). These climate-related challenges raise significant security concerns, prompting scholars to examine the impact of climate change on conflict outcomes (Burke et al., 2015; Buhaug, 2015; Koubi, 2019). However, an important question remains: how do climate shocks and disasters alter the nature of conflict? Specifically, do they drive an increase in climate-related demands from rebel groups? Understanding this dynamic is crucial, as such demands can fragment peace processes and reshape the post-conflict resource distribution. As illustrated in Figure 1, the aggregate levels of both climate-related rebel demands and climate-related peace agreement provisions reveal that while some conflict countries exhibit trends where the provisions align with the increasing demands, others show a stark lack of provisions.

Total Climate Demand by Country (logged)

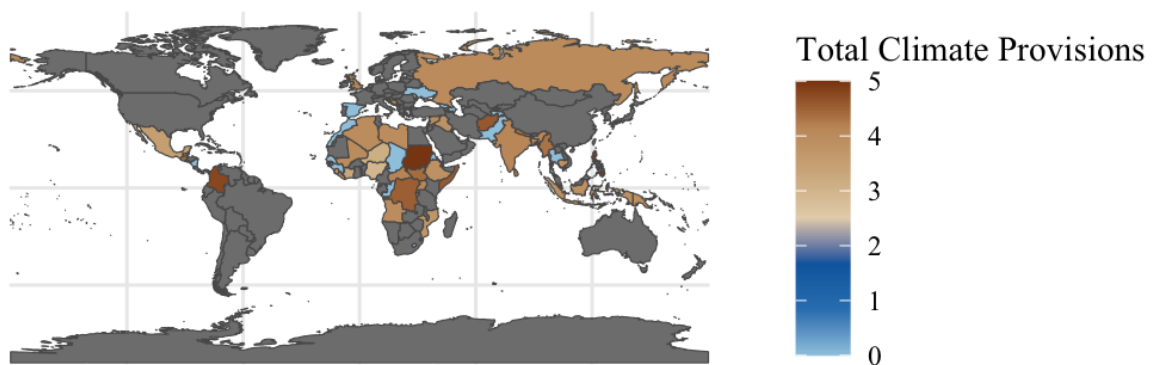
Sum of Natural Resource, Land Management, and Water Demands



Data Source: UCDP PRIO

Total Climate Provisions by Country (logged)

Sum of Natural Resource, Land Management, and Water Provisions



Data Source: UCDP PRIO

Figure 1

As climate-related demands emerge, it is imperative to investigate whether these needs are addressed in peace agreements. This study contributes to these pressing questions by isolating the effects of climate shocks on rebel demands and examining their subsequent impact on

peace outcomes. Our findings hold critical implications for fostering a more equitable and sustainable post-conflict environment, where resources are distributed more equitably and effectively. By shedding light on the relationship between climate shocks, rebel demands, and peace agreements, this research advances our understanding of conflict dynamics in the context of climate change, ultimately aiming for a more just and resilient future in both natural resource and conflict management.

4 Methodology

This project uses the EM-DAT Disaster Database to analyze climate shocks in conflict regions defined by the Uppsala Conflict Data Program (UCDP) datasets [Program \(2022a,b\)](#); [for Research on the Epidemiology of Disasters \(2021\)](#). It examines the period from 1989 to 2018, covering 62 unique conflict countries. Climate shocks are captured by the onset of EM-DAT's climatological and hydrological disaster types¹. The study employs the [Callaway and Sant'Anna \(2021\)](#) double robust staggered difference-in-differences (DID) methodology² to predict climate-related demands, categorized into Land Reforms, Water Resources, and Natural Resources, aggregated by rebel group-year. Following this, panel linear regression (PLM) with random effects estimates the impact of these demands on climate-related provisions in peace agreements, utilizing data from the PA-X Peace Agreement Database [PeaceRep \(2021\)](#).³

5 Climate Shocks and Increases in Climate-Related Rebel Demands

This section examines the effect of climate shocks on rebel demands for water resources, natural resources, and land reform. To interpret Figures 2-4 below, 0 indicates the levels of rebel demands in the periods before the climate shock occurs, and 1 indicates the periods after it occurs. Therefore, we observe levels of demands in the periods before and after the climate shock to understand its effect on levels of rebel demands.

5.1 Water-Related Demands

Climate shocks lead to an increase in water resource-related rebel demands, which is statistically significant in the pooled post-treatment period (ATT: 0.1889, Std. Error: 0.0355). The first year it becomes statistically significant is seven years post-treatment (ATT: 0.1062, Std. Error: 0.0279). This indicates a latent effect of climate shocks on water scarcity over time. Figure 2 illustrates the event study plot of this relationship. However, this effect appears to increase more sharply as time goes on.

¹See [EM-DAT documentation](#) for more details.

²This analysis relies on the parallel trends assumption which is satisfied across all three difference-in-differences models as shown in Figures 2-4.

³For more information on these methodologies, see [Callaway and Sant'Anna \(2021\)](#) for DID and [Zulfikar and STp \(2018\)](#) for PLM.

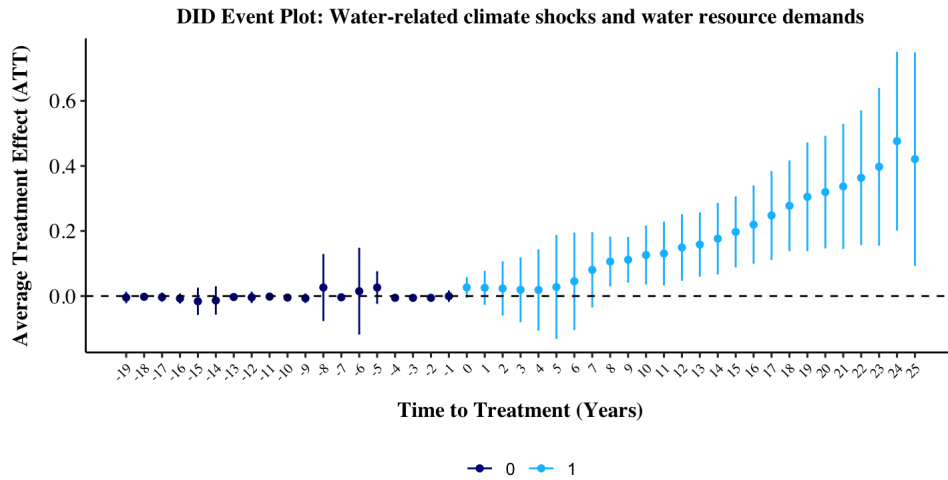


Figure 2

5.2 Natural Resource-Related Demands

Climate shocks also result in an increase in natural resource-related rebel demands, which is statistically significant in the pooled post-treatment period (ATT: 1.1575, Std. Error: 0.1768). The first year it becomes statistically significant is five years post-treatment (ATT: 0.3359, Std. Error: 0.0944). This finding suggests a latent effect of climate shocks on natural resource scarcity over time. Figure 3 depicts the event study plot of this relationship. However, this effect appears to increase more sharply as time goes on.

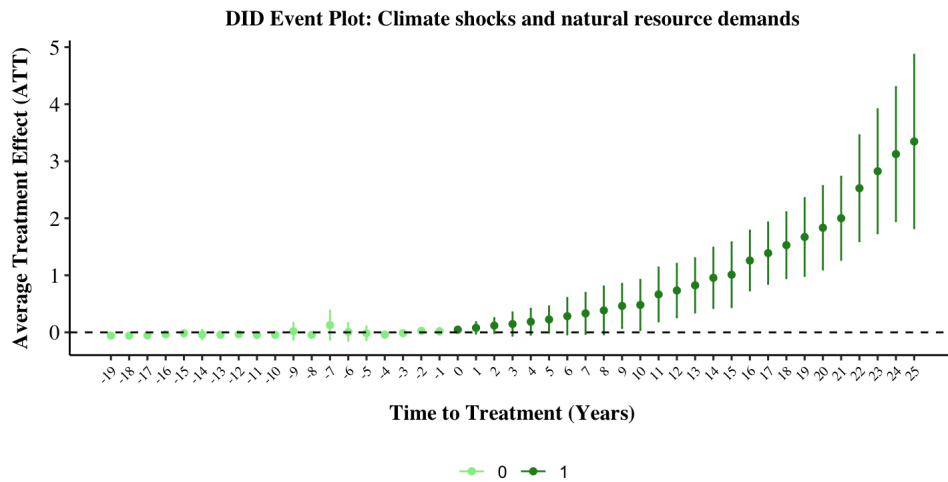


Figure 3

5.3 Land Reform-Related Demands

Climate shocks also contribute to an increase in land reform-related rebel demands, which is statistically significant in the pooled post-treatment period (ATT: 0.3592, Std. Error: 0.1175). The first year it becomes statistically significant is seven years post-treatment (ATT: 0.0561, Std. Error: 0.0163). This indicates an immediate effect of climate shocks on land-related

scarcity. Figure 4 presents the event study plot of this relationship. However, this effect is not particularly sharp and plateaus fairly quickly overtime.

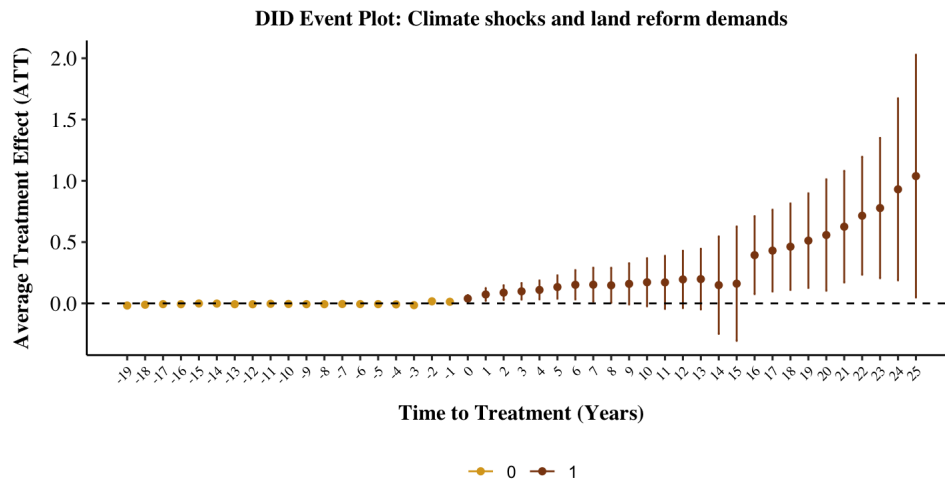


Figure 4

6 Climate-related rebel demands following climate shocks should lead to an increase in climate-related peace agreement provisions.

This section examines the effect of increased rebel demands on peace agreement provisions for water resources, natural resources, and land reform. Each dependent variable in the subsequent models is lagged according to the effect of the climate shock. Water-related provisions are lagged 7 years, natural resource-related provisions are lagged 5 years, and land reform-related provisions are lagged 1 year. Figures 5-7 show the count of corresponding rebel demands and peace agreement provisions collapsed by year, summing all rebel group demands and provisions over time.

6.1 Water-related demands

In early peace agreements, water-related provisions were fairly standard, even though rebel demands for water were generally low. However, as these demands increased in later years, the provisions steadily declined (see Figure 5). This implies that water-related peace provisions do not reflect the rising demands.

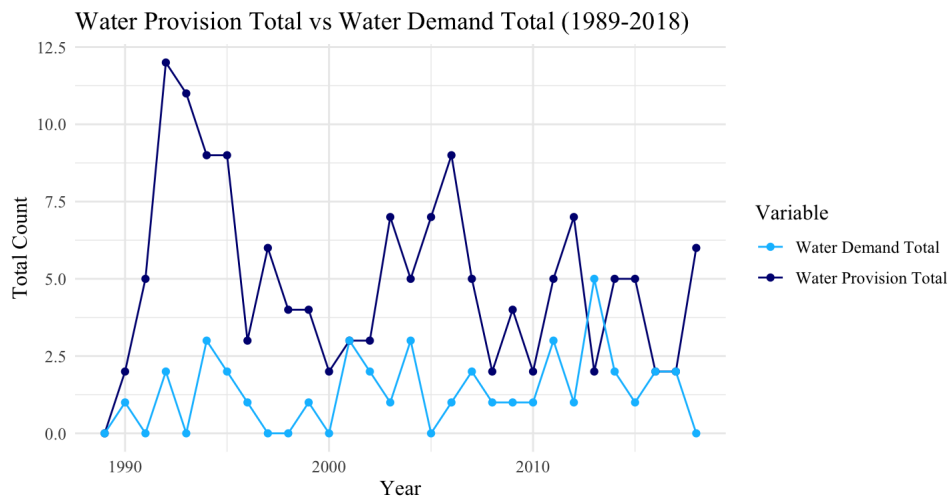


Figure 5

6.2 Natural resource-related demands

Natural resource-related agreement provisions appear to be inconsistent over time. This may be related to the fact that different conflict locales have vastly different natural resource rents (see Figure 6). This implies that peace provisions for natural resources do not consistently align with the varying resource demands of different conflict areas.

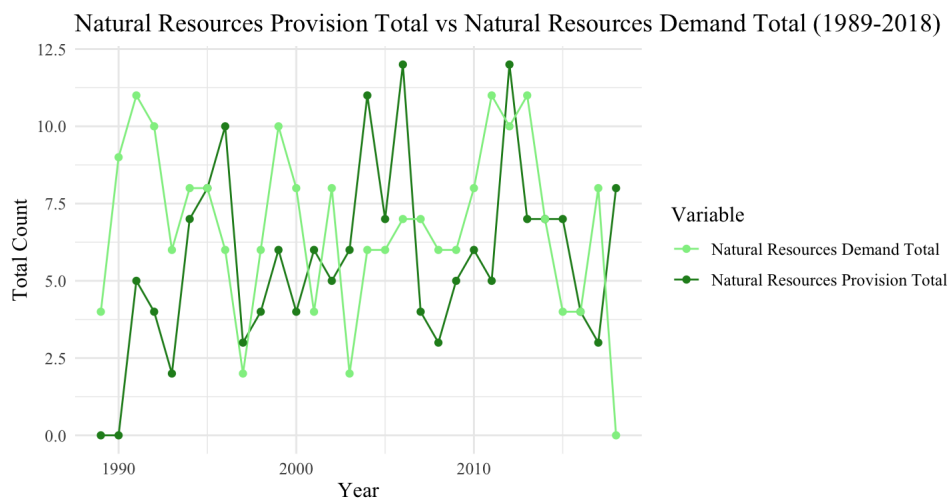


Figure 6

6.3 Land reform-related demands

Relatively consistent demands for land reform are observed over time, with quite inconsistent levels of peace agreement provisions (see Figure 7). This implies that peace provisions for land reform do not consistently meet the steady demands for land reform.

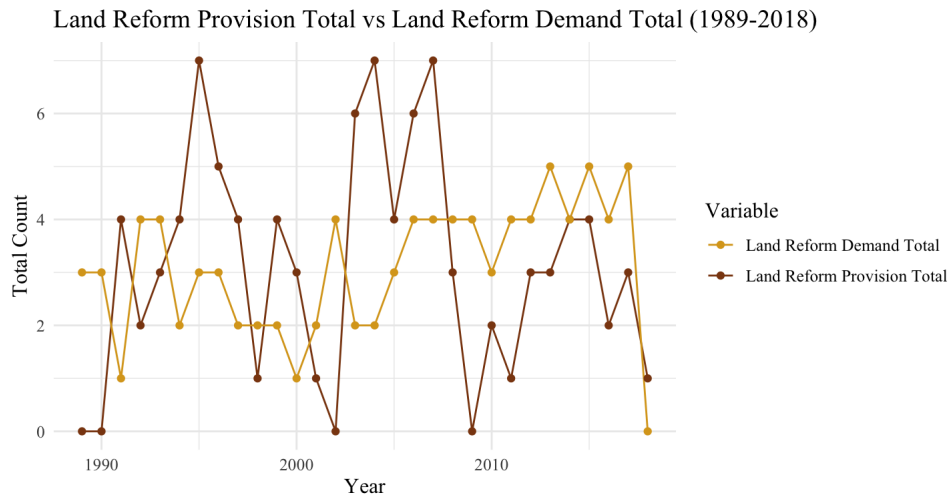


Figure 7

6.4 Estimated Provisions

Finally, Figure 8 shows the relationship between climate-related peace agreement provisions and their demands. Demand types that do not include 0 on the X axis are statistically significant. Whether they are above or below it indicates whether the provisions went up or down respectively. The results show that when there is a demand for natural resources, it leads to more provisions for natural resources, and this result is statistically significant ($p = .00$). However, water and land reform demands do not lead to more provisions in a clear way. While land reform demands are weakly associated with more provisions, water-related demands are weakly linked to fewer provisions.

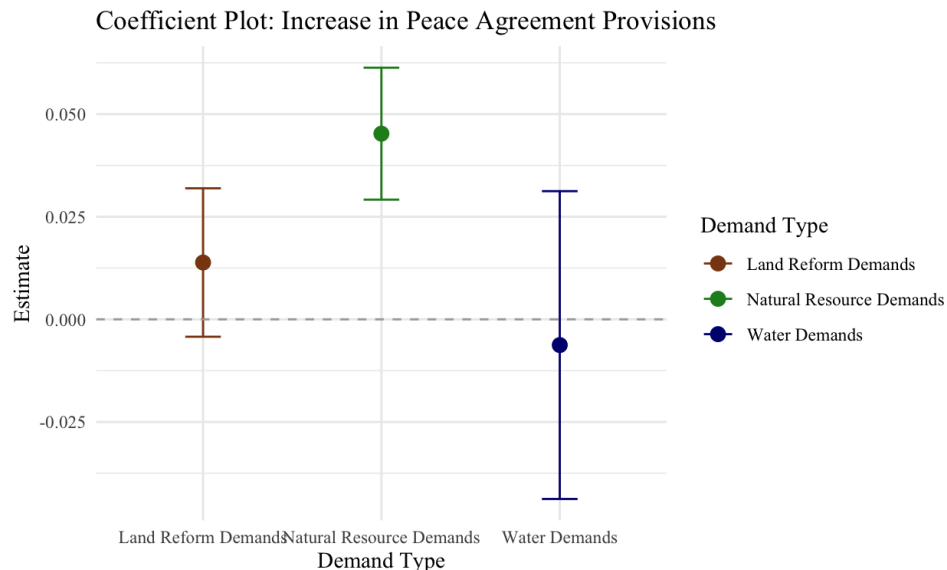


Figure 8

7 Concluding Remarks

The analysis of climate shocks reveals distinct temporal patterns in how they influence rebel demands across different categories. Water-related and natural resource-related demands exhibit a delayed effect, becoming more pronounced over time as the depletion of these resources continues. This suggests a cumulative impact where prolonged scarcity heightens the urgency and frequency of demands. In contrast, land-related demands manifest immediately, likely because the effects of climate shocks on land are more direct and severe, leading to immediate conflicts over devastated areas.

Despite the observed increase in demands across water, natural resources, and land reform categories due to climate shocks, peace agreements predominantly include provisions for natural resources. This selective response may be attributed to the strategic importance and visibility of natural resources in conflict resolution and negotiation processes. The lack of reciprocal provisions for water and land reform demands highlights a gap in addressing the comprehensive needs exacerbated by climate shocks. This underscores the necessity for more holistic and inclusive peace agreements that adequately address all facets of resource-related conflicts to foster long-term stability and resilience in affected regions.

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