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The Environment and Civil War: Exploring the Relationship Between the Environmental Performance Index and Incidence of Internal Armed Conflict

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Abstract

The state of the environment is receiving increasing attention. Environmental quality's possible relationship to violent conflict attracts both popular and academic interest. Prior research has found support for the idea that environmental scarcity is related to higher occurrences of civil war. There have been few comprehensive quantitative studies regarding this relationship. This study tests a more general argument that higher environmental quality can lead to fewer occurrences of internal armed conflict. The study utilizes an environmental performance index found in the Quality of Government Standard Dataset to test its hypothesis. The study finds that the higher the environmental performance index of a state, the lower the annual incidence of internal armed conflict. The relationship found in this study should inspire further research on the relationship between environmental quality and civil war. Further attention to this subject may encourage increased priority toward environmental policy to prevent the incidence of civil war.

Keywords

Environmental Performance Index, Civil War, Internal Armed Conflict, Environment

Disciplines

Environmental Education | Environmental Health and Protection | Environmental Monitoring |
Environmental Policy | Environmental Sciences | Environmental Studies | Military and Veterans Studies |
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Comments

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Environmental Performance Index and Incidence of Internal Armed Conflict**

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Abstract

The state of the environment is receiving increasing attention. Environmental quality's possible relationship to violent conflict attracts both popular and academic interest. Prior research has found support for the idea that environmental scarcity is related to higher occurrences of civil war. There have been few comprehensive quantitative studies regarding this relationship. This study tests a more general argument that higher environmental quality can lead to fewer occurrences of internal armed conflict. The study utilizes an environmental performance index found in the Quality of Government Standard Dataset to test its hypothesis. The study finds that the higher the environmental performance index of a state, the lower the annual incidence of internal armed conflict. The relationship found in this study should inspire further research on the relationship between environmental quality and civil war. Further attention to this subject may encourage increased priority toward environmental policy to prevent the incidence of civil war.

Introduction

“My world, my Earth is a ruin. A planet spoiled by the human species. We multiplied and fought and gobbled until there was nothing left, and then we died. We controlled neither appetite nor violence; we did not adapt. We destroyed ourselves. But we destroyed the world first.”¹

-- Ursula K. Le Guin

Research has identified a relationship between environmental degradation and armed conflict. Poor environmental conditions have been linked to the incidence of civil war (Hauge & Ellingsen, 1998). While this possible connection garners the need for further research, this connection would have serious implications for domestic environmental policies. Much of the research done in this area has focused on studying the effects of environmental scarcity—particularly the scarcity of arable land and other renewable natural resources—with the notion that environmental scarcity will lead to underdevelopment and violent conflict (Binningsbø, Soysa, & Gleditsch, 2007: 338). Pressure on environmental conditions is increasing with the rise of global climate change and an exponentially rising global population. Without proper action from government, resource scarcities and other environmental inequalities will only worsen with increasing pressure from climate change and population growth.

This paper examines a possible connection between environmental quality and the number of internal armed conflicts a country experiences per year. The study seeks to determine whether environmental quality is related to the incidence of internal armed conflict.

¹ Quote from *The Dispossessed: An Ambiguous Utopia*, a 1974 utopian science fiction

These questions are becoming increasingly important as the world prepares to face the rising impacts of global climate change. Countries suffer from a variety of environmental issues, including pollution, deteriorating ecosystems, resource scarcity, and unequal access and distribution of resources. The progression of climate change will worsen these poor environmental conditions. Climate change will have profound effects on the quality of life of hundreds of millions of people (Nordås & Gleditsch, 2007). Many of the worst environmental conditions are also coinciding with areas of internal violence. It is important to study whether poor environmental conditions are related to internal armed violence. If environmental quality issues have a causal relationship with internal armed conflict, stronger environmental policies could become a means of preventing future conflict. This study seeks to discover whether this relationship exists in the hope of finding means of preventing future internal armed conflict.

Literature Review

The state of the environment is receiving increasing attention, but the idea that environmental stewardship could lead to peace is not new. Leaders in the international community have linked environmental conditions to security. In 1994, former US Secretary of State Madeleine Albright expressed the view that “We believe that environmental degradation is not simply an irritation but a real threat to our national security” (Binningsbø, Soysa, & Gleditsch, 2007: 338). Around this time, the Clinton Administration explicitly acknowledged the concept of environmental security in its 1994 national security document, noting that the increasing competition for dwindling

resources “is already a very real risk to regional stability around the world”.² The global community recognized this link between environmentalism and peace when the 2004 Nobel Peace Prize was given to Kenyan environmentalist Wangari Maathai in the widespread belief that good environmental stewardship is related to peace and human security (Binningsbø, Soysa, & Gleditsch, 2007: 338). Not long after this, Al Gore and the Intergovernmental Panel on Climate Change (IPCC) shared the 2007 Noble Peace Prize for their efforts to spread knowledge about man-made climate change and lay the foundations for the measures that are needed to counteract that change.

The connection between environmental conditions and conflicts has received the attention of the academic community. Since the late 1980s, arguments about the negative consequences of environmental degradation, resource scarcity, and population pressure have been discussed in academic and policy circles (Theisen, 2008). Scholars are continuing to study the ways in which environmental conditions affect war. Researchers have been studying this topic in a variety of ways, examining renewable resources, nonrenewable resources, access to resources, and changes in resources due to the changing climate. Scholars have found that environmental degradation, such as the distribution and degradation of land, forest, and water, is linked to economic and political factors (Hauge & Ellingsen, 1998). The majority of current research surrounding a relationship between the environment and armed conflict surrounds the effects of environmental scarcity (Hauge & Ellingsen, 1998; Maxwell & Reuveny. 2000; Percival & Homer-Dixon, 1998; Urdal, 2005, Raleigh & Urdal, 2007). One particular study has indicated strong evidence that scarcities of renewable resources can lead to conflict

² From the document A National Security Strategy of Engagement and Enlargement, cited in Gaan and Das 2004: 26.

(Hauge & Ellingsen, 1998). Hauge and Ellingsen's study of the relationship between renewable resource scarcity and armed conflict expands upon the work of others in the past (1998). Hauge and Ellingsen's study utilized a number of indicators of resource scarcity such as deforestation, land degradation, and scarce freshwater (1998). Their hypotheses were confirmed, finding that environmental scarcity increased the risk of domestic armed conflict, even when controlling for economic and political factors (Hauge & Ellingsen, 1998).

Hauge & Ellingsen's research has prompted others to explore this topic through their own research. Results amongst studies have varied, and none have replicated the same significance for the connection made by Hauge and Ellingsen. A number of studies have failed to find statistical significance in the relationship between resource scarcity and armed conflict in their findings (Raleigh & Urdal, 2007). In Raleigh and Urdal's study, they found that the effects of political and economic factors outweigh local level demographic and environmental factors and conflict (2007). Another study by Hendrik Urdal that examines the pressures of populations on resource scarcity found that countries experiencing high population growth are generally not experiencing a greater risk of conflict (2005).

Other studies of this topic area are becoming increasingly sensitive to the impacts of climate change. New research in this area surround the relationship between climate change, environmental degradation, and armed conflict (Raleigh and Urdal, 2007). This newer research provides insight into which resources will become significantly impacted by climate change and how this may affect the relationship between climate change and war. This research emphasizes the need to study major changes in freshwater availability,

the productive capacity of soils, and patterns of human settlement (Raleigh and Urdal, 2007). Other recent research suggests that measures of sustainability, like the ecological footprint, can be used as valuable measures of environmental impacts on conflict (Binningsbø, Soysa, & Gleditsch, 2007).

Current research in the area of the environment and armed conflict calls for more systemic quantitative studies. Much of the research regarding the relationship between environmental conditions and conflict relies on statements rather than substantial research (Binningsbø, Soysa, & Gleditsch, 2007). This area of research needs more statistical research to study whether the relationship between environmental quality and armed conflict is indeed causal. The study of this relationship also calls for increased control of important variables like political, economic, and cultural factors that might also affect the incidence of war (Hauge & Ellingsen, 1998; Gleditsch, 1998). Other critiques of past research point out a lack of variation in independent and dependent variables (Hauge & Ellingsen, 1998). Hauge and Ellingsen claim that a fuller and broader collection of environmental data is needed to properly assess this issue. (1998).

Gleditsch's critique of literature regarding armed conflict and the environment highlights a number of issues that have arisen in publication regarding armed conflict and the environment (1998). In addition to a need for better control variables in studies, Gleditsch describes eight other issues, claiming that most literature on the relationship between resources, the environment, and armed conflict experiences one or more of these problems (1998). One issue that Gleditsch discusses is a lack of clarity over what is meant by "environmental conflict" (1998). This discrepancy amongst research has a wide spectrum of environmental issues—from small-scale water pollution to holes in the ozone

level—categorized with the same term. Gleditsch mentions that research is too often made up of definitional and polemical exercises rather than analysis (1998). When analysis does exist, Gleditsch argues that models sometimes become so large and complex that they are virtually untestable (1998). Gleditsch argues that the lack of research in this area may call for smaller studies before eventually building up to large-scale models on the subject. The critique mentions that single-factor reasoning should not be discredited in this field. Gleditsch also argues that cases are sometimes selected based upon the values of their dependent variable. These cases are then misleading, as a relationship displayed in these studies may only be coincidental. Another problem identified by Gleditsch is the reverse causality of research on this topic (1998). There is an ample supply of research regarding the detrimental effects of armed conflict on the environment. These results are not surprising and are not helpful in discovering the source of conflict. Gleditsch also mentions the issue of assumptions treated as empirical evidence (1998). Gleditsch additionally discusses the failure of research to distinguish between foreign and domestic conflict, as well as confusion about the appropriate level of analysis (1998). Foreign and domestic conflicts erupt for different reasons; therefore separate research benefits from attention to these diverging factors. Research regarding the environment and conflict fails to address level of analysis and which methods are preferred for this topic. Gleditsch's article provides comprehensive insight into challenges with prior research how the environment and conflict relate. His findings are useful in determining necessary challenges to overcome in this area of research.

The study of environmental quality and conflict needs more substantial quantitative research to examine the effects of environmental conditions on armed

conflict. The evidence of a causal relationship in Hauge and Ellingsen's study motivates further study on the effects of environmental conditions on the incidence of conflict.

Explanation and Hypothesis

This study will use an environmental performance index as an indicator of the possible relationship between environmental conditions and armed conflict. The study will examine whether higher environmental performance is significantly related to the incidence of internal armed conflict. The study will test this hypothesis:

H: The higher the environmental performance of a state, the lower the annual incidence of internal armed conflict.

My prediction is that countries with higher environmental performance will encounter a smaller annual number of civil wars. Evidence from previous research suggests that an assortment of environmental issues can lead to greater incidence of conflict, particularly in internal armed conflicts. I use an environmental performance index to represent a wide span of environmental factors that could be affecting a state's security. I chose to use an index that would include an assortment of various environmental factors to represent both resource availability and sustainability. I narrow the topic of conflict to the study of internal armed conflicts. The only significant preexisting research surrounding the relationship between environmental quality and conflict has suggested a causal relationship between environmental factors and civil war (Hauge & Ellingsen, 1998). Like Hauge and Ellingsen's study, I chose to use the incidence of internal armed conflict. My study controls for a number of factors that have been viewed as rival explanations for variation in the incidence of internal armed conflict (Hauge & Ellingsen, 1998). In this study, I controlled for GDP, polity, ethnic

fractionalization, and economic globalization. Economic, political regime type, and cultural divides have been identified as prominent alternate factors to explain internal armed conflict (Hauge & Ellingsen, 1998).

Research Design, Data, and Methods

To investigate the relationship between environmental performance and internal armed conflict, the study relies on a times-series data set. This study uses data from the Quality of Government Standard Dataset (Teorell, Dahlberg, Holmberg, Rothstein, Hartmann, & Svensson, 2015). The study analyzes data at the state level. I obtained 495 observations between the dependent variable, internal armed conflict, and central explanatory variable, environmental performance index, for the span of 2000 to 2010.

Dependent Variable: Internal Armed Conflict

The dependent variable in this study is occurrence of *internal armed conflict*. The Internal Armed Conflict variable (*ucdp_type3*) measures the number of internal armed conflicts per country in a given year. The variable defines internal armed conflict as conflict between the government of a state and one or more internal opposition group(s) without intervention from other states. The Internal Armed Conflict variable contains data for 106 countries from 1946 to 2013.

Independent Variable: Environmental Performance

The independent variable in this student is an *environmental performance index*. To demonstrate environmental performance, I use an Environmental Performance Index. The Environmental Performance Index (*epi_epi*) is a composite index that measures how well countries reduce environmental stresses on human health and promote ecosystem vitality and sound natural resource management. The index is made up of 22 variables.

These variables are Ecosystem Vitality (epi_ev), Agriculture (epi_evag), Air Pollution (epi_evair), Biodiversity and Habitat (epi_evbh), Climate Change (epi_evclimate), Fisheries (epi_ev_sh), Forests (epi_evforest), Water (epi_ewater), Forest Cover Change (epi_forcov), Forest Growing Stock (epi_forgrow), Forest Loss (epi_forloss), Fish Stocks Overexploited (epi_fsoc), Indoor Air Pollution (epi_indoor), Marine Protection (epi_mpaez), Biome Protection (epi_pacov), Particulate Matter (epi_pm25), Pesticide Regulation (epi_pops), Renewable Electricity (epi_renew), Sulfur Dioxide Emissions per capita (epi_so2cap), Sulfur Dioxide Emissions per GDP (epi_so2gdp), Costal Shelf Fishing Pressure (epi_tceez), and Access to Drinking Water (epi_watsup). The index ranges in scores between 0 and 100, with higher values indicating better environmental performance. The Environmental Performance Index contains data for 132 states from 2000 to 2010. I chose to use this particular environmental index because it is representative of renewable resource availability, ecosystem health, and sustainability. The index encompasses factors that have previously been studied in both resource scarcity and climate change research.

In order to test my hypothesis, I ran a Poisson regression. This linear regression analysis provided insight into whether or not a relationship between environmental performance and internal armed conflict is significant. When running the Poisson regression, I controlled for factors that I determined might provide alternative causes for internal armed conflict, creating error or bias in my results. In selecting the control variables for this study, I chose variables that others have found to be connected to the incidence of internal armed conflict. I have controlled for GDP in my Poisson regression, using the variable Real GDP at Constant 2005 National Prices (pwt_rgdp). This variable

uses units of millions of 2005 US dollars. The Real GDP variable contains data for 164 states from 1950 to 2011. Controlling for GDP will help prevent bias in the results that would display trends based on the relationship between GDP and internal armed conflict rather than environmental performance and armed conflict. I will additionally control for polity in the Poisson regression, using the variable Revised Combined Polity Score (p_polity2). The polity variable determines whether states are more democratic or autocratic by subtracting the p_autoc score from the p_democ score. The resulting scores range from +10 (strongly democratic) to -10 (strongly autocratic). Controlling for polity will prevent bias related to political structure of states in the Poisson regression. I also controlled for ethnic fractionalization, using the variable Ethnic Fractionalization. The variable defines ethnicity through a combination of racial and linguistic characteristics, resulting in a high degree of fractionalization than the commonly used ELF-index. This variable contains data from 1946 to 2012 for 187 countries. Controlling for ethnic fractionalization will prevent bias related to highly ethnically fractionalized states that have been associated with a higher incidence of civil war (Blimes, 2006). The last variable that I will control for is economic globalization, using the variable Economic Globalization (dr_eg). This variable defines economic globalization as the long distance flows of goods, capital and services as well as information and perceptions that accompany market exchanges. The variable measures economic globalization by actual flows of trade and investments, and by restrictions on trade and capital such as tariff rates. This variable uses scores that range between 0 and 100, where higher values indicate a higher degree of globalization.

Results and Analysis

The results of this study support my hypothesis. The study found a statistically significant relationship between the environmental performance index and the incidence of internal armed conflict (Table 1).³ I found a strong negative correlation between the independent variable, environmental performance index, and the dependent variable, incidence of internal armed conflict. The control variables for real GDP and ethnic fractionalization proved to be statistically insignificant in this study (Table 1). The control variables polity and economic globalization were statistically significant in this study (Table 1). The study found a strong positive correlation between polity and internal armed conflict, supporting the statement that more democratic countries face greater occurrences of internal armed conflict. The study found a strong negative correlation between economic globalization and internal armed conflict, supporting the statement that countries with greater economic globalization face less occurrences of internal armed conflict.

The result of high environmental performance leading to fewer occurrences of civil war is telling regarding the importance of domestic environmental policy. The indicators that made up the environmental index used in this study are factors that countries can choose to manage and regulate. This study demonstrates the possibility that better resource management policy could prevent future conflict. This information is particularly important in preparation for the ill effects of climate change on environmental conditions. The knowledge that higher environmental quality leads to lower incidence of internal armed conflict could emphasize the importance of preventing further climate change and responding to climate change's detrimental effects on

³ See the Appendix for Table 1.

environments. This knowledge could be particularly important to countries that have not yet prioritized environmental policy on their political agendas.

Conclusion

Environmental conditions and conflict are connected to each other. This study found statistical significance in the relationship between a variety of environmental factors and civil conflict. I found that countries with higher environmental performance index scores are less prone to internal armed conflict. However, regime type and level economic globalization are also significant factors in predicting domestic armed conflict. I found that more democratic countries are more likely to face internal armed conflict, while countries with higher levels of economic globalization are less likely to face internal armed conflict.

This study demonstrates a correlation between environmental factors and civil war, but this research does not determine that environmental quality is necessarily a catalyst to whether or not conflict will take place. This study provides insight into the relationship between environmental conditions and conflict, but more research is needed in regards to this subject. Future research should pay more attention to the relationship between economic, political, and environmental factors.

More environmental data should be gathered to study the relationship between environmental factors and conflict. My study was limited to a timespan of ten years for which environmental index data was available. More research should be done to determine which environmental indicators are ultimately most closely associated with the incidence of civil war. The environmental performance index used in this study was able to provide a broad understanding that higher widespread environmental quality decreases

the occurrence of civil war, but the study fails to pinpoint direct causes of this relationship. Further research on each of the 22 indicators in the index would help determine which environmental factors are individually significant to incidence of armed conflict. This could help direct environmental policy if any of these factors stand out as more significant or influential than others. The study of individual factors would also help create a better environmental performance index that may be more specifically designed for only those countries that are at risk of civil conflict.

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Appendix

Table 1: Effects of Environmental Performance Index on the Annual Incidence of Internal Armed Conflict

Variable	Model 1
Environmental Performance Index	-0.054*** (0.009)
Real GDP	4.16e-09 (3.77e-08)
Polity	0.089*** (0.016)
Ethnic Fractionalization	0.632 (0.367)
Economic Globalization	-0.055*** (0.000)
N	495
Pseudo R ²	0.3464
Prob > chi2	0.000

*p<.05; **p<.01; ***p<.001