‘Good’ Governance and Reports of Ongoing Environmental Conflicts

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Abstract
Conflict is a feature of all pluralistic societies (Ury, 2024). Variation in needs and norms, priorities and prescriptions lead to divergent perspectives of what ought to be done (Rawls, 1999). At times conflict can be severe and, unfortunately, violent (Walter, 2022). Consequently, conflict theorists have been interested in how various economic, social, and environmental factors influence the prevalence of that phenomenon (Stares, 2017). One type of driver that has been of particular interest is how governments prevent, or cause, and remedy conflict. Indeed, it has been suggested that conflict transformation—from states of war to those of peace—is the primary raison d’être of government (Locke, 1690). As such, this study explores patterns between well-known governance indicators and newly created data on unresolved environmental conflicts reported within 144 countries from 2004 to 2014. Following exploratory analysis of conflicts documented in the Environmental Justice Atlas, models were tested that regressed national case counts against the Worldwide Governance Indicators and several relevant control variables. Regression analysis revealed that several of the governance variables had significant relationships with the conflict counts, including indices for political voice and accountability, rule of law, and control of corruption. These findings suggest that the frequency of ongoing environmental conflicts in the country years studied were significantly related to the perceived quality of ‘good’ governance in those country years.

Keywords: environmental conflict, control of corruption, rule of law, voice and accountability

Introduction

In early June 2022, reporters Dom Phillips and Bruno Araújo Pereira, advocates for indigenous people rights in Brazil, went missing in the Amazon (Nicas et al., 2022). What transpired over the following weeks included international outrage, a missing persons search, the identification of suspects—fishermen who were illegally harvesting from indigenous territories—and, ultimately, the discovery of human remains. The loss of two individuals who had dedicated their lives to the protection of the vulnerable is a tragic event; however, this incident can also be considered to be one example of thousands of cases of environmental conflict around the world (Scheidel et al., 2020, 2023; Temper et al., 2015, 2018).

Le Billon and Duffy (2018) define environmental conflicts as "contested incompatibilities between groups in relation to ecological systems" which are characterized by acts of "persuasion," "litigation," and "coercion" (2018). Indeed, this appears to be the situation with the Phillips and Pereira case: both men were most likely murdered due to their work in documenting illegal fishing and hunting in the Javari Valley (Nicas et al., 2022). While there are unique circumstances for individual conflicts, research on the "ecology of conflict" has gone beyond proximate causes to explore root causes tied to socio-political context and governance systems (Brondízio et al., 2009; McGinnis & Ostrom, 2014). This includes a relatively new body of work drawing on the Global Atlas of Environmental Justice (EJ Atlas), an international platform for documenting the occurrence of environmental conflicts, which included reports of over 4100 cases in 178 countries at the time of the present study.

As Temper et al. (2015) note, the EJ Atlas provides the basis for "a deeper systematic, evidence-based inquiry into the politics, power relations and socio-metabolic processes surrounding environmental justice struggles" including the "crucial processes and relations generating environmental inequalities at broader regional, national, and global scales." For example, Scheidel et al. (2020) investigated the importance of social movements in advancing crucial socio-ecological goals, finding that "the EJ Atlas documents … conflicts in a standardized manner" so that it can "foster systematic and comparative research on environmental conflicts." In a follow-up study, Scheidel et al. (2023) used EJ Atlas cases to evaluate the impact of development on indigenous persons, in which they sought to "build upon comparative and statistical approaches in political ecology" by revealing "environmental conflict characteristics in a more systematic way" (Scheidel et al., 2023).

This study seeks to further explore the political ecology of environmental conflicts catalogued in the EJ Atlas by asking: to what extent are governance indicators related with the number of unresolved environmental conflicts reported in a given country? Work by Fearon (Fearon, 2010a, 2010b), for example, Click or tap here to enter text.evaluated the relationship between Worldwide Governance Indicators (WGIs) on the occurrence of civil wars, finding that "the quality of a country's governance was significantly more important than improving its economy." Specifically, countries which experienced a decline in the "Rule of Law," "Voice and Accountability," and "Government Effectiveness" were at "a significantly greater risk of civil war outbreak in subsequent years" even when controlling for the country's income level. Similarly, Hegre and Nygård (2015) found countries were less likely to experience renewed hostilities after an earlier conflict when 'good' governance was in effect, measured by WGI variables such as "Bureaucratic Quality," "Rule of Law," "Corruption," "Economic Policies," "Military in Politics," and "Political Exclusion and Repression." Other conflict theorists have also suggested connections between low quality governance, environmental degradation, and conflict (Rus, 2012, 2014; Stares, 2017). However the EJ Atlas data provides an opportunity to expand upon previous studies

by considering how a wider set of governance indicators might relate to the number of unresolved environmental conflicts reported across a large sample of country-years when also controlling for multiple other social and environmental factors.

What follows is a brief discussion of the data contained within the EJ Atlas, and how these data were used to analyze the impact of good governance norms on environmental conflicts. The results from a quantitative content analysis of the Atlas' case sheets are included, and this is followed by a description of the experimental and control, predictor variables included in this study, their hypothesized relationships to the dependent, outcome variable, and their descriptive statistics. Additional methodological considerations follow, including model construction choices, and the findings come after. The paper concludes with discussion of the relevance of the findings to refining an ecology of environmental conflict and proposals for future research.

Modeling Environmental Conflict Ecology

The Global Atlas of Environmental Justice

The EJ Atlas provides a standardized reporting process and case sheets for individual environmental conflicts from more than 178 countries. Environmental conflict case data for the Atlas is obtained collaboratively through a crowdsource collection procedure which ensures that cases that are reported to the Atlas' editors are only included in the Atlas when they can be verified through previously published reports, papers, articles, legal or regulatory proceedings, or other credible secondary sources (Scheidel et al., 2020, 2023). Temper et al. (2018) describe the EJ Atlas similarly as a "large, purposive, expert-elicited sample of recent, visible, previously reported … conflicts from around the world." While the EJ Atlas is not a global census or random sample of environmental conflicts, it has been found that country groups, when stratified by their World Bank estimated income level, have similar levels of conflicts reports (Scheidel et al., 2020). These Atlas characteristics are important because there is increased support for the use of modeling techniques on purposive samples, particularly when examining count data, and when certain sample characteristics are met such as sample size (Redondo, 2016; Van Hoeven et al., 2015). Conceptually, EJ Atlas users have also argued compellingly that the global population of many socio-ecological phenomena will always be imperfectly known and so data sources like the EJ Atlas may be the only means through which broader, comparative analysis of the phenomena can occur (Scheidel et al., 2023).

For this study, case sheets were analyzed from this public database from countries with accompanying experimental and control variable data. Each documented case provided the year in which the conflict began, the year of any resolution, and the year of the most recent update. Unresolved conflicts at the time of analysis were coded as 'on-going.' If a start or end date of a conflict was contradicted by other case sheet information—such as, when active protests have ceased but environmental justice is explicitly stated to remain unobtained—then the dates recorded reflected the earliest or latest verifiable start or end date. If only a portion of a conflict took place during the studied period—2002 to 2014, which was selected to maximize data availability—then only the years within the 2002-2014 period were included in analysis. Any conflict which was reported to have occurred entirely outside the range of dates evaluated was excluded from analysis. Cases with unverifiable start or stop dates were also excluded. Finally, any country-years without reported conflicts were recorded as zero.

Case report data contained within the Atlas for the 144 countries selected for analysis was consulted. 3698 independent case reports were found to be accessible for those countries; however, 154 of those cases were found to have unclear start or stop dates. Ultimately, 3544 cases from the

countries analyzed were deemed to have sufficient temporal data to estimate when they took place and were included within this study. Resulting data is summarized in Table 1. Of the cases analyzed, 1134 were found to be ongoing in 2004. This was a net increase of 71 ongoing cases from the previous year (2003). The number of total ongoing conflicts increased each year by an average of about 143 cases through the sampled time period (2004 to 2014), with the smallest increase in unresolved conflicts occurring between 2013 to 2014 (95) and the largest increase between 2009 to 2010 (189). There were reports of an estimated 2566 unresolved environmental conflicts by 2014.

Table 1. Summary Findings of Document Analysis of EJ Atlas Case Sheets

	Study Years										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total Ongoing Case Reports	1134	1238	1361	1515	1640	1791	1980	2166	2338	2471	2566
Change from prev. period	71	104	123	154	125	151	189	186	172	133	95
Mean	8	9	9	11	11	12	14	15	16	17	18
Std. Dev.	16	17	18	20	22	24	27	29	31	33	34
Min.	0	0	0	0	0	0	0	0	0	0	0
Max.	98	108	125	148	163	190	218	234	244	257	266

Note. Mean and standard deviation values are rounded up to the nearest whole conflict. Countries included in analysis are: Albania, Algeria, Angola, Argentina, Armenia, Austria, Bahamas, Bahrain, Bangladesh, Barbados, Belgium, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Comoros, Democratic Republic of the Congo, Republic of Congo, Costa Rica, Côte d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Arab Republic of Egypt, El Salvador, Equatorial Guinea, Estonia, Ethiopia, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Republic of Korea, Kuwait, Kyrgyz Republic, Lao PDR, Latvia, Lebanon, Lesotho, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Mauritania, Mauritius, Mexico, Morocco, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russian Federation, Samoa, Saudi Arabia, Senegal, Sierra Leone, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Suriname, Sweden, Switzerland, Tajikistan, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Türkiye, Turkmenistan, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Uzbekistan, Vietnam, Zambia, Zimbabwe.

The average number of reports of unresolved environmental conflicts rose from about 8 ongoing conflicts/country in 2004 to 18 conflicts/country in 2014. Several countries experienced years with no reported environmental conflicts during the evaluated period, but only the Bahamas, Barbados, Burundi, Cabo Verde, Central African Republic, Comoros, Côte d'Ivoire, Estonia, Fiji, Grenada, Luxembourg, Mauritius, Oman, Samoa, Singapore, and Turkmenistan had no environmental conflicts reported as on-going in each year analyzed. Conversely, India had the largest number of reports of ongoing environmental conflicts per year (see Table 1 above for Max. values). Additionally, a frequency analysis of the national case counts was conducted, and it revealed that the mean case frequency by county/year was about 13 conflicts, but that the standard deviation of the variable was about 26 conflicts. Further, 53% of the country years analyzed had between 0 and 4 reports of environmental conflicts that were ongoing. The dependent variable,

reports of ongoing environmental conflicts, thus exhibits a right-skewed, non-normal distribution. Additional statistics produced by the method of analysis—the dispersion parameter estimates—confirmed this understanding and are highlighted in the findings section.

Worldwide Governance Indicators and Control Variables

Following previous analysis of the WGIs in relation to "civil conflict incidence" (Rus, 2012), "civil war onset" (Fearon, 2010a, 2010b), and "conflict recurrence" (Hegre & Nygård, 2015), data was assembled for each country from 2002 to 2014. The WGIs include six indicators compiled by researchers for more than 200 countries that attempt to quantify the "traditions and institutions by which authority in a country is exercised" (Kaufmann & Kraay, n.d.). Indicators are formed from "several hundred variables obtained from 31 different data sources, capturing governance perceptions as reported by survey respondents, non-governmental organizations, commercial business information providers, and public sector organizations" (Kaufmann et al., 2010). Higher values are indicative of greater variable performance, varying from a minimum of -3.18 (Political Stability, Iraq, 2004) to a maximum of 2.47 (Governmental Effectiveness, Singapore, 2008).

Table 2 summarizes the six variables defined by Kaufmman and Kraay, as well as the relationships between the WGIs and the number of reports of ongoing environmental conflicts hypothesized by this study. The Voice and Accountability (VA) variable was hypothesized to be positively correlated with reports of ongoing environmental conflicts because the perception of higher levels of free speech, free assembly, and free press in a country is likely to encourage more frequent use of those freedoms by its residents (Hossain et al., 2018). Put differently countries with low VA scores are more likely to repress the kinds of civic expression that would be documented by the EJ Atlas, which would depress conflict counts in those countries (Dimitrov, 2023). This hypothesized relationship differs, somewhat, from the relationship identified by Fearon (2010a, 2010b) and Yiew et al. (2016), and this is due to the view that civil conflicts—protests as opposed to wars—might be enabled, rather than prevented, by a more open society. Further, it seems reasonable to suggest that there may be a difference in the effect of a decline in VA, a negative change (Fearon, 2010a), and that of lower levels of VA generally, which is what this study measures. Political Stability (PS) was hypothesized to be negatively correlated with reported environmental conflicts: less civil strife, generally; less environmental strife, specifically (Fearon, 2010a; Yiew et al., 2016).

Governmental Effectiveness (GE) was hypothesized to be negatively correlated with environmental conflicts because countries with an independent civil service that can successfully design and implement governance choices were viewed to be more likely to be able to address the root causes of environmental conflicts, such as pollution (Fearon, 2010a, 2010b; Walter, 2022; Yiew et al., 2016). The Regulatory Quality (RQ) variable was hypothesized to be positively correlated with conflicts due to the potential for economic development to inadvertently encourage unsustainable or socially irresponsible projects. This differs from Hegre & Nygård's identified relationship between bureaucratic quality and conflict (2015), as well as Yiew et al.'s (2016); however, similarly to the VA variable, a different relationship was hypothesized due to differences the respective outcome variables of interest. Unsustainable economic development is regularly cited as a driver of environmental conflicts in that body of literature (Bassett, 1988; Collier, 2004; Collier & Rohner, 2008; Ray & Esteban, 2017).

The Rule of Law (RL) variable was hypothesized to be negatively correlated with environmental conflicts because prolonged civil disagreements were viewed to be less likely in

countries with greater public respect for laws and regulations, with effective venues for legal remedy, and with sufficient enforcement mechanisms to ensure compliance (Fearon, 2010a, 2010b; Hegre & Nygård, 2015; Yiew et al., 2016). Finally, Control of Corruption (CC) was hypothesized to be negatively correlated with environmental conflicts in countries where governance choices are perceived to benefit the general public rather than the private interests of those with economic, political, or social power (Hegre & Nygård, 2015; Rus, 2012, 2014; Walter, 2022; Yiew et al., 2016).

Table 2. World Governance Indicators and Hypothesized Correlation with Conflict Report Counts

Worldwide Governance Indicators (WGIs)	Description by Kaufman and Kraay	H_a
Voice and Accountability (VA)	Extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	Positive
Political Stability (PS)	Likelihood of political instability and/or politically motivated violence, including terrorism.	Negative
Government Effectiveness (GE)	Quality of public services, civil service and the degree of its independence from political pressures, policy formulation and implementation, and the credibility of the government's commitment to such policies.	Negative
Regulatory Quality (RQ)	Ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	Positive
Rule of Law (RL)	Extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	Negative
Control of Corruption (CC)	Extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests.	Negative

To control for economic, social, and environmental characteristics of each country that might contribute to the 'cone of plausibility' for environmental conflicts (Stares, 2017), panel data for several control variables was sought out. Table 3 provides a summary description, including variable name, and units (The World Bank, 2023). Due to this study's focus on the impact on governance on conflict, a more exploratory approach is taken with regard to the effects of the control variables and their hypothesized influence on reported environmental conflict cases. As such, findings regarding these variables are documented within a table in the appendix (Table 8) and are briefly discussed in the concluding thoughts section of this paper. The natural log of several control variables was utilized, as opposed to their untransformed state, as is common when addressing variables with large numbers, substantial variation, and the potential for outliers.

Table 3. Control Variables and Hypothesized Correlation with Conflict Report Counts

Control Variable	Variable Description	H_a
Real GDP adjusted by Purchasing Power Parity_LN (GDP, PPP_LN)	The natural log of the current purchasing power of a country's gross domestic product in international dollars.	Positive
Life Expectancy (LE)	The average age of mortality for persons living in a particular country.	Negative
Population_LN (Pop_LN)	The natural log of the total number of people estimated to be living within a particular country. Data for analysis was sourced from the World Bank's 'Open Data, by Indicator' database.	Positive
Land Area _LN (LA_LN))	The natural log of a country's land area in square kilometers. Data for analysis was sourced from the World Bank's 'Open Data, by Indicator' database.	Positive
Natural Log of Carbon Dioxide Equivalent _LN (CO_2.E_LN)	The natural log of the total amount of greenhouse gasses produced within a country converted into the equivalent number of tons of CO_2 required to produce the same amount of warming. Data for analysis was sourced from the World Bank's 'Open Data, by Indicator' database.	Positive

Note. All variables sourced from the World Bank 'Indicators' database.

One control variable selected, life expectancy, was included to explore the relationship between relative human welfare and conflict (Yazdi Feyzabadi et al., 2015). Country-level income was included due to previous consideration of income by EJ Atlas analysts (Scheidel et al., 2020) as well as the consideration of income-based contexts by other conflict scholars (Fearon, 2010a; Hegre & Nygård, 2015; Ray & Esteban, 2017; Rus, 2012) when assessing conflict contexts. Country population estimates (Fearon, 2010a; Hegre & Nygård, 2015; Ray & Esteban, 2017; Rus, 2012; Yiew et al., 2016), land area (Arbatlı et al., 2015), and greenhouse gas emissions (Carman et al., 2024; Temper et al., 2020), were included to operationalize and control for the impact of a country's scale—how populus, how large, and how polluting—on count data with variables that have also been considered by conflict scholars to influence conflict. Descriptive statistics for all of the model variables, as is customary, can be viewed in Table 4 below.

Table 4. Independent and Control Variable Descriptive Statistics

	N	Min	Max	Mean	σ
Voice and Accountability$_{t-0}$	1584	-2.259	1.801	-.015	.963
Voice and Accountability$_{t-1}$	1584	-2.250	1.801	-.015	.965
Voice and Accountability$_{t-2}$	1584	-2.250	1.801	-.013	.965
Political Stability and Absence of Violence$_{t-0}$	1584	-3.180	1.620	-.103	.932
Political Stability and Absence of Violence$_{t-1}$	1584	-3.180	1.687	-.103	.940
Political Stability and Absence of Violence$_{t-2}$	1584	-3.180	1.753	-.092	.947
Governmental Effectiveness$_{t-0}$	1584	-2.083	2.470	.036	.988
Governmental Effectiveness$_{t-1}$	1584	-1.809	2.470	.034	.989
Governmental Effectiveness$_{t-2}$	1584	-1.962	2.470	.034	.990
Regulatory Quality$_{t-0}$	1584	-2.348	2.226	.065	.942
Regulatory Quality$_{t-1}$	1584	-2.349	1.964	.065	.940
Regulatory Quality$_{t-2}$	1584	-2.349	1.964	.063	.944
Rule of Law$_{t-0}$	1584	-1.870	2.125	-.024	.996
Rule of Law$_{t-1}$	1584	-1.870	1.995	-.029	.998
Rule of Law$_{t-2}$	1584	-1.870	1.995	-.029	.999
Control of Corruption$_{t-0}$	1584	-1.673	2.459	-.025	1.031
Control of Corruption$_{t-1}$	1584	-1.673	2.459	-.021	1.032
Control of Corruption$_{t-2}$	1584	-1.673	2.459	-.019	1.032
GDP, PPP (Current, International Dollars, ln)	1584	20.428	30.496	25.226	1.960
Life Expectancy (years)	1584	42.914	83.588	69.982	9.170
Population (ln)	1584	11.603	21.039	16.069	1.728
Land Area (hectares, ln)	1584	5.704	16.612	11.847	2.141
Total Green House Gas Emissions (CO_2 Equivalent, ln)	1584	12.689	23.203	17.571	1.862

Note. Values for variable descriptive statistics have been rounded up to the nearest thousandth place.

Model Development

The Generalized Linear Model (GLM) tool in SPSS was used for regression analysis. We utilized the negative binomial regression, as opposed to ordinary least squares or Poisson regression, because the dependent variable is a count and, as revealed by the frequency analysis, the variable's variance is significantly larger than its mean (Green, 2021; Laerd Statistics, n.d.; UCLA: Statistical Consulting Group, n.d.; Wheeler, n.d.). The appropriateness of this choice was verified by the dispersion parameter estimate produced by the analysis, and it is discussed in the findings section (UCLA Office of Advanced Research Computing, n.d.). A similar approach has been used by other modelers of EJ Atlas count data (Le Billon & Lujala, 2020). The modeling approach features a negative binomial distribution, a log link function, and a model parameter value which is model-estimated—rather than pre-specified—to address potential over/under-dispersion of the outcome variable (IBM, 2021). Additionally, a robust estimator was utilized to address any remaining heteroskedasticity-based model fit issues (Carroll et al., 1998; Liu et al., 2019; Olvera Astivia & Zumbo, 2019; Zeileis, 2006). Finally, a bootstrapping procedure was used to construct additional confidence intervals for each parameter. This was done was as a way to evaluate the veracity of the relationships identified by the base model against models constructed with different samples of the data (Campbell, 2008; Carroll et al., 1998; Fan, 2003; Olvera Astivia & Zumbo, 2019; Puth et al., 2015; Tamborrino M, 2015). The Mersenne Twister was set at 2000000, for replicability, and 5000 bootstrap samples were computed and subsequently regressed (Puth et al., 2015). Noting that there is some disagreement in the literature regarding standard error calculation preferences when bootstrapping regression models, both the 'percentile' and 'bias-corrected, accelerated' (BCa) confidence intervals were calculated and reported in the findings (Cheung et al., 2023; Jung et al., 2019; Puth et al., 2015).

Three model specifications were explored, including: (1) an intra-year model (a separate negative binomial regression for the count of ongoing conflicts within each year of the study); (2) a pooled model with all country-years and a one-year lag of the WGI variables; and (3) a pooled model with a two-year lag. All models controlled for the basket of economic, social, and environmental considerations, described above in Table 3. Model goodness of fit was evaluated by the Pearson goodness-of-fit (χ^2) and deviance goodness-of-fit (d) scores, with values of χ^2/df and d/df closer to 1 (i.e., a lack of significance) indicating better fit (Green, 2021). Model dispersion parameter estimates are also reported to evaluate over/under dispersion issues. A 95% confidence level was selected for all statistical tests, with a single tailed, <0.05 p-value threshold used to test the model parameter coefficients' estimates for significance. The regression coefficients for the associations between predictors and the outcome (count of conflict reports) for all models are exponentiated and reported as incident rate ratios, which can be interpreted as the percent change in reported environmental conflicts for a 1-unit increase in the predictor variable.

Model Results

All three models were found to be significantly better at predicting the outcome variable than the null model, as reported by the Omnibus Test for the respective GLMs ($p<0.001$). They also were reasonably 'good fits' for the data. The intra-year model exhibited both χ^2/df and d/df close to 1 (χ^2/df=1.054, d/df =1.069) as did the pooled model with a one-year lag applied to WGI variables (χ^2/df =1.057, d/df =1.071) and the model with a two-year lag (χ^2/df =1.057, d/df =1.071). See Tables 6 and 7 in the appendix for these and other model fit statistics. The negative binomial dispersion coefficients produced by the regression analysis are .460 (95% CI, .415 to .509), .460 (95% CI, .416 to .509), and .461 (95% CI, .416 to .510) for Models 1, 2, and 3, respectively. These 'dispersion parameter estimates' reveal that the dependent variable, as is frequently the case with count variables, is over-dispersed, and that, consequently, the negative binomial model selection was the superior to the Poisson model for this study (UCLA Office of Advanced Research Computing, n.d.).

A table of the estimated effects of the WGI variables on reported environmental conflicts, Table 5, follows this paragraph. A similar table was included for the parameter effects of the control variable types included in the model; however, as they were not the main focus of this study, their findings are more exploratory and are discussed in the concluding section (see Table 8 in the Appendix). A brief description of the findings for the governance variables follows and it includes a description of the identified variable effect, the significance of the effect, and its 95% confidence interval (CI), as well as comparable information produced by the bootstrapping procedure.

Table 5. The WGIs and Counts of Reports of Ongoing Environmental Conflicts

	Study Models		
	Model 1 $WGIs_{t-0}$ Panel	Model 2 $WGIs_{t-1}$ Panel	Model 3 $WGIs_{t-2}$ Panel
Voice and Accountability	115.6%, <0.001*** (95.9% to 137.4%)	114.9%, <0.001*** (95.3% to 136.4%)	113.6%, <0.001*** (94.2% to 134.9%)
Stability and Lack of Violence	1.3%, 0.383 (-6.9% to 10.2%)	-1.7%, 0.341 (-9.5% to 6.8%)	-4.6%, 0.129 (-12.1% to 3.5%)
Governmental Effectiveness	11.8%, 0.130 (-7.9% to 35.7%)	12.2%, 0.122 (-7.5% to 36.0%)	12.7%, 0.110 (-6.9% to 36.3%)
Regulatory Quality	-2.5%, 0.381 (-17.5% to 15.1%)	-2.1%, 0.406 (-17.4% to 16.2%)	-1.9%, 0.415 (-17.4% to 16.6%)
Rule of Law	-54.9%, <0.001*** (-45.1% to -62.9%)	-54.8.%, <0.001*** (-45.1% to -62.7%)	-53.1%, <0.001*** (-43.2% to -61.3%)
Control of Corruption	-17.4%, 0.011* (-2.9% to -29.7%)	-15.9%, 0.018* (-1.2% to -28.4%)	-16.6%, 0.012* (-2.3% to -28.8%)

Note. Results are reported as the percent increase or decrease in reported environmental conflicts due to a one unit increase in the predictor variable value above the mean. 95% Confidence Intervals are also provided and are the values in parentheses. P-values are divided by two for the one-tail significance test. P-value <.05, '*'; p-value <.01, '**'; p-value<.001, '***'.

Voice and Accountability (VA) was found to be correlated with the counts of environmental conflicts reported to be ongoing in the country years evaluated. In each of the three models constructed, the significance of the effect of VA on the outcome variable was measured at a p-value of <0.001. In the intra-year model, a one unit increase in VA above the variable mean (about -0.015) was associated with 115.6% (95% CI, 95.9% to 137.4%) more reported environmental conflicts per year in a country. The bootstrapped VA parameter estimates were also significant (p-value <.001). The percentile and BCa 95% confidence intervals were found to be 96.0% to 138.0% and 95.6% to 138.5%, respectively. A similar relationship was demonstrated in the one-year lag model. A one unit increase in VA above the variable mean (about -0.015) was associated with 114.9% (95% CI, 95.3% to 136.4%) more reported environmental conflicts per year. As with the previous model, the relationships between the one-year lagged VA parameter and the dependent variable in the bootstrapped models were also significant (p-value <.001). The confidence intervals, 95%, for the percentile and BCa estimates were 95.6% to 136.1% and 95.0% to 137.3%. In the third, two-year lag model, a one unit increase in VA above the variable mean (about -0.013) was associated with 113.6% (95% CI, 94.2% to 134.9%) more environmental conflicts reported to be ongoing per country year. Bootstrapped relationships for VA were also significant in the two-year lag model (p-value of <0.001). The parameter confidence intervals from the percentile estimates ranged from 94.5% to 135.1% and the BCa estimates ranged from 94.1% to 135.6%. Consequently, we deemed it reasonable to reject the H_0 that there was not a significant, positive relationship between the Voice and Accountability variable and the counts of environmental conflicts reported to be ongoing.

Rule of law (RL) was found to be negatively correlated with the counts of ongoing environmental conflicts reported in the country years evaluated. In each of the three models constructed, the significance of the effect of RL on the outcome variable was measured at a p-value of <0.001. In the intra-year model, a one unit increase in RL above the variable mean (about -0.024) was associated with 54.9% (95% CI, 45.1% to 62.9%) fewer ongoing environmental

conflict reports per year in a country. The bootstrapped RL parameter estimates were also significant (p-value <.001). The percentile and BCa 95% confidence intervals were found to be -45.3% to -63.1% and -45.5% to -63.0%, respectively. A similar relationship was demonstrated in the one-year lag model. A one unit increase in RL above the variable mean (about -0.029) was associated with 54.8%, (95% CI, 45.1% to 62.7%) fewer reported environmental conflicts per year. Similarly, the relationships between the one-year lagged RL parameter and the dependent variable in the bootstrapped models were also significant (p-value <.001). The confidence interval estimates for the percentile and BCa bootstraps of the RL were -44.9% to -62.8% and -45.3% to -62.6%. In the third, two-year lag model a one unit increase in RL above the variable mean (about -0.029) was associated with 53.1% (95% CI, 43.2% to 61.3%) fewer reported environmental conflicts per year. The bootstrapped relationships for the RL variable were also significant in the two-year lag model (p-value of <0.001). The parameter confidence intervals from the percentile estimates ranged from -43.1 to -61.4% and the BCa estimates ranged from -43.3% to -61.2%. As such, we rejected the H_0 that there was not a significant, negative relationship between the Rule of Law variable and the counts of environmental conflicts reported to be ongoing.

Control of corruption (CC) was found to be negatively correlated with the reported counts of unresolved environmental conflicts in the country years evaluated. In all three of the models created, the effect of CC on the outcome variable was significant at $p<0.05$ (.011, .018, .012, respectively). In the intra-year model, a one unit increase in CC above the variable mean (about -0.025) was associated with 17.4% (95% CI, 2.9% to 29.7%) fewer reported environmental conflicts per year in a country. The bootstrapped CC parameter estimates were also significant (p-value = .012). The percentile and BCa 95% confidence intervals were found to be -2.9% to -30.0% and -3.3% to -29.7%, respectively. A similar relationship was demonstrated in the one-year lag model. A one unit increase in CC above the variable mean (about -0.021) was associated with 15.9% (95% CI, 1.2% to 28.4%) fewer reported environmental conflicts per year. Likewise, the relationships between the one-year lagged CC parameter and the dependent variable in the bootstrapped models were also significant (p-value = .022). The confidence interval estimates for the percentile and BCa bootstraps of the CC were -1.0% to -29.0% and, again, about -1.0% to -29.0%. In the third, two-year lag model a one unit increase in CC above the variable mean (about -0.019) was associated with 16.6% (95% CI, 2.3% to 28.8%) fewer reported environmental conflicts per year. The bootstrapped relationships for the CC variable were also significant in the two-year lag model (p-value = .014). The parameter confidence intervals from the percentile estimates ranged from -2.0% to -29.3% and the BCa estimates ranged from -2.4% to -28.9%. We elected, therefore, to reject the H_0 that there was not a significant, negative relationship between the Control of Corruption variable and the counts of environmental conflicts reported to be ongoing.

Unlike the previously addressed variables, the political stability and absence of violence (PSAV), governmental effectiveness (GE), and regulatory quality (RQ) variables were not demonstrated to have significant relationships to with the counts of ongoing environmental conflicts reported in the country years analyzed for this study. All three of these predictor variables' effects on the outcome variable, in all three models created, were significant at $p>0.05$. The inability to reject these three variables' H_0 was confirmed by the bootstrapping procedure: all three had p-values above the .05 significance threshold and confidence interval ranges that include zero.

Discussion

Voice and Accountability – Illuminating Injustice

Due to the nature of the voice and accountability variable—that it is intended to indicate the degree to which the norms of "freedom of expression, freedom of association, and a free media" are reflected within a country—it seems intuitive that higher values for the VA variable were found to be correlated with more reported environmental conflicts in the countries studied (Kaufmann & Kraay, n.d.). Upon consideration, this finding seems to suggest that governance conditions that are more tolerant of civic expression may encourage more frequent reports of environment-oriented civic expression. Conversely, governance conditions which impede civic expression—chosen, perhaps, due to a concern that "opposition" will inevitably "serve as a catalyst for political destabilization"—are likely to limit public acts of contestation of environmental disagreements as well as the documentation of those acts of contestation (Dimitrov, 2023).

A crucial understanding which informs the interpretation of this finding is that conflict, in addition to being an outcome, is also considered by many political ecologists to be an important process. Some have argued that environmental conflicts can have "transformative and emancipatory effects" by challenging and undermining "structural and cultural forms of violence" (Peet & Watts, 2004). Other political ecologists have described environmental conflicts as a "symptom of injustice and uneven power relations" and argue that they represent an opportunity for the liberation of "marginalized and oppressed populations and their ecosystems" (Le Billon & Duffy, 2018). That environmental conflicts can be viewed as articulations of opposition to real and perceived 'environmental incompatibilities' does seem to suggest that these conflicts can present "constructive potential, rather than a universally destructive one." As such, though higher levels of voice and accountability may be correlated with more unresolved environmental conflicts being reported in a given country year, this pattern should be tolerated so that conflicts can be revealed, and then, through conflict management strategies, pathways for their constructive resolution can be identified and pursued (Kriesberg & Dayton, 2017).

Additionally, it is necessary to highlight the instrumental role of activists, journalists, and mobilized community members in contesting environmental disagreements. They are the human side of conflict reports. That reported environmental conflicts were demonstrated to be more frequent in places with more open expression, speech, and media environments is additional evidence in support of previously articulated findings regarding the role of protesters, advocates, and journalists in socio-ecological movements (Escobar, 2008; Peet & Watts, 2004; Scheidel et al., 2020). These individuals' hardships and successes should be recognized and remembered. Just as importantly, the causes of their grievances should be understood so that they can be resolved.

Rule of Law – Of, Not By, Environmental Laws

Legal scholars have praised the rule of law, stating that there "appears to be widespread agreement, traversing all fault lines, on one point, and one point alone: that the 'rule of law' is good for everyone" (Tamanaha, 2004). They have also critiqued preferences for legalism by suggesting, as Li Shuguang has, that "the law can serve as a mere tool for a government that suppresses in a legalistic fashion" (Mufson, 1995). The rule of law has been described as both a "star in a constellation of ideals that dominate our political morality" (Waldron, 2011) and has also had the cautionary wisdom "too much, even of a good thing, is bad for you" applied to its exercise (Marmor, 2004). Rule of law was also revealed to have a significant, negative relationship between its expression as a WGI and the number of unresolved environmental conflicts reported in a country year. Due to its relevance and the theoretical ambivalence, it seems reasonable to suggest

additional investigation into its relationship with environmental conflicts. Several interesting, substantive legal proposals for consideration already exist, however, and are worth highlighting here.

For example, the dissent offered by US Supreme Court Justice Douglas in the case Sierra v. Morton, the rights of nature contained within in Ecuador's national constitution, and Bolivia's Law of Mother Earth are all interesting legal conventions that explicitly promote the prevention and reconciliation of environmental conflicts by awarding nature, indirect, legal standing (Boyd, 2018; Mariqueo-Russell, 2017). Further, the explicit prohibition of acts of aggression against nature during armed conflict that was included in the 1977 update to the Geneva Conventions, to which hundreds of countries are parties or signatories, is also deserving of further review (Gasser, 1995; Office of the High Commissioner on Human Rights, 2023). The articulation of the duty of nation-states to protect nature contained within the 'Protocol Additional' should be reviewed, and an extension its protections to other governance sectors considered. Even traditional environmental laws such as the US National Environmental Policy Act, Endangered Species Act, Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, and comparable laws in other countries should be considered to be a part of the legal mesh which constitutes the environmental rule of law (Brinkley, 2022). While these laws are not without criticism, with some suggesting that they have mixed success and that they are too anthropocentric, their enforcement and reform could yield tangible environmental quality improvements (Kotzé & French, 2018). As long as their use does not grow to constitute a form of eco-legalistic autocracy, these environmental laws and others can be helpful for formally designating which interactions with environment are and are not acceptable conduct within a particular society in a non-abusive way (Scheppele, 2018).

Finally, it is worth noting the compliment of statutes and regulations contained within the concept of rule of law—effective and consistent enforcement (Bedner, 2010). Bingham (2011) wrote of the need for enforcement in his book *The Rule of Law* very succinctly: "laws publicly made" should be "publicly administered in the courts" (2011). There must be a venue and process, according to Bingham, for resolving "disputes which the parties [to the dispute] themselves are unable to resolve." Extending this logic, to advance environmental rule of law will require sufficient venues and processes for resolving environmental disputes. While the UK's court-based model was Bingham's preference for resolving conflicts by enforcing compliance with "publicly made law," it would be wrong to assume that similar, place-based alternatives to courts do not or could not exist which could accomplish the same function (Charpleix, 2018; Segall, 2006; Sternlight, 2014). If these local bodies are able to make decisions that are "binding on the parties and enforceable by the process" that meet "minimum standards of fairness" and that are "equally enforced and independent" from inappropriate influence, then these alternative venues and processes could assist in environmental conflict resolution while also contributing to the rule of law (Bingham, 2011).

Control of Corruption – Power, Capture, and Conflict

As noted in previous sections, control of corruption has frequently been considered by conflict theorists as a potential driver of conflict (Fearon, 2010b; Hegre & Nygård, 2015; Rus, 2014). Further, the perception that public entities are making public decisions for their own profit or that they have become captured by economic elites has received ample public condemnation. Writing in the forward of the United Nations Convention Against Corruption (UNCAC), former Secretary General of the UN Kofi Annan described corruption as an "insidious plague" with a "wide range of corrosive effects on societies" (United Nations Office on Drugs and Crime, 2004).

Current Secretary General of the UN António Guterres, reflecting on a 2018 release of a World Economic Forum (WEF) report on the costs of corruption, articulated similar views. Speaking fifteen years after the adoption of the UNCAC, Secretary General Guterres argued that corruption "rots institutions," "deprives people of their rights," "despoils the environment," and is "often at the root of political dysfunction and social disunity" (Office of the Secretary General of the UN, 2018). Yet, in spite of progress made toward implementing the UNCAC, the scale and impact of corrupt acts, globally, is still large. In the same speech, Secretary General Guterres notes that "corruption is present in all countries, rich and poor, North and South, developed and developing" and that, corrupt acts likely cost global society about $2.6 trillion (US)—every year.

While there is wide support for control of corruption, others have articulated a more nuanced understanding. Perhaps one of the starkest arguments offered in favor of a corrupt act was articulated by Rose-Ackerman (1978) *Corruption: A study in political economy*. A notable anti-corruption scholar, she notes that there are circumstances in which "an individual, unable to affect overall government policy, may in some situations, pay a bribe without moral opprobrium". She invokes the experience of victims of the Shoah, stating that "one does not condemn a Jew[-ish person] for bribing his way out of a concentration camp". For genuinely repressed individuals or communities, 'corrupt' behavior such as this has the grand outcome of subverting that oppression and the functional outcome of increasing the likelihood of survival. For non-oppressed peoples who possess agency, however, this argument does not hold.

Others have adopted what could be viewed as a more relativist understanding of corruption, arguing that overly universalized or moralistic interpretations of corruption suffer from a lack of "historical and cultural contextualization" and suggest that while "corruption has in itself a corrosive effect on economies and rule-based institutions," its expression may be "part of the fabric of social and political relationships" that provide organization and order to a particular society (Johnston, 1986; Le Billon, 2003). Similar sentiments have been offered by Larmour (2008) in *Corruption and the Concept of Culture: Evidence from the Pacific Islands*, in which he notes that "ideas about culture still seem useful in understanding how people recognize and respond to what is judged to be corrupt behavior." This suggests that there is a need for an expanded understanding of what constitutes corruption, one which adopts a more pluralistic, place-based perspective. Such a conception would center the important system contexts that shape what is and is not perceived as corrupt behavior in a specific locale while also identifying common pathologies for particular types of institutions. Johnston's (1986) typology of corruption, which delineates between "criminal" versus "legitimate" corruption is one early attempt at crafting such a perspective.

Political Stability, Governmental Effectiveness, and Regulatory Quality—A Role to Play?

It seems intuitive that crucial governance contexts like political stability and absence of violence, governmental effectiveness and regulatory quality should be connected to reported environmental conflict counts. All three of these governance norm types—the 'how' of political organization—appear to address important governmental functions and serve important public needs. As such, these variables should not be dismissed as irrelevant to environmental conflict ecology; however, their relevance cannot be confirmed by this study. Perhaps future research, suggestions for which are included in the final, concluding section, can shed new light on these important but less understood governance contexts.

Concluding Remarks

The goal of this project was to identify potential relationships between several established governance contexts as measured by the Worldwide Governance Indicators and newly created counts of unresolved environmental conflicts that were reported within a group of 145 countries between 2004 and 2014. Three of the WGI contexts demonstrated significant relationships to these case counts in all three estimated models, including voice and accountability, rule of law, and control of corruption. Consequently, it seems reasonable to conclude that these contexts should be considered when developing an ecology of environmental conflict. Specifically, the 'openness of civil society and the tolerance of dissent,' the 'presence and perceived legitimacy of rules and a dispute resolution process,' and 'the extent to which public actions are inappropriately influenced by those with power' within a country are likely to be important governance contexts to consider when developing understanding about a specific environmental conflict or about environmental conflicts generally within that country.

Future research should be conducted into the influence of governance on environmental conflicts to replicate or compliment the findings of this study. Similar research could be expanded to include a more inclusive group of countries, a longer time period, and the effects of sub-national governance contexts on conflicts. Further analysis of the EJ Atlas case sheets could also identify specific, qualitative references to WGI variables or similar governance contexts on the documented conflicts. These strategies could replicate and expand the research into the identified governance effects on reported conflicts, which could assist in confirming their validity (Hubbard et al., 2019). This is important analysis to conduct: the identification of governance processes that can impact environmental conflicts in countries could yield insights into opportunities for substantively improving the lived experience of many adversely affected humans and non-humans globally by providing pathways for Just conflict prevention, transformation, or resolution.

Additionally, future research that specifically focuses on the relationships between the model control variables and reported environmental conflicts would also likely be fruitful (see Table 8. Though not the main focus of this study, these controls represent important socio-ecological characteristics of the countries that they represent and could, if altered, have potentially significant effects on reported environmental conflict prevalence. Furthermore, the expansion of the socio-ecological contexts considered, beyond those included in this study, to include additional contexts would also be welcome when possible because their inclusion would provide a more holistic picture of the drivers of environmental conflicts.

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Appendix

Table 6. Goodness of Fit Test Results for Study Models

Model Fit Indices	Model 1 WGI Intra-year Panel			Model 2 WGI One-Year Lag			Model 3 WGI Two-Year Lag		
	Value	df	Value/ df	Value	df	Value/ df	Value	df	Value/ df
Deviance	1680.178	1571	1.069	1682.495	1571	1.071	1682.931	1571	1.071
Scaled Deviance	1680.178	1571		1682.495	1571		1682.931	1571	
Pearson Chi-Square	1655.841	1571	1.054	1660.322	1571	1.057	1660.983	1571	1.057
Scaled Pearson Chi-Square	1655.841	1571		1660.322	1571		1660.983	1571	
Log Likelihood[b]	-4287.469			-4289.268			-4290.073		
Akaike's Information Criterion (AIC)	8600.939			8604.535			8606.145		
Finite Sample Corrected AIC (AICC)	8601.171			8604.767			8606.377		
Bayesian Information Criterion (BIC)	8670.719			8674.315			8675.925		
Consistent AIC (CAIC)	8683.719			8687.315			8688.925		

Note. 'Value/df' values that are closest to '1' are best. A value of <1 indicates under-dispersion of outcome variable data based on the model type selected; a value of >1 indicates over-dispersion of outcome variable data based on the model type selected.
Model Dependent Variable: Number of Unresolved Environmental Conflicts Reported in a Country Year
Model: (Intercept), Voice and Accountability, Political Stability and Absence of Violence, Governmental Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption, the Natural Log of GDP (PPP, 2023 International Dollars), Life Expectancy, the Natural Log of Population, the Natural Log of Land Area, the Natural Log of the CO_2 Equivalent of Green House Gasses Produced.

Table 7. Omnibus Test Results for Study Models

Model Fit Index	Model 1 $WGIs_{t-0}$ Panel			Model 2 $WGIs_{t-1}$ Panel			Model 3 $WGIs_{t-2}$ Panel		
	Value	df	Sig.	Value	df	Sig.	Value	df	Sig.
Likelihood Ratio Chi-Square	2147.368	11	<.001	2143.772	11	<.001	2142.162	11	<.001

Model Dependent Variable: Number of Unresolved Environmental Conflicts Reported in a Country Year
Model: (Intercept), Voice and Accountability, Political Stability and Absence of Violence, Governmental Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption, the Natural Log of GDP (PPP, 2023 International Dollars), Life Expectancy, the Natural Log of Population, the Natural Log of Land Area, the Natural Log of the CO_2 Equivalent of Green House Gasses Produced.

Table 8. Exploratory Control Variables Analysis

	Model 1 $WGIs_{t-0}$ Panel	Model 2 $WGIs_{t-1}$ Panel	Model 3 $WGIs_{t-2}$ Panel
Life Expectancy	4.8%, <0.001*** (3.7% to 5.8%)	4.7%, <0.001*** (3.9% to 5.6%)	4.7%, <0.001*** (3.7% to 5.8%)
GDP, PPP (Current, International $s)_LN	64.1%, <0.001*** (44.3% to 86.6%)	63.1%, <0.001*** (40.9% to 79.6%)	62.1%, <0.001*** (42.5% to 84.5%)
Population_LN	76.9%, <.001*** (61.0% to 94.5%)	76.5%, <.001*** (58.1% to 88.4%)	76.2%, <.001*** (60.2% to 93.8%)
Land Area_LN	35.7%, <.001*** (30.4% to 41.2%)	35.9%, <.001*** (30.5% to 42.0%)	36.2%, <.001*** (30.7% to 41.8%)
CO_2 Equivalent of GHGs_LN	-44.9%, <.001*** (-38.4% to -50.7%)	-44.9%, <.001*** (-38.4% to -50.7%)	-44.9%, <.001*** (-38.4% to -50.7%)

Note. Results are reported as the percent increase or decrease in reported environmental conflicts due to a one unit increase in the predictor variable value above the mean. 95% Confidence Intervals are also provided and are the values in parentheses. Unlike the model independent variables, a two tailed test of significance was used due to the exploratory nature of the interest in the relationships between the control and dependent variables. Still, all displayed significance: the H_0 that the impact is not different from zero would be rejected.