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ECOLOGICAL STRESS, DEVELOPMENT, AND THE CONDITIONAL DYNAMICS OF PREJUDICE: A CROSS-NATIONAL ANALYSIS OF SOCIO-CULTURAL AND INSTITUTIONAL INTERACTIONS

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Abstract

Culture is not the sole determinant of human prejudice and democratic quality; it is a product of interactions among ecological pressures, developmental conditions, and institutional environments. This study examines these dynamics from a cross-national social–ecological perspective, focusing on whether development alters how ecological stress is reflected in socio-cultural attitudes. Using a cross-sectional quantitative design, the analysis draws on country-level data from 186 nations and employs descriptive statistics, correlation analysis, and multiple ordinary least squares regression models. An interaction model is estimated to assess whether the Human Development Index (HDI) moderates the relationship between disease prevalence and prejudice, alongside a secondary model predicting democratic outcomes. The findings indicate that disease prevalence is positively associated with prejudice, whereas HDI and institutional integrity are negatively associated with it. The interaction analysis reveals that the effect of ecological stress on prejudice becomes stronger at higher levels of development, suggesting that development does not uniformly buffer environmental pressures. In the institutional model, government functioning emerges as the strongest predictor of democracy, while prejudice is negatively associated with democratic outcomes. These results support a conditional understanding of socio-cultural dynamics in which ecological stress, development, and institutional quality operate jointly. Development reduces baseline prejudice but also reshapes how societies respond to ecological strain, highlighting the need for integrated approaches to understanding social attitudes and institutional outcomes.

Keywords: ecological stress, prejudice, human development, institutional quality, democracy

1. Introduction

Human societies are embedded within the intricate social-ecological frameworks wherein environmental factors, cultural behaviors, and institutional frameworks interplay to determine the behavioral outcomes. Modern research is becoming more and more aware that human attitudes and social processes cannot be interpreted outside of ecological contexts within which they are produced. The interdependence of the environmental pressures and the social organization have come into focus, especially in explaining the variation of the socio-cultural phenomena among countries. Studies on social-ecological systems underline the role of local environments in shaping governance systems, collective behavior, and adaptive responses, and how place-based interactions should be considered when explaining human behavior (Hakkarainen et al., 2022). On the same note, ecological and developmental approaches that focus on a larger view of ecology and development imply that ecology is closely connected to cultural norms and developmental patterns, which further supports the notion that social results are context-related (Nagla, 2021).

Ecological stress has become the topic of attention in the environmental and social sciences concerning its role in human behavior. Social interactions, perceptions of risk, and group dynamics can be affected by ecological conditions such as climate variability and disease prevalence. Environmental psychology studies have shown that environmental limitations influence cognitive and behavioral reactions, which usually result in a greater susceptibility to perceived threats (De Groot, 2019). Specifically, the presence of ecological stressors, including exposure to pathogens has been associated with heightened in-group cohesion and out-group bias, which implies that it is a behavioral adaptive process that aims to reduce the perceived risks (Jackson et al., 2019). Meanwhile, ecological disruptions and environmental stresses have the potential to transform larger social systems that may affect not only personal perceptions but institutional and social reactions (Wilson et al., 2020).

Current literature also supports the significance of social resilience in ecological situations. The study of social-ecological resilience proves that communities respond to environmental pressures by having resilience based on the integration of social capital, institutional structures, and cultural behavior (Cinner and Barnes, 2019). These adaptation mechanisms are not, however, universal in societies. The differences in socio-cultural attitudes, such as prejudice, are usually the embodiment of a more profound structural and ecological disparity. As some researchers find the evolutionary or behavioral immune system to be the basis of prejudice, other studies are critical to explain that these reasons must be placed in the context of socio-political and institutional contexts (Kusche & Barker, 2019). Simultaneously, studies of environmental system perceptions indicate that socio-cultural understanding of ecological situations is quite different in different situations, which supports the necessity of unified analysis even further (Thiemann et al., 2022).

Another dimension that is critical in influencing human attitudes and social outcomes is socio-economic development. Variations in education, health and income are development indicators like the Human Development Index (HDI) that affect social values and openness. Empirical data indicate

that the general pattern is that the more a society is developed, the more socially tolerant and the less prejudiced it becomes, as better living conditions decrease competition among people over resources and institutional trust (Obasi, 2019). More recent studies also show that development is influenced by various interacting factors, such as the quality of governance and economic stability, which, in combination with other factors, affect larger societal outcomes (Dagohoy et al., 2025). But development is not a unilateral process; the impact of development is mediated by ecological and institutional contexts that influence the manner in which societies react to environmental pressures.

The quality of institutions is important in the connection between ecological and socio-cultural processes. Good systems of governance lead to social cohesion, trust and controlling collective behaviour. The studies show that the institutional quality is linked to greater social cohesion and stability of society, and thus the role of governance in influencing social outcomes cannot be underrated (Nadeem et al., 2022). Simultaneously, ecological stress may have implications for institutional performance as it exerts pressure on the governance systems and changes social interaction patterns. Recent studies on host-pathogen interactions highlight how environmental stressors may upset social systems and increase the preexisting inequalities, which only complicates the connection between ecological conditions and social outcomes (Vicente-Santos et al., 2023).

One of the main limitations in the literature is the lack of research on ecology, development and socio-cultural behavior despite the accumulating literature on these topics. Most research investigates these dimensions separately, either with the emphasis on ecological factors, or socio-economic development, or institutional quality, without combining them into a single entity. Consequently, little focus has been on the interaction of these factors in combination to influence socio-cultural outcomes. Specifically, the moderating effect of development on the association between ecological stress and prejudice has not been sufficiently studied. Knowledge of whether development can alleviate or enhance the consequences of ecological stress is essential to developing theoretical and empirical knowledge on cross-national differences in social attitudes.

This paper fills this gap by exploring how the relationship between ecological stress, socio-economic development, and institutional quality influences prejudices and democratic outcomes in countries. It examines the relationship between disease prevalence as a measure of ecological stress and prejudice, and also takes into account the development and governance factors. Notably, the research examines the possibility that development is a modulator of the association between ecological stress and prejudice, thus offering knowledge about the conditional dynamics of socio-cultural reactions. This study, with its combination of ecological, structural, and institutional approaches, adds to the deeper understanding of the shaping of human behaviour in complex social-ecological systems.

2. Methodology

2.1 Research Design

The proposed study will use a cross-sectional, quantitative research design to investigate the ecological conditions, structural development, and socio-cultural outcomes in relation to other countries. The method of analysis is based on comparative, cross-national studies, which makes it possible to identify systematic relationships between environmental, institutional and cultural factors. The design focuses on the simultaneous evaluation of immediate effects and conditional relationships, especially the degree of development moderation of the effect of ecological stress on socio-cultural attitudes.

2.2 Data Source

The data used in this research were based on an open-access cross-national dataset, which had been collected to enable the analysis of ecological, cultural, and institutional differences between nations. The dataset combines pointers that reflect environmental conditions, socio-economic development, governance structures, and cultural attitudes to allow interdisciplinary analysis of human behavior in context. It offers country-level measures that are harmonized to enable a consistent comparison of a wide variety of societies (Wormley et al., 2023).

2.3 Variables and Measures

There are three types of variables in the analysis: ecological, structural, and socio-cultural. Ecological conditions are represented by indicators which show ecological stressors like disease prevalence, temperature and rainfall, which may cause human behavior. The structural variables are values of socio-economic development and institutional quality, including Human Development Index (HDI), GDP per capita, government functioning, corruption and democracy. Attitudinal and behavioral aspects, such as prejudice, social capital, optimism, and work ethic, are reflected in socio-cultural variables. The main models address prejudice as the main dependent variable, whereas democracy is studied as an institutional outcome in a secondary analysis. All variables were selected based on standardized indicators at the country level to be comparable across the contexts.

2.4 Data Preparation

The data was filtered to eliminate missing data and redundant indicators before analysis. Missingness of variables that had considerable missingness was also omitted to maintain analytical consistency. Where there were conceptually similar indicators in more than one form (e.g., mean, range or standard deviation), a representative measure was retained to prevent redundancy. In the case of regression analysis, continuous variables were normalized (z-scores) in order to compare them in terms of coefficients, in order to minimize the scale effect distortions. However, to maintain interpretability, the original (unstandardized) values were used to compute descriptive statistics. The end product of analysis was a sample of 186 countries that had all the required data on the variables of interest.

2.5 Analytical Strategy

The analysis was done in a number of steps. First, descriptive statistics were calculated to determine the distribution and variability of key variables among countries. Second, correlation analysis was performed to analyze the bivariate correlations of ecological, structural, and socio-cultural indicators. Third, several linear regression analyses were estimated to determine predictors of prejudice. An initial full model was specified using ecological, structural and institutional variables and a reduced model was specified to test robustness and parsimony. A model of interaction was subsequently estimated in order to determine whether the correlation between ecological stress (disease prevalence) and prejudice changes as a result of development (HDI). Lastly, another regression equation was estimated to test the predictors of democracy, which enabled the evaluation of the relationship between socio-cultural variables, especially prejudice and the outcomes of institutions. All the analyses were performed by standard ordinary least squares (OLS) estimation, and statistical significance was checked by conventional levels.

3. Results

3.1 Descriptive Statistics

The descriptive statistics of the most important ecological, structural and socio-cultural variables of the analysis are provided in Table 1. The data is on 134-185 countries, based on the data availability of particular indicators.

Table 1. Descriptive Statistics

Variable	N	Mean	SD	Min	Max
Population Density	171	236.05	1176.49	1.20	14157.35
Government Functioning	161	4.82	2.56	0.00	9.64
Human Development Index (HDI)	165	0.64	0.19	0.14	0.94
Pluralism	161	5.78	3.64	0.00	10.00
Corruption (Index)	163	43.33	19.29	9.00	89.00
Disease Prevalence	183	0.20	0.20	0.01	0.64
Prejudice	185	-0.36	0.48	-1.70	0.31
Social Capital (SCI)	134	51.50	7.08	35.23	66.85
GDP per Capita	185	7029.58	10629.23	110.84	91143.73
Life Expectancy	181	63.89	9.70	40.73	78.01
Political Culture	161	5.60	1.67	1.88	10.00
Mean Temperature	185	18.81	8.32	-6.89	28.28
Political Rights	182	22.73	13.71	-3.00	40.00
Political Participation	161	5.27	1.88	1.11	10.00
Poor Journalism	169	34.80	15.52	7.84	85.44
Democracy Score	161	5.44	2.24	1.13	9.87
Rainfall	184	1192.09	842.56	33.26	3810.36
Gender Egalitarianism	150	0.70	0.06	0.49	0.88
Civil Liberties	182	37.02	34.31	2.00	436.00
Optimism	138	-0.11	0.19	-0.61	1.00
Work Ethic	134	4.78	3.09	0.00	19.00

The statistics show a high degree of heterogeneity in countries. The high dispersion of economic indicators like GDP per capita and population density is observed, whereas the socio-cultural measures like prejudice and optimism show relatively smaller dispersion. The institutional indicators are also quite different as they represent the difference in the governance structures and political environment of the countries.

3.2 Correlation Analysis

Figure 1 shows the entire correlation structure of all variables. The outcomes of the correlation reveal a high degree of clustering of the development and institutional variables, such as HDI, government functioning, and democracy. These variables are positively connected, which implies a coherent structural dimension. The prevalence of diseases is significantly linked to development indicators, developing a reverse ecological gradient.

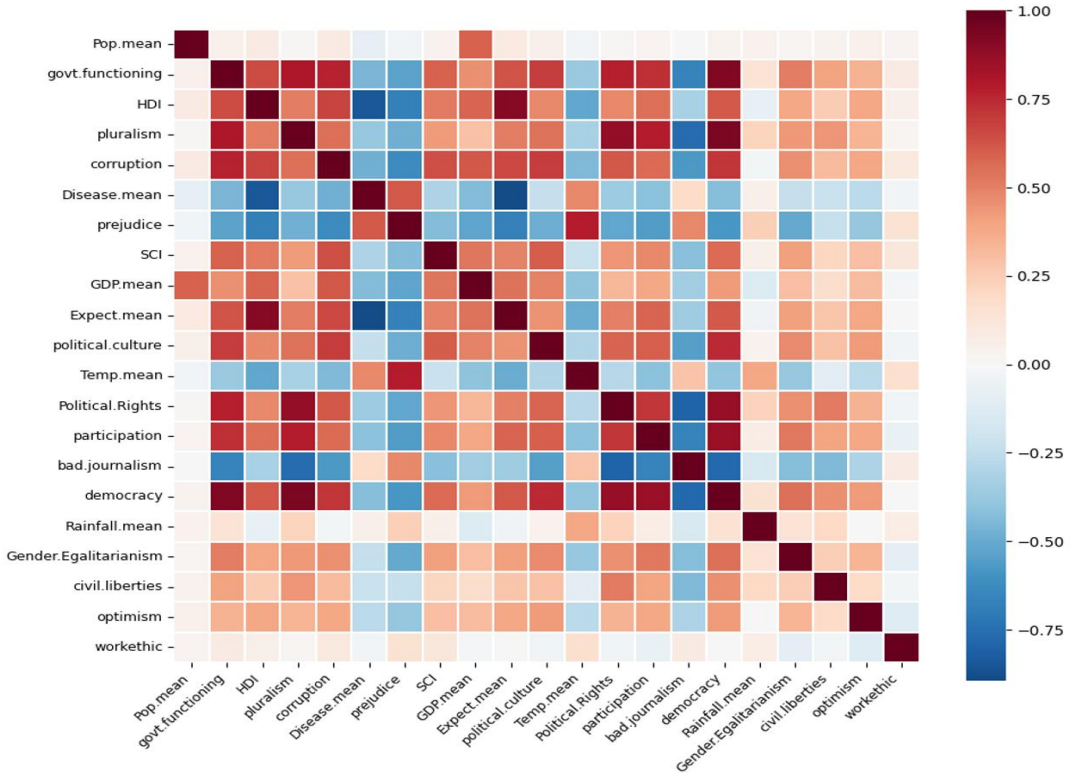

Figure 1. Correlation Matrix of Socio-Cultural, Structural, and Ecological Variables

Prejudice shows consistent relationships with ecological and structural variables. It has a positive relationship with the prevalence of diseases and a negative relationships with development and government indicators. The trends show that socio-cultural attitudes are connected with both environmental stressors and institutional conditions.

3.3 Bivariate Relationship Between Ecological Stress and Prejudice

Figure 2 shows the direct correlation between ecological stress and prejudice. In the figure, there is a positive and evident correlation between prejudice and disease prevalence. The more ecologically stressed countries are, the more prejudice they exhibit. Meanwhile, the color gradient that shows HDI suggests that more developed nations tend to have lower baseline levels of prejudice, but this does not exclude the differences in the contexts.

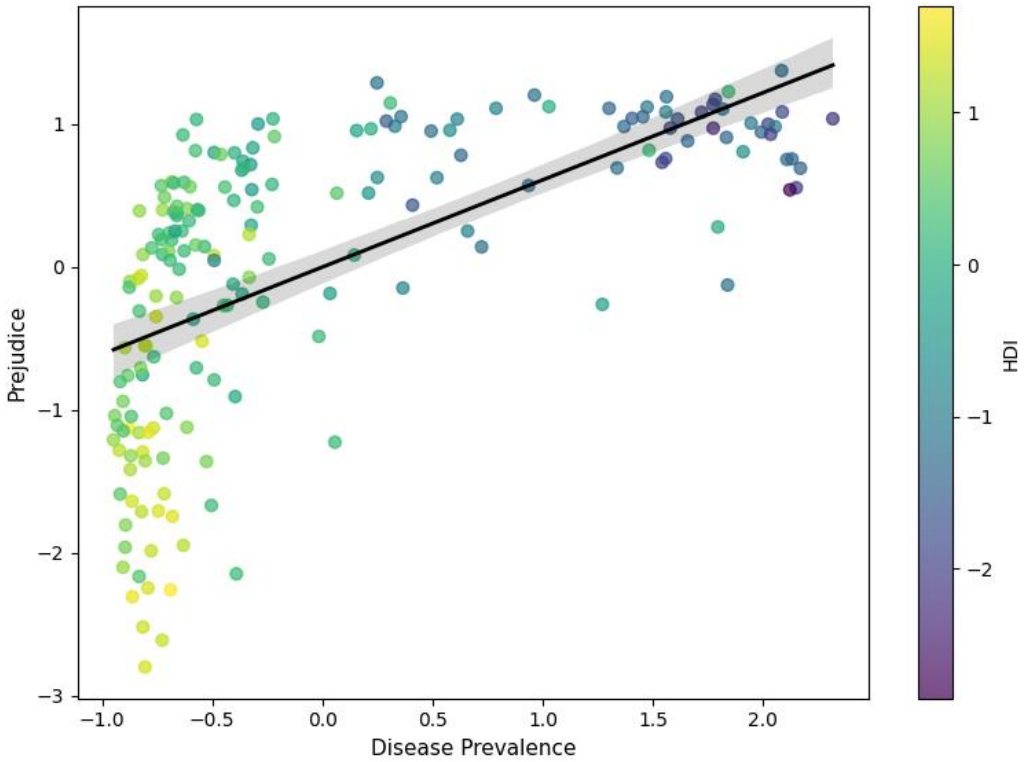

Figure 2. Relationship Between Ecological Stress and Prejudice

3.4 Regression Analysis

The data in Table 2 reveal a negative correlation between Human Development Index (HDI) and prejudice, as well as a positive correlation between disease prevalence and prejudice. Another strong negative predictor also comes out as corruption, which means that institutional integrity is associated with a decrease in prejudice. The stability of these relationships is confirmed by the reduced model, and the explanatory power changed slightly. The interaction model also shows that the disease impact on prejudice is stronger with a greater development level, which is shown by the positive and statistically significant interaction term. This trend implies that, despite the fact that development correlates with reduced baseline prejudice, socio-cultural reactions to ecological pressure tend to increase with increasing development.

Table 2. Regression Models Predicting Prejudice

Variable	Model 1	Reduced Model	Interaction Model
HDI	-0.276*	-0.283*	-0.409***
Disease	0.214*	0.209*	0.408***
HDI × Disease	N/A	N/A	0.309***
Corruption	-0.332***	-0.339***	-0.191*
Govt Functioning	0.002	N/A	N/A
SCI	-0.017	N/A	N/A
Constant	0.000	0.000	0.262***
R^2	0.535	0.534	0.583
Adj. R^2	0.522	0.527	0.574

Table 3 demonstrates that government functioning is the best predictor of democracy with a large positive and statistically significant influence. Conversely, prejudice is negatively related to democratic outcomes, implying that the greater the amount of prejudice, the less democratic is the system. Other factors, such as HDI and corruption fail to be statistically significant when there are governance indicators, perhaps because of common variance with structural factors.

Table 3. Regression Model Predicting Democracy

Variable	Model 2
HDI	-0.041
Corruption	-0.059
Govt Functioning	0.892***
SCI	0.029
Prejudice	-0.151***
Constant	0.000

R^2	0.858
Adj. R^2	0.854
N	186

3.5 Interaction Effect of Development and Ecological Stress

Figure 3 shows the moderating effect of development. The figure shows that even though the levels of higher development correlate with lower levels of prejudice at the baseline, the correlations between disease prevalence and prejudice increase in steeper proportions in the higher-development settings. Prejudice in less developed environments is relatively strong and not so sensitive to ecological differences. Conversely, prejudice in more developed situations is more responsive to increases in ecological stress.

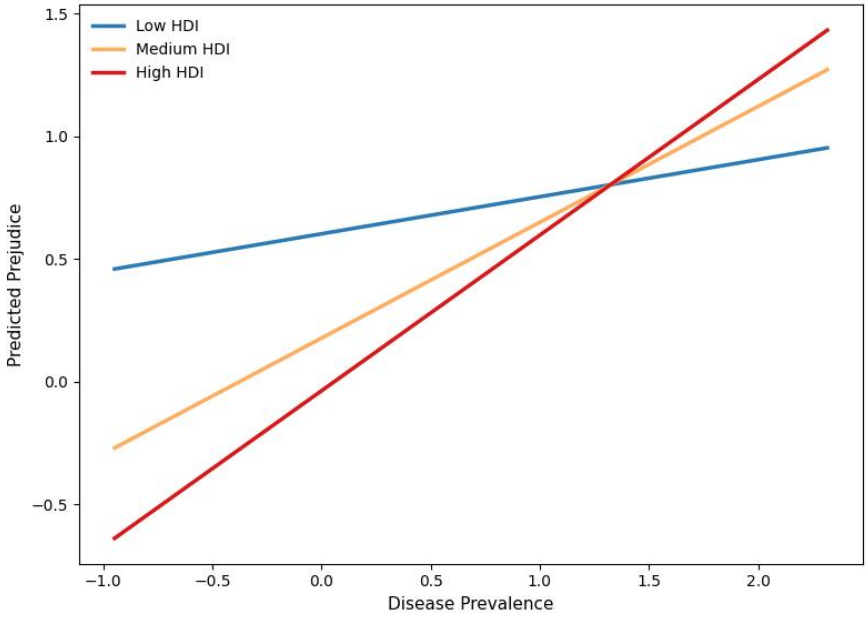

Figure 3. Interaction Effect of Development and Ecological Stress on Prejudice

This trend lays emphasis on the conditionality of the relationship between ecological conditions and socio-cultural attitudes, which implies that structural development alters the manner in which the society reacts to environmental demands.

4. Discussion

The findings indicate that there is a patterned relationship between ecological stress, development, institutional quality and socio-cultural attitudes. Increased disease prevalence was linked to increased prejudice, and increased human development was linked to decreased prejudice. Corruption also proved to be a negative predictor, which shows that the better the institutional environment, the less prejudice attitude will be observed. Combined, these results indicate that environmental pressures do not determine socio-cultural responses, but rather the responses are predisposed by structural environments in which those pressures are felt. This pattern is the most significant pattern whose layer is added by the interaction analysis. The correlation with development was lower baseline prejudice, but the positive interaction term indicated the relationship between disease prevalence and prejudice was stronger with an increase in development. Substantively, the lower-development contexts seemed to perpetuate a relatively high level of prejudice under ecological circumstances, and the higher-development contexts were characterized by the tighter attitudinal responses with the rise of ecological stress. This implies that the process of development does not tend to undermine the social impacts of ecological strain. Instead, it alters the mode of processing and expression of such strain. The model of democracy supports the significance of the institutional context. The most significant predictor of democracy was the government functioning, and prejudice had a negative relationship with democratic outcomes even after taking into consideration structural factors. This implies that the socio-cultural attitudes and the quality of the institutions are neither analytically distinguishable. Prejudice is not just a social orientation, but also an element that is associated with the overall political situation, especially in the context where the ability to govern and popular confidence are important to the performance of democracies. The general trend is that there is a conditional explanation of socio-cultural dynamics whereby ecological pressures, development and institutions work together as opposed to acting independently.

This pattern can be explained by arguments that, in order to comprehend human behaviors, it is necessary to adopt a broader paradigm that involves the integration of the psychological processes with broader social and structural forces instead of looking at behavior as an outcome of individual motives only (Guerin, 2025). It is also consistent with socio-ecological explanations that environmental pressures are perceived and handled by locally incorporated systems of practice and meaning, and not by having the same impact on environments (Maru et al., 2020). This negative correlation between development and prejudice is more consistent with more general explanations of development as the dynamic process of socio-cultural organization, which is influenced by agency, institutional organization, and normative change and not as the economic state of affairs (Yolles, 2020). Simultaneously, the outcome of interaction indicates that development might not necessarily be a direct protective mechanism. This can be congruent with work that has found that coherence, adaptation and resilience in cross-national conditions are contingent on the social mediation of stress, rather than just the existence of structural resources (Kim et al., 2025). This positive association between ecological stress and prejudice can also be interpreted alongside the studies of the social effects of rejection, threat, and insecurity that demonstrate that the perceived vulnerability frequently leads to defensive boundary-making and exclusionary reactions (Downey & Daniels, 2020). The results thus substantiate current ecological explanations by suggesting that national developmental contextualizes the

social manifestation of threat as opposed to being constant across societies.

The institutional outcomes conform to the new literature on the socio-cultural determinants of governing systems and environments of public decision making, especially the fact that institutional structures both create and are created by social norms, trust and distributive perceptions (Huyskes, 2025). They also echo the ideas that socio-ecological change can only be conceptualized through multilevel processes whereby psychological reactions, collective action and systemic change are intertwined (Wullenkord & Hamann, 2021). The robust contribution of government functioning to the forecast of democracy supports even further the literature that emphasizes the idea that institutions emerge within intricate social-ecological settings and cannot be delineated by formal rules only; instead, it is maintained through recurrent interactions between the capacity to govern, the legitimacy of the populace, and the environmental conditions (Epstein et al., 2020). Lastly, the development-ecological stress conflict in the interaction model is similar to criticisms of development paradigms that prioritize growth and capacity building without paying sufficient attention to the vulnerabilities and inequalities generated by socio-ecological stressors (Eisenmenger et al., 2020).

There are a number of implications of these findings. To start with, prejudice cannot be viewed as a mere cultural residue or attitudinal feature that exists outside of the context. Its dispersion seems to be connected with the concerted functionality of ecological circumstances and institutional settings. Second, development is not an adequate explanation as protective. Despite development reducing the prejudice of the baseline, it can also provide an environment where the ecological stress is more likely to cause stronger social responses. Third, the quality of the institutions is of concern to the democratic performance as well as to the societal climate where the prejudice is confined or supported. There are also practical implications of these results. The policy of social cohesion by the government can be ineffective when it is limited in both its scope and its emphasis on economic development without considering the vulnerability of the environment and trust in the institutions. The interactions between health crises, ecological disturbance, and a weak government may lead to changes in the attitudes between groups. The integration of policies that concern the public health preparedness, institutional accountability and inclusion can thus be more effective than those that consider them individually.

The results are to be viewed through a number of limitations. The study is cross-sectional, and thus, it is unable to give a causal direction. Ecological fallacy is also a potential issue with the use of country-level indicators because it is not always true that the patterns of countries are reflected in individual attitudes or behaviors. Moreover, there was less coverage on some of the variables compared to others, potentially impacting the scope of the analytical sample and stability of some estimates.

This piece of work needs to be extended in three ways in future studies. Longitudinal would assist in identifying whether ecological stress is a lead-up to changes in prejudice or is both a reflection of wider historical events. The multilevel research which involves the integration of national indicators and individual-level survey, would help in a more detailed analysis of the influence of context on attitudes. Also, future research is needed to explore why more advanced contexts seem to be more sensitive to ecological stress, and the media environment, risk communication, institutional demands, and perceived social threat are potential causes. This kind of direction would be helpful to gain a better insight into the interactions between ecological pressures and structural conditions in determining socio-cultural outcomes.

5. Conclusion

Production of socio-cultural and political outcomes is jointly charged to ecological stress, development and institutional quality. More prejudice was related to increased prevalence of the disease, and development and institutional integrity were also related to less baseline prejudice. Meanwhile, the interaction analysis revealed that development did not merely counterbalance ecological stress, but instead reshaped the magnitude of the intensity in which ecological stress was manifested in prejudicial attitudes. The government functioning was also the most significant determinant of democratic results, and prejudice had a negative correlation with democratic results, even when other more extensive structural factors were taken into account. These results affirm a situational interpretation of human conduct where environmental forces, developmental situations and governance systems do not work on different lines but rather, they interact. They further indicate that the enhancement of social cohesion cannot be based solely on development, especially in those situations in which the vulnerability of the ecological integrity and institutional frailty have not been addressed. It is thus a more integrated socio-cultural analysis that is required to understand why prejudice remains, why there are differences in the quality of democracy, and how societies react in an unequal manner to ecological strain.

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