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Migrants from Central America have moved in large numbers in recent years. According to the most recent Global Trends Report of the United Nations High Commissioner for Refugees (UNHCR), the total number of asylum seekers, refugees, internally displaced persons, and returnees from Central America was 107,407 in 2014, while a total of 905,796 were registered by 2019. The arrival of so many internally displaced populations (IDPs), migrants, and refugees has created challenges and opportunities for countries in the region. Natural disasters and the COVID-19 pandemic have only added complexity to the situation.

As it has become clear that many displaced migrants will remain abroad for an extended period, if not permanently, the focus has begun to shift from the provision of humanitarian aid to understanding the root causes of migration to strengthen the countries of origin preparedness, infrastructure, access to services, and institutional reforms to address the situation. These measures hold the potential to benefit the displaced populations, migrants and refugees, and the communities in which they live by boosting economic development and social equity and reinforcing social cohesion.

To examine the link between climate change and human mobility of migrants and refugees in this region, this article analyzes data from the Internal Displacement Monitoring Centre (IDMC), Armed Conflict Location & Event Data Project (ACLED), United Nations Office on Drugs and Crime (UNODC) studies, and various data from other sources, reports, and additional research resources. The report explores the correlation between three key dimensions that could trigger factors for human mobility northward—natural disasters, internal displacement, and violence—across the three Northern Triangle countries (El Salvador, Guatemala, and Honduras). Together they comprise 86 percent of Central Americans arriving at U.S. borders, and as of 2017, eight percent of the United States' 44.5 million immigrants.¹

This study also examines the correlation of these variables across time, considering the accumulation (sum) of episodes in three years of variable *b*, which has a correlating effect on variable *a*. For example, when correlating natural disasters in any given year with the number of internally displaced population, this investigation totaled the number of internal displacements in the three consecutive year period and then correlated this number with the natural disasters that happened at any given year. Consequently, this research looked at answering the

following questions: is there a connection between the increase in the frequency and severity of climate events in Central America and migration? How would this relationship come about? What role does internal migration play? And what impact does the forced internal displacement of these populations affected by climate events have on community social and security conditions? Can internal displacement explain violence in these countries? And how do these impact these populations' move toward the North?

The article answered these questions by answering whether *internal displacement caused by natural events is an underlying factor that incubates violence and social instability, and if forced migration northward stimulated by violence should also be associated with the frequency of natural events.*

The analysis suggests all variables correlate positively. However, correlations are stronger when analyzing internal displacement and violence and violence with out-migration. The data and analysis of the findings presented in this report provide a valuable indication of trends and insights to support effective policymaking in the region.

These were then crossed following the transitivity principle.² In this case, the hypothesis is that if natural disasters correlate with internal displacement in the Northern Triangle countries, they could increase the number of homicides (used as a proxy for violence) in the region. The increase in violence could be correlated with migration toward northern countries (Mexico, the United States, and Canada). Two important caveats to keep in mind is that correlation does not imply causation. Although there might be a correlation between the variables, one cannot make any claims of causality between the different variables solely based on the existence of this correlation. Secondly, we discovered a limitation of available data in this case, which could provide an important opportunity to identify new gaps in the prior literature and present the need for further development in this area of study. These two caveats are explored further in the following sections.

Results

The results corroborate previous studies relating to the relationship between migration, internal displacement, conflict, and natural disasters. After running the four different correlations that this report proposes, the findings suggest a weak but positive correlation between natural disasters and internal displacement. In other words, the findings indicate that the existence of floods, hurricanes, or earthquakes, among other natural events, may not be the only determinant of internal displacement in these

three countries. Still, it is definitively influencing people’s decision to move. As more variables are included in the correlations and more factors are considered, the correlations get more potent, as Figure 1 shows.

When assessing the second correlation between internal displacement due to natural disasters and homicide, the correlation coefficient is 0.7. This shows that the relationship between internal displacement caused by natural disasters and homicide is strong. This correlation coefficient was found by comparing the three-year sum of the internally displaced people due to natural disasters in each country with the total homicides in the region. In other words, there is evidence that internal displacement caused by natural disasters in these three countries may exacerbate violence measured by the number of homicides occurring in communities that have received IDPs due to natural disasters. Since this correlation between IDPs due to natural events and homicides is strong, this study recommends further studies that account for other factors and use alternative methodologies such as linear regressions.

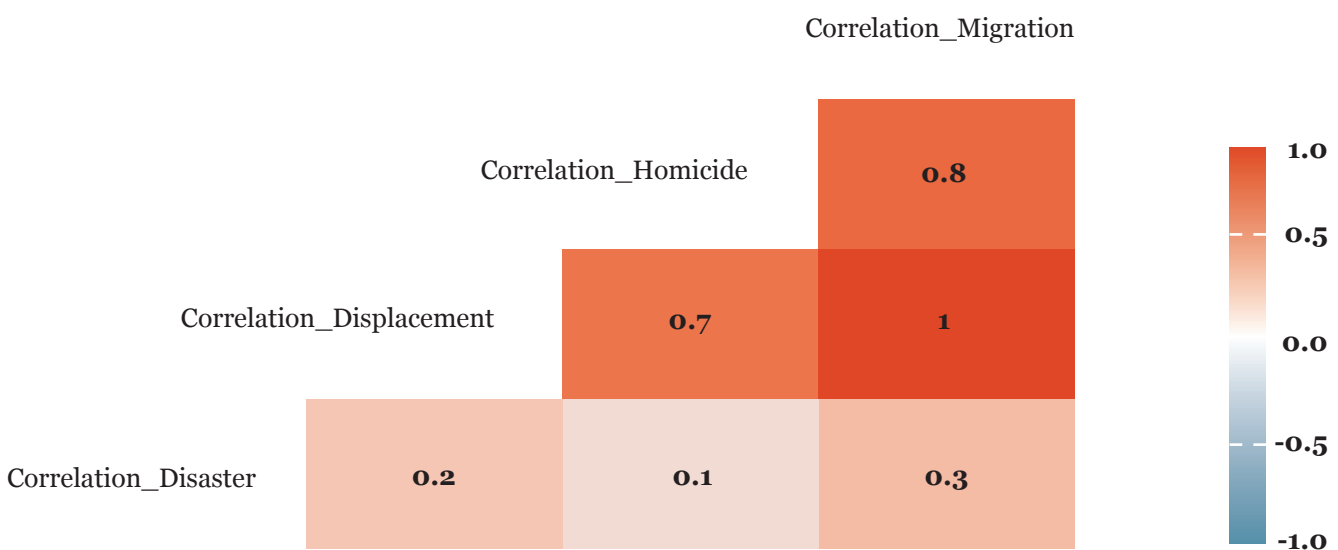
Moreover, there is a correlation between homicide and migration. The correlation coefficient, in this case, is 0.8. When testing for the significance of this coefficient, the p-value was 0.031. Given these results, there is an essential and strong correlation between homicide and migration toward the North. What Figure 1 suggests, then, is that this study shows strong results when it comes to the correlation between homicide and migration toward the

northern countries. As it still exists to some degree, a correlation between displacement and natural disasters ($r=0.220$), did not yield a significant result at the 90 percent confidence level. Therefore, this study cannot rule out the possibility there might not be a correlation at all. In other words, all variables are positively correlated. However, as we crossed the different variables, the levels of correlation became stronger.

Furthermore, the significance tests applied, and which measure the confidence levels, rejected the null hypothesis of this research. In this sense, this study is an invitation to create more accessible data on human mobility associated with environmental factors that are sufficient and of quality. Thus, the region could make visible and provide a better understanding and attention to migration triggers, allowing and thereby substantiating policies, actions, and decisions at the regional and national level.

Putting these results into perspective and contextualizing them, as Figure 2 shows, the correlations intensify as more variables are factored into the model. This report argues that this is the case since emigration is a process that occurs progressively after an initial shock (in this case, natural disasters). The study accounts for countries that have suffered years of deterioration and have not improved their resilience mechanisms to defend themselves against these shocks. Thus, there are increases in internally displaced populations and migrants who look for opportunities in Northern countries.

Figure 2: Intensity of correlation between natural disasters and migration toward the North



Source: Prepared by the authors

After assessing the results, the report suggests different reasons explaining the results. First, looking at the results from a vulnerability perspective, when a natural disaster strikes a country, the level of vulnerability that individuals face has a certain impact. However, as displacement begins to occur because of these disasters, their vulnerability levels increase, reflecting why correlations get stronger.

Figure 3. Country of Hazard Type.

Hazard Type	El Salvador	Country Guatemala	Honduras
Drought			1
Dry mass movement		2	1
Earthquake	3	6	2
Extreme Temperature		6	
Flood	11	25	20
Storm	5	5	4
Volcanic Eruption	1	6	
Wet mass movement	2	3	
Wildfire			1

Source: Prepared by the authors

Data related to violence, conflict, and economic factors prevail as primary triggers of human mobility in the region. Other more easily identifiable factors often hide the environmental trigger, either by the absence of studies and the production of specific data, practical and methodological difficulties to generate this type of data, or the limited perception of the environmental factor as a mobility inducer. It is necessary to reinforce the relationship between multiple vectors of mobility in the region and, especially, how environmental factors are the trigger and are related to economic vulnerability, insecurity, conflict, and violence.

Generating evidence and data about the phenomenon requires two aspects: (i) developing, testing, and validating specific methodologies, and (ii) reinforcing, improving, and coordinating methodologies and existing data sources. The absence of characterization and precise definition of the phenomenon and its categories and a defined and coherent methodology with the region's specificities are the main barriers.

It is necessary to invest in data production systems with integrated indicators on the environment and human mobility. This can generate a set of regional indicators of human mobility induced by climate change and disasters, which requires an integrated analysis and coordination between different databases and data sources and the development of specific methodologies.

This study, therefore, indicates the need to expand the availability of specific data, identify and fill gaps in data on the phenomenon, produce new data where it does not exist, and develop methodologies, standards, and common protocols for harvesting, analysis, and data collection. In addition, creating collaborative platforms for the dissemination and exchange of data to improve its accessibility and applicability is highly recommended.

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²Transitivity principle in which, if A influences B, and B influences C, then C must also be influenced by A.

³When we tested for the significance of the Pearson correlation coefficient, the p-value obtained is 0.063, which is lower than the alpha level of 0.10 (confidence interval of 90 percent), so we can reject the null hypothesis.

⁴United Nations High Commissioner for Refugees, 2020 Global Trends Report (Geneva: UNHCR, 2021). Arango, Joaquín. September 2000. "Enfoques conceptuales y teóricos para explicar la migración." *Revista Internacional de Ciencias Sociales*, No 165: 33-47.

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