

# Identifying vulnerable populations to Climate Change in Mexico: spatial analysis of a Social Vulnerability Index (2020)

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## Background







Communities’ health and well-being are increasingly being threatened by natural disasters and infectious disease outbreaks, where **socially vulnerable populations are particularly at risk**. The recurrence of shocks caused by climate change and natural degradation has driven investment of billions of dollars in the resiliency and adaptation of communities worldwide. Making sure that these investments reach those living in the most vulnerable conditions is imperative to close the existing inequality gaps. This is particularly relevant in Mexico, which has a high socio-economic inequality.

## Research Questions

- What are the States in Mexico with the highest concentration of population with a social vulnerability that makes them more prone to suffer from natural disasters and infectious diseases?
- Are there differences in the most vulnerable States by population (indigenous peoples, elderly, minors?)
- Given the vulnerability of its population, where should the Mexican government focus its investments in climate change resiliency and adaptation?

## Methodology

The United State’s CDC Social Vulnerability Index (SVI) determines the degree to which a given community may be unable to prevent human suffering and financial loss in the event of a disaster. It ranks the Census Tracts on 15 social factors. An SVI from Mexico was created, based on data from the following 6 social factors at a municipal level:

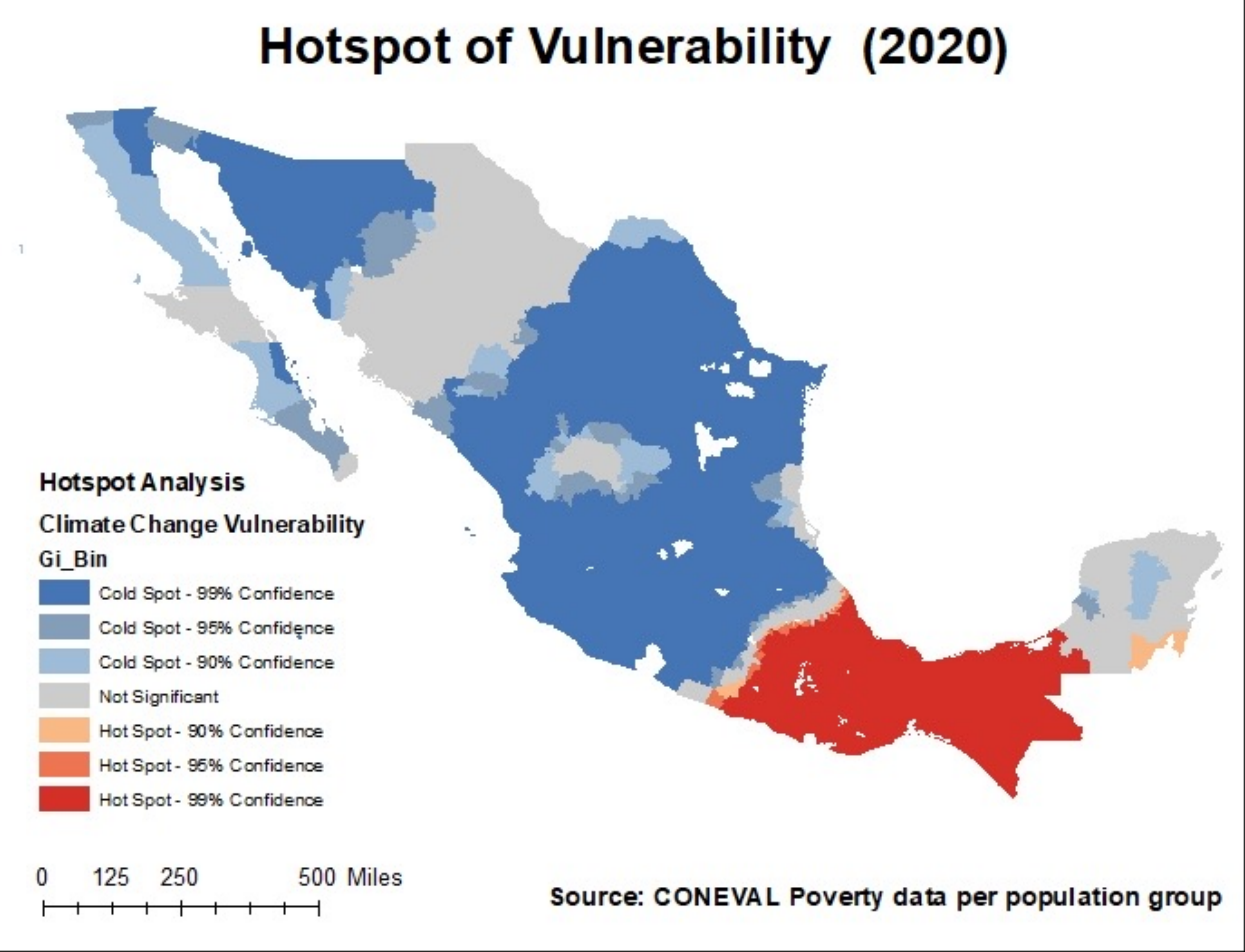
-  Inadequate Housing
-  Minors (0-17 years)
-  Living below the poverty line
-  Elderly (65 + years)
-  Low education level (no high school)
-  Indigenous populations

Data sets with percentages of population per municipality that has the characteristics of each of the social factors were retrieved from the National Council for the Evaluation of Social Development Policy (CONEVAL), a Mexican organization coordinated by the Ministry of Social Welfare.

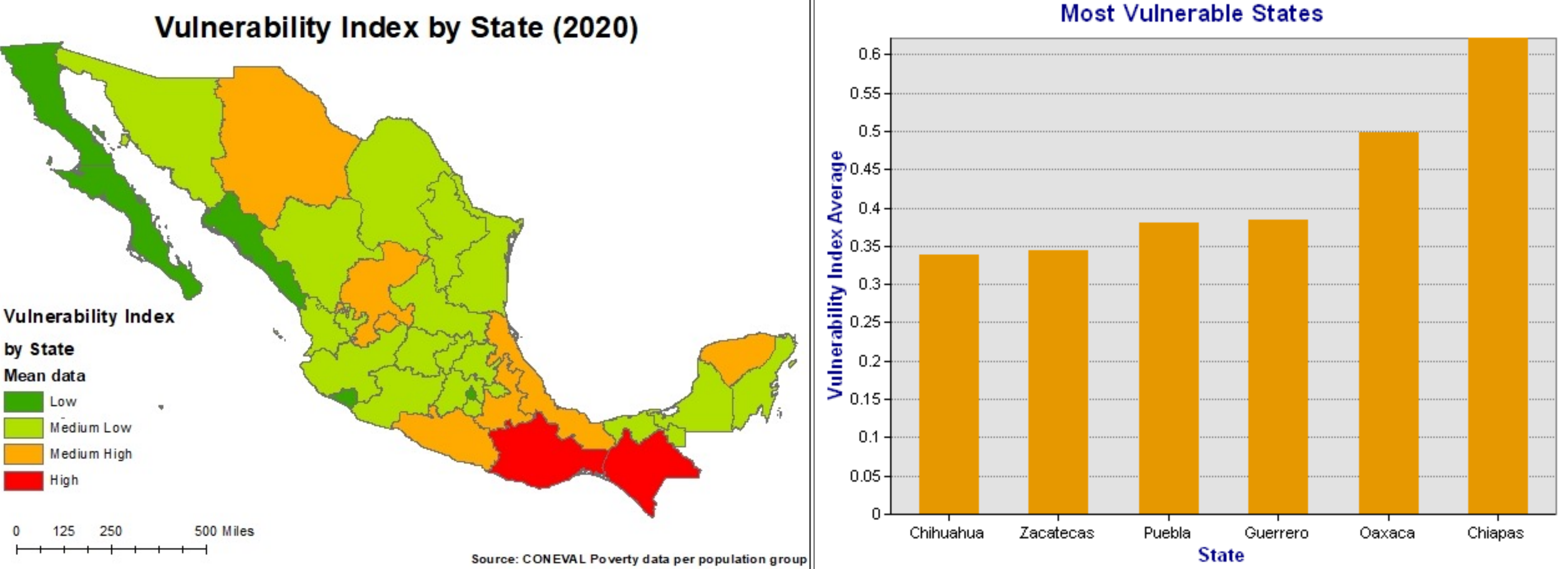
To build the SVI for Mexico, first, a normalized score was calculated for each housing, poverty line, and education indicator per population. The normalized scores of these three variables were added to have a compounded score for each municipality per population. Lastly, the SVI was built by getting the average of the compounded scores of each population.

Three different maps were created at ArcMap to find which States have the greatest concentration of population with social vulnerability according to the SVI built:  
**Map A** – Hotspot analysis to find hot and cold spots based on the percentage of the confidence level of data.  
**Map B** – Choropleth Map that identifies states with a low to high SVI. The input data was at a municipal level, but the geoprocessing dissolve tool was used to portray data at a State level, by finding the average SVI of municipalities of each State.  
**Map C** – A choropleth map was created for each population to identify the top 5 states with the highest social vulnerability compound score. A selection through a definition query was made to only portray the top 5 States.

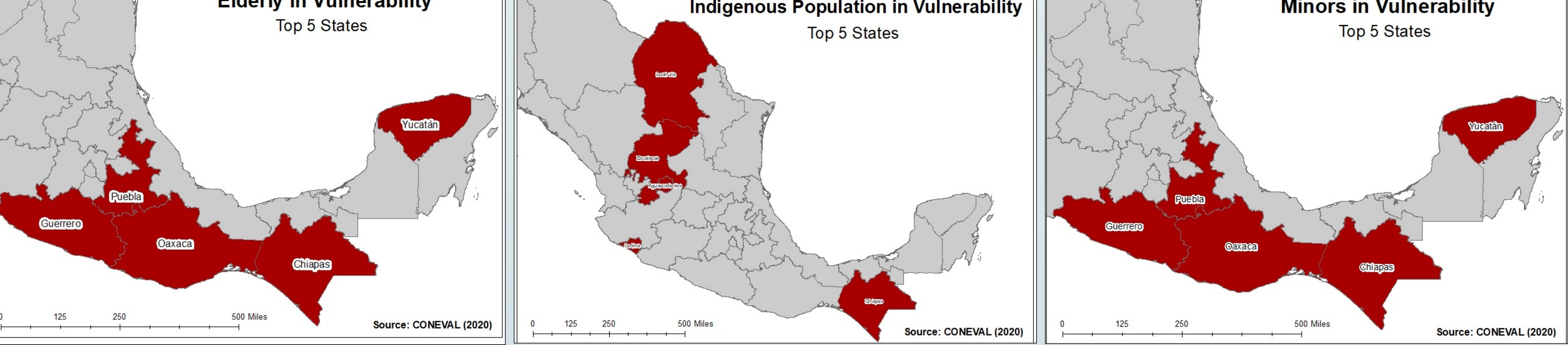
## Map A- Hotspot Analysis of Vulnerability



## Map B - Vulnerability Index by State



## Map C - Top 5 Vulnerable States by Population



## Findings

- According to the SVI in Mexico, there is a hotspot of the population living in Social Vulnerability in the Southwest of Mexico from the Pacific to the Gulf of Mexico coastal areas, making this region the most vulnerable to Climate Change shocks.
- Oaxaca and Chiapas are the two most vulnerable States of Mexico which consistently appeared in the top 5 vulnerable States in all the map analyses made.
- Puebla, Guerrero, Zacatecas, and Chihuahua are also states with medium-high SVI differing only in the type of population, as shown in the bar graph.
- Indigenous populations are more vulnerable in the north-center Center states, in addition to Chiapas compared to elderly and minor populations.

## Policy Recommendations

- The government of Mexico should focus its climate change resiliency investments on social protection programs targeted at indigenous populations, the elderly, and minors located in the Southwest region of Mexico, particularly in Oaxaca and Chiapas.
- There is a need for improvement in data collection of indigenous populations and overall social vulnerability indicators segregated by gender to have an intersectional understanding of the difference in vulnerability per population group and gender.
- Further research is needed with gender-disaggregated data and gender equality mainstreaming in the research design. Having more qualitative research on the social vulnerability factors would also be crucial to better understanding the population’s needs in different regions.
- The CDC’s Social Vulnerability Index (SVI) should include a gender-disaggregated data analysis to identify the differences between women and men and better target programs and policies. The design of future indexes for other countries should also integrate a gender perspective in their design and analysis.

## Bibliography

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