

Vulnerability to Climate Change | Guangdong Province, China

Introduction:

As the recent climate change agreement concluded between the United States and China demonstrates, the PRC is increasingly acknowledging the serious risks posed by unabated greenhouse gas (GHG) emissions. The breakneck economic growth that has persisted for several decades and ensured the continued legitimacy of the Chinese Communist Party (CCP) is significantly threatened by the effects associated with higher GHG concentrations, and nowhere is this danger more apparent than the southeastern province of Guangdong. China's most populous and wealthiest province, subtropical Guangdong faces an increased incidence of harmful heat waves, stronger storms, greater flooding, and higher (albeit more variable) precipitation in the years to come. Many of these threats are likely to be particularly pronounced in the low-lying Pearl River Delta, which is now the largest urban area in the world, and a vital economic engine for China. Given the stakes involved as they pertain to the CCP's rule and China's continued economic ascent, this project seeks to determine precisely how climate change risk is distributed across Guangdong, based on an analysis of historical weather data, hydrology, and socioeconomic characteristics.

Defining Climate Change Vulnerability:

According to the Intergovernmental Panel on Climate Change (IPCC), human vulnerability to climate change stems not only from exposure and susceptibility to climatic variations, but the ability of a society to adapt to these shocks, by "adjusting to climate change, moderating the potential damage from it, taking advantage of its opportunities, or coping with its consequences." Vulnerability indicators, moreover, can be found in many natural and manmade systems, from water networks, to healthcare capacity, to infrastructure.

Methodology:

To construct an index on overall climate change vulnerability, 3 sub-indices were constructed, reflecting environmental vulnerability, social vulnerability, and adaptive capacity. The most granular demographic information available on China is county-level data sourced from the 2000 national census; as such, the level of analysis was set at the 124 county-level divisions of Guangdong.

- **Environmental vulnerability** is comprised of three components: waterway density, average annual temperature from 1950-2000, and average annual precipitation from 1950-2000. These variables, meant to serve as proxies for flood risk and exposure to extreme weather, were averaged at the county level after being calculated.
- **Social vulnerability**, meanwhile, consists of five anthropogenic factors that impact susceptibility to the effects of climate change: population density, the percentage of the population older than 65, the percentage of minority ethnicities, the percentage of impervious land cover, and the percentage of the population employed in environmentally sensitive sectors such as agriculture, fishing, forestry, and animal husbandry.
- Finally, **adaptive capacity** measures five indicators that serve as proxies for the ability to absorb the economic and public health impacts associated with climate change: GDP per capita, highway and railroad density, illiteracy among the population older than 15, and the percentage of healthcare personnel in the population.

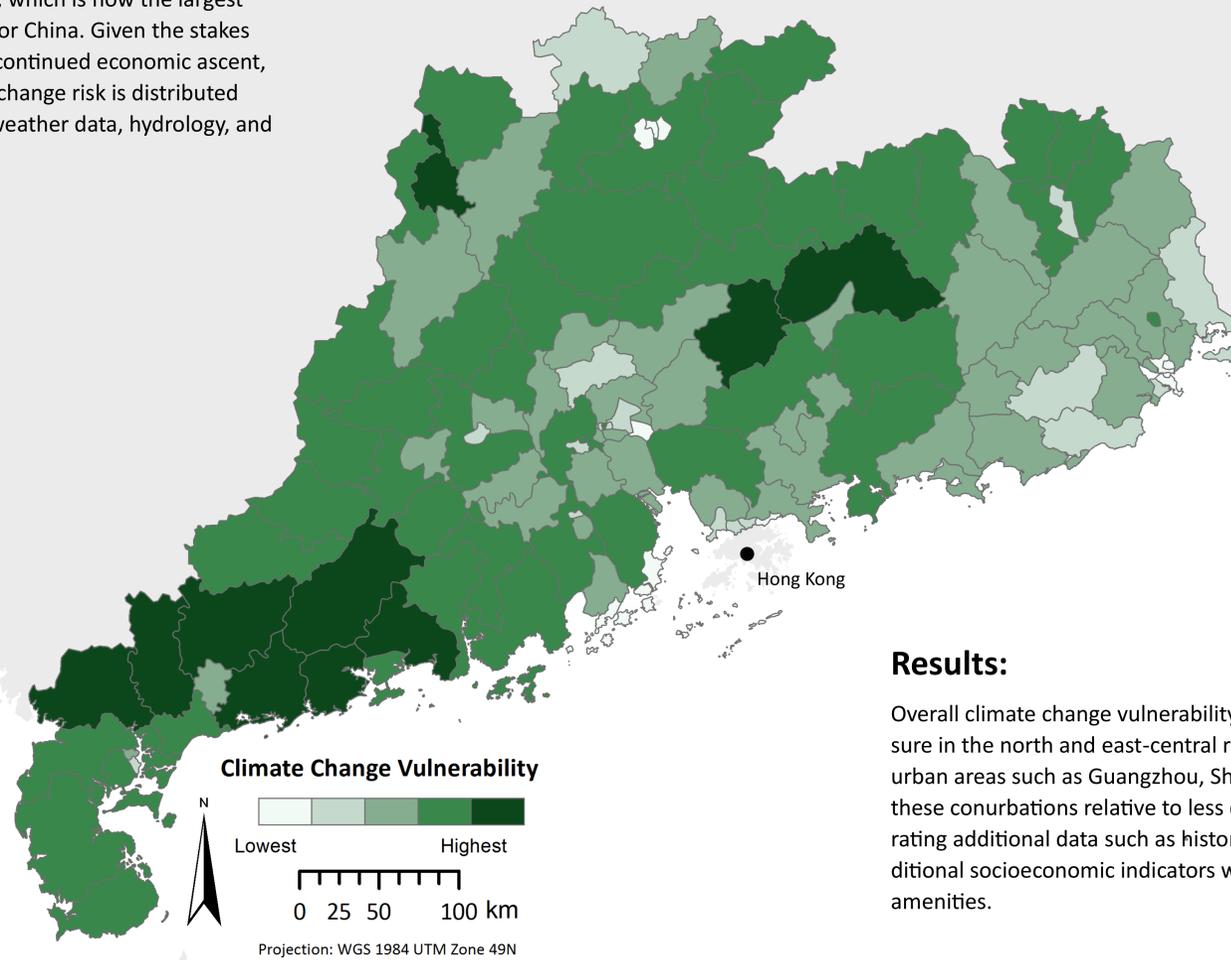
After compiling the variables above, every county was assigned a score from 1 to 5 for each indicator, based on the quintile in which it fell; 1 represented the least vulnerable, while 5 represented the most. For certain components of adaptive capacity, the evaluation is reversed; a high ranking on healthcare personnel, for example, would earn a county a lower score. For each sub-index, the scores assigned to each county for relevant variables were summed, resulting in 3 sub-scores that were used to create the secondary maps below. Next, these sub-scores were added together to obtain a final measure of climate change vulnerability, which was used to generate the primary map.

Results:

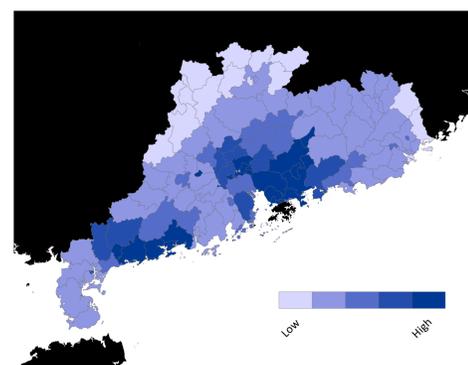
Overall climate change vulnerability is highest in rural southwestern Guangdong, with several other pockets of elevated exposure in the north and east-central regions of the province. Vulnerability is lowest, meanwhile, in small counties within major urban areas such as Guangzhou, Shenzhen, and Shaoguan, reflecting the greater wealth and socioeconomic advantages of these conurbations relative to less developed parts of the province. More significant results may be obtained by incorporating additional data such as historical flood records, future meteorological scenarios, projected global sea level rise, and additional socioeconomic indicators with bearing on adaptive capacity, such as access to air conditioning and other modern amenities.

Most Vulnerable Counties	Population (2000)
Gaozhou	1,219,132
Yangxi	380,272
Yangdong	409,982
Dianbai	1,459,219
Dongyuan	312,282
Total:	3,780,887

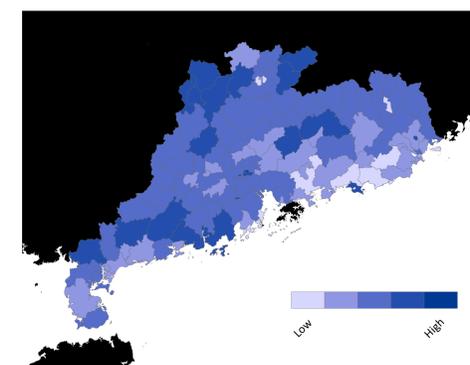
Least Vulnerable Counties	Population (2000)
Wujiang	191,655
Huangpu	389,413
Beijiang	139,684
Yantian	152,323
Xiangzhou	833,908
Total:	1,706,983



Environmental Vulnerability



Social Vulnerability



Adaptive Capacity

